ENCLOSE

ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

SULP PORTFOLIO

Sustainable Urban Logistics Plan developed by 9 European Cities for enhancing the Sustainable Urban Mobility

Including the methodology/guidelines for developing the SULP in your city

Co-funded by the Intelligent Energy Europe Programme of the European Union

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DEVELOPING AND IMPLEMENTING A SUSTAINABLE URBAN LOGISTICS PLAN

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ENCLOSE Doc. Type/ No. / Title
Deliverable D5.2: "A Framework for the definition and implementation of Sustainable Urban Logistics Plans in historic small-/mid-size towns"

WP
5

Date/ Version
02/13/2015 - v. 2.0

Diffusion Level
Public

Document responsible
MemEx

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DOCUMENT STRUCTURE

PURPOSE OF THE SULP GUIDELINES

This document, based on various acts and papers produced in the last decade by the EU on Urban Mobility and Energy efficiency (not least the Urban Mobility Package - 2013, White Paper - 2011, Action Plan on Urban Mobility - 2009) and in particular on the EU guidelines for "Developing and Implementing a Sustainable Urban Mobility Plan", aims to provide realistic and simple guidelines for city stakeholders and technicians, for developing a Sustainable Urban Logistics Plan (SULP) focused on the optimisation of urban freight logistics processes in order to reduce the related energy consumption and environmental impacts yielding its economic sustainability.

The present guidelines result from the work carried-out by the ENCLOSE partners in more than 2 years of project activities and, after setting the scenario and the concept of SULP, this document aims to present and discuss the methodology for implementing the SULP itself as part of the Sustainable Urban Mobility approach on a step-by-step basis, thus including operative working details, such as specific requirements and crucial actions to be carried out for setting up the urban logistics plan.

For each basic element of the methodology described in the following sections, a sample of the approach followed by a selected ENCLOSE towns is provided, including real examples and solutions implemented as well as the tools and the followed approach.

The ENCLOSE consortium is made of 9 towns and 7 different public/private entities (i.e. universities, technology research and energy agencies, independent consultancy companies, etc.) and since the beginning of project activities (May 2012), ENCLOSE partners have adopted an approach to urban freight distribution processes considering the point of view of Public Authorities (at different levels - Municipality, Province and Region), as these are the main responsible for identifying the most suitable solutions to logistics issues and for defining the suitable regulation framework, by considering different interest groups (shop keepers, retailers, distributors, transport operators, trade and citizens associations, Chambers of commerce, etc.) and the impacts on the environment and other city aspects.

Therefore, these guidelines can represent a key tool for supporting city stakeholders and decision-makers in the SULP definition and in monitoring its implementation process. Moreover, these guidelines can be a valuable support also for other stakeholders and actors involved in freight processes at different levels (including private sector, transport operators, shopkeepers associations, etc.), by allowing them to well understand the mainstreams and rules followed by local Administrations in planning, choosing and implementing city logistics policies and actions.

The present guidelines do not provide universal city logistics solutions, but they supply a possible method for analysing freight distribution processes, defining and choosing among the possible measures and services in collaboration with other relevant actors and stakeholders. It is therefore crucial to tailor the approach and methods here described on specific local needs and peculiar characteristics.

Eventually, these guidelines can be considered as a living document that will be continually edited and integrated including any comments and inputs from readers. The present document will be updated within 12 months after publication, in order to include any useful information received from other European Projects (mainly IEE projects), other European towns (i.e. those involved in EAHTR Association) and the general public (including practitioners and experts active in the fields tackled by ENCLOSE).

INTRODUCTION

European cities are forced to tackle a wide range of urban traffic problems: first of all the big challenge of reducing traffic congestions, CO_2, pollutant emissions, and energy consumption. According to the European Environment Agency, cities emit 69% of Europe's CO_2 and urban transport accounts for 70 % of the pollutants and 40 % of the greenhouse gas emissions from European road transport (European Environment Agency). On the other hand, cities have to guarantee to citizens not only the overall accessibility to the different city and transport services, but also an efficient urban freight distribution with respect to the economic and environmental factors. According to this, the Transport Policy White Paper set up the CO_2 free urban logistics as one of the 10 objectives to reach by the 2030.

Cities have to face the challenge of combining economic growth, competitiveness and sustainable urban development by taking into account the economic and technological changes that have been caused by globalisation processes. This challenge has an important impact on issues dealing with urban quality, such as a sustainable mobility, urban transport, and social, economic and environmental conditions.

Thanks to the application of specific technologies and local policies, and to the adoption of specific practices and solutions, European cities are in need to balance continuously their challenges and needs.

Cities are growing at a rapid pace with related increase in residential and business needs. The 70% of the population lives in cities, the majority of which in mid-sized cities (around 2000 in Europe), resulting in high demand of services, in the related increasing movements of goods in the city, and in significant energy consumptions (75% of the energy is consumed by cities). Cities therefore play a key role for achieving the EU objective of 20% energy saving by 2020 and for developing a low carbon economy by 2050[1].

Urban freight transport, unlike passenger transport, is largely due to private businesses and works on a pure commercial basis. Urban freight transport is a vital part of the economy of cities, but results also in significant environmental impacts. Despite this, the urban freight distribution sector has received relatively limited attention from both researchers and policymakers. Data on urban freight distribution are in fact quite limited, but where available, trends can be recognised and urban freight transport seems to be characterised by road transport.

It has been estimated that freight transport accounts for round 10-18% of urban road traffic, but the share of emissions of freight vehicles could vary between 20% and 30% of total urban traffic emissions depending on the local situation.

The impacts of freight movement to/within cities suggest that city logistics should be a key priority for their evolving transportation networks, but this is not the case in most urban contexts. In fact, a proper planning for good distribution has largely been forgotten in many urban plans and policies[2-3].

Based on gathered evidence, there is today a considerably growing consensus on the idea that more sustainable urban freight operations and significant benefits in terms of energy efficiency can be achieved by an appropriate mix of different measures such as: urban consolidation centres, optimised urban freight transport and delivery plans, use of clean vehicles and low emission technologies, focused regulation framework, public incentive/qualification policies, last mile and value added services, integration of city logistics processes within the overall urban mobility planning and management. Thus, considering that a single model is not valid for all towns (in particular if those are small and medium in size) one of the main objectives of the ENCLOSE project has been to develop a realistic and usable methodology/framework for setting and defining the Sustainable Urban Logistics Plan (SULP). This methodology was used (and tested) by the 9 ENCLOSE towns for developing their local SULPs and is now available to use by other European cities, willing to address urban freight related issues in the framework of the overall urban mobility planning.

1 - http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/citiesoftomorrow/citiesoftomorrow_final.pdf
2 - Hall, P. & M. Hesse (2013). Cities, Regions & Flows. Routledge, New York
3 - Dablanc, L. (2009). Freight Transport for Development Toolkit: Urban Freight. World Bank Report, Washington.

URBAN MOBILITY GOVERNANCE

In the last decade, the role of cities in the economic development of Europe has strongly emerged, as showed by the wide range of initiatives and measures targeted for towns that have been undertaken not only in European countries, but also in third countries (including developing countries).
As anticipated before, the 70% of the European population lives in urban areas and this percentage is expected to increase in the next years. Thus, the objective of making cities livable and competitive shall be one of the key priorities, as cities shall be one of the main driving forces of local and regional development.
Recently, both at European and international level, the concept of Smart City has quickly emerged, and the present document considers this concept with the broader meaning of "well functioning" city, able to tackle the issues affecting and producing significant impacts on the overall quality of life of citizens, such as energy consumption, pollution, health, social cohesion, efficient administration, accessibility and quality of Public Transport (PT) services.
For this reason, the concept of Smart City shall not be seen as a unique model to which all the different cities should refer to, but rather it should be considered as a multidisciplinary approach aiming, on the one hand, to the identification of real city requirements and, on the other hand, to the support in choosing, designing and implementing specific solutions and services, which are suitable to the needs of citizens and other actors belonging to the specific urban context.
In particular, based on gathered evidence, all the cities generally recognised as the most attractive, efficient and productive, show that a Smart City cannot exist without an efficient, integrated, collective, high-quality transport service in place (currently indicated also as "smart or intelligent mobility").
Therefore, mobility is becoming one of the key priorities to be addressed by local policy-makers and city stakeholders and it is mainly based on the following concepts: integration of urban and transport planning, implementation of actions and measures for boosting Pubic Transport use.
A sustainable mobility governance should be based on different services that have been already identified and, in some cases, yet consolidated and available on the market. However, the majority of cities (and relevant stakeholders) are still in need to undertake significant actions in terms of need-analysis, solutions planning, application of rules and allocation of resources. In fact, an overall agreement among transport and mobility actors is essential, in order to tailor and customise the available solutions to specific city features and citizens needs, and to integrate the different services in order to achieve a unique and efficient mobility offer.
In the following illustration (which is not intended to be exhaustive) the main services and solutions available for mobility governance are shown.
Efficient solutions usually consist in a mix of measures involving infrastructures (i.e. parking areas or bays, reserved lanes, loading/unloading lots, etc.), regulations (i.e. LTZ, access time windows for freight vehicles, parking lots management, etc.), "green" services (i.e. bike sharing, car and van sharing, etc.), technologies/systems (ITS such as, for instance, traffic and access control systems, user information systems, integrated payment, etc.) in the overall operation and management scenarios. All these measures and services shall be integrated and efficiently designed by means of a proper action plan (know at European level with the acronym of SUMP – Sustainable Urban Mobility Plan), which is usually based on the paradigm "Avoid - Shift - Improve", that is to say:

- Avoid unnecessary travel by integrating land use and transport planning, based on public transport prioritised corridors, and improved communications;
- Shift travels to more efficient modalities and increased (green) transit options as public transport;
- Improve fuel and vehicle technologies.

This paradigm highlights that sole technology does not automatically solve problems. Moreover, it is essential to consider that no effective results can be achieved – and no "Smart or Intelligent Mobility" can exist – unless smart mobility governance, including efficient Public transport, is implemented.
The main axes of intervention involve services, infrastructures and measures depending on the city objectives and specific requirements such as, among the others:

- Qualification, extension and differentiation of Public Transport services (dedicated and priority corridors as BRT/BHLS, flexible services/demand responsive/feeder, etc.);
- Implementation of "Green Measures" (low emission zone, pedestrian zone, bike sharing, bike stations, collective taxi, car-sharing, car-pooling, etc.);
- Development of Urban logistics services (last mile distribution, consolidation centres, etc.);
- Integration of different modalities (parking houses-Public Transport, Public Transport-bikes, etc.) and services interoperability (integrated ticketing, etc.);
- Updating measures to the already existing regulations, being flexible to needs changing (route optimisation, time windows season adapting, tourist bus parking spaces during summer, etc.);
- In particular, as regards Small/Mid-sized Historic European Towns (SMHT, the target of the ENCLOSE project) the

above approach should take into account specific situations with respect to the large urban and metropolitan areas by considering that: Private car trips are up 70% of total (in some cases up 80%);

- Attractiveness of Public Transport is decreasing for citizens and demand for flexibility of mobility services is increasing;
- Freight distribution has significant impacts in historic city centres;
- Parking management plays a key role in mobility policies with negative impacts on urban conditions, if not properly planned and implemented;
- ITS Technology scenario for managing mobility process is quickly evolving (e.g. Access Control, traffic and transport information platforms, VMS, Intelligent Routing based on real-time traffic state or AVL-automatic vehicle location management systems used for fleet management);
- Cycle and pedestrians trips are increasing, as well as alternative "green mobility services";
- The "political sensibility" for smart mobility services is emerging.

Thus, in SMH Towns the mobility governance approach should focus on the main axes below:

Mobility Governance: services and measure

People: rethinking the PT offer (from the Operator/Authority and from the end-users' point of view) with new organisation and services and in the perspective of a cooperation and integration with other modalities;

Goods: development of logistics services to optimise the efficiency of urban freight distribution processes and face the main problems related to shop keepers and self-supply activities;

Parking: development of new parking schemes combined with flexible PT and other green services.

In this context, urban freight distribution (or City logistics) is one of the key components of smart urban mobility governance contributing to the production of negative impacts on urban environment. City logistics should be planned and defined by City administrations for supporting sustainable freight distribution processes in terms of economic, environment and social equity/cohesion aspects. In this regards the relevance of Smart Cities' networks would facilitate the transfer of knowledge across national borders, creating a synergy between governments and academic partners, too.

CITY LOGISTICS IN SMALL AND MEDIUM EUROPEAN TOWNS

As pointed out in the previous sections, freight traffic flows are responsible for around 25% of the overall traffic congestion in urban areas. In small and medium historic towns, this situation is even more complex due to the peculiarities of such city context, such as old roads infrastructure, narrow streets, strict access regulations and the presence of valuable buildings, including heritage and historic assets. Historic towns can in fact experience high impacts (due to pollutant emission, noise, vibrations, safety hazards, etc.) and consequently high direct and external costs of logistics operation.

In the last years, whilst efforts and city logistics innovation projects have been undertaken in most European capitals and major cities, small and mid-sized towns, particularly those with historic centres, have been somehow lagging behind, as they have to face and overcome several peculiar barriers (e.g. shortage of resources, competences, organisational structures, institutional backing, etc.) to be able to effectively embrace innovation, adopt and implement appropriate plans and measures towards sustainable city logistics. Moreover, SMHTs also have to tackle additional issues related to their specific territorial, social and economic characteristics (e.g. difficult mobility and freight distribution flows, higher impacts of environmental pollution on citizens and quality of life, etc.) and show increasing demand for effective measures as well as large potentials for improvements of energy efficiency and sustainability of city logistics operations.

The need to address these issues is clearly recognised by the already mentioned White Paper, with two of its main objectives (among the 10 set up) dedicated to urban areas, and one specially devoted to urban freight distribution processes targeting free CO_2 city logistics.

Freight distribution flows are strictly dependent on the organisation of the commercial sectors of the city and on the related needs of different actors involved in the logistics chain (transport operators, shopkeepers, HoReCa operator, etc.). Other significant flows are related to other urban processes/services, such as mail distribution, garbage collection, cleaning activities, emergencies, building sector, home service, etc.

City logistics is therefore a key element of the whole urban mobility governance with a specific peculiarity: it is regulated/influenced by local authorities (both at municipal and regional level), and organised and operated mostly by private actors/companies.

This peculiarity implies, at the town level, the need of efficient solutions for facing different and (often) conflicting interests of the various actors involved (Municipality, citizens, shopkeepers, transport operators, etc.).

Considering this, today, especially in Europe, there is a considerably growing consensus on the idea that more sustainable urban freight operations and significant benefits in terms of energy efficiency and GHG emissions reduction can be achieved by an appropriate mix of different measures such as, among the others:

- Urban Consolidation Centres (UCC);
- Optimised urban freight transport and delivery plans;
- "Green" vehicles and low/zero emission technologies;
- Clean fuels;
- Access and parking restrictions and public incentive policies;
- Last mile delivery and added value logistics services;
- Integration of city logistics processes within the overall management of urban mobility;
- Updating measures to the already existing regulations, being flexible to the changing needs (route optimisation, time windows season adapting, tourist bus parking spaces in summer season…).

Specific requirements, characteristics, limits and constraints affecting European SM (H) Towns are necessary elements, at city level, to set up a specific Sustainable Urban Logistics Plan (SULP) as a useful tool for identifying the main needs, and to plan and evaluate the possible solutions integrated with the overall Sustainable Urban Mobility Plans (SUMP).

To this aim the ENCLOSE Consortium, as one of its project key objectives, has developed an updated and detailed SULP methodology. The present guidelines have been developed following a participatory approach and the policy level involvement, and adopting a bottom-up perspective that starts from user's needs, operators/associations' requirements and towns' objectives.

SUSTAINABLE URBAN LOGISTICS PLAN (SULP)

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

In other words, a Sustainable Urban Logistics Plan is a strategic plan designed to satisfy freight mobility needs of people and business in cities and their surroundings, in order to achieve a better quality of environment and of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles.

The SULP must be considered as one of the main parts of Sustainable Urban Mobility Plan (SUMP) devoted to integrate urban logistics schemes/services/regulations in the overall mobility strategies and solutions.

Within ENCLOSE and based on its project activities implemented by partner cities, the SULP has proved to be a useful tool for tackling different issues, in particular: managing freight distribution processes and designing solutions able to satisfy urban freight mobility needs of people and business within a midterm horizon; defining the common vision and priority goals of the city, analysing and identifying the most suitable solutions and evaluating related impacts; building consensus on the possible set of solutions among different actors and Local Authorities involved in the City Logistics processes; defining a road map for the adoption of the plan at Institutional Level.

5.1 CONSISTENCY WITH THE REFERENCE CONTEXT

As for the SUMP, also the SULP should take into account the socio-economic, territorial and environmental objectives reported in local, Regional and National plans on both short and medium term perspectives.

Therefore, the SULP should be defined by taking into account the constraints and the indications of Territorial and Urban Plans, in compliance with infrastructure management and other municipal programs and plans (i.e. social and economic programs, environment and air quality plans, etc.). Moreover, at city level the SULP, besides being part of the SUMP, should comply with the other local plans and documents, such as Urban Traffic Plan, Urban Parking Plan, Urban Governance Plan, Climate Change Mitigation Plan, etc.

Mobility policies that may affect freight transport in urban areas must be consistent with the relevant territorial elements and with the demand for transport services from businesses in the urban area (i.e. incentives for electric cars/vehicles could produce significant positive impacts on the local environment). Such policies could be adopted only after having thoroughly and carefully evaluated their potential effects on the economy both at local level and in a larger territorial context.

During the design and planning phase of the mobility policies, a continuous discussion and negotiation with, at least, the following actors shall be guaranteed:

- Representatives of all the actors involved in urban freight distribution processes;
- Neighbouring Municipalities or other Local Authorities that may be interested in the plan;
- Other interested public/private actors.

Specific agreements could be made in order to make these discussion forums official at the institutional level.

During the discussion, Regional Authorities shall support Municipalities in organising periodic meetings with logistics operators' associations, by means of institutional regional round tables meetings or by a specific Mobility Observatory useful for the definition of common guidelines.

In order to face the different aspects and issues of the urban freight distribution, SULP should affect different levels:

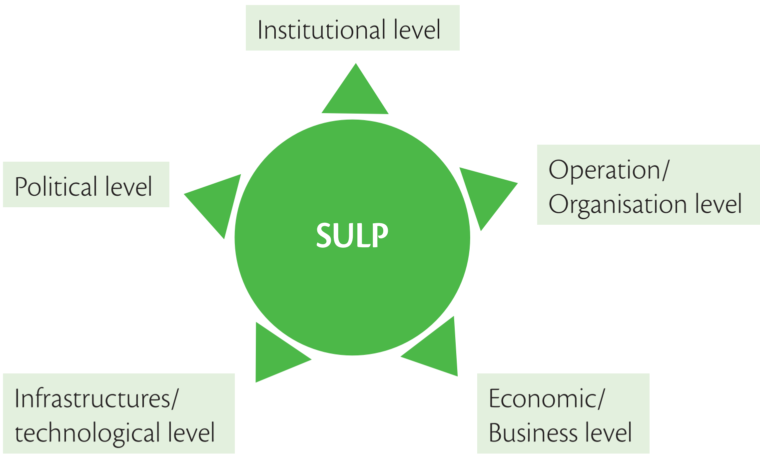
- Institutional level: legal framework, rules and conditions;
- Political level: consensus among different city actors and stakeholders (authorities, associations, operators, citizens groups, etc.);
- Operation/Organisation level: freight distribution schemes, base services, value-added services, operational procedures, integration in the mobility plan;
- Infrastructures/technological level: ICT platform, communication systems, innovative vans/vehicles, web services, etc;
- Economic/Business level: investment, operation cost, social/environment impacts, business model, etc.

As it will be better detailed in the following sections, a clear identification of the competences and appointment of (future) responsibilities among the involved stakeholders is a crucial factor to be duly considered both during the very definition of the SULP and, as a consequence, in the following implementation phase.

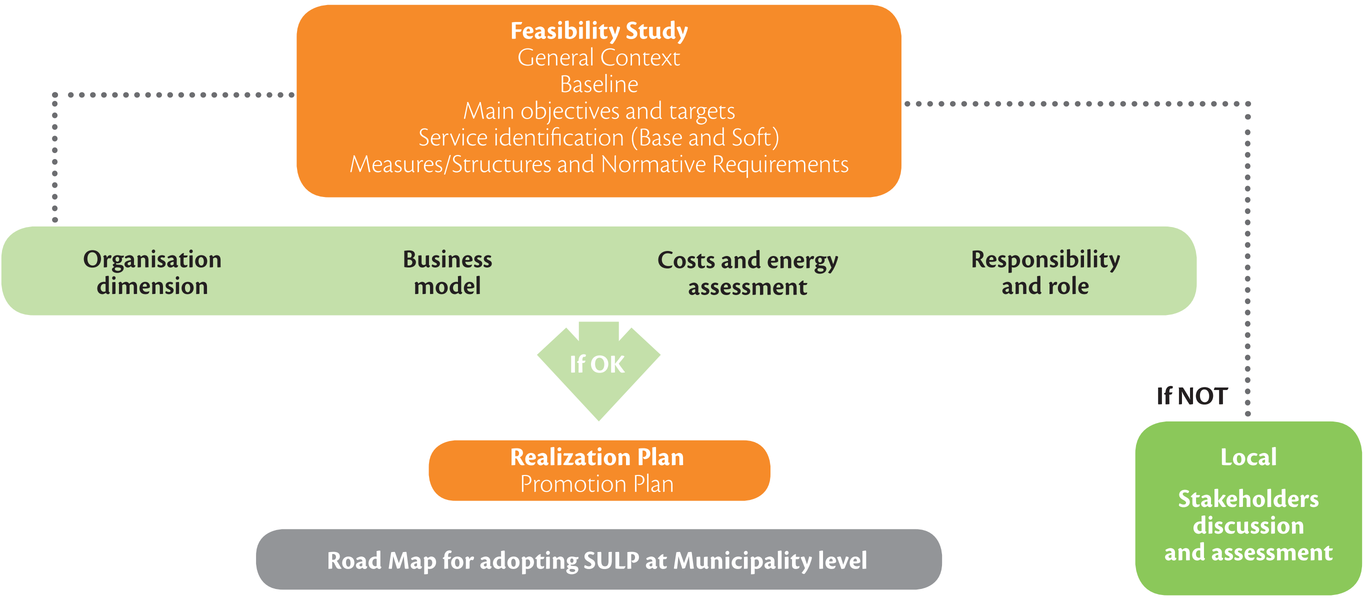
The methodology described in the following, aims to support city stakeholders in the definition and choice of the most suitable logistics services for the identified city requirements and the main mobility strategies (as defined in the SUMP).

The methodology workflow is represented in the figure below. The graph shows the main steps of the methodology: the analysis of city requirements and the definition of logistics baseline, the identification of the most suitable logistics measures and services, the description of each measure/service considering the results of the feasibility analysis (organisation and operating dimensions, costs analysis, impacts, responsibilities, regulation framework, etc.). Eventually, the involvement of actors and stakeholders in the evaluation and acceptance of measures, the promotion and dissemination campaign and the road map for the potential adoption by the Municipality/City authorities are indicated.

SULP action level



Main aspects of Sustainable Urban Logistic Plans Structure



LOGISTICS SERVICES: NEEDS, CHALLENGES AND BENEFITS

Logistics needs and requirements are rather different from town to town due to specific local characteristics, for example the size of the city, the dimension and structure of the inner centre, the existence of specific facilities and the urban road network, the shops and products, etc. Therefore, It is not possible to identify a "one for all" solution, but it is essential to define several options based on specific towns features, characteristics and identified needs.

During the ENCLOSE project activities, the most suitable logistics solutions for 9 European SMHTs have been identified in terms of challenges, opportunities and priorities. Firstly, a set of possible options and solutions paths was identified by carrying-out a review on the existing European situation. In parallel, specific needs of the 9 ENCLOSE towns have provided priorities in terms of importance, complexity of solutions, assessed/potential benefits and main issues and challenges to be faced. Then, a framework was defined focusing on the goals to be achieved and on the possible solutions to be adopted by the ENCLOSE towns, both for developing in a "smart" way the specific measures for urban freight process management and for involving different local stakeholders in policy and decision-making processes.

A cross-site assessment of needs and priorities of the ENCLOSE Towns has been carried-out for identifying the key high-level requirements common to all ENCLOSE sites. Needs/Requirements are grouped into the 4 investigation categories – socio-economic, commercial, operational, technical – and, for each site, the corresponding priority level has been assigned as follows: strong interest (■■■), fair interest (■■), moderate interest (■) as showed in Table 1 below.

The main issues / priorities outlined by the ENCLOSE towns were the following:

- Implementing more sustainable city logistics solutions to contribute to the reduction of traffic impacts in the historic centres: forerunner towns already have in place specific measures in this sense and they consider them as key goals in their urban mobility policies. Providing more sustainable city logistics entails the objective of increasing the quality of life of the urban centre;
- Increasing the competitiveness of the commerce and retail system and of connected business services with a more sustainable city logistics. Based on own experiences, the ENCLOSE pilot towns are also very focused on the definition of business models enabling a substantial reduction of the operating costs;
- Improving the regulation for accessing the urban centre: this is considered relevant due to the direct involvement of Local Authorities and the perception that they can act directly (i.e. formulating new rules by-local law) and quickly (as the enforcement is under their duties), achieving immediate benefits.

From the technical point of view, towns are very interested in technology, allowing an easy management of the whole operation/logistics cycle. However, integration of smart logistics policies in the overall Sustainable Urban Mobility Planning (SUMP) mitigates to some extent the need to use technological approaches. Thus, the common approach "buy technology and solve the problem", that has become a trend in the transport and mobility context, can be reconsidered as a half-truth: technology surely helps transport and mobility management, but it cannot solve problems without an accurate revision of mobility/logistics urban planning.

In parallel, an analysis of best practice existing in Europe, particularly regarding small and mid-sized towns, was performed, highlighting measures with the highest potential for the ENCLOSE towns (and for European SMHTs in general).

Mobility Governance: services and measure

	Key needs & reqts.	Lucca	Trond.	Den'B.	Burgos	Almad.	Dund.	Alba I.	Serres	Balch.
Socio-economic	Reducing traffic impacts in the historical centre	■■■	■■■	■■■	■	■	■■■	■■	■■	■■■
	Increasing livability of urban environment	■■■	■	■	■■	■■	■■	■■	■■	■■
	Enhancing local economic development	■■			■■	■■	■■	■■	■■	■■
Commercial	Generate benefits on competitivn. & business	■■■	■■■	■■■	■■■	■■■	■■■	■■	■■■	■■
	Optimise logistics operations	■■■	■■■	■■	■■	■■	■■	■■	■■	■■
	Reduce costs, improve knowidg of delivery cost	■■■	■■■	■■■	■■	■■	■■■	■■	■■■	■
Operational	Improved city access regulations	■■■	■■■	■■■	■■	■■	■■	■■	■■■	■■■
	Support adoption/use of sustainable vehicles	■■	■■	■■	■■	■■			■■	
	Measures supporting transp. operators market.	■■	■	■	■	■	■■	■	■■	■
Technical	Systems to optimise fleet and delivery operations	■■■	■■■	■■	■■	■	■■	■	■■■	■■■
	Systems to optimise logistics operations	■■■	■■■	■■■	■■■	■■	■■	■■	■	■■
	Improved integration of logistics in urb. mobility	■■■	■■	■■	■■	■	■■	■■■	■■■	■■

SOLUTION'S PORTFOLIO FOR SMALL AND MID-SIZED HISTORIC TOWN

A selection of key solutions were identified in order to tackle the needs of small/mid-sized historic towns:

1. ***Urban Consolidation Centres (UCC)*** represent one of the most common and successful measures implemented in European SMHTs, with several remarkable experiences recorded in Italy (Vicenza, Lucca, Padua, Parma, Modena), France (La Rochelle), Switzerland (Thun), UK (Bristol, Southampton) and in The Netherlands.

The required investment, which may be high in relation to the physical infrastructures and technical installations involved, pays off in terms of benefits for the urban environment and services for the population: optimisation of vehicle loading and optimisation of routing, reduction of the number of trips, etc. However, in most cases, the (strong) support from the local administration is necessary to ensure financial sustainability of UCC operations.

Overall, critical factors shall be considered for any transferability investigation in ENCLOSE sites: build-up of consensus around the "UCC project", among all the key stakeholder categories involved (freight transport service providers, shops and retail operators, citizens associations, etc.); identification of the best position and accessibility of the UCC (e.g. proximity to the main road network, city access areas, etc.);

Definition of the role of public authorities and of supporting regulations fostering UCC take off (restrictions, incentives, impacts on the market, etc.).

An analysis of the key aspects (in terms of challenges and benefits) about different approaches to urban logistics consolidation centers was done comparing Lucca's solution (LuccaPort) with the solution implemented in s'Hertogenbosh (Binnestad-Service) for potential transfer to the other ENCLOSE towns.

2. The implementation of ***Low Emission Zones (LEZ)*** is also an emerging measure in European cities and towns (e.g. Bologna, London, Maastricht, Prague, Randstad, Rotterdam, Utrecht, etc.). This measure is naturally linked to other city policies, plans or measures, such as Air Quality Plans, Controlled Access Zones, etc.

Access to the LEZ and transits may be controlled by ITS equipped barriers of tollbooths, or simply advised without any special control infrastructure/technology. Pricing and enforcement systems may be also applied, e.g. through fixed and mobile cameras system.

The positive impacts and benefits of LEZs are generally significant, leading to air quality improvements due to the reduced traffic emissions in terms of particulate matter (PM10) and other pollutants (O3, CO, NOx, SOx etc.). On the other hand, several obstacles may be faced before and during their introduction: the consultation process with the involved stakeholders may be long (and often controversial), the costs of enforcement may be high for authorities, etc.

3. The introduction of ***"eco-vehicles", particularly Fully Electric and Plug-in Hybrid Vehicles (FEVs, PHEVs)*** for city logistics operations is becoming a viable option for local administrations and logistics service providers addressing sustainability policies and objectives.

In most cases electric vehicles are vans and small trucks (up to 3,5 ton), but also other types of FEVs that started to be used for operating last mile service, and several forms of B2C services as well cargo cycles (used, for instance, in the Petite Reine scheme in Rouen, FR, or Gnewt Cargo scheme in London, UK). Besides last mile services, FEVs are used to support sustainable self-supply transport (for shops, businesses and citizens) for example with van sharing schemes.

Overall, the surveyed best-practice operating FEVs have shown that electric vehicles bring clear benefits as regards the abatement of exhausted gases, CO_2, and noise emissions. Not least, FEVs are easily accepted by the public and providing a positive "image" which may be an important support factor for the introduction of new sustainable logistics services in a site.

During the ENCLOSE project, services operated in the forerunner towns of Lucca and Trondheim were investigated for potential transferability of FEV-based schemes in other sites. The surveyed best practice show the importance of adapting or introducing new administrative measures and regulations to properly support FEV-based schemes in urban logistics operational and organisational context. Moreover, during the ENCLOSE project, a detailed analysis was carried out by AUSTRIATECH for defining the specific features of FEVs for meeting the requirements of city logistics and in particular the needs and objectives of transport operators. A specific report was delivered about European cities that have successfully introduced electric vehicles into their logistics fleets with a specific focus on: regulation, incentives and options defined for facilitating the modification of infrastructure by cities and companies[1]. Moreover, an overview of the state of the art about the existing low emission vehicles was carried out[1].

4. ***ITS and technologies*** have gained a

1 - "Electric Fleets in Urban Logistics Improving urban freight efficiency in small and medium-sized historic towns". ENCLOSE Project report, AUSTRIATECH, Wien April 2014 crucial role in the implementation of advanced city logistics solutions. More than 50% of surveyed best practices involves the use of ITS and other technical tools, from load and delivery planning software, to fleet monitoring systems, track-and-trace solutions, vehicle occupancy/transit detection technologies, automated vehicle identification (e.g. number plate reading), monitoring and enforcement systems and others.

The introduction of ITS and ICT services to optimise logistics operation, fleet management and delivery scheduling has been also expressed as a main technological requirement by ENCLOSE towns.

5. The importance of the ***integration*** between new urban logistics measures and urban and mobility planning has clearly emerged in the surveyed European best practices.

The relationships more frequently identified in ENCLOSE survey concern:

- The location of the Urban Consolidation Centre and its integration within the overall urban (and regional) transport network;
- The location of other urban logistics infrastructures such as a "Proximity Logistics Spaces", dedicated freight load/unload areas, etc.;
- The development of Urban Mobility Plans, Freight Distribution Plans, Low Emission Zones, etc.

The integration of sustainable urban logistics plans in the broader context of urban planning represents a strategic issue for ENCLOSE cities both in the design and in the implementation of a particular sustainable logistics measure.

Summing up, a few key facts describing the actual situation about city logistics at European level can be usefully mentioned:

- City Logistics development is an ongoing process;
- There is quite a long history with many good examples and some failures (also useful as references);
- There are many solutions, different schemes and services;
- A "one model fits all" towns does not exist. On the contrary, local objectives and requirements must be analysed and should drive the implemented solution/model;
- A fundamental role is played by Local Public Administrations;
- It is essential to identify and clearly allocate responsibilities among the involved actors and stakeholders;
- It is important to share knowledge and experiences with other sites;
- In some cases a "simple" measure (i.e. enforcement of measures already in force) can be an actual and effective step ahead;
- The definition of a realistic and robust budget plan on a long and short/medium perspective is important for the sustainability of the action;
- The business model remains an "open issue".

"SOFT AND HARD" MEASURES REFERENCE CONTEXT

ENCLOSE project defines two different levels of solutions implemented at local level, tackling urban logistics issues:

- "Soft" measures: measures not requiring high-value investments, that may produce complex and significant impacts (i.e. measures as new/enhanced regulation dealing with restriction of access to the historic centre or to parking rules for freight vehicles, etc.);
- "Hard" (or pilot) measures: measures requiring significant investments, structures and specific organisation and operational dimensions.

ENCLOSE follower Towns have implemented different soft measures taking into account their own local objectives and requirements. These measures have been defined also on the basis of the experiences of ENCLOSE Pilot Towns and taking into account the emerging reference context in the European cities and projects funded by different EU Programmes.

The following table provides some examples of the two categories of measures, Soft (S) and Hard (H), based on the type of action adopted and on the involved stakeholders:

Soft (S) and Hard (H) measures context

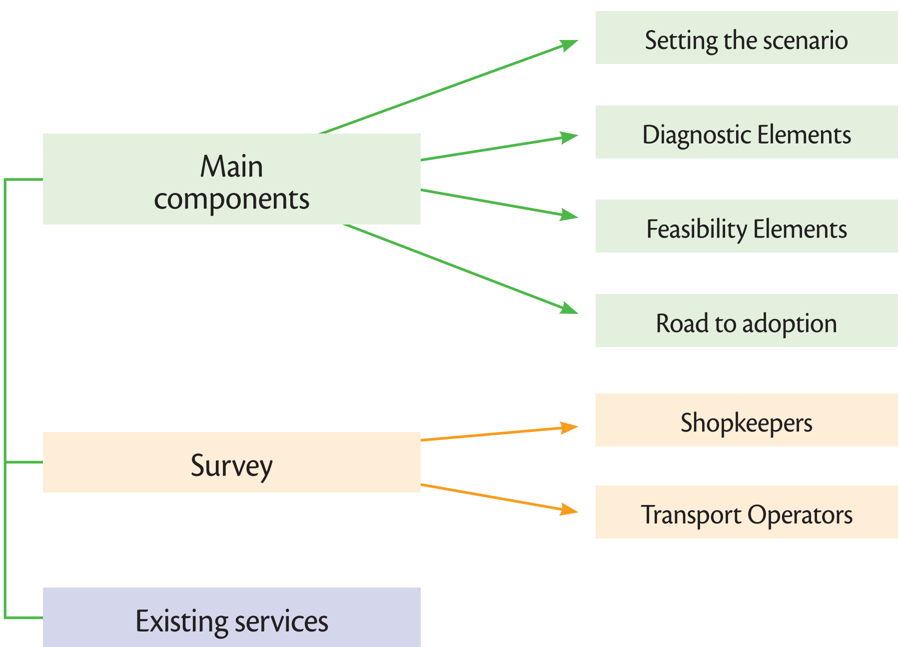
Service Measure	Key Actor Interested Actors	Type S/H	Requirements	NOTEs
Regulatory changes	Municipality Associations Transport operators	S	By-laws	Changing the rules on vehicle engines and fuel, time windows, load factor, certification (example Copenhagen)
Load consolidation	Municipality and/or Logistics Platform Manager, Transport operators Association, etc.	H	- Logistics Infrastructure - ICT Platform - Eco-fleet	Lucca Port - Consolidation centres - Trans-shipment centres - Freight terminals/transit points - Public logistics terminals - Urban platforms - Off-site stock room/logistics support centres, collection points
Last-mile delivery	Municipality and/or Transport Association, etc. Transport operators	H	- Logistics Base - ICT Platform - Eco-fleet	A good example for this kind of measure is provided by the experience of Lucca Port, www.luccaport.it
Reverse logistics	Municipality, Transport operators Local trade associations, shop-owners	S	-Eco-fleet	Reverse logistics deals with e.g. refused/returned goods, collection and transport of packaging materials, etc. The collection of used packaging and other waste materials from shops can be operated according to subscriptions or, if possible, on-demand.
Delivery services through "Pick-up-Points"	Transport operators Other actors (e.g. gas stations, ...) Shop owners	H	- Logistics Base - Pick-Up-Point boxes	- Pick-up Points (PuP) operated in public locations (e.g. public buildings). A reference for this scheme is the Packstation™ system operated by DHL-German Post in several cities and towns in Germany - PuP based delivery services involving facilities from other service chains; e.g. using petrol stations like in the Kiala service, operated in Benelux, TNT and Shell partnership, etc - PuP based delivery services integrated with other mobility related services; e.g. delivery services at parking and Park & Ride locations, like the Park & Buy scheme piloted in Siena or a similar scheme operated in Ipswich, UK and Trondheim (N)
Home delivery	Transport operators Association Large-scale distribution	S	- Eco fleet	Similar to the former service, this measure is used for operating the delivery of goods at specific locations within the historical centre, such as hotels and other service locations Such services could be operated as value-added services offered by the involved organisations (e.g. individual hotels, hotel chains, Tourist Office, etc.) to their customers. Agreements between such organisations and organisations of the retail system (i.e. shops, Trade Association, the Chamber of Commerce, etc.) is also required

Service Measure	Key Actor Interested Actors	Type S/H	Requirements NOTEs	
Delivery at the Parking lots – Park&Buy	- Transport Operators - Parking Operators - Shop owners	S	- ECO Fleet - Dedicated spaces in the parking	Insurance problems to be faced. As in the former case.
Remote warehouse services	UCC's Logistics platform operators Shop owners Transport operators	H	Logistics Base	This facility produces the following benefits: - allowing shop owners to access and consult the state of their remote stocks; - services to allow shop owners to request the collection and consignment of any item from the remote warehouse to the shop; - replenishment transport services between the logistics base and the involved shops operated by eco fleet vehicles as a result of previous operations. This service has a particular importance for small shops and points of sales as it contributes to make the most of their usable space, increasing the space available for those activities that are commercially most relevant (i.e. clients area, show room, displays and promotion space, etc.)
Loading-Unloading Areas management services	- Parking Operator - Municipality	H	- road infrastructure - ICT	This service scheme involves: - The possibility for users to book the required Loading-Unloading Areas, in accordance with the relevant regulations: day/time access restrictions for the particular user category (see Annex 1), allowed time window, etc. - The assignment of the requested loading -unloading bays to the users, according to the overall situation of demand and offer and, eventually, to any additional restriction related to the applied policies (e.g. max. number of allowed vehicles in the area). - The control of usage conditions and the generation of information or alerts to the police (e.g. exceeded time limits, unauthorised vehicle for the specific UA, etc.)
Van-Sharing for self-replenishment of the shop	- Transport Operators - Municipalities - Shop owners - Trade Associations	H	ECO Fleet ICT	Common use of commercial vehicles under a sharing scheme.

METHODOLOGY APPROACH

This chapter provides user-friendly guidelines on how to develop a SULP - Sustainable Urban Logistics Plan, highlighting key elements that should be considered.
The SULP methodology should follow a participatory approach, based on a strong involvement of the political level (as in SUMP methodology) but maintaining a bottom-up perspective, starting from user needs, operators/associations requirements and following town policy priorities and perspectives. The following chapters deal with and thoroughly analyse each single element which shall be considered in order to develop a realistic SULP supporting city stakeholders/managers in strategic planning and decision-making regarding freight distribution processes in local urban contexts. Each element of the methodology includes a set of actions, that are described by providing real examples coming from the work carried-out in the 9 partner towns for the implementation of their SULPs. Therefore the proposed methodology, including each one of its unique components, has been already tested "on site" by the cities involved in ENCLOSE project activities and this surely results in an added value for this document, containing a very practical approach to the topic. It is important to highlight that elements and related actions described in the following sections shall be considered as a reference framework that city stakeholders (urban mobility planners or decision-makers) should take into account during the SULP development, yet this methodology is subjected to changes and adaptations depending on local needs and requirements. Obviously, there is no unique official method for elaborating a Sustainable Urban Logistics Plan, but ENCLOSE activity allowed to develop a consistent and detailed approach that involves all the elements described below. The graph below summarises the key structure of the SULP Guidelines.

Key structure of the SULP Guidelines



The following table provides the list of the specific steps related to each methodology elements.

The SULP elements

E0: Setting the objective and target
E1: Urban mobility scenario and priorities
E2: Analyze the logistics context and processes
E3: Setting requirements and logistics baseline
E4: Identified measures and services vs. requirements
E5: Service design
E6: Organisation, business model and contracting
E7: Assessment and impacts evaluation
E8: roadmap di adopt the SULP
E9: Responsibilities and implementation/ monitoring plan
E10: Promotion and Communication Plan

EØ: SETTING THE OBJECTIVE AND TARGET

RATIONALE

The reference scenario for the definition of the main objectives to be reached at town level, in terms of urban mobility and transport, is provided by policies and official documents issued by the EU in the last 10-12 years.
As regards strategic planning and identification of priority objectives dealing with urban mobility and city logistics, city stakeholders and decision-makers shall consider the White Paper (2011), which sets 10 goals for a competitive and resource-efficient transport, two of which are specific for urban areas:

- "Halve the use of 'conventionally-fuelled' vehicles in urban transport by 2030, phase them out by 2050";
- "Achieve essentially CO_2-free city logistics by 2030 - in major urban centres.

In this document, the transition from a car-based mobility to a mobility based on walking, cycling and high-quality public transport as well as to sustainable solutions for freight distribution in urban areas is outlined.
This objective can be well recognised also in the methodology set-up for developing Sustainable Urban Mobility Plans, where the transition from "traffic planning" to "planning for the people" is emphasized. Concerning logistics processes, the main objectives stated in the White Paper can be summarized as follows:

- Optimising urban logistics efficiency considering market and environmental aspects. This means that different problems need to be tackled by adopting a multi-disciplinary approach, always keeping in mind that logistics is strictly related to the overall city life and economic growth;
- Improving the links between long-distance, inter-urban and urban freight transport;
- Incorporating freight transport in local mobility policy and developing "Sustainable Urban Logistics Plans".

Despite the provisions of EU positions/legislation as key reference pillars, service planning at local level shall be based mostly on the real urban and transport situation. As anticipated, the absence of one model valid for any town means that strategic objectives shall be clearly identified on the basis of local stakeholders priorities and on local mobility services for accessing the city.
The approach usually adopted is focused on the minimisation of both economic costs and negative impacts to improve the sustainability, by taking into account the interests and needs (often conflicting) of different actors involved in the urban logistics chain (local authorities, service providers or agencies, logistic companies, transport service providers, commercial operators, consumers, etc.) in their different representation bodies (Chambers of Commerce, citizens associations, operators associations, etc.).

TASKS

Different activities should be set-up at this stage for creating the suitable baseline in terms of knowledge:

- Identify key actors interested in City logistics and involve them in the planning process;
- Involve Local Administrations, stakeholders and politicians (first of all the Mayor and its staff) and assist them to thoroughly understand city logistics approach and solutions, starting from the EU directives;
- Set the priorities, based on the overall Municipal strategy for urban and economic development plan and on the overall mobility policies including measures defined in SUMP, if any;
- Guarantee the alignment with the upper-level policy (mainly regional/national and, if necessary, European);
- Discuss with key stakeholders about possible hypothesis and check the possible consensus in carrying-out a city logistics process.

METHODS AND TIMING

City stakeholders should use web sites and official documents in order to get information regarding existing experiences and relevant legislation.
Focus groups are a useful tool for setting the objectives allowing to make high-level discussion and to involve other relevant stakeholders. This activity should be carried-out in a short time (ideally in one month).

EXAMPLES FROM ENCLOSE

BOX 1 - Stakeholders – Main actors and their goals

Actor category	Example	Goals and interests
Freight delivery services	Freight forwarders Shippers	More efficient delivery chain, less delays in delivery, increase delivery volumes, etc.
Freight transport services	Long-distance transport Express couriers, etc.	Less mileage, less delays, less operational costs, empty runs reductions, etc.
3rd Party Logistics providers (3PL)	Consolidation Centre Operators Added-value logistics service providers	Business opportunities, new customers Optimise service to reduce operational costs (e.g. increase load factor, decrease number of trips)
Retail system service providers	Shops, Retail associations, e-Commerce, HoReCa	On-time delivery, less storage, new services (packaging/waste collection, etc.) No increase of costs.
Local Authorities	City Council Mobility Dept. Urban Police City Council Commerce Dept City Council Traffic planners City Roads Authority, etc.	Less congestion Less emissions/noise Better living conditions Increased City attractiveness, etc.
Citizens	Consumers Residents Tourists and travellers, etc.	Better services (e.g. on-time delivery, information, etc.) Better urban environment, More safety (e.g. for pedestrians), etc.

BOX 2 - General city objectives

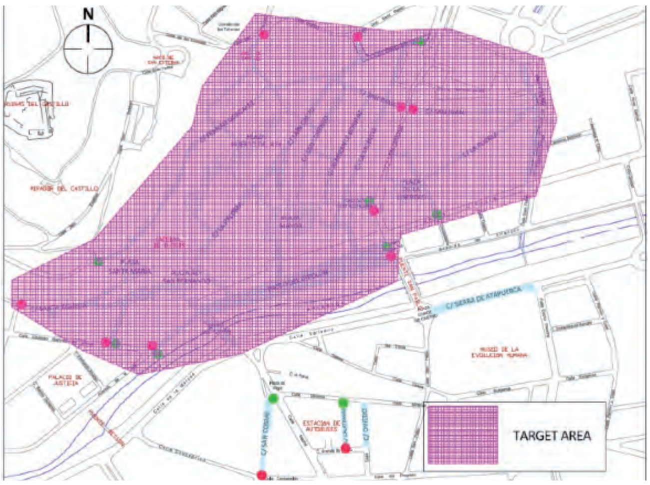
From the socio-economic point of view: - Reducing traffic impacts in the historic urban centre - Increasing the livability of the urban environment - Enhancing local economic development	*From the commercial point of view:* - Generate tangible benefits on competitiveness and business expansion - Optimise logistics operations - Reduce costs and improve knowledge about the costs of deliveries/logistics
From the operational point of view: - Improved city access regulations - Measures to support the adoption and operation of sustainable (e.g. fully electric) vehicles - Measures to support the transport operators market	*From the technical point of view:* - Tools, systems and solutions to optimise fleet and delivery operations - Solutions to optimise logistics operations - Improved integration of logistics operations within the overall urban mobility system

BOX 3 - The case of Burgos

Burgos is a medium-sized city (180.000 inhabitants) situated in the North-central part of Spain in the region of Castilla y León.
The urban area is 108,26 km^2 with a population density of about 1.662 inhabitants/km^2. Burgos is an important commercial and touristic city, worldwide known because of its cultural, monumental, and artistic heritage including 3 sites declared Human Heritage by UNESCO.
Its historic centre extends for over32 km^2 and houses 14.041 residents.
The funnel effect of the river and the Castle hillside, the wide historic heritage, narrow roadways and streets complicate mobility and logistics in the historic centre. With a view to reducing pressure in the urban zone arising from various economic and social factors, different activities have been carried out over time and in an orderly manner: traffic has been limited to certain streets, pedestrian areas established over 3% of the surface area, energy substitution introduced in buildings, parking areas built for 8% of the residents, etc.
The area identified in Burgos for the analysis of commercial and logistic activities and possible solutions ("study area"), is the vehicle-restricted area of Burgos Historical City centre.
It is located in the historic city centre, around the cathedral, where about 628 commercial activities are placed, in particular: HO-RE-CA (32%), food (9%), personal equipment (33%), home equipment (10%), commerce with high service component (9%), banks (5%) and pharmaceuticals (2%).
The strategic objective set-up by the City administration was to design and establish a sustainable model capable of solving logistics needs of the city of Burgos both in the present and for the future.

On the basis of the Burgos context the following main strategic objectives/lines have been defined:
- Strategy Line 1: Deepening the understanding of various aspects of urban logistics management with new technologies. Smart city approach;
- Strategy Line 2: Optimising and implementing common infrastructures, services and resources;
- Strategy Line 3: Greening urban logistics system;
- Strategy Line 4: Rearranging the space devoted to parking. Refurbish urban public spaces and small key points;
- Strategy Line 5: Promote intermodality, coordination and integration of logistics.

The municipality set-up a specific "focus group" involving the different actors actively involved in the logistics chain. The focus group has been active all along the production of the SULP report.



E1: URBAN MOBILITY SCENARIO

RATIONALE

One of the crucial parts of the methodology is the analysis of the overall situation of the city. It is therefore essential to understand well from the very beginning the city context, paying a special attention to the inner centre, from the mobility, transport and logistics points of view, in order to identify the specific issues and concerns that need to be tackled. One of the key preparatory actions is the clear definition of the study area (that usually corresponds to the city centre) and the identification of the main features of the reference area by, for instance, collecting mobility information and data about economic

activities, social aspects, attraction centres (including the position of shopping centres and small shops) and traffic nodes.
Moreover, it is fundamental to identify:
- Zones which are mainly interested by freight flows, especially in those areas with a high percentage of economic and commercial activities;
- Characteristics and main types of city logistics flows (e.g. clothing, foods and drinks, Ho.Re.Ca., supermarkets, consumer electronics, house appliances, etc.); main regulatory aspects in force (e.g. traffic restrictions, pedestrian areas, regulated access areas, special regulations for residents, etc.) with particular attention to regulations for commercial and freight vehicles circulation. Eventually, the analysis of the study area from the perspective of ITS and city mobility technologies (e.g. Access Control System, Road Pricing systems, Parking Management System, etc.) is also important.

TASKS
Among the most important tasks involved in setting a urban mobility scenario are the following:
- Identifying key city documents to be used for analysing the local situation (statistics, political decisions, past traffic surveys/data, city strategic planning, spatial development plans) considering different aspects, from mobility to social conditions;
- Reviewing the main existing/planned investment programs and decisions, dealing with mobility and logistics at Municipality level;
- Revising the available data on different transport modalities and making a critical reading of the main figures;
- Identifying the main data-source campaign on traffic already carried-out by the Local Authority, also by using the census data for obtaining a real picture of the city (e.g. definition of an o/d matrix);
- Analysing the situation of the technological systems and devices available in the urban area (i.e. access control system, urban traffic management system);
- Identifying existing infrastructures and facilities for city logistics and freight distribution (e.g. Distribution Terminals, load/unload areas for freight) that can be available and already in operation (forerunner sites) or are planned, studied or of potential interest for the site (followers sites);
- Analysing the key existing regulation framework and identifying the main relevant rules.

METHODS AND TIMING
The implementation of this task is mainly based on desk activity and on the existing documents produced by the departments of the Municipal administration and by other involved public and private entities (chambers of commerce, associations, etc.).
It is advisable to use GIS tools and a user-friendly database to summarise and process all the collected information, to clearly identify the most significant zones or points of interest, and to highlight the areas where city logistics solutions are currently lacking and could be implemented.

BOX 1 - The case of Serres

The city of Serres is located in the Northern part of Greece (Region of Central Macedonia). Following a recent legislative reform in the Greek local administration, Serres is now an extended Municipality (resulting from 4 former municipalities and 2 communities of the Region) and the largest in population among the 7 Municipalities of the Regional Unit of Serres.
Situated 80 km NE of the city of Thessaloniki, Serres is integrated in the Transeuropean Transport Networks, part of the Egnatia Motorway vertical axe. Since its complete destruction in 1913, Serres has gradually become a remarkable urban administrative and commercial centre with rich traditions, sports and cultural activities in arts and literature.
Serres area is around 600 km2 and its residential population sums up to 75.233 people (2011 census). There is also a considerable student community due to the presence of the Technical Institute of Serres and the Physical Education Department of the Aristotle University of Thessaloniki.
During working days, the number of people increases up to round 100.000 due to commuters, students and city users.

Mobility management is an open issue for the Municipality of Serres. In 2008, an important Traffic Regulatory decision was made by the Municipal Council concerning improving sustainable urban mobility, with pedestrian paths expansion towards the whole historic and commercial centre, increase of controlled parking area up to 4,000 spaces, construction of cycling pathways and creation of three regional facilities for park and ride.
The Municipality of Serres has shown a significant interest in environmental protection and energy saving matters. Among other activities, it has established an office for energy management and promotion of energy environmental technologies. Given recent national funding opportunities, Serres has gained considerable funding on energy saving related projects, mostly concerning buildings and green energy solutions. Sustainable urban mobility was also part of the energy saving rationale of these projects. Therefore, a urban mobility study will be undertaken in 2015.
In addition, as regards urban space management, a lot of new infrastructures have been recently developed, such as pedestrian areas, cycling paths, urban equipment, accompanied by mobility management measures.
In this context, urban freight transport is a key issue, and regulatory decisions are also in place. However, Serres needs a revision as actual regulations are a bit out of date and have to be enforced by traffic police control, given the recent abolition of Municipal Police. Having acknowledged the problems related to the current freight traffic situation, especially in the city centre, the Municipality of Serres is interested in making steps forward in this field. In close collaboration with different stakeholders, a strategy towards sustainable urban freight mobility needs to be developed in order to avoid traffic congestion or energy consumption, towards more environmental friendly commercial fleet and logistics management in order to obtain social approval and bring economic growth. The Serres SULP will be integrated in the municipal agenda, giving space to a new urban freight regulation in the commercial area shown below.

BOX 2 - Dundee users' needs analysis (the table is also relevant for component E2)

Technical Users' needs	Operational Users' needs	Commercial users' needs	Socio economic users' needs
Allowing track-and-tracing	Possibility to contact and contract different transport operators (transport operators 'market')	Maximising profits	Enhancing local economic development
Possibility to generate statistical reports about the logistic processes	Creation of a consistent framework of institutional measures (public and private): public private partnership construction	Generating recognisable benefits for the participants (price, delivery time/quality) to optimise logistic measures	Increasing citizen's employment opportunities
Interfaces with other systems sharing data / information	Removing authorised time windows restrictions for delivering goods to customers	Minimising transport costs of inner city deliveries	Increasing pedestrian citizen / tourist city tours
Possibility to handle external warehouses	Harmonising access restrictions (weight/length) between municipalities	Increasing business	Reducing impacts of traffic congestion
Route planner (GIS) and real-time traffic information system	LC	Deliverying cost knowledge	Improving the environmental sustainability and CO_2 reduction within the city
Using logistic optimisation technologies to increase load factors of carrier trucks		Maintaining goods transport prices in the inner city at a competitive level	Improving the urban area traffic safety
Optimising the assignment of available loading and unloading spaces (network optimisation)	LM	Increasing the number of deliveries	Reducing kilometers driven related to goods distribution
	LM	Optimising the distribution system for retailers	HM

E2: ANALYSING THE LOGISTICS CONTEXT AND PROCESSES

RATIONALE

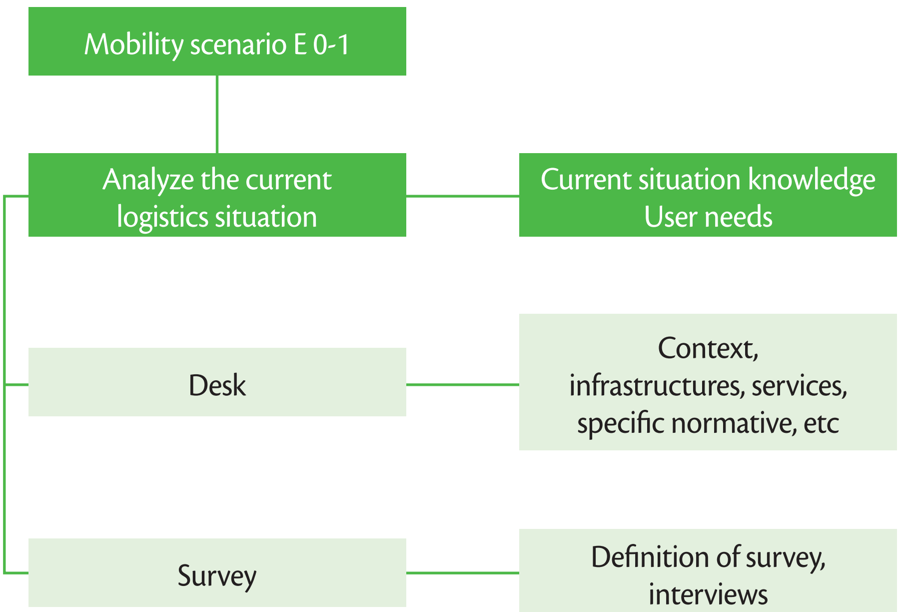
Based on the results of the activities carried out in E0-E1 and, in particular, on the main collected data related to freight distribution processes and to the mobility scenario, this step is dedicated to the analysis and understanding of the general town situation from city logistics and freight transport points of view, in order to identify specific issues and concerns.

TASKS

The analysis involves these main aspects:

- Characterising the study area from the commercial point of view. Identifying various commercial structures (bars, res-

Activities for logistics context analysis



taurants, shops, small markets, and large retail groups and large-scale distributors/ department Stores) on the basis of their supply chain, size and type of product;
- Analysing the specific regulations for commercial and freight vehicles circulation in the study area;
- Overview of characteristics and main types of logistics flows in the study area (e.g. clothing, foods and drinks, Ho.Re. Ca., supermarkets, consumer electronics, house appliances, etc.);
- Analysis of logistics process of the identified infrastructures and facilities for city logistics and freight distribution, if any (e.g. city distribution terminals, load/unload areas for freight, etc.);
- Identification of the most relevant supply chains including the related commercial vehicle flows and packaging typologies. Moreover, the main aspects and figures of the demand (shop owners, hotel, HO.RE.CA) and existing transport operators have to be identified. For each identified activity, an analysis of the organisational and operational conditions should be carried-out with the identification of the main transfer logistics points, if any, and of the main specific indicators.

On the other hand, a specific data collection and information survey must be carried-out on the main roads of the reference area (study area). Data can be collected by means of already consolidated methodologies, suitable to the level of detail that shall be achieved.

METHODS AND TIMING

The method to be adopted for carrying-out this activity is mainly based on interviews/surveys, besides, of course, desk activities dedicated to the collection of information on existing logistics processes and infrastructure. As regards the survey, key activities are:

a) Interviews with local stakeholders: a more detailed analysis of freight and city distribution processes must be carried out through interviews with key stakeholders, aimed at identifying the needs of each relevant category. Particularly, two main categories will be addressed and interviewed on-site: shop owners and transport operators.

Both individual stakeholders and Associations belonging to each relevant category must be interviewed, depending on the particular context in the site (i.e. whether any Associations is present, or relevant for logistics processes, etc.).

The support of chambers of commerce or trade associations can be an important success factor in this activity, allowing a larger data collection and contacts database.

b) On-field data collection: information shall be collected from Transport Operators and complemented by surveys carried-out on road during specific time windows.

Depending on the economic and staff resources, traffic counting can be also implemented. These can either be:
- Automatic: enabling to monitor time of transit, length of vehicles and relevant speed in a continuous way during a fixed period of time;
- Manual: by employing operators along the routes. Compared to automatic counting, this system, besides being less accurate, is also rather discontinuous as it is not possible to guarantee the constant presence of operators on the road.

Useful information can be collected by merging traffic counting with specific surveys to drivers of commercial vehicles:
- Traffic typology (within the urban area, crossing the urban area, etc.);
- Type of transport (self-supply, 3rd party, courier, etc.);
- Origin/destination of freight;
- Type of freight carried;
- Number of deliveries per day;
- Average stopping times of vehicles during delivery processes;
- Time slots and days characterised by higher traffic flows of commercial vehicles.

For an optimal implementation of surveys and counting, it is essential to quantify the costs, define staff resources, investigating areas, prepare questionnaires for surveys, etc.

Both types of surveys (automatic vehicle counting, on-road interviews) can provide additional information allowing to:

(a) Extend the information collected through stakeholders interviews (see above);

(b) Validate such information through direct observation of logistics flows in the area.

It is worth noting that repeating the survey for two or more times can prove to be very useful, in order to cover different days of the week and time periods (e.g. peak vs non-peak hours). It will also avoid any irregular situation that may happen in case of a single survey (i.e. market days, etc.). In case any significant data/information is not available, it is possible to approach the different stakeholder groups (transport associations, chambers of commerce, etc.). This may be achieved by organising specific focus groups. Data and information can be collected in a quick and efficient way, helping to set-up a useful reference scenario.

BOX 1 - Structure of questionnaires

In the following table, a blend of the different questionnaires structures related to specific town stakeholders is provided. For more information and details please refer the Deliverable D2.2 released by the ENCLOSE consortium.

Addressed stakeholder	Section	Addressed stakeholder	Section
Shop Owners	Company information	European SMHTs	Reference site - short description of the site
	Contact Person		EXISTING MEASURES OF URBAN LOGISTIC
	Type of Company		Name of the initiative
	Type of shop		Description of the initiative
	Type of shop management		Type of measure/field of application
	How are goods you receive packed		RESULTS
	Selling surface		Achieved logistics results
	Available storage surface		Quantitative energy end environmental results achieved
	Supplies and deliveries		KEY CONSIDERATIONS
	Deliveries		Lessons learned
	Delivery time		Primary Obstacles
	Reverse logistic		Critical Success factors
	Other issues related to delivery and suggestions		Transferability considerations: 1 - Policy/Administrative/ Normative details 2 - Infrastructure and technologies details 3 - Operational details 4 - Supporting Mechanism
Transport operators	A - GENERAL INFORMATION	Transport operators (On the road survey)	A - GENERAL INFORMATION
	Company information		Company information
	Contact Person		Contact Person
	Type of company		B - OPERATIONAL SCHEME
	B - WAREHOUSE/DEPOT		Type of transport
	How much warehousing space do you have?		Other info
	Eventual special storage requirements		C - VEHICLES AND DELIVERIES
	Added value activities		Dimension of the fleet operating on the targeted area versus total
	Other warehousing		Description of the interviewed Vehicle
	C - PRODUCTS INFORMATION		Delivery trip
	Products usually delivered in the study area		Product packing (for the targeted area only)
	Product packaging		Where do you stop the truck/van for the delivery
	Number of outbound deliveries per week		Loading/unloading areas
	Use of barcodes		Type of goods usually transported by the company
	Type of goods usually transported by the company		Reverse logistics
	Reverse logistics		D - ADMINISTRATIVE ISSUES
	Other logistics services		Eventual access permits
	D - GOODS VEHICLES INFORMATION		Any other normative/rules
	Description of the commercial vehicles operating in the referenced area		E - OTHER ISSUES OR NEEDS RELATED TO DELIVERY AND SUGGESTIONS
	Dimension of the fleet operating on the targeted area versus total		
	Outsourcing		
	Delivery trips		
	Transit point		
	E - ADMINISTRATIVE ISSUES		
	Eventual access permits		
	Eventual access regulations		
	F - OTHER ISSUES RELATED TO DELIVERY, NEEDS AND SUGGESTIONS		

BOX 2 - Example of questionnaire (deliverable d2.2 form t2.2b - question 15-19)

The following figure provides some questions defined in the questionnaire for the transport operator.

D. Goods vehicles information:
15. Description of the good vehicles operating in the referenced area

	Gasoline			Diesel			Electric/hybrid		
	N°	Euro	Loading capacity	N°	Euro	Loading capacity	N°	Euro	Loading capacity
Light commercial vehicles (LCV) with a gross combination mass of not more than 3.500 kg									
Trucks with a gross combination mass above 3.500 kg									

D. Goods vehicles information:
16. Dimension of the fleet operating on the targeted area versus total

Please, express in % the dimension of the local fleet operating on the targeted area into your entire fleet (directly owned or outsourced)	%

D. Goods vehicles information:
17. Outsourcing

Do you outsource the delivery services to the targeted area to others (owners, local transport cooperatives, etc.)? In % on the total provided serviced on the targeted area, how much is the outsourced one?	%

D. Goods vehicles information:
18. Delivery trip

Average loading of the goods vehicle (in %)	%
Average weight of each delivery - Palletized:............Kg - Palletized:............Kg	%
Average number of drops for each trip	%
Average number of trips per day	%
Average number of km per trip	%

D. Goods vehicles information:
19. Transit point

Interest to evaluate the possibility of outsourcing the services operated in town to a specific transit point	yes/no

BOX 3 - Survey results: the case of Almada

Study area and general aspects
The city of Almada, with around 100.000 inhabitants and strong tourist flows, has significant dynamic patterns. The city is organised in several districts, with particular characteristics as regards to mobility and logistics.
Cacilhas district – Almada's downtown neighborhood, close to the harbor, one of Almada's strongest mobility areas. Cacilhas is Lisbon Metropolitan Area's most important Multimodal Interface, where around 50 000 people arrive every day, with an important commercial area, counting restaurants and small shops hooking local citizens, Lisbon visitors and foreigners, which has been recently pedestrianised (June 2012) so that no vehicles are allowed, except for bikes and electric mini-buses.
Almada Centro – is the city commercial centre, with a large shared space area where pedestrians, public transports, bikes and cars circulate daily. The area is an open-air commercial district, although the economic crisis has constraint its vivacity in the last couple of years.
Almada Velha - is the historic area of the city, with small streets, old shops, little restaurants, churches, gardens, theatres, museums and service facilities. Most part of Almada Velha streets are so narrow that not all types of cars can go through, which makes the district particularly problematic when it comes to logistics aspects.
The proximity and differences among the three districts imply that Almada logistics approach, for both people and goods, is a significantly complex problem. Thus, Almada City Council is considering these or some of these districts to be part of the pilot area for its logistics measures.

Regulations in the study area
The area covering the three districts includes over 500 commercial activities. For the pilot project in Cacilhas district, in the areas surrounding Rua Cândido dos Reis, it has been planned to restrict accesses, allowing only authorizsed private cars; moreover, specific areas and l/u time windows will be defined as regards to commercial traffic.
In Almada Centro, a maximum speed limit of 20 km/h will be defined for all vehicles. Moreover, for freight vehicles, access widows will be established, with a maximum loading mass and dimensions (exceptions only in special cases). In Almada Velha, no restrictions of speed or access are planned, as the nature of streets themselves represents a physical barrier to traffic, yet loading/unloading windows and other small measures are planned.

Main types of logistics flows
The presence of more than 500 shops implies large amounts of goods delivered with more than 1500 freight vehicles/day circulating in this area, with peaks of 480 vehicles in the time window 08:00-10:00 am.
On the average, the load factor of freight vehicles is less than 50%. For what freight typology breakdown regards: 40% are alimentary products, 8% clothing and sports, 4% furniture, 8% electronic equipments, 7% pharmaceuticals. As in many commercial areas, about 27% of shops and restaurants use their own vehicles for freight own-supply, while the remaining commercial activities are served by couriers and transport operators. Almost all the commercial vehicles have Euro 2 and Euro 3 diesel engines.

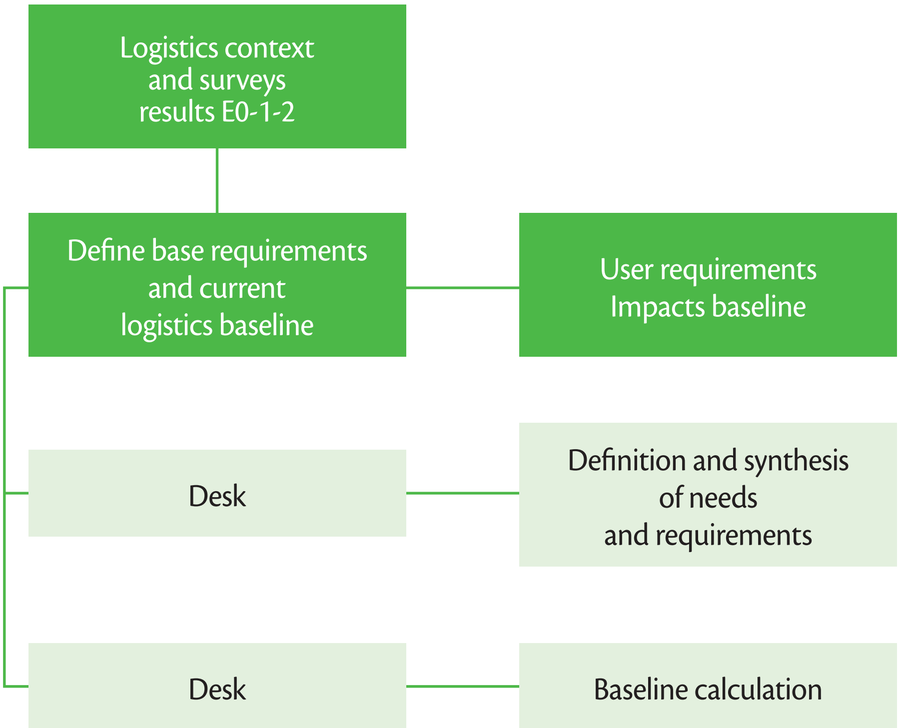
Infrastructures and facilities for city logistics
In the historic City Centre, there are no significant logistics infrastructures or organised measures (optimised logistic platform, electric vehicles, optimised loads, etc.) to save energy and improve city mobility and air quality. The only existing logistics infrastructure are loading and unloading parking areas in commercial streets and some electric vehicles for municipal gardening services.

Local logistics data
A survey done in the study area shows that 200 commercial vehicles per day have access to commercial area in the Cacilhas district of historical centre. The peak of about 60 accesses is between 8.00 am and 9.00 am, and more than 56% of accesses is concentrated in the morning from 8.00-12.00 am with considerable impact on mobility of pedestrians, citizens and tourists. For the type of vehicles used, the majority are vans and trucks with diesel engines.

Integration of parking schemes with last mile goods distribution rules.

E3: SETTING REQUIREMENTS AND LOGISTICS BASELINE

Setting requirements and logistics baseline



RATIONALE

Based on the above steps and, in particular, starting from the results of the surveys carried-out, key users' needs shall be identified. Special attention should be paid to the main town objectives, needs and constraints, and to the identification of the main requirements related to logistics services, to the institutional background, and the regulatory and organisational framework.

The needs of the different stakeholders shall be identified in order to define the main requirements that can be classified in four main categories (additional categories can also be identified depending on specific local situations):

Technical users' needs focusing on the technical and functional aspects of the involved city logistics schemes and applications;

Operational needs addressing day-to-day city logistics operations including elements such as the type of operations carried-out, the workload, work environment, motivation, monitoring and control of logistics processes;

Commercial impacts on economic and sales processes. This category deals with, for instance, services and support offered to commercial operators, customer service and satisfaction, quality of information supply, competitive advantage or company image.

Socio-economic impacts consisting in the wider impacts of city logistics schemes and services on socio-economic related user needs.

Moreover, it is essential to identify the main problem to be addressed and objective to be achieved. Some examples are listed below:

- Alleviating traffic congestion and reducing the number of heavy trucks in urban centres;
- Sustaining economic development;
- Maintaining accessibility to the (historic) town centres, increasing the attractiveness of the city for residents, tourists and commercial organisations;
- Optimising loading and unloading lots and parking spaces.

In parallel to these key activities, based on the data collected with local surveys, a baseline should be defined from the energy consumption and environmental emissions point of view.

TASKS

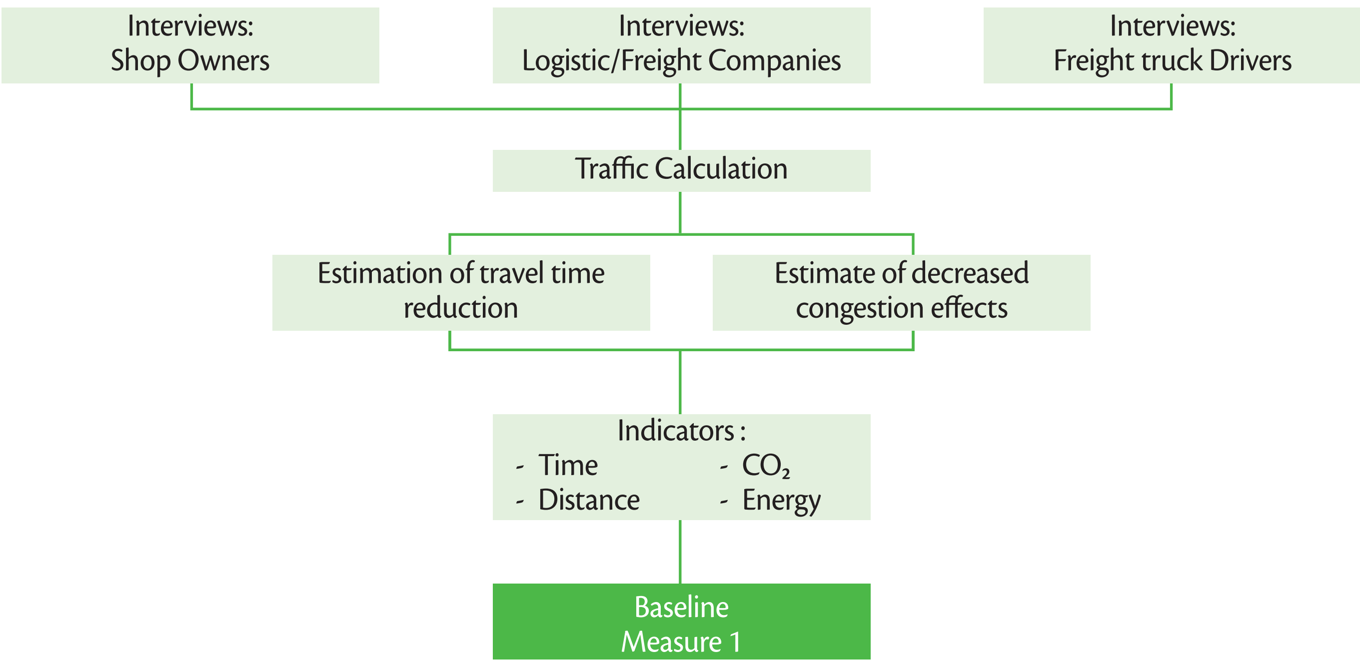
The identification of requirements should be based on the results of the surveys and on the information and data gathered from the activities described at E1 and E2 above. Specific requirements should be identified for the 4 categories detailed above.

Based on the data collected during the surveys, an analysis should be carried-out in order to define the baseline for the interested area. For example, the number of commercial vehicles, their type and size, average distance covered by each trip and the daily number of trips. This will allow calculating the number of kms per year covered and consequently impacts produced by urban logistics processes. In fact, based on these data and considering average consumptions of fuel (diesel or gasoline) and engine standard emissions (Euro), it is then possible to calculate the baseline regarding both energy consumptions and commercial traffic.

METHODS AND TIMING

The analysis should be predominately a desktop study, using specific tools for synthesising the various collected information. The specific methodology developed in ENCLOSE for this specific assessment is based on the following steps (see Almada case in BOX 1 below):

Measure 1 - Loading and Unloading Regulations



BOX 1: Almada baseline

Data inputs (from surveys)

Parameter	Data	Unit
LIGHT VEHICLES		
N of vehicles	1024	
Average trip	6	km
Working days/yr	300	
Deliveries/trip	17	
HEAVY VEHICLES		
N of vehicles	512	
Average trip	6	km
Working days/yr	300	
Working days/yr	17	

Almada baseline (Emission and Energy aspect)

Parameter	Heavy	Light	Sum	Unit
CO_2 Emission	543	412	955	tonCO_2/year
Energy consumptions			3632	MWh
Total distance	3072	6144	9216	km/day
CO	1382	1843	3225	kg/year
NOx	719	922	1640	kg/year
PM	157	147	304	Kg/year

Assumptions for extrapolation

Assumption	Value	Unit
Vehicle tier	EURO 2	
Heavy consumption	16,67	l/100km
Light consumption	11,00	l/100km
Trip/day/vehicle	1,00	

Adopted parameters

Parameter	Heavy	Light	Unit
Diesel density	0,835	0,850	Kg/l
Diesel CO_2 emiss.	2680	2680	g/lit
CO_2 Emission	447	295	g/km
Kcal/kg	10200	10200	
Energy conversion	11,84	11,84	MWh/toe
Diesel CO emiss.	1,50	1,00	g/km
Diesel NO emiss.	0,78	0,50	g/km
Diesel MP emiss.	0,170	0,008	g/km

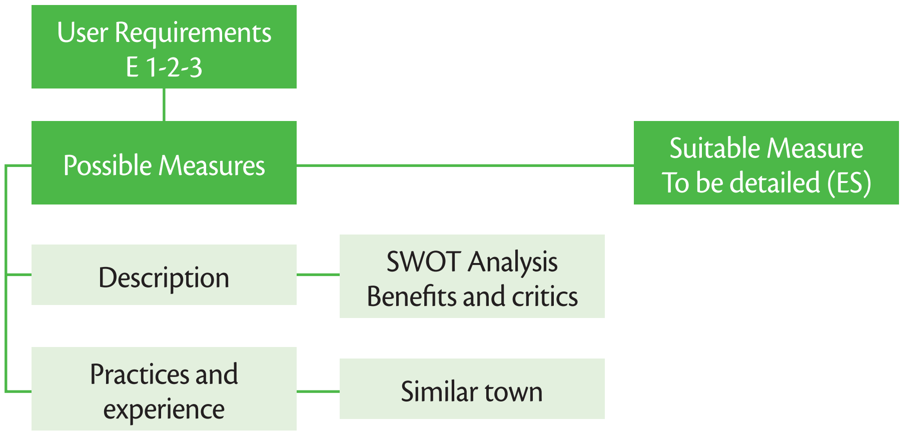
E4: IDENTIFIED MEASURES AND SERVICES VS. REQUIREMENTS

RATIONALE

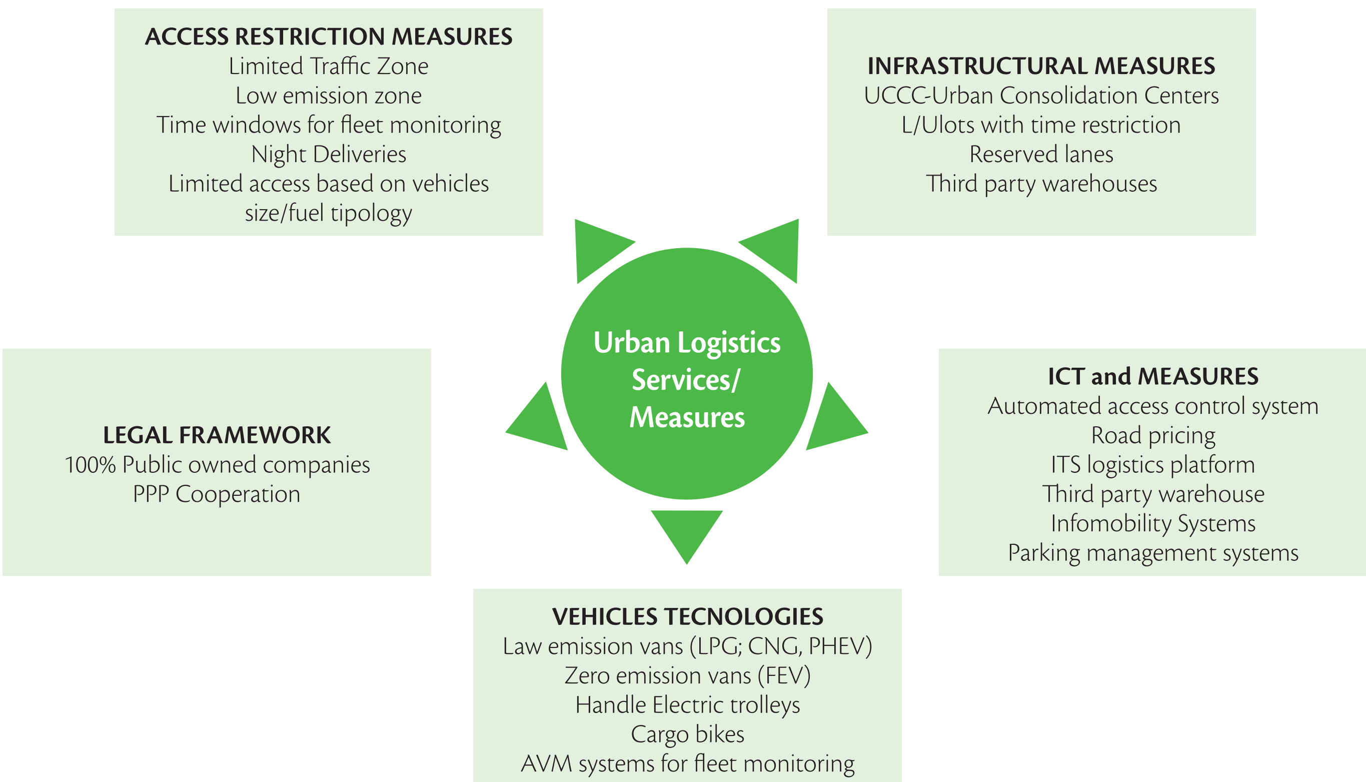
On the basis of the requirements identified in E3, the possible measures/solutions to be adopted by the Municipality shall be identified and analysed, as showed in this scheme. All the involved Elements are essential parts for the definition of a robust and coherent Feasibility Study, which is the core component of any SULP in the ENCLOSE project, as it identifies main needs and problems at local level. It will also establish the suitable set of logistics measures/services to be adopted. In fact, as stated in the above sections, one of the main challenges is to assess the viability and the efficiency of the proposed measures with respect to the known city requirements, in order to identify the most suitable ones for the town. Thus, a set of possible solutions/measures to be implemented for tackling the problems identified shall be analysed. Such solutions are based on successful examples and best practices at European level. An exhaustive collection of successful cases is available in the ENCLOSE Deliverables D2.1, D2.3 (also available on the project website).

Generally speaking, the set of possible solutions suitable for different local needs can be represented in the figure below, where some of the available options are grouped in specific categories (from regulation to demand management measures, infrastructures or services schemes). This figure is not intended to be fully exhaustive but aims to give an idea of the possible (and most popular) existing solutions.

Definition of possible measures/solutions to be adopted



Main urban logistics services/measures



After the feasibility study, a detailed SWOT analysis (in terms of Strengths, Weaknesses, Opportunities and Threats) shall be carried out in order to plan a realistic and efficient SULP. The SWOT analysis will allow to compare all the different solutions identified in terms of "pros and cons" with respect to the objectives to be achieved, and to facilitate decision-makers to identify the most suitable measures for the local situation.
The SWOT analysis can assess the strengths and weaknesses of each measure and provides useful information about real possibilities for the Municipality. It also identifies the potential opportunities and threats (internal or external) to be considered in the implementation of the solution. The SWOT analysis can also provide useful support information for helping the Municipality to adopt a specific solution by overcoming particular barriers (i.e. need of support infrastructures, etc.).
A useful opportunity for subjects that are deciding about a candidate measure to be adopted is the possibility to participate to study visits to sites where similar initiatives have already been implemented. This approach, followed by the towns of the ENCLOSE project, will help to discuss directly with local actors about problems, limits and potentialities of the implemented solutions.
The result of this activity is a list containing the most suitable measures/services to be designed for tackling city issues and pursue main city strategies/objectives, as defined in the previous steps.
The selected measures aim at enhancing the overall management of city logistics, in order to improve and optimise these processes, thus producing significant benefits not only from a logistics/commercial perspective, but also from the ecological sustainability point of view. They will also produce positive effects on the overall city mobility, by contributing to lower logistics-related traffic congestion.

TASKS
The main tasks of this step are the following:
- Overview of existing measures, experience and best practices by desk activity and, if possible, participation to technical visits to towns already implementing successful logistics solutions;
- SWOT analysis on each of the identified candidate measures/services;
- Discussion on the results of the SWOT analysis with target stakeholders.

METHODS AND TIMING
The SWOT analysis should take into account the perspectives of the various actors involved such as:
- City administration;
- Citizens;
- Private business (e.g. Ho.Re.Ca. representatives, shops, retailers, etc.);
- Logistics service providers;
- Urban freight transport operators;
- Associations and any other important player for city logistics.

To this purpose, it is useful to organise periodical meetings and focus groups with representatives of various interest groups to well understand their point of view on urban logistics development.
For the sake of transparency and for a clear idea of meetings outcomes, all the identified SWOT results (in terms of Strengths, Weaknesses, Opportunities and Threats) should be summarised in a table format and the parameters should be ranked in order of importance from the most urgent to the less important.
Technical visits should be organised to more experienced cities with similar characteristics, which are implementing or have already implemented similar solutions.

BOX 1 - Example of swot analysis for one of serres' logistics measures

Strengths Better urban freight transportation management Synchronisation of transport operators in loading and unloading areas and better service Reliability Improvement Coordination and planning of trucks arrivals in heavy traffic areas Congestion reduction	*Weaknesses* Flexibility for simultaneous customer service Reduced use, in case the use of the platform is free of charge Familiarity with information technologies and an Internet connection is a prerequisite
Opportunities Exploitation of increasing carriers and customers familiarity with new technologies Better exploitation of loading/unloading places Better organisation for shopkeepers and transporters Better planning and coordination of trucks' arrivals in the centre of the city Reduction of traffic flows Reduction of noise and air pollution	*Threats* Limited level of carriers' organisation Technical problems Requirement for stakeholders' cooperation non-acceptance of the system by users

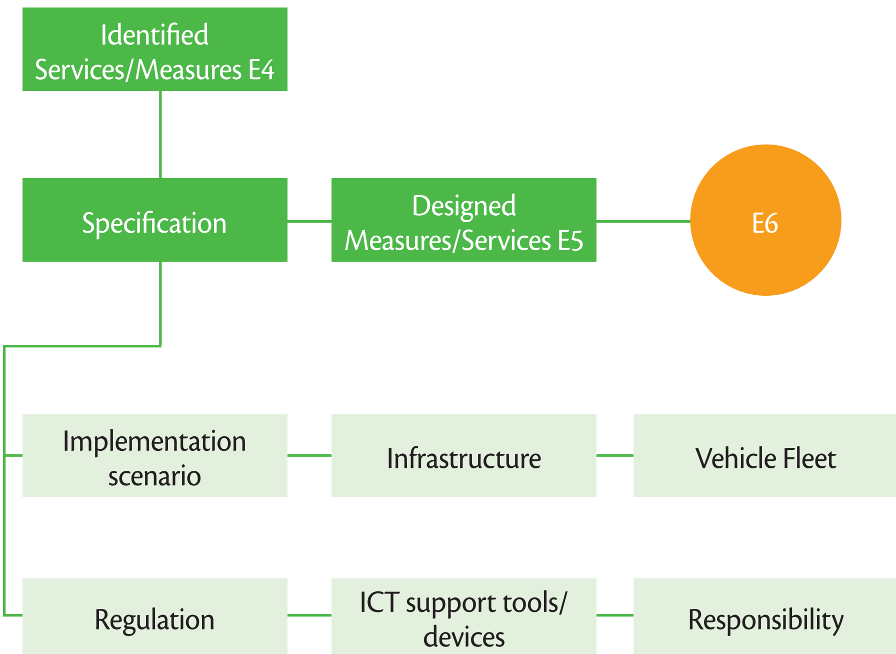
BOX 2 - Measures and best practices: expected benefits, key enablers and success factors, possible implementation obstacles

Measure and example of best practices	Benefits and Opportunities	Key enablers and Critical Success Factory	Possible Primary Obstacles
Sustainable Urban Mobility Plants Den Bosch, Granada, Terrasa, San Sebastian-Donostia	Reduced access, circulation and impacts of traffic in critical (protected) urban areas Less pollution, less noise and risk for pedestrians. Improved accessibility to historic centre, improved urban life. Urban renewal and possibility to regain qualified public spaces, attract more businesses opportunities. Increase citizens participation. Raiser awareness on sustainable city solutions.	Willingness of public authorities and stakeholders representatives (associations) to accept the idea and purpose of the project. Suitable policies balancing restrictions and incentives. Importance of communications to increase the societal revenue of the initiative. Relevance of neighbourhood participation to enlarge the acceptance of the measures.	Insufficient political commitment. Possible resistance and opposition to norms and rules enlarging pedestrianisation and introducing limitations on traffic circulation. Concerns by shops and retail open possible reductions of activities.
Low emission zones, Freight distribution Plans London, Bologna, Utrech, Prague	Reduced access, circulation and environmental impact of traffic (PM10, CO, NO, etc.) in critical (protected) urban areas. Reduced noise and risks for pedestrians. Improved accessibility to historic centre, improved urban life. Reduced traffic stress on historic assets and heritage. An overall policy including both passenger and goods transportation is possible.	Willingness of public authorities and stakeholders representatives (associations) to accept the idea and purpose of the project. Importance of communications to increase the societal revenue of the initiative. Decision about the type and age of the vehicles accepted for circulation. Enforcement patterns and system for the LEZ, combination with road pricing schemes. Integration with other mobility governance measures (e.g. Zone Access Control, access and road charging, etc.).	Possible long and controversial process. Possible resistance and opposition to norms and rules enlarging pedestrianisation and introducing limitations on traffic circulation. Worries by shops and retail operators on possible reductions of activities. Need to balance between restrictive policies and the requirements of free market and competition. Enforcement costs may be high for the authority.
Urban consolidation Centres and related services Vicenza, Lucca, Padua, Siena, Parma, Thun	Optimisation of distribution trips. Reduction of trips and vehicles on the centre. Possibility to serve both direct and reverse logistics. Possible support for 3rd party logistics services. Enhanced safety and liveability of the historic centre.	Adequate support by legislation (regional, national) transport operators. Consultation and consensus building with key stakeholders associations (transport operators, small independent carriers, shop and retailers, businesses, consumers, etc.) To reach the critical mass of small independent transport operators for consolidation services.	Cost of infrastructures and required investment. Possible resistance and opposition from transport operators (impact on current practices, worries about competition, etc.). Competition between UCC and other carriers not using UCC services is to be dealt with. Economic sustainability of operation (moving from public subsidy to financial autonomy). Strong efforts in marketing may be required.
Quality partnership programs Den Bosch, Toulouse	Improving the sharing of the road space between cars, delivery vehicles, pedestrians and other street space users. Rationalise delivery operation in the urban centre, reduce the impacts of freight vehicles. Reduction of through commercial traffic in the area. Higher number of energy efficient and green vehicles used by suppliers.	Definition and sharing of a common "charter" fixing the roles and good practices for the urban transport of goods. Solution must ensure entrepreneurs and suppliers both benefit from the scheme. Carriers have been in favour of the scheme. Cooperation with all parties is essential. Local initiatives need to work on a commercial basis to survive. Long term involvement of the administration and elected officials is needed.	To reach a consensus for the definition of the common Charter. To make the Charter easy to enforce Commercial initiatives need a certain time to develop. In economic downturn times, suppliers tend to protect their own business.

Measure and example of best practices	Benefits and Opportunities	Key enablers and Critical Success Factory	Possible Primary Obstacles
Green public procurement for freight transport Den Bosch	Stimulate suppliers to focus environmental impact for freight and suggest green alternatives. Higher number of energy efficient and green vehicles used by local governments	Procurement policy as an instrument to stimulate innovation and apply sustainable solution and corporate responsibility	Market offer of vehicles meeting all requirements is still limited. Development of highly customized vehicles might be conflicting with the transparent procurement policies of public organisations and governments
Use of green vehicles (FEVs, PHVEs, Bio Gas Vehicles) Den Bosch, Trondheim, Lucca, Reggio Emilia, Parma	Integration of zero-emission vehicles in the overall urban mobility. Societal benefits (more employment, education, air quality, noise, etc.). Significant public acceptance.	Electric vehicles can replace operationally conventional freight vehicles for last mile services. Electric vehicles are technically reliable and accept by the drivers. Public financial support in the context of an overall program involving environmental targets	A relatively new market, cost of vehicles and related services are still high. Lack of core infrastructures such as gas filling stations and charging infrastructure. Electric driving has new issues around road safety and daily use (e.g. recharging strategies). The use of (local/regional) renewable energy is still difficult.

E5: SERVICE DESIGN

Identified measures design



RATIONALE

The services/measures which were identified in the E4 element as the most suitable for towns' objectives shall be detailed and specified.

The design of each suitable measure/service should be performed on the basis of clear specifications, considering the peculiarities of each site and dealing with, at least, the following aspects:

- *Implementation scenario*: this is a key specific feature characterising every different measures, thus it shall be thoroughly analysed and generalisations should be avoided.

Implementation scenario often affects service provision modalities and/or the choice of infrastructures and vehicles to be adopted. This is the case, for instance, of the issues related with the type of road network and the fleet vehicles' characteristics (e.g. narrow streets in the city centres often require minivans).

Moreover, the environmental context is another important factor influencing project specifications. For example, in high value areas it is essential to design services and adopt vehicles that can minimise emissions and pollution impacts. Moreover, regulations regarding LEZ/LTZ shall be duly considered (particularly as regard to vehicle characteristics).

- *Infrastructure*: the specifications dealing with this aspect are of typical "engineering" nature, as they can concern hard measures such as Urban Consolidation Centres (i.e. warehouse location, typology of building, new or adaptation of existing ones, accessibility, internal and external areas, devices, energy supply, etc.).

The size and typology of infrastructures are also influenced by additional factors. These include the use of electric vehicles (requiring suitable recharging systems and equipment, in some cases solar panels covering logistics bases), service schemes (i.e. third-party warehouse, Pick up Points services), type of goods delivered (fresh, refrigerated, frozen product, etc.).

Finally, minor but important measures shall also be considered for infrastructural specifications. This is the case of road signals highlighting loading/unloading areas and/or reserved lots for electric or shared vans (also by using variable message panels, if needed).

- *Vehicle Fleet*: this element is strictly related to the specific logistics measures to be implemented, but also to the regulatory framework and the road network (see also the above mentioned "Implementation scenario"). Additional aspects to be considered in the definition of fleet specifications deal with particular logistics measures such as: "van sharing" for self-replenishment of shops (by equipping vehicles with specific monitoring devices), "reverse logistics" services (i.e. collection of packaging waste), use of eco-friendly vehicles (i.e. conventional/electric bikes, electric cargo motorbike/scooters, electric handled trolleys, etc.). Eventually, the size of the served area is an additional factor affecting vehicle specifications considering that extra-urban services with longer routes cannot be provided by FEVs but require different technologies/fuel (CNG, Hybrid, Bi-Modal, etc.). About this aspect, the ENCLOSE consortium has carried out a specific activity regarding the analysis of the city logistics requirements related to FEVs. Results of this analysis have been reported in a specific document available on the ENCLOSE website (D2.2 "Sustainable logistics in European small/mid-sizde historic towns: stakeholders goals and User Needs Analysis" and D2.3 "Sustainable logistics in European small/mid-sized historic towns: challenges, opportunities and priorities").

- *Regulation*: this element shall be detailed in order to support the implementation of the overall measures. Regulations shall deal with both access modalities to the different urban areas and operations within a specific area (i.e. specific time windows for commercial vehicles – that may depend on the nature of transported goods – specific/dedicated routes, restricted areas, vehicle weight/dimension, type of engine, load factor, etc.) and may differ based on the operator (third-party operator, provider, self-supply, etc.).

- *ICT support tools/devices*: despite specifications of this aspect usually have an engineering/technological character, the definition shall be strictly related to operational and service schemes of the logistics measures to be implemented, to the type of vehicles to be adopted and to the identified regulatory aspects. In the field of city logistics, ICT tools have several applications. For instance, specific technological platforms can be used for the management of UCC, for monitoring the different phases of last-mile delivery (collection of orders, delivery/route planning, track & tracing, goods return, administrative procedures), vehicles and delivery status. By integrating specific modules, the platform can also be used for managing added value (i.e. pick-up points systems, park & buy, etc.) and van sharing services, vehicles booking, fleet scheduling, reporting and administrative management. In relation to the points above, for monitoring and enforcing regulation of freight delivery processes, Local Authorities can adopt ICT systems – such as Automated Access Control Systems or on street parking systems– in order to control the compliance of logistics vehicles with the related city regulation. If ICT systems are used for the control and monitoring of freight vehicles, the relevant specifications shall be included within those related to city logistics measures.

- *Responsibility, organisation and operation*: this aspect is closely related to each specific measure typology and is also necessary for the development of the business model (see E6). It is the case of a new regulatory framework for accessing the LTZ or for dedicated loading/unloading areas. It is fundamental that specifications shall concern the Municipality as a key actor, with the full responsibility of defining the rules.

Also in the case of UCC, specifications should consider the Municipality as the main actor for the implementation phase. When the UCC starts operating, specifications for different solutions can be envisaged (i.e. either by internal management team, or by an external company contracted through bid under specific service constraints). On the contrary, as regards the control of load/unloading parking areas occupancy, measure specifications shall include the possibility of different solutions depending on local situations (i.e. the on street parking system managed directly or by subcontracting private companies, etc.).

Besides responsibilities, organisational and operational specifications shall be clearly detailed in order to allow the assessment of the overall costs (investment, maintenance and management) to be carried-out (see following E7 element). In particular, the organisational dimension is closely related to the operational schemes defined for the measures/services and should be identified in step E6.

TASKS

The term "design" here highlights the need to develop a detailed analysis of each measure/service identified, in order to allow a practical assessment of the overall sustainability of the solution (in terms of efficiency with respect to energy, environment and economic aspects) to be carried out in the following steps E6 and E7. Therefore, the main tasks, at this level, relate to the analysis, identification and specification of the main characteristics and/or elements involved by each measure/service.

The level of detail of the project specifications is strictly connected to the nature of the service to be implemented. For instance, the specifications and the design of an UCC for last-mile delivery services, at this level, shall involve several aspects such as the identification of the suitable location, the possible infrastructure (adaptation of an existing warehouse or realisation of a new one), the definition of supporting ICT, the identification of the equipments and devices necessary for the specification of the fleet vehicles.

Other kinds of added-value services such as van sharing, pick-up-points and park&buy require particular attention to the planning of technological aspects dealing with operations management, vehicles (i.e. on-board devices) and infrastructures (ie. delivery boxes like "pack stations", parcels delivery sites at parking areas, etc.).

In this service-design phase it is essential to consider normative aspects: logistics measures/services can produce expected benefits only if supported by a robust regulation. For instance, a van sharing service operated by low/zero emission vehicles can succeed only if a specific regulation that forbids (or limits) the use of (non eco-friendly) private vehicles for shops' self-replenishement is adopted by the Municipality. Regarding the specifications related to the so-called "soft" measures, it is important to remind that the definition of "soft", meaning "easy" measures with low/zero costs like, is applicable in practice mainly to infrastructural aspects, for instance, the implementation of loading/unloading lots with specific road signs. For what regulatory aspects concerns, the definition of "easy implementation and low implementation costs" is not correct, because although the definition of a regulation does not imply any direct costs, its application can produce significant impacts on operational aspects and thus on the relevant costs for the operators, and may require high level of acceptance.

This is the case, for instance, of all those regulatory measures that can directly or indirectly affect urban logistics processes (and often related costs), such as restriction of time-windows for LTZ and limitation of accesses to LEZ based on emission standards of commercial vehicles, regulation of stops inducing loading/unloading lots, extension of pedestrian areas, etc.

The design of a "soft" measure requires a specific detailed analysis of their implications not only from the point of view of the Municipality (or of the Public Authority in charge of the rules) but also from the perspective of involved transport/commercial operators.

Therefore, an essential recommendation for the specifications and design of urban logistics measures concerns the importance of providing all the elements for a robust evaluation (in terms of organisational, operational and economic aspects) of the possible different impacts of each measure by the relevant stakeholders.

METHOD AND TIMING

The design shall be carried-out by using the classical approach of design tools and be as much accurate as possible. This should be based, if needed, on former significant experiences, in order to benefit from any support initiative that already proved to be useful for correcting problems and overcome barriers toward the success of the solution.

In particular, the methodology adopted for the definition of specifications shall duly consider and develop the different aspects detailed in the E5 "Rationale" section, in order to achieve an efficient implementation of the measures from all the different perspectives (regulatory, technological/technical, operational and economic).

The time schedule for this phase depends of course on the quantity and on the complexity of the measures to be implemented (or enhanced), as well as on the level of requested integration and priority.

It is important to stress that the possibility to plan different logistics services separately is a good opportunity: starting with the "simplest" services, going to the more complex ones and integrating the two categories in the subsequent phase.

This approach allows to follow from the beginning, and step-by-step, the possible problems that may arise (and that are inevitable due to the complex nature of some measures), and to adopt any needed corrective action before an advanced planning status, thus guaranteeing important savings during the whole planning process. This time schedule eventually produces also an overall enhancement of the skills of the involved staff all along the various steps of the planning phase, as these are characterised by a growing level of technical and operational complexity.

EXAMPLES FROM ENCLOSE

BOX 1 - UCC GENERAL FEATURES: Burgos SULP Measure.

A UCC can result from a private (i.e. an operator or a consortium of operators) or, more frequently, a public entity (i.e. Municipality or other Local Authority). In the latter case the Public Authority is in charge of setting-up the structures, purchasing the fleet vehicles and managing the service, also availing itself of external staff.
At a following stage, once UCC experience is consolidated, the Authority may also involve private actors in the overall UCC management, maintaining only the function of control and regulation, thus establishing, in practice, some form of Public-Private Partnership (PPP).
The UCC can operate, from the commercial point of view, on two different approaches:

1. the UCC makes an agreement with the main long range transport operators that often prefer avoiding to enter the inner city centre for delivering low volumes of goods. In this case, the transport operator goes directly to the UCC, leaving parcels to be delivered in the city centre by the UCC fleet. The operator bears the cost of these last mile transport service. This scheme was implemented in several European cities (with different characteristics and dimensions), such as Bremen, La Rochelle, Parma, Vicenza, Siena, Barcelona, Lucca, etc.
2. The UCC makes an agreement with the owners/responsible persons of the main commercial activities located in the city centre or urban area (shops, restaurants, cafés, minimarkets, etc.). This agreement foresees that the delivery of the ordered freight is to be made directly to the UCC address. In this case, the shop bears the cost of last mile service but, at the same time, can also benefit from a lower delivery price applied by the freight operator, thanks to the agreement that guarantees significant quantities of freight to deliver during the year.

In addition, shopkeepers do also benefit from added advantages, because they can avoid the costs of other related logistics activities e.g. storage management, reverse logistics processes, etc. Moreover, additional benefits can also be represented by the possible lower delivery prices, thanks to the possibility for the shopkeepers to order larger quantity of goods without any problem of storage.
This is the scheme adopted in 's-Hertogenbosch (NL) by the private company Eco2city (http://www.binnenstadservice.nl/).
The two different schemes detailed above highlight the fundamental characteristic of a successful UCC: for operators not having a logistics centre in the reference city, the delivery of freight to UCC, upon payment of a fare, may be more convenient than to overcome the difficulties for its own vehicles to enter into the city centre.
Such a convenience can either be "pushed" by the Municipality (i.e. Vicenza, Lucca, etc.) imposing tight city access restrictions (i.e. time windows, parking time on load/unload lots, vehicles sizes, vehicle emissions, one way streets, pedestrian areas, etc.), or be caused by the city morphology itself (i.e. Siena), where the characteristics of the historic centre, with narrow and steep streets and alleys, are the first deterrent for entering in the inner centre (along with regulations and restrictions).
As already pointed out, the UCC is based on significant investments on infrastructures, fleet and organisation, therefore this solution can be only the final step of a process aiming to identify the most suitable solutions and it can only result from a strong political commitment and from the capability to evaluate the different benefits and costs (both direct and indirect).
For this reason UCC are usually viable solutions mainly for big cities or metropolitan areas, where they usually play the role of urban interports. As regards small/medium sized cities, these structures should, if possible, be based on existing infrastructures and operators. Two ENCLOSE towns can be taken as reference in evaluating the feasibility of a UCC in Burgos:

- Lucca, where the Municipality, taking advantage of significant European and National co-funding, set up its UCC (infrastructures and vehicles fleet) after a long process lasted 8-10 years, adopting as logistics base (during the experimental phase) an existing minor public warehouse;
- Trondheim, where the system implemented by Posten Norge is composed by two hubs located at the opposite sides of the city. Large vehicles bring freight to the hubs, where electric vehicles collect goods to be delivered to the city centre.

Moreover, an interesting solution is given by the possibility to adopt a logistic "cross docking" approach consisting of a service operated by the UCC, where freights are collected by the UCC vehicles directly from national operators warehouses and delivered to the shops in the city centre for last mile distribution (e.g. Siena, Italy).
Whatever the chosen solution is, the implementation of a UCC usually produces several advantages, mainly dealing with freight flows and environmental sustainability of the logistics system. Among these, the most important are:

- Enhancement of the loading factor and reduction of half-load trips with reduced transport unit cost;
- Reduction of fuel consumption (energy savings) and of polluting emissions and noise pollution;
- Possibility to use low impact vehicles – electric, CNG or hybrid – for last mile deliveries management;
- Compatibility with different transport, environmental and social policies.

Logistics operators can also benefit from significant advantages by using UCC services, such as:

- Reduction of kms covered by freight vehicles;
- Reduction of waste of time due to traffic congestions;
- Reduction of delivery times.

Finally, from the point of view of the city of Burgos, shop owners also enjoy positive advantages by using new delivery services:

- Possibility to receive useful delivery information from UCC (tracking) and to indicate specific hours for delivery;
- Possibility to enjoy other added-value logistics services based on UCC infrastructure (i.e. third party warehousing services, packaging collection, etc.).

The main problems concerning UCC deal with economic sustainability, in particular:

- Costs for building the logistic base infrastructure (when already existing infrastructures cannot be used);
- Costs for supporting infrastructures and devices;
- Costs for purchasing commercial vehicles, in particular FEVs, hybrids and low emission vans;
- Costs for freight trans-shipment.

Finally, marketing problems could consist in the unwillingness of national transport operators to allow delivery operations of their own freight made with vans showing different brands.

BOX 2 - Almada urban consolidation centre - Selected location

In the selection phase of the Almada UCC location, some key requisites were to be considered:

- Easily accessible for long range operators (i.e. close to main roads and/or railways);
- Not too far from the main city delivery area (in order to avoid excessive long trips, enhancing trips/day, thus allowing the adoption of electric vehicles);
- According to these pre-requisites, the area which best suits the Almada case is the one located at the beginning of Avenida Bento Gonçalves, close to the Centro-Sul roundabout, which is currently exclusively dedicated to a parking area, close to the Metro line 1.

This location is particularly close to the junction connecting Almada to the main northern ("25 de Abril" bridge), southern (A2) and western roads (IC20 and A38), it is around 2,5 km far from Praça Movimento das Forças Armadas, which can be considered as the central point of the study area and, finally, it is 3,3 km far from the farthest point of Cacilhas.

BOX 3 - Almada infrastructure: general features and dimension

Warehouse
To keep the initial investment as lowest as possible, it would be enough to start with a small/medium modular structure that could be enlarged in order to satisfy any future need for a wider space. Based on estimation about the volume of freight to be managed (around 4.2 tons/day – considering to operate around 7% of freight entering the study area), requiring at least 8 trips per day, a 600 sqm (i.e. 20x30 m, including a small office and facilities), a warehouse with unloading/loading portals along two opposite façades and side doors was estimated to be enough. At the very beginning, only two loading areas could be sufficient and would be used for both loading and unloading freight vehicles. Doors of loading part shall be equipped with canopies in order to protect goods and operators from rain.

External area
An external maneuver area of 500 sqm (i.e. 20x25 m) is the minimum space required for allowing truck operations in front of the unloading portals. The side of loading portals, occupied by vans, needs a smaller external area of 200 sqm.
In principle all these infrastructures should be fenced (and CCTV controlled) for security and safety reasons.
With the infrastructure dimensions detailed above a total surface of around 1500 sqm is needed. The selected Almada UCC location, with an overall extension of around 13.500 sqm, well meets all these requirements in terms of available space. It is important to highlight that this area is at present a car parking area (mainly used by commuters travelling on the close tramline), and that the UCC would occupy only around 11% of it.
Thus, the UCC would not create any problem to parking users (considering that a reduction of a maximum of 100 parking lots would be needed), thus fostering the acceptance of new logistics services by citizens.


Example of prefab warehouse


Front view with loading spaces and Interior

BOX 4 - Balchik soft measures

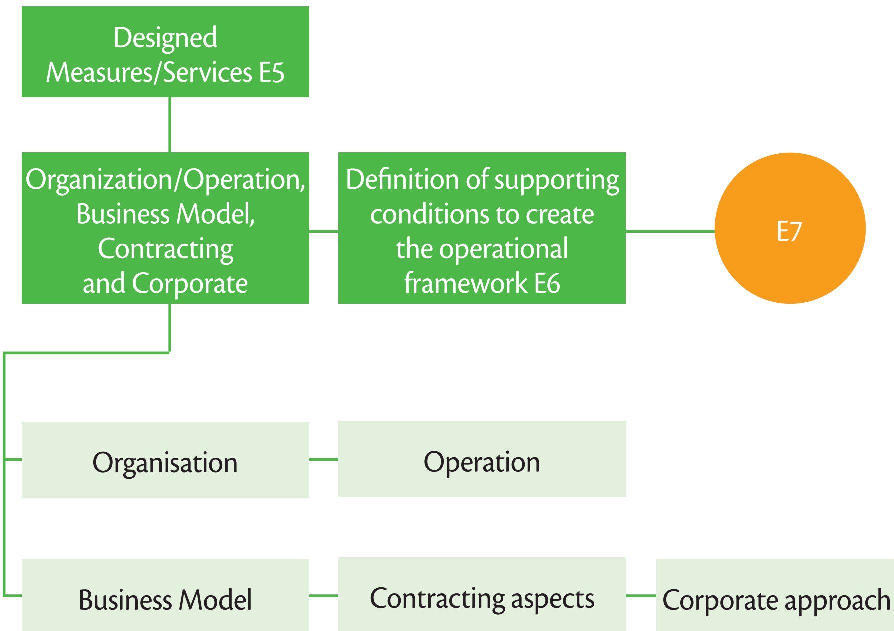
The new logistic regulation for freight deliveries in Balchik is focused on the seaside "Dambata Promenade" area, where the main hotels, restaurants, shops and entertainment facilities are located.
Main activities carried out have been:
- Definition of specific time windows for loading/unloading activities;
- Definition of conditions for commercial vehicles allowed to enter the restricted area;
- Definition of conditions by order issued by the Town Mayor and adopted by the Municipality Council for the peak season (high tourist flow);
- Restrictions by barriers, side channels and half-meter-high solid columns;
- Signage panels to be put at the beginning of access roads;
- Indication of loading/unloading areas in the official urban parking plan layout;
- Definition of dedicated parking lots on the ground by using coloured lines or, better, a different coloured asphalt;
- Signage panels indicating maximum stopping time for commercial vehicles and forbidding private cars to park;
- High level of controls by guards.

E6: ORGANISATION, BUSINESS MODEL AND CONTRACTING

RATIONALE

This element, which is strictly related to the results of above E5 and to the impacts assessment to be carried-out in the following E7, is focused on the specific organisational and operational dimensions, connected to the different service schemes required by the designed measures that involve a significant level of complexity. The overall aim of this E6 is to identify the support conditions of each measure/service for the implementation of the services designed in E5 and for the evaluation of the different impacts to be carried out in E7.

Organisation, Business Model and Contracting



As already described, the complexity of measures/services is directly linked to the complexity of levels of every single component involved in the specification and design (phase E5). For this reason, for the identification of the supporting conditions, it is essential to consider, at least, the following issues:

- Organisational/operational aspects and management model of the different design logistics measures;
- Business model related issues;
- Contractual issues (regulating the relationship among the different actors involved);
- Aspects related to the possible structure of the actors providing/managing services.

In the following, some details are provided for each relevant aspect:

- ***Organisational aspects:*** the definition of this aspect shall take into account a wide range of factors, related to the specific characteristics of the different urban logistics services identified and designed in the former E5 step. For this reason, it is essential to avoid any general consideration and to carefully analyse this aspect.

Whatever SULP measures are defined, in order to achieve a successful management of city logistics processes, it is essential to idenitify organisational and operational aspects in close connection with each other, in terms of both staff and infrastructures.

As an example, it is worth considering the case of an UCC employing a lower level of staff resources (as it may happen in the start-up phase) - compared to the actual need: this can negatively affect operations efficiency and may also undermine service success. A different result can be obtained when a new service is introduced in an already existing and consolidated system for the management of logistics process in a specific local context: in this case, minor measures for rearranging the existing resources can be enough for guaranteeing a good operation of the new service.

In most cases, at least at the early stage of the UCC implementation, human resources needed to perform daily activities (administrative and operational) should be workers with "multifunctional" skills, in order to minimise staff costs (i.e. drivers shall collaborate also to loading/unloading operations, etc.).

A possible alternative solution consists in outsourcing some activities by subcontracting, for example, the delivery transport, allowing a flexible management of the fleet "tailored" on the volume of freight to deliver. The last solution is particularly valuable for cities characterised by significant variations of freight transport demand, depending on the season and due to the touristic presence.

The same considerations can be made also with reference to infrastructures (i.e. dimension of the logistics base, equipment, etc.), vehicle fleet (i.e. UCC or van sharing) and technologies (i.e. functionalities of the ICT platform).

In order to reduce the impact of these issues, it is very important, during the definition of the organisatioaln aspects, to plan, at least in the start-up phase of a city logistics system, a "step-by-step approach" with the progressive introduction of new logistics services (starting from basic ones) and the related definition and assessment of the organisational adjustments requested, following the introduction of each service.

- ***Operational aspects:*** as already anticipated, this aspect is closely linked to the former one.

Procedures shall be specified for every service, by stressing needed resources in terms of staff and infrastructures. Economic issues related to operations shall be considered when defining the Business Model.

As an example, it is worth considering an additional service such as the "park & buy" one, consisting in the delivery of purchased goods at a parking area, in order to ease shopping also in low demand areas. Operational procedures shall detail not only collection/transport and delivery modalities of the operator, but also all the different existing options in terms of service booking, temporary stocking of freight at parking areas, use of support technologies (i.e. specific smartphone apps, sms service…), etc.

- ***Business Model:*** the definition of thebusiness model shall duly consider the whole set of measures/services provided by every single operator. Economic aspects shall be evaluated both in the initial phase and in following periods, based on specific milestones in terms of time and operation development.

Taking as a reference a complex logistics measure as an UCC, such kind of procedure allows to monitor and evaluate the economic issues related to basic services (that may sometimes, over those in the start-up phase, result in some losses) and added-value services that can make UCC-solutions economically sustainable from the beginning of their activity.

Of course, bearing in mind the considerations dealing with organisational and operational aspects, it is essential to take into account a progressive implementation of the different services also in mid-/long term analysis. Economic feasibility studies of the possible additional services to be introduced can set-up the priorities and consequently re-steer organisational, operational and technical decision.

- ***Contracting aspects:*** one of the key aspects of the definition of supporting conditions for setting-up the operational framework deals with contract factors, that can be considered from different perspectives:

a) Level of Contracting Authority/Operator (i.e. Municipality/UCC manager);
b) Level of Operator/User (i.e. Van Sharing operator/Shop owners).

The a) hypothesis represents a "classical" contract between contracting entity and contractor, with specific indications concerning the relationship and the allocation of responsibilities between the involved actors. The modality to adopt shall be chosen among the different forms available in order to identify the one that best suits managing (but also operational and organizational) needs and that is more convenient for the contracting authority. For this reason, this choice is particularly important as it affects (positively or negatively) the final outcome of the business model. Such an activity requires also to identify public procedures and administrative tools needed to adopt the chosen contract form and to clearly define relevant responsibilities, duties and roles. Besides the Service Contract, a detailed "Management Performance Chart" between the Municipality and the operator contracted for UCC management should be defined, in order to clearly set-out from the beginning not only contractual issues (in terms of rights and obligations) but also the level of performances that the operator shall guarantee for the whole contract duration. Key performance indicators shall be easy to monitor and thus shall be characterised by well understandable qualitative measures.

The Case b) represents, in general, a contract/regulation for the use of the service. A good example is the regulation for the use of van sharing vehicles, which is characterised both by contractual issues (i.e. temporary rental of the vehicle - such as rent, loan for use, etc. – responsibility, etc.) and by aspects related to modalities of vehicle use (i.e. booking modality, vehicle pick-up/drop-off, vehicle maintenance).

- *Corporate aspects:* another important aspect for the definition of supporting conditions is related to the type of Company in charge of managing (from the legal, administrative, organisational and operational point of view) city logistics measures and services.

The E6 activity shall take into account the possible company options, considering that these may also vary following the different achievements of logistics services designed in E5. Company typologies that might be evaluated are:

- *Direct management by the Public Authority:* this option can have a temporary character limited to the initial service start-up phase, in order to demonstrate the feasibility of the solution before making the final decision about corporate aspects (logistics activities are not included among the task of Public administrations).
- *In-house company:* a body belonging to the Public Administration (public owned company) which is financially and administratively dependent on the Public actor. In such case, the contract is awarded directly, with no need to adopt any public procedure.
- *Public-private partnership:* a private company, in collaboration with the public institution, participates as a partner in the mixed capital company set-up for the management of services. In most cases, this company structure allows Public actors to obtain economic benefits resulting from the achievement of public value objectives, identified in the contractual phase, with the most convenient price/quality ratio. In case of mixed public/private companies for service awarding, a Service procurement partnership is needed: a public tender and relevant following contract regulating the relationship between Public Administration and Private Company.

The definition of supporting conditions to create the operational framework is an essential factor for implementing city logistics services.

The main tasks at this level are related to the analysis and definition, for each designed measure/service, of the supporting conditions with respect to the aspects outlined in the above mentioned rationale section:

- Organisation - in terms of involved staff and operational procedures;
- Management model - in terms of how to organise the process of managing the overall set of measures, taking into account their different aspects (regulation, ICT, vehicles fleet, infrastructures, etc.) and the involved actors;
- Service contract - in terms of typology of service awarding (procurement, company structure, etc.), objective and tasks/commitments, performance indicators, etc.

Of course, in the portfolio of possible measures and services available for city logistics optimisation, the Urban Consolidation Centre (UCC) represents a case study with the highest level of complexity and thus it is taken as a reference in the analysis of supporting conditions.

From the organisational point of view the UCC represents a much more invasive solution with respect to other services/measures, as it involves many different elements (infrastructure, fleet, regulation, ICT platform, organisation, etc.), that can be tuned depending on the requirements and objectives of the Municipality. The UCC (logistics base and collection/consolidation activities) represents a "breaking point" in the urban logistics chain and therefore, in order to be competitive, it should present quality performances, efficiency and reliability similar, at least, to those offered by National/International freight operators (if not even better, considering the advantages of a small-scale structure and the support of the local public administration).

The UCC management and organisational level should be based on three key requirements, in particular:

i) provision of "last mile" freight distribution services (delivery and reverse logistics), as base services;

ii) provision of "added value" services, which are additional services, with a high economic return, that can boost the whole urban logistics system towards self-sustainability;

iii) implementation of ICT platform (that in a UCC is to be considered as mandatory) that, besides performing basic functions dealing with daily logistics management, can guarantee a correct exchange and integration of data with the informational systems of various long/medium range transport operators, allowing a real continuity in delivery tracking & tracing. Actually, meeting the reliability and efficiency demand of transport operators for being involved in the UCC process, is one of the main issues related to the success of an UCC. The definition of the supporting conditions shall be approached both at system level and from the perspective of every single measure/service. For instance, considering the case of an UCC, it is essential to define all the different contractual, corporate and financial issues dealing with the UCC system and, at the same time, organisational/operational aspects of logistics services (both "base" and "added value") shall be detailed.

METHOD AND TIMING

Always taking as a reference the most complex urban logistics system, an UCC, the methodology to be adopted for defining the organisational structure to manage the different logistics measures/services consists, in a first phase, in identifying all the actions to be implemented.

In this perspective, in order to achieve the economic self-sustainability of the UCC, in particular during the early stage of implementation, the approach should be oriented towards a "light and simple" management/organisational level in terms of facilities, procedures (administrative and operational) and human resources. At infrastructural level, this means to look for solutions based on an existing warehouse and, at operational level, to try to involve some transport operators already operating delivery services in urban area.

Once these aspects are clarified, the following steps consist in setting-up the organisational chart, allocating human resources (also considering temporary replacements of staff for holiday/other absences) and identifying the tasks to be performed by the figures identified. The estimation of human resources depends on freight volumes, structures used, ICT systems, typology of vehicles and skills of the staff and is a key factor to be considered, as it significantly affects management costs.

According to these considerations, in the initial operations phase of an UCC, the different operational activities shall be set-up, in particular: freight unloading, collection and consolidation of goods based on delivery destinations, optimisation of loading factor on delivery vehicles, delivery, service invoicing, etc.

The staff needed to perform the activities identified shall be allocated and, in order to minimise costs, this shall be composed of persons with multifunctional skills. In the reference case a minimum of n. 2 professional skills (1 technical/administrative, 1 warehouse/delivery planner) and n. 2 drivers (also collaborating in loading and unloading activities) shall be dedicated to the service.

Regarding the support technologies, in the very first phase the administrative/planning procedures can also be performed without ICT or with low-complexity ICT systems. Once freight volumes progressively grow and added-value services are introduced, it will be necessary to increase the number of staff members and to adopt an integrated ICT system, with specific functions allowing to duly perform delivery planning and management, tracking & tracing procedures integrated with long/medium range freight operators (by using GPS equipped vehicles), warehouse control and administration tasks (including service invoice).

On the contrary, taking as an example the case of a van sharing service, after the definition of the number and typology of vehicles (electric or conventional, with or without ICT system) and of the standing zones, it is essential to detail both organisational activities (booking modalities, pick-up/drop-off of vehicle, vehicle refueling or recharge – in case of FEVs – ordinary/extraordinary maintenance, etc.) and those dealing with administrative issues (service registration, vehicle booking, service invoicing, penalties and fees in case of misuse of vehicles, etc.). Once the planning actions concluded, the organisational chart can be defined and staff can be allocated with specific responsibilities based on the task to be performed. Also, in this case an efficient allocation of staff is very important as it significantly affects management costs.

EXAMPLES FROM ENCLOSE

BOX - Service Contract for the Management of LUCCAPORT UCC

A "Service Contract" regulating the relationship between Lucca Municipal Administration and the "Contracted operator" managing LuccaPort UCC. A detailed "Management Performance Chart" is also defined.
Municipality can act on the UCC for the extension of business and obtaining funds while the Contracted operator:
- manages logistics services and has the right to use the infrastructures, technologies and all tools for the UCC;
- carries out last mile services with zero emission vehicles;
- guarantees the service with respect to market standards and quality indicators directly and/or with sub-contractors;
- guarantees the UCC operation, maintenance and expenditure;
- guarantees the services vs. market tariffs;
- can subcontract the service as a whole or in part;
- can perform promotion campaigns, customer satisfaction surveys and control quality and quantity indicators.

E7: ASSESSMENT AND IMPACTS EVALUATION

In the previous steps the suitable measures/services were identified and designed (E5) and the relevant support conditions for their implementation were defined (E6) at different levels (organisational/operational, contractual dimension, business model, corporate aspects, etc.).
In E7 the planners should work along two specific stages:
- In the first stage, for each designed measure/service, the impacts on energy consumption, environment and economic aspects shall be elaborated by using basic tools based on reference standards and conventional procedures. The result of this stage is a table summarising, for all measures, the level of impact related to the following three main categories: energy, environment and costs;
- The second stage ranks the measures based on these impacts, on the resources available at city level (including private investments) for a specific time perspective (i.e. years) and on the general objectives and city policies (urban and mobility plans first of all).

Once all the different impacts have been evaluated, city administrators shall identify the more sustainable/convenient measures for the City also in terms of availability of resources, estimationing the related timing (short and medium period) for the activation of the identified measures, and checking the possibility to push private investments by collaborations or partnerships.
The result of those stages is represented by a specific priority list representing a useful tool for decision makers in defining the overall Implementation Plan and in elaborating the Road Map for adopting the identified measures/services at Municipal level (political and administrative).

TASKS

The core task of E7 is the evaluation of the impacts/benefits produced by each identified measure/service, to be carried-out on 4 evaluation categories:
*i) **environmental benefits,***
*ii) **energy efficiency gains,***
*iii) **technical performance, service provision and quality,***
*iv) **economic viability.***

For each of the 4 categories above, details on the main aspects to be taken into account are provided:
i) Positive results regarding environmental impacts (reduction of GHG, polluting, acoustic emissions and vibrations, etc.) can be achieved by reducing the overall number of kms travelled by freight vehicles in the urban environment. This result can be reached by operating on city logistics aspects, with the adoption of a wide range of measures that may be rather different from each other:

- Reducing the number of circulating vehicles thanks to the optimisation of the vans loads (making better use of loading capacity) by consolidating goods at a UCC;
- Making use of route planners;
- Creating an adequate number of load/unload areas in order to reduce the traffic of vehicles in search of a free parking space.

Furthermore, besides the reduction of kms travelled, significant benefits in terms of emissions can be produced also by using zero/low emissions vehicles (i.e. latest generation diesel Euro6, PHEVs, FEVs, etc.).

The adoption of such kind of fleet can start from the vehicles used for UCC services and then be extended to private operators, also by means of specific regulations boosting the use of eco-friendly vehicles and of political incentives to invest in electric cars/vehicles. For example, in Norway an environmental agreement among all political parties in the Parliament has led to a significant increase in sales of electrical cars. For the first 6 months of 2014, Tesla Model S and Nissan Leaf have been among the 5 most sold models in Norway. The incentives consist of reduced car and road taxes, toll-free driving on toll roads, free parking and free use of public transport lanes. These incentives are also available for businesses.

Eco-friendly behaviours, such as the optimisation of delivery processes, can be boosted also by adopting specific rules and regulations aimed at, for instance, enlarging LTZ and/or LEZ, reducing/modifying time windows, etc. It is essential for all these measures to be fully supported by adequate control/enforcement schemes as, for instance, automatic access control systems. Other kinds of services are oriented in the same direction, as an example, the implementation of a van sharing service allowing to reduce the number of vehicle accesses of shop owners in self-supply.

ii) As regards the evaluation of energy impacts/benefits, all the above detailed measures for emissions reduction, in particular those aimed at reducing kms travelled, do also produce positive effects regarding energy aspects.

Furthermore, innovative vehicles (including FEV in case these are recharged by photovoltaic systems) play a key role in reducing emissions.

Finally, also non-logistics related aspects should be considered when carrying-out the impacts evaluation. In fact, important benefits can be produced also by improving infrastructures like, for instance, logistics bases characterised by high-efficiency buildings (high-energy performances), low-consumption equipment, photovoltaic systems guaranteeing energy autonomy, etc.

iii) The evaluation of the impacts related to technical performances, service provision and quality is closely related to the above mentioned points and shall take into account all the technical/technological elements involved in city logistics processes, both directly (i.e. ICT platform, freight vehicle fleet, etc.) and indirectly (i.e. UCC infrastructures, access control systems, infomobility systems for L/U areas, etc.). Special attention requires the assessment of the performance of the technologies used for managing the different services, in particular of ICT platforms.

The quality and efficiency level of logistics services defined in the SULP is essential to achieve the necessary support from operators/users that is, in turn, a key factor enhancing service consolidation.

For instance, taking into account the various delivery services operated by a UCC, specific procedures and technologies shall guarantee that, at least, the same standards and service levels (i.e. delivery times, track & tracing, interface with complex systems of involved companies, insurance) offered by private medium/long-range operators are achieved. Otherwise, for example, in the case of a van sharing service the assessment of efficiency and quality level shall consider different aspects, such as: booking possibility, vehicle maintenance and cleanliness, efficiency of on-board devices (black box), insurance, etc.

iv) The evaluation of economic aspects is crucial as it allows checking the feasibility of the measures/services and of the overall logistics system identified in the SULP.

Such kind of evaluation, to be carried-out by adopting the methodology described in the section below, shall take into account both investment costs and operational costs/revenues.

The assessment of economic aspects allows to adopt corrective actions in case of losses - such as the revision/optimisation of costs – and to implement added-value services in order to enhance the profitability of the overall logistics system (i.e. UCC and related services).

This evaluation shall start from the assumption that the economic sustainability of a service/measure – or of a whole system – is not a compulsory objective to be achieved by Local Authorities. This would be the case of private operators (or of a public-private partnership), but it can be a secondary objective in case of public initiatives, where the key focus is on citizens' life quality in historic centres (city logistics would be considered as a public service like Public Transport), and Local Authorities can provide contributions for achieving this objective.

METHOD AND TIMING

Although the evaluation of impacts/benefits of the identified solutions plays a key role in E7 as it can orient organisational, operational, infrastructural and economic decisions, the analysis methodology and the level of accuracy are closely linked to the resources available.

It is recommended to adopt a rather conservative approach in estimating the expected benefits produced by the solution chosen, as well as operation and installation costs. Low-cost, simple measures that can be implemented in a short time are to be preferred, at least in the initial phase.

As regards energy and environmental aspects (see evaluation categories i) and ii) of the tasks above described) the evaluation

methodology to be adopted in E7 should be based on the following elements: Methods for the identification, collection and analysis of data;
- Parameters for baseline definition;
- Parameters for the evaluation of the measures identified by the SULP in the ex-ante scenario;
- Guidelines for future ex-post assessments.

Once the set of indicators and data collection methods are identified, the evaluation process will be structured along four phases:

Phase 1) – Definition of baseline scenario, that is the situation before the introduction of SULP-related measures. For a correct definition of the baseline, it would be important to have specific data collected through surveys (also dating back to former periods). Once kms traveled and circulating vehicles are identified, it is necessary to calculate the total of emissions/year and the energy consumption of commercial vehicles in TOE/year by using standard methodologies. The baseline can deal with a specific category of vehicles toward which the logistics measure/service is addressed (i.e. private vehicles used by shop-owners in self-supply).

Phase 2) – Collection and analysis of environmental, energy, quality and efficiency data dealing with already implemented measures/services (i.e. pilot and soft measures implemented in the framework of the ENCLOSE Project).

Phase 3) – Evaluation of the overall ex-ante scenario, including estimation of the impacts produced by the services/measures introduced by the SULP, based on existing knowledge, on former experiences in the relevant field and on data available both from former surveys and from specific campaigns (i.e. investigations carried out while implementing ENCLOSE feasibility studies).

Specific software applications for the micro-simulation of traffic flows and calculation of emissions – such as the "COPERT - COmputer Programme to calculate Emissions from Road Traffic" model implemented by the EEA (European Energy agency) – can be used for this assessment. When performing energy and environmental assessment the European standard to refer to is the one set-out by the CORINAIR (COordination INformation AIR) project, in the framework of CORINE program. The classification of emission sources used for CORINAIR is based on SNAP (Selected Nomenclature for Air Pollution) categories divided into 3 levels (sector, sub-sector, activity/technology).

The pollutants considered in the methodology are 10, in particular: nitrogen oxides NOx, nitrogen dioxides NO2, sulphur oxides SOx, methane CH4, non-metallic volatile hydrocarbons, carbon oxide CO, carbon dioxide CO_2, ammonia NH3, particulate and lead-based compounds.

Usually, for substances like CO, VOC, NOx and PM (only for diesel vehicles) and for the fuel consumption (in g/km) it is possible to make accurate estimations, while in the case of CO_2, SO2, N20, CH4, NH3, heavy metals and benzene calculations are less accurate and based, generally, on the quantity of fuel used.

Any further environmental evaluation shall take into account the aspects related to noise pollution produced by circulating vehicles. In fact, even if this is not a key factor as regards extra-urban traffic, the role that it plays in urban environment and historic centres (above all in night hours) is very important.

Noise pollution evaluation (and its limitation by adopting FEV) shall be carried-out by means of specific phonometric activities on conventional (diesel) and on electric vans (either FEV or latest generation diesel vehicles).

Phase 4) – Comparison between the ex-ante (existing measures and planned measures) and the baseline scenario.

Finally, E7 should also provide the guidelines for future assessments of the measures/services implemented following the SULP and allow a comparison among baseline, ex-ante and ex-post scenario.

As regards technical performance, service provision and quality (evaluation category iii) of the above section "Tasks") the methodology to be adopted is based on:
- Set of indicators;
- Modalities for identification and collection of data;
- Analysis of collected data.

The evaluation of these impacts shall not consider only data used for the evaluation of the two former categories, but also some specific indicators dealing with:

- Technical/technological components, referred in particular to the performances and reliability of the ICT platform and freight vehicle fleet. In case the two elements have already been implemented, data can be acquired both automatically (i.e. by means of ICT platform "troubleshooting" tools) and manually by using specific logbooks (i.e. filled in by platform operators or drivers);

- Operational components that, for instance, in the case an UCC is implemented, shall consider at least: average number of trips, average number of deliveries per trip, average weight of the different deliveries, type of freight, kms travelled for each trip, etc. Also in this case the collection of data (in case the logistics base is already functioning) can be both automatic (i.e. by means of AVL systems, electronic delivery documents, etc.) and manual (i.e. paper documents, specific logbooks filled-in by drivers, survey to operators, etc.);

- Quality and efficiency levels both expected and achieved (in case of already implemented measures). The collection of relevant data can be carried-out by surveys to both the operators (single operators and associations) and customers, which are commercial operators (i.e. for last-mile delivery and third-party warehouse) but also residents and tourists (i.e. for Park & Buy, Pick-up-Points, delivery to hotels, delivery of bulky goods, etc.). As regards to the evaluation of economic aspects (IV evaluation category) of the above section "Tasks") it is essential to consider both investments and operational costs/revenues.

In principle the overall cost should be calculated by taking into account the investment for infrastructures (i.e. in the UCC solution: the cost of the warehouse - depending also on the typology of intervention, new or existing structure), vehicle fleet (in case of a renting approach, this represents an operational costs), equipment, ICT platform, etc. Other significant costs are related to maintenance of infrastructures, equipment and with operational/management activities (mainly staff costs, energy, fuels, insurances, etc.).

When assessing economic aspects, a special attention shall be paid to the calculation of break-even points, in particular for all the measures/services that require significant resources to be committed, as it is the case of an UCC.

A possible calculation option is detailed below:

- *Total measures/servicse costs (Investment costs + Operating costs + Infrastructure and equipment/fleet maintenance costs);*
- *Calculation of the freight quantity delivered by logistics operators in the baseline scenario;*
- *Estimation of the quantity and typology of freight that could be taken in charge;*
- *Calculation of tariffs to be applied for reaching the break-even point.*

Another methodology ("backward analysis" type) is based on the a priori definition of a tariff - with a price per delivery which is competitive and in line with the existing market – and on the following calculation of the minimum number of deliveries (per day/year) to be performed for reaching the break-even point.

As anticipated, the economic assessment described above refers to the implementation of a UCC and deasl only with the "last mile" delivery service.

Several experiences at European level (among which also some of the ENCLOSE towns – such as 's-Hertogenbosch and Lucca – are included) have demonstrated that, in order to achieve an economic self-sustainability, added-value services are essential for the UCC to compensate any possible losses related to the last-mile delivery service by economies of scale and introduced enhancements/improvements.

The high investment cost needed for the construction and start-up of an UCC requires, from the very beginning, a significant turnover that can be achieved only by exploiting the full potential of the infrastructures (logistics base, ICT platform, vehicle fleet, etc.) and of the staff, by diversifying the logistics services provided.

A correct economic assessment shall then consider all the revenues coming from the different services (both base and added value services).

Other key issues to be duly considered in the economic assessment are:

- Legacy aspects, concerning i.e. the evaluation of the best procurement process for subcontracting external subjects with the responsibility to implement the measures/services);
- Social aspects, concerning i.e. benefits in terms of human resources, both as regards new jobs and the enhancement of skills of the existing staff, that the adoption of the measures identified in the SULP can produce.

EXAMPLES FROM ENCLOSE

BOX 1 - Almada baseline

According to several surveys, a total of around 1,000 commercial vehicles per day enter Almada study area. Each vehicle has an average of 6 km travelled within the area, for a total of 6.000 km per day. Number of working days/year is 240. An average vehicle emission of 325 gr/km (Euro 2 COPERT III) and 6.000 km per day with an average consumption of 16 liters per 100 km were considered.

• Total energy consumption 202 toe/year
• Total CO_2 emissions 623 tCO_2/year

BOX 2 - Burgos baseline

Relate to transport operators

Type	Car/Minivan	Vans	Light truck	Total	Unit
Number per day	3	10	12		
Fuel Used	Diesel	Diesel	Diesel		
Fuel Economy	7,2	9,1	9,3		l/100km
Load Factor	65	53	87,5		%
Trips per year per vehicle	450	405	247,5		
Distance per year per vehicle	5400	10206	7493	23099	km
Distance per Trip per vehicle	12	25,2	30,3		Km/trip
Fuel consumption	425736	3389923	3052321	6867980	Litres/year
Fuel per trip	946	8370	12333		Litres/year
Energy	4329309	34472126	31039050	69840486	kWh/year
Final consumption CO_2	1143	9097	8191	18431	Tonnes of CO_2/year
Primary CO_2	1490	11865	10683	24038	Tonnes of CO_2/year
Nitrous Oxide	447	3563	3208	7218	Tonnes of NOx/year
Carbon Monoxide	2193	17458	15719	35370	Tonnes of CO/year
Particles	298	2373	2137	4808	Tonnes PM10/year

Related to vehicles owned by shopkeepers

Type	Car/Minivan	Category 1 Usage	Category 2 Usage	Total	Unit
Number per day		75	225	300	
Fuel Used	Diesel				
Fuel Economy	7,2	7,2	7,2		l/100km
Load Factor	65	65	65		%
Trips per year per vehicle	450	450	450		
Distance per year per vehicle	5400	5400	5400		km
Distance per Trip	12	12	12		Km/trip
Fuel consumption	389	29160	87480	116640	Litres/year
Fuel per trip	0,86	0,86	0,86		Litres/year
Energy	3954	296528	889584	1186112	kWh/year
Final consumption CO_2	1,043	78	235	313	Tonnes of CO_2/year
Primary CO_2	1,361	102	306	408	Tonnes of CO_2/year
Nitrous Oxide	0,41	31	92	123	Tonnes of NOx/year
Carbon Monoxide	2	150	451	601	Tonnes of CO/year
Particles	0,27	20	61	82	Tonnes PM10/year

"Category 1 Usage" are businesses that use their own vehicles, daily
"Category 2 Usage" are businesses that use their own vehicle exceptionally, this is assumed to be once/week

BOX 3 - Almada UCC break-even point calculation

The initial configuration of the Almada UCC plans the use of n. 2 FEV (3,5 tons vans), operating 4 trips/day each (2 trips in the morning + 2 trips in the afternoon) to perform all the expected deliveries.
Considering a revenue of 6€ for each delivery (composed of one or more parcels for a total of max 100 kg), which is a price in line with the logistics market, a minimum number of deliveries/day is required to achieve a balanced budget (excluding depreciation costs), in particular:
8 trips/day x 300 days/year x 6 € = 14.000 €/year; yearly income for 1 delivery of each vehicle
200.000 €/year management cost / 14.000 €/year = 15; number of deliveries to be made by each vehicle
These figures draft a business plan showing that the Almada UCC is economically sustainable only if an average of 15 * 8 = 120 deliveries/day can be ensured.

E8: ROADMAP TO ADOPT THE SULP

RATIONALE

The SULP is a planning act at Municipal/inter-Municipal level. In the version defined in the above steps, having positively passed the quality and congruity check, also with respect to the priority list defined at E7 and to implementation timing, it shall be officially approved and adopted by Local Authorities.

Usually, the approval and adoption process for a planning act is regulated by national and local laws, which may significantly differ from country to country, characterised by different methods and publicity level in order to guarantee the interests of all the citizens and not only those of the directly involved actors.

As discussed in the sections above, the SULP can be considered as a part of the SUMP, both in terms of methodology and as regards the adoption process. For this reason, it is possible to follow for the SULP the same steps/road map for approval/adoption as an official Municipality act like the SUMP.

TASKS

In the following, a possible process for the adoption/approval of SULP is indicated. The suggested process is clearly open to amendments, even significant, depending on the different rules and procedures existing in the EU Countries at local/national level. At European level, at present, there is not even a common meaning of and consensus about the terms and processes of "adoption" and "approval".

In any case, some key steps are listed below:

- Preliminary activities for the publication and release of SULP approach and contents, by involving in particular the interested citizens and stakeholders. Focus groups and discussion about and possible adoptions of the indications/contributions provided;
- Analysis and correction (if needed) of possible interactions/conflicts of SULP with SUMP and/or any other urban planning acts (i.e. General urban plan, Land use plan, urban traffic and parking plan, etc.);
- Presentation of the SULP to the Municipal Authority by the SULP Planning Team (depending on the different local cases, this can consist either of internal staff or on external consultants). In this phase minor remarks and corrections can be integrated in the SULP;
- Discussion and adoption of SULP by the Municipal Council by means of specific acts;
- Large dissemination and promotion of SULP adoption trough various Municipality channels and media (i.e. Municipal bulletin, website, local gazette and newspapers/TV, etc.);
- Filing the SULP at Municipal Secretariat for a reasonable period (i.e. not less than 30 days) in order to guarantee that any interested actor can read it (either by email request or directly at the Municipality premises) and can submit any possible objection/remark. It is important to highlight that the participatory approach followed from the very beginning of SULP definition (see, as an example, the AREs organised in the framework of the ENCLOSE project) should avoid too many remarks and, at the same time, should guarantee a significant knowledge and understanding of the document from relevant stakeholders;
- In parallel to the "adoption period" a "safeguard period" shall start, in order to avoid to implement any single measure which is not in line with SULP provisions, even is these are not in force yet;
- The SULP team analyses all the remarks and objections received and prepare the "technical answers" to be submitted again to the Municipal Council, that shall decide about their approval or rejection;
- After the conclusion of these activities and institutional discussion/analysis, the Municipal Council should approve the SULP;
- Once approved, the SULP comes into force.

It is essential to include specific participatory steps (i.e. events/meetings) all along the SULP adoption-approval process, in order to guarantee a wide dissemination of and to build-up a large consensus on strategic, regulatory and operational choices that Local Authorities intend to adopt.

The participatory approach, already in place in the analysis, study and design phases (see, in particular, the above E0, E2 and E5) should be maintained during all the SULP development steps, in order to guarantee to the different stakeholders and citizens several opportunities to discuss and accept/reject the planning document, thus avoiding too many objections during the adoption-approval phase.

The main tools supporting this step can be summarised as follows:

- Specific information and promotion campaigns addressed to local stakeholders (in particular to commercial and transport operators operating in the SULP study area). In this phase, beyond the dissemination of specific information material, in the case of more complex measures (as the Urban Consolidation Center is), it is possible to organise specific technical visits to already existing structures, for representatives of associations and other relevant actors;
- Organisation of discussion/information events involving local stakeholders, associations and citizens (in particular those living in the interested area) in order to collect their suggestions/remarks to be integrated in the SULP before the submission to Local authorities.

Finally, it is important to stress that the road map is a process where a high level of involvement of different actors can be observed: from single operators to Associations, to citizens, Municipal offices and external planning experts. For this reason, it is worth noticing that any kind of discussion forum is welcome, from "live" meetings, to virtual and social spaces provided by new social networks (i.e. Twitter, Facebook, etc.). Finally, when adopting a participatory approach it is essential to bear in mind that quality and quantity are closely related to each other.

EXAMPLES FROM ENCLOSE

BOX 1 - Road map for Burgos SULP adoption

The SULP development has been a progressive process: from the solid basis of the Feasibility Study, developed within the ENCLOSE project, and the results of the Soft Measures, a draft document was designed.




SULP → 2° ARE: 20 May 2014 → Strategic Plan Approval: 2014 → Stakeholders committment

The city of Burgos opened a participatory process with the stakeholders for the validation, consolidation and embracing of the SULP. Here, 3 basic elements were considered:

- Information/Training: information about any public action is crucial for the stakeholder's participation;
- Consultation/Debate: stakeholders give their opinion, make suggestions and present alternatives, and a phase of dialogue is opened for consensus;
- Management participation
- Joint decision makes the implementation shared with stakeholders.

In particular, as regards the case of SULP in Burgos:

The 2 Awareness raising events (AREs) held in Burgos were a useful tool for stakeholders information, as well as the specific training sessions in other experienced cities.

Within the 2nd ARE event, a consultation session was held with stakeholders and was organised as an open debate where the developed work was presented and discussed in order to build-up consensus.

SULP includes both public measures and measures that should be promoted by/in cooperation with the private sector, leading to an implementation shared with stakeholders.

After a review phase with comments and suggestions gathered during the AREs, the SULP will be promoted, discussed and approved with the Strategic Plan City of Burgos Association. The Association is a local entity (promoted and chaired by the City Council) where more than 60 large companies, public and private organisations and technological institutions are integrated, with the common goal of acting in all areas that impact positively on the economic and social progress of Burgos, promoting and coordinating public and private sector.

This means that Strategic Plan City of Burgos Association has a wide representation of key stakeholders of the city, and so, in a third step, these stakeholders will spread and embrace the SULP within their organisations.

E9: RESPONSIBILITIES, IMPLEMENTATION AND MONITORING PLAN

RATIONALE

The final set of measures/services has been selected also on the basis of the available budget. In this step, each selected measure is analysed from the perspective of responsibility upon the development of the SULP, in order to have a clear vision of the actors in charge of the related measures/services.

A realistic implementation plan should be defined in order to have a clear picture of the evolution of the measures with respect to the time.

It is also necessary to have an assessment tool for monitoring the implementation (or the development) of each measure/service.

The most important aspect of this tool is related to the monitoring of the development of the plan in order to keep a close control of the planning process and of the state of implementation of single measures. This control should also support the very planning phase due to its connection role between the planning start phase and the final phase through feedbacks on the planned measures.

This is the base for monitoring the overall planning process. In parallel, it is necessary to make specific resources available for carrying-out the monitoring tasks and for defining a set of indicators allowing the assessment of the performances of the different measures implemented and the level of achievement of the objectives defined. Based on the set of specified measures, as results of the steps above (characterised at minimum by the level of feasibility, the level of needed resources and by the probability for a successful implementation,) a range of specific tools (or methodologies) should allow to monitor:

- The planning process, by verifying each scheduled step for checking the consistency of the work made and to be carried-out and, if necessary, to reschedule or change some actions related to the same planning methodology. This allows all the involved actors to have a continuous control of the planning process, identify the achieved milestones and the compliance with constraints and, if necessary, to recognise the difficulties and the responsibilities in developing the SULP. This monitoring phase can also show the efficacy of the planning process and its actions/results;
- The implementation process, by verifying the implementation level of each of the planned measures and the related effects allowing to adopt corrective actions in case the expected results and the planned objectives were not achieved;
- The after-implementation phase, assessing achieved results with respect to the planned objectives.

The work made in the previous steps drives this monitoring procedure, as the more accurate the results of the steps are (in particular the impacts evaluation), the more effective the monitoring will be.

TASKS

The Implementation Plan is a "working in progress" document defining in details (as the executive design) each operation to be performed for the overall realisation of each SULP measure (already defined in terms of feasibility, provisional and definitive design).

This document can be modified, during the implementation timing, depending both on the possible changes of realisation priorities on new regulations or infrastructure modifications. Moreover, time plan changes could be caused by the experience gained in the realisation of the first SULP measures/services.

Therefore, for each single SULP measure, a specific detailed realisation plan should be defined, indicating the responsible person and related team. The responsible, among the others, will:

- Coordinate the overall realisation actions (interrelations with providers, work monitoring, testing procedures, etc.);
- Carry out all the administrative/reporting activities for achieving the related permits and authorisations (i.e. public space occupancy, building authorisations, plants certification, etc.) needed;
- Manage the subcontractors both in respect to the type of procurement and to the related assignment.

For what the Monitoring plan concerns, the implementation phases/steps (detailed in the Implementation Plan) related to the SULP measures/services (i.e infrastructures realisation, rule issues, authorisations and certifications, testing procedures, operation start up, etc.) should be specifically monitored in order to allow the responsible team (within the Municipality office) to evaluate the level of realisation and the related attainments in terms of timing and budget constraints.

Therefore. it is necessary to establish a specific Monitoring Plan that for each measure/service allows, among the other:

- To continuously check the level of implementation;
- To assess the attainment of measures realisation with respect to its detailed design;
- To support the identification of the discrepancies against the planned activities in order to adopt suitable remedial actions.

Many of these monitoring activities involve procedures already consolidated in the common practice (i.e. work log book/journal, work progress verifications, etc.), while the specific set of indicators and the related operation modalities for collecting data should be defined in the Monitoring Plan.

Once the measure have been in operation, the monitoring activities shall be focused on controlling and verifying the financial and operational efficiency, the different impacts and socio-economic aspects.

EXAMPLE

To make the above indications clearer, a description of the set of indicators identified for monitoring the "load/unload bays" is provided:

a) general indicators

- N. good vehicle /day present in the urban area;
- Travelled Km/day by good vehicles in urban area, n. deliveries for each trip, n. deliveries for each bay.

These indicators can by monitored by data collection campaigns or through on site interviews with transport operators

b) Daily use of the single bay

This indicator is based on on-site counts or by the parking management system (if present) on the basis of maintenance reports

c) Service efficiency and approval

The efficiency can be monitored by the single bay availability verification as indicated above.

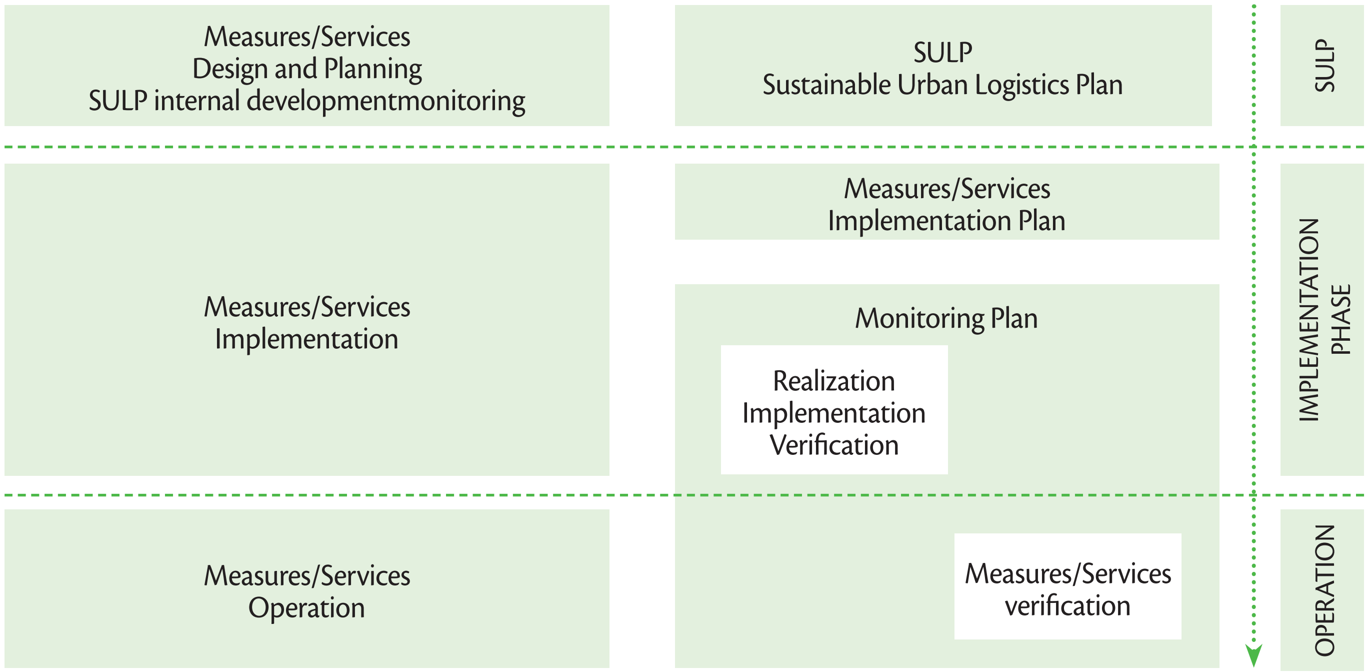
The knowledge and approval parameters can be monitored with specific interviews directed to transport operators and shopkeepers.

METHODS AND TIMINGS

In the SULP measures/services implementation process it is necessary to clearly define different roles, competences and responsibilities among the various actors (municipality, service providers, associations, etc.) in order to minimise the possible conflicts and for better coordination of the different activities and operational phases. Therefore, the Implementation Plan and the Monitoring Plan are operational handbooks, allowing the Municipalities (and its responsible) the continuous control of the activities both during the realisation phase and during the start up.

The main milestones of this implementation process can be outlined as follow:

Implementation and monitoring process



EXAMPLES FROM ENCLOSE

BOX 1 - Dundee municipality logistic measures implementation plan

Two soft measures were identified for application in the Dundee central area in the short term as part of the ENCLOSE project. These were:
- enhanced enforcement of loading bays, increased use of electric powered Dundee City Council vehicles.

The following were identified for consideration in the medium term:
- Urban Consolidation Centre (UCC)
- carriage of customer purchases on Park & Ride buses
- further development of web / app / Sat Nav based information for freight/logistics operators in Dundee.

A programme has been developed that aligns with the time scales of the Dundee SOA (Single Outcome Agreement), until 2017, and the Regional Transport Strategy, until 2023. The programme has been split into short-term measures covering 2014 - 2017 and medium term 2018 - 2023. The short-term programme reflects the current position of financial constraint. Earlier implementation of the medium term programme may be possible as funding opportunities arise. Implementation of the medium term programme will be subject to review during the period 2018 - 2023.

BOX 2 - Serres municipality logistic measures implementation plan

The Sustainable Urban Logistics Plan for the city of Serres foresees the implementation of five specific measures, which are planned in different timing perspectives:

- Short Term Measures:

Users' Awareness Raising and Information campaign;
Spatial and temporal restrictions.

- Medium Term Measures:

ICT e-platforms and collaboration between stakeholders in urban freight transport;
Routes optimisation through the provision of real time traffic system.

- Long Term Measures:

Urban consolidation centre (UCC).

The stakeholders debate for the implementation of these measures ended up in specific conclusions:

- The measure that seems to be easily applicable is users' awareness raising and information. According to public opinion, in order the measure to be effective a synergy between all stakeholders is required.
- Spatial and temporal constraints could be a solution to facilitate access to loading/unloading places, but need a collaborative effort in order to continuously inform citizens about the utility and functionality of these places.
- Routes optimisation through the provision of real time traffic system could improve the time and service reliability, reducing at the same time the operating costs of transport companies.
- The use of ICT platforms could lead to an exploitation of all loading/unloading places in the best possible way and therefore could contribute to the coordination and planning of trucks' arrivals within the city centre, reducing that way traffic congestion, noise and environmental pollution.
- The construction of an UCC, concentrating goods that are grouped and trans- shipped from large trucks to small vans in order to be delivered in an area close to the centre of Serres, is a highly costly measure requiring a strong synergy between the public and private sectors.

E10: PROMOTION AND COMMUNICATION PLAN

RATIONALE

The promotion and communication plan describes the main strategies in order to spread all the information concerning the various activities and actions results, and prepares the ground for sustainable results. Dissemination and promotion activities are designed to address and meet the main objectives of promoting sustainable, eco-compatible services and solutions for city freight distribution. For this reason, local dissemination and promotion are crucial for the success of the measures/action to gain interest, involvement and trust of all concerned user and public categories in the towns and in the surrounding territories.

TASKS

- Communication tools and actions definition;
- Web presence and social media: publication of papers / publications (including multimedia) and articles in the specialised and general press;
- Audio-visual material;
- Newsletters;
- Awareness Rising Events (AREs);
- Meetings with local stakeholders.

The most important aspect that requires a proper communication activity is the willingness of the local Administrations to concretely establish, among the others, commitment of substantial resources in the implementation of infrastructure/measures/regulations towards a more sustainable approach to urban logistics developed through the SULP.

METHODS AND TIMING

The specific methods heavily depend on the local contest. It is essential to define periodically a method, allowing the evaluation of the results obtained and eventually adjusting it.

A number of key elements have to be taken into account and have to be carefully assessed when implementing each single dissemination phase and measure.

The main goal of the promotion plan is the creation of a "communication network" between all parties concerned by city distribution, including the different branches of Public Administration, shop owners and commercial operators, freight transport operators, citizens, visitors and tourists.

The designed communication plan should target and concretely involve a series of stakeholder to help providing the various planned actions with a coherent and consistent drive leading to the achievement of tangible results.

Key issues requiring special attention and careful choices in order to achieve and implement an effective and coherent local dissemination and promotion strategy include:

Integration. All activities concerning dissemination and communication must be integrated in the context of a single communication strategy, with clearly identified targets and lines.

Coordination. For all planned actions and initiatives related to public information and communication about the Sustainable Urban Logistics Plan, a coordination phase is necessary to identify the most suitable ways, instruments and contents to develop the actions within the integrated communication strategy in the most effective way.

Identification. It is of utmost importance that any message related to the town's Urban Logistics strategy is immediately identified by the public, with clear and direct reference to the action by means of easily identifiable elements such as the logo, colors, etc.

Objectivity. It is likewise very important that any message targeting the different public and user categories is felt as much as possible as conveying 'objective' information, to avoid being interpreted as commercially-biased communication and advertising.

Credibility. Even more important, credibility of the action must be ensured, avoiding any propaganda or hype. Messages should not only convey positive pictures and success, hiding difficulties or problems, if any. Rather, a wise communication should use these as useful lessons for the interest of the community.

Persuasiveness. Messages and actions should be persuasive and avoid any imposition or strong statement. Such a model and solutions should be made attractive for the concerned public and user categories, as they suggest proper behaviours, provide evaluations and comparison elements, and are convincing because of collective advantages and proposed benefits.

Visibility. All information and communication activities must contribute (together with integration and coordination) to enhance visibility within the concerned territory and user categories, making measures, implementations and achievements as much visible as possible on a local as well as national and European level.

Accessibility. Information, messages and project products in general must be characterised by simplicity, clarity and immediacy in order to ensure being accessible to all intended target publics and user categories.

Interactivity. Communication and promotion about Sustainable Urban Logistics initiatives must favor interactivity and multidirectionality of messages.

The communication plan identifies and classifies the target audience for the communication material and dissemination activities. Target audience is composed mainly by local stakeholders, including Local Authorities, transport operators, logistics service providers, commercial operators and associations, policy makers, citizens and user groups. From a general point of view, the targets related to the implementation of urban logistics schemes and services are:

- Local authorities, i.e. municipalities (including policy makers, infrastructure managers, urban planners, etc.);
- Local mobility and energy agencies as well as public companies in the transport sector, i.e. in-house or private-public enterprises managing transport or mobility-related services at various levels;
- SMEs, service providers (including shippers, transport operators, etc.), profession-

al workforce operating logistics services in urban areas;
- Chamber of commerce, institutional representatives of the local economic operators;
- Professional associations, in particular the ones related to trade, craft and commerce, whose members are present in the areas interested by urban logistics processes;
- Retailers, distributors, wholesalers, shopkeepers, hoteliers, tourist operators, etc.;
- Citizens (including residents, commuters, visitors and tourist).

Additionally, sponsors and supporting bodies, General Public, Press and Media organizations should also be targeted since they represent also relevant key actors as they has the potential to influence decision makers, support the project general objectives validating its legitimacy, spread the word about the initiative, provide additional support (i.e., political buy-in from sponsors).

EXAMPLES FROM ENCLOSE

BOX 1 - Local awareness raising events in the enclose project

Awareness Rising Events (AREs) integrate with and complement previous experience exchange actions by providing a number of public events and presentations aimed at stimulating the uptake of energy-efficient urban logistics solutions in the ENCLOSE historic towns.

The goal of AREs is twofold:

- to provide a platform to facilitate the involvement and consultation with local stakeholders in the follower/learner sites, and to build up local consensus around energy-efficient urban logistics;
- to support the definition of the local Sustainable Urban Logistics Plan in the sites enabling presentation and discussion of the principles and elements of the SULP to the involved stakeholders, as well as the collection of feedbacks used in the definition process.

AREs are local meetings (duration: 1 day, up to 2 days each) held at local level and targeted and tailored to relevant local urban logistics stakeholders (e.g. Local Authorities, transport operators, local logistics companies, associations of shop owners and retailers, citizens, etc.).

Each event has been organised in two logical parts:

the first one brings the expertise of participating experienced towns, illustrating the audience their success story and explaining the implementation path and process undertaken by them, the goals and main concerns of Local Authorities, etc.

The second part, is more focused on illustrating the general scheme of the SULP to the relevant stakeholders involved in its implementation (e.g. local authority policy dept.), on gathering information on the site in order to later provide support to the preparation of the feasibility studies and in the following phases of development of the local SULP.

During the course of ENCLOSE, each learner partner has organised and hold at least two AREs, which eventually were followed by other events depending on the specific needs and identified urban logistics solutions as well as on the characteristics and complexity of the political and participatory path each learner Local Authority wanted to follow. One representative from one of three forerunner sites, assisted by the ENCLOSE Coordinator, attended the event. The presence of these partners has provided the requested expertise to maximise the results of the events and create the relations and common understating required to develop the following phases of the Action (e.g. energy benefits assessment). The events have had great success supporting local authorities in the following project activities.

BOX 2 - Local enclose contest for Luccaport

In order to disseminate the results so far achieved by the local action Luccaport, the Municipality launched in June 2014 a competition to tell about LUCCAPORT through comics, videos or photographs. The ecological city distribution terminal of the town of Lucca is running some of the services piloted in ENCLOSE. Photography and video enthusiasts and budding cartoonists: they were all the recipients of this contest, designed by the local authority as part of the project and in collaboration with several other stakeholders, with the aim of promoting LUCCAPORT - the city terminal that distributes goods in the city with electric vehicles and sustainable means - through works that can best express the economic, social and environmental benefits derived from its activity. In fact, the main purpose is raising awareness, starting with school kids, about the existence of Luccaport and why this experience is positive and useful for Lucca.

Participation was free and open to all professionals or enthusiasts of all ages, who at the date of submission of the application had already turned 18. Three sections: cartoon, digital photography, video. The awards was eventually presented at an ENCLOSE workshop specially organised by the city of Lucca; the best five works presented in each section were made available on the official ENCLOSE website. The participation to the contest and its press dissemination have let the themes of the Luccaport project reach a variety of interested people both at local and at national level.

SULP INTEGRATION WITH SUMP

The urban traffic flows and related traffic congestion level are the first and main motivations pushing Local Authorities to act and to control urban mobility processes. A set of measures are planned and implemented in various modalities with the main objective of reducing externalities (i.e. pollution and noise, energy consumption, accident risk, urban degradation, congestion, etc.) caused by the traffic flow related to people and goods transport. Traffic congestion is in any case the main factor among the negative impacts directly perceived by "users", both for what timing and costs and, in the case of goods transport, for production costs and the overall production chain regards.

For the above mentioned and other well known motivations and factors, in the last decade many policies, directives and "on field" actions have been defined and promoted by the EU (i.e. Action Plan on Urban Mobility COM (2009)-490/5, The White Paper 2011, the CIVITAS, IEE programmes etc.) in order to tackle mobility problems in both urban and metropolitan areas in the perspective of an overall urban sustainability.

With these measures and initiatives the EU aims to promote an unitary and integrated plan indicated as Sustainable Urban Mobility Plan and defined as "a Strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles ..."

Such an approach is not new for some EU countries (i.e UK - Local Transport Plans, France - Plans de Déplacements Urbains, Italy – PUM-Piani Urbani della Mobilità) but surely more "persuasive" for cities.

The overall objectives of the SUMP can be summarised as follows:

- To ensure that accessibility offered by the transport system is available to all;
- To improve safety and security;
- To reduce air and noise pollution, greenhouse gas emissions and energy consumptions;
- To improve the efficiency and cost-effectiveness of the transportation of persons and goods;
- To contribute to enhancing the attractiveness and quality of the urban environment and urban design. Therefore, the policies and measures to be defined in a SUMP should cover all modes and forms of transport in the entire urban agglomeration, including public and private, passenger and freight, motorised and non-motorised, moving and parking, etc.

With the SUMP approach (and the related directives, actions and founding) the EU does not intend to create a new further planning tool as compared to the national, regional and town level. Instead, it aims to provide a reference methodology for elaborating an integrated urban mobility planning. Taking advantage of the existing planning tools, participation and evaluation principles/criteri,a the SUMP aims to answer the current and future mobility needs of people and goods in order to reduce negative impacts and to enhance life quality in the urban areas.

This methodology is based substantially on these main phases:

- Status analysis and baseline scenario;
- Definition of a vision, objectives and targets;
- Selection and design of policies and measures;
- Assignment of responsibilities and resources;
- Monitoring and evaluation arrangements.

The relevant phases are described in the SUMP Cycle scheme structured in 11 Elements corresponding to the main steps of the Plan) and 32 Activities (corresponding to the detailed specific tasks of the Plan) promoting from one side a participatory and integrated approach, and from the other side measurable targets identifying the various costs and benefits.

In this context, there is a close mutual relation between the SUMP and the SULP methodology introduced and defined in the above sections, which can be summarised as follows:

- SULP is a relevant action or part of the SUMP, dedicated to urban logistics processes;
- SULP provides real and planning working details to implement the specific SUMP approach for what Logistics processes regards;
- SULP follows the participation approach and the political level involvement with a bottom up approach starting from the user needs.

Moreover, the SULP, as the SUMP methodology, puts great attention in covering the different aspects related to the various urban area levels (institutional, political, operational and infrastructural/technological).

It is possible to identify some integration levels between SULP e the sustainable urban mobility (SUMP) as the following ones:

- Stakeholders decision level: SULP supports the SUMP for the main objective of reducing external impacts/costs (traffic congestion, pollution and consumptions, low safety);
- Town situation diagnosis: SULP supports SUMP in identifying the town base line situation not only for logistics processes, but also for some common mobility factors (first of all the identification of the traffic situation);
- Town measures design: the measures regard the road network and its control should be shared between the solutions

for people mobility and logistics (i.e. parking areas, city accessibility, time windows, clean vehicles, etc.). Therefore, SULP and SUMP have mutual feedbacks, the realisation of one can push and facilitate the realisation of the other, thanks to the same participatory approach towards the various stakeholders.

The border line between the SULP and SUMP is provided by the level of solutions dedicated to the different mobility or good distribution processes, and by the fact the SULP should also guarantee an efficient urban logistics system.

Finally, the SULP should be integrated with the emerging "smart city" approach and mainly with the ITS development plan for urban areas, as indicated by the EU directive 2010/40/UE and their national implementations/receptions concerning the development of ICT systems dedicated to the mobility and the interface with the other mobility services and modalities.

The integration with SUMP can be reached at different levels depending on the Town existing and/or planned policies and initiatives.

This integration is still more relevant at the level of small and medium-sized towns, where a set of factors do not allow to have a clear separation of planning tools (or better, a lot of resources to be dedicated) for what concerns the main aspects of urban mobility (traffic, goods and public transport). Therefore, in the small and mid-sized historic towns, the integration should be achieved working on many tasks, requirements and tools that can be shared by the SULP and SUMP methodology in terms of i) expertise practice ii) extension of the range of applications and analysis of specific methodology steps/actions and iii) design of networks, regulations and ITS measures.

For the expertise and capabilities, the possible integration can be achieved with respect to at least the following points/aspects:

- Transportation planning and modeling;
- Data collection, analysis, and forecasting, including use of geographic information systems (GIS);
- Working with Local Authorities and coordinating stakeholders groups, using participatory tools (surveys, interviews or focus groups, stakeholder engagement, and preparation of information for the general public);
- Impact analysis based on different indicators and monitoring and evaluation of the plan.

For what the task concerns, it is possible to extend the following tasks. that could be common among the two methodologies:

- Project management and coordination;
- Stakeholder involvement in terms of: documentation analysis, meeting and focus groups leading, interviews, briefings to a project advisory group, city boards and commissions;
- Database: create the same information system on which to integrate the different useful modeling tools and the results of the data collection/base line activities;
- Baseline: to extend the data collection to the existing town condition (from traffic aspects to freight deliveries, etc.);
- Policy strategy: to extend the vision, goals, objectives, and performance measures to define freight and mobility policies, network, programs and investment decisions and evaluate the near future situation;
- Implementation strategy, in order to classify the different solutions and project measures, programs, and maintenance activities to support an efficient transportation and mobility system. A main focus has to be on prioritising the different activities and projects so they integrate in a collaboration between SUMP and SULP for their implementation .

For the design of specific measures regarding the network, regulations and system aspects, the integration can be reached at these levels:

- Traffic counting and interviews;
- Analysis of loading and unloading areas and detailed traffic impacts evaluation;
- Low emission areas/zone utilisation, identifying the freight routes and the relation with the network hierarchy;
- Definition of time and space accessibility rules (night delivery, use of transit lane, etc.);
- Sharing some requirements for possible ITS solutions/systems (access control for the entrance and exit goods van despite resident vehicles, dynamic loading/unloading areas by Integrated management parking system, etc.);
- Sharing the platform of some innovative service (car sharing platform for good van sharing, bike sharing platform for cargo bikes);
- Sharing the UCC platform for managing the booking and operation of the flexible mobility services (i.e. demand responsive solutions);
- Electric mobility by sharing the electric recharge station;
- Integration of parking schemes with last mile goods distribution rules.

Overall, the present Guidelines provide useful tools to develop a proper Sustainable Urban Logistics Plan. Building on existing planning practices and taking into consideration integration, participation, and evaluation principles, SULP represents a strategic plan designed to satisfy the freight mobility needs of people and business in cities and their surroundings, in order to achieve a better environmental and life quality. SULP must be considered as one of the main parts of the Sustainable Urban Mobility Plan (SUMP), devoted to integrate urban logistics schemes/services/regulation in the overall mobility strategies and solutions.

The 9 ENCLOSE towns


LUCCA (IT)


TRONDHEIM (NO)


'S-HERTOGENBOSCH (NL)


BURGOS (ES)


SERRES (GR)


DUNDEE (UK)


ALBA IULIA (RO)


ALMADA (PT)


BALCHIK (BG)

IEE ENCLOSE PROJECT

SULP Guidelines certified
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ENCLOSE

ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe Programme of the European Union

ALBA IULIA

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project
Deliverable 3.6
SULP "Sustainable Urban Logistics Plan"
WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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Circulation
Public

Date
30.10.2014

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SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

AIM OF THE STUDY WITHIN THE PRESENT CONTEXT

The aim of the present study – **the Sustainable Urban Logistics Plan (SULP)** of Alba Iulia is to identify feasible solutions for the local implementation of sustainable logistics and energy efficiency measures.

The Sustainable Urban Logistics Plan (SULP) is part of the **ENCLOSE** project (ENergy efficiency in City LOgistics Services for small and mid-sized European Historic Towns). ENCLOSE is a pilot project funded by the European Commission under the Intelligent Energy– Europe (IEE) program.

ENCLOSE aims to raise awareness about the challenges of energy efficient and sustainable urban logistics in European Small and Mid-Sized Historic Towns (SMHTs) and about the concrete opportunities to achieve highly significant improvements and benefits by implementing and operating suitable and effective measures, schemes and framework approaches specifically targeted to such specific urban environments.

There are successful innovating practices and mechanisms across Europe providing convincing proofs as to the feasibility and benefits of the proposed approach. Starting from and multiplying these practices, ENCLOSE will contribute to bridge the gaps and to exchange knowledge of feasible solutions for the high number of SMHTs, to investigate and prove the transferability of solutions and the opening of dissemination channels and the implementing of energy-efficiency and sustainable urban logistics solutions in as many European SMHTs as possible.

Freight transport and city goods distribution are widely known factors of energy consumption and environmental degradation in European urban centres and increasing efforts have been undertaken in EU countries to improve operations and reduce their negative impacts. Based on gathered evidence, there is today a considerably growing consensus on the view that more sustainable urban freight operations and significant benefits in terms of energy efficiency can be achieved by an appropriate mix of different measures such as, for instance: Urban Consolidation Centres, optimised urban freight transport and delivery plans, clean vehicles and low emission technologies, restrictions and public incentive policies, last mile and value added services, integration of city logistics processes within the overall management of urban mobility.

Whilst efforts and city logistics innovation projects have been undertaken in most European capitals and major cities (like e.g. Barcelona, Berlin, London, Paris, Stockholm, etc.), Small and Mid-Sized Historic Towns (SMHTs) particularly those involving historic centres, are somehow lagging behind, as they have to face and overcome several barriers (related to e.g. shortage of resources, competences, organisational structures, institutional backing, etc.) to be able to effectively embrace innovation, adopt and implement appropriate plans and measures towards sustainable city logistics. They also have additional constraints and challenges related to their specific territorial, social and economic characteristics (e.g. difficult mobility and significant freight distribution flows, higher impacts of environmental pollution on citizens and quality of life, etc.) and yet show increasing demand of effective measures as well as large potentials for improvements of energy efficiency and sustainability of city logistics operations.

The ENCLOSE project aims to raise awareness about the challenges of energy efficient and sustainable urban logistics in European SMHTs and about the concrete opportunities to achieve highly significant improvements and benefits by implementing and operating suitable and effective measures, schemes and framework approaches specifically targeted to such specific urban environments.

The ENCLOSE project will support the development of Sustainable Urban Logistics Plans in 9 SMHT involving partners from 13 European countries – Austria, Bulgaria, Greece, Ireland, Italy, Norway, Poland, Romania, Portugal, Spain, Sweden, The Netherlands and the UK – with a very high potential of achieving a much wider reach thanks to participation of European and worldwide City Associations and networks.

Starting from urban logistics infrastructures, systems and services already in place and operational, the Forerunner towns of Lucca (Italy), Trondheim (Norway) and s'Hertogenbosch (the Netherlands) will play a motivational role and provide tangible and measurable demonstrations of the possible solutions and benefits that can be attained. Pilot operations will allow investigating all key aspects of interest for less experienced Follower towns, including organisational issues, operational schemes, enabling technologies, underlying service chains and business models, supporting public policies and institutional frameworks, etc. The demonstrations will provide a coherent set of usable town logistics design criteria and evaluation parameters, which will be then adapted against the specific goals, requirements and characteristics of the ENCLOSE Follower towns in order to develop local Sustainable Urban Logistics Plan (SULP) and the evaluation of energy efficiency and impacts.

Forerunner towns:

- Lucca (Italy)
- Posten Norge, Trondheim (Norway)
- s'Hertogenbosch (the Netherlands)

Follower towns:

- Plan Strategico Association, Burgos (Spain)
- Almada (Portugal)
- Dundee (UK)
- **Alba Iulia (Romania)**
- Serres (Greece)
- Balchik (Bulgaria)

Partners:
- EATHR, the European Association of Towns and Historical Regions
- M&C Marketing & Communication (Italy)
- Energi Kontor Sydost (Sweden)
- Tipperary Energy (Ireland)
- Austria Tech (Austria)
- ILIM (Poland)

The ENCLOSE project, based on the real applications carried out by the forerunner towns and on the consolidated experiences of some partners, aims to provide and disseminate viable solutions for urban energy-efficient transport by:
- addressing specific needs, requirements, options and priorities of European SMHTs, demonstrating and assessing feasible and sustainable solutions and releasing a specific SULP (Sustainable Urban Logistics Plan);
- qualifying the demand of European SMHTs for sustainable, energy-efficient urban logistics and freight distribution solutions, generating and spreading the knowledge about good practices and suitable strategies for effective integration logistics schemes in the overall urban mobility and, more generally, town governance policies (SUMP);
- investigating and assessing the operation of "green vehicles" (FEVs, PHEVs, Biogas) and fleets in urban distribution and other logistics schemes from the point of view of the needs and requirements of in SMHTs.

The concept of Sustainable Urban Mobility Plan (SUMP) was developed in the last years by different EU documents (e.g. Action Plan on Urban Mobility - COM(2009)490 final or White Paper Roadmap - COM(2011)0144 final) and carried out by different EU (and in particular in IEE) projects. Updated and detailed information on SUMP and related approaches are available at www.mobilityplans.eu, developed by the IEE Eltisplus project (2010) where, among the others, it is possible to find guidelines for setting up a SUMP and explanation/details on the proposed methodology.

SUMPs can be partially assimilated to the former Mobility or Transport Plans that many towns/cities (with defined dimensions and characteristics) have developed during the last years to face the transport and mobility problems.

The ENCLOSE Project therefore considers the Sustainable Urban Logistics Plans (SULPs) as one of the essential parts of the town mobility plan (SUMP) and aims to address the development of the SULP in each of the ENCLOSE towns, considering its relation with the SUMP.

ENCLOSE aims to have a general and visible impact on promoting the adoption of good urban logistics practices in European SMHTs, by implementing concrete demonstration actions and rising the awareness of the involved local authorities and stakeholders through a number of local dissemination events and media involvement directly in 13 EU member states and, via the participating multipliers association of European historic towns, indirectly in all EU27 countries.

Within the project lifecycle, ENCLOSE expects to achieve over 50 toe/year primary energy savings and a reduction of greenhouse gas emissions of about 900 tCO2e/year. In the longer term (2020 objectives) the impact of ENCLOSE is estimated to amount to total primary energy savings of 2.600 toe/year and over 55.000 tCO2e/year reduction of GHG emissions.

Overall, ENCLOSE will have the following results:
- Assess the applicability and benefits of energy-efficient and sustainable urban logistics measures specifically targeted to European small-/mid-size historic towns, by implementation of (1) pilot operations in 3 urban centres in Italy, Norway and The Netherlands and (2) feasibility and transferability analysis and the implementation of soft measures carried out in 6 historic towns in Bulgaria, Greece, Portugal, Romania, Spain and UK.
- Development of Sustainable Urban Logistics Plans (SULPs) in the 9 ENCLOSE forerunner and learner cities building up a suitable framework for the definition of SULPs for Small-/Mid-size historic towns.
- Promoting the networking of European SMHTs on the themes of sustainable and energy-efficient logistics, to facilitate the exchange of experiences, promoting the adoption of SULPs and investigating policy-level issues to define a strategy to ensure long-term sustainability of the designed framework for SULPs for SMHTs.

Freight transport is vital to the structure of modern society and absolutely essential for supporting a "modern" lifestyle. This provides the circuit goods from production to distribution sites, making them accessible to consumers. Freight transport is even more vital for cities because cities, by definition, are places where almost none of primary goods are produced. In contrast, cities represent the greatest demand for consumables, due to the large number of people who live there.

Europe has in time registered an increase in urban population and its growth is expected from 72% in 2006 to 84% of the total population in 2050. Therefore, it is increasingly important to create an efficient freight transport system for the future.

Freight transport efficiency is based on the term "logistics", which refers to "planning, organization, management, execution and control of freight transport" (European Commission, 2010). The concept of "urban logistics" can be defined as "the total optimization of logistics and transport operations by private companies with the support of advanced information systems in urban areas taking into account traffic congestion, the environmental factor, energy consumption, road safety and energy savings within the context of the market economy."

Currently, the continued growth of freight transport (especially road transport) worsens its impact on the environment and society. In cities, people live and work close to the road network, being exposed to the negative effects of traffic. They are identified by the "UK Round Table on Sustainable Development" (1996) and are summarized in *Table 1.*

Economic impacts	Traffic Congestion Resource waste
Ecological impacts	Greenhouse Gases Cause Climate Change The use of non-renewable fossil fuel The effects of waste products such as tires and oil Ecosystem destruction and species extinction
Social impacts	Negative public health impacts of pollution Crop destruction Injuries and deaths resulting from traffic accidents Noise Visual intrusion Congestion deterring passenger travel Loss of Greenfield sites and open spaces Deterioration of Buildings/Infrastructure

Table1. Impacts of the logistics system

Since the early 90s, there has been a growing interest in reducing the negative impact of logistics and desire to make it more environmentally-friendly.

However, at the level of cities, there is the following difficulty: cities are often too small for proper planning of freight as freight in a given urban area is only part of a chain of distribution between it and other cities or even countries. Therefore, freight infrastructure planning in a particular city should be harmonized with that of other cities.

The present SULP is aimed at presenting solutions for the improvement of logistics in Alba Iulia and also at presenting solutions for future lines of action, in agreement with European policies and based on the experience of similar European towns.

1. GENERAL CONTEXT OF THE TOWN

1.1. The town and the study area

1.1.1. POSITION

Alba Iulia is a natural crossing point and crossroads that organically bound it to the surrounding areas rich in deposits of precious metals, salt and famous vineyards that have spurred the development of its population, as well as its urban and economic development.

The town encompasses 10,365 hectares of land, arable land, pastures, meadows, vineyards, orchards and tree nurseries. *(Appendix I.1 - Alba Iulia – Administrative territory)*

Alba Iulia is located in the centre of the Transylvanian Plateau, 460º5' north and 210º15' east, with an altitude of 330 m, at the meeting point between the hills descending from the Trascăului Mountains and the plains of the valley along the middle course of the Mureş River.

The town itself is located on the first terrace of the Mureş, forming an 8-10 km long and 2-4 km wide plain to the east. The western part of the town is surrounded by the wooded heights of the Metaliferi Mountains with the Mamut Peak (630m). To the east, across Mureş, are the reddish clay hills of the Transylvanian plateau, eroded by the rivers Mureş, Sebeş and Secaş. To the south are the Sebeşului Mountain peaks with Surianul Peak (2245 m) and Pătru's peak (2130 m). The town is crossed by the road E81, which connects the cities of Sibiu and Cluj Napoca.

(Appendix I.2 - Alba Iulia's position on the map)

The area is very rich in historical monuments, works of architecture and art, a proof of its long history. It is also an attractive tourist area rich in natural sights. Alba Iulia has been, since old times, a hearth of human civilization. Nowadays, traditional Romanian customs and rituals are very much alive and they are ready to receive tourists from all over the world.

Alba Iulia is also the symbolic capital of the Romanian people, a symbol of unity of the nation and of the spirit. Here, on 1 December 1918, the Union of Transylvania and mother country Romania took place and thus, the Modern Romanian National State was born.

A representative image of the municipality is the bastion-type Vauban-style fortress of Alba Carolina, built after the establishment of Habsburg domination in Transylvania (1715-1738). It is the most representative bastion-type Vauban-style fortress in the country. Built by the architect Giovanni Morando Visconti under General Stephen of Steinville (1663-1736), commander of the imperial troops in Transylvania, the fortress has seven bastions (Eugene of Savoy, St. Stephen, St. Michael, St. Charles, St. Elisabeth, Trinitarians and St. Capistrano) and all the fortification elements adapted to the military technology of that time - tenaille, ravelins, anterior walls, scarp, counterscarp and glacis organized on the principle of mutual defence and of remote defence.

Access inside the fortress is possible through seven gates, decorated with statues and reliefs by a team of sculptors led by Johann König. The fortress reunites the most significant collection of baroque figurative art works in Transylvania.

The main tourist attractions located within the fortress are: the Route of the Three Fortresses, the 7 gates of Alba Carolina, the Orthodox Cathedral of National Reunification, the St. Michael's Catholic Cathedral, the Museum and the Union Hall, the Batthyaneum Library, the cell where Horea, Closca and Crisan, leaders of the peasant serfs' revolt were imprisoned, and which is located inside the architectural ensemble of the third gate, the Apor Palace, the Princes' Palace, the Palace of the Roman Catholic Archdiocese, the obelisk erected in the memory of Horea, Closca and Crisan, the Roman Encampment gate, the Lossenau monument, the Custozza monument and the statue of Michael the Brave.

The Alba Carolina Fortress, with all its inside and outside areas with its bastions and ravelins is listed as Heritage Monument in Romania and is part of the UNESCO Cul-

tural World Heritage. The Alba Carolina Fortress is a bridge between centuries of history, culture and successive European civilizations, preserving between its walls the vitality and the legacy of successive generations that lived on the site of present day Alba Iulia.

1.1.2. POPULATION

According to the 2011 census, the population of Alba Iulia is of 63,536 residents, lower than at the previous census in 2002, when there were 66,406 residents. Most residents are Romanian (87.62%). The main minorities are the Romany (1.76%) and Hungarians (1.59%). For 8.64% of the population, ethnicity is not known. From the religious point of view, most of the inhabitants are Orthodox (81.31%), but there are minorities such as Pentecostal (2.15%), Greek Catholics (1.93%), Roman Catholics (1.88%) and Baptists (1.51%). 8.85% of the residents did not declare their religious confession.

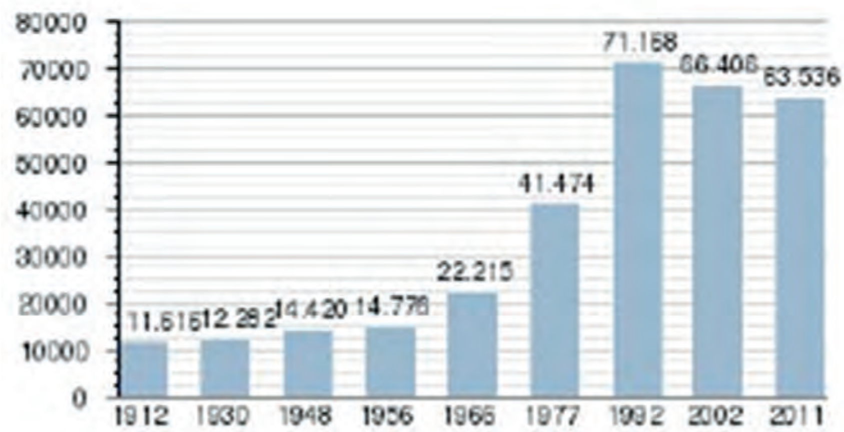


Fig.I.2. Demographic evolution at census

1.1.3. THE ECONOMY AND PUBLIC SERVICES

Alba Iulia is the administrative centre of the Centru Development Region including the counties of Alba, Brasov, Sibiu, Harghita, Covasna and Mures.

Alba Iulia is twinned with:

- Arnsberg-Germany since 1974; there is currently a non-for-profit company called "Pro Alba Iulia" in Arnsberg which aims to enhance bilateral friendship cooperation between the two towns;
- Szekesfehervar - Hungary, with which there are numerous economic and cultural exchanges;
- Nazareth- Illit - Israel, since 1994;
- Aeghio - Greece - since 2001
- Duzce - Turkey - since 2001;
- San Benedetto del Tronto- Italy – since 2001;
- Alcala de Henares - Spain – since 2002;
- Sliven - Bulgaria - since 2002;
- Varese - Italy - since 2003; administrative relations;
- Alessandria-Italy - since 2008; administrative relations and a signed Cooperation Protocol for the development of a renewable energy project;
- Lanzhou - P.R. China - a twinning Agreement was signed and a twinning Protocol is yet to be signed.

Alba Iulia cooperates with cities in Austria, Belgium and the United States of America.

The built-up area within Alba Iulia is divided according to the Urban Plans in force into the following functional areas:

Town centre and public facilities
Residential area
Green areas
Transportation areas
Industrial area
Public utilities, facilities and transportation area
Urban planning and public utility networks
Special area

Economic life is dominated by a few famous enterprises whose production is exported all over the globe. Thus, IPEC SA and Porţelanul SA produce a wide range of chinaware of great finesse and beauty that has brought them international notoriety. Also, Incov SA produces Persian carpets satisfying the most sophisticated orders. Saturn produces iron castings and Rekord SA manufactures a wide range of footwear. The total number of companies in Alba Iulia is 3,079 of which: owned by the state – 81, private - 2998, with foreign capital – 27, Romanian-foreign joint venture - 150, state companies – 9, cooperative organizations -17, sole traders - 335 family associations.

Schools in Alba Iulia own 484 classrooms, 60 laboratories and 35 school workshops. The town and its outskirts (Barabant, Partoş, Miceşti, Oarda and Pâclişa) has 12 public elementary schools, 8 public high schools: "Horea, Cloşca şi Crişan" Theoreti-

Fig.I.1.The functional breakdown of land inside the built-up area – "The urban dynamics of Alba Iulia" cal High School, "Mihai Viteazul" Military High School, Music and Arts High School, "D.P.Marțian" Economic High School, Sports High School, "Dorin Pavel" Technical High School, "Al. Domşa" Technical High School and "Apulum" Technical High School; two seminaries: the Orthodox Theological Seminary and the Catholic Seminary, one public institution of higher education "1 Decembrie 1918" University of Alba Iulia which includes the Faculty of History and Philology, the Faculty of Sciences, the Faculty of Law and Social Sciences and the Faculty of Orthodox Theology. Pre-school education takes place in 21 kindergartens of which 17 are public.

In Alba Iulia there are 36 places of worship for the following confessions: Orthodox, Roman- Catholic, and Franciscan, Greek Catholic, Reformed, Unitarian, Baptists, Protestants, Mosaic and others. The town has one Cultural Centre, one Students' Cultural Centre, one puppet theatre, one museum, 30 libraries, of which the most important are the Batthyaneum Library, the County Library and the "1 Decembrie 1918" University Library. Alba Iulia also has one Children's and Pupils' Club (Palatul Copiilor). In health care, there are 3 hospitals and 23 medical clinics, an orphanage and a recovery complex for children with disabilities "Arnsberg."

Alba Iulia also has recreational areas such as: the Schit sports and leisure area, an Olympic Pool, the Recreational Area Ampoi II, the Sports Complex Victoria Cetate, the Leisure area Winner's Club Ţălnar, Unirii Park, Unirii Square, I.L. Caragiale Park, Maria Park, Sfânta Ecaterina Park, the Arboretum and the Zavoi Park Miceşti.

1.1.4. THE STUDY AREA – TRANSILVANIEI BOULEVARD

In Alba Iulia, there are many public areas for pedestrian traffic (open promenades, parks, squares). By far the most crowded is the Transilvaniei Boulevard, located on the upper side of the town, on Romanilor Plateau in the Cetate district and it makes the connection between the upper town and the downtown area through the Alba Carolina Fortress.

(Appendix I.3. Transilvaniei Boulevard– position on the map)

In 2007, the Transilvaniei Boulevard was one of the objectives of a major project run by Alba Iulia City Hall and called "Re-functionalisation of the area surrounding the blocks of flats located on the Romanilor Plateau in Alba Iulia" (the area between the two streets - Closca and Vasile Goldis). The project included upgrading and changing the functionality of the area by solving problems related to road infrastructure, public utilities, public lighting, landscaping and street furniture. Also, at the same time, the underground infrastructure was rehabilitated through the Environment Programme included in the NDP (National Development Plan).

After the completion of this project in 2009 and with the significant increase of businesses and trade, Transilvaniei Boulevard became the busiest pedestrian street in the town.

For this reason, Transilvaniei Boulevard was identified by the ENCLOSE project as the area in which logistics measures would be extremely useful and would have an impact for the municipality of Alba Iulia.

After the implementation and completion of the modernisation and re-functionalisation area, pedestrian access and car road geometry and traffic flow on Transilvaniei Boulevard have changed. Recent years have seen an increase in traffic flow on Transilvaniei Boulevard, due to both tourism and the emergence of new businesses operating in the area (shops, restaurants, cafes, street vending, etc.). Thus, we identified approximately 100 trade and related activities over a distance of about 1km, taking into account only the activities with direct access to the boulevard.

Freight transport by traders on the boulevard is made extremely difficult because of its interference with the pedestrian area and with the narrow alleys leading to the boulevard.

Currently, there are no regulations that concern the reduction of freight traffic pollution in the area.

Traffic is extremely heavy throughout the year, as Transilvaniei Boulevard is the route that connects the upper town (Cetate district) to the city centre (downtown), through the Alba Carolina fortress. In summer, traffic increases significantly due to the terraces and temporary trade activities - various types of street vending.

The present SULP for Alba Iulia considers data collected from the ENCLOSE study area - Transilvaniei Boulevard in an attempt to identify logistic measures applicable in various areas of interest to the town.

I.2. The town's strategic urban mobility plan (SUMP)

Alba Iulia has got a development strategy that aims to use urban mechanisms as a positive force in improving standards of living, sustainable standards and socio-economic development by observing the sustainable development principles.

The SUMP of Alba Iulia plans to solve traffic problems by improving the quality of public pedestrian and car traffic spaces and to improve accessibility in the Alba Carolina Fortress. All existing and future strategic plans are developed starting from the General Urban Development Plan (GUDP) and from existing town-planning regulations (Zonal Urban Plan - ZUP and Detailed Urban Plans - DUP).

The present SULP of Alba Iulia starts from the premises established by the Town's Development Strategy and it considers the provisions of the General Urban Development Plan (GUDP). These documents are the grounds for finding solutions to improve logistics in Alba Iulia.

1.2.1. THE DEVELOPMENT STRATEGY OF ALBA IULIA MUNICIPALITY (2005)

The Development Strategy of Alba Iulia underlies sustainable development of the local economy and of improving the quality of citizens' life. Drawn up at the initiative of the Alba Iulia Town Hall, the strategy was developed with the support of the recommendations proposed by citizens, Town Hall employees, businesses, institutions and local organizations during workshops, surveys and public debates organized by the Consultant. It is permanently updated, as key indicators change their values in time.

This strategy aims to substantiate the process towards the sustainable development of the local economy and improving the lives of citizens. It is based on the following premises:

- Improving quality of life;
- Competitiveness and attracting investments;
- Good local governance through the elected bodies and effective management;
- Getting citizens' support and involvement;
- Flexibility of approach for better adaptability to future changes.

The strategy puts forward three important approaches for Alba Iulia:

- "Alba Iulia of the residents" - improving quality of life;
- "Alba Iulia of the tourists" - cultural tourism development and advertisement of the town's brand;
- "Alba Iulia of the investors"- promoting businesses.

The Development Strategy includes several components, one of which is the "traffic".

The Alba Iulia street network consists of 274 streets with a total length of 193km, of which 117 km of streets (61 %) are modernised.

As results from the traffic analysis drawn up in 2000, traffic in Alba Iulia must be reorganized in several problematic areas (temporary jams, inconsistency in the spatial organization or in terms of signs, etc.), which could lead to even bigger problems as a result of an increasing number of vehicles. As concerns heavy and transit traffic, priority is given to bypass roads which could provide relief for the urban road network. The current bypass road on the east side of the town partially eases heavy/transit traffic as it links Alba Iulia and Sebes and Alba Iulia and Cluj. Heavy traffic to the Apuseni Mountains is picked up by several major arteries in the town thus overlapping local traffic.

As the living standard of the population of Alba Iulia improves, the number of vehicles in the town is expected to rise significantly. In some parts of the town, there is already a high demand for parking lots, as they are not enough and people park on sidewalks and green areas. Traffic planning in Alba Iulia should estimate and find solutions to the ever-increasing demand for parking spaces and better traffic conditions.

Several actors should be involved in solving traffic problems in Alba Iulia: the public sector (the Town Hall's services responsible for traffic planning, organization and administration of parking areas, transportation licensing), the public transport company, the residents and the private sector (store owners, transport operators). All these actors are interested in a better organization and operation of traffic in Alba Iulia, but they may have different interests in favour of a particular solution. Therefore, a general concept of Alba Iulia traffic is needed, from which more particular solutions can follow.

The following traffic problems were identified by the strategy:

- Lack of a traffic plan, part of the General Urban Development Plan;
- Lack of bypass ring roads to the north, west and south of the town;
- Ad-hoc parking on high traffic roads with negative effects on traffic safety and on the town's image;
- Lack of a buffer land reserve in the town centre which could provide parking areas for future developments coming from increased business and tourism;
- Inadequate state of the road and increased risk of accidents due to a low level of traffic safety on the bypass road.

In order to find solutions to these problems, the Development Strategy suggests policies, projects and programmes such as:

1.2.2. THE GENERAL URBAN DEVELOPMENT PLAN (GUDP)

The General Urban Development Plan is both directive and regulatory and it is the main operational planning tool and the legal basis for the implementation of development programmes and actions.

GUDP includes provisions:

- on a short term, for the entire administrative and territorial unit (the municipality) regarding:

Policies	Programmes	Projects
Policy 1: Improve traffic conditions in Alba Iulia	**Programme 1.1.** Create and implement an improved general concept for Alba Iulia	**Project 1.1.1.** Update the traffic study
	Programme 1.2. Regulate heavy and transit traffic in Alba Iulia	**Project 1.2.1.** Build the western belt and the connection rings of the major street network with the existing belt.
Policy 2: Regulate traffic in the historical area	**Programme 2.1.** Regulate access inside the historical fortress	**Project 2.1.1.** Implement an IT system for car access control in the historical area
	Programme 2.2. Regulate parking conditions in the historical area.	**Project 2.2.1.** Ways to manage parking places inside and in the vicinity of the historical area.

Table.1. Traffic Policies, Programmes and Projects included in the Development Strategy

a) land within the built-up area, as established and defined in relation to the administrative territory;
b) the use of land within the built-up area;
c) functional zoning in conjunction with the traffic network organisation;
d) delimitation of areas for public use;
e) modernisation and development of the urban technical infrastructure;
f) protected areas and protected historical monuments and archaeological sites; areas for which the law has established special protection;
g) forms of ownership and legal circulation of land;
h) requirements for the location and conformity of constructions, landscapes and planted areas.
i) natural risk areas identified and declared so by law, as well as specific measures for prevention and mitigation of risks, land use and construction of buildings in these areas.
j) risk areas due to historical storage of waste.

- on a medium and long term regarding:
  a) the future development of the town
  b) functional development directions on the town's premises;
  c) routes of traffic corridors and equipment as planned nationally, regionally or locally

GUDP highlights the main strengths and weaknesses as regards the current status of traffic roads inside the town:

- Strengths
  - a future motorway Pan-European Corridor IV, future railroad Pan-European Corridor IV and future Sebeş - Turda motorway crossing Alba Iulia, a satisfactory state of streets in the town and a recently modernised public transportation system.
- Weaknesses
  - transit traffic going through the town (DN 1, DN 74) partially crossing residential areas;
  - improper configuration of street profiles
  - risky areas for pedestrians;
  - problematic street junctions;
  - improperly sized river and railroad crossings;
  - not enough parking places, especially near blocks of flats and public institutions;
  - few bike lanes;
  - poor quality of buildings by the street and of urban public areas;

Priorities for traffic roads as set up by GUDP:

- Completion of the ring road Revoluției Boulevard- Ion Lăncrăjan street– Partoş area;
- Completion of the ring road Republicii Boulevard - T. Vladimirescu street- Bypass road;
- Creation of the bypass road to Zlatna – from the national road at the town entrance from Cluj and connected to the Sebeş – Turda motorway;
- Finding appropriate locations for underground or multi-floor parking areas;
- Reserving the necessary corridor for the future Sebeş – Turda motorway;
- Creation of bike lanes inside the town and around the town (biking trails) alongside the Ampoi and Mures rivers;
- Resizing the main junctions in the town by building roundabouts.

All traffic roads provisions of GUDP are included in the *Appendix I.4. GUDP provisions – Traffic roads*

1.2.3. THE SUSTAINABLE ENERGY ACTION PLAN (SEAP)

Alba Iulia Municipality decided in 2010 to join the initiative "The Covenant of Mayors" promoted by the European Commission, taking a unilateral commitment to reduce CO_2 emissions in its territory by more than 20 % by 2020.

This commitment of the local government is its response in terms of energy and environment aimed at countering the challenges brought by the development of the Municipality during its recent decades, and namely: environment pollution caused by an accelerated development, management of an increasing traffic, explosion of the built-up area, urban waste management, the need for public utility services of decent quality.

Within this context, a coherent approach to municipal actions is required to reduce the environmental impact of urban activities and increase the quality of public utilities and also economic competitiveness.

The Sustainable Energy Action Plan (SEAP), developed together with Alba Local Energy Agency is the key document defining the energy policies of the local government for the next 10 years in order to reduce CO_2 emissions throughout the town. This plan includes a number of short and medium -term measures to increase the energy efficiency of public buildings, rational use of energy in homes and buildings in the tertiary sector, sustainable urban transport system, the modernisation of public lighting, producing a significant portion of necessary energy from renewable sources.

The Sustainable Energy Action Plan is integrated into the strategic perspectives established by the "Development Strategy of Alba Iulia" developed in 2005 and valid until 2020.

Work packages in the following key areas have been identified:

- The built environment where the potential for reducing consumption is the highest;
- **Urban transport where a sustainable urban mobility plan is needed;**
- Production of a significant percentage of the used energy from renewable sources;
- Urban planning, sustainable development measures included in the new General Urban Development Plan;
- Raising awareness of citizens in sustainable energy issues and their involvement in sustained actions to reduce energy consumption;

Urban transportation, the second area in which energy savings/cuts could occur, requires resolute action from the municipality to turn it into a modern, cleaner system, which ensures mobility in European terms.

This sector is actually the subject of an integrated package of measures launched by "The Integrated Urban Development Plan" for 2009-2015.

SEAP's actions identified in the "Transport" sector are:

- Municipal Fleet:
  - Purchasing new means of transport with low consumption and high comfort;
  - Municipal fleet rationalisation;
- Public transport:
  - Setting up an intercommunity public transportation system in the area managed by the Intercommunity Development Association Alba Iulia (AIDA);
  - Setting up an intercommunity public transportation system in the area managed by the Intercommunity Development Association Alba Iulia (AIDA), including a single bus stop system, furniture, fee-charging and guiding to avoid crowding the town by public transport means;
  - Exemptions or discounts for public transport fares for pensioners and students;
  - A new passenger fleet, with low consumption and high comfort and promoting green technologies in transport;
- Private and commercial transport:
  - Implementing a differentiated tariff plan to discourage driving in the town centre;
  - ntroducing an electronic system for managing car access and payment in parking lots;
  - Optimal connection of Alba Iulia with the express road and the bypass road;
  - An optimized and secure management of urban and transit traffic;
  - A proper arrangement of the main junctions in relation to the composition and volume of traffic ;
  - Organising proper parking areas, creating new spaces in residential areas and along the 4-lane arteries.
- Other:
  - Implementation of a project of urban mobility by using bikes in the historic area;
  - Implementation of a project of biking-tourism in the Arboretum area – *Mamut* Hill;

The above-mentioned activities presented in the SEAP were identified by means of analyses of the basic emissions' inventory or of energy consumptions for the reference year 2008. They tried to cover all areas of importance in energy consumption/emissions and by estimating the effects of their implementation, they are meant to lead to energy savings and thus to reduce emissions by 24 % by 2020 within the town. SEAP implementation will not be easy as technical solutions and funding sources need to be identified, while keeping the political decision to carry out all the activities, as planned.

A constant monitoring of the implementation of SEAP activities and of results obtained is required. Every two years, an evaluation and implementation report will be presented to the European Commission - the Office of the Covenant of Mayors.

The periodic evaluation will perhaps determine changes in certain activities and thus, to the update of SEAP. What should remain unchanged is the decision of the public authorities to carry out the commitment, and thus contribute to the sustainable development of Alba Iulia.

1.3. Main aspects of mobility laws

the following environmental and traffic legislation is in force:

- Law 363/2006 on the approval of the national land management plan – Section I – Transportation networks;
- Law 215/2001 on local government, republished;
- Government Ordinance 43 / 1997 on the regime of roads with subsequent changes;
- Government Ordinance 27/2011 on road transportation with changes brought by G.O. 11/2013;
- Government Decision no. 1373 of 28/10/2008 regarding the regulation of the supply and transportation of divisible goods on Romanian public roads;
- Order No. 407/991 from 26 July 1999/26 August 1999 for the approval of Norms on the authorization and carrying out of heavy road transportation or of sizes exceeding maximum limits set by Government Ordinance no. 43/1997 on the roads' regime;
- Joint order of the Ministry of Public Works, Transportation and Housing no. 6/2003 and of the Ministry of Public Administration no. 193/2003 regarding measures for observing discipline in urban planning and land management for the purpose of ensuring a more fluid traffic and road safety on public roads;
- Technical norms on the design and building of constructions near the roads and on the sizing of road systems;
- Directive 1996/53/CE
- Law 350 on land management and town planning with subsequent changes and additions;
- Law 422 on the protection of historical monuments, republished;
- Emergency Ordinance 195/2005 on environment protection and subsequent changes;
- The national environment protection strategy
- The Integrated Urban Development Plan of Alba Iulia 2009-2015 approved by Local Council Decision no. 126/27.03.2009.

In Alba Iulia, besides the legislation in force, the provisions of Local Council Decision 26/2003 with subsequent changes and additions apply as regards the transportation of food and non-food commodities in the town.

1.4. Urban Mobility Technologies (Parking Area Management System, Access Control, Etc.)

Currently, Alba Iulia does not have a public parking office, but there is a Local Council

Decision (LCD) no. 45/2009, amended subsequently, which approved the "Regulation on organization and operation of public residence parking lots located in Alba Iulia municipality". The Regulation is currently applied through the care of the Public Office for Local Patrimony Management (LPM).

Also, L.C.D. 16/2003 established the rules for issuing special permits for access in restricted areas. This responsibility belongs to the Office for the Administration and Monitoring of Public Utilities (AMPU) of the Technical-Development Division of Alba Iulia Town Hall that ensures the implementation of legal measures on road safety (signage, signs and road markings, crash barriers, traffic lights, etc.) on public roads in the town of Alba Iulia.

For the time being, there is no intelligent management system for access control implemented in the town, but the municipality's development plans include projects of access control and monitoring of protected and densely populated areas as well as activities concerning ease of traffic flow and decongestion (roundabouts, one-way streets, rehabilitation and expansion of transport infrastructure by upgrading roads, alleys, boulevards, sidewalks, etc.)

2. THE GENERAL CONTEXT OF LOGISTICS

2.1. General aspects

Alba Iulia has a good accessibility, with a higher density of communication channels than the national average. The city is crossed by the European road E81 and it is located near the railway node of Vințu de Jos. Alba Iulia is at a distance of 70 km from the Sibiu International Airport and 100 km from the Cluj International Airport, which makes it easily accessible to tourists.

Alba Iulia, in spite of its almost central geographical position on the Romanian map, is close only to one county capital (Sibiu) from which it can be reached in less than an hour. It is reached in less than 2 hours for 3 county capitals (Cluj- Napoca, Deva, Targu Mures) and in less than 3 hours for 3 county capitals (Ramnicu Valcea, Târgu Jiu and Zalău). 12 other county capitals are available within 4 hours of travelling and other 5 within a time span of 4-5 hours. Bucharest is about 5 hours by car far from Alba Iulia, through the quickest route (Pitesti). Capitals of the 10 counties in eastern and southern Romania require over 6 hours of travel by car (actual time). The longest drive is to the county capitals by the Black Sea, Tulcea and Constanta requiring more than 8 hours of driving.

The average time of access from the 40 county capitals and Bucharest is 4 hours and 27 minutes. At the completion of the motorway network, the average access time to Alba Iulia could decrease by 50 minutes on average and by 33 hours in total (about 20%). The most spectacular decreases in travel time could be obtained for the county capitals in the northeast and southeast: over 2 hours to Constanta, Botosani and Suceava and over 1 hour to Braila, Buzau, Calarasi, Galati, Giurgiu and Slobozia. When traveling from Bucharest and Ploiesti, Alba Iulia could be approx. 1.5 hours closer. There would not be any significant changes for access from Miercurea Ciuc, Vaslui, Drobeta-Turnu Severin, Reşiţa, Bistrița, Baia Mare, Satu Mare, Craiova.

Regarding the access to/from the closest European capitals, we can notice the easy access from/to Budapest (6 hours and 37 minutes) and Belgrade (6 hours and 22 minutes). Within 10 hours of travel (actual time) Bratislava and Vienna are available to the west, Sofia and Skopje to the south, and Chisinau to the east. The most favourable access from the west is by Arad and for the south through Craiova, an access which can be improved by the construction of the road and railway bridge at Calafat - Vidin.

The creation of the motorway network as foreseen by Section I of the National Land Management Plan will result in a better accessibility, which will also favour Alba Iulia, due to its central location. Travel to the west capital cities will be reduced by at least an hour, so Budapest will be less than 6 hours away and Bratislava and Vienna less than 8 hours (which is the current driving distance between Alba Iulia and Constanta).

There is a traffic study conducted in 2000 in Alba Iulia. The factors included in the study are the grounds for all logistics projects proposed or accomplished in the city, some of which have already been completed (one-way streets, four new

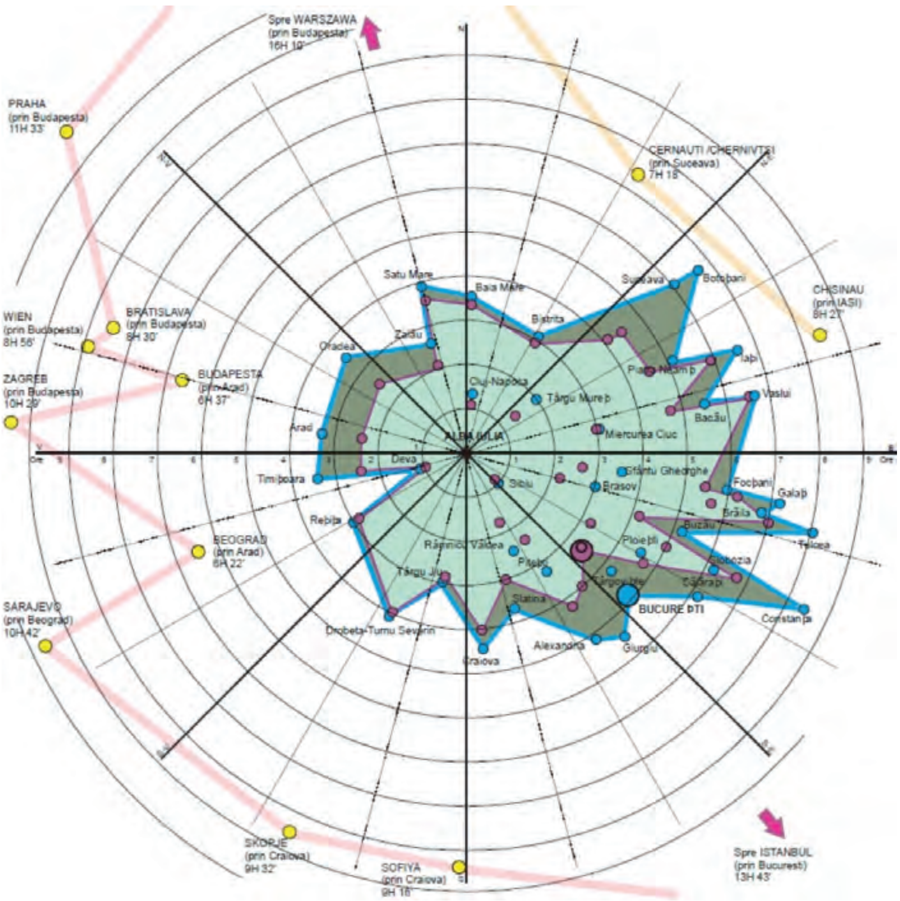


Fig. 2.1. – Accessibility of Alba Iulia by the current roads

roundabouts, expansion of Al.I. Cuza to 4 lanes and expansion of Motilor and Zlatnei streets to 3 lanes, rehabilitation of passages on National Road 1, etc.)

For the traffic study, the traffic relations between different points of traffic polarization in Alba Iulia were identified. This was done through surveys of town-entry arteries from origin to destination. Another stage of in the setup of the traffic model was that of zoning. This involved grouping various centres of attraction - generating traffic within the modelled traffic areas. For each traffic area, significant parameters were established, namely:

- Number of passenger vehicles;
- Number of freight vehicles;
- Employed population;
- Number of jobs;
- Number of trading companies and their activity profile.

In order to generate transit and town-entry traffic, the study picked areas located on the outskirts and on the five entry arteries. The road traffic area distribution (*Appendix II.1*) adopted within the traffic study in Alba Iulia contains an overall of 49 traffic areas of which:

44 inner areas;

5 outer areas: 45, 46, 47, 48, 49. They include the cities, towns and villages connected to Alba Iulia by the following roads:

- area 45 – NR 1 – to Sebeş;
- area 46 – County Road 107 – to Ciugud;
- area 47 – NR 1 – to Cluj;
- area 48 – NR 74 – to Zlatna;
- area 49 – NR 107A – to Pîclişa.

These areas form the major street network of Alba Iulia. *Appendix II.2 presents the classification of streets.*

Figure 2.2. presents the traffic distribution per type of vehicles, as an average of the 49 census points.

Type of vehicle:

- bicycle, motorcycle
- Cars with or without a trailer, motorcycle with a sidecar
- Bus
- Minibus, van, small truck
- 2-axle truck; tractor
- 3-axle truck
- Hinged vehicles, tow trucks with trailer Lorry and tractor trailers

No. of physical vehicles

Equivalence coefficient

Reference no. of vehicles

% of total

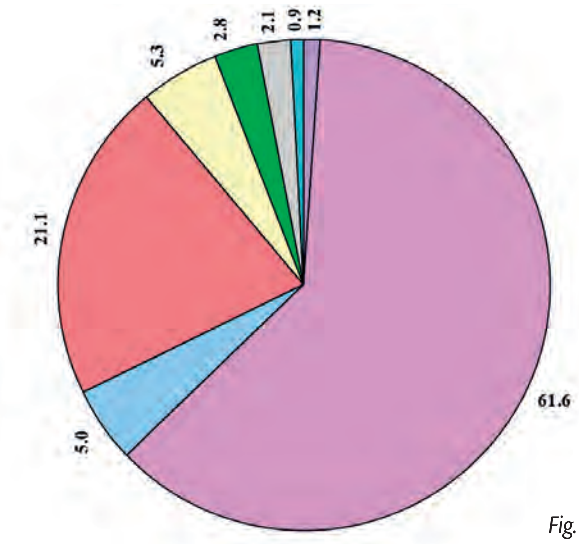


Fig. 2.2. – Traffic distribution LEGEND:

	Tip vehicul	Vehicule fizice	Coef. de echivalare	Vehicule etalon turism, vet	% din total
	Bicicleta, motocicleta	156	0.5	78	1.2
	Autoturism cu sau fara atas, motocicleta cu atas	3963	1.0	3963	61.6
	Autobuz, autocar	93	3.5	325	5.0
	Microbuz, furgoneta, camioneta	1129	1.2	1355	21.1
	Camion cu 2 osii; tractor	98	3.5	343	5.3
	Camion cu 3 osii	52	3.5	182	2.8
	Autovehicule articulate, remorchere cu trailer	33	4.0	132	2.1
	Remorci la camioane, tractoare	38	1.5	57	0.9
	Total:	5562	1.148	6435	100.0

The traffic study must be updated due to the following reasons: (1) the road network is expanding by including the development areas from the neighbouring districts (Oarda, Pâclişa, Bărăbanţ, Miceşti); (2) the construction of the Sebeş – Turda motorway, a major objective of the NLMP section I – Transportation networks, namely motorways.

2.2. Specific regulations for freight transportation

Currently, Alba Iulia applies to vehicles carrying food and non-food commodities in Alba Iulia, the provisions established by Decision no. 16/2003, supplemented with further restrictions on weight. The same decision contains the fees for special access permits.

The fee for a special access permit to restricted areas is updated annually by local council decision on local taxes and dues.

(Appendix II.3 - Traffic regulations in Alba Iulia)

To ensure a smooth and safe road and pedestrian traffic and to avoid and prevent degradation of monument buildings and road in Alba Iulia, the following restrictions apply for heavy vehicles carrying food supplies and non-food items:

- **Unrestricted roads inside and from Alba Iulia:**
  - Regimentul V Vânători street – the whole street;
  - Ferdinand I Blvd– between the rail-

road crossing and the junction with Încoronării Blvd (Railways Station area);
- Take Ionescu street– the whole street;
- Încoronării Blvd– the whole street;
- 1 Decembrie 1918 Blvd– the whole street;
- Horea Blvd– the whole street;
- Calea Moţilor – between Horea Blvd and Zlatnei street;
- Republicii Blvd – the whole street;
- Zlatnei street– the whole street;
- Republicii Blvd - the whole street;
- Tudor Vladimirescu street between Republicii Blvd and Al. I. Cuza street;
- Alexandru Ioan Cuza street - the whole street;
- Unpaved service road between Al.I. Cuza and Turnătoriei street;
- Turnătoriei street from the service road to SC Saturn SA;
- Viilor street - between Ferdinand I Blvd (railroad crossing) until SC Apulum SA;
- The Alba Iulia bypass road;
- Carpenului street – between the junction with Iasomiei street and the limit towards the village of Vurpar;

- **Restricted streets 20 tonnes – maximum allowed weight:**
  - Cloşca street– the whole street;
  - Vasile Goldiş street – the whole street;
  - Livezii street– between Alba Mall and Tudor Vladimirescu street;
  - Petru Dobra street– the whole street;
- **Restricted streets to 10 tonnes – maximum allowed weight:**
  - Revolutiei 1989 Blvd the whole street;
  - Gheorghe Pop de Baseşti - the whole street;
  - Mureşului street - the whole street ;
  - Turnătoriei street between Mureşului street and ER 850;
  - Branduşei street - the whole street;
  - Siretului street - the whole street;
  - Aurel Vlaicu street - the whole street;
  - Gemina street - the whole street;
  - Apulum street - the whole street:
  - All the streets without other restrictions;
- **Restricted streets to 5 tonnes – maximum allowed weight:**
  - Ferdinand I Blvd between the traffic light junction by the Railway Station and I.I.C. Brătianu street;
  - I.I.C. Brătianu street - the whole street;
  - Bucureşti street between I.I.C.Brătianu street and the scrapyard;
  - Mărăşeşti street - the whole street;
  - Ardealului street - the whole street;
  - T. Vladimirescu street between Calea Moţilor and Republicii Blvd;
  - I. Maniu street - the whole street;
  - Trandafirilor street - the whole street;
  - Teilor street - the whole street;
  - Călăraşilor street - the whole street;
  - Mihai Viteazul street between Naţiunii square and O. Goga street;
  - Naţiunii square;
  - Frederic Mistral street - the whole street;
  - Primăverii street - the whole street;
  - Florilor street - the whole street;
  - Iaşilor street - the whole street;
  - Olteniei street - the whole street;
  - Henri Coandă street - the whole street;
  - Doinei street - the whole street;
  - Plevnei street - the whole street;
  - Ion Arion street - the whole street;
  - Păcii street - the whole street;
  - Muzeului street - the whole street;
  - Mitr. Andrei Şaguna street - the whole street;
  - Mitr. Alex. Şterca Suluţiu street - the whole street;
  - Militari street - the whole street;
  - Gabriel Bethlen street - the whole street;
  - Tricolorului Square;
  - Unirii street - the whole street;
  - M. Viteazul street inside the fortress;
- **Streets with no access for any transportation means:**
  - Transilvaniei Blvd between 1 Decembrie 1918 Blvd and Revolutiei Blvd;
  - Mihai Viteazul street between O. Goga street and the 3rd Fortress Gate.

For freight transport vehicles, Alba Iulia Municipality can issue special permits for these streets. The fees are approved by local council decisions, each year.

In Alba Iulia, delivery is restricted to the hours 6.00-12.00 and 17.00-21.00.

According to the same local council decision, vehicles belonging to individuals and businesses that have a parking place in one of these restricted areas and travel to or from the parking place, without cargo, are not subject to a special permit.

In Alba Iulia, there are speed restrictions in areas with high pedestrian traffic or near children's play parks, schools and kindergartens as follows:

- **Speed limit of 30 km/h on the following thoroughfares:**
  - All of N. Bălcescu street;
  - All of Mărăşeşti street;
  - All of Turnătoriei street;
- **Different speed limit depending on the type of vehicle- 50 km/h for cars, 30 km/h freight vehicles:**
  - 1 Decembrie 1918 Blvd. between Brânduşei and Cloşca streets;
- **The residential area inside the Fortress, with a recommended speed limit of 20 Km/h:**
  - Păcii street;
  - Muzeului street;
  - Mitr. Andrei Şaguna street;
  - Mitr. Alex. Şterca Suluţiu street;
  - Militari street;
  - Gabriel Bethlen street;
  - Tricolorului square;
  - Unirii street;
  - M. Viteazul street;

Currently, there is no charge for public car parking in Alba Iulia.

In residential areas, the parking places are rented according to LCD 45/2009 with subsequent amendments.

It must however be noted that, in Alba Iulia, the system of penalties for breaching the law or local regulations is not rigorously applied, and parking violations are frequent (on road lanes, on sidewalks, alleys and green areas), issues that generate discomfort, disturbance and frequent traffic and freight jams.

2.3. Characteristics of the main types of Urban Logistics Flows

In Alba Iulia, freight traffic can be divided into:

- Transit traffic
- Entry traffic
- Local traffic

The local freight traffic overlaps transit traffic and town entry traffic from Sebes towards Cluj-Napoca through the ring road or from Sebes towards Zlatna or from Cluj-Napoca towards Zlatna. *Appendix II.4. Road transit and entry traffic in Alba Iulia* contains graphic information extracted from the Traffic study.

Tables 2.1. and 2.2 present the local traffic composition by type of vehicle, of passenger and cargo vehicle flows, on streets with different traffic regimes.

Table 2.1 presents the average composition of flows for passenger vehicles on streets with different traffic regimes (in percentage of reference freight vehicle flows/14h) and Table 2.2 presents the average composition of the flows of freight vehicles on streets with different traffic regimes (in percentage of reference freight vehicle flows/14h).

Equivalence coefficient

Tip de vehicul	Coef. de echiv.	Regim de circulatie				
		Centura	Strazi fara restrictii de tonaj	Strazi cu tonaje admise <7,5t	Strazi cu tonaje admise <3,5t	Strazi cu tonaje admise <1,5t si cu T.C.
Autocamioane cu 2 osii; tractoare	3.50	50	31	56	60	59
Autocamioane cu 3 osii	3.50	15	43	19	10	7
Autoveh. articulate, remorchere	4.00	27	21	18	7	6
Remorci la camioane, tractoare	1.50	8	5	7	23	28
TOTAL FLUX VEH. MARFA	[vet]	100	100	100	100	100

Table2.2

Traffic regime (bypass, streets without weight restrictions, streets with weight restrictions <7.5 t, streets with weight restrictions <3.5 t, streets with weight restrictions <1.5 t and TC

TOTAL FREIGHT VEHICLE FLOWS

Appendix 2.5. presents *the current road traffic flow in Alba Iulia*

In Alba Iulia, the urban logistics flow is divided into several categories, depending on the type of activity that it covers. A classification of these types of activities and services in different areas on the municipality can be done as follows:

Tip de vehicul	Coef. de echiv.	Regim de circulatie				
		Centura	Strazi fara restrictii de tonaj	Strazi cu tonaje admise <7,5t	Strazi cu tonaje admise <3,5t	Strazi cu tonaje admise <1,5t si cu T.C.
Biciclete, motocicleta	0.50	0.5	1.0	1.5	1.5	1.5
Autoturisme, motociclete cu atas	1.00	66.5	75.0	60.0	78.0	68.0
Autobuze, autocare	3.50	7.0	6.0	9.5	7.5	6.5
Microbuze	1.20	26.0	18.0	29.0	13.0	24.0
TOTAL FLUX VEH. CALATORI	[vet]	100	100	100	100	100

Table 2.1

Type of vehicle (bicycles, motorcycles, cars, motorcycles with a sidecar, buses, coaches, minibuses)

Equivalence coefficient

Traffic regime (bypass, streets without weight restrictions, streets with weight restrictions <7.5 t, streets with weight restrictions <3.5 t, streets with weight restrictions <1.5 t and TC

TOTAL PASSENGER VEHICLE FLOWS

Type of vehicle (2-axle truck; tractor:3-axle truck, Hinged vehicles, tow trucks with trailer, Lorry and tractor trailers)

- Trade:
  - Trade in textiles, clothes, footwear: Alba Mall (Tudor Vladimirescu street), Transilvaniei Blvd., Revoluției 1989 Blvd., Iuliu Maniu square, Vasile Goldiş street, Cloşca street, Zlatnei street (Kaufland hypermarket), etc.
  - Trade in food commodities - supermarkets, markets, neighbourhood shops, etc. - Transilvaniei Blvd., Revoluției 1989 Blvd., Iuliu Maniu square, Vasile Goldiş street, Cloşca street, Zlatnei street (Kaufland hypermarket, Profi hypermarket), the Railway station area (Penny hypermarket), Cetate market, Centru market, Biruinței street in Oarda, etc.
  - Trade in electronics and appliances – Transilvaniei Blvd., Revoluției 1989 Blvd., Vasile Goldiş blvd., Zlatnei street (Kaufland hypermarket), Alba Mall (Tudor Vladimirescu street), etc.
  - Trade in furniture - the Railway station area (Mobexpert), Calea Moților and Al. I. Cuza street;
  - Trade in hardware: - construction materials and interior design stores-Republicii Blvd.(such as Dedeman), NR1 on the exit to Cluj-Napoca (Ambient), Vasile Goldiş street, the Railway Station area and the Bypass road (construction materials and installations) etc.
  - HORECA activities– hotels, B&Bs, restaurants, cafes, seasonal terraces, etc. – everywhere in the town, more numerous on Transilvaniei Blvd, inside the Alba Carolina Fortress, in the downtown area (Iuliu Maniu square), on Calea Moților, Lalelelor and Arieşului streets.
- Production:
  - S.C. SUPREMIA S.A. - food ingredients and VCST Automotive Production - car parts - The development area by the town bypass road;
  - S.C. IPEC S.A. on NR1 - Entry from Cluj-Napoca, S.C. Porțelanul S.A. - Viilor street and S.C. Axa Porcelaine - Fântânele street - chinaware;

- S.C. REKORD - footware on NR1 - entry from Cluj-Napoca;
- S.C. SEWS – electric wiring on NR1 - entry from Cluj-Napoca;
- S.C. House of Art - Lalelelor street and S.C. Kosmos-Tre –Transilvaniei Blvd. – textiles; NR1 – entry from Cluj-Napoca;
- "SATURN" metal foundry - in Bărăbanţ;
- S.C. INCOV S.A. - carpets on Gh. Şincai street;
- S.C. Agra's and S.C. Mercado – meat products and by-products on Biruinţei street, Oarda and Livezii street;
- Milling and bakery – the Railway station area and Calea Moţilor;
- Furniture and carpentry – Al.I. Cuza street, Calea Moţilor, Fântânele street, Olteniei street, etc.

• Public services:
  - Alba County Hospital - Revoluţiei 1989 Blvd.;
  - AVICENA medical centre - str. Mărăşti;
  - TERRA ASTER medical centre - Calea Moţilor and Revoluţiei 1989 Blvd.;
  - CLINIMED medical centre - Revoluţiei 1989 Blvd.;
  - The day centre for the elderly - Libertăţii street;
  - The Nursing Home for the Elderly - Lalelelor street;
  - "1 Decembrie 1918" University - N. Iorga street inside the Alba Carolina Fortress;
  - Local public supplies operators: SC Apa CTTA SA, FDEE "Electrica Distribuţie Transilvania Sud" SA, E.ON Gaz , Romtelecom, RDS, Vodafone, Orange, etc.
  - Waste management and parks and green areas maintenance– S.C. Salprest, S.C. Garden, S.C. Luxor LTD, etc.
  - Post and express couriers: the Romanian Post Service with offices in the Railway station area, on Transilvaniei Blvd., in Iuliu Maniu square, Urgent Curier on Crişanei street, Cargus in the Railway station area, Fan Curier on Bucureşti street, etc.

There are also notable companies in the constructions field with a significant number of transport operations connected to their activity in the area, such as: SC Florea SA , SC Instalatorul SA, SC Alba Cons SA, DPL, NewAmport, etc.

All these areas and activities are highlighted in *Appendix 2.6. Areas of trade, industry and public services in Alba Iulia.*

2.4. Infrastructures and facilities for Urban Logistics and for the existing distribution network

2.4.1. THE ROAD INFRASTRUCTURE

In the past five years, the town of Alba Iulia has implemented a number of major projects that have enhanced or improved the capacity of streets in major thoroughfares of the town, thus ensuring safety measures and proper infrastructure for carrying freight traffic satisfactorily

Such projects are:

- Rehabilitation of Încoronării Blvd.– 1 Decembrie 1918 – Horea;
- Rehabilitation of the road and public utility infrastructure on approx. 24km in the downtown area (the old town settlement), ensuring connections between the Bypass road and downtown – the rehabilitated area is between NR1 (Tudor Vladimirescu street – Ferdinand boulevard) and the Bypass Road, including the streets leading to Octavian Goga street and the 1st Gate of the historical Fortress;
- Rehabilitation of Regiment V Vânători street (Partoş district), including Railroad Passage on NR1 km378 + 0.20;
- Rehabilitation of NR 1 to Cluj-Napoca on 2.8km, including artwork– Bridge over the Ampoi river and railroad crossing – on-going;
- Rehabilitation of NR74 to Zlatna on 3.3km – on-going;

In order to ensure traffic flow, a number of 6 roundabouts were put in place in the junctions where traffic was problematic and where several accidents occurred:

- The junction between Horea street and Calea Moţilor;
- The junction between Octavian Goga street and Calea Moţilor;
- The junction between Revoluţiei 1989 Blvd and Cetate market;
- The junction between Republicii street and Gh. Şincai street–Dedeman store;
- The junction between Vasile Alecsandri street – Doinei - Oborului;
- The junction between Al.I.Cuza street and the Bypass road.

These traffic flow activities are ongoing and the GUDP also mentions other roundabouts to be put in place in all major junctions in the town:

- The junction between Încoronării Blvd. and Ferdinand Blvd. (Railway station area);
- The junction between Calea Moţilor and Tudor Vladimirescu street (Unirea store);
- The junction between Calea Moţilor and Revoluţiei 1989 Blvd.– the Stadium area;
- The junction between Republicii Blvd and Tudor Vladimirescu street;

Also, the GUDP mentions several ring roads, which would considerably improve traffic flow and traffic quality in Alba Iulia *(see Appendix I.4. GUDP provisions – Traffic roads).*

In order to increase traffic flow inside the town, the following streets have been made one-way *(see Appendix II.3. Car traffic regulations in Alba Iulia)*:

- Take Ionescu street- from Ferdinand I Blvd to Încoronării Blvd and O. Goga street;
- Încoronării Blvd between O. Goga street and Ferdinand I Blvd;
- V. Goldiş street from 1 Decembrie 1918 Blvd to Revolutiei 1989 Blvd;
- Ghe. Pop de Băseşti street between Revoluţiei 1989 Blvd and 1 Decembrie 1918 Blvd;
- Banatului street from Iaşilor street to Ferdinand I Blvd;
- Dobrogei street from Ferdinand I Blvd

to Iaşilor street;
- Moldovei street on the section between Iaşilor street and Ferdinand I Blvd;
- Munteniei street from O. Goga to Traian street and fromTraian to Ferdinand I Blvd;
- D. Cantemir street on the section from Traian street to Ferdinand I Blvd.;
- Traian street on the section between Naţiunii square and Basarabiei street;
- Avram Iancu street on the section from T. Vladimirescu Blvd. to Calaraşi street;
- Calaraşi street from Teilor street to Petru Dobra street;
- S. Severus street from M. Aurelius street to the roundabout on Calea Moţilor;
- Toporaşilor street on the section between Revoluţiei 1989 Blvd to M. cel Bătrân Blvd;
- Energiei street on the section between Cloşca and Toporaşilor streets;
- Ştefan cel Mare street on the section between Toporaşilor and Cloşca streets;
- Mircea Eliade street on the section between Toporaşilor street and Transilvaniei Blvd;
- Ioan Alexandru street on the section between Toporaşilor and Vânătorilor streets;
- Liviu Rebreanu from Vânătorilor street to Toporaşilor street;

3.4.2. URBAN LOGISTICS FACILITIES

At present, Alba Iulia has no infrastructure specifically designed to address the needs of logistics in the town, which has recently developed very dynamically due to increased rate of investments, and of privatization and liberalization in the area.

Currently, Alba Iulia has three terminals (platforms) for loading and unloading cargo, serving several operators, and they are private property managed by private investors, namely:
- on NR1 - "ICRA" Platform - intended for food products;
- In the Railway station area - "IPROCOOP" Platform - various types of food and non -food commodities, other than constructions;
- On the bypass road area – only for construction materials.

There are also other platforms in the town created by other private investors but they are only used to supply their own stores. Such examples are:
- Alba Mall – the only trading centre in the town where one can find in the same place clothes stores, footwear stores, electrical products and appliances stores, restaurant, coffee shops;
- Kaufland – the largest hypermarket in the town;
- Mercur network – food stores and restaurants;
- Dedeman, Ambient – hardware stores.

It is understood that cargo unloading platforms and freight management systems in these locations have been specifically designed to strictly serve their owner's needs, so we have to find solutions for the other traders which generally own small neighbourhood shops and do not have the room to provide such facilities.

We have identified a small number of property, land or buildings with a potential to serve storage activities owned by the local government and which could be subject to public- private partnerships, associations or sale to the benefit of these operators. They are located inside the Development Area (near the bypass road) or in the former industrial area of the city (former SUT), with access from T.Vladimirescu street or from Republicii Blvd.

We can also name several buildings or land which are private property and which could be re-functionalised to serve these purposes, such as the former brick factory "Refractara" and the former plant "Utilajul" located on NR1- Al.I.Cuza street or the former "INTERTRANS" on Tudor Vladimirescu street.

2.4.3. URBAN LOGISTICS INFRASTRUCTURE AND FACILITIES IN THE STUDY AREA – TRANSILVANIEI BOULEVARD

The "Enclose" study and reference area - Transylvania Blvd and all adjacent communication roads were the subject of a comprehensive project of Alba Iulia Town Hall called "Re-functionalisation of the area around the blocks of flats on the Romans' Plateau in Alba Iulia", between 2007 and 2009. The following indicators have been met after rehabilitation of the area between Closca street - Vasile Goldis street- 1 Decembrie 1918 Blvd:
- Area V.Goldiş street – Transilvaniei Blvd:
  - Streets: 16.748.sq. m;
  - Sidewalks: 12.092 sq m;
  - Parking lots: 12.890 sq.m;
- Area Cloşca street – Transilvaniei Blvd:
  - Streets: 18.294.sq.m;
  - Sidewalks: 8.111 - sq.m.;
  - Parking lots: 12.034 sq.m.;
- Transilvaniei Blvd.:
  - Streets: 6.357.sq.m.;
  - Pedestrian alleys: 15.726 sq.m.;
  - Parking lots: 4.061 sq.m.;
  - Bicycle lanes: 1060 sq.m.

This is a pedestrian only street and street trading is present alongside many shops.

The current configuration of the area is presented in *Appendix II.7.*

The "ENCLOSE" area of Transilvaniei Boulevard– modernised.

Transylvania Blvd runs a large number of commercial and related activities (considering only those activities with direct access from the Boulevard, we have identified approximately 100 commercial and related activities on a street which is approx. 1 km long), namely:
- 25 clothing stores - most with less than 22sq.m./shop;
- 5 lottery, gambling stores, etc.
- 2 tailor's shops;
- 1 florist's;
- 4 stationeries;
- 3 bars;
- 9 bars with provisional terraces in summer;
- 5 grocery stores;
- 4 banks;
- 9 footwear stores;
- 3 mobile phone stores;
- 4 greengroceries;
- 1 Post Office;

- 2 jewellery stores;
- 1 commercial gallery;
- 2 beauty shops;
- 4 pastry shops;
- other shops.

Closely related to the nature of these activities, on Transylvania Blvd, the types of freight flows can be structured as follows:

- Foodstuff – 25%;
- Clothes and sportswear – 45%;
- Furniture and carpets – 4%;
- Electrical products and appliances – 10%;
- Pharmaceutical products and medical equipment – 6%;
- Other products – 10%.

Given the configuration of the public space and the density of buildings in this area, freight distribution is difficult on the narrow adjacent streets (between 2.5 m to 5m wide) interfering with pedestrian areas and crowded residential area.

Regarding storage areas, the majority of operators in the area do not have adequate storage space, thus resorting to unconventional methods of storage such as storage inside the shops or in improper annexes built on the street.

As in many commercial areas, about 30 % of traders use their own vehicles for transportation of goods, the others being served by courier companies or by transport operators.

On average, approx. 50 commercial vehicles per day have access to the supply of Transylvania Blvd. and about 60 % of freight pickup and deliveries take place between 8.00 and 9.00, causing discomfort to pedestrians and local residents. The vast majority of freight transportation is by vans (3.5 tonnes) and studies show that the average vehicle load is 30 % of the storage capacity of the vehicle.

This causes great loss of time, space and fuel, showing a low efficiency in the organization of deliveries.

Although, as noted above, significant public investments were made in road and pedestrian infrastructure as well as private investments in shops or services, the present freight transportation and distribution in the reference area do not meet the requirements for energy efficiency.

Air pollution in these streets is proportional to the degree of fossil fuels burnt by cars and other transportation means.

Therefore, it is necessary to identify and adopt measures to improve urban mobility and air quality and to find logistics solutions in the area.

3. IDENTIFYING MEASURES TO IMPROVE LOGISTICS

3.1. Eu measures to improve logistics

in the last few years, Europe has tried to develop a common working basis to identify the best solutions for optimizing freight transport, taking into account as many relevant issues that could have an impact on freight transportation.

We have identified several types of actions, research and activities that could directly or indirectly affect urban freight transport. These actions are private, public or public-private strategies, measures or activities with a significant contribution to improving urban freight transport and ideally lead to benefits for all stakeholders.

A proposal for the classification of solutions (measures) concerning urban logistics and possible results could be:

- Measures related to "material" infrastructure
  - linear measures - which refer to connections from the urban transportation network
  - surface measures-regarding areas of freight transportation and storage operations
- Measures related to "immaterial" infrastructure
  - Telematics or Intelligent Transportation Systems (e.g. traffic information systems, route optimization services, etc.).
- Measures related to "equipment"
  - Cargo loading units
  - Transportation units (e.g. Vehicles using alternative fuelling solutions)

There are several alternate approaches available in order to reach some objectives, as summarized in *Table 3.1*.

Also, the "green" logistics solutions presented below (*Table III.2.*) can be divided into the following action fields:

Objectives	Possible approach
Obtaining support for strategies and initiatives in freight transport for the freight industry	Freight transportation partnerships
Improving travel time of vehicles transporting goods	Telematics for urban transportation of goods Traffic signs Information and maps for freight transport Road fees Allowing night delivery Special lanes for trucks
Assistance of truck and van drivers and thus reducing the number of kilometres travelled	Telematics for urban transportation of goods Traffic signs Special lanes for trucks Simplification and harmonisation of weight, size and building regulations Information and maps for freight transport Urban consolidation centres
Assistance of freight transport companies at the delivery and loading points	Loading points on street Proximity delivery areas (ELP) Urban consolidation centres
Reducing the environmental impact and the risk of accidents involving freight vehicles	Standard regulations on vehicle size, weight and GHG emissions Time regulations for access and loading of goods for vans and trucks carrying goods Allowing night time delivery "Green" areas Special lanes for trucks Improving infrastructure Encouraging the use of green vehicles

Table 3.1.

Action fields	Measure
Distribution strategies	Freight platforms – Urban Consolidation Centres (UCC)
Institutional solutions	Public-Private Partnerships - proximity delivery areas - foodstuff quality partnerships
Programme management solutions	Night time deliveries
Taxation strategies	"Road tax" implementation systems
Technological solutions	Technological solutions - smart transport systems - green vehicles

Table 3.2.

3.1.1. FREIGHT PLATFORMS - URBAN CONSOLIDATION CENTRES

Freight platforms have been designed to reduce urban freight traffic. The first platforms were introduced in Paris in the mid-1960s in response to urban congestion. Many countries have adopted this solution, and Italy was the first country to include the development of freight platforms in a national programme in 1990. Germany was next in 1992 and France followed in 1993. Currently, this "trend" has diminished because of the inability of several of such projects to achieve their objectives. However, Urban Consolidation and Distribution Centres remain without doubt one of the very efficient solutions when properly and realistically designed.

Freight platforms can be found in a wide variety of shapes and construction projects because they are not standardised. Each platform of this kind is designed to serve the specific needs of a given area with different purposes and stakeholders. They can also be found under different names, such as "Freight platform", "Urban Consolidation Centre", "Public distribution warehouse", "Logistics Centre", etc. .

Freight platforms are areas where various companies with activities related to the transport of goods (logistics service providers, carriers) work. They are transshipment areas where at least two types of transport ideally meet (e.g. road and rail transport)

A more dedicated term is that of "Urban Consolidation Centre".

3.1.2. PUBLIC-PRIVATE PARTNERSHIPS

There isn't any general definition for public-private partnerships. They can be considered only as a sort of informal communication between members of government and private enterprises or exclusive contractual arrangements between the two parties to the supply of goods or services that are normally provided by the public sector (a notion similar to that of privatization). Therefore, the term public-private partnership is a term covering several forms of cooperation between public and private institutions. All these forms of partnerships share the same idea, namely that public and private actors are different. Each of these actors has advantages in different aspects, be they material, the "know -how", financial, or other. Within the partnership (which can be seen as a form of division of labour), each of the partners does what it does best, leading to a win-win situation for each party.

Public - private partnerships can be classified into three categories:

- informal cooperation
- contractual cooperation/agreements
- joint venture with partners/shareholders in the public and private sectors.

Such partnerships regarding freight have been set up in various forms across Europe. ***They were formed to finance or construct various infrastructure projects and also to negotiate and determine the conditions and agreements necessary to create a working environment between the public and private sectors.***

3.1.2.1. Proximity delivery areas

To facilitate the delivery of goods in the city centre of Bordeaux, a system was developed for the first time that included the creation of so-called "Proximity delivery areas" (Espaces de livraison de proximite –ELP).This approach includes the setup of urban transshipment platforms, where, especially designated staff provides assistance in the last mile delivery of products (e.g. to the city centres). Goods are unloaded from the carriers and loaded into trolleys, electric vehicles, bicycles, etc. And this is how goods get through the last section of delivery. This can also be used in activities such as home delivery, short term storage, etc.

At Bordeaux, this type of public-private partnership began as a collaboration between the association of freight carriers, the Chamber of Commerce and the Municipality to design solutions to deliver goods in the central area during infrastructure works that were carried out at that time and that made the delivery of goods to retailers impossible. The first big success of this partnership process was to include the three main carriers associations.

The objective of any project of this kind is not only to facilitate the delivery of goods in city centres, but also to reduce traffic jams, noise and pollution associated to cargo delivery operations.

3.1.2.2. Freight quality partnerships

A more comprehensive approach to public-private partnerships has been developed in the UK. This approach included document which highlighted the Government's determination to identify problems caused by freight and also the problems faced by freight. Local authorities were encouraged to pay more attention to urban freight and include consideration of urban distribution and sustainability in local transport plans to establish freight quality partnerships.

Freight quality partnerships are partnerships between the freight transport industry, the local government, local businesses, local community, environmental groups and other stakeholders to enable them to work together and to address various problems specific to freight. ***Their purpose is to understand the problems in this area and promote constructive solutions which reconcile the need for access to goods and services with environmental and social issues.***

3.1.3. NIGHT DELIVERY

Night delivery is delivering goods to retailers and stores in city centres at night when the city is usually quiet and inactive. The usual night delivery hours in the European Union is between 10 pm and 6 am. This practice has been successful in several European cities since it replaces a large number of vehicles operating during the day with a smaller number of vehicles operating at night.

If companies are allowed to make deliveries at night, they can improve the efficiency of operations and to increase their sales. ***Unrestricted access to the loading/unloading facilities without interfering with traf-***

fic during the day ensures a faster delivery and minimizes the effect of freight transport on traffic congestion. Also, night delivery schedules promote the use of more environmentally friendly and quieter vehicles (e.g. vehicles with engines that run on compressed natural gas).

3.1.4. ROAD TAX

Road tax can be defined as "all measures imposing direct taxes to carriers for urban road use which could influence urban transport". These include taxation measures for urban roads, be it freight or passengers. On the other hand, the term excludes tax for extra- urban roads, motorway and parking charges, fuel or vehicle tax.

Road tax can have two main purposes: traffic funding or traffic management.

The need for funding is most common when choosing this measure. Tax money can be used to improve infrastructure, public transport and other sectors of the transportation industry.

The tax money for management purposes can be used in environmental projects or accessibility projects. Also, such tax may be used to reduce greenhouse gas emissions and traffic noise and to protect a certain area (e.g. the historical centre of a city).

3.1.5. TECHNOLOGICAL SOLUTIONS

3.1.5.1. Intelligent transportation systems

The "Intelligent Transportation System" or "Telematics" is a term used to describe the combined application of information and communication technologies, its infrastructure and legislative framework related to optimization of operational efficiency and future sustainability of transport.

The development of these systems in freight transport is based on multiple systems and technologies developed that collect a large number of data (on the current status of the transport operation and operations planning parameters), which shall be submitted in one form or another to various transport control centres or authorities' databases, to carriers or to various intermediaries.

These systems can be defined as advanced information and communication technologies which aim to simplify and automate freight transport operations both at the operational level and at the institutional level.

3.1.5.2. Green vehicles

Currently, the introduction of clean vehicles in urban transport is very common in Western countries, Sweden being one of the leading countries in implementing this solution.

Public authorities provide resources and financial support to encourage innovative solutions for freight transport and logistics, including the use of clean vehicles in urban areas.

The use of vehicles with low emissions can help towns and cities deal with environmental and noise pollution caused by traffic.

3.1.6. LOCAL REGULATIONS

The establishment of local regulations on freight transport is a priority in any European city experiencing its negative impact. These rules may apply to certain key areas in cities or they can be general and of several kinds:

- Establish specific delivery hours;
- Apply restrictions to freight vehicles;
- Introduce penalties, fines for operators who do not comply with the rules, etc.

In order for these regulations to be established, it is necessary to involve the municipality and to establish a legal framework so that they can be applied.

The purpose of such regulations is to increase the safety and comfort of city and town residents.

This study does not aim to make a complete record of all possible measures that have been used in the European Union to reduce the negative impacts of freight transport. However, along with a series of measures related to road infrastructure, the above measures may prove reliable and could be adapted to freight traffic in Alba Iulia.

3.2. Possible measures to improve logistics in alba iulia

In Alba Iulia, in the "Enclose" area, we have identified several needs of the actors that play a role in the development of logistics processes in the town. These needs are the foundation of measures to improve logistics processes in the town:

- Technological needs:
  - For Alba Iulia :
    - Ability to generate statistical reports about the logistics processes;
    - Real-time traffic and route planning information system;
    - Using modern technologies to optimize and issue permits for vehicles to access the central distribution centre and loading/unloading areas;
    - An online system for booking loading and unloading areas;
  - For local and national carriers :
    - Interfaces with other data or information sharing systems;
    - Using logistic optimization technologies to increase the load factor for transport trucks ;
    - An online system for booking loading and unloading areas;
- Operational needs :
  - For local and national carriers :
    - Removal of regulated restrictions on the delivery hours for delivery of goods to customers ;
    - The ability of carriers to handle peak loads;
    - Harmonisation of access restrictions (weight - length) between different municipalities;
  - For distributors and distributors' associations:
    - Ability to contact and contract different carriers by creating a transportation "fair";
    - Minimize delivery time and easy storage;
- Commercial needs:
  - For Alba Iulia:

- Generate benefits for participants (Prices, delivery time/quality ratios) to optimize logistics measures;
- Optimize the distribution system to traders;
- For distributors and distributors' associations:
- Minimize transport costs in the urban area;
- For local and national carriers:
- Keep goods transportation prices at a competitive level;
- Socio-economic needs;
- For Alba Iulia:
- Strengthen local economic development;
- Increase employment opportunities;
- Increase the number of on foot guided tours for residents and tourists;
- Lower the impact of traffic congestions;
- Decrease the no. of km travelled to distribute goods;
- For residents and tourists:
- Increase the number of on foot guided tours for residents and tourists;

For a correct identification of measures that are feasible for Alba Iulia, it is necessary to take into account the correlation between traffic flows and socio-economic parameters in traffic areas, thus enabling a high-fidelity simulation of the manner of generation, distribution and network distribution of traffic.

To highlight the factors that disturb the smooth flow of traffic, traffic flows and traffic capacity of streets were compared. The level of flows entering junctions in relation to the traffic signs and traffic lights and to their distribution was analysed. From this analysis, taking into account the overall configuration of the road network and the traffic objectives, the main causes of traffic difficulties were identified:

- Businesses in the southeast area of the town located next to the railway have no other access possibilities than the streets that go through the residential area of the old town and lead to the centre of the town;
- Businesses in the southern part of the town do not have direct access to the bypass road because of the disposition of the railroad crossing;
- The street network in old town, with a rectangular structure, has many discontinuities, which is why there is no smooth route to serve this area and to double the main road in the centre through east; for the same reason, this area cannot be satisfactorily served by public transport means;
- Transit traffic on Zlatna-Cluj relations and especially Zlatna - Sebes affect the city street network because there is no detour route on the west;
- Some junctions are not sufficiently arranged in terms of geometry; the main weakness is the lack of additional bands to channel flows ;
- The number of junctions with traffic lights is smaller than needed and in many cases the existing lights are placed so as to provide better visibility;
- At the junctions between major thoroughfares and secondary streets, there are no turning left restrictions, leading to fragmentation of the major thoroughfare and thus to decrease of its traffic capacity;
- There are no heavy weight restrictions on certain streets crossing residential or protected areas such as streets O.Goga, N. Bălcescu, 1 Decembrie 1918 – Horia.

Some of the shortcomings identified, related to the structure of the road network, cannot be rectified except by investment works that require longer production time and substantial funds. However, the measures identified below are an attempt to resolve these problems as well as others and to contribute significantly to improving logistics in Alba Iulia.

3.2.1. RE-SIZING TRAFFIC AREAS IN ALBA IULIA

This type of approach is difficult to address due to factors such as:

- The urban regulations in force;
- The legal status of properties;
- High costs of expropriation actions, decommissioning, demolition of property - buildings or land;
- Little free space between built areas;
- Recent intervention on certain areas such as the Romans' Plateau, the town entrances from Cluj - Napoca and Sebes, which cannot be resized.

All these factors limit the actions that can be taken in Alba Iulia to restructure the traffic spaces. However, such measures may be adopted in areas such as development areas of the town by completion of ring roads, by building the western bypass road, by resizing street network in the town centre (the junction between Streets T. Vladimirescu, Henri Coanda, Ardealului, Council of Europe square, IC Bratianu square) by consolidating the existing road network , etc. .

3.2.2. MEASURES TO IMPROVE ROAD TRAFFIC CONDITIONS

We can identify the following measures to help increase the traffic capacity of the street network in Alba Iulia, as follows:

- Introduction of weight restrictions;
- Directing transit traffic to different routes derived from the implementation of weight restrictions;
- Increase the traffic capacity of junctions based on the inside traffic flow and on their current planning by re-designing geometries, appropriate sings and street marking;
- Speed limits in residential neighbourhoods;
- Prohibition of left turns in certain junctions;
- Regulation of one-way traffic for better traffic organization and increase of vehicle stopping capacity;
- Increase the level of services on the eastern bypass road;
- Increase the number of parking spaces;

3.2.3. SETTING UP LOCAL FREIGHT DISTRIBUTION CENTRES

3.2.3.1. Local distribution centres

This measure has the immediate effect of reducing urban freight traffic and reducing urban congestion. Creating Urban Consolidation and Distribution Centres is one of the very effective solutions when properly and realistically designed to serve the specific needs of a given area with different purposes and stakeholders. According to their definition, these platforms are transshipment areas where at least two types of transport ideally meet (e.g. road and rail transport).

In Alba Iulia, there are certain areas where such platforms already exist and which could be modernized and extended. There are also areas where such new platforms could be created, such as:

- "ICRA" Platform - with the possibility of expansion and modernization;
- The former Refractara factory;
- The former "Utilajul" plant;
- In Cetate district, in the area of the ammunitions warehouse;
- In the development area along the existing bypass road;
- I• n the development area of the exit to Sebeş, on the right side, before the area known as "Three bridges".

All these platforms would benefit from excellent railway links to the main traffic routes and to the existing NR1 and NR74 as well as those planned in the near future - the Sebes - Turda motorway or the western bypass road proposed by GUDP currently under approval.

3.2.3.2. Proximity delivery centres

On the same principle of Consolidation and Distribution Centres, but at a smaller level, such small platforms can be created to serve only limited areas of the perimeter of the town, such as crowded areas (Transilvania Blvd, Iuliu Maniu square, Revolutiei 1989 Blvd, and so on). These platforms could receive the goods from carriers so that the last mile to the shops and service providers can be travelled by small vehicles, environmentally friendly, such as carts or bicycles specifically designed for the small consignments of goods. This would significantly reduce the flow of logistics in residential, administrative or business areas in the town.

3.2.4. NIGHT DELIVERIES

A regulation that would set specific delivery hours for businesses is a measure that significantly reduces freight traffic in the urban area during the day when the town is active.

Regulations in Alba Iulia provide time frames for supply, but nevertheless, most companies that supply goods and most businesses do not comply with this time frame.

Therefore, a regulation is needed to provide and especially to impose fines for operators who do not comply with these rules.

Another measure that would make a substantial contribution to reducing the logistics flows in the town during the day is the regulation and implementation of a night-time delivery system of goods to traders.

3.2.5. TECHNOLOGICAL SOLUTIONS

3.2.5.1. Modernisation of the freight distribution fleet

This measure is difficult to implement in Alba Iulia in the current traffic conditions, as carriers are not forced to take the decision to modernize their current fleet.

However, by implementing the measures set out above (introduction of weight and speed restrictions, the introduction of one-way traffic, deliveries at night, maximum allowed noise limits in the town, creating distribution centres that would automatically attract the usage of low weight vehicles in the urban area, etc.) would contribute decisively to modernize the fleet of carriers through the use of low-weight, greener, with low emissions and low noise vehicles.

3.2.5.2. It systems for traffic monitoring, taxation or access control

This type of systems completes the measures to improve logistics systems in Alba Iulia and it plays several roles such as:

- The protection of historical sites and buildings;
- The proper management of road and pedestrian infrastructure ;
- The prevention and suppression of traffic indiscipline and avoiding traffic accidents;
- The increase in the degree of civilization of traffic participants and of urban comfort ;

The local authority – the Municipality of Alba Iulia - has approved a study on the deployment of monitoring, taxation and access control systems to be extended to major junctions and town entry/exit areas. Also, to increase awareness of all stakeholders of urban logistics (carriers, store owners, residents in the areas in question, etc.) and to encourage the adoption of green logistics solutions to reduce the negative impact of freight distribution on the environment and on overall quality of life, local awareness raising campaigns must be organized.

4. THE ANALYSIS OF MEASURES TO IMPROVE LOGISTICS

4.1. Re-sizing road traffic areas in Alba Iulia

This type of measures can be adopted in areas such as development areas of the town, by completing the ring roads and the western bypass road according to the GUDP. Another objective for the old town is resizing and functionalizing traffic roads according to the ZUP for the Town Centre Area, etc.

The following principles underlie the measures:

- A growing need for car travels;
- Overcrowding of new buildings and shops on the major thoroughfares of the town;
- Unbalanced development of the town, focused on the northwest side;
- Failures in the traffic related to the current road network structure ;
- Road and pedestrian infrastructure projects in recent years ;
- Proposals for development of the road network contained by the GUDP.

The analysis of these items revealed that, in order to ensure good traffic conditions in Alba Iulia in the future, the following road works are required (see *Appendix IV.1. Proposals to extend the street network, Appendix I.4 GUDP provisions – Traffic roads and Appendix IV.2. ZUP provisions in the Town Centre*):

- Extension of the Republicii Blvd. by a break-through of the junction with T. Vladimirescu Blvd. Up to the railroad and connection to the bypass road through a crossing over the railroad;
- Building a new street along the railroad (on its west side) connecting the above-mentioned road to the Railway Station; connecting this street to the following streets: Gh Doja, Mărăşeşti, Bucureşti, Ion Arion, Olteniei and Iaşilor; at one end, the street will cross the Ampoi river through a bridge and it will be connected to Al. I. Cuza street (NR1);
- Connecting Viilor street and the bypass road through a crossing over the railroad, under the current railroad bridge;
- Creating the street network in the south side of the town by extending the built-up area and by connecting it to the street network on Revoluției 1989, County Road 107A towards Pâclişa and Viilor street;
- Extension of the bridge over Mureş River in Partoş district to four lanes;
- Completion of the ring road Revoluției Blvd- Ion Lăncrăjan str. – Partoş – NR1;
- Completion of the ring road Republicii Blvd- T. Vladimirescu street- Bypass Road;
- Construction of the deviation route to Zlatna – from the national road at the town entry from Cluj and connected with the Sebeş – Turda Motorway;
- Construction of connection streets from the western bypass road to Bărăbanț district to the industrial areas in the north-west, Cetate district and the new district in the south;
- Reconfiguration of traffic in the town centre over and area of approx. 7.4 hectares divided into three separate areas (according to the ZUP Town Centre) defined as follows**:**

  - Area 1 encompasses Consiliului Europei sq. between Ardealului str. and Decebal Str. In this area, the main problem to be solved is the car parks, which are insufficient. That is why, under Consiliului Europei square, an underground parking for public facilities and the blocks of flats in the area will be designed for 150 parking places. Access to the underground parking will be from Ardealului and from Decebal streets, the two major traffic routes in the area, and also from Bucovinei street. Nicolae Titulescu Street will provide access to the housing units and businesses on Ardealului Street. Overground parking lots will also be designed with 30 places for public facilities with access from Ardealului Street, with 33 parking places for the blocks of flats with access from N. Bălcescu Street and with 21 parking places for the blocks of flats on Bucovinei Street. Pedestrian traffic is proposed along Ardealului Street and from it to Decebal Street by two pedestrian squares, one on Ardealului Street and one over the underground parking.

  - Area 2 encompasses IC Brătianu square between Ardealului Street and Mihai Viteazul Street. In this area, a widening of Ardealului Street is intended at the corner of Traian street to make room for a parking lot with 35 places for public facilities and 9 places for the blocks of flats along the street on the side with the County Prefect's Office.

  - Area 3 encompasses Tudor Vladimirescu Street between Calea Moților and Henri Coanda str. In this area, the current parking places along Vladimirescu street are insufficient and block one traffic lane. The suggestion is to move the street centreline to increase the angle of the curve in the junction between Henri Coanda and Vladimirescu streets, to move the sidewalk and the green area to the built street front, thus resulting in a 14 metre-wide road with 4 lanes. These measures lead to 49 new parking places which can be created at 45 degrees on the west side of the road. Parking can also be arranged on the eastern side of the street, along the existing houses. A new building in the area can increase the number of parking places by the street and also, a 60-place underground parking can be designed. Access to houses and businesses will be from Tudor Vladimirescu Street on alleys for partial car traffic and sidewalks. (*see IV.1.1.1. A case study – re-functionalization of the town centre area of Alba Iulia – Tudor Vladimirescu street)*

- Finding locations for underground or overground multi-tier public parking lots:
  - An underground and/or multi-tier parking lot around Platoul Romanilor to serve public facilities and blocks of flats for approx. 50 parking places;
  - An underground parking lot in Iuliu Maniu square;
- Reservation of the necessary corridor for the future Sebeş – Turda Motorway;

4.1.1. MEASURE ANALYSIS

In order to implement these measures, substantial funding is required and also, a total involvement of the Public Administration in order to attract these funds. These are medium and long-term measures, which, if implemented, will significantly contribute to improve traffic conditions in Alba Iulia and hence, to improve logistics in Alba Iulia.

4.1.2. A CASE STUDY – CHANGING FUNCTIONALITY OF THE TOWN CENTRE OF ALBA IULIA – TUDOR VLADIMIRESCU STREET

a) The current status of the investment project:

The study has been conducted on three road sections:

SECTION 1 – west of Tudor Vladimirescu street from Unirea store to B.C.R.Bank;

SECTION 2 – the roundabout designed for the junction between Tudor Vladimirescu str. and Oborului str. and the sidewalk on the east side of Tudor Vladimirescu street from the above-mentioned junction to the entry into the residential complex designed by the company Madini Investiții;

SECTION 3 - the roundabout designed for the junction between Tudor Vladimirescu street and Calea Moților and the sidewalk on the east side of Tudor Vladimirescu street from the entry into the residential complex designed by the company Madini Investiții up to the junction with Calea Moților and part of the sidewalk on Avram Iancu street;

The investment project should be divided into two stages, namely stage 1 = section 1 and section 2; stage 2 = section 3.

a.1.) Current technical status:

SECTION 1: Pavement of the pedestrian area (mosaic cast) on the west side of the street is in poor condition. The sidewalk measuring 5145 sq.m will be replaced. The existing green area of 2371 square meters will be changed in shape. *In this area, the current parking lots along the Tudor Vladimirescu street are insufficient and block one traffic lane*.

SECTION 2: *Traffic in the junction between Tudor Vladimirescu Street and Oborului street does not work well in peak hours. The existing area of 45 square meters will be replaced by a roundabout.* The sidewalk on the east side of Tudor Vladimirescu Street measuring 604 sq m is in a bad shape.

SECTION 3: *The current junction between Calea Moților and Tudor Vladimirescu street has got traffic lights, which will be replaced by a roundabout.* The existing area measuring 97 sq.m of pavement and a green area of 65 sq m will be modernised. The bus stop will be moved in order to make place for the roundabout. The existing sidewalk surface of 772 sq m is in a bad shape and must be replaced.

b) Technical data of the investment project – Description of basic works:

- **SECTION 1:**

The west side of the street will contain a parking lot for 94 cars at 45 degrees, with access through a separate car alley. This will be done by moving the sidewalk and the green area to the built front. Access to parking will be by barriers, an input and an output post and one ticketing post. Thirteen parking lots will be built near Unirea general store and 7 near the BCR Bank. The street will have a width of 14 m with four lanes. The parking area will be separated from the street by a green area where trees will be planted.

The project includes an upgrading of the pedestrian area, green areas with small and big trees, new street furniture.

The area in front of the Unirea store will be modernised, as well as the sidewalk and the green area behind the store.

Two taxi ranks for 15 cars will be created. The existing bus stop will be modernised and the current hoardings will be eliminated.

The new indicators will be:

- Sidewalks and alleys with access to the parking lots paved with cobble stone=1806 sq m;
- Sidewalks paved with large concrete slabs = 3350 sq m;
- Parking area with grassed flagstones = 1371 sq m;
- Bus stops and taxi ranks with concrete block paving = 278 sq m;
- Green areas = 2013 sq m ;

- **SECTION 2:**

A roundabout will be built at the junction between Tudor Vladimirescu and Oborului Streets. The central island will consist of vibro-pressed concrete blocks. The expansion lane around the central island will consist of vibro-pressed concrete slabs. The splitter islands separating traffic flows into and out of the roundabout will be framed with vibro-pressed concrete kerbs and the inner area will be landscaped as a green area.

The access straps to and from the roundabout will undergo road centreline corrections that will require new kerbs to be mounted. The new areas will be covered with slabs (widening sidewalks) or, if the case, remain as green areas.

The widening of the roadway for this purpose will be carried out in a “box” system

The new indicators will be:

- Roundabout area = 103sqm
- Sidewalks in the CEC Bank area = 647sqm;
- Parking lots in the CEC Bank area = 284sqm.

- **SECTION 3:**

A roundabout will be built at the junction between Tudor Vladimirescu and Oborului Streets. The central island will consist of vibro-pressed concrete blocks. The expansion lane around the central island will consist of vibro-pressed concrete slabs. The splitter is-

lands separating traffic flows into and out of the roundabout will be framed with vibro-pressed concrete kerbs and the inner area will be landscaped as a green area.
The access straps to and from the roundabout will undergo road centreline corrections that will require new kerbs to be mounted. The new areas will be covered with slabs (widening sidewalks) or, if the case, remain as green areas.
The widening of the roadway for this purpose will be carried out in a "box" system
The new indicators will be:

- Roundabout area = 103sqm
- Area of sidewalks around the Synagogue = 966sqm;
- Bus stop and parking lots area = 245sqm.

d) Economic data of the investment project:

d.1.) Prior measurements – the quantity assessment of works and investment costs on each sector:

SECTION 1

Lucrari	UM	cantitate	pret unitar	pret/categorie lucrari	eu
Amenajare teren					
Demontat borduri	m	1514	2,5	3785	
Spargere beton/asfalt	mc	800	101	80800	
Desfacere pavaj	mc	320	4	1280	
Defrisare arbori existenti si scoatere radacini	buc	22	50	1100	
				86965,0	**19542,7**
Protectia mediului				0	
				0	
Umplutura pamant vegetal in spatiile verzi si locuri de odihna	mc	956	28	26754	
Insamantare cu iarba spatii verzi	mp	1911	0,5	955,5	
arbori - tei	buc	48	40	1920	
arbusti - ienupar tarator, bucsus	buc	302	60	18120	
				47749,5	**10730,2**
Terasamente				0	
Sapatura pentru sist rutier trotuare, alei pietonale	mc	1267	25	31672,5	
Sapatura pentru sist rutier alei auto si parcari	mc	1640	25	40998,75	
Sapatura pT fundatii ziduri ornamentale mecanizat si manual	mc	37	50	1850	
Taiere asfalt	m	200	10	2000	
				76521,25	**17195,8**
Alei pietonale, trotuare	mp	4223		0	
balast compactat in strat de fundare(20 cm)	mc	845	72	60811,2	
inbracaminte piatra cubica granit - 10x10x10(incl nisip/beton)	mp	873	155	135315	
imbracaminte din pavele din beton vibropresat 40x40x6 cm suprafata "spalata" (inclusiv nisip)	mp	3350	90	301500	
Confectie lemn banci si prinderi metalice	mc	3	1000	3000	
blocuri de zid ornamentale cu fata cu aspect de piatra despicata	buc	2045	35	71575	
beton(C8/10 in fundatia zidurilor ornamentale)	mc	229	250	57250	
				629451,2	**141450**
Alei auto si parcari	mp	2523		0	
strat filtrant din nisip (nisip - 7 cm)	mc	177	87	15365,07	
balast compactat (30 cm)	mc	757	72	54496,8	
piatra sparta(20 cm)	mc	505	130	65598	
bordura beton vibropresat12x25 cm (inc fundatia din beton)	m	80	48	3840	
bordura beton vibropresat 20x25 cm (incl fundatia din beton)	m	1060	57	60420	
imbracaminte pavele beton vibropresat autoblocante- 10 cm	mp	278	75	20850	
inbracaminte piatra cubica, granit - 10x10x10(incl nisip/beton)	mp	934	155	144770	
imbracami pavele beton vibropresat tip grila si delimitari-10 cm		1371	60	82260	
aducere camine la cota	buc	34	900	30600	
guri de scurgere	buc	16	1010	16160	
semne de circulatie	buc	14	200	2800	
sistem de parcare automata	buc	1	200000	200000	
				697159,870	**156665**

Table 4.1. Quantity assessment of works and of investment costs on Section 1

SECTION 2

Lucrari	UM	cantitate	pret unitar	pret/categorie lucrari	eu
Amenajare teren					
Demontat borduri	m	498	2,5	1245	
Spargere beton/asfalt	mc	91	101	9191	
Desfacere pavaj	mp	1489	4	5956	
				16392,0	3683,6
Protectia mediului				0	
Strat de pamant vegetal in insule separatoare- 30 cm	mp	40	28	1120	
Strat de pamant vegetal in insula centrala70 cm	mp	55	28	1540	
geotextil- strat de separare	mp	27	3	81	
Insamantare cu iarba	mp	95	0,5	47,5	
				2788,5	626,6
Terasamente				0	
Sapatura pentru sist rutier trotuare	mc	20	25	500	
Taiere asfalt	m	178	10	1780	
				2280	512,4
Alei pietonale, trotuare	mp	1415		0	
balast compactat in strat de fundare(20 cm)	mc	283	70	19810	
bordura 20x25 cm (inclusiv fundatia din beton)	m	441	57	25137	
imbracaminte din pavele din beton vibropresat 40x40x6 cm suprafata "spalata" (inclusiv nisip)	mp	1415	90	127350	
Imbracaminte din pavele din beton vibropresat gri, 6 cm (inclusiv nisip)	mp	0	57	0	
				172297,0	38718,4
Alei auto, giratoriu si parcari					
casete	mp	76			
strat filtrant (nisip - 7 cm)	mc	5,32	87	462,84	
balast compactat (30 cm)	mc	22,8	72	1641,6	
piatra sparta(25 cm)	mc	19	130	2470	
strat de asfalt Ba16 - 4 cm	mp	76	36	2736	
strat de BAD 25- 6 cm	to	11	270	2970	
geocompozit antifisura la contactul casetelor cu sistemul existent.	mp	30	25	750	
bordura din beton vibropresat12x25 cm (inclusiv fundatia din beton)	m	36	48	1728	
imbracaminte pavele beton vibropresat rosu10x10x8 cm (inclusiv nisip)	mp	47	70	3290	
imbracaminte din pavele din beton vibropresat autoblocante - grosime 10 cm(inclusiv nisip)	mp	283	75	21225	
zid din blocuri modulare din beton vibropresat - blocheti	mp	22	510	11220	
capace din beton vibropresat pentru coronament	m	27	120	3240	
piatra sparta in dren	mc	9	120	1080	
geotextil	mp	25	5	125	
aducere camine la cota	buc	7	900	6300	
guri de scurgere	buc	8	1010	8080	
marcaje rutiere vobsea bicomponent, alba	mp	300	21	6300	
semne de circulatie	buc	24	200	4800	
				78418,44	17622,1

Table 4.2. Quantity assessment of works and of investment costs on Section 2

SECTION 3

Lucrari	UM	cantitate	pret unitar	pret/categorie lucrari	EU
Amenajare teren					
Demontat borduri	m	567	2,5	1417,5	
Spargere beton/asfalt	mc	23	101	2323	
Desfacere pavaj	mp	982	4	3928	
Demontare stalpi semafoare	buc	4	2000	8000	
				15668,5	**3521,01**
Protectia mediului				0	
Strat de pamant vegetal in insulele de separatie- 30 cm	mc	12	28	336	
Strat de pamant vegetal in insula centrala 70 cm	mc	44,8	28	1254,4	
geotextil	mp	25	3	75	
Insamantare cu iarba	mp	105	0,5	52,5	
				1717,9	**386,045**
Terasamente				0	
Sapatura pentru sistem rutier trotuare	mc	78	25	1950	
Taiere asfalt		330	10	3300	
				5250	**1179,78**
Alei pietonale, trotuare	mp	1335		0	
balast compactat(10 cm)	mc	267	70	18690	
bordura din beton vibropresat 20x25 cm (inclusiv fundatia din beton)	m	710	57	40470	
imbracaminte din pavele din beton vibropresat 40x40x6 cm suprafata "spalata" (inclusiv nisip)	mp	1240	90	111600	
Imbracaminte din pavele din beton vibropresat gri, 6 cm (inclusiv nisip)	mp	95	57	5415	
				176175	**39589,9**
Alei auto si giratoriu				0	
casete	mp	327		0	
strat filtrant (nisip - 7 cm)	mc	22,89	87	1991,43	
balast compactat (30 cm)	mc	98,1	72	7063,2	
piatra sparta(25 cm)	mc	81,75	130	10627,5	
strat de asfalt Ba16 - 4 cm	mp	80	36	2880	
strat de BAD 25- 6 cm	to	12	270	3240	
geocompozit antifisura la contactul casetelor cu sistemul existent	mp	40	25	1000	
bordura din beton vibropresat 12x25 cm (inclusiv fundatia din beton)	m	38	48	1824	
imbracaminte pavele beton vibropresat 10x10x8 cm (inclusiv nisip)	mp	50	70	3500	
imbracaminte pavele beton vibropresat autoblocante - 10 cm	mp	245	75	18375	
zid din blocuri modulare din beton vibropresat - blocheti	mp	24	510	12240	
capace din beton vibropresat pentru coronament	m	29	120	3480	
piatra sparta in dren	mc	11	120	1320	
geotextil filtrant	mp	25	5	125	
aducere camine la cota	buc	7	900	6300	
guri de scurgere	buc	6	1010	6060	
marcaje rutiere vobsea bicomponent, alba	mp	300	21	6300	
semne de circulatie	buc	26	200	5200	
				91526,1	**20567,7**

Table 4.3. Quantity assessment of works and of investment costs on Section 3

Structure of the three tables:

Works / MU / Qty / Price / Price/Category / Price in Euros

Land development - Environment protection - Earthwork - Pedestrianized alleys, sidewalks - Car alleys and parking lots

Notations: mc = cubic metre, mp = sqm, buc. = piece

d.2.) General estimate of the cost of the investment, on expenditure heads:

GENERAL ESTIMATE
of expenses needed to complete the project
RE-FUNCTIONALISATION OF THE CENTRAL AREA
TUDOR VLADIMIRESCU STREET

Nr. crt.	Denumirea capitolelor şi subcapitolelor de cheltuieli	Valoare	(fără TVA)	TVA	Valoare (inclusiv TVA)	
		Mii lei	Mii euro	Mii lei	Mii lei	Mii euro
1	2	3	4	5	6	7
CAPITOLUL 1						
Cheltuieli pentru obţinerea şi amenajarea terenului						
1.1	Obţinerea terenului	0,000	*0,000*	0,000	0,000	0,000
1.2	**Amenajarea terenului**	**173,550**	**39,000**	**41,652**	**215,202**	**48,360**
1.2.1.	Amenajarea terenului TRONSON 1	87,220	*19,600*	20,933	108,153	24,304
1.2.2.	Amenajarea terenului- TRONSON 2	16,465	*3,700*	3,952	20,417	4,588
1.2.3.	Amenajarea terenului- TRONSON 3	69,865	*15,700*	16,768	86,633	19,468
1.3	**Amenajări pentru protecţia mediului**	**52,955**	***11,900***	**12,709**	**65,664**	**14,756**
1.3.1.	SPATII VERZI TRONSON 1	47,838	*10,750*	11,481	59,319	13,330
1.3.2.	SPATII VERZI- TRONSON 2	2,893	*0,650*	0,694	3,587	0,806
1.33.	SPATII VERZI- TRONSON 3	2,225	*0,500*	0,534	2,759	0,620
TOTAL CAPITOL 1		**226,505**	**50,900**	**54,361**	**280,866**	**63,116**
CAPITOLUL 2						
2.1 Cheltuieli pentru asigurarea utilităţilor necesare obiectivului						
2.1.1	**Alimentare cu apă**	**281,774**	**63,320**	**67,626**	**349,400**	**78,517**
2.1.1.1	Alimentare cu apă TRONSON 1	110,894	24,920	26,615	137,509	30,901
2.1.1.1a	SISTEM DE IRIGARE TRONSON 1	60,965	13,700	14,632	75,597	16,988
2.1.1.2	Alimentare cu apă TRONSON 3	109,915	24,700	26,380	136,295	30,628
2.1.2	**Canalizare**	**57,405**	**12,900**	**13,777**	**71,182**	**15,996**
2.1.2.1	Canalizare PLUVIALA TRONSON 1	57,405	12,900	13,777	71,182	15,996
2.1.3	**Alimentare energie electrică**	**623,000**	**140,000**	**149,520**	**772,520**	**173,600**
2.1.3	ILUMINAT STRADAL TRONSON 1	600,750	135,000	144,180	744,930	167,400
	ILUMINAT STRADAL TRONSON 3	22,250	5,000	5,340	27,590	6,200
2.1.4	Alimentare cu agent termic	0,000	*0,000*	0,000	0,000	0,000
2.1.5	Alimentare cu gaze naturale	0,000	*0,000*	0,000	0,000	0,000
2.1.6	Telefonie	0,000	*0,000*	0,000	0,000	0,000
2.1.7	Radio-TV	0,000	*0,000*	0,000	0,000	0,000
TOTAL 2.1		**962,179**	**216,220**	**230,923**	**1193,102**	**268,113**
2.2.	***Montaj utilaje tehnologice***					
TOTAL 2.2		**0,000**	**0,000**	**0,000**	**0,000**	**0,000**
2.3.	***Utilaje, echipamente tehnologice şi funcţionale cu montaj***					
TOTAL 2.3		**0,000**	**0,000**	**0,000**	**0,000**	0,000
TOTAL CAPITOL 2		**962,179**	**216,220**	**51,893**	**1014,072**	227,881

CAPITOLUL 3						
Cheltuieli pentru proiectare şi asistenţă tehnică						
3.1	**Studii de teren**					
TOTAL 3.1		4,450	1,000	1,068	5,518	1,240
3.2	**Taxe pentru obţinere de avize, acorduri şi autorizaţii**					
3.2.1	Certificat de Urbanism	0,000	0,000	0,000	0,000	0,000
3.2.2	Obţinerea autorizaţiei de construire	31,818	7,150	7,636	39,454	8,866
3.2.3	Avize şi acorduri furnizori de utilităţi	2,225	0,500	0,534	2,759	0,620
TOTAL 3.2		**34,043**	**7,650**	**8,170**	**42,213**	**9,486**
3.3	**Proiectare şi inginerie**					
3.3.1.	**Proiectare**	87,799	*19,730*	21,072	108,870	24,465
TOTAL 3.3		**87,799**	**19,730**	**21,072**	**108,870**	**24,465**
3.4	Organizarea procedurilor de achiziţie					
TOTAL 3.4		**0,000**	***0,000***	**0,000**	**0,000**	**0,000**
3.5	**consultanta**					
3.5.1	cererea de finantare	2,225	*0,500*	0,534	2,759	0,620
3.5.2	Managementinvestiţiei, administrare contractul execuţie	2,225	*0,500*	0,534	2,759	0,620
TOTAL 3.5		**4,450**	**1,000**	**1,068**	**5,518**	**1,240**
3.6	Asistenţă tehnică					
3.6.1	Proiectant	4,450	*1,000*	1,068	5,518	1,240
3.6.2	Inspector de şantier	21,360	*4,800*	5,126	26,486	5,952
TOTAL 3.6		**25,810**	**5,800**	**6,194**	**32,004**	**7,192**
TOTAL CAPITOL 3		**156,551**	**35,180**	**37,572**	**194,123**	**43,623**
CAPITOLUL 4						
Cheltuieli pentru investiţia de bază						
4.1	***Construcţii şi instalaţii***					
4.1.1.	CIRCULATII +AMENAJARI URBANE TRONSON 1	1404,29	315,57	337,03	1741,32	391,31
4.1.2.	SENS GIRATORIU BCR +TROTUAR VEST	253,69	57,01	60,89	314,58	70,69
4.1.3.	SENS GIRATORIU UNIREA +TROTUARE	273,23	61,40	65,58	338,81	76,14
TOTAL 4.1		**1931,21**	**433,98**	**463,49**	**2394,70**	**538,14**
4.2	***Montaj utilaje tehnologice***					
TOTAL 4.2		**0,000**	**0,000**	**0,000**	**0,000**	**0,000**
4.3	***Utilaje, echipamente tehnologice şi funcţionale cu***					
	CIRCULATII +AMENAJARI URBANE TRONSON 1	200,25	45,00	48,06	248,31	55,80
	4.3.2.	0,00	0,00	0,00	0,00	0,00
	4.3.3.	0,00	0,00	0,00	0,00	0,00
TOTAL		**200,25**	**45,00**	**0,00**	**200,25**	**45,00**
4.4	***Utilaje fără montaj şi echipamente de transport***					
	Cheltuieli pentru procurarea utilajelor şi echipamentelor	0,00	*0,00*	0,00	0,00	0,00
TOTAL		**0,00**	**0,00**	**0,00**	**0,00**	0,00
4.5	***Dotări***					
TOTAL		**0,00**	**0,00**	**0,00**	0,00	0,00
4.6	***Active necorporale***					
	TOTAL 4.6	0,00	**0,00**	**0,00**	**0,00**	0,00
	TOTAL CAPITOL 4	**2131,46**	**478,98**	**511,55**	**2643,01**	**593,94**
	CAPITOLUL 5					
Alte						
5.1	***Organizare de şantier***					
	5.1.1. Lucrări de construcţii	59,28	*13,32*	14,23	73,50	16,52
	5.1.2. Cheltuieli conexe organizării şantierului	3,12	*0,70*	0,75	3,87	0,87
	TOTAL 5,1	**62,40**	14,02	14,98	77,37	17,39
5.2	***Comisioane, cote, taxe, costul creditului***					
	5.2.1Comision banca finanţatoare	0,00	*0,00*	0,00	0,00	0,00
	5.2.2.Comision ICPLUAT (0,1% + 0,7%+0,5%)	41,37	*9,30*	0,00	41,37	9,30
TOTAL		**41,37**	**9,30**	**0,00**	**41,37**	**9,30**
5.3	***Cheltuieli diverse şi neprevăzute***					
	TOTAL 5.3	**347,67**	78,13	83,44	431,11	96,88
	TOTAL CAPITOL 5	**451,44**	**101,45**	**108,34**	**559,78**	**125,79**

	CAPITOLUL 6					
Cheltuie						
6.1	Pregătirea personalului de exploatare	0,000	0,000	0,000	0,000	0,000
6.2	Probe tehnologice şi teste	0,000	0,000	0,000	0,000	0,000
	TOTAL CAPITOL 6	0,000	0,000	0,000	0,000	0,000
	TOTAL GENERAL	3928,13	882,73	932,82	4860,96	1092,35
	DIN CARE C + M	3182,29	715,12	753,82	3936,11	884,52

Table 4.4. General estimate of re-functionalisation works in the Central Area – Tudor Vladimirescu street.

Table structure:
No. Expense head Value without VAT VAT Value with VAT (thou. RON) (thou. Euro) (Thou. RON) (thou. RON) (thou. Euro)
Head 1 Land development
Head 2 Utilities
Head 3 Technical Designs and Assistance
Head 4 Basic investment (construction, installations)
Head 5 Construction Site management
Head 6 Training of personnel, tests and technological examinations
Notations: TRONSON-SECTION
SPATII VERZI – GREEN AREAS
TOTAL GENERAL-GRAND TOTAL

4.2. Measures to improve road traffic conditions

Although the existing street network will not change in the next 3-5 years through the measures described above, there are less costly measures to be proposed to the municipality to help increase the traffic capacity of the street network and of traffic flow, such as:

APPENDIX 4.3. Measures to improve road traffic conditions

- Introduction of weight restrictions:
  - Without weight restrictions - on the following streets: Al. I. Cuza , Mureşului (partly), Turnătoriei, Republicii, Gh. Şincai (from Republicii to the exit), NR74 (to the exit from the junction with Republicii), NR1 from the entry from Sebeş to the junction with Încoronării Blvd., Încoronării from the junction with Ferdinand I Blvd to the Railway Station, Viilor.
  - More than 7 tonnes – only on the following streets: Încoronării, Pop de Băseşti, Lalelelor, Revoluţiei 1989, Gh. Şincai partly, H.Coandă, T. Vladimirescu Blvd (between H.Coandă and Republicii), Mărăşeşti (route CR107), Livezii partly, Mureşului partly, Petreşti and Măceşului.
  - More than 2.7 tonnes – only on the following streets: Calea Moţilor, Horea, 1 Decembrie 1918, Doinei, T. Vladimirescu (between Henri Coandă and Moţilor), Ardealului, Brâncoveanu, Ferdinand I, the route Olteniei – Ion Arion – Bucureşti until CR107.
  - On the rest of the streets, including the historical area, access should be allowed for vehicles less than 1.5 tonnes.
- Transit traffic direction (through properly set up traffic signs) on the above-mentioned street network and with the observance of weight restrictions as follows:
  - Sebeş - Cluj-Napoca: directed only to the bypass road;
  - Sebeş – Zlatna:
    - ■ For passenger vehicles: NR1 through Partoş – Încoronării – 1 Decembrie 1918 – Horea – Moţilor – Zlatnei – NR74 exit;
    - ■ For freight vehicles more than 7 tonnes: NR1 through Partoş – Bypass Road – Al.I.Cuza – Republicii - Zlatnei – NR74 exit;
    - ■ For freight vehicles less than 7 tonnes: NR1 through Partoş – Încoronării – Pop de Băseşti – Revoluţiei 1989 - Zlatnei – NR74 exit;
  - Zlatna – Cluj: directed only to NR74 – Zlatnei – Republicii – Al. I. Cuza – NR1 town exit;
  - Ciugud - Sebeş and Cluj directed only to the bypass road;
  - Ciugud - Zlatna:
    - ■ For passenger and freight vehicles less than 7 tonnes: Mărăşeşti – T. Vladimirescu – Republicii – Zlatnei - NR74 to exit;
    - ■ For freight vehicles more than 7 tone: Bypass road – Al. I. Cuza - Republicii – Zlatnei - NR74 exit;

- To increase traffic capacity of junctions depending on the level of traffic flows and their landscaping, the following measures are suggested:
  - Correcting of geometry to channel traffic flows in the following junctions:
    - Al. I. Cuza – Orizontului;
    - Al. I. Cuza – Livezii;
    - Al. I. Cuza – Mureşului;
    - Republicii – Arieşul;
    - Republicii – Emil Racoviță;
    - Republicii – V.Alecsandri;
    - Revoluției 1989 – Pop de Băseşti;
    - Revoluției 1989 – Cloşca;
    - V.Alecsandri – H. Coandă;
    - Calea Moților – Ştefan cel Mare;
    - Dr. Ion Rațiu – Petru Rareş – C. Brâncoveanu;
  - Geometry correction and the construction of roundabouts and traffic lights:
    - Încoronării – O.Goga;
    - Calea Moților – T. Vladimirescu;
    - T. Vladimirescu – Oborului;
    - Ardealului – P-ța Iuliu Maniu;
    - 1 Decembrie 1918 – Pop de Băseşti;
    - 1 Decembrie 1918 – Vasile Goldiş;
    - Horea – Cloşca – 1 Decembrie 1918;
    - Revoluției 1989 – V. Goldiş
    - Revoluției 1989 – Cloşca;
    - Revoluției 1989 – Alexandru cel Bun;
    - Încoronării – B-dul Ferdinand I (Railway station).
  - Geometry corrections and green light traffic lights (until the above-mentioned roundabouts are built) of the following junctions:
    - Ferdinand I – Moldovei;
    - Ferdinand I – Munteniei;
    - Ferdinand I – Olteniei;
    - Ferdinand I – Bucureşti;
    - I.C.Brătianu – Pța Națiunii;
    - I.C.Brătianu – Rubin Patiția;
    - Ardealului – Iului Maniu;
    - Ardealului – Calea Moților;
    - Ardealului – H. Coandă;
    - T. Vladimirescu – Mărăşeşti;
    - T. Vladimirescu – Republicii
  - Re-designing the road marking along the streets Ferdinand I – IC Brătianu - Ardealului –T Vladimirescu from Încoronării to Republicii Blvd. so as to create along the green light traffic sector a continuous lane in each direction for the forward direction and additional lanes to channel flows in all junctions on route by removing existing parking places along the streets. This would create conditions for increasing capacity on this route in both directions. On the roadway not used by traffic, markings shall be arranged as appropriate, for public transportation, taxi racks or stops.
- A speed limit of 30 km/h in densely built areas in the Cetate district;
- To increase the flow and safety on the streets of the major network, it is recommended to ban left turns at the following junctions:
  - Ferdinand - Banatului;
  - T. Vladimirescu – Târgului;
  - T. Vladimirescu – Emil Racoviță;
  - B-dul Republicii – Craivei;
  - Calea Moților - A.Vlaicu;
  - Calea Moților - I.Micu Klein;
  - Calea Moților - T.Cipariu;
  - Calea Moților - Şt. Cel Mare;
  - Calea Moților - Septimius Severus;
  - B-dul Horea - Ion Agârbiceanu;
  - B-dul Horea - Dr. Ion Rațiu;
- One-way traffic should be introduced on the following streets for a better traffic management and to increase traffic or stopping capacity:
  - Pop de Băseşti;
  - Lalelelor;
  - Petru Rareş;
  - C-tin Brâncoveanu;
  - Ion Antonescu;
  - Şt. Cel Mare between Cloşca and Petru Rareş;
  - Mircea cel Bătrân;
  - Dr. Ion Rațiu between Cloşca and Petru Rareş;
  - Alexandru cel Bun;
  - Lucian Blaga;
  - Traian between Munteniei – Luminii - Pța Națiunii;
- Increase the level of services on the (existing) Eastern belt in collaboration with CNADR to attract transit traffic on the route Sebes - Cluj (in its entirety) and most of the town entry traffic in these two directions by better maintenance of the roadway and of the roadside, by ensuring horizontal and vertical signage and by installing lights all along the road.
- Increase the number of parking places to reduce stationary traffic on the roadway which seriously affects the traffic capacity of several streets. Their implementation, however, is virtually impossible in most areas for lack of space (most existing vacancies have already been designed for this purpose). For this reason, it is recommended to discourage stopping in central areas and of general interest so as to increase traffic flow. This objective can be achieved by introducing a system of limiting and charging stops around and inside the historical fortress and along the following streets: Regiment V Vânători, Regele Ferdinand I, I.C.Brătianu, Ardealului, T. Vladimirescu, Al.I.Cuza, Republicii, Revoluției 1989, 1 Decembrie 1918, Horea and Calea Moților. It can also be achieved by the use of access fees for motorized transportation means to certain areas of the town and by traffic calming plans.

4.2.1. Measure analysis

By integrating the above proposed measures in the current road network, new traffic flows result. Compared to the current state of flow, we can emphasize the effects of the proposed measures on the distribution of the traffic on the street network.

The total flow on the following sectors is expected to increase:

- Revoluției 1989 Blvd between Moților and Cloşca by approx. 19%;
- Revoluției 1989 Blvd between Cloşca and Vasile Goldiş by approx. 60%;
- Revoluției 1989 Blvd between Vasile Goldiş and Pop de Băseşti by approx. 2.6 times;
- The Bypass Road by 31%.

These increases are mainly due to freight vehicle traffic from 2.7 to 7 tonnes that have imposed severe restrictions on the rest of the network. Also, a flow increase by 40% on the route V.Alecsandri – Gh. Şincai is expected by streamlining the two junctions at the ends of the route.

On the other hand, the thoroughfares that cross the protected and residential areas can witness a decrease of flows on certain sections, such as:

- Cloşca street by approx. 20%;
- V.Goldiş street by approx. 30%;

1 Decembrie 1918 (between Pop de Băseşti and V. Goldiş) by approx. 40%;

- 1 Decembrie 1918 (between Cloşca and V. Goldiş) by approx. 25%;
- Horea by approx. 18%;
- O.Goga street by approx. 27%;
- N.Bălcescu by approx. 19%;
- Calea Moţilor (between Horea and Republicii) by approx. 34%.

In central areas proposed for green light traffic, the total traffic would increase only slightly on Ardealului Street by approx. 3% as between Bucuresti Street and Iuliu Maniu square, while between Iuliu Maniu and Calea Moţilor by approx. 7%. On T. Vladimirescu Blvd a decrease in traffic by about 12% can be expected between H.Coandă and Mărăşeşti and by 7% between Mărăşeşti and Republicii Blvd.

From the analysis of the technical and economic indicators of the existing network and of the proposed option, the proposed option ensures greater traffic flow which is reflected in increased speed. The total distance travelled is longer in the proposed option, which is mainly due to restrictions for freight vehicles and one-way streets. However, due to increases in the average travel speed, total fuel consumption as proposed is somewhat smaller, achieving savings and reducing the total cost of travel.

By analysing the effects of the measures at town level, we can draw the following conclusions:

- The degree of urban comfort level and especially of traffic participants and pedestrians increases significantly ;
- A significant decrease in emissions and noise levels in residential areas is achieved;
- Freight operators benefit from more fluent routes, thus reducing the cost of transport operations ;

Also see *Appendix IV.4. Prognosis for road traffic flow in Alba Iulia*;

4.3. SEtting up local freight distribution centres

4.3.1. LOCAL DISTRIBUTION CENTRES

This measure has the immediate effect of reducing urban freight traffic and reducing urban congestion. According to their definition, these platforms are transshipment areas where at least two types of transport ideally meet (e.g. road and rail transport).

The setup of such Distribution Centres (Distribution Platforms) provides logistics companies with scheduled deliveries in urban areas the opportunity to transfer the load to the distribution centre, thus avoiding access to the overcrowded urban area. The Centre's operators sort cargoes from a larger number of carriers and deliver them in the urban area by a schedule, often using environmentally friendly vehicles.

In Alba Iulia, there are certain areas where such platforms already exist and which could be modernised and extended. There are also areas where such new platforms could be created, such as:

- The "ICRA" Platform - with the possibility of expansion and modernisation and numerous advantages given by its location, namely:
  - Direct access to Al. I. Cuza street (NR1);
  - Access to the bypass road, main railway, the future Sebeş – Turda motorway and the future west bypass road in less than 500m.
- The former "Refractara" factory with many advantages given by its extent and location, namely:
  - Direct access to Al. I. Cuza street (NR1);
  - Access to the bypass road, main railway, the future Sebeş – Turda motorway and the future west bypass road in less than 1000m.
- The former "Utilajul" plant with many advantages given by its location, namely:
  - Direct access to Al. I. Cuza street (NR1);
  - Direct access to the railroad;
  - Access to the Bypass road, main railway, the future Sebeş – Turda motorway and the future western bypass road in less than 1000m.
- In Cetate district, in the area of the ammunitions warehouse;
- On Brânduşei street (to Pâclişa) in direct connection to CR107A and a distance of less than 2 km. from the railroad;
- In the development area along the existing bypass road, which has many advantages due to its location, namely:
  - Direct access to the Bypass Road;
  - Between 100m and 2000m from NR1, the main railway, the future Sebeş – Turda motorway and the future western bypass road.
- In the development area of the exit to Sebeş, on the right side, before the area known as "Three bridges" which has many advantages due to its location, namely:
  - Direct access to the NR1;
  - Between 200m and 2500m distance from the main railway, the future Sebeş – Turda motorway and the eastern bypass road.

4.3.1.1. Measure analysis

The strengths and weaknesses of this measure are:

- Strengths:
  - Social and environmental benefits arising from more efficient and less invasive transport in the central areas of the town;
  - Better planning and implementation of logistics operations ;
  - Better control of inventory;
  - Theoretical cost benefits by excluding last mile delivery;
  - Benefits to participants as regards PR, etc.
- Weaknesses:
  - High cost of building the necessary infrastructure;

- Difficulty of a single centre to manage a too broad variety of goods due to the diversity of vehicles involved in transporting each type of goods;
- Contractual and organizational issues,
- Loss of direct contact between customer and provider.

However, the above proposals may prove feasible if the funding source is identified (private investment or public and private) and if they are designed realistically. All these platforms would benefit from excellent connections with the railroad, the main traffic routes, existing and future (Sebes - Turda Motorway) or proposed (GUDP - Western Ring Road and connecting rings) providing optimal access to carriers and connections in all directions. (*Appendix IV.5. Areas identified for the possible location of distribution centres*)

The implementation of the measure also attracts numerous benefits to all stakeholders, such as:

- Benefits for local authorities and residents of the town:
  - Local roads' decongestion;
  - Low emissions limiting the environmental impact of freight transport;
  - Fewer trips which lowers the risk of accidents;
  - Better quality of life for the inhabitants by noise reduction, reducing freight vehicle access through the districts and lowering the risk of accidents;
- Benefits for investors and contractors:
  - Reducing delivery costs and increasing safety ;
  - Safe deliveries resulting in a continuous process without interruptions;
  - Time saved
  - The opportunity to belong to a corporation with a responsible schedule which ensures compliance with health and safety regulations;
- Benefits for freight operators:
  - Legally defined spaces for loading-unloading operations – meaning a low risk of fines
  - Reduction of fuel consumption by safe deliveries;
  - Certainty of delivery leads in time to fleet productivity;
  - Fewer travels and a lower risk of accidents.

4.3.1.2. The cost assessment for a local distribution centre

Given the complexity of setting up such a centre in Alba Iulia and without a well-established site and a technical project, the project value described below has been determined in accordance with Government Decision 363/14.03.2010 "List of standards cost for investments financed from public funds" for the basic investment project. A General Estimate has also been prepared according to GD 28/2008. The cost standard is a reference document with a leading role in promoting investment projects financed from public funds. The cost assessment has taken into account a 5.000sqm site in the Town Development Area, adjacent to the major road network of Alba Iulia.

- The technical data of the investment project are:
  - built-up area: 1,628.00 sqm;
  - deployed built-up area: 1,780.00 sqm.
  - metal support structure (pillars and space trusses);
  - three-layer panels (steel sheet 0.5 mm + fireproofed polyurethane foam + steel sheet 0.5 mm), mounted on the bearing structure;
  - thermo-insulated roof;
  - PVC joinery with thermal-insulating windows.
- In determining the total cost, the following were taken into account:
  - For overheads and profit: 10 % and 5 %;

For an efficient spending of public funds, in the following expenditure Heads/subheads expense not included in cost standard, the following maximum levels of expenditure were considered, as a percentage:

a) Design and engineering: 3.0 % of the basic investment project value;
b) Consulting: 1.0 % of the basic investment project value;
c) Technical assistance: 1.5 % of the basic investment project value;
d) Site management: 2.5 %;
e) Contingency expenses: 10.0 %.

The expenditure referred to at d) and e) is consistent with the provisions of Appendix 4 "Methodology for planning a general estimate for investment and intervention projects" to the Government Decision no. 28/2008.

GENERAL ESTIMATE

regarding necessary expenses for

A LOCAL DISTRIBUTION CENTRE IN ALBA IULIA

In thousands RON / thousands Euro at an exchange rate of 4.45 RON/Euro

Cr. No.	Expense Heads and Sub-heads	Value (without VAT)		VAT	Value (including VAT.)	
		Thou. RON	Thou. Euro	Thou. RON	Thou. RON	Thou. Euro
0	1	2	3	4	5	6
HEAD 1.						
Expenses with buying the land and with land development						
1.1.	Buying the land	378.25	85.00	90.78	469.03	105,4
1.2.	Land development	55.18	12.4	13.24	68.42	15,37
1.3.	Developments for environment protection and return to initial state. Planting in the near vicinity	13.79	3.09	3.31	17.10	3,84
TOTAL HEAD 1.		***447.22***	***100.49***	***107.33***	***554.55***	***124.61***
HEAD 2.						
Expenses with utilities						
TOTAL HEAD 2.		***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
HEAD 3.						
Expenses for technical design and assistance						
3.1.	On site studies	0.00	0.00	0.00	0.00	0,00
3.2.	Tax for permits, clearances, agreements	0.00	0.00	0.00	0.00	0,00
3.3.	Design and engineering 3.00 %	82.77	18.60	19.86	102.63	23,06
3.4.	Organization of procurement procedures	0.00	0.00	0.00	0.00	0,00
3.5.	Consultancy 1.00 %	27.59	6.20	6.62	34.21	7,68
3.6.	Technical assistance of the designer...... 1.50 %	41.38	9.30	9.93	51.31	11,52
3.7.	Site supervision	0.00	0.00	0.00	0.00	0,00
TOTAL HEAD 3.		***151.74***	***34.09***	***36.41***	***188.15***	***42.28***
HEAD 4.						
Expenses for the basic investment project						
4.1.	Constructions and installations	2646.50	594.71	635.16	3281.66	737,45
4.2.	Machinery assembly	44.59	10.02	10.70	55.29	12,42
4.3.	Machinery and equipment assembly	67.99	15.28	16.32	84.31	18,95
4.4.	Machinery without assembly and transport equipment	0.00	0.00	0.00	0.00	0,00
4.5.	Amenities	0.00	0.00	0.00	0.00	0,00
4.6.	Intangible assets	0.00	0.00	0.00	0.00	0,00
TOTAL HEAD 4.		***2759.08***	***620.02***	***662.17***	***3421.25***	***768.82***
HEAD 5.						
Other expenses						
5.1.	Site management 2.50 % 5.1.1. construction work 5.1.2. related expenses	68.98	15.50	16.55	85.53	19,22
5.2.	Commissions, tax, quotas, cost of loan	0.00	0.00	0.00	0.00	0,00
5.3.	Contingency expenses 10 %	275.08	62.00	66.21	342.12	76,88
TOTAL HEAD 5.		***344.06***	***77.50***	***82.76***	***427.65***	***96.10***
HEAD 6.						
Commissioning expenses						
6.1.	Training of staff	0.00	0.00	0.00	0.00	0,00
6.2.	Technological tests	0.00	0.00	0.00	0.00	0,00
TOTAL HEAD 6.		***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
GRAND TOTAL		***3702.10***	***831.93***	***888.50***	***4590.60***	***1031.59***

4.3.2. PROXIMITY DELIVERY CENTRES (ELP)

On the same principle of Consolidation and Distribution Centres, but at a smaller level, such small platforms can be created to serve only limited areas of the perimeter of the town, such as crowded areas (Transilvania Blvd, Iuliu Maniu square, Revolutiei 1989 Blvd, the historical area, and so on, where deliveries are difficult).

These platforms could receive the goods from carriers so that the last mile to the shops and service providers can be travelled by small vehicles, environmentally friendly, such as carts or bicycles specifically designed for the small consignments of goods.

The specific area can be controlled by two operators who can help carriers and assist them in delivering to recipients using trolleys. This type of platform can serve between 3 and 5 vehicles with a width of 30m. For its operating schedule, time periods overlapping normal working hours could be arranged (i.e. from Monday to Friday from 09.00 to 17.00 and on Saturdays between 09.00 and 13.00).

For example, in Alba Iulia, in the central area, an ideal location to establish an ELP would be the underground parking intended to be built under Consiliului Europei square with access to the underground parking from the Ardealului, Decebal and Bucovinei streets. This could serve the entire central area and could have ideal connections to the major road in the area.

For the busiest area, namely Transilvaniei Blvd., such a location could be the site of the current parking adjacent to the boulevard (behind the "Albina" block of flats) with direct access from Closca Street, which could be re-designed for both parking and storage. *(see Appendix IV.5. Areas identified for the possible location of distribution centres)*

4.3.2.1. Measure analysis

To implement this measure, it is necessary to involve the local authorities and support the establishment of public-private partnerships between investors or owners of locations matching size and location requirements.

The benefits of such a partnership are:

- Benefits for the local authorities:
  - A better quality of life for the residents by noise reduction, reducing freight vehicle access through districts and lower the risk of accidents;
  - Local road decongestion ;
- Benefits for investors:
  - Publicity benefits by working with the authorities;
  - A continuous flow of carriers and therefore of deliveries;
  - A contact with traders in the area and the possibility of attracting more customers.
- Benefits for carriers:
  - Guarantee the existence of a safe unloading area near the commercial area and the town centre;
  - Reduced delivery times and lower fuel consumption by eliminating travel to areas with poor access.

Implementation of this measure would significantly reduce logistics flow in residential, administrative or business areas in the town. Proximity platforms make delivery of goods to central and business areas easier and they reduce congestion, noise and pollution associated with the supply of goods and they reduce transportation costs.

4.4. Night deliveries

A regulation that would set specific delivery hours for businesses is a measure that significantly reduces freight traffic in the urban area during the day when the town is active.

Regulations in Alba Iulia provide time frames for supply, but nevertheless, most companies that supply goods and most businesses do not comply with this time frame.

Therefore, a regulation is needed to provide and especially to impose fines for operators who do not comply with these rules.

Another measure that would make a substantial contribution to reducing the logistics flows in the town during the day is the regulation and implementation of a night-time delivery system of goods to traders.

This measure involves the delivery of goods to traders, shops, etc. at night when the town is usually quiet and inactive. Such a range would be between 22.00 and 06.00. This operation would reduce the large number of vehicles that supply goods during the day. Regulations can be of several types:

- Regulations on deliveries and collections to/from a certain company (shop, office or factory);
- Regulations on the delivery of goods to traders all over town or from a specific area.

4.4.1. MEASURE ANALYSIS

This measure attracts a number of benefits such as:

- Reducing delays caused by heavy traffic during the day by using free traffic at night;
- Reducing emissions and fuel consumption by avoiding traffic congestion and the possibility of direct access to stores;
- Reducing the cost of delivery;
- Increased efficiency of the logistics process;
- Increasing road safety.

On the other hand, if the carriers do not allow deliveries at night, they can face a number of consequences:

- A need for larger vehicles during a smaller time window in which day delivery is allowed (ranges covered by the decision of the local council) ;
- The delivery of goods is done in a much more crowded time frame, increasing fuel consumption and reducing vehicle and driver efficiency;
- Delivery times could be delayed ;
- The supply chain may be less effective;
- The cost of delivery is increased.

On the other hand, by allowing deliveries at night, companies can increase their efficiency and sales. Unlimited access to delivery and collection spaces without interfering with traffic throughout the day ensures faster delivery and minimizes the effect of freight

transport on traffic congestion. Also, night delivery schedules encourage the use of much more ecological and quieter vehicles.
The most important issue raised by this type of measurement is noise. It is created by vehicles, their engines and manoeuvring for loading and unloading, opening doors, etc. To avoid this drawback so that the people living in these residential areas accept this type of delivery, allowable noise levels at night in the town must be regulated. Also, operators need to train and educate their staff to properly manage this delicate issue.
Another critical part of this measure is increased exposure to theft, both for the vehicle and driver and for the goods.

4.5. TECHNOLOGICAL SOLUTIONS

4.5.1. MODERNISATION OF THE FREIGHT DISTRIBUTION FLEET

To implement this measure, the involvement of public authorities is crucial for the allocation of resources and financial support through a mix of incentives and regulations to encourage innovative freight logistics and new concepts (including environmentally friendly vehicles and technologies) in urban areas. Low emission vehicles help cities by increasing air quality and reduce traffic noise.
Green vehicles can be of several types:

- Vehicles that operate on alternative fuels such as biofuels and hydrogen fuels. These types of fuels and related technology exist, but the availability on the market of such vehicles is not at a sufficient level;
- Vehicles operating on diesel fuel or gasoline. Standard "Euro" emissions for freight motor vehicles significantly reduce emissions. Also, vehicles may be equipped with mechanisms such as particle traps that can be mounted on vehicles to capture particles before their entry into the atmosphere;
- Electric and hybrid vehicles. The use of electric vehicles is particularly suitable to reduce exhaust emissions and noise.

The actors and key players involved in schemes to introduce green vehicles on the market are:

- Local authorities by initiating a strategy and policies on the use of ecological vehicles;
- Politicians by political support for strategies involving the introduction of clean vehicles and especially tax incentives, both locally and at regional or national level;
- Fuel distributors diversify the products they sell ;
- Automotive manufacturers by manufacturing several models of vehicles of this type.

Initiatives are therefore needed for the use of green vehicles, which can take many forms, such as:

- Informal partnerships: establishing sustainable solutions based on the desire to create an environmentally friendly transport system by bringing together local authorities, transport operators and local businesses ;
- Tax reductions and benefits to users of environmentally friendly vehicles, alternative fuel traders and for using modern filtering technology for diesel vehicles;
- Use of environmentally friendly vehicles by operators to perform deliveries in urban areas;
- Facilities and access permits in urban areas of vehicles that meet certain emission standards;
- Road Toll Schemes with discounts for users of environmentally friendly vehicles;
- Funding innovative research projects and studies in the field of urban freight transport.

4.5.1.1. Measure analysis

This measure is difficult to implement in Alba Iulia in the current traffic, as carriers are not under pressure to take the decision to modernize its current fleet. Also, there is no special infrastructure for alternative fuel powered vehicles in Alba Iulia.
Finding solutions for the implementation of this measure is complex, and local authorities cannot be the only players involved. Through their cooperation with various interest groups such as carriers, they can try to integrate green vehicles into the policies regarding urban freight transport.
However, private operators tend to use the measure to change the fleet only if:

- There is a financial benefit for the company;
- There is an adequate network of alternative fuel stations;
- There are marketing benefits to the Company;
- The company has a strong policy of protecting the environment;
- Such vehicles are available on the market.

Success in promoting the use of such vehicles depends on framework conditions such as:

- Regulations on environment and emissions standards
- Incentives such as tax cuts;
- The existence of a network of filling stations for alternative fuels;

However, by implementing the measures set out above (introduction of weight restrictions or one-way streets, deliveries at night, distribution centres which automatically imply the use of smaller vehicles in the urban perimeter, etc.) Alba Iulia would contribute significantly to the modernization of the fleet carriers by encouraging them to use smaller vehicles, environmentally friendly with low emissions, low noise, etc. These measures underlie long-term policies to help introduce clean vehicles in urban and freight transport within the context of the implementation of European Commission Directive 2009/28/EC on the promotion and use of energy from renewable sources.

4.5.2. IT SYSTEMS FOR TRAFFIC MONITORING, TAXATION OR ACCESS CONTROL

The local authority - Alba Iulia Municipality- has got an approved study on the implementation of a monitoring system for the Alba Carolina Fortress. A professional monitoring system is proposed for both outside and inside the fortress (a system consisting of approx. 60 video cameras). The system ensures the monitoring on three areas as follows:

- Area 1 - will monitor access ways into the Fortress and to the outer routes: North, East, South and West;
- Area 2 - will monitor all tourist routes in the outer ditches of the Vauban Fortress;
- Area 3 - will be all streets located within the town and all the objectives of national and local heritage;

The Centre for image monitoring and recording is proposed to be set up in the local police headquarters or somewhere else in the town, to reduce travel and intervention time.

Regarding local traffic and heavy traffic in Alba Iulia, this type of monitoring should be expanded to all major intersections and areas of entry/exit from the town, such as:

- On the Bypass Road: at the railroad crossing in Partoş; at the junction with Mărăşeşti (DJ 107); Junction with NR1 at the exit to Cluj;
- Junction Ferdinand Blvd and Incoronării Blvd;
- Ion I.C.Brătianu square and Iuliu Maniu square;
- Junctions Calea Motilor and Ardealului – T.Vladimirescu, Doinei, Horea and Revoluției 1989;
- Încoronării Blvd. with O.Goga and Take Ionescu streets;
- Junctions of 1 Decembrie 1918 Blvd. with the following streets: Brânduşei, Pop de Băseşti, V.Goldiş and Cloşca;
- Junctions of Revoluției 1989 Blvd and the following streets: V.Goldiş, Transilvaniei Blvd., Cloşca, Petru Rareş and Vănătorilor;
- Junctions of Republicii Blvd and the streets Gh.Şincai, Emil Racoviță, Arieşului and Tudor Vladimirescu;
- Junction T.Vladimirescu Blvd. and Livezii street;
- Junction of Al.I.Cuza with Mureşului.

In addition to monitoring systems, the Municipality should take further measures to regulate traffic by creating an access control system into the Alba Carolina Fortress at the entry on Nicolae Iorga Street, where there is already the infrastructure to install a card-based system and on the other sides (North and South sides) where there are wide areas for parking buses and cars.

We also believe that, as a result of reconfigurations of the street network and increase of parking places, Alba Iulia needs a Traffic and Parking Management Department which could apply the parking fees approved locally and ensure maintenance of specific infrastructure across Alba Iulia.

4.5.2.1. Measure analysis

This type of measures improves the whole system of logistics on the territory of Alba Iulia and plays multiple roles such as

- The protection of historical sites and buildings;
- The proper management of road and pedestrian infrastructure;
- The prevention and suppression of traffic indiscipline and avoiding traffic accidents;
- The increase in the degree of civilization of participants in urban traffic and increase of urban comfort;
- Fighting problems caused by urban traffic, etc.

In addition to the measures discussed above, it is also necessary to involve the municipality, the media and the non -governmental sector in local awareness campaigns to address carriers, shop owners and residents. .

This type of campaign can be made on various themes related to urban logistics, where they will raise the awareness of all actors involved in the urban logistics (transporters, store owners, residents in the affected areas, etc.) and encourage the adoption of green logistics solutions to reduce the negative impact of freight distribution on the environment and overall quality of life.

4.5.2.2. A Case Study – The introduction of road traffic monitoring systems in Alba Iulia

The following represents the needs and the costs for introducing a system of video monitoring at the major junctions in the town and in the key points on the main roads in the town (e.g. pedestrian crossings). These are:

- Junction Ferdinand Blvd- Incoronarii Blvd- Take Ionescu street;
- Junction Iuliu Maniu square- Calea Motilor - Tudor Vladimirescu Blvd;
- Junction Revolutiei 1989 Blvd - Republicii Blvd - Calea Motilor;
- Junction Republicii Blvd - Tudor Vladimirescu Blvd;
- Junction 1 Decembrie 1918 Blvd - V. Goldis street- Mihai Viteazu street;
- Junction 1 Decembrie 1918 Blvd - Closca street- Horea Blvd;
- Junction Revolutiei Blvd – Closca street;
- Regimentul V Vanatori street (between buildings180 and1; no. 128 and no.125);
- Ferdinand I Blvd. (between buildings no. 28 and 35);
- Tudor Vladimirescu Blvd.(near Dorin Pavel and Alexandru Domsa high schools);
- Republicii Blvd. (between blocks 27 and 44);
- Calea Motilor (at building no. 81);
- Zlatnei street (between buildings no. 68 and 71);

(Appendix IV.6. Areas identified for introducing traffic monitoring systems in Alba Iulia)

For this system to be operational, the following works are required:

- Electrical wiring (replacement of kerbs, trenches in the sidewalk and roadway, pillars, manhole chimneys, etc.):

SUMMARY OF ELECTRICAL WIRING

Nr. crt.	Denumire	U.M.	Cant.	P.U. total (RON)	Valoare (RON)
0	1	2	3	4	5
1	Desfacere si inlocuire borduri	ml	**19**	47,25	897,75
2	Canalizatie in carosabil -sapatura si refacere	ml	**110**	509,26	56.018,16
3	Canalizatie in trotuar -sapatura si refacere	ml	**388**	270,04	104.775,13
4	Canalizatie in spatiu verde -sapatura si refacere	ml	**385**	126,04	48.524,63
6	Locatie - priza de pamant PP tip C in trotuar ; sapatura + refacere	buc	**0**	0,00	0,00
7	Camere de tragere CT 64	buc	**0**	0,00	0,00
8	Camere de tragere CT 40	buc	**65**	463,50	30.127,50
9	Stalp propriu cu consola tip AN - Fundatie + Procurare si Montaj	buc	**41**	7.795,41	319.611,81
10	Soclu cabinet Fundatie + Procurare si Montaj	buc	**0**	0,00	0,00
11	Procurare si montare in sant teava d 90	ml	**0**	0,00	0,00
12	Procurare si pozare in sant teava d 50	ml	**1104**	16,51	18.218,50
13	Procurare si pozare aparent pe stalp teava d 50	ml	**15**	39,00	585,00

TOTAL = 578,758.48 RON WITHOUT VAT

ELECTRICAL INSTALLATIONS

Nr. crt.	Denumire	U.M.	Cant.	P.U. total (RON)	Valoare (RON)
0	1	2	3	4	5
	Dispecerat				
1	Instalare statie de lucru	buc	1	432,00	432,00
2	Instalare videorecorder	buc	2	324,00	648,00
3	Instalare switch	buc	1	108,00	108,00
4	Instalare si configurare router	buc	1	216,00	216,00
5	Montare Media Converter	buc	1	72,00	72,00
6	Configurare + Incercare sistem ; PIF	buc	1	1.080,00	1.080,00
	Intersectii				
1	Montarea pe stalpi - existenti cu consola - a	buc	41	620,71	25.449,19
2	Cutie de joctiune - procurare si montare	buc	41	58,50	2.398,50
3	Electrod priza de pamant (1,5) - procurare si montare	buc	0	0,00	0,00
4	Conducta metalica pt legarea la pamant OL Zn 40 x 4	ml	0	0,00	0,00
5	Executie priza de pamant	buc	15	579,00	8.685,00
6	Cablu FY 6 tras prin tub - procurare si montare	ml	2326	6,97	16.218,62
7	Cablu de legatura FTP - UTP de legare a camera	ml	2495	7,42	18.504,77
8	Executie conexiuni electrice - incercare	buc	164	11,35	1.861,73
9	Media Convertor - montare in cabinet si incercare -	buc	15	72,00	1.080,00
10	Router - montare in cabinet si incercare (adaptor	buc	15	216,00	3.240,00
11	Modul alimentare - camera de detectie video -	buc	15	36,00	540,00
12	Montaj cabinet (500x600x210) propriu pe stalp -	buc	15	678,06	10.170,90

TOTAL = 90,704.71 RON WITHOUT VAT

Machinery and technological equipment, amenities:

MACHINERY AND TECHNOLOGICAL EQUIPMENT, AMENITIES

Nr. crt.	Denumirea	U.M.	Cant.	Preţul unitar RON/U.M.	Valoarea (exclusiv T.V.A.) - RON -
0	1	2	3	4	5
	Dispecerat				
1	Statie de lucru Dell Optiplex 790 MT	buc	1	3.579,58	3.579,58
2	Network Video Recorder Qnap VS-8024	buc	2	18.984,48	37.968,96
3	Monitor Monitor LED Samsung 24"	buc	2	1.014,59	2.029,18
4	Ethernet Media Converter: TP-LINK MC111CS cu Atenuator Optic *	buc	1	286,80	286,80
5	Switch MikroTik 250GS	buc	1	181,25	181,25
6	Router MikroTik 450	buc	1	339,72	339,72
7	Hard disk intern Western Digital WD2003FYYS (2TB)	buc	8	1.500,71	12.005,66
8	Software Nuuo SCB-IP +64	buc	1	23.992,75	23.992,75
9	Sursa MikroTik 24V	buc	2	33,63	67,26
	Intersectii				
1	Camera videosupraveghere IP SONY SNC-CH160	buc	41	5.471,85	224.345,92
2	PoE Injector 900002010G	buc	41	223,92	9.180,67
3	JetCon 3401G-Industrial Media Converter cu Atenuator Optic *	buc	15	1.226,28	18.394,15
4	Router MikroTik 450	buc	15	339,72	5.095,80
5	Sursa MikroTik 24V	buc	30	33,63	1.008,90

TOTAL = 338,476.59 RON WITHOUT VAT

SUMMARY

Nr. crt.	Denumire	U.M.	Cant.	P.U.	Valoare
1	Lucrari - Canalizatii electrice	set	1	578.758,48	578.758,48
2	Lucrari - Instalatii electrice	set	1	90.704,71	90.704,71
3	Procurare echipamente	set	1	338.476,59	338.476,59

GRAND TOTAL = 1,007,939.78 RON WITHOUT VAT

1. Works – electrical wiring
2. Works – electrical installations
3. Equipment purchasing

5. THE ENVIRONMENTAL IMPACT OF THE PROPOSED MEASURES

Freight and goods distribution are widely known as the factors of energy consumption and environmental degradation in European urban centres. The present study has tried to identify measures to significantly improve logistics operations whose implementation would reduce their carbon footprint.

In what follows, we will briefly mention the positive environmental consequences of implementing the proposed measures.

The measure of resizing traffic spaces in Alba Iulia has the effect of a double positive impact on the environment by reducing the number of small vehicles that run through heavily populated central areas and by removing heavy traffic and a large number of freight cars outside heavily populated areas.

Also, adjacent to resizing traffic spaces, the building of underground car parks in densely populated areas provides considerable improvement in environmental issues by:

- Reducing vehicle noise during the day and night;
- Reduction of air pollutants in the vicinity of residential areas by closing down parking areas too close to buildings;
- Making room for green areas and children's playgrounds to be built.

Green areas are not only the lungs of the city or a pleasant environment, but they are the green curtain that significantly reduces noise, dust and other pollutants produced by cars.

Heavy traffic generates high levels of noise and vibration, which can lead to stress, sometimes with major consequences on the general health of the population.

Noise from traffic affects people in different ways:

- Noise causes discomfort as well as health problems for the inhabitants;
- Higher risk of cardiovascular disease;
- Psychiatric disorders and high levels of stress, sleep disorders, congenital problems, understanding and focus problems in children, hearing problems.

Traffic exhaust gases contribute to atmosphere acidification and tropospheric ozone formation by direct or indirect effects on all components of the environment (vegetation, fauna, soil, water). Heavy metals in the exhaust gases have an impact on human health, water and soil quality.

By creating proximity distribution centres and area distribution centres at the outskirts of Alba Iulia (diversion of freight traffic and prohibiting access of this type of vehicle in heavily populated areas of the city) and by implementing the measure of night deliveries (reducing freight traffic and supply during the day) there will be a significant decrease in GHG emissions in densely populated areas, and they will be better spread.

Also, by encouraging large carriers to renew their fleet, we could comply with the limit of 120 g / km of CO2 required by European legislation and emission values would fall between the allowed European levels.

Modernization of the current fleet leads to significant reduction in emissions from the traffic affected residential area. Cars fitted with Euro IV and V that use diesel fuel Euro IV and V have catalytic convectors that do not pollute the atmosphere.

By the measures proposed in this study, the carbon footprint is reduced to a minimum by:

- Reducing traffic congestion;
- Improving car traffic flow in densely populated areas;
- Reducing waiting time at junctions;
- Equal distribution of the car traffic on all thoroughfares;
- Speed limits;

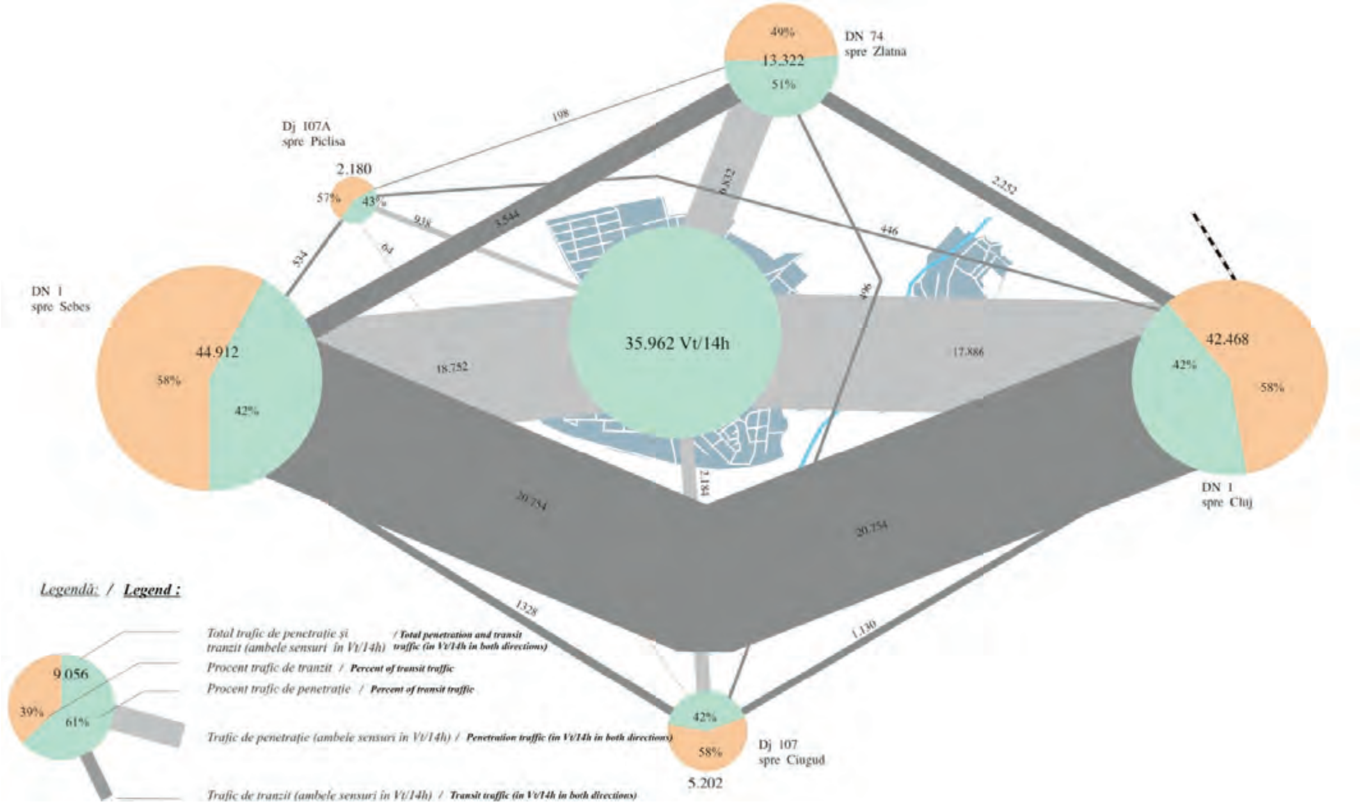
These measures lead to an improvement of the environment by reducing emissions in densely populated areas because less fuel is used and polluting means are replaced with cleaner means.

The positive impact on the environment of the measures proposed in this study is summarized in the following table:

The following chart gives an image of the

Economic impact	•Traffic decongestion •Reduce resource waste
Environmental impact	•Reduce the impact of GHG emissions •Use of bio fuels •Reduce the negative impact of product waste (tyres, oil)
Social impact	•Important decrease of pollution and of its impact on public health •Decrease the number of traffic accidents •Reduce noise in highly populated areas •Improve visual impact •Traffic decongestion encourages the use of public transportation •Increase of green areas and open spaces •An end to infrastructure/buildings deterioration by directing heavy traffic outside of the residential areas

estimated entry and transit traffic as a result of the measures implemented in the present study. It also helps us to measure the GHG emissions in three key places in Alba Iulia: the city entry, the city centre and the city exit, by dividing the traffic volume to the vehicle tonnage and considering the standard emissions for that type of vehicle. The Sustainable Urban Logistics Plan for



Example: a vehicle of 3.5 tonnes running on petrol

Location	Vt/14h	No. veh. 3.5to/14h
City entry	44.912	12.832
City centre	35.962	10.274
City exit	42.468	12.134

Emission factors for light vehicles (< 3.5 tonnes) - petrol

Emission type	NOx	CH4	VOC	CO	N2O	CO2
Medium control, a fuel consumption of 13.7 l/100 km						
g/kg petrol	28.7	0.80	47.4	356.0	0.059	3183

Also, the study of technical and economic indicators for the proposed measures shows that the proposed option leads to a smoother car traffic, as testified by an increase in the average traffic speed from 35.94 km/h to 37.76 km/h. The overall distance is longer and it is due to cargo vehicle restrictions and to one-way streets. However, because of the increase in the average traffic speed, **the total fuel consumption will decrease with annual savings of approx. 45 tonnes**, thus lowering traffic costs and the carbon footprint.

Based on this fuel saving, we can calculate the decrease of GHG at the city level, using as an example a small vehicle running on petrol, as follows:

Example: one vehicle, petrol fuel

Emission factors for vehicles – petrol engine

Emission type	NOx	CH4	VOC	CO	N2O	CO2
Medium catalysis, a fuel consumption of 7.3 l/100 km						
Total g/km	0.67	0.005	0.19	0.71	0.010	190.0
g/kg petrol	11.0	0.083	3.08	11.7	0.165	3138.0
g/ tonnes petrol	11000.0	83	3080.0	11700.0	165.0	313800.0

The decrease of yearly emissions matching a saving of 45 tonnes of petrol per year in the city for one vehicle:

Emission type	NOx	CH4	VOC	CO	N2O	CO2
g/45 tonnes petrol	495000.0	3735.0	138600.0	526500.00	7425.0	14121000.0

If implemented, the proposed measures will not cause additional negative impacts on the soil, water drain, microclimate, surface waters, vegetation, fauna or from the point of view of noise and landscape.

If implemented, the effects of measures defined by the present Sustainable Urban Logistics Plan include a healthy and unpolluted environment in which both human life and economy can thrive.

FINAL CONSIDERATIONS

Alba Iulia proposed in this study cannot be implemented by itself as such, without a comprehensive local development policy designed to determine beneficial changes in the infrastructure of Alba Iulia, thus strengthening the role of the town as catalyst in the development of adjacent cities and of Alba County. The cost of measures and actions mentioned here will be the subject of separate feasibility studies at the time of set up of the framework of their application.

We believe that the SULP satisfies the local policies to improve the conditions of access and transit in Alba Iulia and also, that the investments required to implement the proposed measures are intended to contribute to the balanced development of technical and utilities infrastructure throughout the municipality, with an impact on quality of life, the environment and economic development in the area.

COMMUNICATION AND DISSEMINATION PLAN FOR THE SULP

The Communication and Dissemination Plan for the SULP describes the main guidelines of the communication dissemination and promotion strategy, in order to make known the activities and results of the plan.

The Sustainable Urban Logistics Plan of Alba Iulia is a public document, meant to raise all stakeholders' awareness on the challenges of energy efficiency and sustainable urban logistics, as well as on the existing opportunities for improvement and for significant benefits through the implementation and operation of appropriate and effective measures, mechanisms and specific framework approaches focused on this type of urban environments.

One of the key activities of the ENCLOSE project is promoting the solutions described in the present SULP of Alba Iulia and the results obtained during the implementation phase.

The target audience for the presentation of its contents and of future activities consists of:

- carriers, business and shop owners in the town;
- inhabitants of Alba Iulia.

In order to achieve this, the municipality will elaborate a workpackage with updated information on the contents of this plan, so as to increase the visibility of the project.

Mainly, these activities are:

- together with the local media and NGOs, the municipality will be involved in awareness raising campaigns to address carriers as well as shop owners and residents;
- issuing a press release;
- publication of SULP on the official website of the Municipality of Alba Iulia (www.apulum.ro);
- publication of SULP on the Facebook page of the ENCLOSE project Alba Iulia;
- sending the SULP by e-mail to 30 collaborators from Alba county;

Furthermore, given its contents aimed at providing solutions to improve logistics in Alba Iulia and at presenting suggestions for future lines of action consistent with European policies and based on the experience of other cities in Europe, the Sustainable Urban Logistics Plan for Alba Iulia will be recognized as an official planning document of the Municipality through its approval in a Local Council meeting.

www.enclose.eu

ENCLOSE

ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe
Programme of the European Union

ALMADA

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6

SULP "Sustainable Urban Logistics Plan"

WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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14.10.2014

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ALMADA

SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. INTRODUCTION

Cities are home to over 70 % of the EU population and account for some 85 % of the Union's GDP. Most journeys begin and end in cities. In many urban areas, however, increasing demand for urban mobility has created a situation that is not sustainable: severe congestion, poor air quality, noise emissions and high levels of CO2 emissions. Urban congestion jeopardises the European Union (EU) goals for a competitive and resource-efficient transport system. Giving special concern to these issues, the EU has taken a leadership role in the development of mitigation policies, especially the commitments set out in the 2020 Energy Package - Climate 20-20-20 targets:

- Reduce by 20% (30% in the context of an international agreement post-2012) greenhouse gases (GHG) emissions compared to 1990 levels;
- A 20% share of energy from renewable sources in gross final consumption;
- 20% increase in energy efficiency.

In the Energy-Climate package of the EU, Portugal committed to the goal of limiting to 1% the increase in its GHG emissions (compared to 2005 in the period between 2013 and 2020), for the sectors not covered by the European Emission Trading System.

Combating climate change is governed in the motto "Think Globally, Act Locally". On one hand, global concerted efforts are critical to the achievement of goals that prevent dangerous anthropogenic interference with the climate system. On the other hand, it is at the local level and with concrete actions that GHG emissions are reduced. Thus, planning and promoting actions at the initiative of local governments have great potential because there is a closer relationship with the community. In 2008, the European Commission decided to capitalize on this potential with the launch of the movement of the Covenant of Mayors, in which municipalities are committed to reduce their GHG emissions by at least 20% by 2020 in line with the Energy - Climate package of the European Union. Under the Covenant of Mayors, Almada pledged to reduce by 20% its greenhouse gas emissions by 2020 compared to the baseline value of 2006, corresponding to an overall reduction of 72 ktones of CO2eq. It is within this dynamic of the municipality of Almada that the Local Strategy for Climate Change (ELAC) for the period 2010-2020 appears, containing the Action Plan for Mitigation (PAM) which proposes energy efficiency measures to reduce consumption and emissions.

Concerned not only with GHG emissions, but also with environmental sustainability and energy saving issues, in March 2011 the European Commission released its Transport White Paper, "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system" which gave significant attention to urban transport and set the goal of achieving essentially CO2 free city logistics in major urban centres by 2030. The White Paper also proposed to examine the possibility of a European support framework for a progressive implementation of Urban Mobility Plans in European Cities. A Sustainable Urban Mobility Plan (SUMP) is a strategic plan that builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles to satisfy the mobility needs of people today and tomorrow for a better quality of life in cities and their surroundings.

In line with the sustainability policies of the EC, the Municipality of Almada has set up relevant policies on transport and mobility in the last decade in order to face significant traffic problems due to the large number of private cars and commercial vehicles, as described in the previous sections. This strategy is focused on the development of a multimodal transport system by the integration of the different mobility services, the enhancement of the overall accessibility to the public transport network, the promotion of soft mobility modes and alternative vehicles and fuels.

Almada's second generation Mobility Plan (called Strategic Plan for Urban Mobility - PUMA), for the overall Almada municipal area is currently under development and is based on the guidelines for the development of SUMP elaborated by the European Commission. The PUMA encompasses the adoption of some specific services and development of support infrastructures and until now includes the following areas:

- Almada Centre and the "Old town": creation of shared zones/low speed zones (20km/h) and pedestrian areas in the street network;
- Residential areas: traffic calming measures, speed limits and parking specific rules;
- Cacilhas area and the ferry harbour zone: traffic calming measures and pedestrian streets.

Within the scope of PUMA is the identification of solutions which give the mobility system of Almada the most appropriate responses to local needs, safeguarding the following key principles: energy efficiency, environmental and economic equity, universal access to mobility and accessibility to the multiple functions of the territory. Among the areas of mobility whose analysis is important for the proper development of the PUMA is Urban Logistics, which is a key component of the urban mobility system and involves a wide range of actors and stakeholders, encompassing different types and models of operation. The Almada SULP is the key part of PUMA devoted to the integration of urban logistics in the overall mobility strategy, and was

developed within the framework of the ENCLOSE project.
Its main objectives are to identify and evaluate measures and proposals to improve the energy efficiency of the urban logistics system of Almada and its environmental performance.

The planned actions and objectives of the Almada SULP are presented below:

- Improve the efficiency of the urban logistics system by identifying processes of management and control of freight flows;
- Identify and propose low-cost measures for efficient urban logistics;
- Reduce the impact of loading and unloading operations;
- Implementation of the most cost-effective measures assessed in the scope of the SULP.

2. ALMADA CONTEXT

The city of Almada is located on the south bank of the Tejo river across from Lisbon (Figure 1). With 174.030 residents living in 70 km2 (2.355 people/km2), including urban, suburban and rural areas with and 35 km of water front, Almada is one of the 18 municipalities forming part of Lisbon Metropolitan Area (AML). Almada is directly connected to Lisbon by the "25 de Abril" bridge over the Tejo (Tagus) river, for trains and cars, and by ships (passenger and ferries). Almada territory lives the constant pressure of simultaneously making part of an intensively living metropolitan region while playing a major role as a touristic destination.

The region's local economy is primarily based on Tourism, Services and Public Administration.

The Almada area presents natural resources, several green protected areas with high biodiversity, geological sites of recognized importance, significant terrestrial, coastal and marine ecosystems, etc.

Almada Atlantic Ocean beachfront (Costa de Caparica) extends for approximately 13 km and is a popular summertime destination for Lisbon residents as well as for tourist, receiving more than 8 million visitors each year, with an increased demand for tourism-related services.

Almada is substantially composed by three main areas:

- Almada City, north peninsular area, with nearly 100.000 inhabitants;
- Costa de Caparica, including the seaside area with 13 km of beaches.
- The central areas of Almada, a mixture of lower density residential areas and green and semi-rural areas.

From the geographic point of view, the City of Almada forms a sort of peninsula and extends itself along the Tagus river, facing Lisbon, and progressing South, with some residential areas close to the neighbouring Municipality of Seixal.

This urban area, which is not very circumscribed (unlike Lucca, for instance), as well as the particular road network, reduce the access points to the main urban area to only 4 (see section 2.2 below for details).

This is the area that most requires the development of a study on urban logistics.

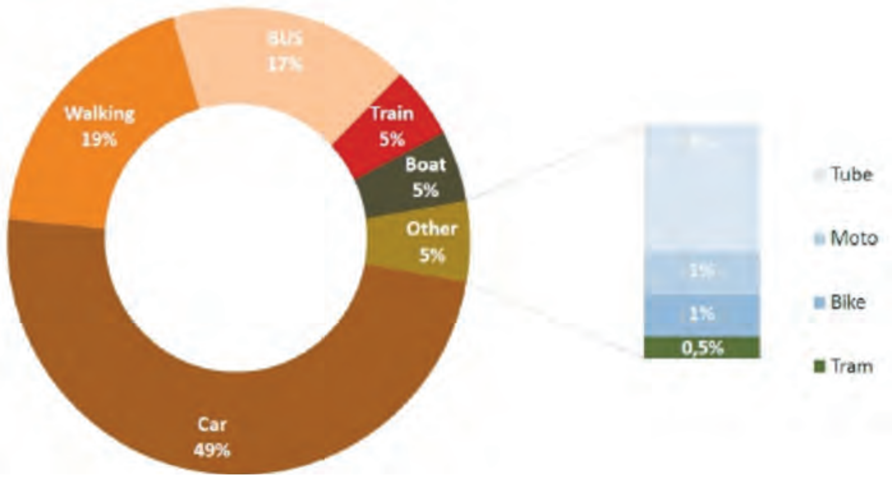


Figure 2 – Almada residents commuting modal split (2006)

Figure 1 - Almada city in relation to the Lisbon metropolitan area

2.1 Mobility and traffic figures

The Almada motorization rate reached 443 cars/1.000 inhabitants (2006 data), with 71% of the population having access to a car, and its modal split shows that 50% of commuting trips are made by private motorized vehicle, 30% by public transport and 20% by soft modes. Nearly 50% of the trips made in Almada refer to "crossing traffic", since Almada is the southern gateway to Lisbon: the "25 de Abril" bridge crossing the Tejo river (Figure 3), connecting Almada and Lisbon, serves nearly 160.000 vehicles a day. The traffic is strongly influenced by the commuters living in Almada and moving every day to Lisbon by car (main modality), train and ships.

Figure 3 – Highways and "25 de Abril" bridge

It is important to underline the fact that the tram was not included in this analysis for 2006 because it was not yet in operation. For information, the consumption of this mode of transportation in 2009 was 23.320 GJ, a value 100 times smaller than the total energy consumption of the Transport sector, and corresponding to only 1,3% of the energy consumption allocated to individual motorized road transport.

With a per capita consumption of around 15 MJ annually, transport is the most energy- consuming sector in the Municipality of Almada, 57% higher than the residential sector and 105% higher than the commerce/services sector.

In synthesis the main problems to be faced by the Almada Municipality with its mobility strategy are the following:

- Poor metropolitan coordination and management;
- Lack of an efficient Public Transport network (incl. intermodality);
- High development of road infrastructures;
- Very easy access to the inner city centre for private cars (low-cost parking services);
- Lack of an updated and effective regulation and of adequate infrastructures for freight delivery processes in urban area;
- Walking and cycling infrastructures (public space) occupied by cars.

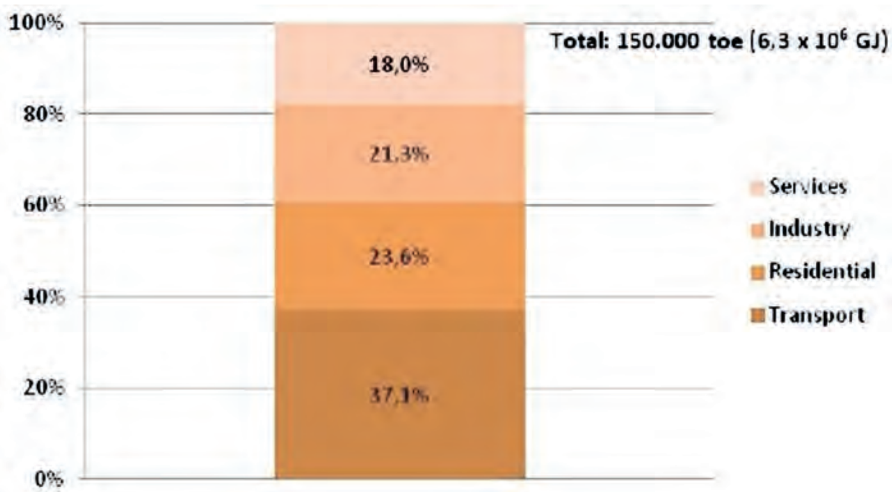


Figure 4 – Distribution of total energy consumption in Almada, by main sector (2006)

2.2 Energy consumption in the Transport sector

Energy consumption of the transport sector in the Municipality of Almada was around 2,4 million GJ (data from 2006) of which 98% were the responsibility of road transport, particularly as a result of the mobility of passenger cars. Based on the Energy matrix of the municipality of Almada, Transport sector is responsible for 37% of total energy consumption of Almada (which is in total 6,3 million GJ) as seen below.

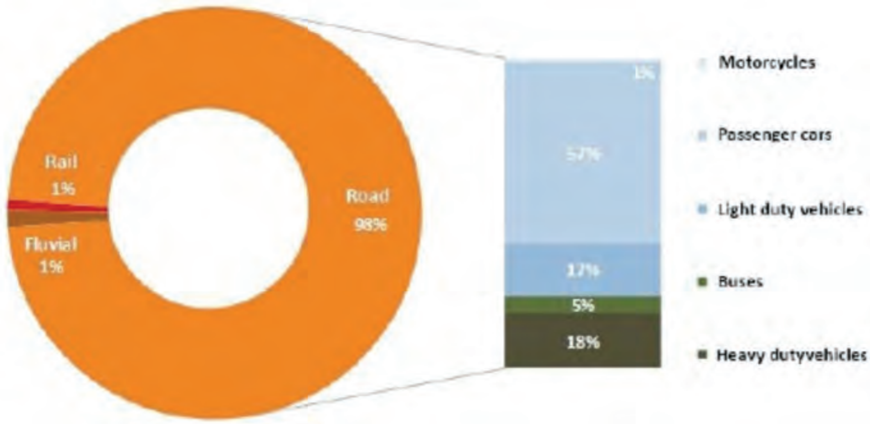


Figure 5 – Distribution of total energy consumption in the transport sector, by mode of transport (2006)

The transport sector is responsible for about one third of greenhouse gases (GHG) emitted in the municipality of Almada. This quota includes crossing traffic in the "25 de Abril" bridge which cannot be directly targeted by amelioration measures implemented by the
Municipality. This volume of traffic is responsible for about 23% of total emissions from this sector. Road transport is the main source of emissions from the transport sector, with more than 171.000 tCO_2eq, leaving the bulk of emissions to individual motorized transport, especially by private car.

We should bear in mind that crossing traffic in Almada is a strong contributor to total GHG emissions, equivalent to 63.000 tCO_2eq, while the municipal traffic accounts for about 85.000 tCO_2eq (53% of total).

Although the Transport sector remains an important contributor to the environmental issues of the Almada municipality, we should have in mind that the continued and structured interventions of the municipality in terms of mobility are visible in different dimensions of life of the population, but also, in a less tangible way, the energy and environmental impact, particularly in terms of air quality and noise.
Analyzing the data of the air quality monitoring station (AQMS) of Laranjeiro which is located in Almada, in the last ten years there was a significant decrease in the levels of some pollutants which originate from traffic, to which may also have contributed the natural process of fleet renewal (although this has not been significant in recent years, due to the effects of the economic crisis in Portugal):

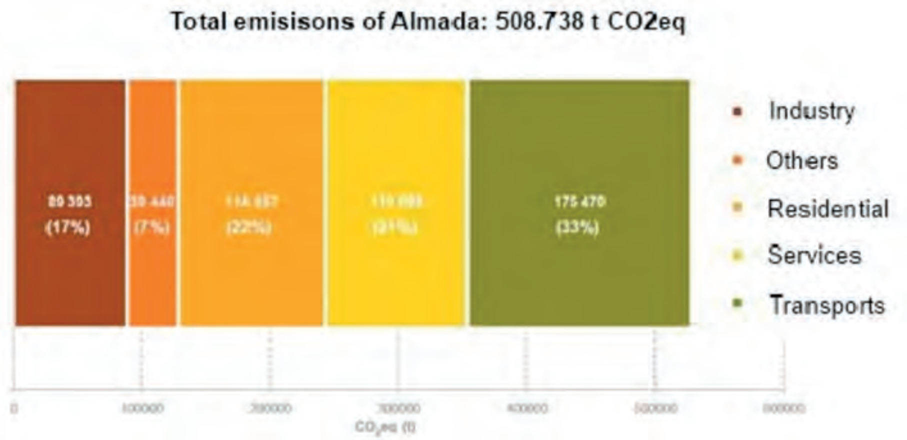


Figure 6 – Distribution of GHG emissions in the Municipality of Almada (2006)

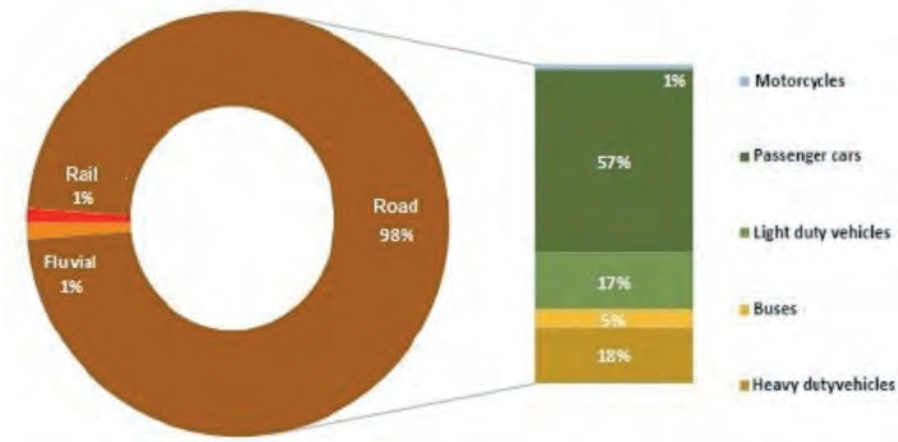


Figure 7 – Distribution of GHG emissions in the transport sector in the Municipality of Almada (2006)

- Nitrogen Dioxide (NO_2): 68% reduction in annual average concentration of this pollutant between 2004 and 2012; •
Fine particles (PM10): the average concentration of this pollutant decreased 29% and the number of annual exceedances to the daily limit-value decreased 82% between 2004 and 2012.

In addition to air quality there were also improvements in ambient noise levels. The reorganization and reduction of car traffic resulted in an overall decrease in the estimated ambient noise by 10 dB, which is reflected in a higher quality of the urban environment.

2.3 Road network and main access axis

Private cars and commercial vehicles traffic flows, from and to the urban peninsular Almada area, usually use the following main road axis (Figure 8):

- Axis n.1: along the eastern harbour zone, through Av. 23 de Julho, Av. Aliança Povo MFA.
- Axis n.2: across the central area, from Av. Bento Gonçalves and Rua Dom João de Castro to Av. Dom Nuno Álvares Pereira, Av. Dom Afonso Henriques and Av. 25 de April, connecting the "25 de Abril" bridge junction (Rotunda do Centro-Sul) and Pragal to Cacilhas ship, tram and bus terminal, the most important in the south region of Lisbon metropolitan area.
- Axis n.3: an additional access point (less used) to the centre-southern part of the urban area through Av Henrique Barbeito, Rua Cabo Boa Esperança and Av. Rainha Dona Leonor.

According to a 2001 survey, the daily traffic along the above mentioned axis was:

- Axis 1: around 30.000 vehicles;
- Axis 2: around 37.000 vehicles from Av. Bento Gonçalves and 23.000 from Rua Dom João de Castro;
- Axis 3: around 20.000 vehicles.

The introduction of the tram system ("Metro Sul do Tejo") changed this scenario, and in 2009 the traffic values in this 3 axis were down to:

- Axis 1: around 20.000 vehicles;
- Axis 2: around 16.000 vehicles from Av. Bento Gonçalves and 14.000 from Rua Dom João de Castro;
- Axis 3: around 18.000 vehicles.

Remarkable traffic flows also characterize the Centro-Sul junction, the intersection between "25 de Abril" bridge and highways A2 and IC20, connecting Almada respectively with Lisbon, the south municipalities and Costa da Caparica. Here, the traffic flows account for some 160.000 vehicles per day in the bridge, 130.000 in the A2 highway and nearly 100.000 in the IC20 highway.

Another important factor affecting traffic in this area is the high usage of car parks located in Cova da Piedade area (see car parks n. 4, 15, 22, 23, BG and LS in chapter 2.4) by some of the commuters. From parking spaces located in this area commuters have an easy access to "Metro Sul do Tejo" tram line 1 & 3 to the city centre. Also important is the use of parks in multimodal interfaces for commuters going to Lisbon by train (see car parks n. 8 and 9 - in chapter 2.4) or ship (see car parks n. 10, 11, 12, 19 e 21 - in chapter 2.4), terminating at Cacilhas where they depart to Lisbon.

2.4 Main mobility and transport systems

The mobility system of Almada has a very diverse range of options compared to the transport networks in other municipalities of AML. In recent years has undergone a major change with the emergence of new modes of rail transport (train and light rail surface), defining new rules of circulation and parking, enhancement of public space and the increasing integration of soft modes (march on foot and bicycle).

An overview of the main mobility and transport system components is provided in the following sections. This could be suitable (with different modalities and roles) for the implementation of the logistics solutions analysed in the study.

2.4.1 PUBLIC TRANSPORT

The Public transport system in Almada is based on the following main components:

– Train, bus and ship services (including ferries), for the commuters from and to Lisbon and the southern regions,

Figure 9 – Diagram of the multimodal transport system in Almada (2012)

– Bus and tram services for the transport services inside the Almada area.

Train services operated by Fertagus (main private train operator in Portugal) connects Lisbon to Setúbal (south) with a frequency of 5 to 10 minutes in peak hours (20 minutes outside peak hours) and about 10 minutes between Almada and central Lisbon (business district). In 2006, Fertagus made over 40.000 trips (all with stop in Pragal) and had a total flow of about 154 million pkm within the municipality of Almada.

The ship transport service is based on 2 lines connecting Lisbon every 10 minutes and operated by Transtejo (public – private owned). In 2009 about 120.000 trips between Lisbon and Almada were carried by ship, with about 14 million passengers.

Figure 8 – Main axes towards North Almada area

Figure 10 – Transtejo ship/ferry connections and Cacilhas fluvial station

The bus service is operated by Transportes Sul do Tejo (private company) with 120 buses, 66 bus routes and 83 million passengers/year. The most important bus terminal is located in Cacilhas, near the fluvial station (Figure 11).

Figure 11 - Bus network and Cacilhas bus terminal

The new tram system (which started operating in 2008) significantly enhanced the public transport offer and service quality and the integration with the other transport modes (bus, train and ship).
The tram network indicated as Almada "Metro Sul do Tejo" (Figure 12) is operated by MTS (a private company) and is composed of 3 main lines:

– Line 1: Cacilhas – Corroios
– Line 2: Corroios – Pragal
– Line 3: Cacilhas – University

Currently the frequency is 5 minutes in peak hours (10 minutes outside peak hours) and the number of passengers transported is 25.000 to 30.000/day that, despite being a considerable amount, is significantly less than the initial estimates of expected users that were the demand hypothesis for its realization (and as requested by these kind of modal
service).

There are still problems regarding the integration of tram lines and bus services. Some bus lines are overlapping the tram line (in particular tram Line 1) and a discussion concerning their modification to bus feeder lines to the tram is ongoing.
Taking into account that the bus and tram services are managed by two different operators it is clear that the effort to be carried out by the Municipality for redefining the overall PT network based on dedicated

corridor (represented by the tram line) and feeder services (to be operated by bus) should be focused on the dialogue of the two different operators and in realizing an integrated payment system/card.
The recent creation of the Lisbon Metropolitan Transport Authority should solve this type of problems, but it has still no capacity to do it.

Figure 12 – Almada "Metro Sul do Tejo" tram network and Line 1

In the frame of TP system it is worth noticing the FLEXIBUS initiative, a public service based on a demand responsive approach with a high level of flexibility, adapted to the needs and requirements of the citizens.
FLEXIBUS is in operation since 1st of July 2010 on a network of about 5,5 km from Monday to Friday: 7:00 – 19:00 (Saturdays: 8:00 to 13:00). The average waiting time at the bus stop is 20 minutes. It allows route deviations by request, for instance to serve the users of the day care centres.
FLEXIBUS is managed by ECALMA, the Municipal Company for Parking and Circulation, and uses 4 drivers and 2 electric mini-buses: parking place for the buses and to charge/replace batteries is the Afonso Henriques parking located in the city centre (former Citroen garage).

Figure 13 – FLEXIBUS services network

Figure 14 – FLEXIBUS electric bus in Afonso Henriques parking terminal and on the road

2.4.2 PARKING SYSTEM

Overall, in the Almada area the parking system is composed of infrastructures (parking buildings) and a high number of surface car parks (in total about 13.000 parking places) as showed in the table below. Around 5% of these (650) have restricted time windows, while 20% (2.600) have a fee.

5 parking buildings located in Almada center are of particular importance:

- 3 parking buildings in the old town: Capitão Leitão with 146 parking places; Conde Ferreira with 215 parking places; Afonso Henriques with 70 parking places. These are managed by ECALMA (this municipal parking and mobility company in also in charge of the management and the control of the street parking spaces).
- 1 parking building named Gabriel Pedro, close to the Courthouse, with 280 parking places, managed by a private company.
- 1 parking building located in Liberdade Square (Praça da Liberdade), with 780 parking places, also managed by a private company.

The occupancy level of the different parking buildings is around 80% for the infrastructures managed by the private

Nº	Designação	Lugares
1	Almada Forum	5045
2	Pingo Doce Feijó	52
3	Mercado Municipal de Feijó e LIDL	138
4	Parque junto à SFUAP	270
5	Parque Praça da Liberdade	780
6	Modelo/ Bonjour	40
7	Parque do C. C. M. Bica	485
8	Fertagus/	672
9	Fertagus	50
10	Parque de Cacilhas	356
11	Parque da Misericórdia de Cacilhas	190
12	Parque do 'Morro de Cacilhas'	300
13	P. da M. junto ao Hosp. G. da Horta	850
14	P. Terminal Rod. C. da Caparica	360
15	Parque do Centro-Sul	200
16	Parque da Paz	150
17	Parque da UNL	1660
18	Parque do Complexo Desportivo	120
19	Parque perto dos Bombeiros	116
20	Parque Duriforte	80
21	Silo de Cacilhas	140
22	Parque Florival	300
23	Parque Almeida e Costeira Lda	126
24	Parque Gabriel Pedro	280
AH	Afonso Henriques. Parque	70
BG	Bento Gonçalves. Parque	142
Lrj	Laranjeiro. Parque	155
LS	Luísa Sigeia. Parque	158
CF	Conde Ferreira. Parque	215
CL	Capitão Leitão. Parque	146

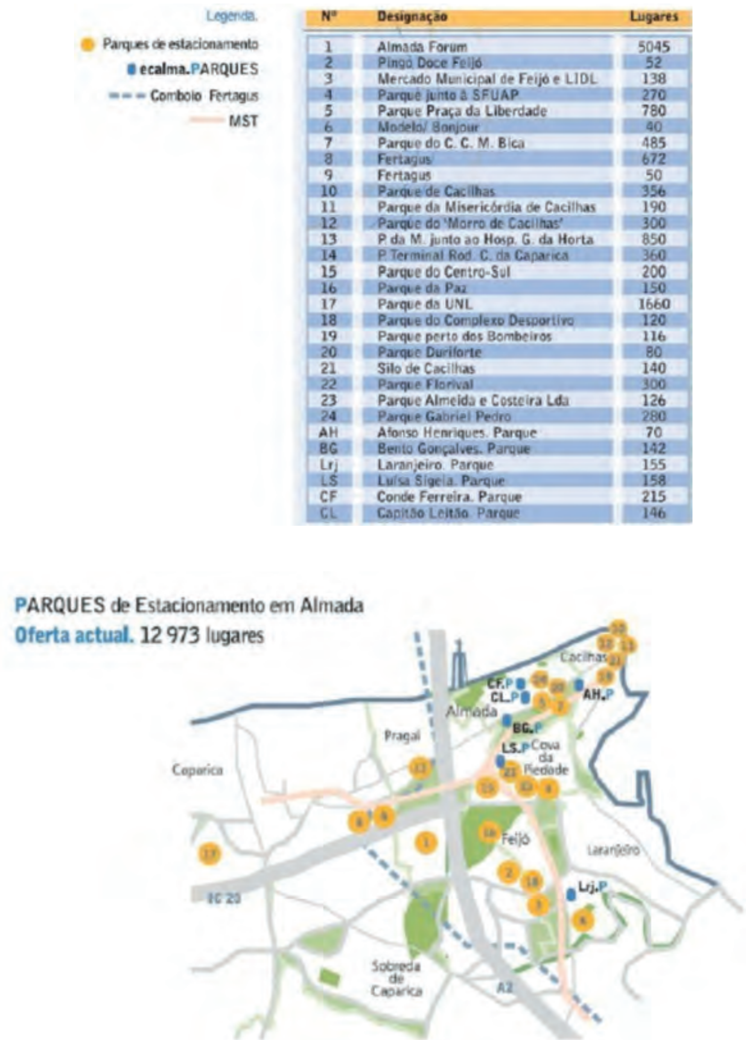


Figure 15 – Almada parking system

operators, while for the ECALMA parking buildings it is around 40%.

In order to control parking payments along the street, ECALMA operators monitor the streets by checking vehicles parked in the blue spaces. Such operators are also in charge of checking the time that the commercial vehicles stop in the loading/unloading places.

One of the main needs is now to update the current parking regulation/normative (defined nearly 20 years ago) and to act with a strong and continuous control on road.

2.4.3 EXISTING ELECTRIC VEHICLES CHARGE POINTS

Regarding e-mobility, the Municipality has already a network of 48 electric recharging points, located at parking buildings and street parking areas (Figure 16).

Figure 16 – EV charging points location and devices at Conde Ferreira parking and on the street

Moreover the 6 parking buildings managed by ECALMA are some of the spots equipped with electric charging points.

2.5 Almada Mobility Plan

The development of the Almada Mobility Plan foresaw four main objectives:

- Planning and developing a Multimodal Transport System;
- Creating better infrastructures for Public Transport and Soft Modes;
- Promoting the use of new and more efficient technologies/alternative fuels (including electric mobility);
- Involving citizens in the decisions, informing and raising awareness.

The key goals are:

- Diversifying the transport offer;
- Achieving an adequate integration between transport modes;
- Improving accessibility;
- Reducing car use by boosting modal shift from private cars to PT and soft modes;
- Improving public space, creating safety and adequate conditions for pedestrians and cyclists;
- Promoting bike use for daily commuting (< 6 km);
- Enhancing the city logistics processes mainly related to “last mile” freight distribution;
- Enhancing the quality of life in Almada, mitigating CO_2 emissions and contributing to the EU burden sharing of the Kyoto Protocol.

The following pictures provide an overview of some infrastructures and solutions in the area of Almada.

Figure 17 – Pedestrian area and 20 km/h speed limit area along tram line

Figure 18 – Pedestrian street in Cacilhas, and Capitão Leitão parking entrance

2.6 Almada Study Area

The area identified in Almada for the analysis of commercial and logistic activities and possible solutions (hereinafter "study area"), is the peninsular northern part of the city and consists of three districts: Cacilhas, Almada Velha and Almada Center.

Each city district forming part of the study area is characterized by specific features, as indicated below:

- **Cacilhas district** is the Almada downtown neighbourhood and it is one of the more traffic congested areas. The ferry terminal (from and to Lisbon), with around 50.000 people arriving/departing daily, and the bus terminal, with a traffic of around 800-900 bus daily trips are located in Cacilhas. This neighborhood presents a strong commercial area as well, with restaurants and small shops attracting local residents, Lisbon visitors and foreign tourists.
- **Almada Centro** is the city's commercial centre, with a large shared space where pedestrians, public transport, bike and cars circulate daily. The area is called an "open air commercial district", although the economic crisis has reduced its dynamism in the last couple of years with the closure of a relevant number of shops.
- **Almada Velha** is the historical area of the city, with small streets, old shops, little restaurants, churches, gardens, theatres, museums and service facilities. Most part of Almada Velha streets are so narrow that not all types of vehicle can circulate within its boundaries, which makes the district particularly difficult when it comes to logistics.

The geographical limits of the study area are shown in the following Figure 19:

Figure 19 – Almada study area

The overall study area is characterized by the following features :

– Cacilhas old area includes the tram/ship/bus terminals and Rua Câdido dos Reis (connecting the Largo Bombeiros Voluntários to the PT interface in Largo Alfredo Dinis), the most emblematic street of Cacilhas, recently pedestrianized (June 2012) and where no vehicles are allowed, except for bikes, electric mini-bus and commercial vehicles in restricted time windows for loading/unloading operations.
– The commercial and residential areas (Av. Dom Nuno Álvares Pereira, Av. Afonso Henriques, etc.) around the tram line 1, crossing Almada for a total 2,8 km and starting from the fluvial station, with lateral traffic lanes and the possibility to park for 15 minutes on the lateral sides.
– The main Almada square, Praça Movimento das Forças Armadas, a shared zone with speed limit of 20 km/h, connecting with two pedestrian streets and the possibility for the commercial vehicles in loading/unloading operations to park for 15 minutes in central slots.
– A road network characterized by narrow streets, often one-way.

Figure 20 – Praça Movimento das Forças Armadas

2.7 Traffic surveys

During the investigation about logistics activities in the reference area, traffic counting campaigns were carried-out in 4 main access sections, counting vehicles entering and leaving the study area (Figure 21).

Figure 21 – Almada study area including vehicles counting point

The results of vehicle counting are reported in the following table.

Table 1 - Almada traffic data updated March 2013

Counting point	Location	Total vehicles		Trucks and buses		Total vehicles
		07-20	Day	07-20	Day	2 hours rush time
CA 24	Av. Dom Nuno Álvares Pereira	20.730	24.600	497	620	
CC 24	Av. António José Gomes	10.703	13.100	907	1260	
C 12	Rua D. João de Castro/Rua Cidade de Ostava					7.500
C 10	Rua Henrique Mota					1.450
C 16	Largo 5 de Outubro					3.100
C 14	EN 10/acess viaduct to Centro					2.800

As it was expectable, the above data show that the higher volume of traffic flow (82-85%), both private and commercial, is observed during the timeslot 07:00 - 20:00.
Most interesting data for this study are the 24h counting points CA 24 (Axis 1 - Avenida Dom Nuno Álvares Pereira) and CC24 (Axis 2 - Avenida António José Gomes), which are located on the major road axis.
It is worth noticing the considerable decrease in traffic, with respect to the 2001 survey. In fact:

- Axis 1 (Av. Antonio José Gomes, counting point CC 24): from 30.000 vehicles in 2001 to 13.100 in March 2013;
- Axis 2 (Av. Dom Nuno Álvares Pereira, counting point CA 24): from 42.000 vehicles in 2001 to 24.600 in March 2013.

The above does surely depend on recent policies adopted by Almada Municipality in the last few years, aiming to foster the modal shift from private to public transport (tramway, pedestrian areas, speed limit long Axis 2, increase of bus lines and frequencies, etc.).

3. GENERAL LOGISTICS CONTEXT

3.1 Overview of characteristics and main types of city logistics flows

As detailed in the above Table 1 (traffic surveys performed in Almada), the more significant flows of commercial vehicles entering/leaving the study area originate from the three penetration axis.

- Axis n.1: (CC24 - Av. Aliança Povo/MFA)
  - Total heavy vehicles - 1.261/day
  - Total buses - 722/day
  - Total heavy goods vehicles - 539/day
- Axis n.2: (CA 24 - Av Dom Nuno Álvares Pereira)
  - Total heavy vehicles - 624/day
  - Total buses - 495/day
  - Total heavy goods vehicles - 129/day
- Axis n.3: (Rua Cabo da Boa Esperança and Av. Rainha Dona Leonor)
  - Total heavy vehicles – 500/day
  - Total buses - 144/day
  - Total heavy goods vehicles - 356/day

Therefore, the total daily number of heavy good vehicles (entering and exiting) the Almada study area is:
539 + 129 + 356 = 1.024 heavy commercial vehicles/day

In view of these results it is estimated that the total number of heavy goods vehicles that circulate daily in the Almada study area is roughly 512. Considering, based on the ENCLOSE surveys, that 1/3 of all commercial vehicles are heavy goods vehicles and 2/3 are light commercial vehicles, we would have roughly 1024 light commercial vehicle circulating in Almada every day.

3.2 Freight vehicles regulation

The circulation, access and parking of freight/goods vehicles is regulated as follows:

– Parking places for loading and unloading are signalized by a yellow line and specific panels (Figure 23).
– Time windows for loading/unloading operations in working days are foreseen from 10.00 to 12.00 and 15.00 to 17.00 or from 10:00 to 17:00 (depending on the districts), but parking spaces are often misused by commercial vehicles for the whole day, also due to the lack of an effective and continuous control. Outside the above mentioned timeslots parking spaces can be also used by private cars.
– Loading/unloading parking spaces are very often occupied by private cars also in the time windows reserved to commercial vehicles (Figure 23).
– In some areas, maximum parking time allowed to the commercial vehicles is 15 minutes. Vehicles in any case, should keep doors open, demonstrating they are loading or unloading.
– Panels indicating loading/unloading rules and timing are located next to the parking spaces.
– Along Avenida Dom Nuno Álvares Pereira, as for any private vehicle, commercial vehicles must circulate below 20 km/h in the two lateral lanes separated by the tram tracks.
– Commercial vehicles during operations of loading/unloading can park free of charge in the "regular" parking spaces marked in white, and paying a normal fee in the blue ones, according to specific fares that change from zone to zone.
– No specific parking normative is foreseen for big trucks during deliveries to the several minimarkets (Pingo Doce, M. Bica, Mini Preço, etc.) and this often causes risks for pedestrians, with vehicles occupying sidewalk space.
– No specific permit (paper or electronic) is foreseen for commercial vehicles, while paper permits are issued to residents (to be put on the car window) allowing to park only in limited areas.

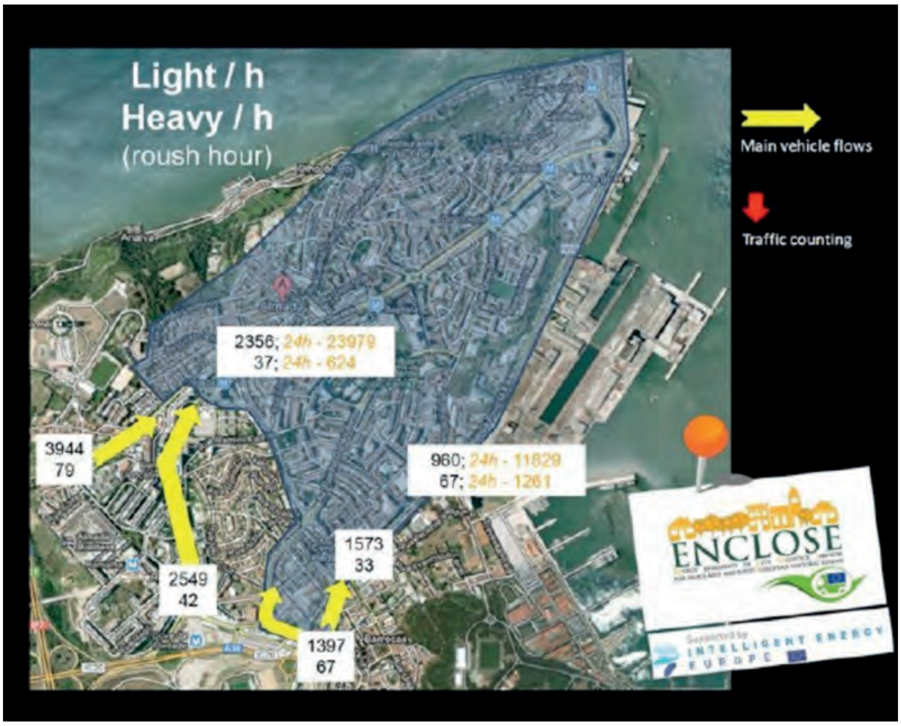


Figure 22 – Almada study area and commercial vehicle traffic numbers

Figure 23 – Reserved loading/unloading parking spaces in front of mimimarket, and occupied by private cars

3.3 Existing logistics services

Freight delivery processes in the urban area are currently performed individually by every single operator.
The different logistics processes can be summarized as follows:

- Direct delivery by the producer: is a wide percentage of the overall freight transport in the urban area (32%) and it is generally operated by the people who produce goods and deliver these to shop owners directly from their production centres or warehouses;
- Direct delivery from the wholesaler: represents a minor part of freight urban transport (4%) and it is operated by mono/multi brand wholesalers delivering goods to shop owners directly in their small vehicles;
- Large scale deliveries: refers to the delivery/stocking processes of the big commercial operators (i.e. supermarket chains) towards their sales points or franchising partners;
- Third party delivery: is the most common logistics process in the urban area and it is based on the "classic" delivery process managed by freight operators (including express couriers) from their warehouses to shop owners, offices, authorities and private agents;
- Self-supply: around 44% of shop owners make use of this form of freight transport and it is hard to quantify the volume of freight involved;
- Transport by pedlars: concerns around 5% of freight and usually deals with small markets;
- Private freight transport: regards the goods that are transported by purchasers' private cars.

At present, with the exception of the loading/unloading time windows, no specific city logistics solutions, aiming at rationalizing freight distribution and at reducing CO2 emissions and energy consumption, exist in the study area.
Moreover, no significant agreements are known to exist among freight operators (mainly based in Lisbon), for consolidating and optimized deliveries and trips to Almada.

4. SETTING LOGISTICS BASELINE

4.1 Commercial activities

In order to identify the best measures to be adopted within urban logistics, AGENEAL carried-out a survey in the study area in the beginning of 2013, in order to classify shops and circulating logistic vehicles.
Data gathered with this detailed survey described the dynamics of the study area, that accounts for a total of around 2.300 shops located in the city areas of Cacilhas, Almada Velha and Almada Centre.
A total of 700 shop owners were interviewed during the survey.

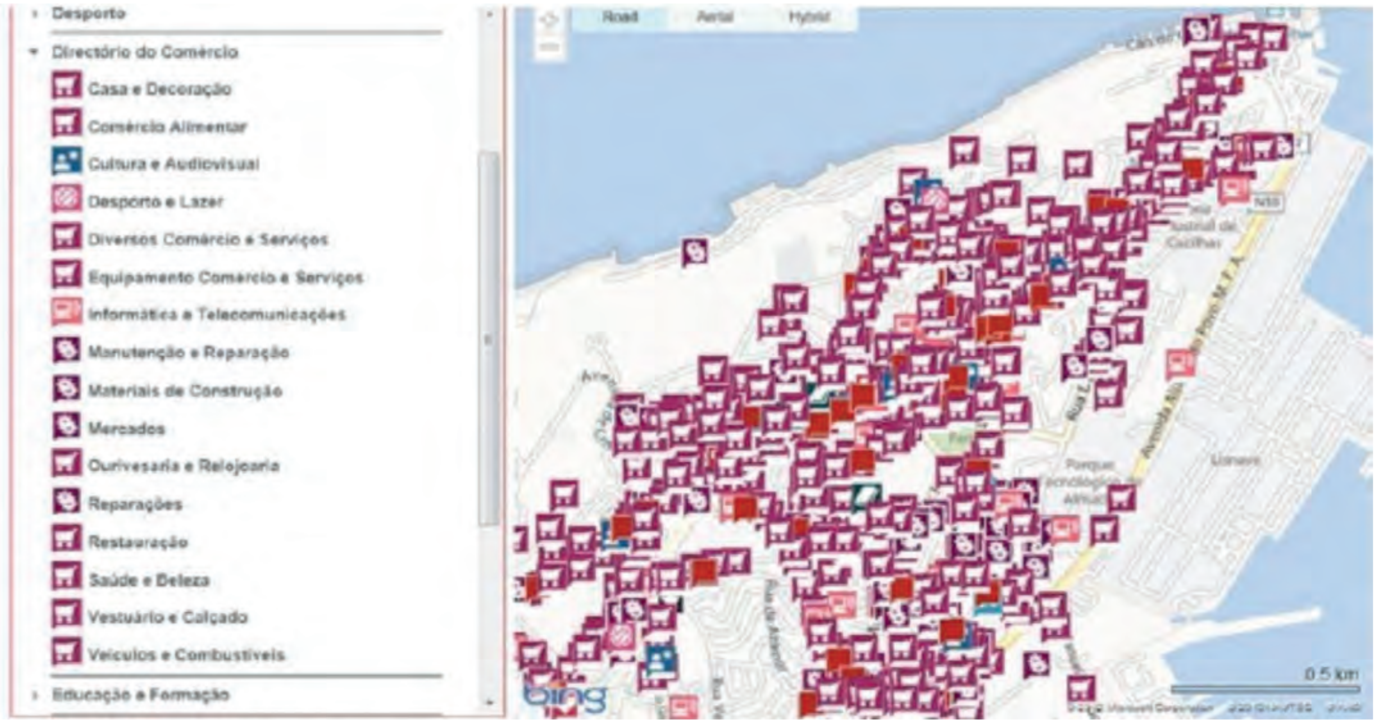


Figure 24 –Almada commercial activities overview

The following tables show the results of the analysis carried out in January 2013 in the study area.

TYPE OF ACTIVITIES

Shop	1.287	56 %
Craftswork	138	6%
Restaurants & Cafés	552	24 %
Services	336	14 %

ORGANIZATION STRUCTURE OF COMMERCIAL ACTIVITIES

Single	1920	83 %
Network	347	15 %
Franchising	46	2%

TYPE AND WEIGHT OF PRODUCT CONTAINERS

		Average Weight (Kg)
Cardboard boxes	43%	8,0
Big plastic bags	17%	5,4
Pallets	3%	85,0
Plastic boxes	15%	7,6
Rolls/Bobbins	3%	18,0
Tins /Drums	6%	10,8
Other	12%	27,5

WHO DELIVERS?

Transport operators	59%
Producers	32%
Hawkers	5%
Wholesalers	4%

* excluding self supply

TYPE OF VEHICLE

	Light vehicles	Vans	Heavy trucks
Transport operators	1,6%	52,4%	46,0%
Producers	3,1%	59,4%	37,5%
Hawkers	45,5%	52,3%	2,2%
Wholesalers	59,0%	41,0%	-

DELIVERY FREQUENCIES TO THE SHOPS

	2 or + times/day	1 time/day	4 times/week	3 times/week	2 times/week	1 time/week
Transporters	10,2%	8,5%	6,7%	6,8%	11,8%	17,0%
Producers	9,4%	15,6%	6,2%	6,0%	12,8%	25,0%
	3 times/month		2 times/month		1 time/month	
Transporters	3,4%		6,8%		28,8%	
Producers	3,0%		3,2%		18,8%	

SELF SUPPLY FREQUENCIES

2 or + times/day	1 time/day	4 times/week	3 times/week	2 times/week	1 time/week	3 times/month	2 times/month	1 time/month
6,8%	29,5%	-	6,4%	4,7%	31,8%	-	7,2%	13,6%

DELIVERY TIMEFRAME

6:00-8:00	8:00-10:00	10:00-12:00	12:00-14 :00	14:00-16:00	16:00-18:00	18:00-20:00
9%	46%	29%	6%	4%	5%	1%

REVERSE LOGISTIC - SHOPS

Yes	29 %
No	71 %

REVERSE LOGISTIC PRODUCTS (IN WEIGHT)

Cardboards	46%
Plastic packages	16%
Other packages	25%
Refillable bottles	8%
Goods from inner city producers	5%

As showed by the above data, goods are supplied almost completely by cardboard boxes (43%) and are delivered by transport companies (59%) and by producers (32%). The weight of packaged goods, excluding pallets, is usually between 5 to 20 Kg.

The significant presence of shops in the study area implies a large amount of delivered goods, estimated in an average of more than 60 tons/day, excluding self supply with an average of 512 freight vehicles/day circulating in the reference area (peaks of 240 heavy goods vehicles during the time window 08:00-10:00). To these, the vehicles of shopkeepers in self-supply (private small vans/cars) must be added.

Considering this last transport modality, a very important factor issuing from the in-

terviews is that the current economic crisis significantly changed shop owners behaviour in terms of supply of goods. In particular, instead of stocking goods on a regular basis, most of them do stock considering only missing goods. Moreover, in order to cut-off costs as much as possible, the use of private vehicles in self-supply transport activity has recently increased.
The same applies to restaurants and cafés, directly using the services of their suppliers or their own vehicles, in order to avoid transport costs.
Food suppliers operating consigned goods represent a very small part of transport operators, and the freight volume that they supply to restaurants and shops is relatively limited. In fact, they only visit food shops weekly/monthly and restaurants every week.
This kind of activity is becoming less frequent recently, due to the fact that it is not convenient for suppliers to visit shops, as the owners only buy missing goods and do not buy for stockpile.

4.2 Freight transport operators

According to December 2012 interviews, one third of the operators that were interviewed declared collecting goods from warehouses located in Palmela, Sesimbra, Lisbon and Cova da Piedade.
Products are packed in cardboard boxes (13%), ice boxes (10%) or cooled (1%). Both light (gross weight <3,5 tonnes) and heavy goods vehicles come mainly from Lisbon metropolitan area. 10% of the interviewees confirm that freight transport processes respect EU regulation.
Average length of every trip is of around 100 km, with 10 to 25 deliveries. Average weight of deliveries is about 100 kg for major shops and 10-15 kg for minor ones.
All the operators that were interviewed use diesel vehicles (mainly EURO 2 and EURO 3): in particular, for 17% of interviewees this is the only vehicle owned, while for the remaining interviewees it represents part of their commercial fleet (up to 50 vehicles).
Loading capacity ranges from 600 kg to 12.500 kg and most common vehicles have a gross capacity from 2.500 kg to 7.500 kg. Despite the fact that operators declared that 30% of commercial vehicles start delivery services with a full load, investigations carried-out during the study showed that the actual average is of around 50% (or less) of the full capacity for the most part of the transport trips.
During the interviews performed in December 2012 freight operators were also asked to provide useful suggestions for improving delivery service: 30% did not give any answer/suggestion, 50% suggested enhancing control of loading/unloading areas, due to the fact that these are frequently occupied by private vehicles, 17% declared that more reserved parking spaces are needed and that some areas do not have any (7%). For Cacilhas area the interviewees suggested shorter administrative times for issuing access permits.

4.3 Main environmental and energy aspects

Almada Municipality published in 2003 a plan for CO2 and energy consumption reduction within its area named "Estratégia Local Para as Alterações Climáticas do Município de Almada", a strategy that was updated in 2008 and is now under a new revision. In particular, a series of actions have been adopted in order to reduce emissions and energy consumption of 20% by 2020, comparing to the 2006 reference value.
Specific initiatives were developed in the fields of construction (i.e. thermal insulation of buildings), industry (i.e. incentives to firms enhancing energy class and producing renewable energy) and transport (i.e. MST tram, increased share of electric vehicles), in line with the provisions of Kyoto agreements.
Regarding urban logistics, baseline situation of study area environmental data is calculated based on traffic analysis carried-out in December 2012, as indicated in the above Table 1.
Every day approximately 512 heavy commercial vehicles enter the Almada study area, making an average trip of 6 km, for a total of 3.072 km/day.
From the survey we can estimate that the total number of commercial vehicles consists of about 1/3 of heavy and 2/3 of light vehicles, which means that the latter account for around 1.024, with a similar trip length.
Heavy goods vehicles have a total average consumption of 24 L/100 km, corresponding to an average vehicle CO2 emission of 730 g/km (EURO2 COPERT III emissions).
On the other hand, light commercial vehicles consume roughly 11 L/100 km, emitting 334 gCO2/100 km.
The daily total CO2 emissions amounts to 4,3 ton/day, which adds up to to 4,3 x 300 days = **1.289 ton CO2/year**.
The same applies to the energy situation: 1.024 light commercial vehicles doing 6 km trips with a average consumption of 11 L/100 km for 300 days, and 512 heavy goods vehicles doing 6 km trips with a average consumption of 24 L/100 km for 300 days leads to a consumption of diesel fuel of 173 + 188 = 361 toe/year.

4.4 Highlight logistics problems

Logistics services in Almada do not feature particular issues similar to those of many small historic towns, due that the main commercial streets are usually rather wide (except for some streets in Cacilhas center and the old neighbourhoods of Almada) and do allow freight vehicles to transit and stop without implying significant problems to mobility Even when illegal parking is used, it does not represent major problems for traffic flow.
Yet the following critical factors can be identified:

- Lack of loading/unloading areas
  Interviews highlighted a lack of loading/unloading areas. In fact, only 26,4% of the interviewees declared using reserved areas for deliveries, while the majority (40,4%) admits doing second-

row parking and 28,3% stops right in front of the shop. Finally, 4,8% declares parking elsewhere, in particular on the sidewalks.
This behaviour is said to be mostly due to the fact that reserved slots are always full (77%) or not available (73%). Other minor reasons are: forbidden entry to the area, lack of space for performing operations and necessity of quicker lading/unloading operations.

- Poor signalling and control of reserved spaces
Existing loading/unloading spaces are sometimes not adequately indicated with panels or with road markings (i.e. specific lines along with different coloured asphalt). Moreover, control pressure by the municipal parking management company and police is low, thus resulting in a frequent misuse of reserved parking spaces by private vehicles. These are often occupied for extended periods by vehicles belonging to shop owners themselves, removing it only in case of authorities' enforcement, thus forcing other logistic actors to double park.

- Lack of knowledge of freight regulation by operators
The majority (90%) of the operators do not know specific regulation dealing with restricted access (i.e. time windows) to the areas they deliver goods to. The highest knowledge concerns Cacilhas pedestrian zone. In fact, 7% of operators declares the access is limited to residents only, while 3% states that the entry is forbidden to vehicles of over 3.500 kg.

- Minimarkets
The shops of different minimarket chains account for more than twenty. The trucks supplying the two main mini market chains (Pingo Doce and Mini Preço) are considered as one of the main factors of the negative environmental situation and congestion problems in Almada (Figure 25).
This is both because these markets are located in the inner Almada area and because they use, in addition to the big trucks, also small vehicles during the whole day for transporting fresh products (in particular fruits and vegetables).

- Self supply
As explained above, the reduction of commercial activities due to the economic crisis led to a growing number of shop owners/keepers using self supply to stock up goods, above all in case of low quantities. This results in an increase of traffic of light freight vehicles or cars and, in particular, implies that many shop owners do park their vehicles right in front of their shops, often occupying loading/unloading areas or prohibited parking spaces, for the overall day.

- The main Almada fish and vegetables market
The vegetables and fish market (Figure 26) is an "hexagonal" building located in Almada old town (Praça do Comércio), 150 meters away from the main street where the tram line 1 is running. The market acts also as a "big roundabout" around which freight vans, owned by market workers, are parked during the overall market operating time - from 6:00 to 14:00. These vehicles work as small mobile depots, preventing market customers from using parking spaces (Figure 27).

Figure 25 – Truck supplying minimarket

Figure 26 – Vegetables and fish market

Figure 27 – Parked vans used as depots outside the market

5. CANDIDATE MEASURES/SERVICES IDENTIFICATION AND SELECTION

In this Chapter, we provide a synthesis of the logistics solutions/services identified as suitable for Almada context and needs. These services/solutions have been assessed and selected according to the requirements foreseen by the new Almada mobility plan (PUMA) and especially to the specific key goal of "Enhancing the city logistics processes mainly related to last mile freight distribution", as mentioned in section 2.3.

In particular, general approaches, infrastructural and operative aspects and strengths/weaknesses related to Almada situation are described for the following measures/services:

- Urban Consolidation Center (UCC)
- Electric Van sharing service
- Self-supply services
- Park and buy service
- Pick-up points service (PuP)
- Loading/unloading areas
- B2C services (e-logitics Agency)

5.1 Urban Consolidation Center (UCC)

The Urban Consolidation Center (UCC) is a complex structure, based on a physical infrastructure (i.e. warehouse) as a primary component (indicated also as Logistics Base) connected with a range of organization and service measures.

For this reason the UCC is also classified with other different names and acronyms (i.e. Freight Consolidation Centre, Freight Transhipment Centre, Transit Point, Public Logistics Terminal, Urban Logistics Platform, Freight Collection Point etc.), but it substantially presents a common structure and approach: main reference point for rationalizing urban logistics processes and providing logistics services that can significantly improve the environmental sustainability of freight delivery in urban areas and city centres.

Freight consolidation management is the key activity of UCC. The expression "Freight consolidation" refers to a group of operation models and commercial relationships among the UCC and different logistics operators or between the UCC and shop owners, aiming at reducing the number of freight delivery trips within the urban area.

The UCC will act as base for gathering goods of different operators (groupage) and implementing "last mile" delivery services managed by UCC fleet. Figure 28 shows the operation model of the UCC solutions.Normally the UCC can result from a private (i.e. an operator or a consortium of operators) or, more frequently, a public enterprise (i.e. Municipality or other Local Authority). In the latter case the Public Authority is in charge of setting-up the structures, purchasing the vehicles of the fleet (if possible eco-friendly) and managing the service, also availing itself of external staff.

Figure 28 – Urban Consolidation Centre and last mile delivery services

At a following stage, once UCC experience is consolidated, the Authority may also involve private actors in the overall UCC management, only maintaining the functions of control and regulation, thus establishing, in practice, some form of public-private partnership (PPP - public private partnership).

The UCC can operate, from the commercial point of view, based on two different approaches:

1. The UCC makes an agreement with the major long range transport operators that often prefer to avoid entering the inner city centre for delivering low volumes of freight. In this case the transport operator goes directly to the UCC bases leaving the parcels to be delivered in the city centre by the UCC fleet. The operator bears the cost of these last mile transport service. This scheme was implemented in several European cities (with different characteristics and dimensions), such as Berlin, Bremen, Bristol, La Rochelle, Malmo, Parma, Vicenza, Siena, Barcelona, Lucca, etc.
2. The UCC makes an agreement with the owners or people responsible for the main commercial activities located in the city centre or urban area (shops, restaurants, cafés, minimarkets, etc.). This agreement foresees that the delivery of the ordered freight is to be made directly to the UCC address. In this case the shop bears the cost of last mile service but, at the same time, can also benefit from a lower delivery price applied by the freight operator, thanks to the agreement that guarantees significant quantities of freight to deliver during the year.

Shopkeepers also benefit from added advantages, due to the fact that they can avoid the costs for other related logistics activities e.g. storage management, reverse logistics processes (i.e. card boxes, pallets, plastics), etc. Moreover additional benefits can also be represented by the possible lower delivery prices obtained thanks to the possibility for the shopkeepers to order larger quantity of goods without any problem of storage.

This is the scheme adopted in 's-Hertogenbosch (NL) by the private company Eco2city.

The two different schemes detailed above highlight the fundamental characteristic of a successful UCC: for operators not having a logistics centre in the reference city the delivery of freight to UCC, upon payment of a fare, shall be more convenient than the difficulties for its own vehicles to enter in the city centre.

Such a convenience can either be "pushed" by the Municipality (i.e Vicenza, Lucca, etc.) imposing tight city access restrictions (i.e. time windows, parking time on loading/unloading areas, vehicles sizes, vehicle emissions, one way streets, pedestrian areas, etc.), or be already present in the city morphology itself (i.e. Siena), where the characteristics of the historic centre, with narrow and steep streets and alleys, are a first deterrent for entering in the inner centre along with regulations and restrictions.

As already pointed out, the UCC is based on significant investments on infrastructures, fleet and organization, therefore this solution can only be the final step of a process aiming to identify the most suitable solutions and it can only result from a strong political willingness and from the capability to evaluate the different benefits and costs (directly and indirectly).

For this reason UCC are normally viable solutions for big cities or metropolitan areas, where these usually play the role of urban interports. As regards small/medium size cities these structures should, if possible, be based on existing infrastructures and operators.

The experience of two ENCLOSE towns can be taken as reference in evaluating the feasibility of a UCC in Almada:

- Lucca, where the Municipality, taking advantage of significant European and National co-funding, implemented its UCC (infrastructures and vehicle fleet) after a long process lasting 8-10 years, adopting as logistics base (during the experimental phase) in an existing minor public warehouse;
- Trondheim where the system implemented by Posten Norge is composed by two hubs at the opposite sides of the city. Large vehicles bring freight to the hubs, from where electric vehicles collect goods to be delivered to the city centre.

Moreover, an interesting solution is given by the possibility to adopt a logistic "cross docking" approach consisting of a service operated by the UCC where the freights are collected by the UCC vehicles directly at national operators warehouses and delivered to the shops in the city centre for last mile distribution.

Whatever the chosen solution is, the implementation of a UCC usually produces several advantages, mainly dealing with freight flows and environmental sustainability of the logistics system. Among these, the most important are:

- Enhancement of the loading factor and reduction of half-load trips with lower transport unit cost;
- Reduction of fuel consumption (energy savings) and of polluting emissions (air and noise);
- Possibility to use low impact vehicles – electric, CNG or hybrid – for last mile deliveries management;
- Compatibility with different transport, environmental and social policies.

Moreover, logistics operators can also benefit from significant advantages by using UCC services, such as:

- Reduction of km covered by freight vehicles;
- Reduction of time waste due to traffic congestions;
- Reduction of delivery times.

Finally, from the Almada point of view, shop owners also enjoy positive advantages by using new delivery services:

- Possibility to receive useful delivery information from UCC (tracking) and to indicate specific hours for delivery;
- Possibility to enjoy other added-value logistics services based on UCC infrastructure (e.g. third party warehousing services, packaging collection, etc.).

The main problem concerning UCC is the economic sustainability, in particular:

- Costs for building the logistic base infrastructure (when already existing infrastructures cannot be utilized);
- Costs for supporting infrastructures and devices;
- Costs for purchasing commercial vehicles, in particular EVs, hybrids and low emission vans in general;
- Costs for freight transhipment.

Finally, marketing problems include the unwillingness of the national transport operators to allow delivery operation of "their" freight with vans showing different brands.

5.2 Electric van sharing service

Usually van sharing service is more focused on the needs and requirements of shopkeepers in self supply, than on those of transport operators, and can be implemented by adopting different approaches.

In any case this solution can be also suitable for those small transport operators that do not have the economic possibility to directly purchase commercial EV (characterized by high purchasing costs) but need to satisfy demand of freight deliveries in those cities having wide pedestrian zones or traffic restricted areas, and/or rules/normative allowing the access only to electric vehicles.

In order to adopt a van sharing solution the municipality, or a transport operator consortium, purchases a fleet of electric vehicles (the number is to be defined based on local needs, area dimensions and funds availability) which are at freight operators disposal upon reservation.

An advanced version of this service could include an Information and Communications Technology (ICT) platform to manage bookings and the use of electric vans (equipped with specific on board terminals and a smart card reader).

Electric vans can be located either at strategic points in the city or at the headquarters of one operator.
The cost of the service should be related to the effective time of usage and to the agreement criteria among transport operators (including, not last, the operation and maintenance costs). Some of the advantages of such a scheme for the operators are, among others:
- No significant investment and management costs are needed;
- The courier is led to optimize the number of trips by trying to drive a full-load van (in order to reduce the cost for renting the electric vehicle);
- The historic centre is preserved from emissions and noise pollution.

Yet, the sharing concept also features disadvantages:
- It is not convenient for the transport operators based far from the city;
- Couriers are not often able to optimize shipments and may use half-loaded vehicles (i.e. in the case of urgent deliveries);
- Managing and maintaining the fleet;
- Need for a call-centre and/or suitable ICT platform (including development and maintenance costs) for managing booking, operation, revenues and fleet.

5.3 Self-supply restrictions

As pointed out in the previous section, one of the main mobility problems in the inner centre is related to the self-supply processes operated by shopkeepers using their own private vehicles (small vans and/or cars).
This problem is becoming even more evident due to the current economic crisis that is pushing many shop owners to economize on freight transport by using their own vehicles for transporting goods from and to the shops.
Because of this, not only traffic but also parking related problems got worse: often shop owners park their vehicles (either vans or minivans) in loading/unloading areas illegally for long periods, or even double park in no-parking zones close to their shops.

In order to solve this issue some European cities (i.e. Burgos with the solutions identified as ENCLOSE soft-measures) set up restrictions on the number of vehicles that can circulate in the same time window in the restricted traffic area, by implementing specific measures such as: access control devices (i.e. bollards) operated under specific code/password, a limited number of access permits issued to the shopkeepers (managed by their association) with specific rules for booking the permits, the time period and for pickup and delivery.
This measure has the advantage of regulating and limiting the number of shopkeepers' vans/cars circulating of the in urban city centres, especially to those featuring large pedestrian areas, without penalizing shopkeepers too much.

5.4 Park and buy

"Park and buy" - P&B service (Figure 29) is applicable to any tourist city having parking infrastructures (parking building) with presence of operators. The tourist who leaves his car in parking buildings, usually at the border of the city centre, is not willing to buy bulky items as carrying such kind of goods during the visit is uncomfortable. In order to solve this problem the P&B service, thanks to an agreement between shopkeepers and the parking manager, allows tourists to shop and find the purchased items later on, directly at the parking building.
This service is based on an operative scheme allowing the shopkeeper to alert the P&B transport operator to collect the goods and to deliver it to the specific parking place indicated by the client. Once the delivery is done an SMS is sent to the customer informing that the parcel is at the parking building. The same system can be used for delivery purchased items to hotels.
The following figure is related to park and buy scheme demonstrated in the Italian historic city of Siena some years ago.
The results of the service demonstration implemented in Siena showed that the dedicated infrastructure and organization for the parking building are relevant (security boxes, electric van, booking system, personnel presence, goods insurances, etc.) and can be successful only if this service is one of several logistics services provided by a transport operator or is one of the services provided by an UCC.

Figure 29 – "Park and Buy" service scheme implemented in Siena

5.5 Pick-up Points (PuP) services

B2C commerce, and in particular Web commerce, is constantly growing, implying an increase of the volume of delivery services requested to the transport operators (mainly express couriers). One of the main problems that these operators have to face in this process is represented by the absence of addressees at the final destination (usually home) during working hours. This implies that the transport operator shall do one or more unsuccessful trips to attempt the delivery and often the customer is obliged to go to the depot for collecting the item(s), thus generating additional traffic.

In order to avoid (or minimize) this problem, several interesting experiences were implemented in Europe, usually consisting in the setup, by the main freight operators, of some pick-up points either in public areas or at commercial activities (i.e. fuel stations, railway stations, etc.) with a 24h operating time.

The courier delivers the parcel(s) at the PuP (usually located in close peripheral and easy accessible areas) and sends an SMS to the consignee providing the reference number to self- collect the freight. This way freight operators avoid useless trips within the city and customers do not need to travel to the courier warehouses, that are frequently far from the city and have opening times coinciding with customer working hours.

One of the main successful PuP service experience in Europe (and in particular in Germany) is represented by the Packstation™ service operated by DHL/Deutsche Post, characterized by a specific technological infrastructure (advanced boxes with IT) directly managed by the courier.

The main limit of this solution, from the operation point of view (apart relevant costs, area to be reserved to the infrastructure, etc.) is represented by the fact that the boxes "fulfillment" can be only operated by one courier.

Despite the willing of the different transport operators to reach an agreement for a common and integrated solution, the real possibility to share this infrastructure among different couriers is very low, due the different information systems and flow integration required. Other minor experiences have been developed in the last few years (i.e. Kiala services), based on similar concept, but although foreseeing more practicable solutions, these require in any case specific agreements among transport operators and the PuP responsibles, that limit their diffusion.

5.6 B2C services

Apart from freight transport/distribution related to Web commerce a city logistics transport scheme in B2C commerce is represented by the delivery of purchased goods (not only heavy freights) from shops and supermarkets to customer house.

This service is very useful above all for elderly people facing mobility problems or for people that don't use private car to shop and wish to have their purchased goods directly at home.This service is mainly provided by shopping centers and supermarket organizations, while for small/single shops a call center and a small fleet (often electric vehicles) are needed.

5.7 e-Logistic Agency

In some European cities, also on the basis of significant pilot experiences developed under EU programmes (i.e. eDRUL Project - "eCommerce Enabled Demand Responsive Urban Logistics", FAMS Project - "Flexible Agency for Collective Demand Responsive Mobility Services" - 5th Framework Programme R&D EU-IST) the concept of the e-Logistics Agency for the provision of urban logistics services is emerging.

The e-Logistics Agency involves four main components:

- B2C services, enabling interaction among the customers and the goods retail/distribution system (last mile, added value service and eCommerce interface);
- B2B services, enabling the networking and collaboration of the different actors of freight distribution chain (goods delivery operators, trans-shipment and logistics platform operators, retail operators, etc.) and allowing dynamic cooperation among these actors;
- B2A City oriented services in order to

Figure 30 – Pick up point DHL (Packstation) and Kiala PuP service

implement flexible, demand-driven goods distribution schemes under mobility constraints, integrated (if it exists) with the ITS urban scenario and the mobility policies.

- Base Planning services to enable optimal management of the available resources related to freight distribution process (fleets and available capacity, logistics bases, consolidation, routing, etc.)

Figure 31 shows the e-Logistics Agency concept developed by FAMS project.

5.8 Loading/Unloading areas

This measure, which has been commonly adopted in most part of European cities since many years, is characterized by a low level of complexity and investment, but requires accompaniment by specific rules and regulations defined by the Municipality (not simple/fast process as well known), and operated under a strong control activity. In general normative aspects for loading/unloading areas concern time windows, time occupancy, type of vehicles allowed, type of goods allowed, etc.

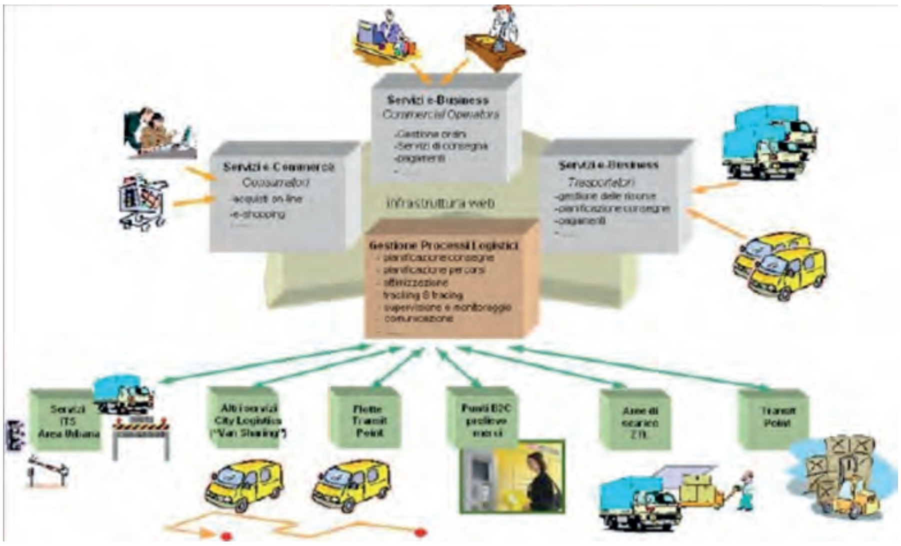


Figure 31 – e-Logistics Agency concept

The e-Logistics Agency concept has been often developed (and in some pilot cases demonstrated) as an extension of the existing demand responsive transport services (DRTS), as carried out in Almada with the FLEXIBUS service, where passengers can book their trip and choose the hour and the meeting point for pick-up.

DRTS services are based on a Travel Dispatch Center (TDC), for managing reservations and planning optimised trips.

In a perspective of enhancement towards the e-Logistics Agency concept, the TDC should be also involved in city logistics management as a "tool" for collecting requests and planning deliveries (preferably operated by FEV) in an optimized way.

In order to perform these tasks the e-Logistics Agency needs to be equipped with a specific web based ICT platform.

The main problem of these simple road infrastructures, in case of no close surveillance, is represented by very frequent abusive occupation, both by privates not allowed and by commercial vehicles exceeding the maximum parking time. This implies that often the transport operator double parks (provoking traffic congestion) or, looking for a free parking space, drives for more meters contributing to traffic congestion, energy consumption and pollutant emissions.

The following actions can be undertaken for facing this issue:

– Enhancing on-street surveillance. This simple solution is hindered by the lack of staff, which is often occupied in other activities (i.e. traffic management);
– Make loading/unloading areas more visible by using panels and road signs. Yet, this measure needs to be strengthened by an accurate surveillance;
– Concentrate loading/unloading spaces in the same area. Instead of having different parking spaces located far from each other it is better to concentrate these in some areas which are easier to control, even though couriers must walk freight (using carts) for some meters.

A more advanced solution, based on ICT devices, is related to the installation of specific sensors under the road pavement that, interacting via wi-fi to the closest parking meter, control the effective occupancy time of each single slot. Authorized vehicles are endowed with a smart card to be inserted in the parking meters. In case the loading/unloading space is occupied by a non authorized vehicle or for longer than allowed, the sensor signals the irregularity to the surveillance authority for a prompt control/fine.

Such kind of loading/unloading areas parking system is under development in Treviso (Figure 32), where an advanced parking system already exists, aiming to control

Figure 32 – Treviso parking system

parking space occupancy by private cars, and working under the above described scheme.

Considering the significant costs of technological devices and the specific organization required, this solution could be taken into account only if the investment costs could be shared with other parking services.

5.9 Selection of the most suitable measures

Based on the characteristics of Almada study area (see Chapters 2 and 3), on the Project Deliverable D2.2 - "Sustainable logistics in European small-/mid-size historic towns: stakeholders goals and User Needs Analysis" and on the exchange of experiences with the other ENCLOSE towns, a selection of the most suitable measures that could be implemented in Almada in the future was made.

The selected measures, which will be described in detail in the following Chapter, aim to enhance the overall management of city logistics, in order to improve and optimize these processes, thus producing significant benefits not only from a logistics/commercial perspective, but also from the eco-sustainability point of view and in particular for energy saving and CO2 emissions reduction.

Moreover, such kind of measures will also imply positive effects on the overall city mobility, as these will contribute to lowering traffic congestions (and related problems) depending on logistics processes.

The selected measures for further analysis are the following:

1. Urban Consolidation Center (UCC) - this measure is deemed feasible in Almada's context, due to the fact that there is a suitable area with an easy access to/from the city centre, connected to the main road axis. Moreover, the geographic situation of the area (peninsular) allows the adoption and implementation of specific access control measures addressed to commercial vehicles and aiming to boost UCC use. Yet, due to freight volumes, a "light" infrastructural/operational solution is preferred, in order to enhance the economic sustainability of this measure.
2. Extension of FLEXIBUS service: Pick up point PuP service – Due to the existence of a flexible BUS service and thanks to the availability of a specific location suitable to the set up of this service, this measure is feasible in Almada's context and sustainable from the economic point of view, even with (initially) low freight quantities.
3. Restructuring of Vegetable and fish market area - This measure was deemed particularly useful for improving road and pedestrian circulation in the study area, also thanks to the existence of appropriate infrastructures allowing an easy implementation along with reasonable and sustainable costs.
4. Loading/unloading areas - This measure is focused on the restructuring and new layout of road signage and panels. It is in the framework of the overall Municipality revision of parking regulation for commercial vehicles, which is now planned for Cacilhas area in the scope of ENCLOSE, and planned to be extended in the future to the whole study area. The preliminary pilot application of these actions is being implemented as a two steps "soft measure" within ENCLOSE project: SM1A – Regulation Update & SM1B – Applying the new regulation.

The other measures described were not selected because they are not considered sustainable from the economic point of view and would not have a significant impact of pollution reduction and energy saving in the study area, in particular:

- Electric van sharing : for the disadvantages mentioned at Chapter 5.2;
- Surveillance of self-supply vehicles: an access control system monitoring the whole area would need to be installed. The main obstacle is the high cost of such sophisticated control system, able to identify and select vans/trucks and private car from the vehicles used by the shop-kepeers for self-supply. The related cost is not justified by the small benefits in terms of energy consumption end emissions reduction.
- Park and buy: besides the specific characteristics that a city shall have for making this scheme a successful one (see above Chapter 5.4), it is important to notice that most part of the few tourists visiting Almada come from Lisbon by ship (not by car), thus no parking is used.
- Packstation: for Almada, considering the current level of freight deliveries related to web commerce and the predictable low revenues, the high installation costs of this system makes it not convenient (at least for the moment), also taking into account that this scheme is usually implemented by main freight operators/express courier (like DHL).
- B2C Service and e-Logistics Agency: rather high investment and management costs are not justified by the limited dimension of the city logistics in Almada, and in particular in the study area. Consequently, the reduction of energy consumption and pollution emission achieved by these solutions would not be sufficient to justify the investment and operative costs.

6. FEASIBILITY OF THE SELECTED SOLUTIONS

A deep analysis of prerequisites and operating conditions of the measures identified above is provided in the following section, along with a description of infrastructures/equipment, staff, operation schemes and supporting regulation. Also, a deep analysis of investment and operation costs is given. Finally, specific benefits in terms of mobility, energy savings and emission reductions are discussed.

6.1 Urban Consolidation Center (UCC)

6.1.1 PRECONDITIONS AND REQUIREMENTS

Before starting any feasibility analysis it is fundamental to highlight that an UCC can be successful only if the Almada Municipality is strongly willing to implement it, with real administrative acts, which in this cases are bylaw acts.

This means that specific regulation aiming at limiting the access of commercial vehicles to the study area (i.e. time windows, access control, extension of limited parking areas, typology of authorized vehicles - in weight/dimension and fuel, etc.) should be defined and applied in Almada, in order to make it more convenient for freight operators to bear a relatively low cost for charging the UCC with final delivery, thus avoiding to enter the area and saving time.

Finally, it is important to consider, as a precondition, the possibility to implement a "light" solution both in terms of infrastructures and of operating management in order to ensure, above all during the critical initial phase, economic sustainability of the solution.

6.1.2 Almada UCC city logistics services

The city logistics services provided by the studied Almada UCC can be distinguished in two main categories:

1. Base city logistics services;
2. Additional, added-value city logistics services.

6.1.2.1 Almada ucc base city logistics services

The key function of the Almada UCC is to provide services to support "last mile/km" deliveries to the reference centre area, within the wider scale regional (and national) freight logistics chains.

Almada UCC provides all typical logistics services to support cooperation between long/mid- range freight operators and the local distribution actors, including:

- Transhipment of goods at the UCC logistic platform;
- Organisation of best operations possible (e.g. groupage, load consolidation, etc.) for deliveries of goods to their final destinations by the UCC eco-fleet;
- Provision of ICT services enabling the exchange of updated information – including particularly track-and-trace information – between transport operators making use of Almada UCC delivery services, the UCC itself and all the actors throughout the logistics service chain.

The UCC will also provide services to operate freight transport in the opposite direction (reverse logistics), i.e. logistic flows with goods collected from locations within Almada centre and final destinations outside the area.

6.1.2.2 Possible future Almada UCC added-value on city logistics services

In addition to the base services introduced in the previous section, the Almada UCC foresees, at a later stage, also a number of value-added services that will be gradually implemented and offered to the users and operators of the city logistics system in Almada, after the start up phase and consolidation of base services.

Such additional services address different city logistics market segments, as well as some services with a social relevance, and include:

- Home delivery services, for generic users (i.e. citizens living in the service area) or specific user categories (e.g. elderly people, people with mobility problems, etc.).
- Delivery services to specific locations within the reference area, such as parkings, hotels and other service locations.
- Reverse logistics services, for collection and delivery (through the UCC) of refused/returned goods, packaging materials, logistics waste, etc.

6.1.3 LOCATION

When choosing the UCC location, some key requisites are to be considered:

- Easily accessible for long range operators (i.e. close to main roads and/or railways);
- Not too far from the main city delivery area in order to avoid excessive-length trips, enhancing trips/day. Also for having the possibility to adopt electric vehicles.

According to these pre-requisites, for the Almada case the area which best suits is the one located at the beginning of Avenida Bento Gonçalves close to the Centro-Sul roundabout, which is currently exclusively dedicated to a parking area, close to the tram line 1.

This location is particularly close to the junction connecting Almada to the main northern ("25 de Abril" bridge), southern (A2) and western roads (IC20 and A38), it is roughly 2,5 km far from Praça Movimento das Forças Armada, which can be considered as the central point of the study area and, finally, it is 3,3 km far from the farthest point of Cacilhas.

Area location and distance from Praça Movimento Forças Armada are indicated in Figure 33

Figure 33 – Selected best area for setting up UCC and study area

6.1.4 INFRASTRUCTURE: GENERAL FEATURES AND DIMENSION

In principle the first elements to be considered in planning an UCC basic structure are a warehouse (including offices) and a loading/unloading operation external area.

Warehouse

In order to keep the initial investment as low as possible it would be important to start with a small/medium modular structure that could be enlarged in order to satisfy any future need for a wider space.

Based on the volume of freight to be managed (around 4.2 tonnes/day – considering to capture around 7% of freight entering the study area), requiring at least 8 trips per day, a 600 km2 (i.e. 20x30 meters, including a small office and facilities) warehouse with unloading/loading portals along two opposite façade and side doors would be enough. At the very beginning only two loading areas could be enough, and would be used for both loading and unloading freight vehicles. Loading areas door shall be equipped with canopies in order to protect goods and operators from rain.

An example of such kind of structure, with two loading doors, is shown in Figure 34.

External area

An external manoeuvre area of 500 km2 (i.e. 20x25 meters) is the minimum space required for allowing trucks operations in front of the loading doors. The side of loading doors occupied by vans needs a small external area of 200 km2.

In principle all these infrastructures should be fenced (and CCTV controlled) for security and safety reasons.

With the above detailed infrastructure dimensions a total surface of around 1.500 km2 is needed. The selected Almada UCC location, with an overall extension of around 13.500 km2 well meets all these requirements in terms of available space. It is important to highlight that this area is at present a car park (mainly used by commuters travelling on the close tram line) and that the UCC would occupy but around 11% of it.

This way the UCC would not create any problem to parking users (considering that a reduction of a maximum of 100 parking spaces would be needed), thus fostering the acceptance of new logistics services by citizens.

6.1.5 ECO-FLEET TYPOLOGY

Besides being an efficient logistics service for customers, UCC activities in Almada shall also represent an example of environmental sustainability. For this reason a fleet

Figure 34 – Example of prefab warehouse – Front view with loading spaces and Interior

of eco- sustainable commercial vehicles is preferred.

The suitable options shall be found among one of the following (featuring a decreasing environmental impact):

- New generation diesel vehicles (i.e. EURO 5 with DPF - Diesel Particulate Filter)
- Bi-modal (diesel/electric) vehicles
- Hybrid vehicles
- Electric vehicles (FEVs)

Logistics base location and operating conditions for the Almada UCC (the average distance between the UCC and the delivery area is rather limited 2,5 km, with a maximum of 4,0 km) and the total distance to be covered by each van (from 40 up to 60 km in the worst case of 4 trips/day), are fully compatible with electric vehicles, which are the most suitable solution, in terms of pollution reduction.

Considering the peculiar characteristics of the reference area (with many narrow and steep roads and alleys), vehicle fleet, at least at an initial phase, could consist of two electric vehicles of 3,5 tonnes of gross weight (1,1 - 1,2 tonnes of loading capacity), and operating on distances up to 120 km full-load (i.e. IVECO Ducato, Figure 35). At a following stage the possibility to widen UCC fleet, in order to diversify vehicle typology and satisfy different needs, could be considered. For instance, deliveries in the narrowest streets could be performeed by means of electric mini-vans, such as the Fiat Fiorino, showed in Figure 36).

6.1.6 ICT SUPPORT TOOLS/SYSTEM

Although in the initial phase (and in case of limited activity) all the procedures can be essentially managed manually, it would be important for an UCC to be equipped with an ICT system for managing freight services and planning, thus ensuring fundamental support all along the delivery process phases: from freight collection, to trip planning, parcels and final delivery tracking in addition to the accounting report and administrative documents.

In any case the platform and related functional modules can be implemented by steps foreseeing specific main modules for the management of:

- Last-Mile Management
  - *Delivery Request Submission*
  - *Parcel Labelling*
  - *Parcel Collection*
  - *Load Consolidation & Trip Planning*
  - *Parcel Delivery*
  - *Delivery Failure Management*

Figure 36 – Electric mini-van Fiat Fiorino

Figure 35 –Electric van Micro-Vett IVECO Ducato 3.5 tons

- Reverse Logistics Management
- System Resource Management
- Track & Trace Service
- Vehicle Localization Service

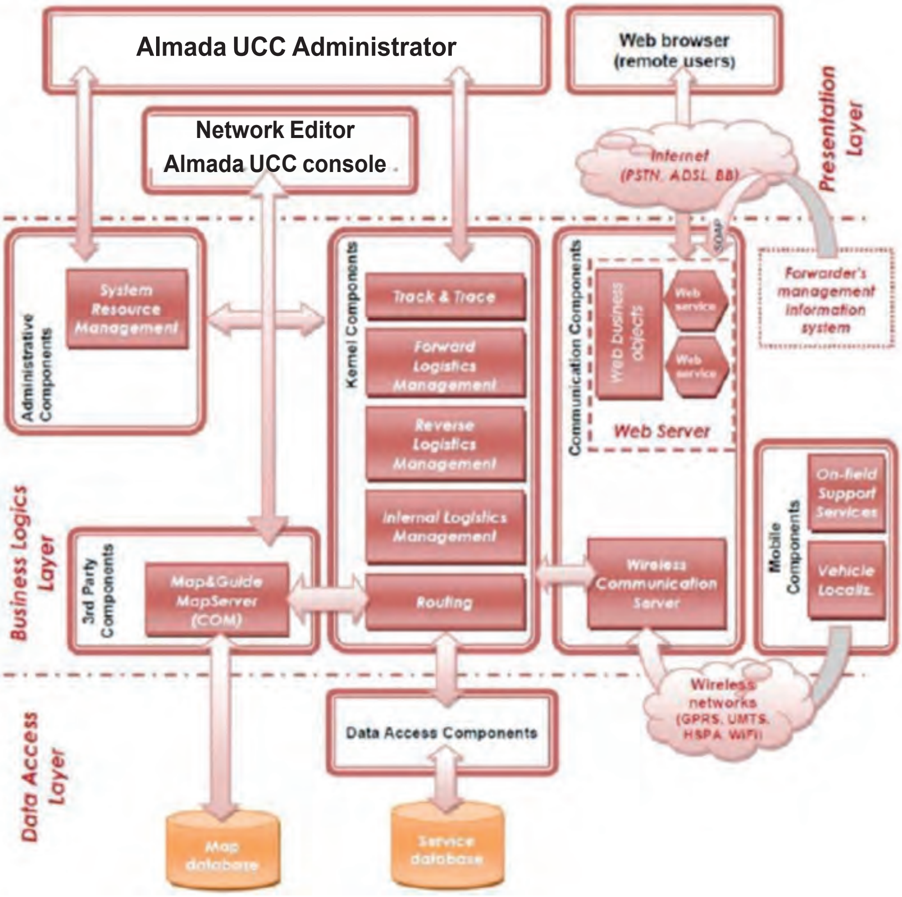


Figure 37 – Almada UCC ICT platform: possible software architecture

- Internal Logistics Management

The following Figure 37 shows possible reference software architecture.

Therefore, from a functional architecture perspective, an ICT platform should include:

- Specific services for users allowing an interaction among the customer/transport operator and the UCC;
- Web interfaces easing the operability and the collaboration among the different actors involved in the freight distribution chain;
- Services for the use and the optimal management of the available resources of the freight distribution process, so as to realize freight distribution flexible schemes assigned to the B2B, B2C and B2A services.

The system shall be implemented in order to easily allow a subsequent seamless integration of advanced solutions, providing tools and systems for the integration with the overall freight distribution system.

In any case the introduction of an ICT platform to manage the logistics processes related to the Almada UCC will be evaluated in a future phase, after a deep analysis of the level of services and of the quantity of freight delivered.

Therefore it is not a preliminary priority in setting the UCC for Almada.

6.1.7 KEY STAKEHOLDERS

Apart from the Almada City Council and the institution who will manage the system, the main stakeholders to be involved for UCC activities are: freight transport operators and shopkeepers in the reference area.

Both of these groups shall be addressed before making any decision on UCC, in order to make clear that, despite adding transhipment costs to delivery processes, the UCC is also an important opportunity for achieving a more efficient and sustainable freight delivery system, producing benefits for both freight transport operators (time saving avoiding access to the inner city centre for small deliveries, possibility to use bigger vehicles, etc.) and for shopkeepers (more delivery flexibility, reverse logistics for carton box packaging, better urban environment, better accessibility and safety for pedestrians, increased possibility of parking, possibility to use the UCC as third party warehouse with eco-sustainable delivery on shop demand, etc.).

Finally, it is important to outline that the introduction of an UCC should be a participative process involving several public and private stakeholders. Several unsuccessful experiences stressed that innovative logistics services like UCCs can be implemented only with a close collaboration and agreement among public authorities, parking management company (ECALMA), Police, logistics and transport operators, shopkeepers, citizen associations, etc.

6.1.8 PRELIMINARY ORGANIZATION/ OPERATION DIMENSION HYPOTHESIS

The main UCC service priority is represented by last-mile delivery. Usually, for these basic services, the main national long-range freight transport companies/operators, that in many cases have a depot in the surrounding city areas (as in Almada) turn themselves to the services of small local operators, owning one vehicle, or of small local transport cooperatives.

In the starting phase it is important to setup a light structure (i.e. existing depot for the physical base) and to collaborate with local small operators (by means of individual or collective service contracts), in order to use their vehicles (before purchasing UCC electric ones).

In the initial phase, taking into account the logistics and transport situation, the following resources (in terms of staff, equipment, etc.) are required:

- Two 3,5 tonnes trucks
- One electric transpallet
- Two truck drivers
- One loading/unloading responsible person (supported by the drivers)
- One administrative employee

At a later stage (i.e. after 6 to 12 moths) on the basis of the real development of the UCC activities in Almada the following elements should be redefined:

- Equipments, in terms of vehicle fleet, devices for freight handling, etc.;
- Warehouse (and office) size;
- ICT platform installation (see above Chapter 6.1.4 for details);
- Staff resources.

As regards the management structure, at the beginning a full public (Municipal) management (in a direct way or by means of a municipally owned company – i.e. ECALMA) is preferable while, at a later stage, one of the following solutions can be adopted:

- "In house" company; a structure belonging to the Public Administration (public owned company), entrusted with service management.
- Public-private partnership; where a private company, in collaboration with the public one, participates as a partner in the mixed capital company set-up for the management of the services. This kind of partnership is foreseen by the European Commission (Green paper on public-private partnerships, Brussels 30/04/2004, COM (2004) 327 final).
- Service procurement partnership; this approach is based on a public tender and on a relevant contract regulating the relationship between Public Administration and Private Company.

In any case, besides the Service Contract, a detailed "Management Performance Chart" between the Municipality and the operator contracted for UCC management should be defined, in order to clearly define since the beginning not only contractual issues (in terms of rights and obligations) but also the level of performances that the operator shall guarantee for the whole contract duration.

Some of the provisions to be included in the two above mentioned documents are listed, as an example, below.

- Contracted operator manages Logistics Services and has the right to use the infrastructures, technologies and all the tools for the UCC, provided by the Municipality, which is the sole owner;
- Contracted operator must guarantee the service with respect to market standards and quality indicators, directly and/or with sub-contractors (sub-contracting part of the service should be allowed);
- Contracted operator must guarantee service fares in line with market prices;
- Contracted operator must guarantee maintenance of infrastructures, vehicles and devices, all logistics operations and related expenditure;
- Contracted operator must guarantee the ICT platform operation and maintenance and all the accessibility services;
- Last mile services should be carried out with zero emission vehicles;
- Contracted operator shall comply with quality and quantity service indicators (defined by the Municipality and agreed before the start of the contract);
- Contracted operator shall perform at least 2 promotion campaigns and customer satisfaction surveys.
- Municipality can act on the UCC for the extension of business and obtaining funds;
- etc.

6.1.9 COST AND IMPACT DIMENSIONS

6.1.9.1 Management model

As already highlighted, in synthesis, the key objectives for the Almada UCC are represented by the freight collection and the last-mile delivery in the reference area. In order to achieve economic self-sustainability of these services in a short time it is mandatory, in particular during the early stage of implementation, to adopt a "light and simple" management in terms of infrastructures, procedures (administrative and operational) and human resources.

This approach cannot fail to carefully appraise two crucial elements:

i) Logistics services shall guarantee a level of quality, efficiency and safety (i.e. freight insurance) which is equal to the one offered by National/International freight operators (if not better, considering the advantages of a small-scale structure);
ii) Besides performing basic functions dealing with daily logistics management (i.e. collection and delivery planning, real-time monitoring of vehicles/deliveries, administrative management, etc.), the ICT platform shall guarantee a correct exchange and integration of data with the information systems of the different operators, in order to have continuity in delivery tracking and tracing.

Concerning the human resources needed to perform the Almada UCC activities (administrative and operational), at least at the early stage of the UCC implementation, the employment of workers with "multifunctional" skills would be preferable, in order to minimize staff costs (i.e. drivers shall collaborate also to loading/unloading operation, etc.).

A possible alternative solution consists in externalizing some activities by sub-contracting service providers cooperatives (i.e. driver cooperatives) allowing a flexible management of the fleet, "tailored" to the volume of freight to deliver, that, in particular for those operators located in Almada and supplying the Caparica area, is characterized by significant seasonal variation, due to the touristic importance of the beach front.

According to these considerations on staff members, a minimum of 3 professional skills is needed for managing the studied Almada UCC:

- Technical manager and administrative manager (1 person at the start, 2 people in case of future expansion);
- Delivery planner and warehouse re-

sponsible (1 person);
- Drivers (also collaborating to loading/unloading).

As already stated above, after a first phase when administrative/planning procedures can be performed with no ICT systems, at a later stage an appropriate IT management platform should be implemented, paying particular attention to the integration aspects.

The management model should foresee the "classic" operational schemes dealing with freight collection (direct or cross-docking), consolidation, delivery, track and tracing (using GPS equipped vehicles), management, administration, etc.

6.1.9.2 Investment costs

Considering the Almada UCC as built on a public (Municipal) area, the overall costs can be summarised in the following categories:

1. Warehouse and fence;
2. Office furniture and equipment;
3. ICT platform;
4. Electric transpallet and freight handling equipments;
5. Electric commercial vehicles (2).

In order to reduce investments in the start-

Costs detail – maximum estimation

1. Construction of 600 km2 warehouse and related fence (see Annexes for details)

- Iron structure and insulation		110.000 €	(72.200 € basic cost)
- Construction works		30.000 €	
- Electrical and the hydraulic systems/phone		5.000 €	
- Fencing		30.000 €	
	TOTAL	175.000 €	

2. Office

- Furniture and equipment		10.000 €
- Service box		5.000 €
	TOTAL	15.000 €

3. ICT systems

- Software logistics platform		15.000 €
	TOTAL	15.000 €

4. Electric transpallet and freight handling equipments

- Transpallet 1.600 kg capacity		4.000 €	(for details: www.carrelli.eu)
	TOTAL	4.000 €	

5. Electric vehicles

- 2 electric commercial vehicles - 3,5 tonnes		140.000 €
	TOTAL	140.000 €

The estimated initial investment amounts to around 370.000 €, +25% unexpected costs, for a total of around 470.000 €, while in case of renting electric vehicles (around 600 €/ vehicle/month), the total estimated investment costs is reduced to 290.000 €.

6.1.9.3 Operating and maintenance costs

a) Management costs

1. Almada UCC operation costs in the start-up phase (minimum staff)

	Costs/year	
- 1 administrative person	35.000 €	
- 1,5 warehouse staff	45.000 €	(with substitute staff for holiday periods)
- 2,5 drivers	75.000 €	(with substitute staff for holiday periods)
	TOTAL 155.000 €	

2. Almada UCC operation costs in full activity (minimum staff).

	Costs/year	
- 2 administrative people	70.000 €	
- 1,5 warehouse staff	45.000 €	(with substitute staff for holiday periods)
- 2,5 drivers	75.000 €	(with substitute staff for holiday periods)
	TOTAL 190.000 €	

This second configuration can be also considered as a “reinforced” staff in the start-up phase.

b) Structure and equipment/fleet maintenance costs

This item can be considered as a yearly 10% of investment costs (470.000 €): 47.000 € /year.

In case of electric commercial vehicles renting:

- Structure and equipment maintenance costs	29.000 €/year	(10% of 290.000 €)
- Renting of 2 electric vehicles (600 € * 2 *12)	14.400 €/year	
	TOTAL 43.400 €/year	

The initial yearly management costs amount to around 200.000 €/year (155.000 € + 47.000 €/year). This amount does not include buildings depreciation costs (around 14.000 €/year) and electric vehicles consumption costs (in terms of batteries and recharging).

up phase, second-hand transpallet and electric vehicles can be purchased (considering 50% of full price) or rented.

6.1.9.4 Estimate Business plan

The initial configuration of the Almada UCC foresees the use of two FEV (3,5 tonnes vans) that can run 4 trips/day each (2 trips in the morning + 2 trips in the afternoon) to perform all the expected deliveries.

Considering a revenue of 6 € for each delivery (composed of one or more parcels for a total of max 100 kg), representing a price in line with logistics market, a minimum number of deliveries/day is required to achieve a balanced budget (excluding depreciation costs), in particular:

- 8 trips/day x 300 days/year x 6 € = 14.000 €/year; yearly income for 1 delivery of each vehicle
- 200.000 €/year management cost / 14.000 €/year = 15; number of deliveries to be made by each vehicle

*These figures draft a business plan showing that **the Almada UCC is economically sustainable only if an average number of 15 * 8 = 120 deliveries/day can be ensured.***

6.1.9.5 Energy and environmental impacts

CO2 emissions reduction

The planned Almada UCC will be located 2,5 km far from the central point of the study area (Praça Movimento das Forças Armadas), thus every electric van will cover around 10 km/delivery trip.

Considering that the UCC electric vehicles have an optimized load (min 90% of full capacity vs. 30-40% of freight operator vans), an optimized electric vehicle is equivalent to around 2,5 current freight vehicles.

The use of optimized electric vehicles is equivalent to:

- 8 trips x 10 km x 2,5 = 200 km/day, not covered by conventional diesel vehicles.

As GHG emissions of a light diesel vehicle are around 430 gCO2eq/km (equivalent carbon dioxide):

- 200 km/day x 0,43 kg/km x 300 operation days/year = ***25,8 tonnes/year gross CO2eq emission reduction.***

To take into account the CO2 emissions related to the energy consumption of the 2 electric vehicles adopted by the Almada UCC, it is important to consider that in Portugal, production of electricity by renewable sources can reach 60%, thus CO2eq emission per produced kWh can be as low as roughly 255 g.

Considering that the average consumption of one of the electric vehicles taken into account for Almada UCC would be 0,25 kWh/km, for an overall yearly distance of around 24.000 km a consumption of around 6.000 kWh can be calculated. Therefore, 1,53 ton CO2eq/year would be emitted for producing the kWh/year needed by the electric vehicles of UCC fleet.

Thus, the ***net CO2eq emissions reduction*** related to the implementation of the Almada UCC and the adoption of commercial electric vehicles would be of about 25,8 – 1,5 = ***24,3 tonnes/year.***

Energy consumption reduction

- Diesel vehicles

  Considering that a 3,5 t light diesel vehicle normally consumes 16,6 L/100 km:

  16,6 x 200/100 x 300 days = 9.960 L/year diesel x 0,835 diesel density = 8.317 kg/year diesel

  8.317 kg/year x 10.200 kcal/kg = 84.833.400 kcal /year

  84.833.400 / 10.000.000.000 = 8,84 toe/year

- Electric vehicles

  Consumption = 0,25 kWh/km

  200 km/day x 0,25 x 300 days = 15.000 kWh/year

  15.000 x 0,000086 =1,29 toe/year

Net energy consumption reduction = 8,84 – 1,29 = 7,55 toe/year

6.1.10 IMPLEMENTATION PLAN

Several positive European experiences highlight that a reasonably time needed for implementing an UCC, until its full operation phase, amounts to around 3 years.

Months	6	6	6	6	6	4	8
Deep analysis of Almada UCC sustainability, including evaluation of existing commercial activities and interviews dealing with the interest in a UCC by the stakeholders							
Interviews with the main freight operators for evaluating the possibility to sign commercial agreements allowing the companies to use the UCC							
Meetings with interested stakeholders, such as transport operators associations, minor freight operators, shopkeeper associations, citizens association, Chamber of Commerce, Municipality, etc. in order to create the maximum level of consensus regarding UCC implementation and operation							
Permits for UCC implementation (several procedures at Municipal offices, change of "intended use" of the area)							
Emission and adoption by the Municipality of specific normative for city logistics, oriented to push operators to the use of UCC services							
UCC Implementation							
Operations start-up							
Low operation level							
UCC in full operation (target 120 deliveries/day)							

According to this indication, the following table provides a possible implementation calendar for the Almada UCC case study.Table 2 - Iimplementation calendar for the Almada UCC

6.2 Pick-up Point (PuP)

6.2.1 DESCRIPTION OF THE MEASURE

The planning activities performed for the present study identified, as a possible location for setting up the innovative Almada PuP, the parking building of Afonso Henriques, close to the fish market in the central part of the study area, where FLEXIBUS depot and ECALMA call centre are currently located.

As already indicated, FLEXIBUS provides Almada residents and visitors with a flexible transport service from 7:00 to 19:00 in weekdays and from 8:00 to 13:00 on Saturdays.

A fenced freight area could be arranged inside the garage and dedicated to the collection and delivery of parcels related to B2C sector, i.e. goods purchased on the web (eCommerce).

As already stressed one of the main limits of eCommerce is that people are frequently (specially in the morning) out of home for several reasons (work, school, shopping, etc.) and thus are not able to collect their parcels/envelopes, which are brought back to the express courier depot, often outside the city, where the user will collect it, wasting time and fuel.

With the Almada PuP set-up at FLEXIBUS depot citizens could indicate this as the final address for delivering purchased goods and require the supplier to inform them by email once the delivery was made. This way the user will have the possibility to go to the PuP and collect his parcel during a long time window (opening hours of FLEXIBUS service or other timing periods defined on the basis of this service and on its success).

The presence of FLEXIBUS service infrastructure represents a particular opportunity to set up an interesting additional service to the "classic" PuP, consisting of the possibility to deliver the goods at a specific point, with a minor increase of the delivery fare. The electric bus driver could deliver parcels by agreeing a delivery time with the customer at one of the existing FLEXIBUS service stops.

6.2.2 MAIN ADVANTAGES OF PUP SERVICE IN ALMADA

The introduction of a PuP service for Almada residents is strongly recommended, also considering the very low investments needed and the benefits for users, environment and mobility produced by this light and simple solution, in particular:

- Useless trips in the city centre can be avoided;
- Customers will not need to move by car to the outskirts of the city for collecting their parcels. Afonso Henriques parking (FLEXIBUS service depot) can be easily reached walking from the city centre, by means of FLEXIBUS services, by tram, by bus and by bicycle;
- Supporting FLEXIBUS funding;
- First step for characterizing FLEXIBUS system as a possible first nucleus of e-urban logistics agency.

A future possible extension of the PuP service could take advantage from the Almada UCC implementation. In this sense the UCC logistics base can also operate, in principle, as an additional PuP located outside of the inner center of the city.

6.2.3 CONSTRAINTS, COSTS AND REVENUES

PuP service does not require significant investment costs considering the existing infrastructure (FLEXIBUS depot). Also the possible implementation of parcel delivery service at FLEXIBUS stops does not demand any investment, since this makes use of existing structures and staff.

The only constraint envisaged is that the service must be run by the parking company ECALMA, or an agreement with this institution, already working in the depot, must be reached for their staff to perform these additional activities.

Costs for setting-up the pick-up point inside the Afonso Henriques parking consist only of the expenditure needed for purchasing some shelves and to rearrange an existing office, for a total of less than 5.000 €.

Figure 38 – Afonso Henriques parking location – FLEXIBUS depot

Concerning the revenues of PuP service (and additional agreed freight delivery to a bus stop), fares should be at very low cost (maximum 1-2 € /parcel) in order to foster its use. In any case, also small revenues could be used to support FLEXIBUS service.

6.3 Market area service

6.3.1 DESCRIPTION OF THE MEASURE

As stated at Chapter 4.4, during the morning (from 6:00 to 14:00) the area around the Almada fish and vegetable market, an "hexagonal" building located in Praça do Comércio in the old town (and in particular the related parking spaces), is almost entirely occupied by freight vans, owned mainly by market internal shop keepers and working people. Indeed the market shopkeepers use their vans as second depots for their needs and activities.

Figure 39 – Vans traffic congestion in market area (Praça do Comercio)

Besides implying significant traffic congestion problems during the day (customers double- park their cars), this strongly affects the walking flow and the possibility for market clients to park near the market, provoking also negative impacts on the overall market business (Figure 39).

The solution could be defined around the following possible main elements/rules:

- After 7:00 parking times for freight vehicles should be limited to 30 minutes (45 minutes for private cars);
- After 8:00 freight vehicles should be allowed to park only for 15 minutes, and private cars for 45 minutes maximum;
- After 14:00 parking is re-allowed also to vans;
- Market shop keepers can park their vans for free inside the Afonso Henriques parking, located at a distance of around 120 meters;
- In the Afonso Henriques parking, one or more electric (or manual) trolleys, with a load capacity of 500 kg, are available to market shopkeepers, for free, so that they can easily transport freights all along the day to and from the market.

The main advantages of these logistics measures are:

- A better and more harmonized environment around the building, that would be visible to people passing by;
- A significant improvement of mobility in the area (also covered by FLEXIBUS service);
- Better walkability in the outside area;
- More parking space available for providers arriving during the morning, thus avoiding waste of time and fuel in the search for free spaces;
- More parking spaces available for market customers to park their cars during the whole morning.

From the environmental point of view significant benefits can be identified in terms of lower emissions and energy consumption, leading to an overall improvement of the quality of life in the area.

6.3.2 CONSTRAINTS AND COSTS

Envisaged possible problems can be identified in:

- Overcrowded garage damaging FLEXIBUS service operation;
- Opposition of shopkeepers to accept the new planned measures, although these could lead to an enhancement of sales (higher possibility for customers to park). This aspects should be addressed by a strong involvement activity (meetings with market shopkeepers, transport operator associations, citizens association, Chamber of Commerce, Municipality, etc.) in order to create the maximum level of consensus;
- Investment on the electric trolleys.

This measure benefit of already existing public infrastructures, thus no significant costs are foreseen.

The only devices to be purchased are the electric trolleys (two, at the start-up) costing around 1.850 € - 2.500 € each (source: www.carrelli.eu).

Figure 40 –Market (Praça do Comércio) and Afonso Henriques parking location

Figure 41 – Examples of electric trolleys

6.4 Extension of the Cacilhas logistics parking regulation and parking space signalling

In 2014 Almada City Council is going to promote a revision of the parking regulation of the Cacilhas zone, due to the need of including logistics issues, in the scope of ENCLOSE.

A parking regulation for this area already exists but it does not address logistics problems and it does not define loading and unloading areas, time windows nor any other type of logistic related norms.

In order to regulate parking of commercial vehicles, Almada City Council, as ENCLOSE project soft measure, will revise and update the parking regulation of Cacilhas.

Other Almada neighbourhoods have also specific parking regulations, but these have also not considered logistics in the planning phase. These neighbourhoods will benefit from the measures and their regulations will also be revised later on, according to the experience of Cacilhas.

This new regulation, covering the whole study area, foresees:

- Definition of specific time windows for loading/unloading;
- Definition of conditions for commercial vehicles to enter the Cândido dos Reis street, taking advantage of the recently installed access control equipment;
- Signage panels to be put at the beginning of access roads;
- Indication of loading/unloading areas in the official urban parking plan layout;
- Definition of these dedicated parking spaces on the ground by using coloured lines or, better, a different coloured asphalt (Figure 42);
- Signage panels indicating maximum stopping time for commercial vehicles and prohibiting parking to private cars and;
- Higher level of control/enforcement.

Figure 42 – Rendering of a possible layout for loading/unloading parking spaces

6.4.1 IMPACT DIMENSIONS

Based on traffic data surveys from December 2012, each day around 512 heavy goods vehicles enter the study area for freight deliveries, with 10-25 average deliveries per vehicle (see Chapter 4.3).

In the hypothesis that the new implemented system allows for a 50% reduction of the delivery route of commercial vehicles of around 10 meters (or that it improves the mobility of other vehicles for 10 meters):

512 x 0,5 x 17 average deliveries x 10 m = 43,5 km/day reduction Considering a number of 300 working days/year = 13.056 km/year According to data indicated at Chapter 6.1.9.5:

CO2 emissions reduction

13.056 x 0,73 kg CO2eq/km = **9,53 tons CO2eq / year of emission reductions**

Energy consumption reduction

13.056/100 x 24,0 L/100 km = 3.133 L of saved fuel

1.793 x 0,835 (sg) x 10.200 (sh) / 10.000.000 = **2,67 toe of primary energy saved**

If we consider light commercial vehicles also, the impact would be significantly higher.

7. CONCLUSIONS

The feasibility study for city logistics in Almada city centre shows that all the analysed measures represent an added value in environmental and energy terms.

In particular, setting-up an UCC along with the utilization of electric vehicles for freight delivery, besides bringing environmental and energy benefits, can also lead to an overall improvement of urban life quality, by reducing traffic and noise pollution.

It is nonetheless important to stress that the economic sustainability of the Almada UCC (break-even point), in a minimum start-up scenario, can be achieved with a minimum of 120 deliveries/day at a price of 6€ each.

In order to guarantee the economic sustainability of UCC implementation it is strongly recommended to identify, develop and set-up additional added value services (i.e. third party warehouse, packaging collection, hotel luggage services, elderly and disabled services, etc.), contributing to an enhanced use of logistics infrastructures, not being limited only to last mile/km service.

The planned logistics measure dedicated to the delivery of freight related to B2C processes (i.e. goods purchased on the internet), based on setting-up a pick-up point and related services, may provide citizens with a high value service, also considering the possibility of using FLEXIBUS in this useful service.

In what regards the new Cacilhas logistics parking regulation and its possible extension to the whole Almada urban area, and also the planned support measures and the new parking rules (and services) in the fish and vegetables market area, it is important to highlight that they will bring important benefits in terms of mobility, environment and energy, resulting in an overall improvement of quality of life in the city centre, with very low investments required.

8. REALIZATION PRIORITY

8.1 The overall realization timing and constraints

At the moment besides the "soft measures" which are already implemented concerning the creation and regulation of the parking areas for goods loading/unloading in the Cacilhas district, it is expected for the short term (by 2015) the extension of the legislation the whole city of Almada.
There are no specific technical constraints associated with the implementation of the selected measures. Of course these will be more thoroughly detailed after the feedback/suggestions from interested stakeholders. Besides the search for consensus of stakeholders the only constraint is represented by the financial resources of the municipality of Almada regarding the implementation of some of the measures (such as UCC) which have particular financial commitment.

For the adoption of the SULP the first measure to be implemented is the Market area service, along with the use of shared electric trolleys for freight delivery which could lead to an overall improvement of the quality of life in the area. Afterwards, the implementation of PuP system could be put into practice since it does not require significant investment costs considering the existing infrastructure.
Finally, due to the significant implementation and operational costs, along with the time needed for full implementation, the UCC was selected to be the last measure to be implemented. It is important to outline once again that the introduction of an UCC should be a participative process involving several public and private stakeholders in close collaboration and agreement, and including a strong political willingness.

8.2 Energy and emission savings for 2015

The energy and emissions savings for 2015, assuming conservatively that regulation of the loading/unloading areas remains implemented only in the Cacilhas district, amounts to 36,52 ton of CO2 and 10,23 ton of oil equivalent.

8.3 Energy and emission savings for 2020

Based on the decisions that it will be taken after the debate with the stakeholders and considering the financial resources of the of Almada Municipality, an action plan will be set and consequently the energy and emissions savings for the time period will be calculated taking into account the calculations detailed for each measure in Chapter 5.

9. PROMOTION AND COMMUNICATION PROCESS

An effective information campaign both to citizens and to stakeholders (in particular the shopkeepers and the logistics operators) should be carried out for each measure that will be implemented. A strong involvement activity is fundamental to the implementation of the measures, which need the highest possible level of consensus.

As in other follower towns, the SULP document development has been a progressive process: from the solid basis of the Feasibility Study developed within the ENCLOSE project and the "soft measures" results, a draft document was designed.

The several promotional and discussion activities (including 2 ARE) hold in Almada were a useful tool for stakeholder's information and consultation After the implementation of the "soft measures" and the adoption of the Almada SULP, the monitorization of the impact of the measures and services, along with feedback from the main stakeholders (shopkeepers, logistic operators, clients and residents in the city centre) will provide better understanding of the effectiveness of the SULP, and provide indications about the possible need of assessment and implementation of additional measures.

10. ROAD MAP TO THE SULP ADOPTION

After the comparison with the stakeholders held in September 2014, the SULP developed by the Almada Municipality was improved with some suggestions, which allowed to produce the final version of the document. It will be established an implementation schedule highlighting the priorities. These will be determined, as stated above, on the basis of cost/benefit and the financial capabilities of the Municipality.
This updated version of the SULP will therefore be shared by the local authorities and by the stakeholders interested in urban logistics. The SULP therefore will represent the guideline for the realization of the plans of mobility in general and freight transportation in particular for the near future for the city of Almada.

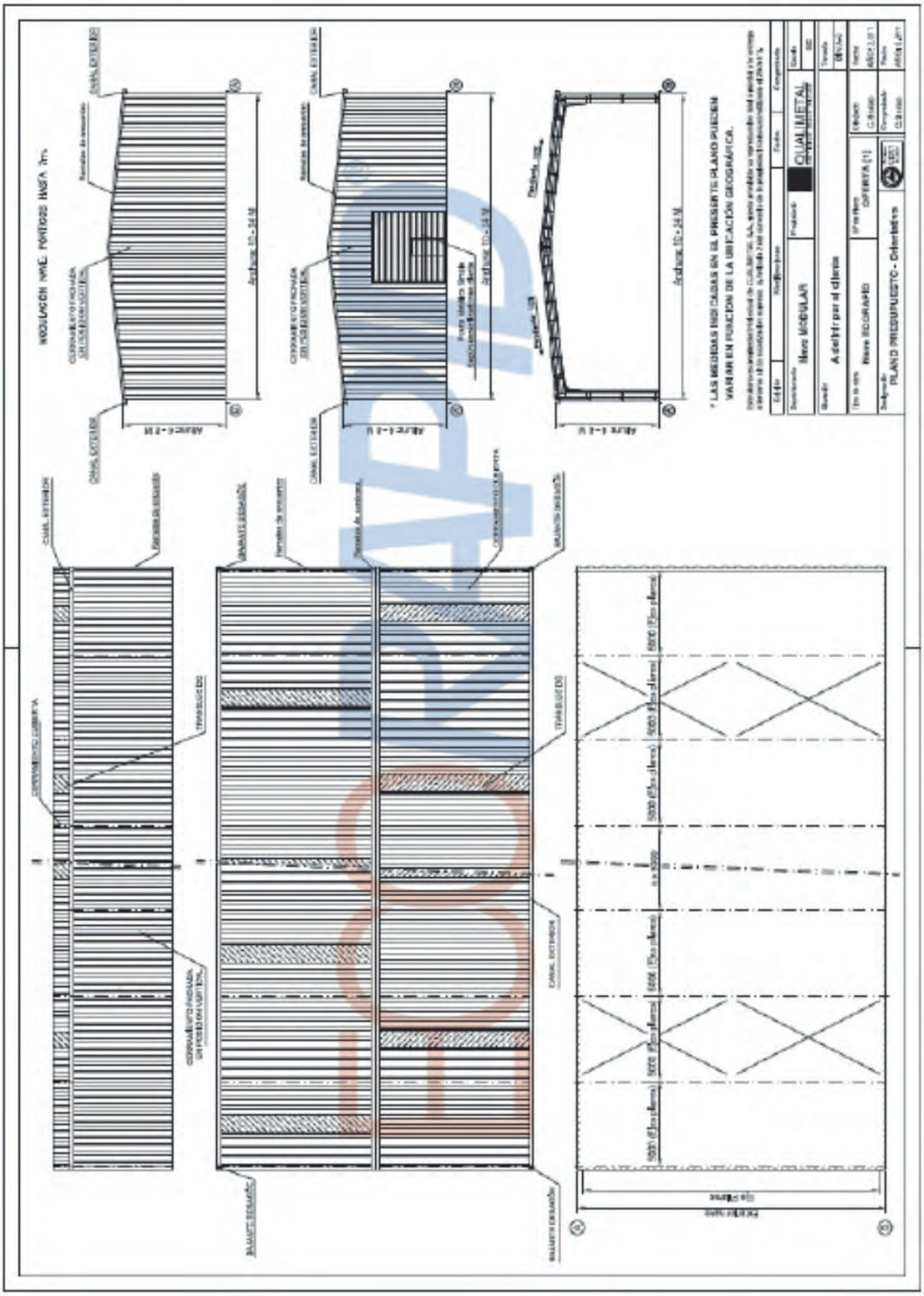
ANNEX

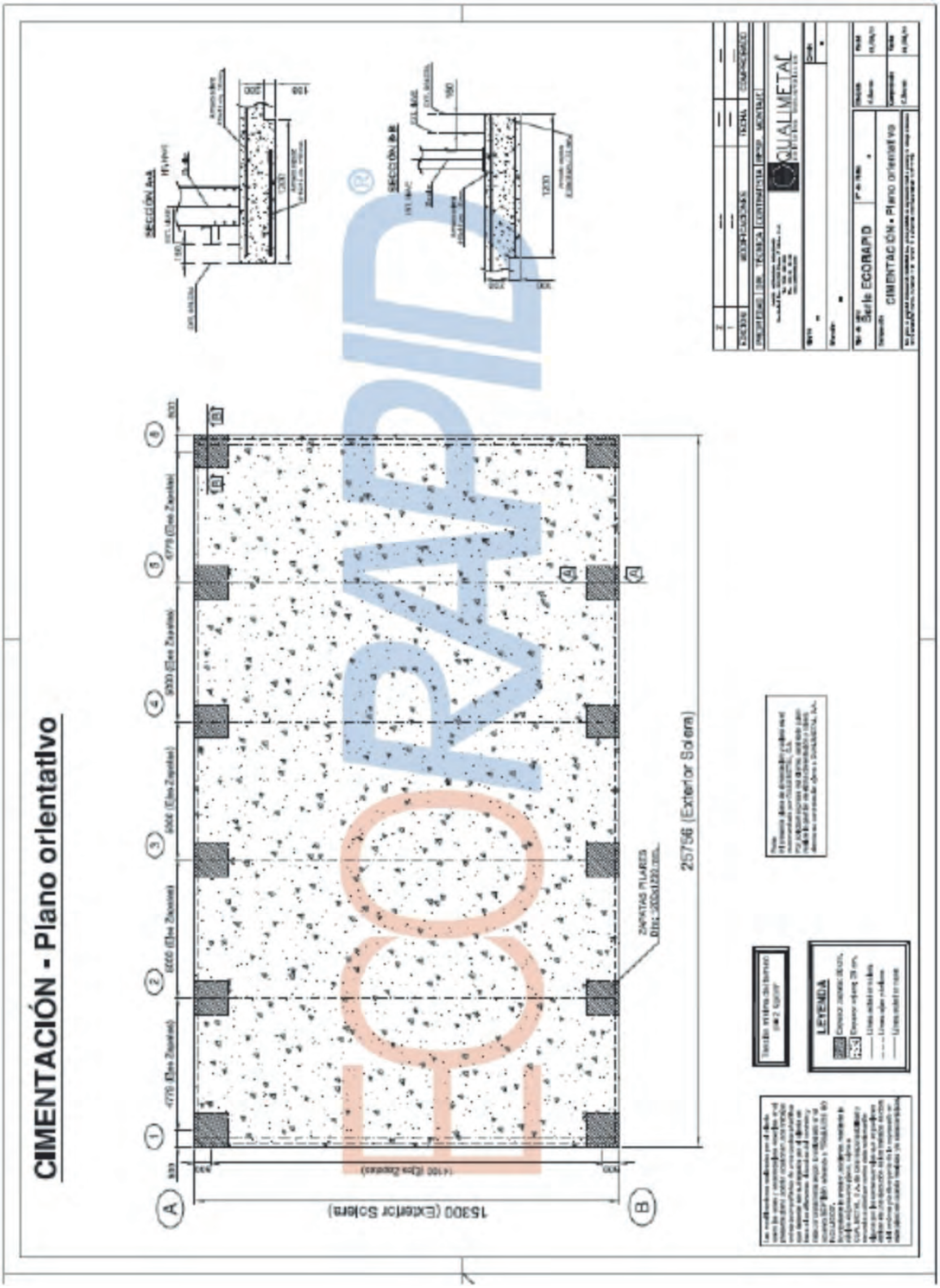
ALMADA BASELINE

Light vehicles				*ENCLOSE Benefits*	
N of vehicles	1.024	CO2 Emission	334 gr/km	Cut trip/delivery	10 m
Average trip	6,00 km	Density	0,835	Cut trip	170
Working days/yr	300	Kcal/kg	10.200	Relative cut	2,8%
Deliveries/trip	17	Consumption	11,00 l/100km		
				Emission benefit	17,46 ton CO^2
Emissions	616 ton CO^2/year			Energy benefit	4,89 toe
Energy consumption	173 toe/year				
Heavy vehicles				*ENCLOSE Benefits*	
N of vehicles	512	CO2 Emission	730 gr/km	Cut trip/delivery	10 m
Average trip	6,00 km	Density	0,835	Cut trip	170
Working days/yr	300	Kcal/kg	10.200	Relative cut	2,8%
Deliveries/trip	17	Consumption	24,00 l/100km		
				Emission benefit	19,05 ton CO^2
Emissions	672 ton CO^2/year			Energy benefit	5,34 toe
Energy consumption	188 toe/year				
BASELINE		*Feasibility S.*		*Enclose benefits*	
CO2 emissions	1.289 ton CO^2/year	623		Emission benefit	36,52 ton CO^2
Energy consumptions	361 toe/year	202		Energy benefit	10,23 toe

Assumptions	
Vehicles	EURO 2
Diesel CO2 emiss.	3,04 kg/l
Share of heavy duty vehicles	33%
Heavy duty consumption	24,00 l/100km
Light duty consumption	11,00 l/100km

Warehouse details

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BALCHIK

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6

SULP "Sustainable Urban Logistics Plan"

WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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Circulation

Public

Date

30.10.2014

Община Балчик

BALCHIK

SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. GENERAL TOWN CONTEXT

Balchik municipality is located in North-East Bulgaria in the Dobrich District. It is a Black Sea municipality, a resort center and a popular tourist destination. The town of Balchik is small sized with about 23 000 inhabitants. During the summer time they can reach a number of about 25 000. There are two ports in the town - Cargo berth and Yacht marine – both located on the sea coast just down the town.

The Cargo is used generally in season's regime – mainly summer and autumn due to the exported goods – mainly corn and wheat. Huge storage building about such goods is located just at the port entrance. During the summer and autumn season's huge quantities of rough grain are exported. The road entrances and exits of the town are two min and two smaller due to the specific geography position - hill area - and are dictated by the local topography. The huge landslides surrounded the town above.

ALBENA Resort

The ALBENA resort's hotels are about sixty and have more then 20 000 beds in single, double, triple rooms and apartments. During the summer time almost all facilities are in use. During the other seasons – only part of the hotels are open, especially those with SPA facilities. The ALBENA resort is a huge complex with large development of the logistics during the summer. It could be the only place, where the optimization of logistics, ENCLOSE experience and CO2 and other gas polluters can decrease due to the different measures. Unfortunately, this is a private consortium property and not under the Balchik municipality owners' jurisdiction.

Sea resort TUZLATA

This is a small recreation area (Sanatorium) with a unique former lagoon and a mud lake with healthy mud and all mud procedures included in it. It is located about 10 km north of town of Balchik and is very famous among the people needed mud procedures.

University Botanical Garden

The Botanical Garden is the main attraction in town of Balchik. Its 10 hectares surround the small summer palace of the Romanian Queen Marie – XX century. The gardens are set on a steep hillside – deep huge landslide with Pleistocene age, and descend in 6 terraces to the sea - supposedly one for each of the Queen's children. There are over 3000 varieties of shrubs, roses and flowers, set among streams, waterfalls, and ornamental channels. This is the only almost pure "green area" in Balchik with all restrictions to cars and logistics. The Botanical garden is under the jurisdiction of the Sofia University "St.K.Ohridski"

Some statistics about Balchik and Balchik municipality

Area size of Balchik municipality: 523km^2

Area size of Balchik town: 23 km^2

Population of Balchik municipality: 23161 people (during summer time increased by 2000-3000 people)

Total Towns and Cities in Balchik municipality: 1

Total Villages in Balchik municipality: 21

Centre of Municipality Balchik: Town of Balchik

Total length of streets in Balchik: 213 km

Main industry: tourism (Albena resort), mining (Village of Obrochishte - a manganese mine), port activities (Balchik - two ports)

Cities and villages in Balchik municipality: Town of Balchik, Village of Bezvoditsa, Village of Bobovets, Village of Bryastovo,

Balchik town, Obrochishte mining village (blue), Botanical gardens with the Queen's Mary Palace (magenta) and the main tourist areas – Balchik promenade and Albena resort (green)

Areas in Balchik with straight streets (red) and curvy streets (magenta)

Village of Gurkovo, Village of Dropla, Village of Dabrava, Village of Zmeevo, Village of Karvuna, Village of Kranevo, Village of Kremena, Village of Lyahovo, Village of Obrochishte, Village of Prespa, Village of Rogachevo, Village of Senokos, Village of Sokolovo, Village of Strajitsa, Village of Trigortsi, Village of Hrabrovo, Village of Tsarichino, Village of Tsurkva

TOWN PROBLEM STATEMENT AND OBJECTIVES

Balchik problems regarding mobility and environmental aspects are related mainly to the summer season, when the traffic and goods flows increase dramatically.

During the present days Balchik is a small Black Sea municipality, a resort centre and a popular tourist destination. There are two ports in the town of Balchik - Cargo berth and Yacht marine – both located on the sea coast just down the town. The Cargo is used generally in season's regime – mainly summer and autumn due to the exported goods

Balchik – main road entrances/exits. The "green area" is magenta circle. The peers of the ports (Cargo berth and Yacht marine) are visible in the sea (blue area).

Predominant wind directions (breeze - green arrows) and dominant seasonal winds - magenta arrows.

– in general corn and wheat. Huge storage building about such goods is located just at the port entrance. During the summer and autumn season's huge quantities of rough grain are exported. This suggests the huge seasonal traffic by heavy trucks.

The main traffic streams are going trough the two main entrances/exits located at the relatively smooth plain. Going down steep slopes are developed by the very intensive local active landslides. It gives the town very specific morphology of the streets, shops and entertainment facilities.

The local streets are developed in two main types:

- straight streets (localized in the new built part of the town) and
- very curvy streets (on the steep slopes) of the older part of the town.
- air quality

The air quality is not a significant issue in Balchik. This is due to the local morphology and year wind directions.

The local sea breeze is blowing to and from the sea almost all year. Very few days (during the winter cold days) are with local inversion. The dominant season winds are North-ward and South-westward.

Due to the limited budget and the good climate conditions the environmental issues are not of significant importance for the Municipality authorities.

2. STUDY AREA AND GENERAL ASPECTS

The studied areas include the main touristic and commercial part of Balchik.
Two main localities are outlined:
- Balchik town (divided to old and new part).
- Promenade area – with the main hotels, restaurants and attractions

Goods distribution scheme
The shops (and hotels, restaurants, etc.) are divided in several groups (see Table 1)
The delivery flows are going in two directions – to the old part and to the new one.
The main suppliers are private firms using light vans (LGV).

In the central part there are several office buildings within the study area including the headquarters of Balchik Municipality and underground garage for about 40-50 cars.

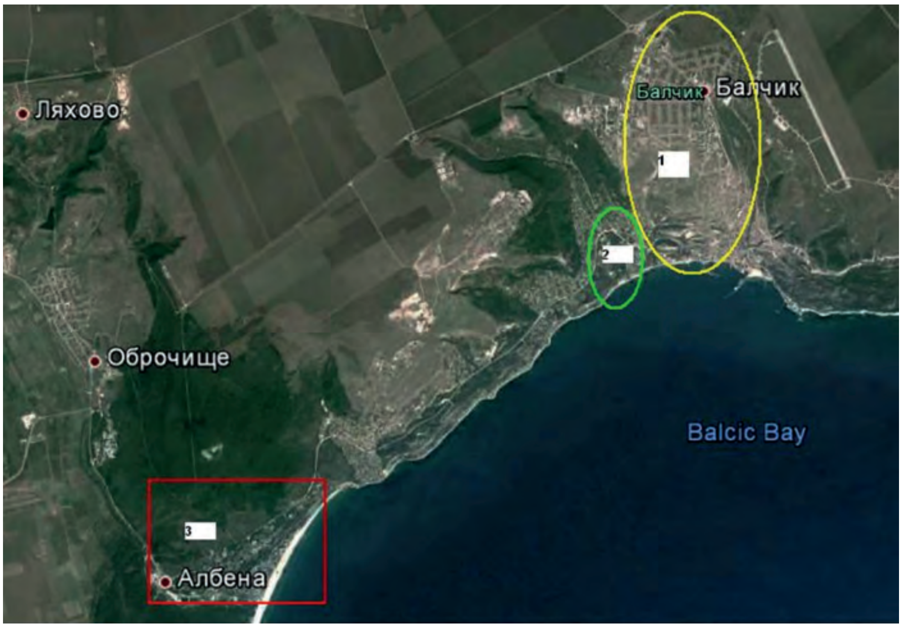
Table 1

Shops (hotels, restaurants, etc.)	Number	%	Location (old or new part)
Supermarkets	2	2	1 old part 1 new part
Small private shops (foods, drinks, ice-cream, etc.)	24	24	18 – old part 6 – new part
Beach supplies	5	5	4 old part 1 new part
Souvenirs	7	7	5 old part 2 new part
Light industry goods (electronics, house appliances, cloths, etc.)	8	8	4 old part 4 new part
Hotels	5	5	5 old part
Restaurants	14	14	9 old part 5 new part
Storages	1 huge	1	1 old part
Offices (admin., banks, posts, etc.)	17	17	13 old part 4 new part
Coffee shops	15	15	8 old part 7 new part
Total	100	100	

3. LOGISTICS CONTEXT

The study area covered the entire Balchik town and related with it local “villa - cottages” zones, which are incorporated. Then Queen Mary’s summer palace (the main historical site) and botanical gardens (like typical “green” zone) and Albena resort as part of the Balchik municipality administrative ruled area are presented. After some discussions – both – Botanical gardens and Albena resort have been excluded of the studied area.

Some of the LGV – light goods vehicles (in general private) are entering the restricted zone from 6 to 9 AM and from 23 to 24 PM (changeable during the different seasons) just for fast loading/unloading procedures – mostly for goods supply – small industrial products like gifts, souvenirs and fruits and vegetables, as well as ice-cream.
The studied areas include the main touristic and commercial parts of Balchik.
Two main localities are outlined:



Balchik town (1-yelow), green zone (2-Botanical gardens and Queen’s palace (green) and Albena resort (3-red quadrangle)

The focus of investigations is related to the coastal area – Balchik Promenade, where the main hotels, restaurants, shops and entertainment facilities are located.
There are some limited specific regulations for commercial and freight vehicles circulation, entrance and parking. Almost all (4 for now) big hotels have their back yards access areas where heavy vehicles can temporary (juts for loading and unloading) stop. As the schedule is well known by the drivers, car traffic jam is practically not possible.

- Balchik town (divided to old and new part).
- Promenade area (Dambata)– with the main hotels, restaurants and attractions

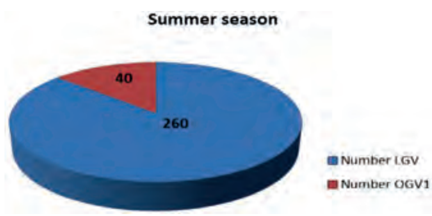
3.1 Specific regulations for commercial and freight vehicle circulation

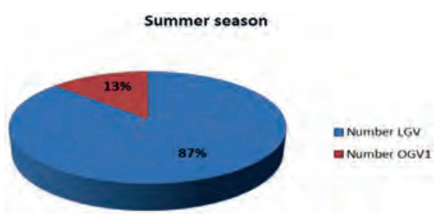
There are no specific regulations governing commercial and freight vehicle circulation in the study area. These vehicles are subject to the small regulations outlined above that apply to all vehicles except buses. These are some distances of space that are available only for vehicles loading and unloading goods for hotels. Enforcement of the loading intervals are provided by the private security firm. The parking places are limited due to the topography restriction from the hilly and landslides activity.

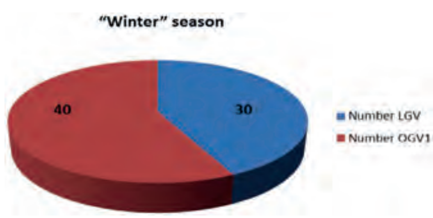
3.2 Main types of logistics flows

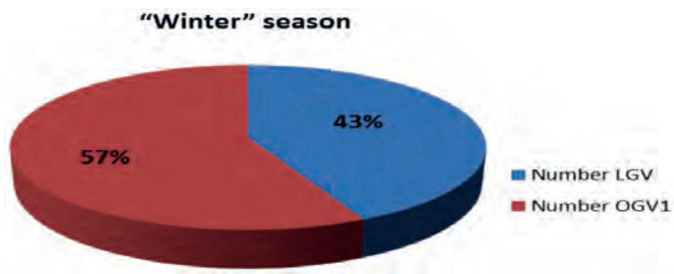
Traffic counts were undertaken during several days in tourist, intermediate and non-tourist season in 2012-2013 to determine the number of commercial vehicles entering the study area during weekends and working days. The total numbers of commercial vehicles entering and leaving the study area Balchik are:

seasonality	N# LGV	N# OGV1	Km in average
Summer season	260	40	6
“Winter” season	30	40	8





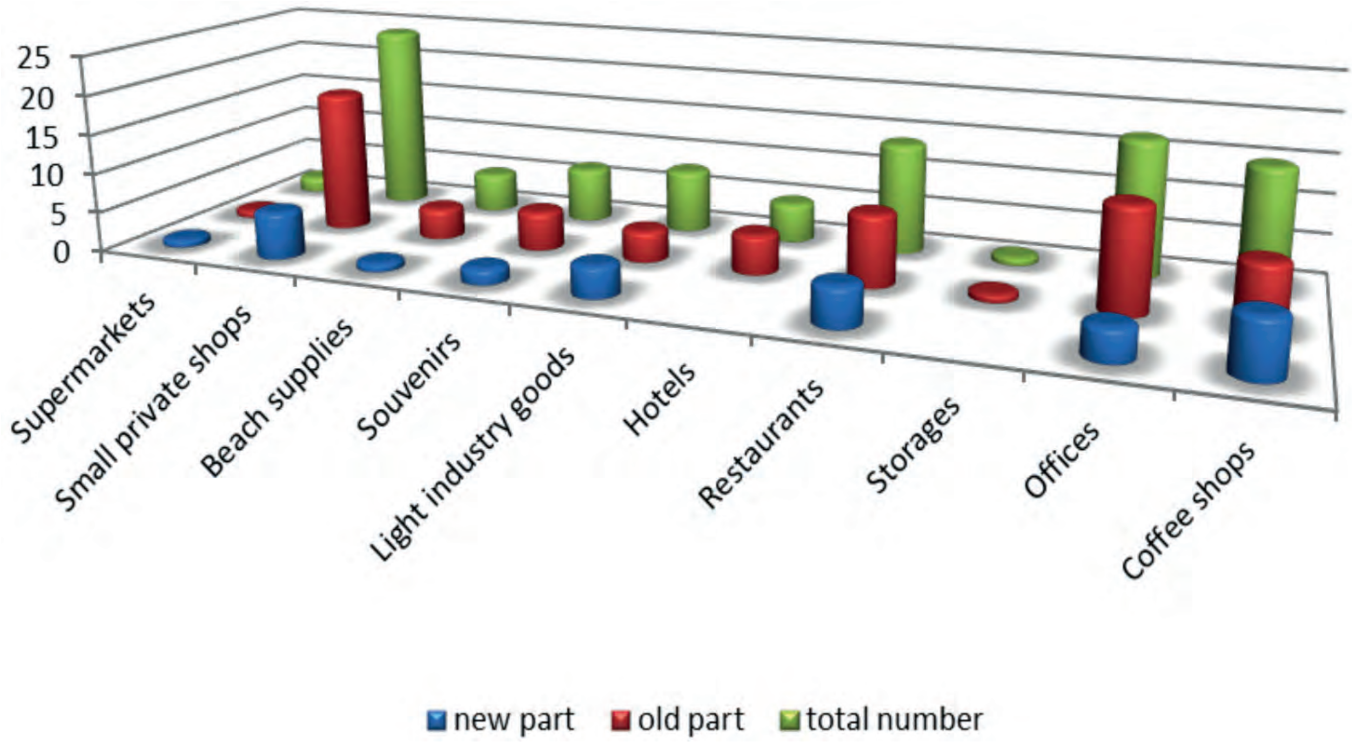




Diagrams of the numbers of vehicles during the winter and summer season, as well the average kilometers of the respective types of vehicles traveling in the town.
Responsibility for organization of deliveries is generally through small private companies. They cover deliveries of about 76% of hotels and small shops located in the study area.

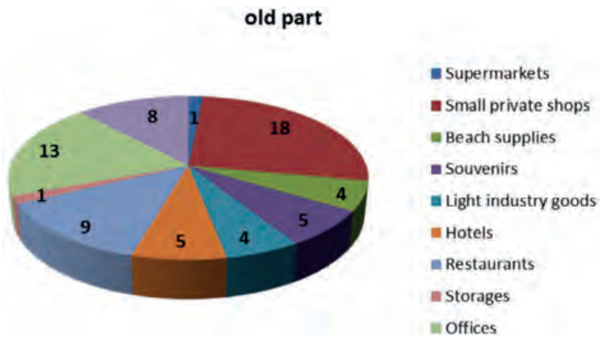
3.3 Logistics baseline

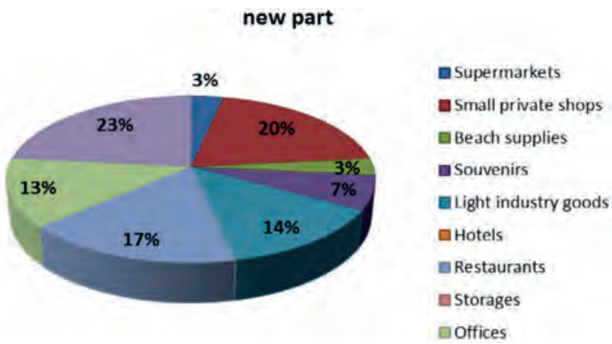
The commercial activities in Balchic are located in the two main parts of the town – the "old part" and the new part.
Due to its topography peculiarities – high hills moderated by the huge landslides, the old part is characterized by two main entrances/exists of the transportation roads and two secondary roads to the direction of Tuzlata. The streets are curvy and steep and can not absorb huge traffic. The only larger roads are around the sea and over the hills. They are responsible for the main traffic – tourist cars, LGV and OGV1 vehicles. In general the shops, restaurants and hotels are located near the sea shore. Predominant hoses are between 1 and 3-4 stores.
The "new part" was build up during the 1960-ies and was related mainly with the military activity – the military and training base for air jet commands. The urban planning is modern and streets are straight. The building stock is mixed – higher blocks of flats (5-8 stores) and lower houses and public buildings – offices, schools etc.
In both parts shops, coffee shops and other public buildings are located approximately equally.
The population is also distributed approximately equally – about 45% (old part) to 55% (new part). In general the shops, restaurants and hotels are located near the sea shore.



Distribution of the commercial activities in Balchik – new part, old part and total number

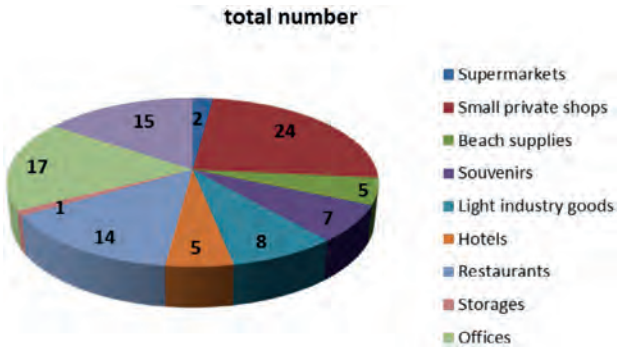
The number of the shops and other commercial units are presented to the following pies and diagrams:



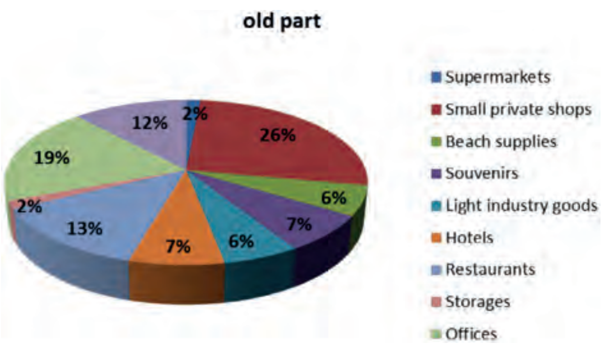


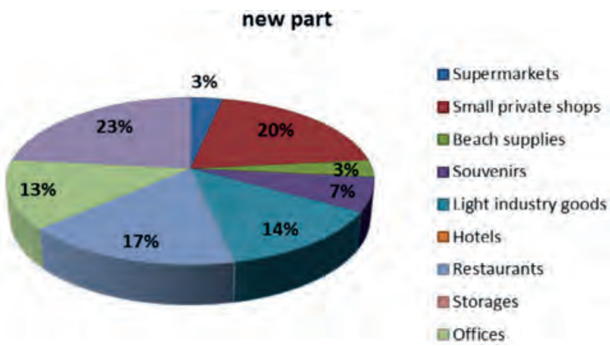
The goods traffic flows are directly related to the location and the number of the commercial buildings, shops, coffee shops (frequently placed in the street floors of the private homes), etc.

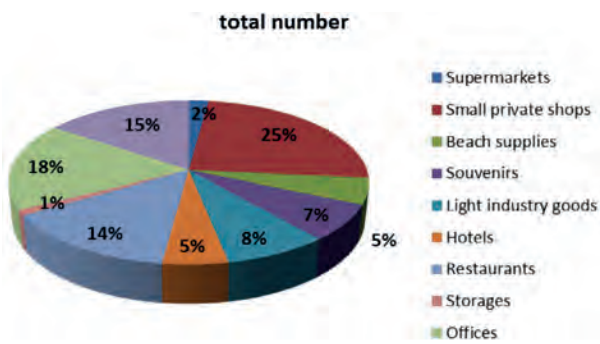
The delivery of the goods is executed by the private firms which have contracts with the shop owners. The time schedule is rather free and is arranged mainly for the big consumers like hotels and supermarkets – they are supplied in general each week to keep the vegetables, fruits, meet and other goods in fresh condition. Distribution of deliveries in the town involved regulating the vehicles that enter the urban zone and assigning specific areas for distribution in the pedestrian and access restriction area. The end results are deliveries that are more methodical and less damaging to the surrounding environment



The following pies and diagrams show the percentage distribution of the different commercial units – both in the old and new part of Balchik.







The analysis of the figures above shows that the old part and the new part are almost equaly suplied for the local food shops, coffee shops and supermarkets. The predominant number of the hotels, souvenir shops and beach suplies is related to the old part due to the tourist buisnes and are located near the sea shore. These goods flows together with the huge corn storage and the offices covered more then 40% of the trafic flow near the shore.

3.3.1 COMMERCIAL VEHICLE FLOWS AND MAIN TYPOLOGIES

To highlight the traffic and possible logistics problems the survey of the entering/leaving cars, LGV and OGV1 vehicles have been preformed at the entrances/exits of the town (study are "entire Balchik") and Promenade (study area "promenade")

Traffic counts were undertaken during August and September 2013 in both study areas – Study area 1 – "entire Balchik" and study area 2 – "Promenade" to determine the number of commercial vehicles and tourist cars entering the study areas during weekdays (Monday to Friday) and holidays (Saturdays - Sundays).

The following abbreviations are used:

TC – tourist cars are included in the study, because they are the main traffic flow

Commercial vehicles were classified by two types, as follows:

LGV – light goods vehicles – comprising car derived vans and goods vehicles up to 3.5 tones.

OGV1 – 2 and 3 axle rigid vehicles over 3.5 tones GVW

Gross Vehicle Weight (GVW) (typically Ford Transit type vehicles)

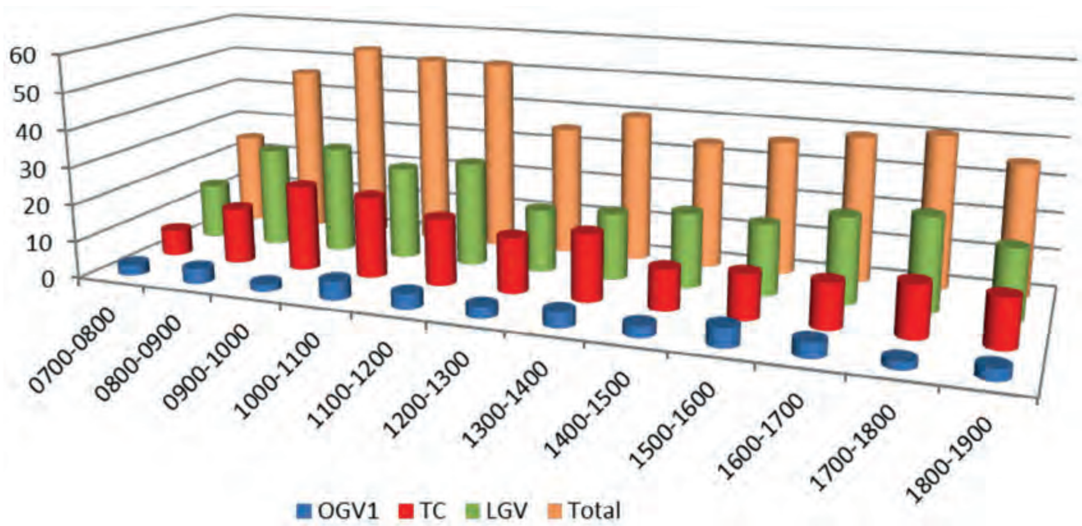
The only two entrances and exits (main streets) in the study area make the counting procedure pretty easy and effective.

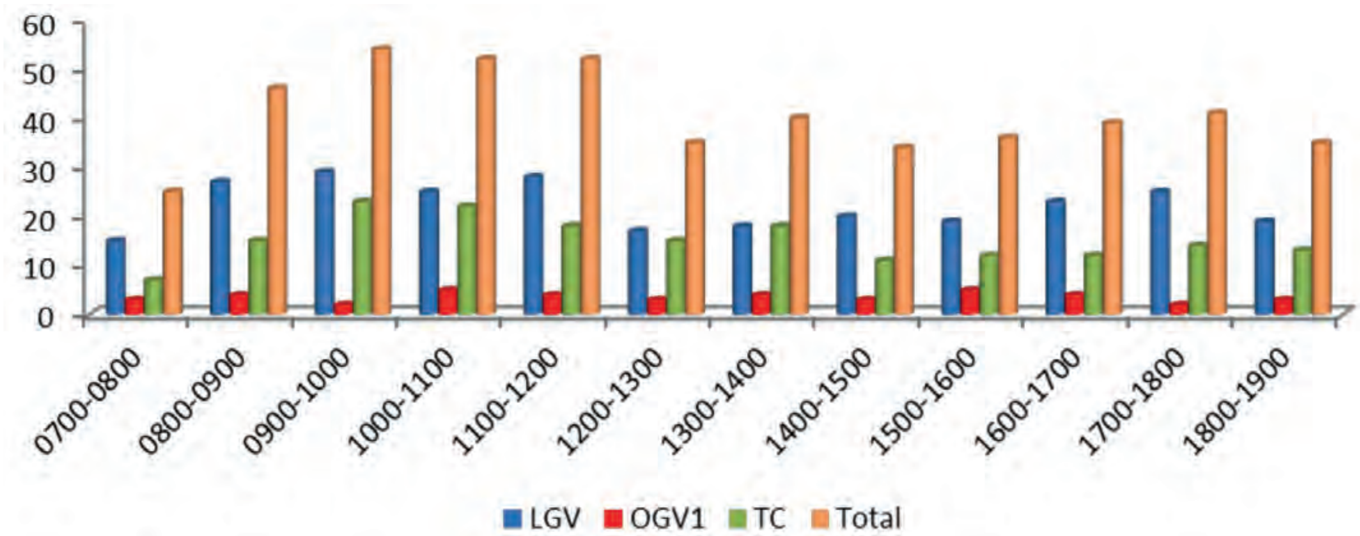
The counts were made for 60 minute periods over a 12 hour day from 07.00 to 19.00. (workdays - tourist season – entire Balchik) – Table 2

Table 2 – Numbers of cars for the study area "entire Balchik"

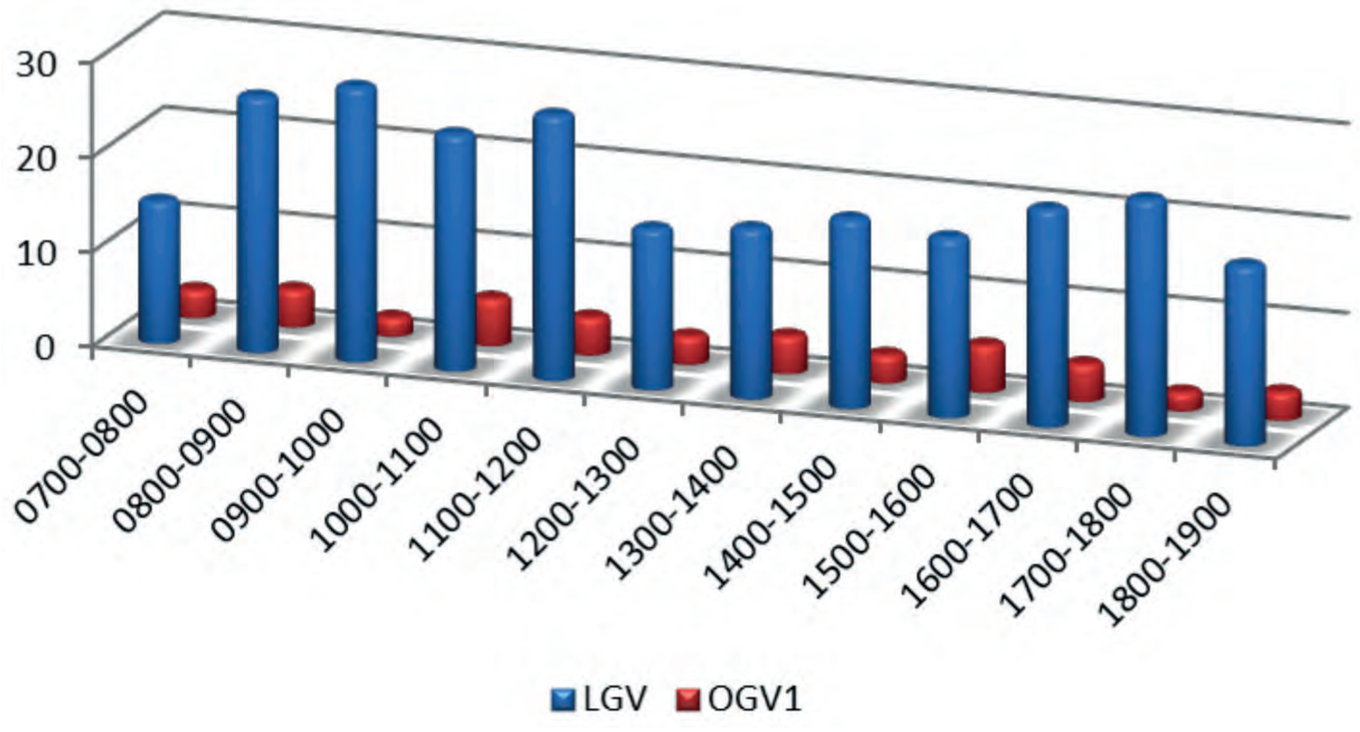
Time period	Number of vehicles			
	LGV	OGV1	TC	Total
0700-0800	15	3	7	25
0800-0900	27	4	15	46
0900-1000	29	2	23	54
1000-1100	25	5	22	52
1100-1200	28	4	18	52
1200-1300	17	3	15	35
1300-1400	18	4	18	40
1400-1500	20	3	11	34
1500-1600	19	5	12	36
1600-1700	23	4	12	39
1700-1800	25	2	14	41
1800-1900	19	3	13	35
Total	265	41	182	488

The traffic flows are presented by the following histogram and diagram.





To separate the tourist cars (they are the main component of the traffic flow), the LGV and OGV1 vehicles have been counted. The results are presented to the next diagram.



The analysis shows that these flows (LGV+OGV1) formed more then 70% of the CO_2 emmissions. This is approximately constant value. It changes mostly during the summer time, but not more than 10-15%.

3.3.2 ROUGH ENERGY AND EMISSION QUALITATIVE CONSIDERATIONS

To investigate the seasonality distributions additional investigations have been performed during the winter season in Balchik - 2013. The seasonality of the tourist activity has been studied, about "winter" (called calm tourist season) and "summer" – called active tourist season and CO_2 emissions calculated. Table 3.

The data related to the daily traffic in the study area extended to all vehicles (cars and commercial vehicles) are very useful. From these data we calculated the baseline (CO_2 emission and energy) which shall only refer to logistics activities. For this purpose we indicated the data that we have already assumed for commercial vehicles (diesel vehicles Euro 2-3). We consider these averaged values are suitable):

-Emissions :

OGV1 : average experimental consumption = 6 Km/lt; CO_2 emissions = 0,433 gr/Km

LGV: average experimental consumption= 8,3 Km/lt; CO_2 emissions = 0,342 gr/Km

Diesel specific gravity = 0,835 Kg/lt

-Energy:

1Kg diesel = 10.200 Kcal

For the calculation is possible to estimate how many kilometres a commercial vehicle run in average within the Study Areas.

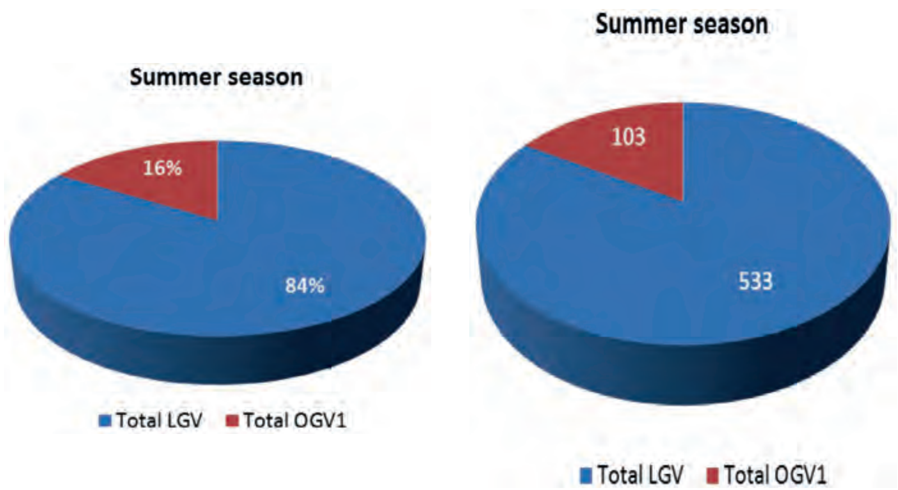
Estimation of the average consumption of the LGV and OGV1 – Table 3

Table 3. Seasonality rate of average numbers and kilometers of LGV and OGV1 with the CO_2 emissions

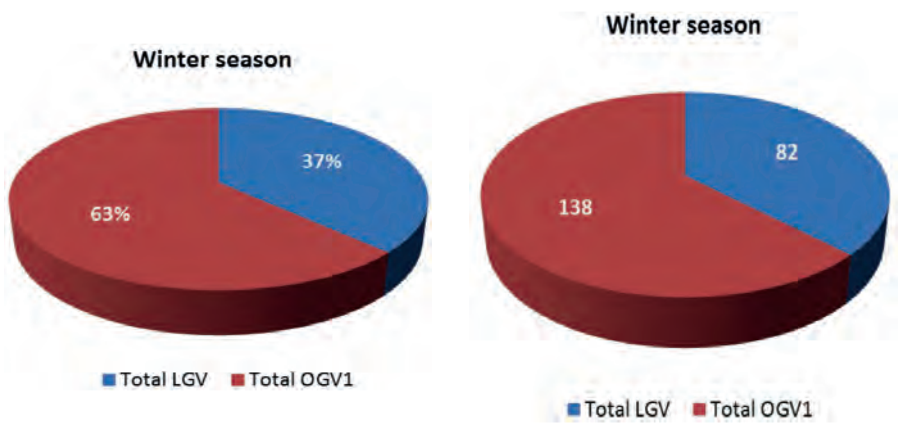
seasonality	Total LGV/OGV1	CO2 emission
Summer season	1560/240	533/103
Winter season	240/320	82/138

Furthermore, since the baseline must be calculated on a seasonal basis, the available data for commercial vehicles on a summer/winter season have been extrapolated to the seasonal basis.

It was established that during the "winter" (non tourist) season the traffic of LGV decreases approximately 10 times. The heavy vehicles – OGV1 we kept in an average year basis having in mind that the intensive traffic is for about 2-3 months for the corn production export period trough the port.



CO2 emissions during the summer season



CO2 emissions during the winter season

Table 4. Numbers of vehicles in the Study area – "Promenade" (workdays-tourist season)

Time period	Number of vehicles			
	LGV	OGV1	TC	Total
0700-0800	2	1	0	3
0800-0900	3	1	0	4
0900-1000	2	2	0	4
1000-1100	2	0	2	4
1100-1200	2	1	1	4
1200-1300	1	0	1	2
1300-1400	1	0	0	1
1400-1500	0	0	0	0
1500-1600	0	1	1	2
1600-1700	2	0	0	2
1700-1800	2	0	0	2
1800-1900	1	1	1	3
Total	18	7	6	31

During the out of tourist season time ("winter") this area is fully free of any transportation.

Traffic counting surveys were employed, to find the numbers of and breakdown of vehicles that currently enter the target area. Distance travelled on average by vehicle and fuel economy of the vehicles, within the area was estimated. Table 5 shows the results of the data used to calculate the baseline. The number of vehicles is based on calculations of deliveries per business types, street surveys with business owners and the quantity of business in the study area. The distance has been calculated by map.

Input	No. of vehicles	Journey Distance - (Km)	Working days (summer)	Total - (km)
Delivery with Private Vehicles	80	3	90	21,600
Deliveries with third party	12.8	5	90	5,760
			Total	27,360

Table 5

Parameter	Private Vehicle	Third Party	Total	Units
Total Distance (km)	21,600	5,760	27,360	km
Average Fuel Economy	7.1	16		l/100km
Number of vehicles	80	12.8		
Fuel Consumption	1,534	922	2,455	litres
Energy	15,595	9,372	24,967	kWh/year
Carbon Dioxide (Final)	4.1	2.5	6.6	tCO2/year
Carbon Dioxide (Primary)	5.1	3.1	8.2	tCO2/year
Carbon Monoxide	31.4	18.0	49	kg CO/year
Nitrous Oxide	25.2	7.2	32	kg NOx/year
Particles	1.9	1.0	2.9	kg PM10/year

Table 6 - Baseline KPIs - Balchik

Some assumptions have been established to quantify the baseline as follows:

Private Car fuel Economy = 7.1l/100km

Third Party Fuel Economy (Vans mainly) = 16l/100km

Euro Class 1-3 for private and 3rd Party are evenly proportioned to get an average for CO, NOx and PM factors /km

The first two assumptions are in relation to the fuel economy of the logistical vehicles. The third is in relation to the emission factors, which are indicated and evenly distributed, approximately.

The results obtained described the total logistical effort from both business' won transport and third party effort for the enclose study area. Therefore this data produced a baseline of the logistical efforts in the area.

Table 6 displays the energy and environmental KPIs for the measures implemented.

The above results are based on factors below. Factors from Carbon Monoxide, Nitrous Oxide and Particles are based on Table 7.

Variable	Private Vehicles	Third Party	Units
Energy Conversion Factor	10.169	10.169	kWh/ l
Carbon Dioxide (Final)	2,680	2,680	g CO2/l of diesel
Carbon Dioxide (Primary)	3,322	3,322	g CO2/l of diesel
Carbon Monoxide	1.45	3.12	g CO/km
Nitrous Oxide	1.17	1.25	g NOx/km
Particles	0.09	0.17	g PM10/km

Table 7 - KPI Factors: Balchik

As mentioned in the assumptions the number of different classes in use in the areas is estimated to be of equal proportion therefore the average is taken for Private Cars and Vans, Table 8.

EURO	CO (g CO/km)	NOx (g NOx/km)	PM (g PM10/km)
Euro 1	2.72	2	0.14
Euro 2	1	1	0.08
Euro 3	0.64	0.5	0.05
Average	1.45	1.17	0.09
EURO	**CO (g CO/km)**	**NOx (g NOx/km)**	**PM (g PM10/km)**
Euro 1	6.9	1.7	0.25
Euro 2	1.5	1.2	0.17
Euro 3	0.95	0.86	0.1
Average	3.12	1.25	0.17

Table 8 - KPI Factors Derivation: Balchik

There is no any air monitoring sites located in the study area to record air pollution.

4. SUSTAINABLE URBAN LOGISTICS PLAN (SULP)

4.1. Town mobility and logistics analysis

- All road space in the study area is regulated by means of Traffic Regulation Orders (TRO), drawn up by the City Council under the auspices of national legislation and is subject to enforcement by City Council-employed Parking Assistants. The TROs define the times that parking or loading/unloading are permitted or restricted and the types of vehicles that can park or load/unload there. These are backed up by traffic signs.
- The main Promenade street is pedestrian with restrictions on access for vehicles and are landscaped to restrict vehicle speeds and discourage general traffic use. Primorsky boulevard is the main supply road and passes parallel to the Promenade pedestrian alley. The main parking places in the old part are located near the street.
- The retail businesses on the pedestrian streets are dependent on front-door deliveries with time restrictions in place from 6.00 till 9.00AM. The back door delivery time of the hotels have off-street servicing areas, which can be accessed without time restriction. Elsewhere in the city centre designated loading bays provide access for retail and office properties.
- There are not very much traffic difficulties in the town. The streets' network can absorb the main traffic flows. The only heavy problems could exists during the intensive tourist season (July-August), so the new parking places are intended to prevent the entrance of overloaded tourist cars flow.
- The pollution generated by the traffic flows is not measured up to now. All calculations are made on a model basis. The wind environment usually prevented the heavy gas pollution in the town.
- Intelligent Transport Systems (ITS) have been proposed to Balchik Municipality according the ENCLOSE working plane, but after discussion rejected due to the lack of funds. The Municipality controls the city's traffic signals, including bus priority, variable message car park signs, and parking places ensuring the efficient movement of traffic and the provision of transport information within the city.

4.2 SULP identified measures

On the basis of the above presented results, several logistics measures have been identified, discussed and implemented. All the logistics measures have been divided in several groups:

Two soft measures have been identified for application in the Balchik study area.

These are:

- Time limitation of vehicles access to the hotel area near the sea-shore
- Space limitation of vehicles and tourist cars

Extra soft measures have been identified and implemented – in the "Promenade" area:

- There is 1 guarded barrier on the entrance to the seashore pedestrian area
- 2 parking places – 1 life guarded and 1 guarded with barrier

Logistics measures intended to be implemented in the near future

- Extension of the time and space limitations to the new buildings deployed around the Promenade (this measure is obligatory, as the extension is going to the opposite direction of the present Promenade pedestrian area)

This measure is due to the new building constructions. Most of them are under the stage of final works, so very soon the access to them will be restricted by time for the delivery of any goods and supply.

4.3 SULP implemented soft measures

Due to the identified measures and actions, two soft measures have been applied in the Balchik study area.

These are:

- Time limitation of vehicles access to the hotel area near the sea-shore
- Space limitation of vehicles and tourist cars

Due to the local conditions

Extra soft measures have been identified and implemented – in the "Promenade" (Dambata) area:

- 1 guarded barrier was put in operation on the entrance to the seashore pedestrian area
- 2 parking places – 1 life guarded and 1 guarded with barrier have been developed and activated

Extension of the time and space limitations to the new buildings deployed around the Promenade was introduced by the Mayor order from 25 May, 2014 to the opposite direction of the present Promenade pedestrian area. This area was open for pedestrians and bikes at the beginning of May, 2014.

Bike alley was put in operation at the Dambata (the whole Promenade length of about 4.5 km). To avoid the car entrance to this alley the special deep (about 70 cm.) and with (about 50 cm.) channel construction is build up and now used at the inside periphery of the bike and pedestrian alleys.

4.4 SULP – soft measures analysis and recommendations

To be able to assess the soft measures implementation and the results of these actions new field survey was performed during the summer time of 2014.

Special observations targeted to the count of the entering and limited cars and other vehicles to the Promenade have been performed. The statistical average of this survey is presented to the next table.

Time period	Number of vehicles			
	LGV	OGV1	TC	Total
0700-0800	2	1	0	3
0800-0900	2	1	0	3
0900-1000	2	1	0	3
1000-1100	2	0	1	3
1100-1200	2	1	1	4
1200-1300	1	0	1	2
1300-1400	1	0	0	1
1400-1500	0	0	0	0
1500-1600	0	1	1	2
1600-1700	2	0	0	2
1700-1800	2	0	0	2
1800-1900	1	1	1	3
Total	17	6	5	28

Due to these new data the new calculations based on average values have been performed:

Input	No. of vehicles	Journey Distance - (Km)	Working days (summer)	Total - (km)
Delivery with Private Vehicles	80	3	90	21600
Deliveries with third party	12,8	5	90	5760
			Total	27360

The results are presented as follows:

Parameter	Private Vehicle	Third Party	Total	Units
Total Distance (km)	21600	5760	27360	km
Average Fuel Economy	7,1	16		l/100km
Number of vehicles	80	12,8		
Fuel Consumption	1534	922	2455	litres
Energy	15 595	9 372	24 967	kWh/year
Carbon Dioxide (Final)	4,1	2,5	6,6	tCO2/year
Carbon Dioxide (Primary)	5,1	3,1	8,2	tCO2/year
Carbon Monoxide	31,4	18,0	49	kg CO/year
Nitrous Oxide	25,2	7,2	32	kg NOx/year
Particles	1,9	1,0	2,9	kg PM/year

These results show that the fuel economy is about 15-16% and the pollutant gas emissions decrease about 20-30%.

4.5 SULP new ideas – investigation and analysis

As a result of the ARE 2 meeting in Balchik, some new ideas about sea (boat) delivery for the hotels, restaurants and other entertainment facilities were suggested by the professionals in the branch of tourism and attractions.

The conceptual issue is:

To deliver goods and some services by boat transport instead by OGV and LGV. This will need a small investment to build up a storage center at the cargo terminal, from where the goods to be delivered to the hotels and restaurants located just near the sea shore. The transportation could be by bicycles or hand-driven electric cars. The idea also needs such a centralized center to be organized in the Varna part.

As a result of discussions during ARE2 meeting it was decided to try to assess the effectiveness of such an idea (4.4.1.1-4.4.1.6).

4.5.1. MULTIVARIANT ANALYSIS ABOUT LAND AND POSSIBLE SEA TRANSPORT LOGISTICS FOR BALCHIK (FACILITIES ON PROMENADE-DAMBATA) - BALCHIK MUNICIPALITY – BULGARIA

According to the ARE2 Meeting Minutes (ARE2 Meeting in Balchik - June 11th 2014) the study of the possibilities of the proposed idea to make deliveries by boat and to include these prospects as a possible part of the final SULP for Balchik, some actions and models have been performed.

4.5.1.1. Scope of the study

This study is performed to assess the possibilities of the transport logistics to the study area (Promenade – Dambata) and compare results between "on land" transport logistics for the hotels, restaurants and other tourist facilities located to the study area of Balchik where the largest part of these facilities are located and the "sea delivery" (by boat) instead of the land transport.

Study area – Balchik coastal zone – Promanade ("Dambata")

4.5.1.2.Facilities and needs of goods

The statistics of the shore line (Promenade-Dambata) entertainment facilities (hotels, restaurants, pubs etc.) are presented on the following table:

ORIGINAL NAME	ORIGINAL ADDRESS	PHONE	CONTACTS
КЛАСИЧЕСКИ РЕСТОРАНТ "БЯЛА КЪЩА"	ГР. БАЛЧИК, УЛ. "ГЕО МИЛЕВ" 18	0579/73-822	
КЛАСИЧЕСКИ РЕСТОРАНТ "ДВАТА ПЕТЕЛА"	ГР. БАЛЧИК, АЛЕЯ "ДАМБАТА", УЛ."САМАРА" 3	0579/76-465	losdosgalloshotel@gmail.com
КЛАСИЧЕСКИ РЕСТОРАНТ "КОРОНА"	ГР. БАЛЧИК, ДКИ КУЛТУРЕН ЦЕНТЪР "ДВОРЕЦА"	0579 768 47	-
КЛАСИЧЕСКИ РЕСТОРАНТ "ЛОТОС"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 12	0579/72-195; 0579/71220; 0893/509882	office@lotos-hotel.com
КЛАСИЧЕСКИ РЕСТОРАНТ "СЕЛЕНА"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 18	0894/354565	helios_bg@abv.bg
КЛАСИЧЕСКИ РЕСТОРАНТ "ФРАНСИС ДРЕЙК"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 8Б	0579/ 71130; 0579/ 71140	reservation@hotelmistralbg.com
СПЕЦИАЛИЗИРАН РЕСТОРАНТ - ГРИЛ "КАВАЦИ"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 22	0888/713939	
СПЕЦИАЛИЗИРАН РЕСТОРАНТ - ГРИЛ "КЕДЪРА"	ГР. БАЛЧИК, АЛЕЯ "ДАМБАТА", УЛ."САМАРА" 3А	0889/614743	
БИСТРО "МОРСКИ БРИЗ-ПРИНЦА"	ГР. БАЛЧИК, АЛЕЯ "ДАМБАТА"	0887/252536	
БИСТРО "СТАРАТА ЛОДКА"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 22	0889/434-305	
БИСТРО "ФИНГЪРС"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 26	0889/308055	
ПИЦАРИЯ "МИКАДО"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 16	0886/892430	
ПИЦАРИЯ "ПАНОРАМА КАВАЦИ"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 22	0579/73-013; 0897/874851	

ORIGINAL NAME	ORIGINAL ADDRESS	PHONE	CONTACTS
ПАВИЛИОН ЗХР "ВОДОПАДА"	ГР. БАЛЧИК, АЛЕЯ "ДАМБАТА", МОРСКИ ПЛАЖ БАЛЧИК-ДВОРЕЦА	0888/230756	
ПАВИЛИОН ЗХР "ТИХОТО ГНЕЗДО"	ГР. БАЛЧИК, КЗ "ДВОРЕЦА", МОРСКИ ПЛАЖ "ДВОРЕЦА"	0579/75-918	
КАФЕ - БАР "НЕГРО"	ГР. БАЛЧИК, АЛЕЯ "ДАМБАТА"	0889/505070	reservation@hotelmistralbg.com
ДИСКОТЕКА "БИЖУ"	ГР. БАЛЧИК, КЗ "ДВОРЕЦА"	0899/888626; 0876/888626	
В БЛИЗОСТ:			
КЛАСИЧЕСКИ РЕСТОРАНТ "АИРИШ РОВЕР"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА",27 - БАЗАР "ХЕЛИОС"	0888/510530; 0579/73556	plamenvs@abv.bg hotel@balchikirish.com
РЕСТОРАНТ С БЪЛГАРСКА КУХНЯ "ЮПИТЕР - 1"	ГР. БАЛЧИК, УЛ. "ПРИМОРСКА" 1А	0579/76-470	iveetta@abv.bg
ДРУГИ:			
HOTELS	HOTEL SELENA		WEB-SITE
	HOTEL WHITE HOUSE		WEB-SITE
	HOTEL MISTRAL		WEB-SITE
	HOTEL VALEO		WEB-SITE
	HOTEL BISER		WEB-SITE
	HOTEL OAZIS		WEB-SITE
	HOTEL IRISH ROVER		WEB-SITE
	HOTEL REGINA MARIA		WEB-SITE
STATISTICS			
Hotels - 8			
Restaurants - 8			
Pizza (grill) pubs - 7			
Café and bars - 3			
Discotheque - 1			

According to the interviews with the owners and the manager staff the following goods are necessary for a week (in average).

Name	Quantity	Frequency of delivery	Total per week	Grand total (kg)
Meet and products	500 kg	1 per week	500	
Vegetables	600 kg	2 per week	300	
Fruits	400 kg	2 per week	200	
Milk and products	500 kg	1 per week	500	
Ice cream	100 kg	2 per week	50	
Sweets	100 kg	1 per week	100	
Coffee, tea	100 kg	1 per month	25	
Wine	1600 kg	1 per month	400	
Alcohol (40%)	400 kg	1 per month	100	
Beer	1000 kg	1 per month	200	
Sugar	200 kg	1 per month	50	
Vegetable oil	200 kg	1 per month	50	
Wheat powder	1000 kg	1 per month	200	
Bread	500 kg	2 per week	250	
Refreshments	500 kg	1 per week	500	
				2 425 kg

4.5.1.3. "On land" logistics

The on land logistics is provided by the local logistics firms delivering the necessary goods mainly by VANS (more then 60%). As from the previous study, as well as the new observations and some interviews with the local owners, managers and the guards to the barrier and the parking places near Promenade, the "on land" logistics is organized in similar way. The daily traffic is presented on the next table.

Time interval	Number of vehicles			
	LGV	OGV1	TC	Total
0700-0800	4	1	0	5
0800-0900	4	1	0	5
0900-1000	1	1	0	2
1000-1100	0	0	1	1
1100-1200	1	1	1	3
1200-1300	1	0	1	2
1300-1400	1	0	0	1
1400-1500	0	0	0	0
1500-1600	0	1	1	2
1600-1700	2	0	0	2
1700-1800	2	0	0	2
1800-1900	1	1	1	3
Total	17	6	5	28

As can be seen on the table the traffic flow per day is about 30 cars. This means about 80 cars' entrances. The calculation done on the basis of these input data show the following results:

Input	No. of vehicles	Journey Distance - (Km)	Working days (summer)	Total - (km)
Delivery with Private Vehicles	80	3	90	21600
Deliveries with third party	12,8	5	90	5760
			Total	27360

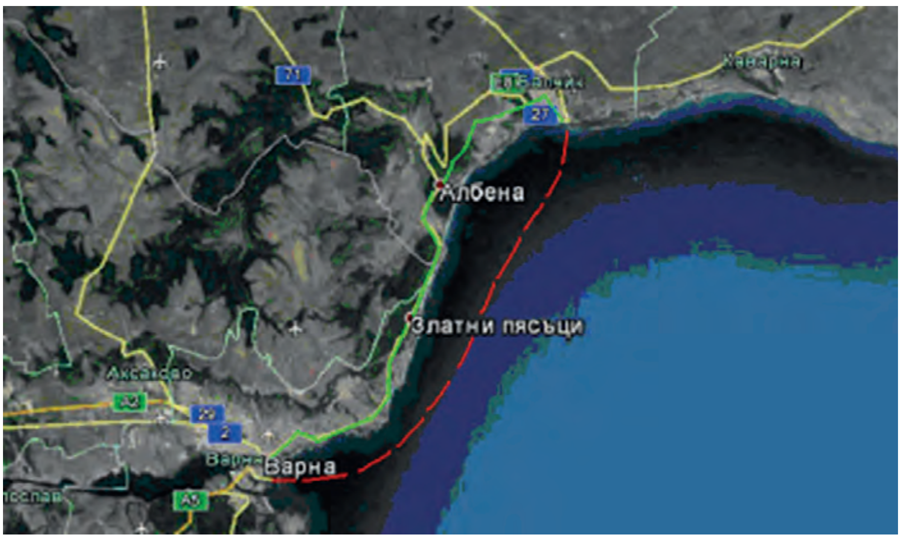
Results of the calculations

Parameter	Private Vehicle	Third Party	Total	Units
Total Distance (km)	21600	5760	27360	km
Average Fuel Economy	7,1	16		l/100km
Number of vehicles	80	12,8		
Fuel Consumption	1534	922	2455	litres
Carbon Dioxide (Final)	4,1	2,5	6,6	tCO2/year
Carbon Dioxide (Primary)	5,1	3,1	8,2	tCO2/year
Carbon Monoxide	31,4	18,0	49	kg CO/year
Nitrous Oxide	25,2	7,2	32	kg NOx/year
Particles	1,9	1,0	2,9	kg PM/year

Here the important note is that these results are only to the local traffic (the travel distance, resp. the fuel consumption from Varna to Balchik – are excluded). This means that the effect is only about the study area. This note is important because of the comparison analysis which follows in the next chapters.

4.5.1.4.Sea ("by boat") logistics

The idea to use a boat for the goods transportation from other ports to Balchik port was suggested during the ARE2 meeting in Balchik. The nearest ports from where the boat can transport the goods necessary for the facilities around Dambata (Promenade) are several (roughly assessed) – Mangalia (80km), Constanta(100km), Varna (30km) and Bourgas (100km). The sea distances to Balchik are presented in (…). In this case is clear that the best port – nearest with enough supply and goods variability is Varna. The intended facilities to do such goods supply in very general plan are – 1 boat (about 20 brt – could be rented), two simple terminals (just storage facilities for about 10 tons) – one at the Balchik port (a simple construction of about 100 m^2 is possible at the berth terminal) and one – similar – at the port of Varna. The cost of these constructions could be about 5 000 EUR – each. The cruises of the boat could be one or two times per week – to be able to deliver fresh vegetables and fruits. The boat will carry about 2-3 tons – each cruise. The coast for the boat (rented) and the crew is about 3000 EUR per trip. The velocity of each trip is about 2 hours. The fuel consumption is about 1 ton per trip.



Distances between Varna and Balchik – green (road), red (boat)

The sea supply investments table

Investments	Unit price	Number	Cost	Total (EUR)
Storage center	5 000	2	10 000	
Simple load/unload mashie	4 000	2	8 000	
Electric car	4 000	1	4 000	
(or Two bike-cars)	500	2	1 000	
				22 000 (or 19 000)

In the calculations to the above table are NOT included: different taxes, expenses related to the legalization of the storages, permissions, etc.

4.5.1.5. Comparison between "on land" and sea ("by boat") logistics. Multivariant approach

Variants for boat delivery to Balchik and other cities and resorts (Golden sands, Albena and Kavarna)

It is possible to use the boat for deliveries also to the other ports (Kavarna) and resorts: Golden sands – Zlatni piasatsi) and Albena. This can increase the efficiency of the sea transportation – including Balchik.

Distance from Varna to:	Balchik	Golden sands	Albena	Kavarna
On land	32	18	22	57
Sea	27	15	20	42

To try to calculate the functional costs for both variants – "by boat" and "on land" some comparative calculations have been performed and presented to the following table.

A comparative table for the functional costs

Current maintenance	Unit price	Number	Costs	Total cost
Total sea supply				
Guards	300	2	600	
Boat rent	2 500	1	2 500	
Fuel	1.3 (EUR per litre)	1 000	1 300	
Crew salaries	400	2		
Land supply (salaries)				
Variant 1 (el.cars)	300	1	300	4 700
Variant 2 (bike cars)	300	2	600	5 000
Total land supply				
Guards	300	2	600	
Fuel consumption (on Dambata roads)			1 500	
Fuel consumption (from (Varna (Dobrich) deliveries)	1.3 (EUR per litre)	2 000	4 600	
* In this table the VAT is not included				6 700

Calculations only for Dambata (Promenade)

Comparison of the introduction of the bike-cars and/or mini electric cars for the Dambata deliveries – present status and in case (if the storage center will be introduced).

Present status/ New cars	Quantity (liters or kW/h) per month	Value in EUR (per month)
Fuel consumption	2455 (~25000 kW/year)	1 500
Bike-cars	2 salaries x 300	600
Electric mini cars	4 000 (48 000 kW/year)	1 200

4.5.1.6. Conclusions

- “By boat” logistics introduction needs some investment costs, before starting functioning. The buildings of at least two simple storage points (in Balchik and Varna called “hubs”) need investments projects, execution and legalization of their functions and other time consuming activities.
- In general – the sea “by boat” supply seems a little bit cheaper for the functional expenses, but it depends a lot of the volumes of goods, the regularity of deliveries (one or twice per week), etc.
- The social benefits can be described in several directions:

a) Decreasing the noise level to the people (especially located in the hotels and entertainment facilities (at the Pronmenade – Dambata) due to the introduction of the electric (or bike) delivery cars and the decreased number of vehicles for the “on land” delivery.

b) The pollution emissions will decrease dramatically. The drastic decrease of the cars delivery to the hotels and restaurants will eliminate the gas emissions. The only emissions will come from the boast, but with two trips weekly, this is negligible.

c) The use of a “boat” delivery can be done more efficient, if the combined trips to the other heavy populated resorts during the summer time (like “Albena” and “Golden sands”) are performed. This approach needs additional investigations.

5. ROAD MAP TO THE SULP ADOPTION

5.1. Consensus Process

Meetings with Stakeholders, Association, Citizen

Several meetings have been performed during the ARE1 meeting. As there is no any Association of the transportation bodies and most of them are private firms. They are small and not organized in the Associations. So, it is rather difficult to perform the meeting with centralized bodies. The citizens are also rather passive, as they do not consider the environmental issues of primary importance.

During the ARE2 meeting with some outside stockholders, tourist agencies and private transportation firms several new players appear and propose new ideas and interest. The Association of the Hotels owners and the representatives from other institutions (for example EICT-EUREKA) proposed some new ides:

- The new idea to deliver goods and some services by boat transport instead by OGV and LGV. The transportation could be by bicycles or hand-driven electric cars. The idea also needs centralized centers to be organized in the Varna and Balchik ports.
- New suggestion to organize a common centre for goods deliveries outside the Dambata (Promenade) and then to use low emission transport (like electric hand-drive cars and bicycles).
- Indications, suggestions and several opinions have been raised to decrease pollution and to optimize the delivery time intervals to the Promenade limitations.

• Main problems and timing for adopting the solution

- Low interest to the environmental issues of the population due to the good weather (climate) conditions
- Low priority of the city Municipality to the environmental issues due to the lack of funds for this topic.

5.2.Main Municipality strategies

• Consolidation of the solutions and priorities

The solutions could be consolidated to several main directions:

- Limitations of the traffic in time and space to the pedestrian areas near the sea shore to preserve the tradition pedestrian walks to be performed every evening
- Limitations to the traffic of the tourist cars by new and existing parking places.
- Introduction of the paid “blue zones” in the old part of the town for the limitation of the non regulated parking places for the outside coming cars. Privileges to the local citizens for parking nearby their homes

• Main problems and challenges for the SULP adoption

- Low interest to the environmental issues of the population due to the good weather (climate) conditions
- Low priority of the city Municipality to the environmental issues due to the lack of funds for this topic.
- Governmental proud that Bulgaria is one of the most clean gas polluted countries in the EU

Intensive dissemination activity in a very near time is intended to increase the interest of the population and administrative bodies to the measures planned by the ENCLOSE Project. Also some specialized scientific events (like conferences participation, book edition, exhibition presentations, etc.) related to the scientific approach and model investigations, as well as the general publications to the wide public are intended to reflect on wider basis the results of the ENCLOSE Project and Balchik SULP development.

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ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe Programme of the European Union

BURGOS

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6

SULP "Sustainable Urban Logistics Plan"

WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

Document responsible

Burgos Municipality

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Circulation

Public

Date

10.10.2014

BURGOS 2020

Asociación Plan Estratégico Ciudad de Burgos

BURGOS

SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. GENERAL BURGOS CONTEXT

1.1 Burgos problem Statement and objectives

Moreover, Burgos is a city that has been steadily growing around its historic centre and along the Arlanzon River. The area of the old city occupies 32 km2, measuring 8,500 m by 4,000 m. If the outskirts of the city are taken into consideration, the area could be said to be 12.5 km long and 8.5 km wide, which represents a surface area of 104 km2. There are 6 bridges within the city for the circulation of automobiles and pedestrians, concentrated principally in the oldest part of the city. N-S traffic has to pass over one of these bridges, 3 of which are situated in the historic centre. Currently, travel through the city involves driving as close as 300 metres to the historic centre and traffic jams are frequent during rush hours.

Furthermore, heavy vehicles circulate around the principal thoroughfares of the city. This high volume of traffic is principally due to the position of the city that lies at a crossroads between the North and South of Europe, for traffic passing through Madrid and, in addition, is crossed by traffic travelling from the East to the West of Spain. The high volume of heavy vehicles obstructs the flow of traffic and considerably increases air pollution in specific areas of the city. Moreover, their parking in the city is a contentious issue as there is no specific parking zone for heavy vehicles, which are left with little or no choice other than to park in the main roads and streets of the city.

Ring roads around the city are still incomplete and some phases are currently under study or being drafted, principally by the Ministry of Development and the Development Council of Castilla and León. The progressive completion of these construction projects, scheduled over the next 10 years, is expected to culminate in a strategy that will mitigate many of the negative effects of traffic and pollution currently experienced in the city, principally due to the passage of heavy vehicles.

In conclusion, the movement of people in the historical centre is very high because the number of tourists visiting the area has increased by 20% over the last 5 years, added to which there are numerous small businesses and administrative offices located in its streets, as well as a large number of hotels, restaurants and bars surrounding each tourist attraction. Traffic in the historic centre is dense and continuous, resulting in frequent traffic jams during rush hours. In short, demand within the historic centre has increased considerably in recent years while the area has yet to adapt to its changing circumstances.

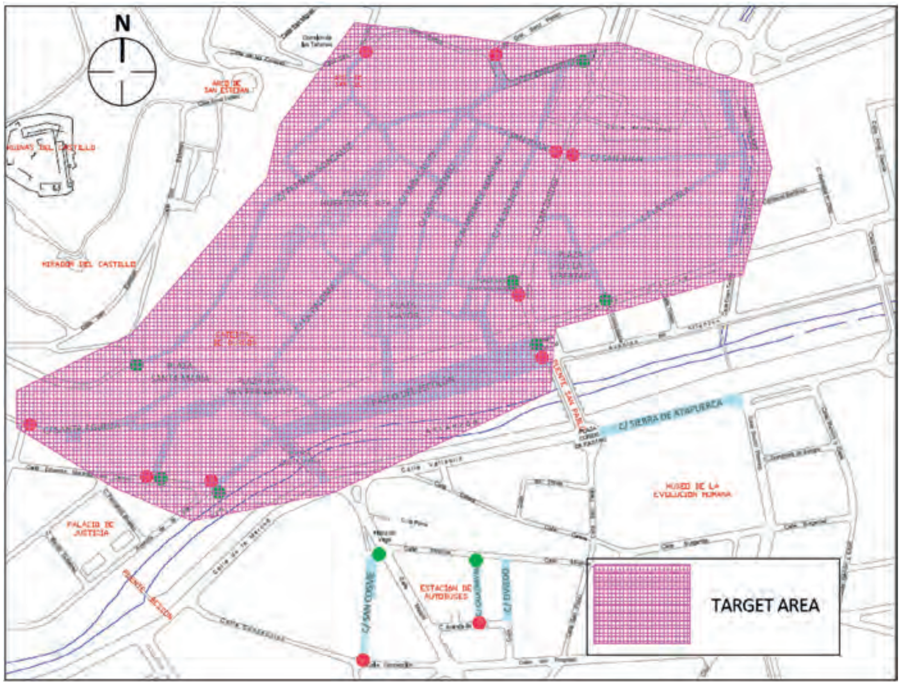
1.2 General aspects and Study area

Burgos is a medium-sized city (180.000 inhabitants) situated in the North-central part of Spain in the region of Castilla y León. The core urban area is 108,26 km2 and has a population density of 15,84 hb/ha. The agglomeration area has an extension of 175 km2 with 248.000 inhabitants.

Burgos is an important commercial and touristic city, known world-wide because of its cultural, monumental, and artistic heritage including 3 sites declared Human Heritage by UNESCO. Its Gothic Cathedral; The Pilgrim´s way Camino de Santiago; and the Atapuerca Prehistorical remains.

The layout of Burgos is determined by its 3 levels with a difference in height of 75 metres. The funnel effect of the river and the Castle hillside, the vast historic heritage, different narrow roadways and streets, complicate mobility and logistics in the historic centre.

Burgos is a Spanish city of great historical and cultural interest. Among its noteworthy buildings figure the cathedral, the Casa del Cordón, the churches of San Esteban, San Gil, Santa Águeda and San Nicolás among others, the walls of the medieval city, the arch and bridge of Santa María, etc. Its historic centre extends over 320,000 m2 and houses 14,041 residents. In recent years, a great effort has been made to conserve and restore many of the buildings whose stone facades have suffered damage due to air pollution produced in part by heating systems and traffic.



With a view to reducing pressure in the urban zone arising from various economic and social factors, different activities have been carried out over time and in an orderly manner: traffic has been limited to certain streets, pedestrian areas established over 3% of the surface area, energy substitution introduced in buildings, parking areas built for 8% of the residents, etc.
The area identified in Burgos for the analysis of commercial and logistic activities and possible solutions (hereinafter "study area"), is the vehicle restricted area of Burgos Historical City centre.
It is placed on the historical city centre, all around the cathedral, where about (estimation) 628 commercial activities are with this average breakdown: HO-RE-CA (32%), Food Commerce (9%), Personal Equipment Commerce (Clothing,...) (33%), Home Equipment Commerce (10%), Commerce with high service component (9%), Banks (5%), Pharmaceuticals (2%).

1.3 Overall mobility approach

The flows of people in the historical centre is high due to the number of tourists visiting the area, which has increased during last years, added to which there are numerous small businesses and administrative offices located in its streets, as well as a large number of hotels, restaurants and bars surrounding each tourist attraction. Traffic in the centre is dense and continuous, resulting in frequent traffic jams during rush hours. This flow of traffic produces widespread parking problems and parking violations within the urban centre. In short, demand within the historic centre has increased considerably in recent years while the area has yet to adapt to its changing circumstances.
Since 2006 the Municipality established clean areas in the historic city center, covering 2,5 km, by controlling the pedestrian areas with bollards and phones and cameras surveillance 24 hours a day. Since the same year in the historical center freight urban transport (loading and unloading areas and routes) is regulated with an access control system.
Within the city centre, the conservation of monuments of great artistic and patrimonial value and their protection from all forms of pollution is a highly important issue. In this area, air pollution due to unclean vehicles has been reduced by the means of mechanical controls to restrict access and 30% of its surface area was limited to pedestrian traffic.
In addition, a policy on information and management was developed (i.e. electronic access systems, identification cards) with residents in the area, which allowed them access to their homes. The system is monitored from a control centre.
In order to reduce the commercial vehicles traffic, in April 2012 a pilot test for using loading and unloading areas in two delivery routes in the historic centre (restricted area) has been conducted, and will be the base for a new freight traffic regulation within the restricted area.
Based on the positive results of test, the City Council is very interested to develop a Sustainable Urban Logistics Plan (SULP) and support this by further testing of sustainable, energy-efficient logistics soft measures.
In the following sections an overview of the main mobility and transport measure done in the last years, which could be suitable (with different modalities and roles) for the implementation of the logistics solutions analyses in the study, is provided.

1.4 Main regulation aspects

The objective was to develop integrated actions within the city centre and its surrounding areas that relieved the pressure produced by social and economic demands, with special emphasis placed on clean and sustainable urban transport.
The activities were developed within the tasks of the CIVITAS developed in the "Historical city centre" of Burgos.
In addition, a policy on information and management was developed (i.e. electronic access systems, identification cards) with residents in the area, which allowed them access to their homes. The system was monitored from a control centre.
At the same time, pedestrian traffic was encouraged around the city centre by providing its streets with comfortable and safe areas for walking, resting and enjoying to achieve this, the priority areas for pedestrians was analyzed and will continue to be

developed until pedestrian zones constitute 25% of the city centre.

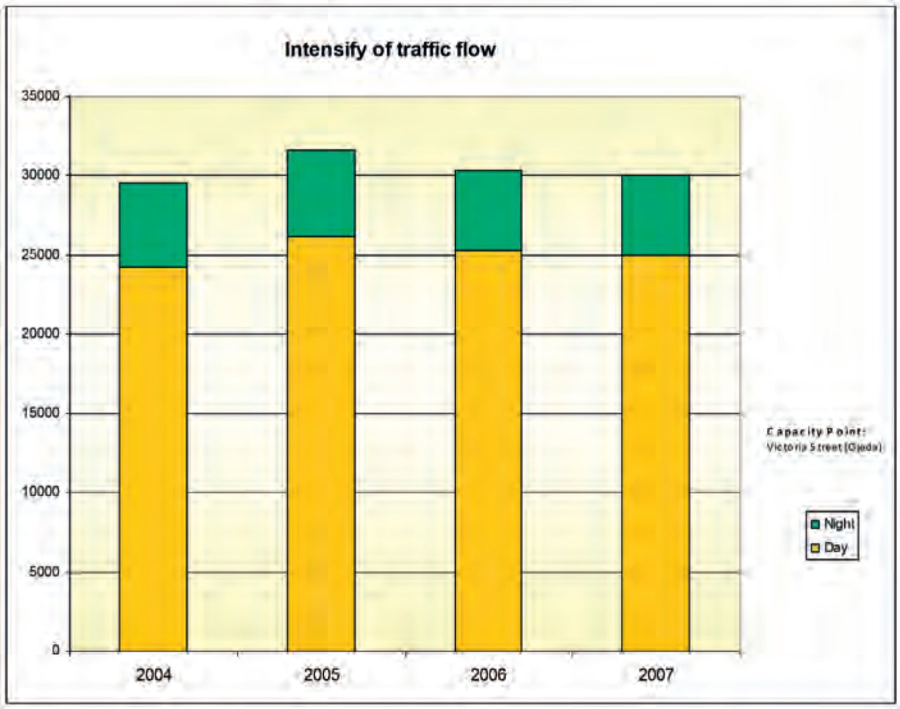
To accompany these measures, the traffic department drew up new itineraries for heavy vehicles, design traffic signs for the outer ring roads including electronic message signs and prepared various training sessions for relevant sectors throughout the project.

Demonstration activities were established and the following actions were developed in the historical city centre and surrounding areas:

- Development of infrastructure required for different levels of pedestrian zones
- Enhancement of pedestrian walkways
- Development of access to pedestrian zones for residents
- Introduction of mechanical systems to restrict access
- Implementation of access and parking measures for residents (actively involving neighbour-hood associations in drawing up procedures for stakeholders, permits, secure methods etc)
- Design of access schedules for delivery vehicles and communication of such measures to relevant organisations and collectives
- Promotion of restricted access for heavy vehicles in the city centre
- Modifications to traffic directions around the inner city to reduce congestion

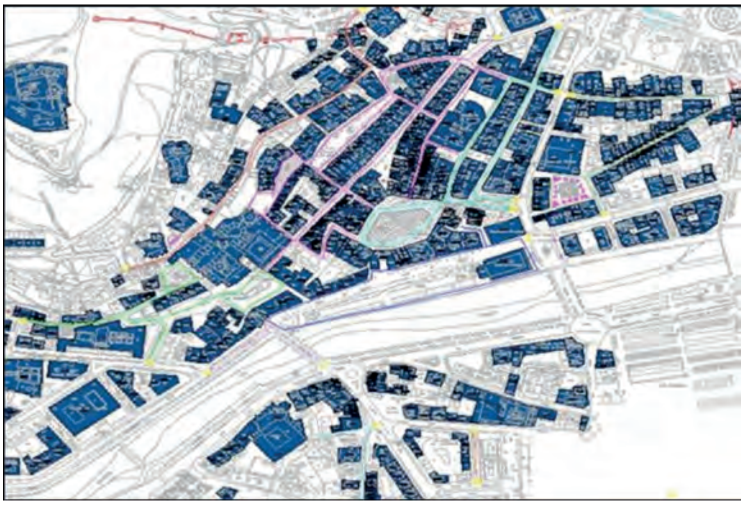
The measure results regarding traffic are listed below:

- Average vehicle speed peak/off peak indicator: The vehicle speed was realized through speed radars which were included next to Historical Area, in a street where the mayor number of vehicles used this street to arrive the town. The data was an average of the data obtained during one day using the speed radars. The results obtained were 65 km/h in 2004 (obtained of Police statistics) and 61 km/h in 2007 with the speed radars. A short reduction of the velocity was observed in the period of the project; however it is 11 km/h beyond what the law stipulates in urban environments (50 Km/h).
- Car reduction in restriction area indicator: The data reflected as the number of vehicles were reduced in the internal trips inside the restriction area. This data shown as in the baseline data (2004) the number of internal trips by vehicle was very high (20%) respect the results obtained in 2007 (97%). It is due to the actions of access restriction and pedestrian areas which forced to reduce the impact of the particular vehicle and loading and unloading at the centre.
- Pedestrian/cyclists counts in restricted area indicator: The data were obtained through the counts in concrete streets, close to the town, where the bicycles and pedestrian used to arrive to the town. The counts were realized during eight hours in a labor day. The data obtained of baseline were obtained of a study of Council. The results were the following:
    - The number of cyclists counted was 30 in 2004 respect to 110 in 2007. The difference between 2004 and 2007 values was 80 cyclists more in the town.



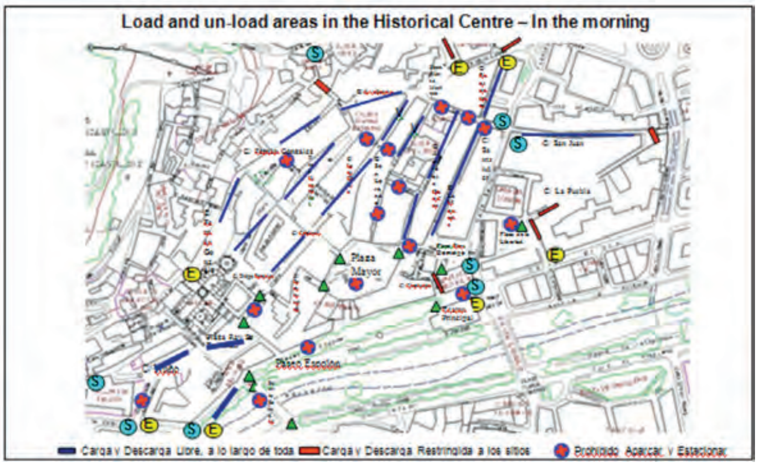
Evolution of traffic flow Intensity in surrounding roads to the City Centre

• The number of pedestrian counted was 8810 in 2004 respect to 14230 in 2007. The difference between 2004 and 2007 values was 5.420 pedestrians more in the town.
- Traffic flows in surrounding roads indicator: The data were obtained through the traffic capacity points in a specific point in surrounding road. The intensity of vehicles during the day was so constant in all period of study. Emphasize that intensity is close to 24.000 vehicles diary in the day and there was a short increase in 2005. The difference between baseline data in 2004 and 2007 was 722,8 vehicles.
- Modal split change for people travelling in Burgos indicator: it can observed that there was a moderate change in the modal split for the people of Burgos, about all respect to split on foot and by Public Transport.



1.5 ITS and city mobility technologies

Within the city centre, the conservation of monuments of great artistic and patrimonial value and their protection from all forms of pollution was a highly important issue. In this area, air pollution due to unclean vehicles will be reduced by means of mechanical controls to restrict access and 30% of its surface area was limited to pedestrian traffic.



2. LOGISTICS CONTEXT

2.1 Overview of city logistics process

The research activities involved the design and development of all aspects of an integrated regulation scheme activities were developed within the tasks of the CIVITAS in the "Historical city centre" of Burgos. This activity also implied the management of political discussion and consultation with all stakeholders affected by the adoption of these measures.

The aim was that delivery vehicles working within pedestrian and restricted access areas were clean vehicles. An active policy of vehicle replacement followed until all delivery and packaging companies gradually acquired clean vehicles. Delivery followed the measures defined in access control.

The activities developed were as follows:

- Optimisation of goods distribution logistics in the pedestrian and restricted access areas:
  - Identify specific zones around the clean zone for loading and unloading.
  - Determine the permits needed to access the clean zone
  - • A new concept for distribution in the pedestrian and restricted access areas:
  - Analyse the situation and involve distributors, logistics services, industries
  - Analyse the social and economic feasibility of a new goods distribution system.
  - Analyse the actual conditions actively involving distribution companies, logistics services and industries
  - Determine the areas of influence and products/stakeholders involved in distribution.
  - Specify the managerial criteria for a new concept of goods distribution in the city
- Design routes, schedules, products and areas for the distribution of goods.

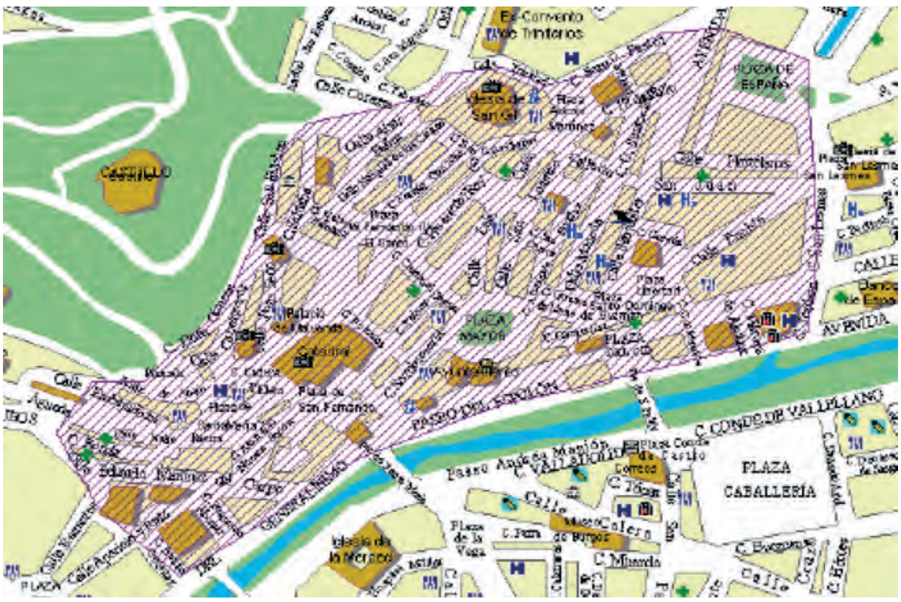
A small area of the historic centre was included in the mobility study of the city of Burgos and the following results were obtained:

- Shops and restaurants numbered 84 (bars, hotels, restaurants, shops). They have no backyards, garages or specific storage areas for their goods.
- Recorded operations numbered 62, of which 4 were for loading and 58 for unloading goods.
- Goods were distributed to food shops more frequently than to any others.
- 80% of loading and unloading took place during the morning and 20% during the afternoon. In the morning hours (07-14 h.), only 40% of the deliveries were undertaken before 11.00 am, a figure which represents a mere 30% of total operations.
- 94% of the operations lasted less than 15 minutes.
- Goods were distributed in vans (49%), lorries (47%) and cars (4%).
- 17% of the operations used zones reserved for loading and unloading and 83% used public streets away from the parking zones.
- Loading and unloading takes place at a distance of less than 15 m. from the commercial outlet.

This study indicated that regulation and control of goods distribution was a key project for the city. Such data gathered in the historic centre may be extrapolated to other areas of the city and is seen as standard practice by traders and distributors of goods.

A parallel innovation action examined the social and economic impact on stakeholders. Particular attention was devoted to any eventual changes to the structure of goods distribution networks. Working methods were designed to organize transport between distributors and retail commercial outlets.

Distribution of deliveries in the city involved regulating the vehicles that enter the urban zone and assigning specific areas for distribution in the pedestrian and access restriction area. The end results are deliveries that are more methodical and less damaging to the surrounding environment.

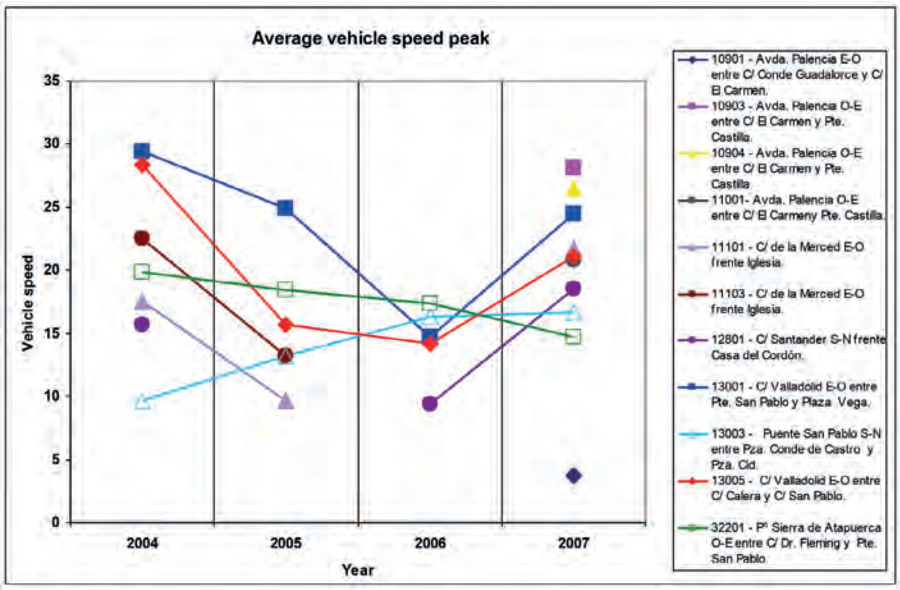


The results of transport indicators have been obtained from the traffic gauging took place from 2004 to 2007 in restricted access areas and surroundings.

Indicator – Average vehicle speed peak:

Indicator	Baseline Data 2004	Data Result 2007
Average vehicle speed peak	20,42 km/h	19,63 km/h

The average vehicle speed peak has not suffered high differences between 2004 and 2007. The next graphic showed that the different average vehicles speed peaks have been obtained each year in different places of traffic capacity. Only it could be remarked, some big differences in 2006, where the most of average vehicle speed peaks were very reduced in comparison with others years because of the implementation of the access restriction area.
In conclusion, the small difference between the results of 2004 and 2007 is thanks to the new access restriction regulation and control in the pedestrian area, so that the freight distribution is performing in nowadays in a calmer way, respecting the citizens in the sensitive area. The average speed included all kind of vehicles in the surrounding area of the access restriction zone. The freight distribution vehicles have suffered a higher reduction of speed in the sensitive area, as the conditions are now more favourable for pedestrians, not for vehicles.



Indicator – Freight movements:

Indicator	Baseline Data 2004	Data Result 2007
Freight movements (nº movements per day)	460,6	240,3

The freight movements have been reduced in 2007 due to increased access restriction areas and it corresponding control through new organisational arrangements or relationships and physical infrastructure solutions.
This result is a clear consequence of the success of the new distribution scheme, which has allowed to the companies to distribute the goods in a more sensible and intelligent way, saving unnecessary trips and stays in the city centre. The data has been provided by all the freight distribution companies, apart from some account methods. The trips are longer now and the distance covered by these vehicles is longer, but they disturb less to pedestrians, nevertheless.

2.2 Specific regulations for freight distribution process

In order to stimulate and improve sustainable mobility, "clean areas" in the historic city center were created by controlling the pedestrian areas with bollards, phones and cameras surveillance 24 hours a day. This involved the reorganization of traffic by restricting to pedestrian several streets, the design of routes and neighboring access protocols, and other traffic and public road use.
The recent extinguished mobility regulation on freight urban transport (loading and unloading areas and routes,…) in the historical City Center comes from the 2007 Local Decree on access control system.
This regulation limited the vehicle maximum speed in pedestrian areas to 20 kilometers per hour. Freight transport vehicles could access the target area only in the time slot 7.00 - 11.30 and 16.30 - 17.30, with a maximum load mass of 3.5 tons (unless authorized) and a maximum stay of 20 minutes in the restricted area.
The City Council developed a new regulation, which was on public exhibition phase and entered into effect in February 2013.
The main characteristics included in the regulation are:

Vehicular access to the restricted area of Burgos historical city centre:

1. The maximum vehicle speed is 20 km / h.
2. Drivers must give priority to pedestrians.
3. Pedestrians can use the entire circulation area.
4. Vehicles may be parked only in authorized areas for this.
5. You can only access by vehicles of less than 8,000 kg of PMA, except in the Plaza Mayor that its limit is 3,500 kg of PMA

Loading and unloading:

Vehicles for goods delivery tasks will upload and download exclusively on the schedule; outside it need special authorization. The route to be made by vehicles for goods delivery is set out in the resolution.

Vehicles carrying out loading and unloading tasks may park every day from Monday to Saturday morning, on the following schedule:

- Inputs and outputs of interested sectors: From 7:00 to 12:00 hours.
- For food and beverage distributors output will to 13:00 throughout the year, Monday, Tuesday or Wednesday depending on the street.
- The afternoon schedule for work of loading and unloading will be from 16:30 to 17:30 all year, Monday to Friday (apart from some areas).
- PMA for these areas will be 8,000 kg.
- Parking places concentrate for loading and unloading (Restrictions: Parking only on the side of the road specified)

General changes:

One-way circuits to circulate across the sectors

Area divided in 12 sectors (with a specific entrance/circuit/exit)

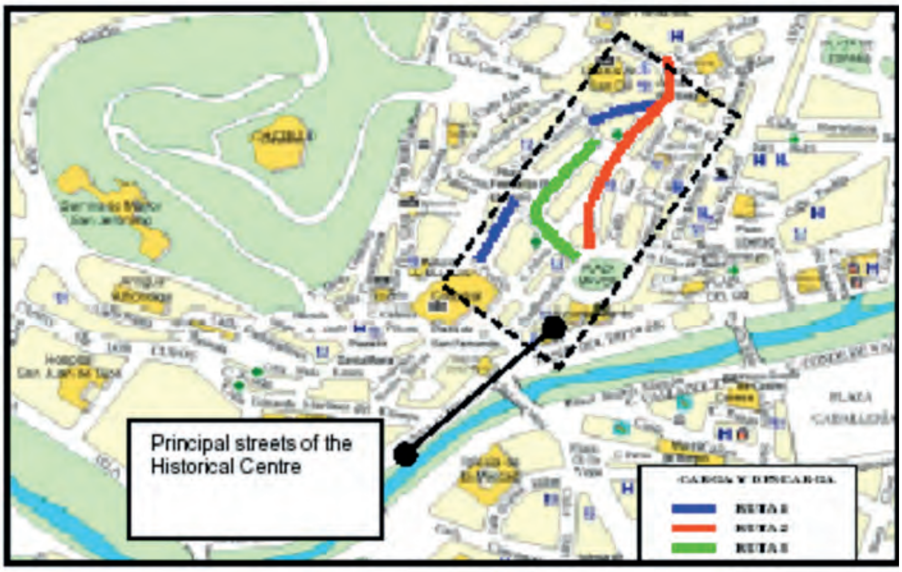
20 streets where it is not possible to park/stop

3 special treatment areas.

2.3 Existing freight distribution services and infrastructures

Goods were distributed from numerous central warehouses outside the city on a daily basis in small vans that circulate around the city. Some of the problems related to this type of distribution were:

- Numerous vehicles of various sizes dependent upon the goods they carry
- Circulation throughout the city worsens traffic problems and goods vehicles enter unique, sensitive zones in the historic centre
- Double parking during loading and unloading; although there were specific parking places and timetables for loading and unloading, these surfaces tend to be occupied by ordinary vehicles
- Access to pedestrian zones in the city endangering pedestrian safety



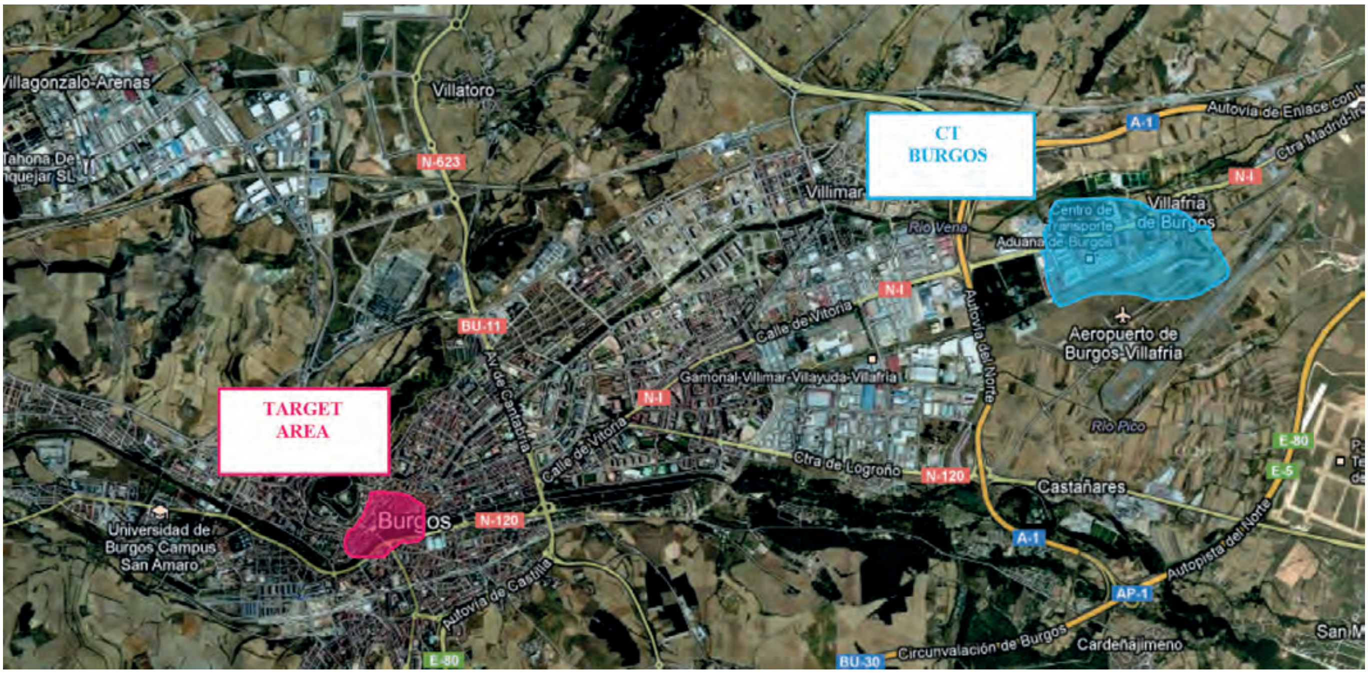
Above all, goods distribution currently exercises considerable pressure upon the historic and monumental centres, given that these areas were home to a large number of various small businesses. Delivery vehicles use a wide variety of routes and park wherever was most convenient for them. The length of time spent parking was usually related to factors such as the type of outlet receiving the goods, the availability of storage space etc.

There were a large number of freight and delivery vehicles distribute goods to retail commercial outlets in the historic centre. These vehicles circulated throughout the day and, as a consequence, pedestrian areas are frequented by large vehicles for extensive periods during working hours.

The loading and unloading areas are the only existing logistic infrastructures in the historical City Center.

About the realization of a logistics distribution centre near the target area (Plaza España- España Square) it was done a calculation about the resources and cost estimation needed to implement the centre (There was a specific location planned for the centre). In the short term there are no specific plans for the centre implementation.

Burgos has an intermodal logistics center. The creation of "Centro de Transportes Aduana de Burgos" company (Freightage Facility Burgos Transit Customs) dates back to 1980, culmination of a long job period to fulfill the initiative. The setting up of the company is backed up by the Burgos vast industrial activity, its freightage and foreign trade business flow, its good communication networks (main roads and highways, railway, airport), and Burgos excellent geographic location within the region and Spain.



The success of the company led to its constitution in Public limited company with the following partners and institutions: the local banks, Burgos City Council, the local commerce and industry association, the Province Authority, and the Regional Authority.

"CT Burgos" services:

- Users and crews: Hotel, Coffee Bar, Restaurant, Bank Offices, Green areas and rest areas and Car park area
- Vehicle services: Car park area, Lorry park area, Service station and Garages
- Customs services: International Terminal and Customs Clearance, Free and Tax Depot, Phytosanitary Controls, Groupage, Break Bulk and Freight Storage Facilities
- Logistic services: Premises Available for Warehouse-Owners, Premises for Logistic Companies, Cold Stores, Temperature-Controlled Warehouses and Vehicle Warehousing

2.4 Main critics and needs

According to the logistics baseline developed, it is important to highlight the critical logistics problems that can be identified in Burgos, although they are quite similar of the ones feature in many city centres of small/medium historic and touristic cities.

These critical issues are listed below:

- Raise the distribution of goods from a purely regulatory and legal prism: Strategic, social and ecological dimension course of this activity is not conceived in the city.
- Insufficient involvement of the stakeholders: Is needed to take advantage of all the stakeholders which are involve on the city logistics. Developing cities tend to have a very active and mobile private sector. Developers and occupants belong to the same class of private dealers. The public sector is not always the best equipped to deal with increased logistics measures.
- Lack of facilitites regarding the support of intermodality around the historic city centre of the city.
- Low promotion of logistics to and within the touristic city centre: This objective should be achieved by coordinated actions involving public and private operators alike. Some measures, such as finding new services for tourists needs on the destinations, promoting the use of space and traffic controls to improve tourists' quality of visit, using information to fill the gap between final users and tourism and transport service providers, can be developed in Burgos.
- Lack of integration of energy efficient activities: is needed to minimize the accompanying environmental deterioration taking advantage of tics, FEVs … promoting Burgos as a smart city.
- "Plaza de España Market": this space represents plainly the major problem of the inefficient utilization of freight vehicles in urban areas, which contributes significantly to congestion and environmental nuisances such as emissions and noise. A more efficient utilization of freight vehicles can be achieved.

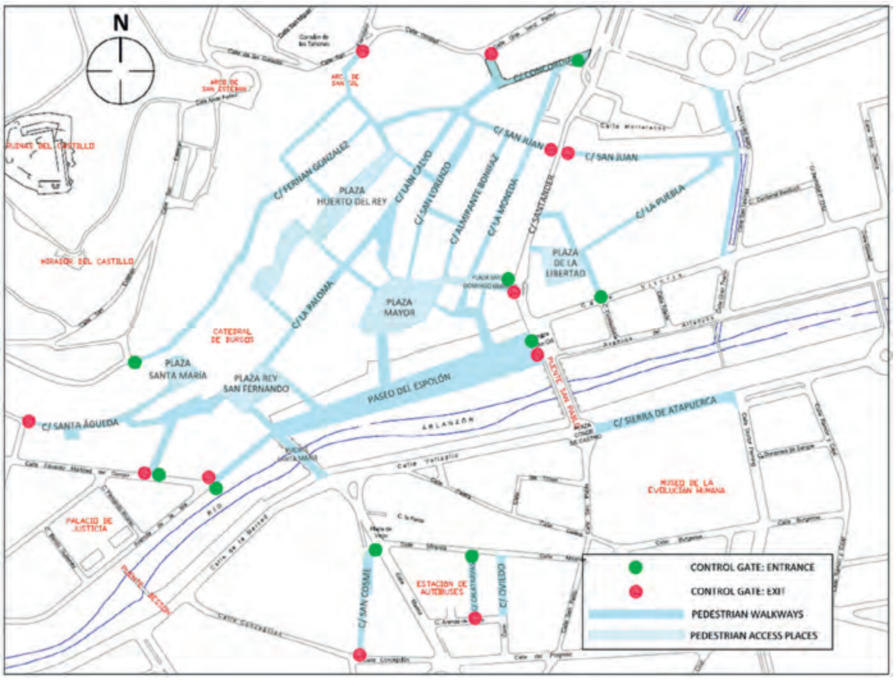
2.5 Strategic lines and priorities

Overall Objective: The SULP approach aims to establish a sustainable model capable of solving logistics needs of the city of Burgos both at present and in the future horizon Plan.

- Strategy Line 1: Deepening aspects of urban logistics management with new technologies. Smart city approach.
- Strategy Line 2: Optimizing and disposing common infrastructure, services and resources.
- Strategy Line 3: Greening urban logistics system.
- Strategy Line 4: Rearranging the space devoted to parking. Refurbish urban public spaces and small key points.
- Strategy Line 5: Promote intermodality, coordination and integration of logistics.

3. LOGISTICS BASELINE

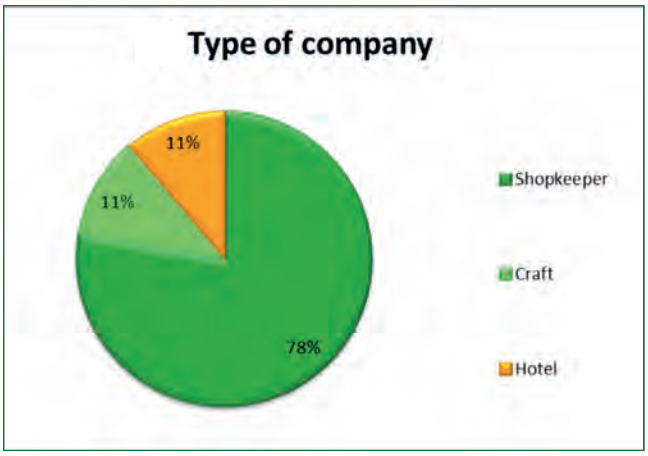
The city data on main flows and its types was being collected through surveys during the year 2012. For further data check chapter 3.3 of this document.
Figure below shows the Entrance and Exit Points. The area is divided in 9 sectors, and for the HO RE CA, sectors 1, 3 and 9, the exits are through C/San Gil; C/ San Juan and C/ San Gil, respectively, in order, to optimize deliveries in specific hostelry areas.

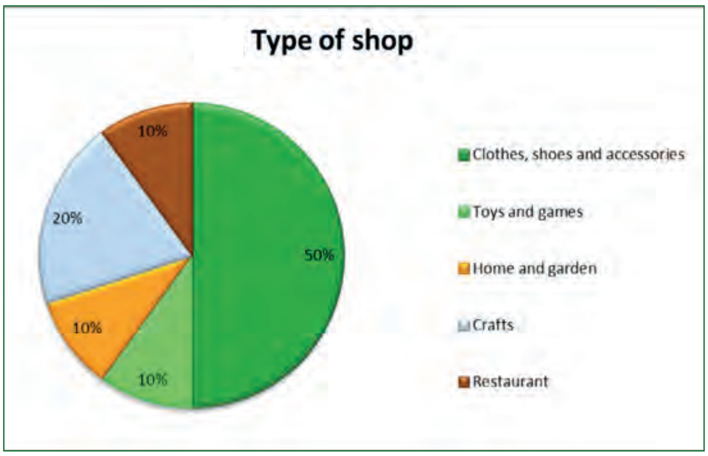


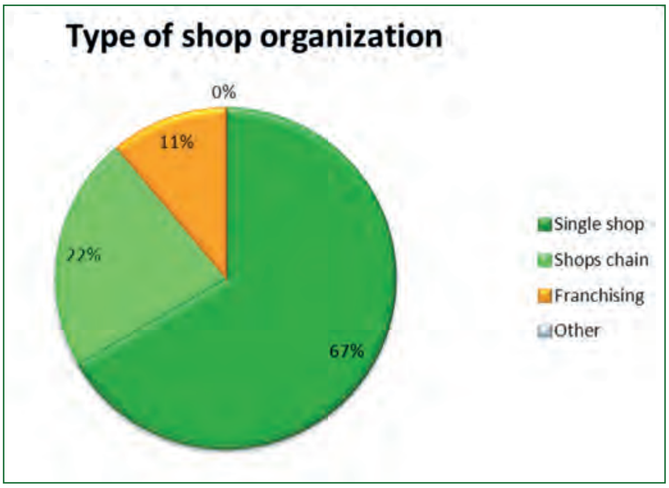
3.1 Main Demand aspects and figures

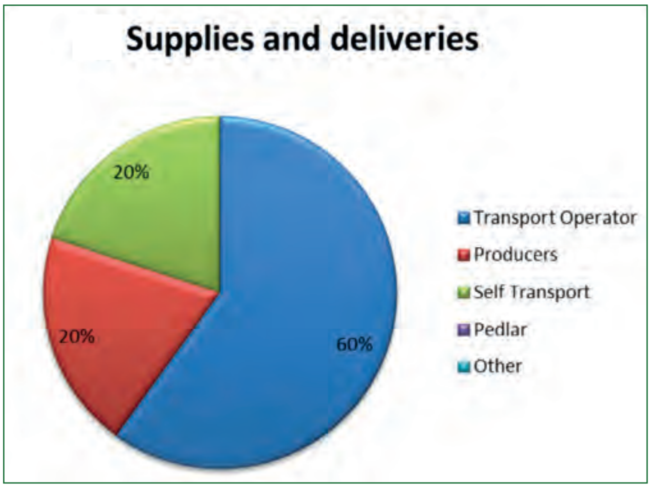
The following pie charts have been developed as a result of the shop owners questionnaires executed in the Burgos Historic Centre Area.
The target area, where logistic services are been analyzed is located in vehicle restricted area of the historical city centre, all around the cathedral, where about (estimation) 628 commercial activities are with this average breakdown: HO-RE-CA (32%), Food Commerce (9%), Personal Equipment Commerce (Clothing,...) (33%), Home Equipment Commerce (10%), Commerce with high service component (9%), Banks (5%), Pharmaceuticals (2%).

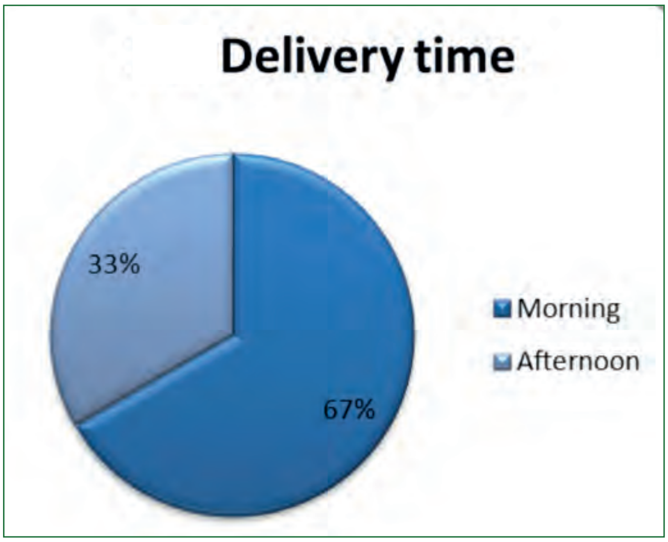
The following information has been analyzed: the kind of vehicles used, the actual load factor, number of trips per week/day/month, days of the week and transported freight type, etc.
Those interviews with local stakeholders (shop owners and transport operators) provide a more detailed analysis of freight and city distribution processes.
The Shop Owners surveys were carried out by email through the Asociación de Comerciantes Centro Histórico Burgos (Historical Centre Shop Owners Association).

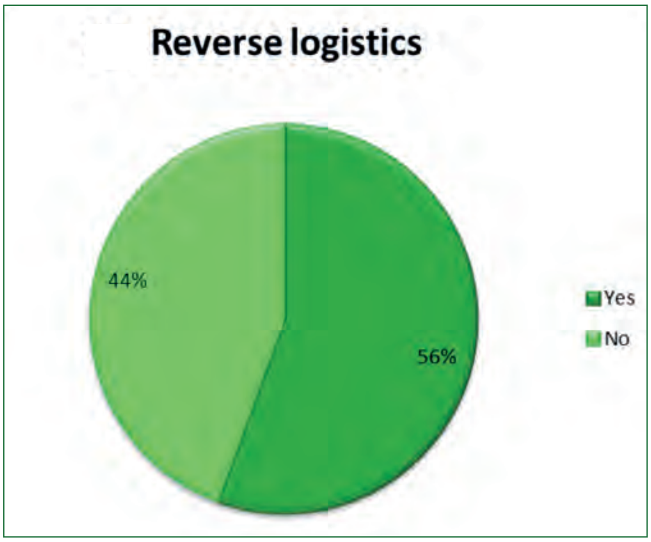












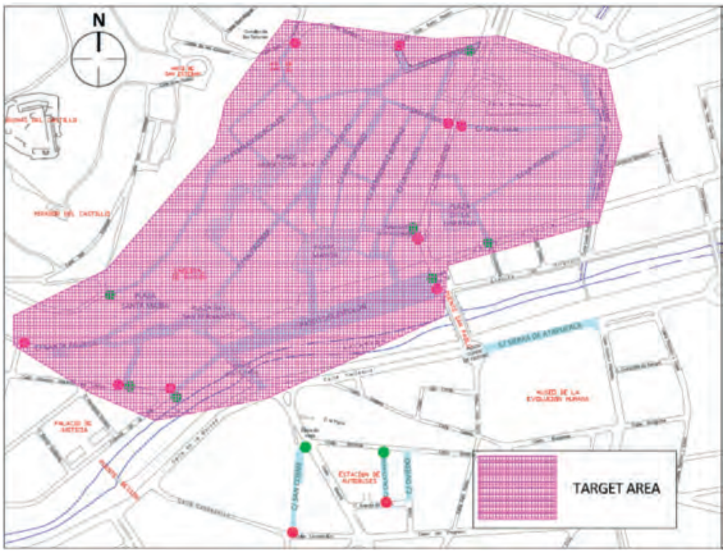
3.2 Existing Transport operators

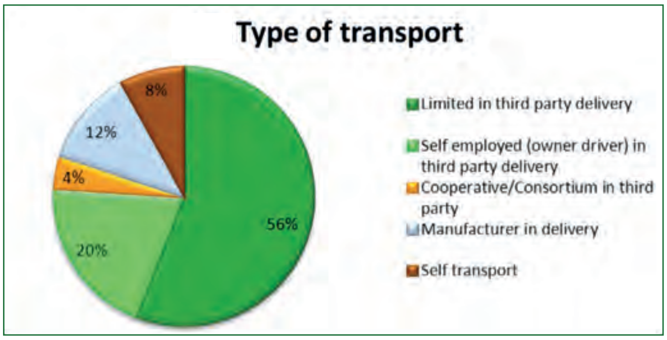
The following data have been developed as a result of the transport operator questionnaires executed in the Burgos Historic Centre Area.

The target area, where logistic services are been analyzed is located in vehicle restricted area of the historical city centre, all around the cathedral, where about (estimation) 628 commercial activities.

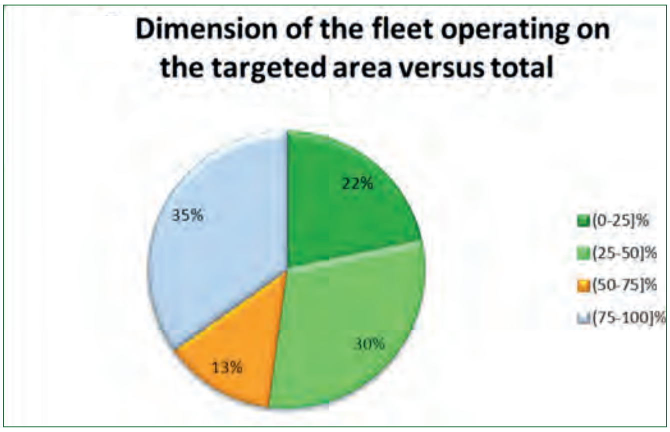
The following information has been analyzed: the kind of vehicles used, the actual load factor, number of trips per week/day/month, days of the week and transported freight type, etc.

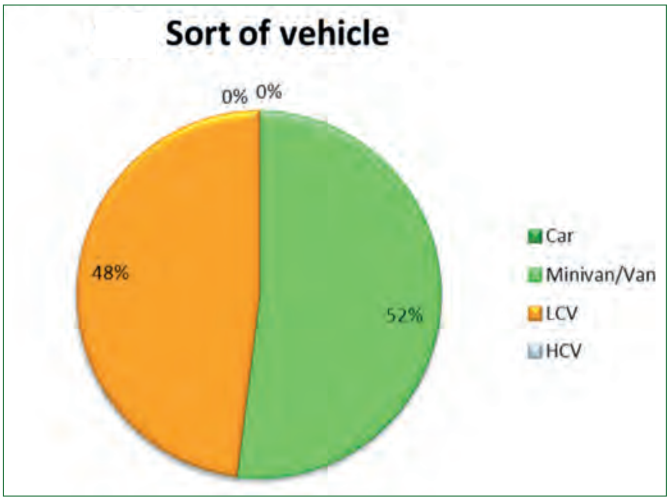
The surveys were repeated in four different times in order to cover different working days of the week and different time periods of the day (peak vs. non-peak hours).

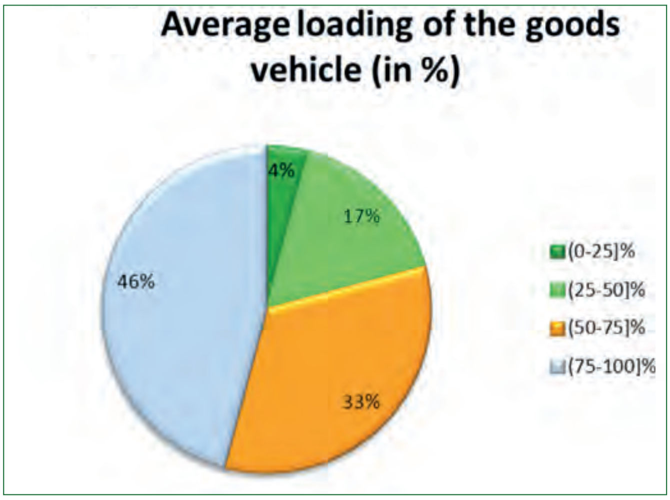


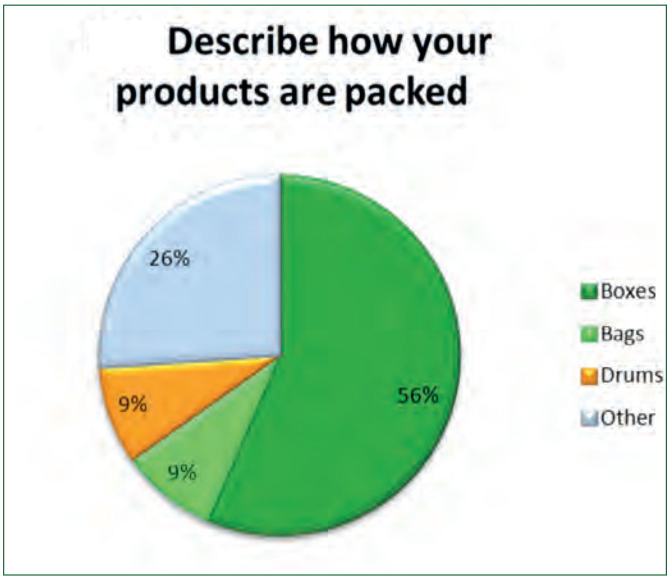

Type of transport
8%
12%
4%
20%
56%
Limited in third party delivery
Self employed (owner driver) in third party delivery
Cooperative/Consortium in third party
Manufacturer in delivery
Self transport

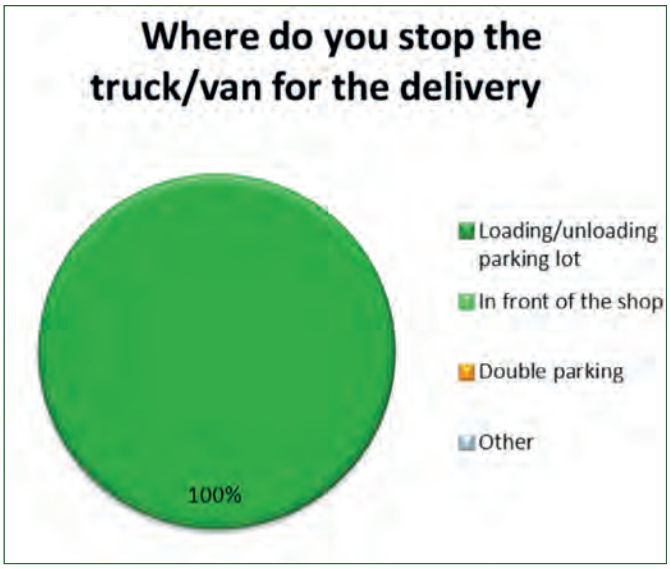

Do you collect goods from other companies' depots?
20%
80%
Yes
No

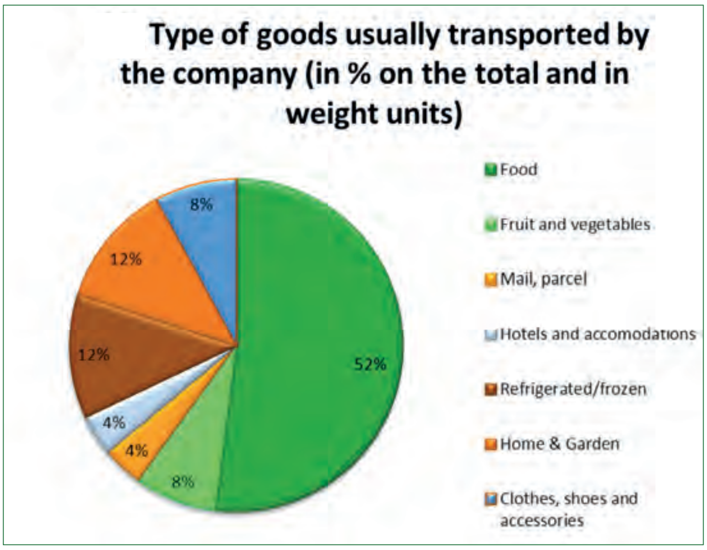

Dimension of the fleet operating on the targeted area versus total
22%
35%
13%
30%
(0-25]%
(25-50]%
(50-75]%
(75-100]%

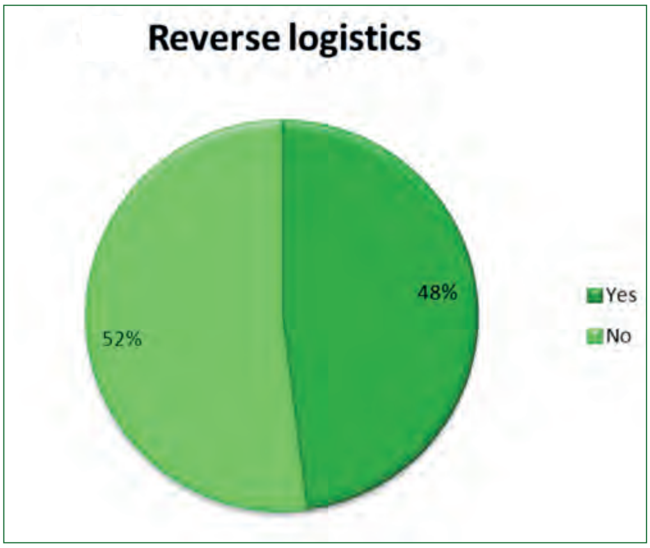

Sort of vehicle
0% 0%
48%
52%
Car
Minivan/Van
LCV
HCV


Average loading of the goods vehicle (in %)
4%
17%
46%
33%
(0-25]%
(25-50]%
(50-75]%
(75-100]%


Describe how your products are packed
26%
9%
9%
56%
Boxes
Bags
Drums
Other


Where do you stop the truck/van for the delivery
100%
Loading/unloading parking lot
In front of the shop
Double parking
Other





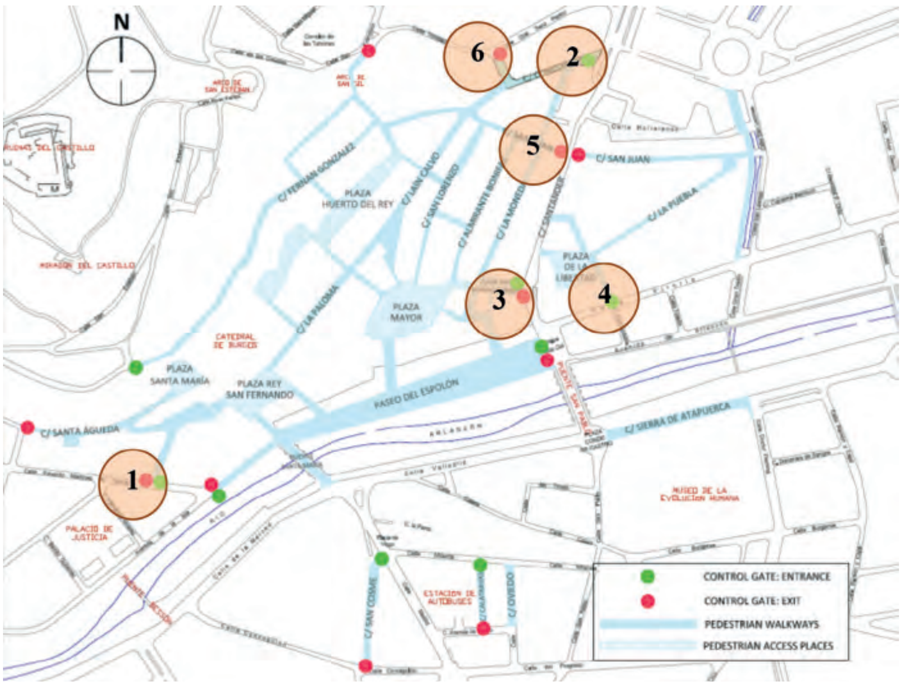
3.3 Commercial vehicle flows and main typologies

The following pages summarize the results of the vehicle count survey carried out on-site at the specific time periods shown during the first weeks of September 2012 (4 September / 11 September).

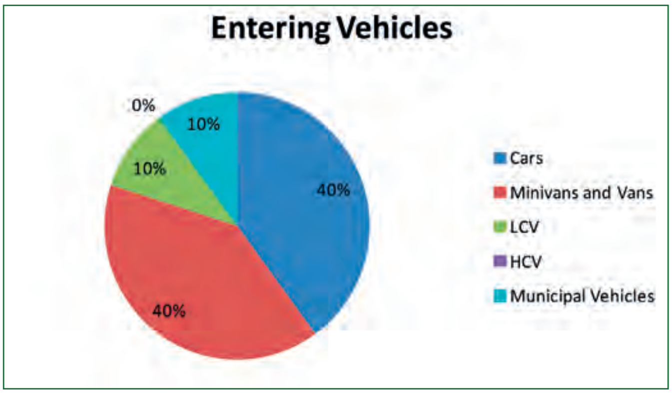
The vehicle counts were taken at the entry/exit points of historic center. These points allow only the freight traffic during certain hours per day. The points for data collection were chosen based on the volume of freight traffic. Not considering those entrances to the restricted area which mainly collect municipal and resident flows.

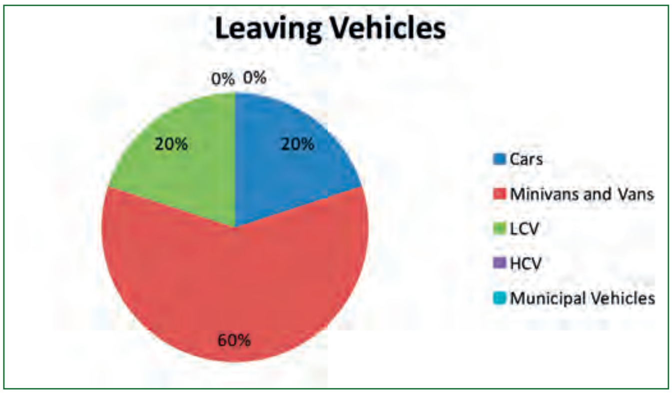
These traffic data collections along with the information collected from the transport operators and shop owners provide an updated picture of the commercial and freight flows in Burgos Historic Centre Area.

Data collected detects 902 vehicles per day, entering and leaving the target area through the points studied, in the time window 8-10. Of this total, 644 were vehicle entries into the area. Surveys were carried Tuesday to Thursday in order to avoid weekend traffic influence. Regardless of the type of vehicles used, the distribution of the 644 incoming vehicles was: cars 26%, minivans and vans 52%, light commercial vehicles 15%, heavy commercial vehicles 0% and municipal vehicles (police, ambulance, cleaning service, etc.) 7%. Vehicles with more than 3.5 tons are not allowed to enter without permission by the regulation, and during the data collection no heavy vehicles were detected trying to access the area.

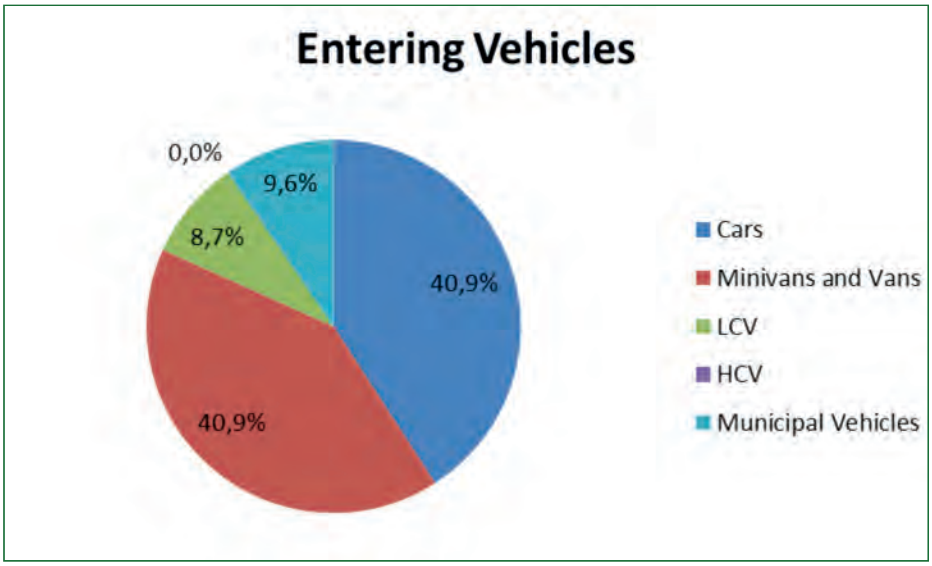


VEHICLE COUNTING POINT 1: C / Asunción de Nuestra Señora

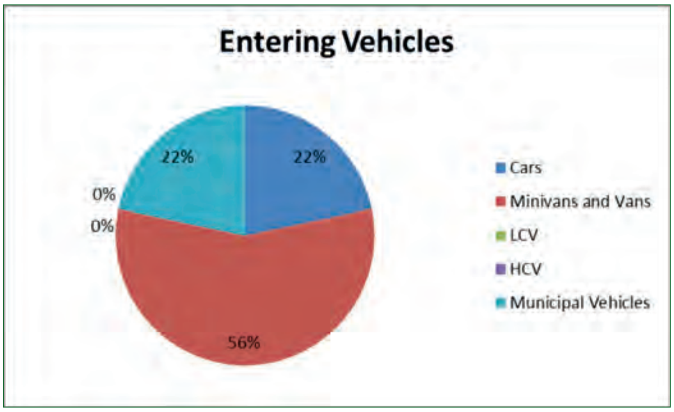


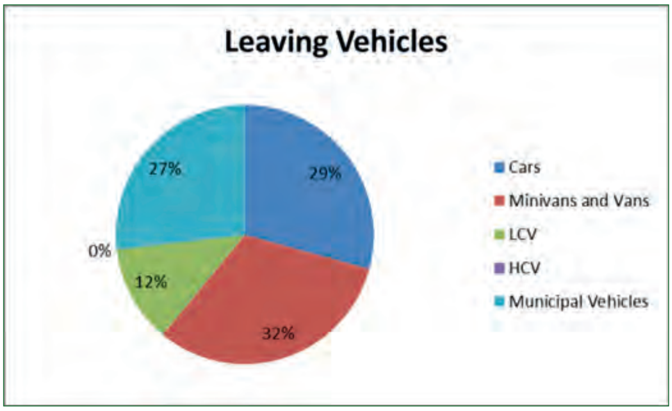


VEHICLE COUNTING POINT 2: C/ Concordia

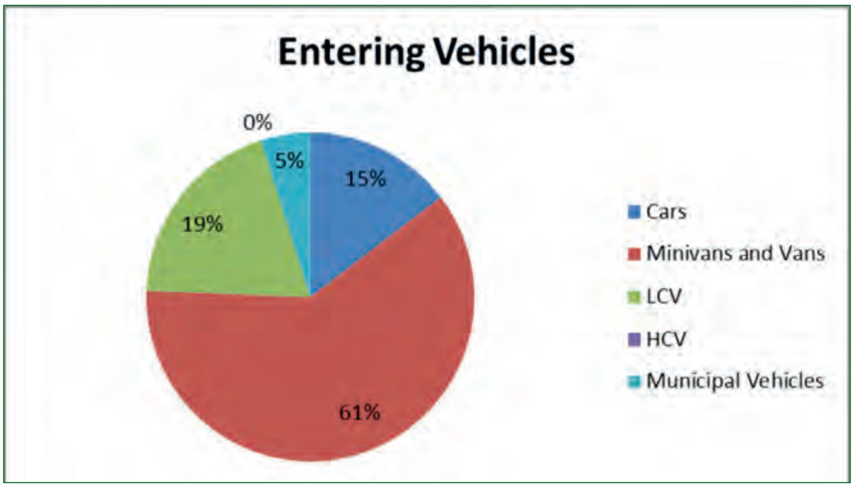


VEHICLE COUNTING POINT 3: Plaza Santo Domingo de Guzmán

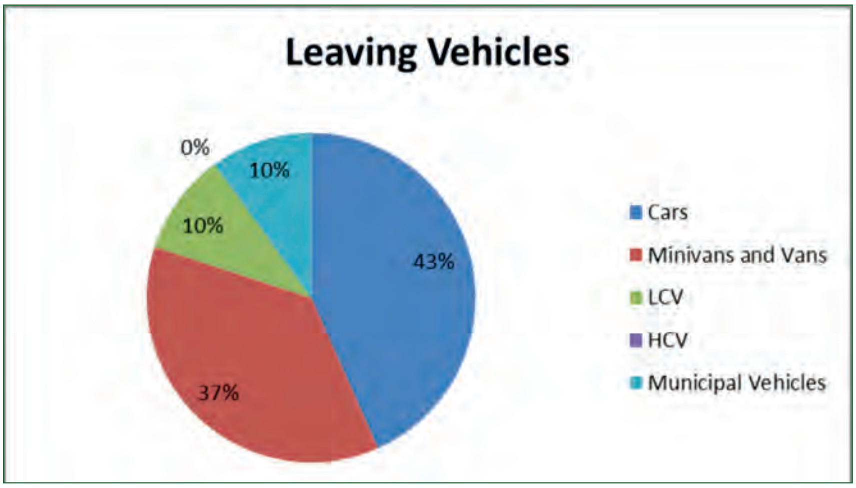




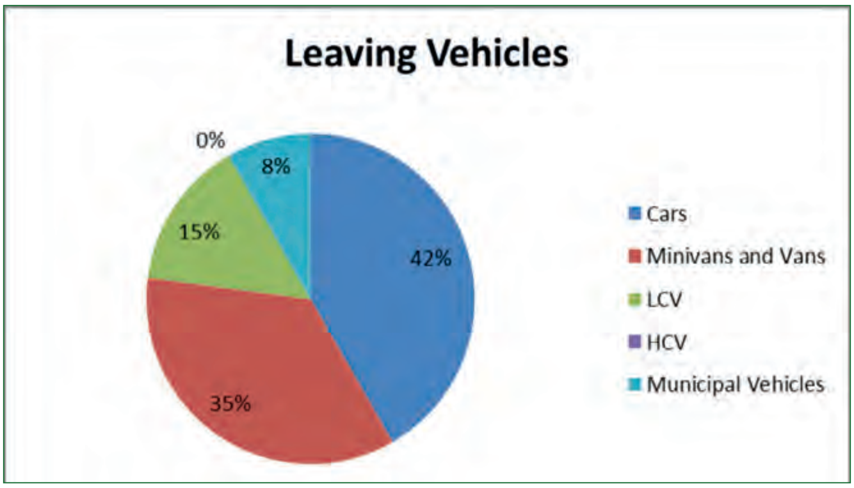
VEHICLE COUNTING POINT 4: C / Condestable



VEHICLE COUNTING POINT 5: C / San Juan



VEHICLE COUNTING POINT 6: C / General Sanz Pastor



4. LOGISTICS SOLUTIONS OVERVIEW

4.1 Measures, services and schemes

In this Chapter a synthesis of the logistics solutions/services identified as suitable for Burgos context and needs is provided.
In particular, general approaches, infrastructural and operative aspects and strengths/weaknesses related to Burgos situation are described for the following measures/services:

- Urban Consolidation Centre (UCC)
- Eco Van sharing
- Self-supply management
- Park and buy
- Pick-up points (PuP)
- e-Logistic

4.2 Main support regulation

Burgos as the result of being involved on the ENCLOSE Project is developing two soft measures regarding the regulation which goals are:

- regulate the loading and unloading time frames and routes within the Burgos historical city centre
- restrict the vehicular access to the area
- reduce the vehicle emissions in the area
- make a more pedestrian friendly city centre

The first measure is a **New regulation for the historical centre access, with special processing for loading- unloading tasks**. There was a previous one from 2007 that started to control the pedestrian areas with bollards, phones and cameras surveillance 24 hours a day. This involved the reorganization of traffic by restricting to pedestrian several streets, the design of routes and neighboring access protocols, and other traffic and public road use.
The second measure is a **Card system on loading and unloading for shop owners and hostelry owners (for non-labelled vehicles).** The City Hall provides the Downtown Historic Merchants Association 20 unidentified registration cards, which will be distributed to members and non-members merchants of the historic centre, who need to work loading and unloading.
More about this support regulation could be found on Chapter "2.2 Specific regulations for freight distribution process".

4.3 Support infrastructures/measures

4.3.1 URBAN CONSOLIDATION CENTRE (UCC)

The Urban Consolidation Centre (UCC) is a complex structure, based on a physical infrastructure (i.e warehouse) as a primary component (indicated also as Logistics Base) connected with a range of organization and service measures.
For this reason the UCC is also indicated with other different names and acronyms (i.e. Freight Consolidation Centre, Freight Transhipment Centre, Transit Point, Public Logistics Terminal, Urban Logistics Platform, Freight Collection Point etc.), but it substantially presents a common structure and approach: main reference point for rationalizing urban logistics processes and providing logistics services that can significantly improve the environmental sustainability of freight delivery in urban areas and city centres.

Freight consolidation management is the key activity of UCC. The expression "Freight consolidation" refers to a group of operation models and commercial relationships among the UCC and different logistics operators or between the UCC and shop owners, aiming at reducing the number of freight delivery trips within the urban area.
The UCC will act as base for gathering goods of different operators (groupage) and implementing "last mile" delivery services managed by UCC fleet. The next figure shows the operation model of the UCC solutions.
Normally the UCC can result from a private (i.e. an operator or a consortium of operators) or, more frequently, a public enterprise (i.e. Municipality or other Local Authority). In the latter case the Public Authority is in charge of setting-up the structures, purchasing the vehicles of the fleet (if possible eco-friendly) and managing the service, also availing itself of external staff.
At a following stage, once UCC experience consolidated, the Authority may also involve private actors in the overall UCC management, only maintaining the functions of control and regulation, thus establishing, in practice, some form of public-private partnership (PPP - public private partnership).

The UCC can operate, from the commercial point of view, basing on two different approaches:

1. the UCC makes an agreement with the main long range transport operators that often prefer avoiding to enter the inner city centre for delivering low volumes of freight. In this case the transport operator goes directly to the UCC bases leaving the parcels to be delivered in the city centre by the UCC fleet. The operator bears the cost of these last mile transport service. This scheme was implemented in several European cities (with different characteristics and dimensions), such as Berlin, Bremen, Bristol, La Rochelle, Malmo, Parma, Vicenza, Siena, Barcelona, Lucca, etc.
2. the UCC makes an agreement with the owners/responsibles of the main commercial activities located in the city centre or urban area (shops, restaurants, cafés, minimarkets, etc.). This agreement foresees that the delivery of the ordered freight is to be made directly to the UCC address. In this case the shop bears the cost of last mile service but, at the same time, can also benefit from a lower delivery price applied by the freight operator, thanks to the agreement that guarantees significant quantities of freight to deliver during the year.
   In addition, shopkeepers do also benefit from added advantages, due that they can avoid the costs for other related logistics activities e.g storage management, reverse logistics processes (i.e. cartonboxes, pallets, plastics), etc. Moreover additional benefits can also be represented by the possible lower delivery prices got thanks to the possibility for the shopkeepers to order larger quantity of goods without any problem of storage.

This is the scheme adopted in 's-Hertogenbosch (NL) by the private company Eco2city.

The two different schemes detailed above highlight the fundamental characteristic of a successful UCC: for operators not having a logistics centre in the reference city the delivery of freight to UCC, upon payment of a fare, shall be more convenient than to overcome the difficulties for its-own vehicles to entre in the city centre. Such a convenience can either be "pushed" by the Municipality (i.e Vicenza, Lucca, etc.) imposing tight city access restrictions (i.e. time windows, parking time on l/u lots, vehicles sizes, vehicle emissions, one way streets, pedestrian areas, etc.), or be already present in the city morphology itself (i.e. Siena), where the characteristics of the historic centre, with narrow and steep streets and alleys, are a first deterrent for entering in the inner centre along with regulations and restrictions.

As already pointed out, the UCC is based on significant investments on infrastructures, fleet and organization, therefore this solution can be only the final step of a process aiming to identify the most suitable solutions and it can only result from a strong political willingness and from the capability to evaluate the different benefits and costs (directly and indirectly).

For this reason UCC are normally viable solutions for big cities or metropolitan areas, where these usually play the role of urban interports. As regards small/medium size cities these structures should, if possible, be based on existing infrastructures and operators.

The experience of two ENCLOSE towns can be taken as reference in evaluating the feasibility of a UCC in Burgos:

- Lucca, where the Municipality, taking advantage of significant European and National co-funding, realized its UCC (infrastructures and vehicles fleet) after a long process lasted 8-10 years, adopting as logistics base (during the experimental phase) an existing minor public warehouse;
- Trondheim where the system implemented by Posten Norge is composed by two hubs at the opposite sides of the city. Large vehicles bring freight to the hubs, from where electric vehicles collect goods to be delivered to the city centre.

Moreover, an interesting solution is given by the possibility to adopt a logistic "cross docking" approach consisting of a service operated by the UCC where the freights where collected by the UCC vehicles directly at national operators warehouses and delivered to the shops in the city center for last mile distribution.

Whatever the chosen solution is, the implementation of a UCC usually produces several advantages, mainly dealing with freight flows and environmental sustainability of the logistics system. Among these, the most important are:

- Enhancement of the loading factor and reduction of half-load trips with lower transport unit cost;
- Reduction of fuel consumption (energy savings) and of polluting emissions (air and noise);
- Possibility to use low impact vehicles – electric, CNG or hybrid – for last mile deliveries management;
- Compatibility with different transport, environmental and social policies.

Moreover, logistics operators can also benefit from significant advantages by using UCC services, such as:

- Reduction of kms covered by freight vehicles;
- Reduction of time waste due to traffic congestions;
- Reduction of delivery times.

Finally, from the Burgos point of view, shop owners also enjoy positive advantages by using new delivery services:

- Possibility to receive useful delivery information from UCC (tracking) and to indicate specific hours for delivery;
- Possibility to enjoy other added-value logistics services based on UCC infrastructure (es. third party warehousing services, packaging collection, etc.).

The main problems concerning UCC dealing with economic sustainability, in particular:

- Costs for building the logistic base infrastructure (when already existing in-

frastructures cannot be utilized);
- Costs for supporting infrastructures and devices;
- Costs for purchasing commercial vehicles, in particular EVs, hybrids and low emission vans in general;
- Costs for freight transshipment.

Finally marketing problems could deal to the unwillingness of the national transport operator to allows deliver operation of "their" freight made with vans showing different brands.

4.3.2 ECO VAN SHARING

Usually van sharing service is more focused on the needs and requirements of shopkeepers in self supply, than on those of transport operators, and can be implemented by adopting different approaches. In any case this solution can be also suitable for those small transport operators that not having the economic possibility to directly buy commercial Electric Vehicles (characterized by high purchasing costs) but are in the needs to satisfy demand of freight deliveries in those cities having wide pedestrian zones or traffic restricted areas, and/or rules/normative allowing the access only to electric vehicles.

In order to adopt a van sharing solution the municipality, or better a transport operator consortium, purchases a fleet of electric vehicles (the number is to be defined based on local needs and area dimensions and funds availability) which are at freight operators disposal upon reservation. An advanced version of this service could includes an ICT platform to manage bookings and the use of electric vans (equipped with specific on board terminals and a smart card reader).

Electric vans can be located either at strategic points in the city or at the headquarters of one operator.

The cost of the service should be related to the effective time of usage and to the agreement criteria among transport operators (including, not last, the operation and maintenance costs). Some of the advantages of such a scheme for the operators are, among the others:
- No significant investment and management costs are needed;
- The courier is led to optimize the number of trips by trying to drive a full-load van (in order to reduce the cost for renting the electric vehicle);
- The historic centre is preserved from emissions and noise pollution.

Yet, the sharing concept also features disadvantages:
- It is not convenient for the transport operators based far from the city;
- Couriers are not often able to optimize shipments and may use half-loaded vehicles (i.e. in the case of urgent deliveries);
- Managing and maintaining the fleet;
- Need for a call-centre and/or suitable ICT platform (including development and maintenance costs) for managing booking, operation and revenues and the fleet.

4.3.3 SELF-SUPPLY MANAGEMENT

As pointed out in the previous section, one of the main mobility problems in the inner centre is related to the self-supply processes operated by shopkeepers using their own private vehicles (small vans and/or cars).

This problem is becoming even more evident due to the current economic crisis that is pushing many shop owners to economize on freight transport by using their own vehicles for transporting goods from and to the shops.

Because of this, really often shop owners enter illegally their vehicles (either vans or minivans) into the restricted area parking on loading/unloading areas for long periods.

In order to solve this issue some European cities set up restrictions on the number of vehicles that can circulate in the same time window in the restricted traffic area, by implementing specific measures such as: access control devices (i.e. bollards) operated under specific code/psw, a limited number of access permits issued to the shopkeepers (managed by their association) with specific rules both for booking the permits, the time period and for pick-up and delivery the permits.

This measure has the advantage of regulating and limiting the number of shopkeepers vans/cars circulating of the in urban city centers, especially to those featuring large pedestrian areas, without penalizing shopkeepers too much.

4.3.4 PARK AND BUY

"Park and buy" - P&B service is applicable to any tourist city having parking infrastructures (parking house) with presence of operators. The tourist who leaves his car in parking houses, usually at the border of the city centre, is not willing to buy bulky items as carrying such kind of goods during the visit is uncomfortable.

In order to solve this problem the P&B service, thanks to an agreement between shopkeepers and the parking manager, allow tourists to make shopping and find the purchased items later on directly at the parking house.

This service is based on a operative scheme allowing the shopkeeper to alert the P&B transport operator to collect the goods and to deliver it to the specific parking indicated by the client. Once the delivery is done an sms is sent to the customer for informing that the parcel is at the parking house. The same system can be used for delivery purchased items to hotels.

The following figure is related to park-buy scheme demonstrated in the Italian historic city of Siena some years ago.

The results of the service demonstration implemented in Siena showed that the dedicated infrastructure and organization for the parking house are relevant (security boxes, electric van, booking system, personnel presence, goods insurances, etc.) and can be successful faced only if this service is one of several logistics services provided by a transport operator or is one of the services provided by an UCC.

4.3.5 PICK-UP POINTS (PUP)

B2C commerce, and in particular Web commerce, is constantly growing, implying an increase of the volume of delivery services requested to the transport operators (mainly express couriers). One of the main problems that these operators have to face in this process is represented by the absence of addressees at the final destination (usually home) during working hours.
This implies that the transport operator shall do one or more unsuccessful trips to attempt the delivery and often the customer is obliged to go to the depot for collecting the item(s), thus generating additional traffic.
In order to avoid (or minimize) this problem, several interesting experiences were implemented in Europe, usually consisting in the setup, by the main freight operators, of some pick-up points either in public areas or at commercial activities (i.e. fuel stations, railway stations, etc.) with a h24 operating time.
The courier delivers the parcel(s) at PuP (usually located in close peripheral and easy accessible areas) and sends an sms to the consignee providing the reference number to self-collect the freight. This way freight operators avoid useless trips within the city and customers do not need to travel to the courier warehouses, that are frequently far from the city and have opening times coinciding with customer working hours.
One of the main successful PuP service experience in Europe (and in particular in Germany) is represented by the Packstation™ service operated by DHL/Deutsch Poste, characterized by a specific technological infrastructure (advanced boxes with IT) directly managed by the courier.
The main limit of this solution, from the operation point of view (apart relevant costs, area to be reserved to the infrastructure, etc.) is represented by the fact that the boxes "fulfillment" can be only operated by one courier. Despite the willing of the different transport operator to reach an agreement for a common and integrated solution, the real possibility to share this infrastructure among different couriers is very low, due the different information systems and flow integration required.
Other minor experiences have been developed in the last few years (i.e. Kiala services), based on similar concept, but although foreseeing more practicable solutions, these require in any case a specific agreements among transport operators and the PuP responsibles, that limit their diffusion..

4.3.6 E-LOGISTIC

In some European cities, on the basis also of significant pilot experiences developed under EU programmes (i.e. eDRUL Project - "eCommerce Enabled Demand Responsive Urban Logistics", FAMS Project - "Flexible Agency for Collective Demand Responsive Mobility Services" - 5th Framework Programme R&D EU-IST) the concept of the e-Logistics Agency for the provision of urban logistics services is emerging.

The e-Logistics Agency involves four main components:

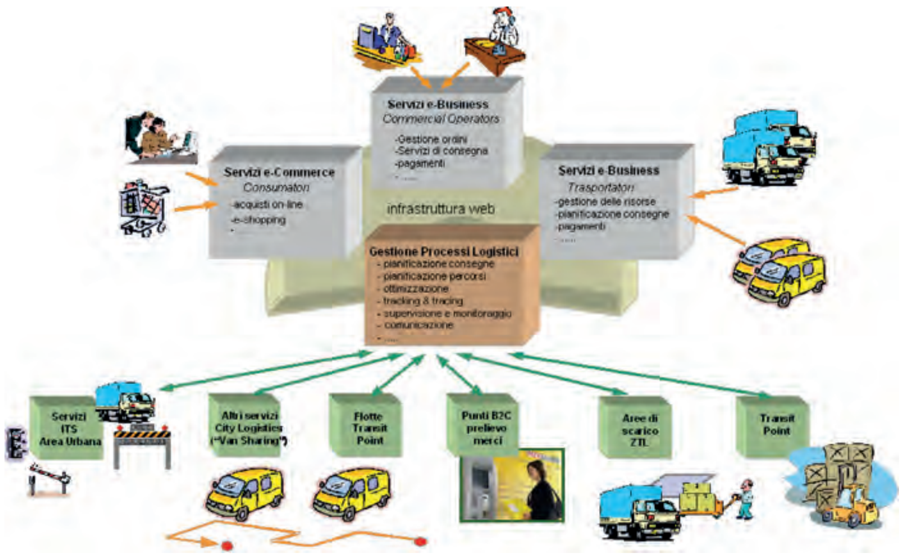
- **B2C services**, enabling interaction among the customers and the goods retail/distribution system (last mile, added value service and eCommerce interface);
- **B2B services**, enabling the networking and collaboration of the different actors of freight distribution chain (goods delivery operators, transshipment and logistics platform operators, retail operators, etc.) and allowing dynamic co-operation among these actors;
- **B2A City oriented services** in order to realize flexible, under mobility constraints, demand-driven goods distribution schemes integrated (if exists) with the ITS urban scenario and the mobility policies.
- **Base Planning services** to enable optimal management of the available resources related to freight distribution process (fleets and available capacity, logistics bases, consolidation, routing, etc.)

The e-Logistics Agency concept has been often developed (and in some pilot case demonstrated) as an extension of the existing demand responsive transport services operate for people (DRTS), as carried out in Almada with the FLEXIBUS service, where passengers can book their trip and choose the hour and the meeting point for pick-up.

DRTS services are based on a Travel Dispatch Center (TDC), for managing reservations and planning optimised trips.

In a perspective of enhancement towards the e-Logistics Agency concept, the TDC should be also involved in city logistics management as a "tool" for collecting requests and planning deliveries (preferably operated by FEV) in an optimized way.

In order to perform these tasks the e-Logistics Agency needs to be equipped with a specific web based ICT platform.



imply positive effects on the overall city mobility, as these will contribute to lowering traffic congestions (and related problems) depending on logistics processes.

The selected measures are the following:

1. Urban Consolidation Centre (UCC) - this measure is deemed feasible in Burgos context, due that a suitable area, with an easy access to/from the main road axis exists and locating it on the city centre. Moreover, due to freight volumes, a "light" infrastructural/operational solution was preferred, in order to enhance the economic sustainability of this measure.
2. Re-urbanization of "Plaza de España Market" area - closely related to the previous measure.
3. ECO-VAN-SHARING for city centre shop owners - Thanks to the availability of a specific location in the UCC suitable to the setup of this service, this measure is feasible in Burgos context and sustainable from the economic point of view, also in case of (initially) low freight quantities.
4. Web management for the -nonlabelled- cars card system - This measure is focused on the new Municipality regulation for commercial vehicles entering into the access control system of the

4.4 Main relations with the strategic lines and objectives

Based on the characteristics of Burgos study area, on the Project Deliverable D2.2 - "Sustainable logistics in European small-/mid-size historic towns: stakeholders goals and User Needs Analysis" and on the exchange of experiences with the other ENCLOSE towns, a selection of the most suitable measures that could be implemented in Burgos was made.

The selected measures, that will be described in detail in the following, aim to enhance the overall management of city logistics, in order to improve and optimize these processes, thus producing significant benefits not only from a logistics/commercial perspective, but also from the eco-sustainability point of view and in particular for energy saving and CO2 emissions reduction.

Moreover, such kind of measures will also study area. The preliminary pilot application of these actions was implemented as a "soft measure" in the frame of ENCLOSE project.

5. **Last mile service for the city centre (Park&Buy by bike)** - This measure was deemed particularly useful for Burgos, as it has the specific characteristics that a city shall have for making this scheme a successful one.

The other measures described were not selected because they are not sustainable from the economic point of view and would not have a significant impact of pollution reduction and energy saving in the study area.

STRATEGIC LINE AND MEASURES LINK:

- Strategy Line 1: Deepening aspects of urban logistics management with new technologies. Smart city approach.
  M5: Web management for the cars card system.
- Strategy Line 2: Optimizing and disposing common infrastructure, services and resources.
  M2: Urban Consolidation Centre.
  M3: Refurbish market and adjacent urban space.
- Strategy Line 3: Greening urban logistics system.
  M4: Eco-van-sharing for city centre shop owners.
- Strategy Line 4: Rearranging the space devoted to parking. Refurbish urban public spaces and small key points.
  M3: Refurbish market and adjacent urban space.
- Strategy Line 5: Promote intermodality, coordination and integration of logistics.
  M6: Last mile service for the city centre.
  M2: Urban Consolidation Centre.

4.4.1 BURGOS NEEDS PRO ASSESSMENT TABLE

For the SULP monitoring and consensus sustainability, a table/committee will be set.

4.4.2 BURGOS NEEDS PRO UCC

The main advantages that make it suitable for the city of Burgos considering the strategic lines and objectives are:

- Optimization of distribution trips
- Reduction of trips and vehicles in the centre
- Possibility to serve both direct and reverse logistics
- Possible support for 3rd party logistics services
- Enhanced safety and liveability of the historic centre.

4.4.3 BURGOS NEEDS PRO RE-URBANIZATION MEASURE

The main advantages that make it suitable for the city of Burgos considering the strategic lines and objectives are:

- Improvement of mobility in the area, enhancing intermodality, safety and liveability of the historic centre.

Lower emissions and energy consumption, leading to an overall improvement of the quality of life in the area.

4.4.4 BURGOS NEEDS PRO ECO VAN-SHARING MEASURE

The main advantages that make it suitable for the city of Burgos considering the strategic lines and objectives are:

- Integration of zero-emission vehicles in the overall urban mobility
- Social benefits (more employment, education, air quality, noise, etc.)
- Significant public acceptance.

4.4.5 BURGOS NEEDS PRO CARD MANAGEMENT SYSTEM MEASURE

TS and technologies have also gained an almost indispensable role in the operation of advanced city logistics solutions. Over 50% of surveyed best practices involve the implementation and operation of ITS and various technical facilities, from load and delivery planning software, to fleet monitoring systems, track-and-trace solutions, vehicle occupancy/transit detection technologies, automated vehicle identification (e.g. number plate reading), monitoring and enforcement systems.

The introduction of ITS and ICT services to optimize logistics, fleet and delivery operations has been also expressed as a main technological requirement by the ENCLOSE towns.

4.4.6 BURGOS NEEDS PRO "PARK&BUY BY BIKE" MEASURE

Regarding the B2C services for citizens, travelers and tourists we find listed some of the available implementations:

- B2C services for citizens and tourists using dedicated Pick-up-Points and delivery services
- Freight operations integrated with leisure mobility: "Park&Buy"-type services providing freight delivery at parking stations for tourists and travelers, luggage transport to/from hotels, etc.;

This service helps with a "hands free walking/shopping" to customers purchasing heavy or bulky products during shopping or sightseeing and having the problem of carrying their goods to the car parked outside a limited access zone or to the hotel where they´re lodging.

5. DESIGN OF THE IDENTIFIED SERVICE/MEASURE

5.1 Urban Consolidation Centre (UCC)

5.1.1 STRUCTURES

In principle the first elements to be considered in planning an UCC basic structure are a warehouse (including offices) and a loading/unloading operation external area.

Location

When choosing the UCC location, some key requisites are to be considered:

- Easily accessible for long range operators (i.e. close to main roads and/or railways);
- Not too far from the main city delivery area (in order to avoid excessive-length trips, enhancing trips/day, also for having the possibility to adopt electric vehicles.

According with these premises, the best area is the one located within the space of the old railway facilities, which is 1.5 km from the reference point at the city centre. Logistics base location and operating conditions for the Burgos UCC (the average distance between the UCC and the delivery area of the city centre is rather 1.5 km) and the total distance to be covered by each van (from 30 up to 40 km considering 6 trips/day), should be fully compatible with FEVS (electric vehicles), which are the most suitable solution, in terms of pollution reduction.

Warehouse

In order to keep the initial investment as low as possible it would be important to start with adapting the existing infrastructure of the all railway station, which could be enlarged in order to satisfy any future need for a wider space.

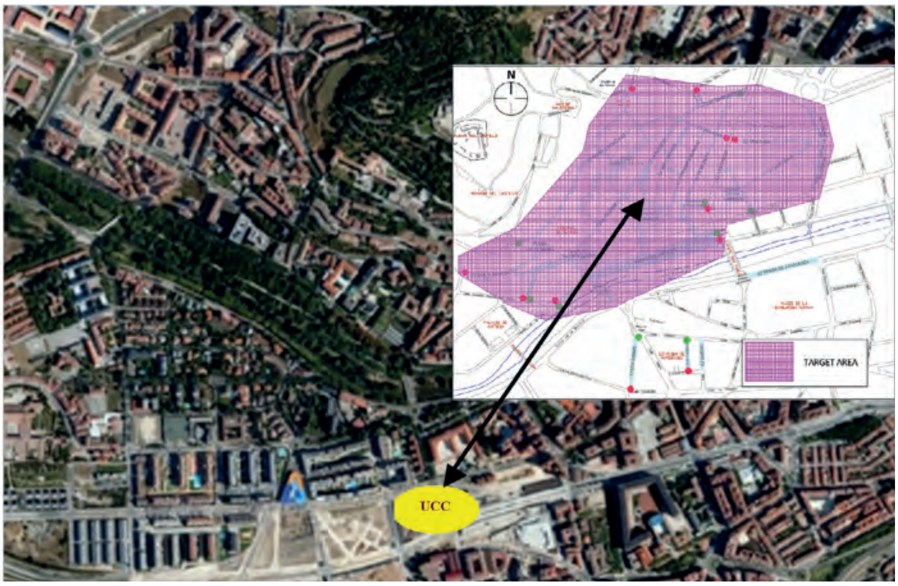
External area

An external manoeuvre area of 500 sqm (i.e. 20x25 m) is the minimum space required for allowing trucks operations in front of the downloading portals. The side of loading portals, occupied by vans needs a small external area of 200 sqm.

With the above detailed infrastructure dimensions a total surface of around 1500 sqm is needed. The selected Burgos UCC location well meets all these requirements in terms of available space.

5.1.2 NORMATIVE/RULES AND LEGAL CONSTRAINTS

A new normative scenario should be made in order to prevent the long range transport provider not to enter in the centre and to promote the use of the new installations.



5.1.3 FLEET TYPOLOGY

The delivery services could be preferable partially operated by a fleet of eco-sustainable commercial vehicles.

The suitable options shall be found among one of the following (featuring a decreasing environmental impact):

- New generation diesel vehicles (i.e. Euro 5 with DPF - Diesel Particulate Filter)
- Bi-modal (diesel/electric) vehicles
- Hybrid vehicles
- Electric vehicles (FEVs)

Considering the peculiar characteristics of the reference area, vehicle fleet, at least at an initial phase, could consist of n. 2 electric vehicles of 3,5 tons mgw - 1,1-1,2 tons of loading capacity, and operating on distances up to 120 km full-load.

At a following stage the possibility to widen UCC fleet, in order to diversify vehicle typology and satisfy different needs, could be considered. For instance, deliveries in the narrowest roads could be performer by means of electric mini-vans.

5.1.4 ICT SUPPORT TOOLS/SYSTEM

Although in the initial phase and in case of a limited activity all the procedures can be essentially managed manually, it would be important for an UCC to be equipped with an ICT system for managing freight services and planning, thus ensuring a fundamental support all along the delivery process phases: from freight collection, to trip planning, parcels and final delivery tracking despite the accounting report and administrative documents.

5.1.5 ORGANIZATION/OPERATION DIMENSION

This UCC will have as main service the last-mile delivery, but other freight and logistics services under mobility restriction policies set up by the Local Authority, such us:

- Full implementation of optimized city center reverse logistics services extended to the regular collection and transport of packaging and wasted elements from shops
- Complementary logistics services for special issues (e.g. transport of heavy/bulky goods for customers)
- 3rd party warehousing and support services for shop keepers and small business

Usually, for the last-mile delivery service, the main national long-range freight transport companies/operators, that in many cases have a depot in the surrounding city areas avail themselves of small local operators, owning one vehicle, or of small local transport cooperatives.

In the starting phase it is important to setup a light structure and collaborates with local small operators, to use their vehicles. In this phase the following resources (in terms of staff, equipment, etc.) will be required: 2 - 3,5 tons trucks, 1 - electric Pallet truck, 2 - truck drivers, 1 - loading/uploading responsible person and 1 - administrative employee

At a later stage on the basis of the real development of the UCC activities the vehicle fleet, the warehouse space, and the staff resources should be redefined.

As regards the management structure, at the beginning a full public (Municipal) management is to be preferred while, at a later stage, the management could be behalf of a public owned company, a public-private partnership or a service procurement partnership.

In any case a detailed "Management Performance Chart" between the Municipality and the operator contracted for UCC management should be defined, in order to clearly define since the beginning not only contractual issues (in terms of rights and obligations) but also the level of performances that the operator shall guarantee for the whole contract duration.

5.1.6 ACTOR ROLE AND RESPONSIBILITY

The main stakeholders to be involved for UCC activities are: freight transport operators, shopkeepers in the reference area, local authorities and Citizens and commercial associations.

All of these groups shall be met before making any decision on UCC, in order to make clear that, despite adding transshipment costs to delivery processes, the UCC is also an important opportunity for achieving a more efficient and sustainable freight delivery system, producing benefits for both freight transport operators (time saving avoiding access to the inner city center for small deliveries, possibility to use bigger vehicles, etc.)and for shopkeepers (more delivery flexibility, reverse logistics for carton box packaging, better urban environment, better accessibly and safety for pedestrians, increase the possibility of parking, possibility to use the UCC as third party warehouse with ecosustainable delivery on shop demand, etc.).

Finally, it is important to outline that the introduction of an UCC should be a participative process involving several public and private stakeholders. Several unsuccessful experiences stressed that innovative logistics services like UCCs can be implemented only with a close collaboration and agreement among Public Authorities, Logistics and Transport Operators, Shopkeepers, Citizen Associations, etc.

5.1.7 ROUGH ESTIMATION OF COST AND IMPACT DIMENSIONS

5.1.7.1 *Management model and investment costs*

As the previous paragraphs describe, Burgos UCC initially will have as main service the last-mile delivery and the corresponding freight storage.

Needed human resources: should be required both, administrative and operational resources. The minimum staff necessary to develop all the services on the UCC could involve:

- 1 administrative employee: who can plan and administrate the warehouse activity;
- 2 truck drivers: with knowledge on operating the loading and unloading machinery.

The management model should foresee the "classic" operational schemes dealing with freight collection (direct or cross-docking), consolidation, delivery, track and tracing (using GPS equipped vehicles), management, administration, etc.

Needed infrastructure:

- Adapting the existing infrastructure to create the warehouse and operational space.
- Furnishing an administrative office.

Needed mechanical equipment:

the minimum equipment should be bought:

- 1 Pallet truck
- Accurate freight handling and safety equipment
- 2 EVs (3,5 tons trucks)

Costs detail (in €) – maximum estimation

1. Staff operation costs in the initial phase

	Costs/year €
1 administrative person	35.000
2 drivers	50.000
TOTAL	85.000

2. Warehouse and external area adaptation

	Costs/year €
- Fence	30.000
- Construction works	30.000
- Electricy and phone	5.000
TOTAL	65.000

3. Administrative Office furnishing

	Costs/year €
- Furniture and equipment	10.000
TOTAL	10.000

4. Pallet Truck

	Costs/year €
- Electric Pallet Truck (with ergonomic lift Capacity 1600 and 800 kg)	3.000
TOTAL	3.000

5. Freight handling and safety equipment

	Costs/year €
- Slings, chains, pins, gloves, jackets,….	1.000
TOTAL	1.000

6. Electric vehicles

	Costs/year €
- 2 electric commercial trucks - 3,5 tons	140.000
TOTAL	140.000

7. Maintenance costs

	Costs/year €
- 10% of 2.+3.+4.+5.+6. Costs	19.900
TOTAL	19.900

The estimated initial management and investment amount should be around 323.900 €, +25% unexpected costs, for a total of around **405.000 € the first year.** In case of renting electric vehicles (around600 €/ vehicle/month), the total estimated investment costs is reduced to **240.000 €.**

5.1.7.2 Energy, environmental and social impacts

The required investment, which may be high in relation to the size of the physical infrastructures and technical installations involved, pays off in terms of several benefits for the environment and population: optimizing vehicle load and runs, reducing the number of trips, direct goods mobility towards less environmental impact conditions, etc.
The support from the local administration should be necessary to ensure the economic sustainability of UFT. Also strong efforts in marketing may be required.

5.1.8 ROUGH ESTIMATION REALIZATION TIMING

Several positive European experiences, such as the relevant UCC created in Lucca (CEDM UCC, now known as LuccaPort), highlight that a reasonably time needed for implementing an UCC, until its full operation phase, amounts to around 3 years.
According to this indication the following table provides feasible implementation timing for the Burgos UCC.

5.1.9 ROUGH ENERGY AND EMISSIONS SAVING IMPACTS

CO2 emissions reduction

The planned Burgos UCC will be located 1.5 km far from the central point of the study area, thus every electric van will cover around 6 km/delivery trip.
Considering that the UCC electric vehicles have an optimized load (min 90% of full capacity vs 30-40% of freight operator vans), an optimized electric vehicle is equal to around 2.5 current freight vehicles.
The use of optimized electric vehicles is equal to:

- 8 trips * 6 Km * 2.5 = 120 Km/day, not covered by conventional diesel vehicles.

As GHG emissions of a light diesel vehicle are around 430 gr/km CO2e (equivalent carbon dioxide):

- 120 km/day*0.43 kg/km*300 operat. days/year = 15.48 ton/year gross CO2e emission reduction.

Energy consumption reduction

- Diesel vehicles

Considering that a 3.5ton light diesel vehicle normally consumes 16.6 lt/100 km:
16.6 * 120/100 * 300 days = 5,976 lt/year diesel * 0.835 diesel density = 4,990 Kg/year diesel
4,990 Kg/year * 10,200 Kcal/kg = 50,897,592 Kcal /year = 5.09 TOE/year

- Electric vehicles

Consumption = 0.25 kWh/km
120 Km/day x 0.25 x 300days = 9,000 kWh/year
9,000 x 0,000086 =0.774 TOE/year
Net energy consumption reduction = 5.09 – 0.774 = 4.316 TOE /year

5.2 Re-urbanization of "Plaza de España Market" area (Hortelanos street)

5.2.1 DESCRIPTION OF THE MEASURE

The location is next to one of the -whole sale fruit- markets of the city, placed in the inner city –Plaza España Square-(out of the pedestrianized area). This market needs several structural refurbishments: the building dates from 1968, one entire floor (out of 3) is out of use, due to structure conservation and does not have its own indoor parking/load area: Shop owners and customers share outdoor parking area in Hortelanos Square, with limited space, deficient urban conservation and

PERIOD (Term)	1st YEAR	2nd YEAR	3RD YEAR
Study of the UCC location and accessibility (close to the main transport network, city access areas, etc.)	■ ■ □ □	□ □ □ □	□ □ □ □
Stakeholders meetings (transport operators, shopkeeper associations, citizens association, Municipality)	□ ■ ■ □	□ □ □ □	□ □ □ □
Support by public authorities and regulations (restrictions, incentives, impacts on competition, etc.)	□ □ □ ■	■ ■ □ □	□ □ □ □
UCC infrastructural implementation	□ □ □ □	□ □ ■ ■	□ □ □ □
UCC operational implementation	□ □ □ □	□ □ □ □	■ ■ □ □
UCC developed	□ □ □ □	□ □ □ □	□ □ ■ ■

traffic conflicts, affecting walking flows as well: Vehicles keep going round looking for a parking space in a very reduced area, in an inefficient way.

The mentioned needed refurbishment have been postponed last years due to political and economic reasons, but it will be implemented in the short term.

The initiative will include the development of urban refurbishing of the close streets (Hortelanos Square), one of the most degraded sites of the city center.

The solution could be defined around the following possible main elements/rules:

- Reconditioning of one market floor (out of 3) for freight vehicles.
- Reorganisation of the outdoor parking space:

- Specific load-unload bays for freight vehicles (covering one parking area out of two- south parking area)
- Spatial redistribution of the parking area (east parking area)
  - Time window redefinition:
- From 7:00 am to 15:00 am parking allowance only for freight vehicles and market users with limited minutes;
- From 15:00 pm on parking allowance only for residents;
- Electric vehicle, will park in special areas for free, so that the sustainability could be promoted in the area.

This measures will be developed together with an integral refurbishment of the pedestrian area, for a more walkeable and harmonized atmosphere.

To be mentioned as well, some long term measures regarding the market building (with big investment) including:

- Rebuilding the market (and related spaces and services) with an authorization for the use of space for a given period (to a private investor)
- Car park underground in the area of influence and study its connection to a near car park.
- Next step (having a disposible car park), the market streets are will be pedestrianised.

5.2.2 NORMATIVE/RULES AND LEGAL CONSTRAINTS

A complementary normative scenario should be made in order to include a special treatment of this area.

5.2.3 ACTOR ROLE AND RESPONSIBILITY

The main stakeholders to be involved for the re-urbanization measure are mainly the Local authorities, Shops owners, users and Residents,...

5.2.4 ROUGH ESTIMATION OF COST AND IMPACT DIMENSIONS

Envisaged possible problems can be identified in:

- Opposition of shopkeepers and residents to accept the new planned measures. This aspects should be addressed by a strong involvement activity (meetings with market shopkeepers, transport operator associations, citizens association, Municipality, etc.).

This measure affects only an existing public infrastructure and consists on a regulatory measure principally, thus no significant costs are foreseen. There will be no initial devices to be purchased, but for a future phase some charging dots for EVs could be achieve.

5.3 Eco-van-sharing for city centre shop owners

5.3.1 STRUCTURES

In principle the first elements to be considered in planning a VAN-SHARING basic structure are a parking (loading/unloading zone) area and a located charging point.
The selected surrounding area of Burgos UCC location, well meets this special need. The van-sharing depot/parking area would occupy a minimum area of the existing parking space.

5.3.2 FLEET TYPOLOGY

Considering the peculiar characteristics of the reference area, vehicle fleet, at least at an initial phase, could consist of n. 1 electric van of 3,5 tons mgw - 1,1-1,2 tons of loading capacity, and operating on distances up to 120 km full-load.
At a following stage the possibility to widen the van-sharing fleet, in order to diversify vehicle typology and satisfy different needs, could be considered. For instance, deliveries in the narrowest roads could be performer by means of other types of FEVs, like the cargocycles used in the Petite Reine scheme in Rouen (FR) or GnewtCargo scheme in London. One of these FEVs can be used in a long-term phase of this measure to support the sustainable own-transport services (for shops, businesses and citizens) of van sharing schemes in Burgos.

5.3.3 ICT SUPPORT TOOLS/SYSTEM

Although in the initial phase and in case of a limited activity all the procedures can be essentially managed manually, it would be interesting for the van-sharing scheme to be equipped with an software/web for both, ECO-VAN and CARD management. The ICT system for managing freight services and planning thus ensures a fundamental support all along the delivery process phases: from freight collection, to trip planning, parcels and final delivery tracking. Complete information of this ICT – technology could be finding on part 5.4 of the present chapter.

5.3.4 ORGANIZATION/OPERATION DIMENSION

The suitable depot point to locate the ECO-SHARED-VAN should be on the UCC (Urban Consolidation Centre), where a perfect control of the vehicle can be done.
Electric driving has new issues around road safety and daily use (i.e. recharging strategies), that is why charging point for the van have to be implemented on the depot area.
A booking web system to manage the use of the van-sharing scheme is needed.
The Public financial support in the context of an overall program involving environmental targets could fit this measure.

5.3.5 ACTOR ROLE AND RESPONSIBILITY

The main stakeholders to be involved for Van-sharing activities are: Local authorities, Shops owners, Business and service operators, Citizens and commercial associations, Residents,...

5.3.6 ROUGH ESTIMATION OF COST AND IMPACT DIMENSIONS

Due to the easy adaptation of the surrounded area of an existing facility to this purpose the general measure could starts with a low investment cost, this will be helpful to make the activity economically self-sustainable.

Needed mechanical equipment: the minimum equipment should be bought:

- 1 EVs (3,5 tons trucks)

Costs detail (in €) – maximum estimation	
1. Electric vehicles + charging dot	
	Costs/year €
- 1 electric commercial trucks - 3,5 tons	70.000
- 1 charging dot	6.000
TOTAL	76.000
2. Maintenance costs	
	Costs/year €
- 10% of 1. Cost	7.600
TOTAL	7.600

The estimated initial management and investment amount should be around 83.600 €, +25% unexpected costs, for a total of around **105.000 € the first year** (the cost of a ICT system is not included on this initial phase, although the cost can be checked on the next section 5.4).
Some of best practices operating FEVs have shown that electric vehicles bring clear benefits as regards the abatement of exhausted gases, CO2 and noise emissions. Not least, although the use of (local/regional) renewable energy is still difficult.
FEVs are accepted by the public and have an "image" which may be a helping factor for the introduction of new sustainable logistics services introduction in a site.

5.3.7 ROUGH ENERGY AND EMISSIONS SAVING IMPACTS

CO2 emissions reduction

As GHG emissions of a light diesel vehicle are around 430 gr CO2e /km (equivalent carbon dioxide).
Considering that the average consumption of one of the electric vehicles taken into account would be 0,25 KWh/Km and that the CO2e emission per produced kWh can be as low as roughly 260 gr.
The net CO2e emission reduction related to the Burgos ECO VAN-SHARING measure would be of about 430 – 260 = 170 gr CO2e /km (per daily km)

Energy consumption reduction

- Diesel vehicles

Considering that a 3.5ton light diesel vehicle normally consumes 16.6 lt/100 km:
16.6/100 * 300 days = 49.8 lt/km-year diesel * 0.835 diesel density = 41.58 Kg/km-year diesel
41.58 Kg/km * 10,200 Kcal/kg = 424,146.6 Kcal /km-year=0.0424 TOE /km-year

- Electric vehicles

Consumption = 0.25 kWh/km
0.25 x 300days = 75 kWh/km-year
75 x 0,000086 =0.00645 TOE/km-year
Net energy consumption reduction = 0.0424– 0.00645 = 0.03595 TOE /km-year (per daily km)

5.4 Web management for the -nonlabelled- cars card system

5.4.1 STRUCTURES

The system controller can use a small office inside of the UCC facilities, described on part 5.1 of this chapter. From this office all the management of the system can be done: card distribution, software/web maintenance, awareness campaigns....

5.4.2 NORMATIVE/RULES AND LEGAL CONSTRAINTS

The City Council developed a new regulation, which was on public exhibition phase and entered into effect in February 2013.
The new regulation for the historical centre access, with special processing for loading- unloading tasks replaces the previous one from 2007 that started to control the pedestrian areas with bollards, phones and cameras surveillance 24 hours a day.
This involved the disposal by the City Hall for the Downtown Historic Merchants Association of 20 unidentified registration cards, which will be distributed to members and non-members merchants of the historic centre, who need to work loading and unloading.

5.4.3 ICT SUPPORT TOOLS/SYSTEM

A management program for land transport of goods by road offers increased productivity, efficiency and management control, allowing simultaneous control of several shop owners with nonlabelled- cars.
Accurate information can be obtained through specific manager listings: traffic, control, administration... etc. This type of ITC gadgets can have the information needed in the appropriate time and place.
This web/software application could be used also for managing the booking of the electric vehicle, as is described on the previous chosen service (5.3 ECO-VAN-SHARING FOR CITY CENTRE SHOP OWNERS).

5.4.4 ORGANIZATION/OPERATION DIMENSION

The Downtown Merchants Association needs to create a historical record that attest to whom delivered card holding period of the card and any incident arising thereon, to realize what the area of Public Safety and Emergency.
The web/software transport management system will help the Downtown Merchants Association in this issue and also can control the Eco-Van-Sharing system which was described previously.

5.4.5 ACTOR ROLE AND RESPONSIBILITY

The main stakeholders to be involved for Van-sharing activities are: Local authorities (including policy makers and urban planners), Shops owners, retail operators, Business and service operators, Freight transport/distribution service providers,...

5.4.6 ROUGH ESTIMATION OF COST AND IMPACT DIMENSIONS

Needed human resources: should be required administrative resources. The minimum staff necessary to develop all the services on the management system could involve:

- 1 administrative employee: who can administrate the system;

Needed infrastructure: as the office will be fitted on the new UCC, minimum changes should be done:

- Furnishing an administrative office.

Costs detail (in €) – maximum estimation

1. Staff operation costs in the initial phase

	Costs/year €
- 1 administrative person	35.000
TOTAL	35.000

2. Administrative Office furnishing

	Costs/year €
- Furniture and equipment	10.000
TOTAL	10.000

3. ICT systems

	Costs/year €
- SW logistics platform	15.000
TOTAL	15.000

7. Maintenance costs

	Costs/year €
- 10% of 2.+3. Costs	2.500
TOTAL	2.500

The estimated initial management and investment amount should be around 62.500 €, +25% unexpected costs, for a total of around **78.000 € the first year.**
The web/software manager system investment should be done by Downtown Merchants Association, although is recommended a Public financial support in the context of an overall program involving environmental targets.
The required investment pays off in terms of several benefits for the shop owners, environment and population: optimizing vehicle load and runs, reducing the number of trips, direct goods mobility towards less environmental impact conditions, etc.
Also several campaigns in marketing and awareness may be required although no in the initial phase of development.

5.5 Last mile service for the city centre (Park&Buy by bike)

5.5.1 STRUCTURES

The Bike Logistic Agency can be placed inside of the UCC facilities, described on part 5.1 of this chapter.
From this office all the management of the service can be done: routes planning and schedule, temporary stockroom for goods in case shops close before the customer leaves the parking, bike fleet parking, bikers toilettes/showers areas...

5.5.2 FLEET TYPOLOGY

Deliveries could be performer by means of FEVs, like the cargocycles used in the Petite Reine scheme in Rouen (FR) or GnewtCargo scheme in London.

5.5.3 ICT SUPPORT TOOLS/SYSTEM

An ICT system for managing freight services and planning ensures a fundamental support all along the delivery process phases: from freight collection, to trip planning, parcels and final delivery tracking. Complete information of this ICT – technology could be finding on part 5.4 of the present chapter.

That system should be implemented with a web service system with wireless technology and hand held computers.

5.5.4 ORGANIZATION/OPERATION DIMENSION

P&B by bike service will offer this chance for any customer that shop in the city centre (citizen, tourist…). He can buy an item in a shop and have the parcel delivered at the parking house or hotel he wants.

If the customer is interested, he selects the time within and the place where the goods have to be delivered. After paying a fee he gets a code for collection. When the customer accepts this service the shop owner contacts the Bike Logistics Agency with the web system and provides information about the pick-up place, the delivery place, and the expected delivery time.

The Bike Logistics Agency plans an optimize route due to the load, available biker, delivery customer restrictions and provides the shop owner with some choices about the calculated trips´ delivery schedule. When the shop owner confirms one of the solutions proposed by the Bike Logistics Agency, the new route will be uploaded to the urban delivery biker using wireless technology and hand held computer.

At the given time the urban delivery biker will pick up the goods from the shop and will deliver them to the selected place. When the parcel has been delivered the Biker, using its own hand held computer, will communicate with the Bike Logistics Agency. The Agency transfers this information to the end customer notifying that his parcel has been delivered by sending an SMS. Finally the customer presents the code when paying for the parking or when entering the hotel and collects the goods.

5.5.5 ACTOR ROLE AND RESPONSIBILITY

The main stakeholders to be involved for Van-sharing activities are: Local authorities (including policy makers and urban planners), Shops and retail operators, Business and service operators, Parking managers, Citizens associations, Customers,…

5.5.6 ROUGH ESTIMATION OF COST AND IMPACT DIMENSIONS

Due to the potential sharing of resources among the previous measures to this purpose the general measure could starts with a low investment cost, this will be helpful to make the activity economically self-sustainable.

Needed human resources: should be required operational resources, cyclist-deliverers. The minimum staff necessary to develop the services on could involve:

1 administrative employee: who could be share with the UCC administrative;

1 ICT/planning employee: who could be share with the card management employee;

4 cyclists: with knowledge on operating the loading and unloading machinery.

Needed infrastructure: as the office could be the same planned for the ICT management system located on the UCC, no costs will be required.

Needed mechanical equipment: the minimum equipment should be bought:

- 4 cargocycles.

Costs detail (in €) – maximum estimation

1. Staff operation costs in the initial phase

		Costs/year €
4 deliverers		72.000
	TOTAL	72.000

2. Vehicles

		Costs/year €
4 cargobikes		6.000
	TOTAL	6.000

7. Maintenance costs

		Costs/year €
10% of 2.Costs		600
	TOTAL	600

The estimated initial management and investment amount should be around 78.600 €, +25% unexpected costs, for a total of around **98.000 € the first year**. (The costs of the technical employees and the ICT system are not included as they would be share and can be checked on sections 5.1 and 5.4).

The new Bike Logistic Agency as well as the place to develop their activity investment should be done by Downtown Merchants Association and parking managers, although is recommended a Public financial support in the context of an overall program involving environmental targets.

6. REALIZATION PRIORITY

6.1 The overall realization timing and constraints

An analysis of requisites and operating conditions of the measures identified above is provided in the following section, along with a description of infrastructures/equipment, staff, operation schemes and supporting regulation. Also, an analysis of investment and operation costs is given.

Table below provides a summary view of the five measures chosen for the city of Burgos for the feasibility study done for the ENCLOSE project. These are grouped into the four investigation categories – socio-economic, commercial, operational, technical – related to each site and show the corresponding relevance: strong development (■ ■ ■), development (■ ■), moderate development (■).

ENCLOSE Investigation Categories	CHOSEN SERVICES/MEASURES - BURGOS			
	UCC and REURBANIZATION	ECO-VAN-SHARING	WEB CARD MANAGEMENT	PARK&BUY BY BIKE
SOCIO-ECONOMIC	■ ■ ■	■ ■	■ ■	■ ■
COMMERCIAL	■ ■ ■	■ ■ ■	■ ■	■
OPERATIONAL	■ ■	■ ■ ■	■	■ ■
TECHNICAL	■ ■ ■	■ ■	■ ■	■ ■

The study for city logistics measure in Burgos city centre shows that all the selected measures cover the four investigation categories – socio-economic, commercial, operational, technical in which the ENCLOSE project focus it purposes and by all means represent an added value in environmental and energy terms.

The temporal diagram recommended the first measure to set up would be the adaptation of the Plaza España Market and implementation of an UCC, that along with the use of electric vehicles for freight delivery, could lead to an overall improvement of urban city centre life quality. Straightaway any of the other three measures could be implemented; despite the Eco Van-sharing system covers more categories, as the table shows, it is suggested to set up the three of them concurrently as they can share some of the resources and this would achieve an optimum economical balance. It is remarkable that in this diagram a permanent table/committee for the SULP monitoring and consensus will be operating.

Finally, specific requirements in terms of mobility, energy savings and emission reductions are discussed for each selected measure.

6.1.1 UCC MEASURE REQUIREMENTS

Critical success factors to be considered for the implementation in Burgos (ENCLOSE site) include:

- Study of the location and accessibility of the UCC (e.g. close to the main transport network, city access areas, etc.);
- Adequate support by public authorities and regulations (restrictions, incentives, impacts on competition, etc.)
- Tight cooperation between public and private entities
- Collaboration between small independent, local and national transport operators
- Consultation and consensus among the key stakeholders associations (transport operators, small independent carriers, shops and retailers, businesses, consumers, etc.)
- Fund raising mechanisms (private project financing) and synergies with public funding programs (e.g. Structural Funds in eligible areas)

6.1.2 RE-URBANIZATION OF "PLAZA DE ESPAÑA MARKET" MEASURE REQUIREMENTS

Critical success factors to be considered for the implementation in Burgos (ENCLOSE site) include:

- Study of the location and accessibility of the UCC (e.g. close to the main transport network, city access areas, etc.);
- Adequate support by public authorities and regulations (restrictions, normative, etc.)
- Consultation and consensus among the key stakeholders associations (transport operators, small independent carriers, shops and retailers, businesses, consumers, residents, etc.)

6.1.3 ECO-VAN-SHARING MEASURE REQUIREMENTS

Critical success factors to be considered for the implementation in Burgos (ENCLOSE site) include:

- Study of the potential demand on the use of this type of vehicles among the

city centre shop owners.
- An Electric vehicle can replace operationally conventional freight vehicle for last mile services and is technically reliable and accepted by the drivers.
- Depot point and management sharing system.
- Availability of electric charging points for the new EV, to ensure that full use of this vehicle can be achieved as EVs are still limited by the vehicle range due to the battery.

6.1.4 WEB CARD SYSTEM MANAGEMENT MEASURE REQUIREMENTS

Critical success factors to be considered for the implementation in Burgos (ENCLOSE site) include:
- Create a specific traffic module for the city to manage loads, vehicles and users.
- Place a GPS Card Management could help on:
  Locate cards in real time locating them on a map, recording his travels and stops.
  Send and receive messages from predefined based on vehicle and back via GPS device in the vehicle.
  Show routes to the driver.
  Receive information start and end load, consumption, and incidents.
  Have a system of warnings and alerts of events, messages, etc..

6.1.5 PARK&BUY BY BIKE MEASURE REQUIREMENTS

Critical success factors to be considered for the implementation in Burgos (ENCLOSE site) include:
- Study of the potential demand on the use of this type of services among the city centre shop customers.
- A Bike delivery fleet organize as an small Bike Logistic Agency to deliver the goods from the shops to the destination selected points (parking, hotels …)
- Acceptance of the parking managers to implement this service on their parking and allow having a small area of their facilities to be used as a temporary stockroom.
- Web service system with wireless technology and hand held computers to make possible the communication among the shop owners, the Bike Logistic Agency and the customers.

7. BURGOS SULP PRE-ADOPTION SITUATION

In this chapter are presented the evaluation methods to create a baseline or an ex-ante scenario of the situation before the SULP measures were introduced, as two soft measures have been implemented in the city of Burgos during the progress of ENCLOSE Project.

The following sections describe the soft measures undertaken, summarise the baseline situation referring to IEE Common Performance Indicators (CPI) energy savings and reduction of greenhouse gas emission, and discusses other Key Performance Indicators (KPI).

Achieved baseline data will be used when final or ex-poste evaluation of the impacts and benefits of the soft actions will take place and reported in deliverable.

7.1 Soft measures description

- New regulations for the historical centre access, with special permission for loading- unloading areas. Currently there are traffic regulations (9 entrances and 10 exits that could be used indistinctly) and the area is divided in 9 sectors (with no specific entrance, circuit, and exit for each of it).
- Card system on loading and unloading for shop owners and hostelry owners (for non-labelled vehicles). Before the card system, there was a survey done amongst the historic centre businesses, to know how often they needed to enter the city with their own vehicles. The results were:
    25% daily
    65% exceptionally
    10% never
- The card system aims to reduce the number of journeys by restricting access while not impacting on business activities within the area.

7.2 Data Collection Process

Data collection adopted:

- Street interviews - The following information has been analysed as part of the business activity in the area: vehicles type, load factor, number of trips per week/day/month and transported freight type, etc.
- Street vehicle counts - The vehicle counts were taken at the entry/exit points of historic centre. These points allow only the freight traffic during certain hours each day. The points for data collection were chosen based on the volume of freight traffic.
- Transportation Operator interviews – Road side interview were conducted to find the following information: the kind of vehicles used, the actual load factor, number of trips per week/day/month and transported freight type, etc. The surveys were repeated four different times in order to cover different working days of the week and different time periods of the day (peak vs. non-peak hours).

The table below presents some of the more important pieces of data gathered by the partner to calculate the KPIs

Input	Car/ Minivan	Vans	Light Truck	Total	Units
Vehicles per day	3	10	12		
Fuel Used	Diesel	Diesel	Diesel		
Fuel Economy	7.2	9.1	9.3		l/100km
Load Factor	65	53	87.5		%
Trips per year per vehicle	450	405	247.5		
Distance Per Year per vehicle	5,400	10,206	7,493	23,099	km
Working days	225	225	225		

Data Inputs: Burgos

7.3 Key Performance Indicators

The following KPIs were chosen for these measures:

- Total Fuel Consumption [l/ year]
- Fuel per Trip [l/ trip]
- Total Energy [kWh/ year]
- Total Final Consumption CO2 [t CO2/ year]
- Total Primary Energy CO2 [t CO2/ year]
- Total Nitrous Oxide [kg NOx/ year]
- Total Carbon Monoxide [kg CO/ year]
- Dust Particles [kg PM10/ year]

7.4 Measure 1 – Loading Regulation Evaluation Methodology

As part of measure 1, traffic survey were undertaken over the course of four days to estimate the total traffic over the course of a year. The counts were taken at 6 entrance/exit points of the histrionic centre.

The data detected 902 vehicles per day, entering and leaving the target area through the points studied, in the time window 8-10. Of this total, 644 were vehicle entries into the area. Surveys were carried Tuesday to Thursday in order to avoid weekend traffic influence.

The traffic study also surveyed transportation operators to estimate their fuel economy, distance travelled within the area and loading capacity. Business activity of the operators was also quantified to find the number of deliveries within the target area.

7.5 Measure 2 –Management System Evaluation Methodology

This methodology utilises the same survey data as measure 1, in addition to measure 1's survey data it also analyses the businesses that use their own transportation to supply their businesses.
It was found that 25% of them (75 businesses) daily, supply their businesses with their own transportation. Using the values found for the van/car fuel data in measure 1, the energy used by their won transportation was calculated and the baseline indicators were derived.

7.6 Baseline Results

Measure 1

Parameter	Car/ Minivan	Vans	Light Truck	Total	Units
Distance Per Trip Per vehicle	12	25.2	30.3		km/trip
Fuel Consumption	1,166	9,287	8,363	18,816	l/year
Total Distance	16,200	102,060	89,920	208,180	km/year
Fuel per Trip	0.9	2.3	2.8		l/trip
Energy	11,861	94,444	85,038	191,344	kWh/ year
Carbon Dioxide (final Consumption)	3.1	24.9	22.4	50.4	t CO2/ year
Carbon Dioxide (Primary Energy)	3.9	30.9	27.8	62.5	t CO2/ year
Nitrous Oxide	8.1	51.0	45.0	104.1	kg NOx/ year
Carbon Monoxide	4.1	25.5	22.5	52.0	kg CO/ year
Particles	0.4	2.6	9.0	11.9	kg PM10/ year

Baseline KPIs (Measure 1): Burgos

Measure 2

Parameter	Car/ Minivan	Category 1 Usage	Category 2 Usage	Total	Units
Fuel Consumption	389	29,160	15,163	44,323	l/ year
Fuel per Trip	0.86	0.86	0.86		l/trip
Energy	3954	296,528	59,306	355,834	kWh/ year
Total Distance		405,000	210,600	615,600	km/year
Carbon Dioxide (final Consumption)	2,680	78	41	118.8	t CO2/ year
Carbon Dioxide (Primary Energy)	3,322	97	50	147.2	t CO2/ year
Carbon Monoxide	0.5	202.5	105.3	307.8	kg CO/ year
Nitrous Oxide	0.25	101.3	52.7	153.9	kg NOx/ year
Particles	0.025	10.1	5.3	15.4	kg PM10/ year

Baseline KPIs (Measure 2): Burgos

"Category 1 Usage", are businesses that use their own vehicles, daily. "Category 2 Usage", are businesses that use their own vehicle exceptionally, this is assumed to be once per week. Both are based on a car/minivan being used for the logistical operations.

The table below shows the factors that were used in the calculations of the above KPIs

Variable	Car/ Minivan	Vans	Light Truck	Units
Energy Conversion Factor	10.169	10.169	10.169	kWh/ l
Carbon Dioxide (final)	2680	2680	2680	g CO2/l of diesel
Carbon Dioxide (Primary Energy)	3322	3322	3322	g CO2/l of diesel
Carbon Monoxide	0.5	0.5	0.5	g CO/km
Nitrous Oxide	0.25	0.25	0.25	g NOx/km
Particles	0.025	0.025	0.1	g PM10/km

KPI Factors: Burgos

Parameter	Car/Minivan	Vans	Light Truck	Units
Load Capacity	652	1240	1900	kg
Engine Types	EURO 4	EURO 4	EURO 3	
Load Factor	65	53	87.5	%
Engine Size	66	100	107	
Deliveries Per day per vehicle	6	3.96	8.36	
Average number of trips per day per vehicle	2	1.8	1.1	
Average distance per day per vehicle	24	45.36	33.31	km

Non Energy KPIs: Burgos

7.7 Non-Energy/Environmental Related Aspects

Implementation: For measure 1 which aims to improving the previous access regulations from 2007 that started to control the pedestrian areas with bollards, phones and cameras surveillance 24 hours a day. This involved the reorganisation of traffic by restricting to pedestrian several streets, the design of routes and neighbouring access protocols, and other traffic and public road use. Vehicles carrying out loading and unloading tasks may park every day from Monday to Saturday morning, on the following schedule:

- Inputs and outputs of interested sectors: From 7:00 to 12:00 hours.
- For food and beverage distributors output will to 13:00 throughout the year, Monday, Tuesday or Wednesday depending on the street.
- The afternoon schedule for work of loading and unloading will be from 16:30 to 17:30 all year, Monday to Friday (apart from some areas).
- PMA for these areas will be 8,000 kg.
- Parking places concentrate for loading and unloading (Restrictions: Parking only on the side of the road specified)

For measure 2, a management card system for loading/unloading for shop owners and hostelry owners (for non-labelled vehicles) was introduced. City Hall provides the Downtown Historic Merchants Association 20 unidentified registration cards, which will be distributed to members and non-members merchants of the historic centre, who need to load and unload goods. Aimed at private persons, business owners situated in areas of the historic centre, with unlabelled vehicles, within generally schedule set for loading and unloading, for a maximum of 20 minutes, in which they actually have to perform loading and unloading tasks. This would lead to a minimal and efficient number of trips per business owner.

Stakeholders/target group Involved: Local authority (including policy makers and urban planners), professional workforce operating logistics services in the area, chamber of commerce, institutional representative of the local economic operators, retailers, distributors, wholesalers, shopkeepers, hoteliers, residents, etc.

Operational Cost: For measure 1, as the regulation itself is free, but some of the terms included in it such as the camera control, bollards, etc., has an economic cost cover by the municipal budget. For measure 2 Minimum cost, just the cards and a registration book..

8. ROAD MAP TO THE SULP ADOPTION

The SULP document development has been a progressive process: From the solid basis of the Feasibility Study developed within the ENCLOSE project and the Soft Measures results, a draft document was designed.

The city of Burgos aimed to open a participatory process with the stakeholders for the validation, consolidation and embracing of the SULP.
It could be mentioned the 3 basic elements for a participatory approach:

- Information/Training: Having enough information about any public action is crucial for the stakeholder's participation.
- Consultation/Debate: Stakeholders gives their opinion, make suggestions and alternatives, and a phase of dialogue is opened for consensus.
- Management participation: Joint decision making and implementation shared with stakeholders.

Specifically, for the Burgos SULP case:
The 2 Awareness raising events hold in Burgos are a useful tool for stakeholder's information and also training sessions on the other cities experiences were hold.
Within the 2º ARE event, a consultation session is hold with the stakeholders. An open debate where the work developed so far is exposed, discussed with the aim of consensus.
The SULP includes public measures but also measures that should be promoted by/in cooperation with the private sector, which will lead to an implementation shared with stakeholders.
After a review phase with the ARE comments and suggestions, the SULP will be promoted, discussed and hopefully approve with the Strategic Plan City of Burgos Association, local entity (promoted and chair by the City Council) were are integrated more than 60 large companies, public and private organizations and technological institutions with the common goal of acting in all areas that impact positively on the economic and social progress of Burgos, promoting and coordinating public and private sector. This means that Strategic Plan City of Burgos Association has a wide representation of key stakeholders of the city, and so, in a third step, these stakeholders will spread and embrace the SULP within their organizations.

8.1 Assessment Table with local stakeholders: Monitoring tool

For the SULP monitoring and consensus sustainability, a table/committee will be set. A non-exhaustive list of stakeholders participating:

- Burgos University
- Strategic Plan City of Burgos
- Burgos City Council: Traffic Unit
- Burgos City Council: Environment Unit
- Burgos City Council: Mobility, transport and accessibility Unit
- Burgos City Council: Public Works Unit
- Burgos City Council: Industrial engineering Unit
- Architects professional Association
- Burgos Confederation of Business Associations FAE
- Burgos Provincial Association of Transport Operators (part load) ATCAF
- Burgos Provincial Association of Transport Operators (full load) ASTRACC
- Burgos Historic Center Shop Owners Association
- Burgos Construction Business Owners Federation
- Historic Centre Citizens Association
- Castilla y León Regional Technical Institute
- Regional Government. Junta de Castilla y León (as European Funding Managing Authority)

This committee may be integrated within the Quality of Life Committee already existing in Strategic Plan City of Burgos. Structure and objectives will be determined.

9. PROMOTION AND COMMUNICATION PROCESS

9.1 Promotion plan

A promotion plan on the SULP adoption will be developed with the following objectives:

- Raising awareness within the local stakeholders.
- Ensuring sustainability and success of SULP and its measures
- Sharing knowledge beyond the local framework.

The key topics and messages will be focused on:

- SULP measures
- SULP benefits
- Private cooperation needed
- …

9.2 Media and tools and planned dissemination campaign

A promotion plan on the SULP adoption The implementation of the dissemination strategy will among others, draw support from ENCLOSE established communication tools:

ENCLOSE dissemination tools

- ENCLOSE visual identity: Take advantage of the project visual identity as a quality image and identity for the SULP for every document and event related.
- ENCLOSE website: This resource will be used for SULP and its updates.

Promotional material

- Printed an electronic leaflet will be generate for SULP dissemination and promotion.

Target:

The dissemination plan will target on two levels:

- Local media (local audience and stakeholders)

This will draw attention to stakeholders the policy issues addressed and will raise awareness on how sustainable urban logistics contribute to these objectives.

Even though the general population is not one of the major target groups, there are some facts that should be disseminated to the general media.

- National and International specialized media

Similar cities, decision makers and technical level is the other target group for disseminating efforts on improving urban logistics and developing in a sustainable manner through a EU-level cooperation with other cities.

Tools:

- Events: SULP launch: Press conference will be developed for the presentation of the SULP.
- Press releases: Press release will be delivered when the SULP launch and any special milestone.
- Events: Possible informative events with stakeholders (if necessary)

9.3 Timing and Monitoring procedures

The dissemination plan timing will be based on the SULP approval date. Taking this into account, the dissemination work plan will be as follows.

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Dissemination milestone/tool	Date
Press conference	SULP launch
Press release	SULP launch
Stakeholder events	2014
SULP leaflet	SULP launch
ENCLOSE website	Continue updating

www.enclose.eu

Co-funded by the Intelligent Energy Europe
Programme of the European Union

DUNDEE

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6
SULP "Sustainable Urban Logistics Plan"
WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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Circulation
Public

Date
October 2014

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SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. SETTING THE SCENE

1.1 Need for the SULP

This Draft Sustainable Urban Logistics Plan (SULP) for Dundee has been developed as part of the Intelligent Energy Europe funded Energy Efficiency in City Logistics Services for Small and Mid-Sized European Historic Towns (ENCLOSE) Project. The goal of the ENCLOSE Project is to raise awareness of the challenges of energy efficient and sustainable urban logistics in European small and medium size historic towns and the opportunities to achieve significant improvements and benefits by implementing suitable and effective measures, schemes and framework approaches.

Measures have already been implemented addressing freight and logistics in Dundee. These have been aimed at resolving traffic flow and safety issues, and specific environmental concerns, principally air quality. The SULP aims to build on current initiatives to extend objectives to achieving more energy efficient logistics and consequent reductions in freight-related carbon emissions. The SULP will also provide a framework for consideration by other urban areas in the Tayside and Central Scotland Region.

1.2 National, Regional and Local Strategies

Development of this SULP has been informed by the following national, regional and local legislation and policies.

National legislation and policies

Scottish Government Freight Action Plan

Climate Change (Scotland) Act 2009 - carbon reduction targets

Environment Act 1995 - Government Air Quality Strategy and Air Quality (Scotland) Regulations 2000, derived from EU Directives

Scottish Government Transportation Noise Action Plan

Regional policies

Tactran Regional Transport Strategy

Tactran Regional Freight Action Plan

Local policies

Dundee Air Quality Action Plan

Sustainability Policy for Dundee City Council

Climate Change Framework 2008-2015 and Action Plan 2008-2011

Local Transport Strategy

The Dundee Single Outcome Agreement (SOA) includes Outcome 10 "Our people will live in a low carbon, sustainable city". This includes Intermediate Outcomes of:

- Dundee mitigates and adapts to the effects of climate change for the transition to a low carbon economy; and
- Dundee has a clean, healthy and safe environment with improved air, land and water quality.

2. BACKGROUND AND KEY ISSUES

2.1 City Context

Dundee is the fourth largest city in Scotland with a population of 147,800 inhabitants, based on the most recent population estimates for mid-2012. It is situated on the northern shore of the River Tay estuary. The city is almost entirely urban and suburban in character and is a hub for major routes in the east of Scotland. A line of hills bisects Dundee; consequently there are gradients on many of the major roads linking the city centre with the outer suburbs. Road congestion occurs in the peak periods, particularly at key road junctions across the city. Dundee is located on the main east coast railway line connecting Edinburgh with Aberdeen and has a modern deep-water port and large harbour area downstream from the city centre.

The city of Dundee has evolved from an industrial and manufacturing centre into a modern city with a focus on bio-science, digital media, education, retail and culture and can be considered as a global leader in life sciences.

Air quality is a significant issue in Dundee with identified hotspots where the EU Limit Values are being exceeded for both nitrogen dioxide (NO2) and particulates (PM10). The main source of air pollution is from road traffic emissions, with additional emissions from industrial sources. An Air Quality Management Area (AQMA), covering the entire city (see Figure 1), was declared in 2006 following a review and assessment of air quality. An Air Quality Action Plan (AQAP) has been developed to set out the measures that the City Council intends to introduce to minimise the effects of air pollution on human health.

Dundee is one of the local authority areas which together make up the Tayside and Central Scotland Transport Partnership (Tactran). Tactran's role is to bring together the local authorities and the key stakeholders to take a strategic approach to transport planning and delivery in the region. A Regional Transport Strategy (RTS) has been developed which sets out a Vision and Objectives over a 10-15 year period for meeting the transport needs of people and businesses throughout the region. One of the RTS objectives is to improve the efficiency, reliability and integration of the movement of goods and people.

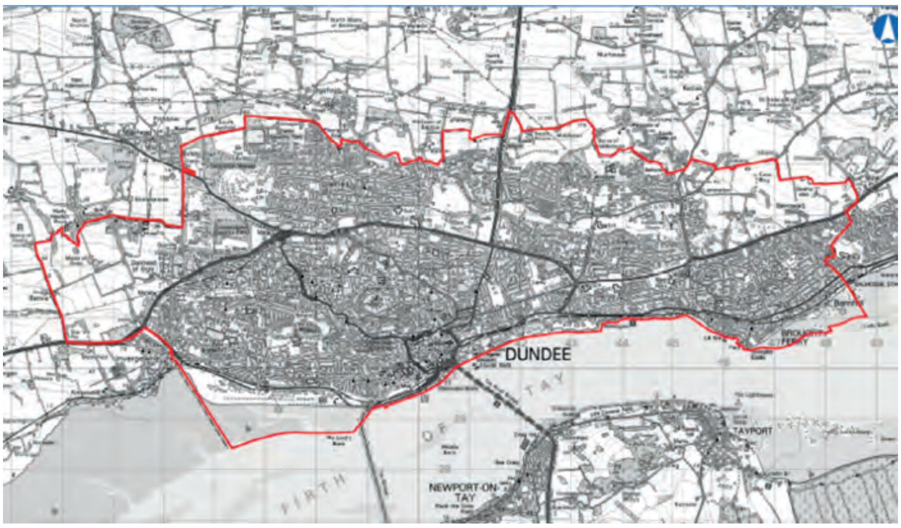

Figure 1 Dundee - designated AQMA area

2.2 Logistics Related Issues in Dundee

An Awareness Raising Event was held in Dundee on 27 June 2013 as part of the ENCLOSE project. Discussion at this event concluded that existing infrastructure and regulations form the basis for good logistics operations. There are no significant problems caused only by, or impacting on, freight movements. In particular, there are no major congestion problems in Dundee which impact unduly on hauliers' operational effectiveness; furthermore, previous research has not uncovered any common complaints from hauliers or traders. The inner ring road, with only limited opportunity for vehicle movement within it, is considered to be fit for purpose, providing a good balance of ready access to the city centre whilst retaining an attractive urban environment.

The discussion identified that there is misuse of loading bays by other vehicle users, namely indiscriminate parking by shoppers/city centre visitors, local business owners and taxi drivers. It was noted that some delivery drivers have been observed to ignore loading regulations by unloading their deliveries outwith defined bays.

It was noted also that freight operations contribute to localised air pollution, albeit the contribution to pollution from HGVs and LGVs is low in comparison with that from buses (as the number of freight vehicles at most of the hotspot locations is relatively small). Despite this, with specific pollution hotspots in the central area it was considered that freight operations should form part of the measures to improve air quality.

A summary of the ENCLOSE Awareness Raising Event is available at:

http://www.dundeecity.gov.uk/citydevelopment/freight

2.3 Air Quality Action Plan (AQAP), Noise Action Plan and City Council Freight Initiatives

Dundee City Council published its AQAP in January 2011. The key objective is to address air quality issues and environmental targets in Dundee. Air quality exceedances, measured at air quality monitoring stations, are focussed on the main radial routes, Broughty Ferry Road and Lochee Road and at four locations in the central area.

Freight related measures within the AQAP are:

- Freight Quality Partnership
- Freight Retail Consolidation Centre
- improve emissions from Council Fleet.

The Scottish Government published the Dundee Agglomeration Noise Action Plan in July 2014, this forms part of the Scottish Government's Transportation Noise Action Plan. It identifies a number of Candidate Noise Management Areas (CNMA) where a range of direct and indirect actions can be considered to address road related noise. The CNMAs are on roads generally with heavy traffic flows, inevitably including significant numbers of commercial vehicles, and large numbers of people potentially affected by traffic noise, these are: along the A823 corridor in Lochee and the Blackness area; A929 King Street/Princes Street/Forfar Road corridor; Hawkhill; Meadowside and Seagate in the central area; Inner Ring Road (Marketgait); and A92 Broughty Ferry Road.

The Council is considering other actions and issues relating to freight in addition to those in the AQAP, though no definite plans have been formulated at this stage, these are:

- traffic management for freight
- electric vehicles.

The Council has constructed an improved access to the Port of Dundee including interventions that will support road freight movements and its connections to the Trunk Road network.

2.4 Tactran Freight Initiatives

Tactran established a Freight Quality Partnership (FQP) in 2008. This brings together at a regional level stakeholders with an interest in freight movements, comprising both public and private sector organisations. A key role for the FQP is to contribute to the development and delivery of freight initiatives.

Tactran has investigated the feasibility of a freight consolidation centre to serve both Dundee and the neighbouring city of Perth, approximately 30 kilometres to the west, and a road/rail freight facility based at the port of Dundee. Freight information has been included in the Tactran's travel and transport information website www.tactranconnect.com.

2.5 Mobility Approach and Regulation in the Central Area

The central area comprises the city centre within the 1960-80s constructed Inner Ring Road (see Figure 2). This includes the Dundee Central Conservation Area which contains the historic heart of the city and provides protection for an area of significant historic and architectural interest and is the main retail and commercial centre for Dundee. The shops are divided between two purpose-built shopping centres developed from the 1970s, the Overgate and Wellgate Centres, and those occupying older properties in Murraygate, Seagate, High Street, Nethergate, Commercial Street and Reform Street. There are approximately 400 retailers in the city centre. A number

Figure 2 Dundee Central Area

of streets are pedestrianised particularly those in the main shopping streets of Murraygate, High Street, Commercial Street and Reform Street. There are also a number of office buildings within the central area including the headquarters of Dundee City Council and Tayside Police. The main buildings of Abertay University are also included in this area.

All kerbside road space in the central area is regulated by means of Traffic Regulation Orders (TRO), drawn up by the City Council under the auspices of national legislation and is subject to enforcement by City Council-employed Parking Assistants. The TROs define the times that parking or loading/unloading are permitted or restricted and the types of vehicles that can park or load/unload there. These are backed up by traffic signs and lines to guide and inform motorists.

Through traffic movement is restricted in the central area which is divided into four traffic zones. Vehicles can access a group of streets, or zone, from a small number of access points on the Inner Ring Road. Movement between the zones is permitted only for buses.

The main retail streets are pedestrianised with restrictions on access for vehicles and are landscaped to restrict vehicle speeds and discourage general traffic use. In Murraygate for example, nineteenth century cobbles and tramlines have been exposed which also enhance the quality of the streetscape.

The retail businesses on the pedestrianised streets are dependent on front-door deliveries with time restrictions in place from 11.00 till 16.00. The Overgate and Wellgate Centres have off-street servicing areas which can be accessed without time restriction. Elsewhere in the central area designated loading bays provide kerbside access for retail and office properties.

Intelligent Transport Systems (ITS) have been applied in Dundee through Urban Traffic Management and Control (UTMC) which controls the city's traffic signals, including bus priority, variable message car park signs, CCTV and Real Time Bus Passenger Information ensuring the efficient movement of traffic and the provision of transport information within the city.

2.6 General Logistics Context

Specific Regulations for Commercial and Freight Vehicle Circulation

There are no specific regulations governing commercial and freight vehicle circulation in any area in Dundee other than to specific roads which are unsuitable due to low bridges, inadequate road width etc. Within the central area these vehicles are subject to the similar regulations outlined above that apply to all vehicles except buses. They do however, benefit from designated loading bays. These are lengths of

kerbside space that are available only for vehicles loading and unloading, and are defined in TROs. Enforcement of the loading bays is provided by Dundee City Council employed Parking Attendants who issue Penalty Charge Notices (PCN) to vehicles contravening the regulations. There are 36 loading bays in the central area which are highlighted in Appendix 1, or can be accessed at www.dundeecity.gov.uk/forms/parking.php.

Overview of Main Types of Logistics Flows

Classified traffic counts were undertaken in 2013 on the principal routes into or through Dundee (see Table 1). These show that on a weekday (Monday to Friday) the heaviest road freight movements are on the A90 through Dundee. This forms part of the main route connecting North-East Scotland with Central Scotland and the South. Light goods vehicle (LGV) flows on the main routes accessing the central area are generally about a half of the comparable flows on the A90 Kingsway, while the numbers of rigid vehicles are no more than 37% of those on the Kingsway; and articulated and drawbar vehicles are less than 19%.

Traffic counts were undertaken during September to December 2012 to determine the number of commercial vehicles entering the central area during a weekday (see Table2). The total number of commercial vehicles entering and leaving the central area is 2,007. 83% of these vehicles are light vans (LGV). The peak time of movements is 08.30-10.30 when 449 vehicles entered the central area. This corresponds with the opening time for most shops until the start of restrictions on vehicle access to the pedestrianised streets. A steady flow of vehicles was evident for the rest of the day from 10.30 till the closing time of most shops at 17.30.

From surveys of retailers it is apparent that 92% of deliveries involve deliveries to more than one shop. Responsibility for organisation of deliveries is generally through company head offices, in the case of 76% of shops, while 15% are arranged by the retailers themselves or through an employee. The majority of retailers (77%) indicated that deliveries are made to a regular schedule, while 13% receive deliveries on an ad hoc basis and 10% on a mixture of regular and ad hoc. The main delivery areas used are split between through the customer entrance (26%), on street (24%) and delivery bays within the premises (33%).

3. OBJECTIVES

This Draft Sustainable Urban Logistics Plan aims to support Outcome 10 of the Dundee Single Outcome Agreement - "Our people will live in a low carbon, sustainable city".

The Plan's objectives are to achieve:

- more energy efficient logistics in Dundee;
- reductions in the adverse environmental impact of freight operations in Dundee; and
- the City Council showing leadership in reducing the environmental impact of the Council's fleet

4. THE PLAN

This SULP outlines proposals to support energy-efficient and sustainable urban logistics. A programme has been developed that aligns with the time scales of the Dundee SOA, till 2017, and the Regional Transport Strategy, till 2023. The programme has been split into short term measures covering 2014 – 2017, medium term 2018 – 2023 and long term after 2023. The short term programme reflects the current position of financial constraint. Earlier implementation of the medium term programme may be possible as funding opportunities arise. Implementation of the medium term programme will be subject to review during the period 2018 – 2023. Full details of measures in the programme are given in a Feasibility Study which is available at:
http://www.dundeecity.gov.uk/citydevelopment/freight
At any time during the period of the SULP the City Council will support emerging urban logistics initiatives with potential environmental benefits, subject to appropriate consideration of feasibility.

Short Term – 2014 - 2017

The short term programme aims to continue current initiatives.
In addition to traffic management controls, particularly in the central area, initiatives have been implemented specifically to promote sustainable urban logistics. These comprise:

- introduction of ECOStars environmental fleet recognition scheme for vans, lorries, buses, coaches and, possibly, taxis. The continuation of this scheme is dependent on future budgetary allocations which cannot be guaranteed at this time
- development of web-based information on lorry routing
- use of electric powered Dundee City Council vehicles.

The traffic management controls are supported by City Council enforcement of loading restrictions and, during the development of the SULP, increased enforcement of these restrictions has been undertaken in the central area.
The Council will explore the feasibility of a Low Emission Zone for the central area.

The Council will disseminate the results of best practice in urban logistics identified in the ENCLOSE project and elsewhere, including the use of electric powered vehicles in the City Council's fleet, through the Tactran Freight Quality Partnership or directly to stakeholders within the city.

Medium Term – 2018 - 2023

CARRIAGE OF CUSTOMER PURCHASES ON PARK & RIDE BUSES

Tactran, supported by Dundee City Council, has a Park & Ride Strategy which aims to develop and implement proposals for Park & Ride sites on the main approaches to Dundee, with priority being given to south of the Tay Bridge and on the A85 on the west side of Dundee. A lower priority has been attached to sites on the north of Dundee adjacent to the A90 and east of Dundee on the A92. The provision of Park & Ride would enable consideration

Case Study – Electric Vehicles

The Norwegian postal service, Norgen Post, in Norway's third city, Trondheim, has replaced diesel mail and parcel delivery vans with fully electric and electric hybrid vans and, for the city centre, electric trolleys. This has enabled Norgen Post to provide a fully CO_2-free postal service in the city centre and reduced the company's emissions in Trondheim by 70%.

of the carriage of heavier or bulky goods purchased in shops on Park & Ride buses which would operate primarily to and from the central area. At this stage it is not possible to determine the nature of operation of the Park & Ride services which could be operated commercially by a private sector bus operator or under contract to the City Council following a tender process.

The principal components of this proposal would be to provide carriage from shop units to the Park & Ride bus, provision of secure carrying space on the bus and a means allowing goods to be picked up at the Park & Ride site by the purchasers. Detailed consideration would need to be given as to responsibility for these functions which could be undertaken by the bus operator or a logistics company and the nature of the relationship with the City Council. Evaluation of the Den Bosch model will be reviewed ahead of the introduction of this action.

Consolidation Centre

The concept of consolidation is to group individual consignments or part-loads that are intended for the same destination at a logistics facility (consolidation centre) so that fewer and fuller loads are transported to the target destination. A consolidation centre warehouse ideally would be located on the western/northern fringe of Dundee to intercept road freight movements on the A90 from Perth which is the primary access route from distribution centres in the Central Belt, suppliers in central Scotland and England, and the UK's main sea ports. The consolidation process would provide for deliveries in the central area but also potentially other locations in the Dundee urban area, such as Dundee University and NHS Tayside medical facilities. It would be targeted at retailers that receive a large number of small consignments or part loads, most likely to be small to medium sized retailers. It would aim to provide additional services to users such as collection and recycling of waste and packaging material, provision of off-site storage space for use by retailers and pre-retailing services In order to optimise the environmental benefits electric/low carbon fuel powered delivery vehicles would be used.

An operator would need to be identified either through a tender process to operate the consolidation centre and provide the delivery function or to offer the scheme for a local entrepreneur to develop as a business opportunity. At this stage it is envisaged that the operator would also be responsible for recruiting users.

It is proposed to review the results of a Perth pilot consolidation scheme before considering this proposal further, particularly with regard to effectiveness in reducing vehicle movements and longer term financial viability. It is unlikely, in the current financial

Case Study – Consolidation Centre

The Italian city of Lucca has established a consolidation service based on a purpose-built consolidation warehouse on the city's outskirts and a fleet of electric powered vans to combine deliveries to the historic city centre.

The scheme has reduced the impact of freight in the historic city centre by:

- ✓ Reduced total number of vehicles
- ✓ Improved distribution schemes: load optimisation (consolidation) and improvement of delivery routes
- ✓ Development of added-value innovative services
- ✓ Eco-friendly delivery vehicles

Eco-friendly delivery vehicles

situation that Dundee City Council could cover any shortfall in revenue from consolidation operations and, indeed, it is difficult to identify any suitable sources of funding to provide support for the establishment of a consolidation centre in Dundee.

FURTHER DEVELOPMENT OF WEB / APP / SAT NAV BASED INFORMATION FOR FREIGHT/LOGISTICS OPERATORS IN DUNDEE

Tactran has already developed web-based information on lorry routing. There is potential for this to be developed further to be more interactive and provide a wider range of information for freight and logistics operators in Dundee. This information could include, for example, directional guidance to individual premises, availability of loading/unloading space on- or off-street and real time route guidance to minimise delays due to congestion or road works, etc. This information could be provided by a number of means including websites, mobile phone apps or as input to commercial vehicle Sat Navs. This will require more detailed consideration at the appropriate time to take into account the general ICT advances and development of the UTMC system in Dundee.

Long Term – 2023 and beyond

DEVELOPMENT OF A FREIGHT RAILHEAD AT THE PORT OF DUNDEE

There are currently no rail freight facilities in the Tactran region and Dundee is one of the largest cities in the UK with no access to the national and international rail freight network. However freight trains from central Scotland pass through Dundee en route to various railheads in the Aberdeen area. A location for a freight railhead has been identified within the Dundee Port Estate adjacent to the Dundee - Aberdeen railway line. This will require a new connection into the main railway line. An initial scheme could comprise a single siding with a rounding loop to enable the engine to run around the train and avoid "propelling" moves from the main line. A dedicated area would be needed for freight handling and container storage, with security, plus permanent diversion of internal port road traffic.

A private sector operator would have to be identified. This would enable the scheme to access Scottish Government Freight Facilities Grant to support the investment required.

A90 through/around Dundee

Transport Scotland's Strategic Transport Projects Review and the RTS Delivery Plan include a project to implement improvements to the A90 Trunk road through/around Dundee. This would comprise either a new Northern Peripheral Bypass around Dundee or upgrades to the existing A90 Kingsway in Dundee such as improved roundabouts and junctions.

Either option would improve logistics operations within Dundee and for through road haulage movements particularly between central Scotland and the Aberdeen City Region. Further work is needed to establish the feasibility of either option.

5. APPRAISAL & MONITORING

5.1 Logistics Baseline

Classified traffic counts were undertaken in 2013 on the main routes into or through Dundee (see Table 1). The data are for a 12 hour weekday from 07.00 to 19.00. Comparable data are not available for the Tay Road Bridge which has been affected by ramps being under construction for the last 2 years and road works in the central waterfront area of the city. The locations surveyed are as follows:

- Broughty Ferry Road West at Greendykes Road
- Arbroath Road at east side of Scott Fyffe Roundabout
- A90 Forfar Road at Kingsway
- A90 Kingsway at West side of Forfar Road junction
- Coupar Angus Road at Lochee bypass, just north of Loons Road
- Riverside Drive at Tesco Access Roundabout,

Commercial vehicles were classified by three types, as follows:

- LGV – light goods vehicles – comprising car derived vans and goods vehicles up to 3.5 tonnes Gross Vehicle Weight (GVW) (typically Ford Transit type vehicles)
- OGV1 – 2 and 3 axle rigid vehicles over 3.5 tonnes GVW
- OGV2 – 4 axle rigid and articulated and drawbar vehicles

Traffic counts were undertaken during September to December 2012 to determine the number of commercial vehicles entering the central area during a weekday (Monday to Friday) (see Table 2).

The counts were made for 5 minute periods over a 12 hour day from 07.00 to 19.00. The breakdown aggregated by half-hourly periods is as follows.

Time period	Number of vehicles			
	LGV	OGV1	OGV2	Total
0700-0730	34	5	1	40
0730-0800	63	18	3	84
0800-0830	78	19	1	98
0830-0900	88	28	2	118
0900-0930	85	21	1	107
0930-1000	94	21	0	115
1000-1030	84	24	1	109
1030-1100	75	18	2	95
1130-1200	80	20	0	100
1200-1230	87	10	1	98
1230-1300	77	17	0	94
1300-1330	68	10	0	78
1330-1400	74	11	0	85
1400-1430	71	15	4	90
1430-1500	76	13	0	89
1500-1530	90	12	0	102
1530-1600	66	15	2	83
1600-1630	76	16	0	92
1630-1700	69	11	2	82
1700-1730	73	5	2	80
1730-1800	54	2	0	56
1800-1830	45	5	0	50
1830-1900	35	3	0	38
Total	1666	319	22	2007

TABLE 2 Commercial vehicles entering Dundee Central area - 2012

Road	Number of vehicles			
	LGV	OGV1	OGV2	Total
Dundee Road (Broughty Ferry)	2385	663	362	26824
Arbroath Road	2728	796	587	21203
Forfar Road	3317	1222	1611	24139
Kingsway	4875	1769	1934	33979
Coupar Angus Road	1509	387	60	12543
Riverside Drive	1376	379	224	17427

TABLE 1 Commercial vehicle flows in Dundee - 2013

The total number of commercial vehicles entering and leaving the central area is 2,007. 83% of these vehicles are light vans (LGV). The peak time of movements is 08.30-10.30 when 449 vehicles entered the central area. This corresponds with the opening time for most shops until the start of restrictions on vehicle access to the pedestrianised streets. A steady flow of vehicles was evident for the rest of the day from 10.30 till the closing time of most shops at 17.30.

5.2 Air Quality

During 2012 four automatic air quality monitoring sites located in Dundee recorded air pollution levels in excess of the Air Quality Standards (Scotland) Regulations which put into effect the EU Air Quality Framework Directive, most of these were located in the central area (see Table 3). Nitrogen dioxide levels in Lochee Road, Meadowside, Whitehall Street and Seagate exceeded air quality standards while particulate levels exceeded the stricter Scottish 24 hour mean objective in Meadowside and Union Street.

All of these locations have significant flows of buses as well as commercial vehicles.

Pollutant	Concentration	Measured as	Results of monitoring - 2012					
			Air monitoring site					
			Broughty Ferry Road	Lochee Road	Meadowside	Seagate	Union Street	Whitehall Street
Nitrogen Dioxide	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	No data collected	38 exceedances	0 exceedances	0 exceedances	0 exceedances	0 exceedances
	40 µg m^{-3} not to be exceeded	Annual hourly mean	No data collected	53	54	48	32	45
Particles (PM10)	50 µg m^{-3} not to be exceeded more than 7 times a year	24 Hour mean	2 exceedances	3 exceedances	4 exceedances	0 exceedance	2 exceedances	No data collected
	18 µg m^{-3} not to be exceeded	Annual hourly mean	14	16	19	14	15	No data collected

TABLE 3 Results of Air Quality monitoring - 2012

5.3 Appraisal of initiatives

Use of electric powered Dundee City Council vehicles

Dundee City Council has one of the largest vehicle fleets in the Tayside region with over 600 vehicles. The vast majority of these vehicles have either petrol or diesel engines which emit CO2, NO2 and PM10. Electric vehicles assist the Council in meeting its environmental objectives as they do not produce any harmful emissions. There are also reductions in CO2 emissions from electric vehicles. Dundee City Council is a very compact area and electric vehicles are particularly useful to the Council as travel distances tend to be relatively low compared with other local authority areas.

The purchase price of electric vehicles is greater than for the equivalent petrol and diesel powered vehicles. Evidence to date suggests that over their lifetime electric vehicles are less costly as fuel and maintenance costs are proportionately lower.

A calculation has been made of CO2 output for the existing fleet of 39 electric vehicles. Within Dundee as a whole it is calculated that the vehicles save 66.1 tonnes of CO2 per annum and within the central area 0.6 tonnes of CO2 per annum. Routing software is being tested to optimise routing away from the central area.

Carriage of Customer Purchases on Park & Ride Buses

It is not possible to gauge the cost of providing carriage of customer purchases on Park & Ride buses as the detailed operation of Park & Ride services is not known at this time. It is envisaged that the impact would be to reduce the need to drive in to the city centre to collect heavier and bulky goods from city centre stores. It could also have the potential to reduce the need for retailers to make deliveries of heavier and bulky goods from city centre stores to purchasers' home addresses with a net reduction in delivery vehicle mileage. Gauging the impact on delivery vehicle distances in the central area in the absence of a more detailed assessment is not possible.

Data to appraise this initiative may become available from the Den Bosch pilot which forms part of the ENCLOSE project

Consolidation Centre

The results of a feasibility study undertaken in 2010/11 provided an indicative cost of operation for a consolidation centre in Perth of between £120,000 and £345,000 per annum. This is based on assumptions of utilising existing logistics premises and a single electric delivery vehicle operating four delivery runs per day. The provision of a new-build warehouse would incur significant capital costs. These assumptions would apply equally to a Dundee consolidation centre.

The study modelled the impacts of a consolidation centre serving Dundee and concluded that, with a 20% retailer take-up rate, emissions reductions would be possible up to the following levels:

- CO_2 96.1 - 113.6 tonnes per annum (11.8 - 13.9% reduction)
- NOx 555 - 646 kg per annum (12.5 - 13.2% reduction)
- PM10 29.5 - 31.2 kg per annum (13.3 - 13.4% reduction)

Further development of web / app / Sat Nav based information for freight/ logistics operators in Dundee

It is not possible to gauge the cost of expanding the existing web-based information. Any impact should be positive in terms of reducing unnecessary vehicle mileage and enabling delivery vehicles to avoid congested road conditions, delays at road works, etc.

Development of a freight railhead at the Port of Dundee

Full data to determine the potential strength of business case for a railhead are not available. Potential benefits would be reduced flows of HGVs particularly along the western and central sections of the Kingsway, with consequent impact on air pollutants and CO2 emissions.

The port operators are currently attempting to direct lorry flows away from the central area by concentrating on an eastern access onto Stannergate and thence the A92 and A90.

A90 through/around Dundee

Further work is needed to establish the feasibility of either option for improvements to the A90 through/around Dundee.

5.4 Monitoring

Monitoring will play a key role in ensuring that:

- the initiatives are meeting the SULP Objectives
- the initiatives are achieving their intended outcomes
- the assumptions behind the Objectives remain relevant.

Monitoring will comprise a repeat of the traffic counts of commercial vehicles entering the central area to be undertaken at the end of the short term period in 2017 and again at the end of medium term period in 2023. Monitoring of air quality will be undertaken on an annual basis using the existing air quality monitoring sites.

APPENDIX 1

Loading Bays within Dundee central area highlighted in red

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ENCLOSE

ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe
Programme of the European Union

’s-HERTOGENBOSCH

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6
SULP "Sustainable Urban Logistics Plan"
WP3 - T3.3 Local assessment of mobility and energy benefits:
development of Sustainable Urban Logistics Plans
in the 9 ENCLOSE towns

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Circulation
Public

Date
30.10.2014

's-Hertogenbosch

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SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. GENERAL TOWN CONTEXT

's-Hertogenbosch is a city in the southern part of Netherlands. Located 80 km south of Amsterdam, it is the capital of the province of North Brabant. The city has 140,000 inhabitants, 100,000 of them working in various sectors in 9.890 companies, with a particular focus on food, healthcare and pharmaceutics. A considerable activity is also tourism with the presence of 5 mln. annual visits.

's-Hertogenbosch is working closely together with 4 other city's in de province of Noord-Brabant. These city account for 10% of the dutch population, 19% of the foreign investments and 20% of the national industrial production. The cities work together in several fields under there "trademark" Brabant Stad (city of Brabant).

In 's-Hertogenbosch motorized transport causes 5,3 million annually and is expected to grow to 6,5 million in 2020 accounting for 30% of the CO2 emissions in de city and is the main cause of air quality problems, mainly around the historic inner city. The city is working towards towards zero CO2 emissions in 2050. For the municipal institutions itself that goal should be reached in 2020.

's-Hertogenbosch chooses an integrated, comprehensive solutions that contribute and include better accessibility, economics, climate and other environmental targets, as well as the attractiveness of city for both dwellers and visitors.

The city of 's-Hertogenbosch has several goals on issues related to clean transportation.

Document	Theme	Targets and ambitions
Coalition Agreement 2010 – 2014	Sustainability & accessibility	Innovative and clean public transport; Promotion of clean transport to the inner city;. Reinforcing P&R facilities and shuttles; Low-car inner city.
Sustainable Urban Mobility Plan (SUMP) "Koersnota 2013"	accessibility & livability	Keeping the city accessible & attrective. Reduction automobility (-/- 10%); Increase public transport from 7% naar 10% 2015; Increase bicycle use from 33% naar 44 % in 2020;
Air quality scheme	Air quality & livability	Reaching air quality targets in time; Extra effort when people are exposed
Energy & climate scheme 2008 – 2015	Climate	Zero emission (CO2) for the municipal institutions 2020 Zero emission (CO2) as a city in 2050
Economic Action plan 2010 – 2014	Economy & Attractiveness	Stimulate innovation in energy transition & mobility Improve attractiveness Accessibility
Strategic Regional	Region	· Make public transport, garbage collection en schooltransport more sustainable · ....

's-Hertogenbosch has a small (2,5 sq.km) historic triangular shaped condensed inner city with narrow streets. There are 550+ shops (retail) and businesses. "HORECA" and "clothing and fashion" contribute for 40% each adding up to over 80% - 90% of the businesses. Retailers account for 94.000 sq.m floor space. The inner city also houses 13.000 inhabitants.

's-Hertogenbosch has a strong regional function in employment and cultural activities.

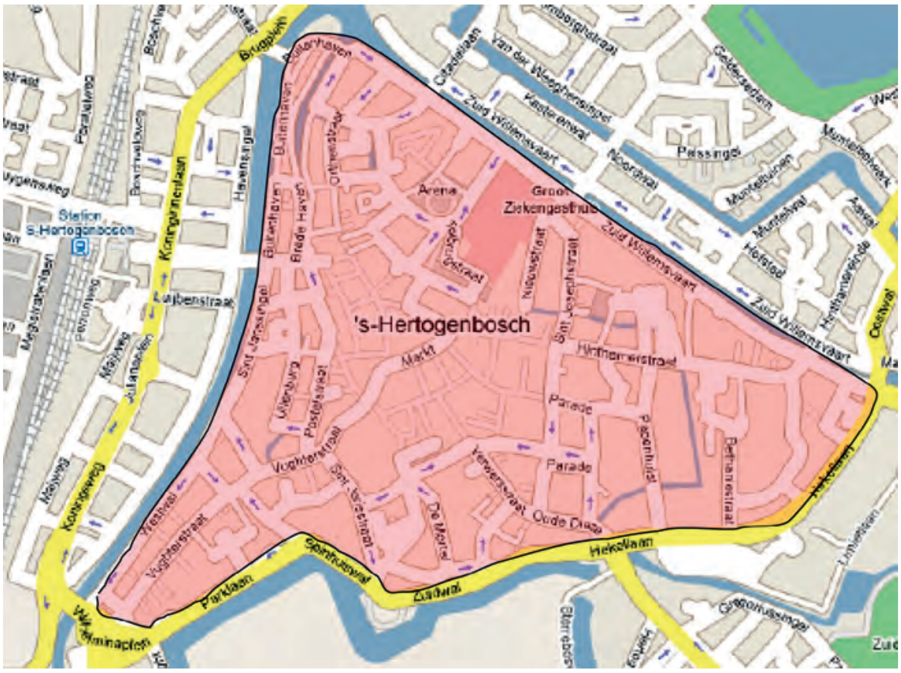
The access to the city centre is facilitated by a number of car parking adjacent to the centre and several Park & Ride facilities in areas adjacent to the city connecting the city by shuttle busses.

Most bus lines run in or close to the city centre. Within the city centre all distances so limited that they are done on foot. Furthermore there is a high percentage of bicycle use. In the city there are free guarded parking places for bicycles.

For residents there's a limited number of parking spaces and a system of parking permits. Due to a considerable waiting list it takes several years before a parking space will be obtained.

's-Hertogenbosch chooses an integrated, comprehensive solutions that contribute and include better accessibility, economics, climate and other environmental targets, as wel as the attractiveness of city for both dwellers and visitors.

In the field of urban logistics, 's-Hertogenbosch Municipality is promoting a sustainable approach to transportation: access to the environmental zone in the city centre is

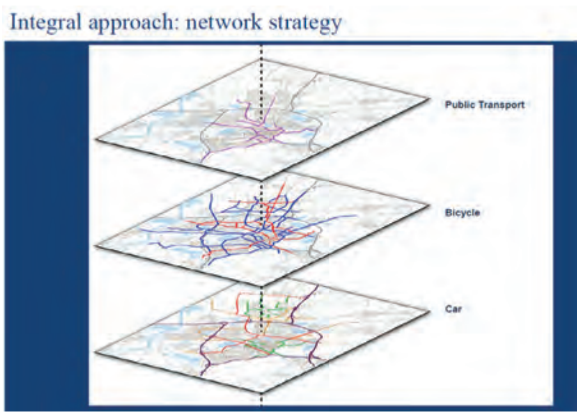


only allowed to clean trucks such as clean diesel, electric and (green) gas vehicles. Regulations seek to reduce the number of freight vehicles and optimize delivery schemes. Load/unload spaces for freight, and other advanced logistics measures will be improved in the near future.

The main goal of the mobility policy of the city is to ensure accessibility in combination with a good quality of life and an strong economy. These targets are translated into goals for the three transport flows. The "Accessibility Scheme" 2013-2015 aims to increase the use of bicycles and public transport towards the inner city and to decrease the use of private cars. Therefore an integral approach is used to combine these targets. To achieve the goals there are investments in roads, cycle lanes and public transport. To 2015, the focus is on the access to the inner city and the accessibility of the Rosmalen (sub-center). Public transport on the cityring to increase the reliability of the timetable at the same time aiming on zero emission vehicles in 2025.

Another example of measures to be taken is the extension of the parking Route information system (PRIS). The aim is to direct visitors of the city centre to the parking facilities and the transferia around the city centre. The exact measures are to be determined in the near future.

The main regulatory instrument is the time window. This is being reinforced by the use of physical barriers and reinforcement officers. The time windows apply both for residents and logistic movements. The city



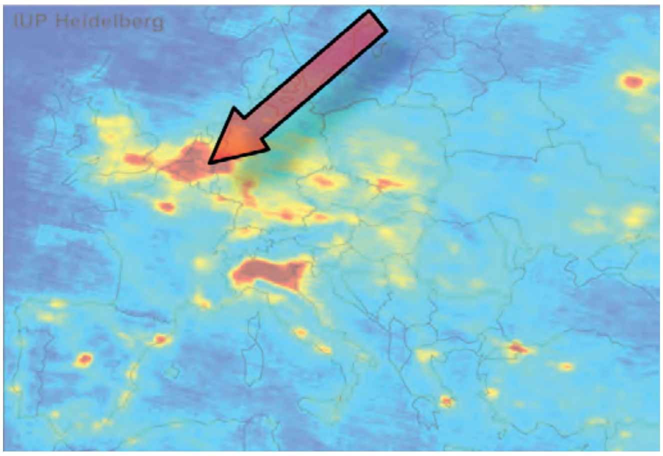
Inner city of 's-Hertogenbosch with pedestrian area (purple)

has a relatively large pedestrian area. A low emission zone around the inner city reduces the emissions of delivery trucks entering the city center. A length limitation is put in place to avoid big trucks to enter the small streets. A parking management system indicates the amount and location of free parking spaces including the P&R facilities.

Air quality

De provincie Brabant ligt tussen drie hoogindustriële gebieden namelijk de Randstad, het Ruhrgebied (Duitsland) en Antwerpen (België).

Met overwegend zuid-westen wind wordt bovendien veel luchtverontreinging aangevoerd van schepen vanaf de Noordzee, één van de drukst bevaren wateren van Europa. Daarnaast veroorzaakt de intensieve veehouderij veel luchtverontreinging in oost Brabant.
's-Hertogenbosch ligt ook ingeklemd in een ring van snelwegen.
's-Hertogenbosch ligt daarmee in een regio met hoge achtergrondconcentraties. De lokale bijdrage aan de luchtverontreiniging aan de rand van de stad in de buurt van de snelwegen is de bijdrage van lokaal verkeer verwaarloosbaar. Hier is lokaal beleid niet effectief. In de binnenstad draagt het verkeer echter voor ca. 20% bij. De belangrijkste knelpunten bevinden zich ook in en rond de binnenstad.
Door deze speciale aanpak is in Nederland door Rijk, provincies en gemeenten een nationale aanpak opgesteld. Op basis van deze aanpak werd door de EC uitstel verleend waardoor in 2015 aan de normen voor NO2 moet worden voldaan (PM10 in 2011).
Stikstofdioxide is de meest kritische stof als het gaat om het overschrijden van de norm. Het is ook een goede indicator voor de



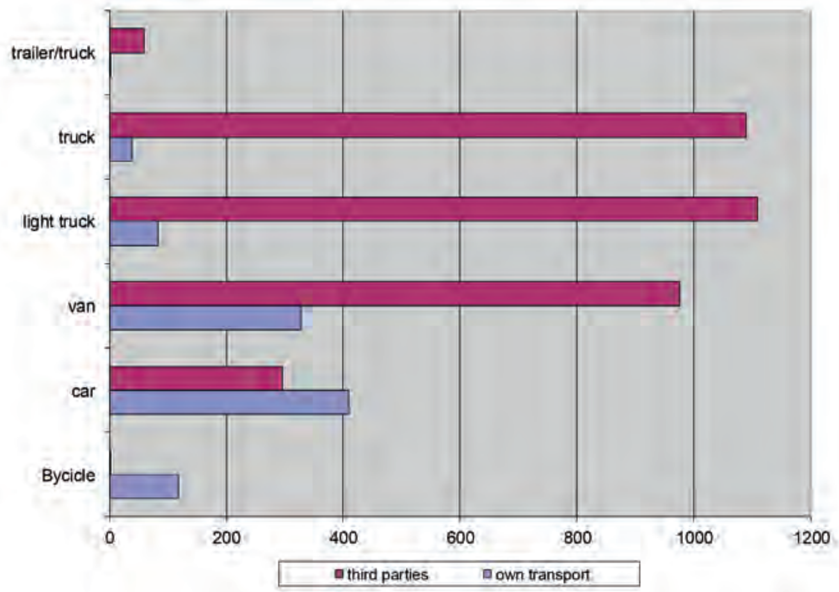
aanwezigheid van andere luchtverontreiniging en wordt ook zo gebruikt.
Aan de normen voor PM10 moest in Nederland vanaf 2011 zijn voldaan. In 's-Hertogenbosch is dat ook gelukt: sinds 2009 is de jaargemiddelde concentratie PM10 lager dan 35ug/m3 en het aantal overschrijdingsdagen kleiner dan 35. PM2,5 is daarmee ook lager dan 20 ug/m3. De 8- en 1 uur gemiddelden.

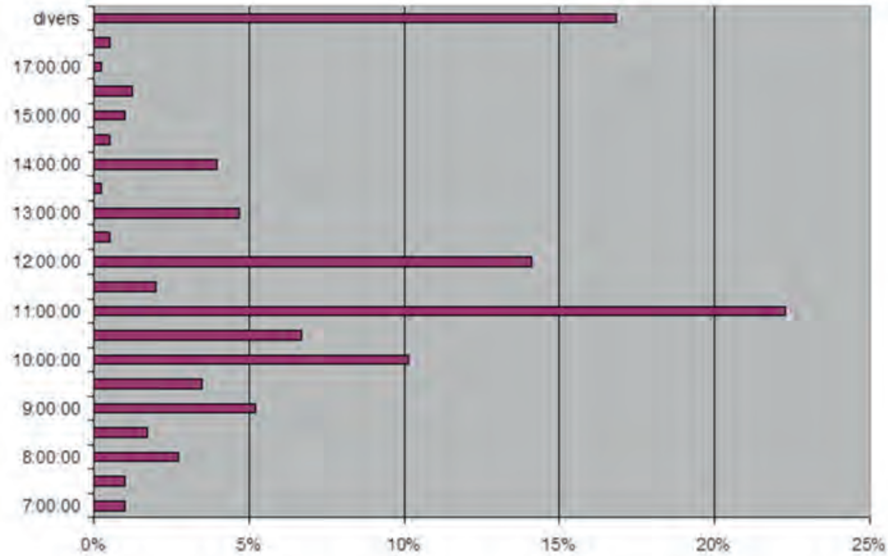
2. LOGISTICS CONTEXT

Weekly a volume of 5000 m3 of merchandise enters the city centre. This is done in 5050 deliveries with 2500 rides with an average of 1-2 deliveries per shop per day. 20% receives deliveries every working day (6 days per week), 1/3 receives them 1-3 times per week. 50% of the deliveries is consolidated. Delivery days are mainly from Tuesday to Friday.
For some area's loading and unloading is done on designated spaces. Mainly this is done however in the pedestrian area.
Waste collection for private companies (shopkeepers) is privatized in the Netherlands. So for shopkeepers it is mandatory to deliver their waste to a contracted private (licensed) company of their choice. Because of this, several waste collecting companies access the city centre each day. 28 % of the waste (mainly used packing material) is taken back and combined with the delivery of goods. The rest is collected by three big waste collecting companies en some smaller ones. Part of the waste (glass en paper) is also brought out by shopkeepers themselves. For residents waste collection is a task for the municipality of 's-Hertogenbosch.
83 % of the waste is done by the "Afvalstoffendienst". This company has both a commercial and a public branch. Therefore they can collect garbage from both shops and residents. Both are owned by the city.
About 1/3 of the deliveries is done by shopkeepers themselves; 2/3 by third parties such as logistic companies or direct suppliers. 3.700 of the deliveries are done by truck or van. There's a good insight in how freight is distributed in the inner city.

Regulations

Time-windows are from 8:00 – 12:00 and from 18:00 – 20:00. Peek time (55% of the accesses) is between 10:00 and 12:00. Two mayor exemptions are made. The delivery of fresh food can be done outside of the time windows.
The second exemption is the delivery by professional freight transporters with a minimum load factor. A permit is given to companies with at least 60 customers in the inner city serving at least 20 addresses per trip. These suppliers can be issued a special permit.





The Selective access system closes off the city centre between 12:00 – 18:00. Outside this timeframe it is closed as well but opens automatically when approached. This regime has a strong psychological effect and reduces (private car) traffic even within the delivery time-windows. The system has a few goals: access only by local traffic; It protects road users in the area (less traffic movements, thus safer); Limiting inconvenience to residents and road users within the area.

The low emission zone (LEZ) (Milieuzones, Environment Zones, Umweltzonen). The LEZ covers the same area as the study area but has positive side effects on incoming roads. The main goal is to reduce concentration of fine particles, nitrogen dioxide and indirectly ozone. The most polluting vehicles are restricted from entering to maintain the European air quality standards on the most polluted roads. The LEZ does not only improve air quality but also the reduction of noise and a general improvement of the living conditions in the cities.

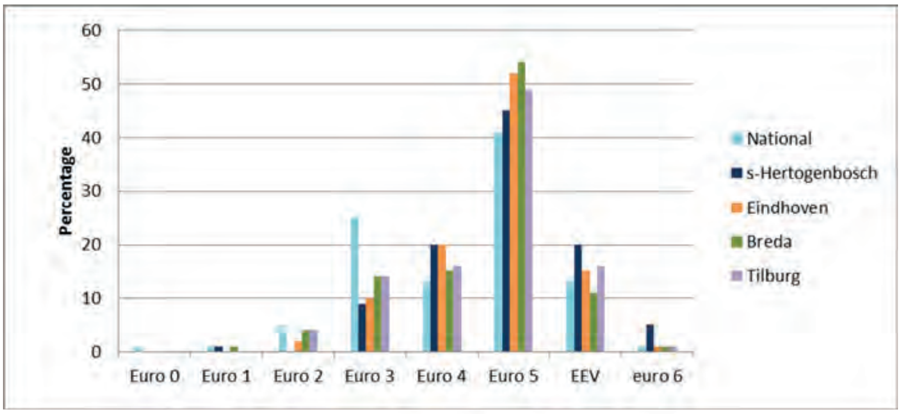
From the start (2007) the emission restriction where gradually tightened. These restrictions where agreed upon by 12 dutch cities and the transport sector in order to reach a uniform regulation. From 2013 only Euro 4 vehicles (and cleaner) are allowed in.

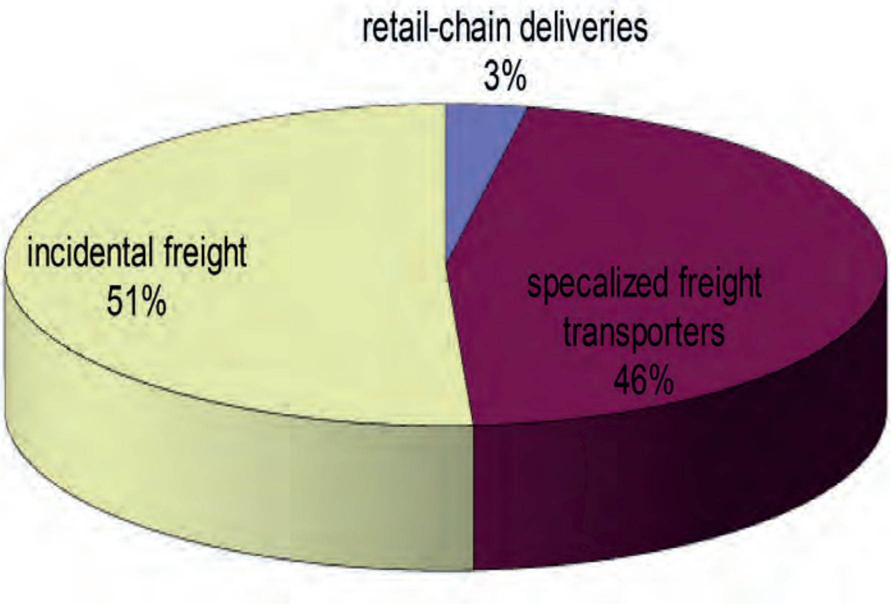
Reinforcement is done by comparing the license-plates with a national database. In 2013, 98 fines (€ 220,--) where issued and trucks sent back without being able to unload. The latter one appears an very effective way in preventing recurrence.

Despite of the increased emission standards, compliance has gone up from 45% (2007) to 90% in 2013.

"Binnenstadsservice" is a commercial distribution service (UDC) in 's-Hertogenbosch. The city provided a start-up grant, but no further stimuli or regulations are imposed. Apart from de delivery service, additional services like storage, stock management and removal of package materials are provided. The use of the UDC still is modest but growing.

3 % of the deliveries are done by chain companies (like Mc Donalds, clothing etc.). They enter the city centre with rather large vehicles for relatively small deliveries. From the perspective of the city centre this is inefficient.

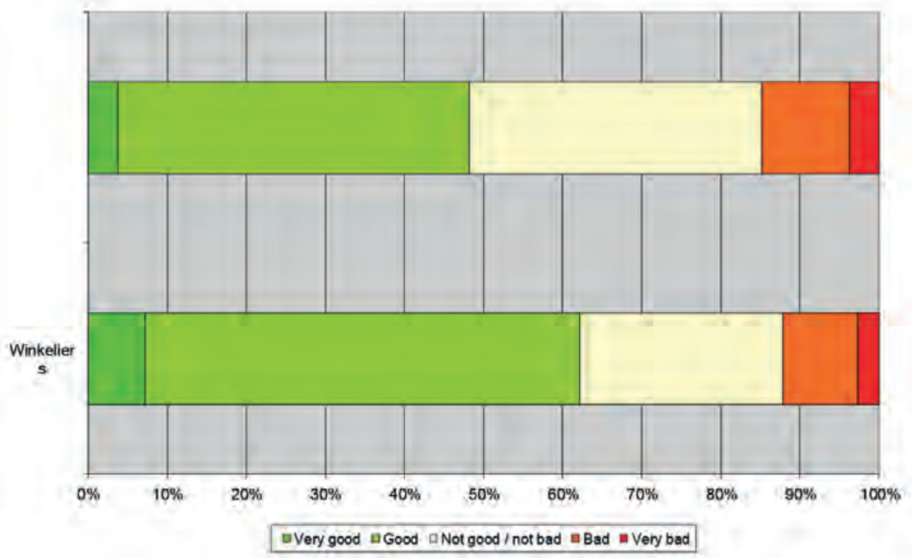




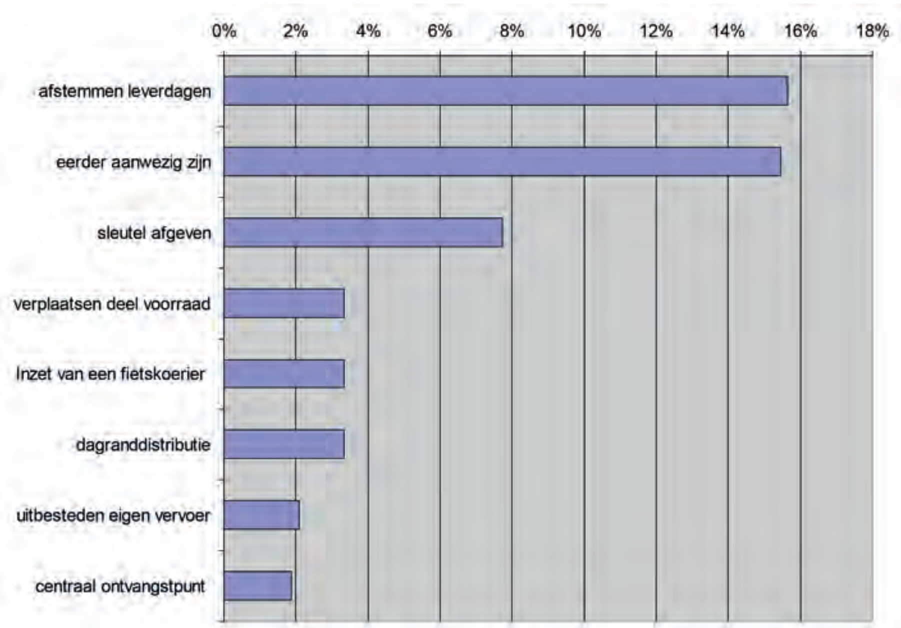
51% of the freight is not/hardly consolidated. Therefore about 46 % of the deliveries cause 83% of the trips. This volume would also fit in 170 vehicles (instead of 2500 weekly). Although these figures are theoretical, it is a good indication for the potential.

A survey was held (questionnaires and interviews) on the satisfaction of shopkeepers and drivers on the issue of accessibility. The results are shown in the graph. The conclusion may indicate that (especially shopkeepers) are rather satisfied about the accessibility. This may also indicate a limited support for measures. This conclusion must be verified first.

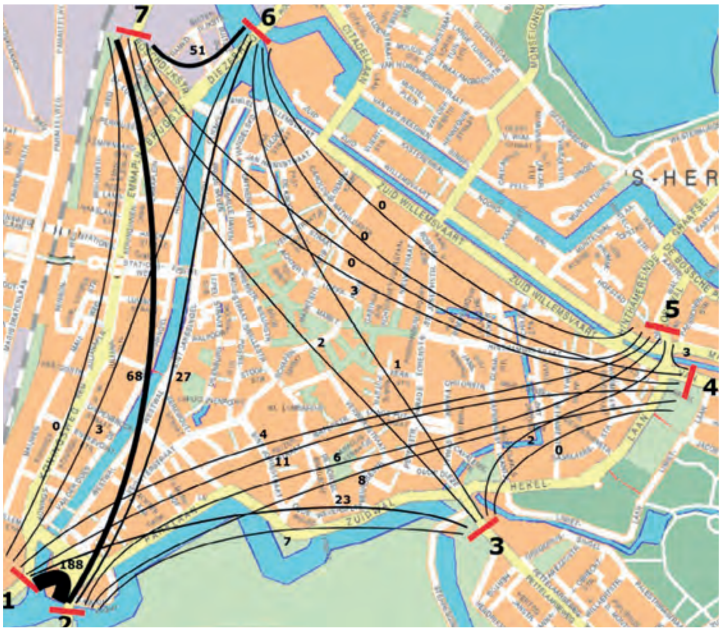
In the next graph support for solutions are scored.

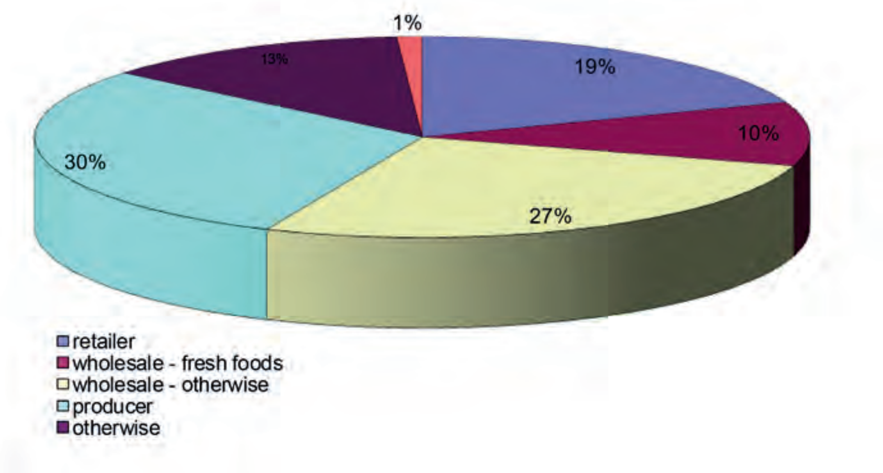


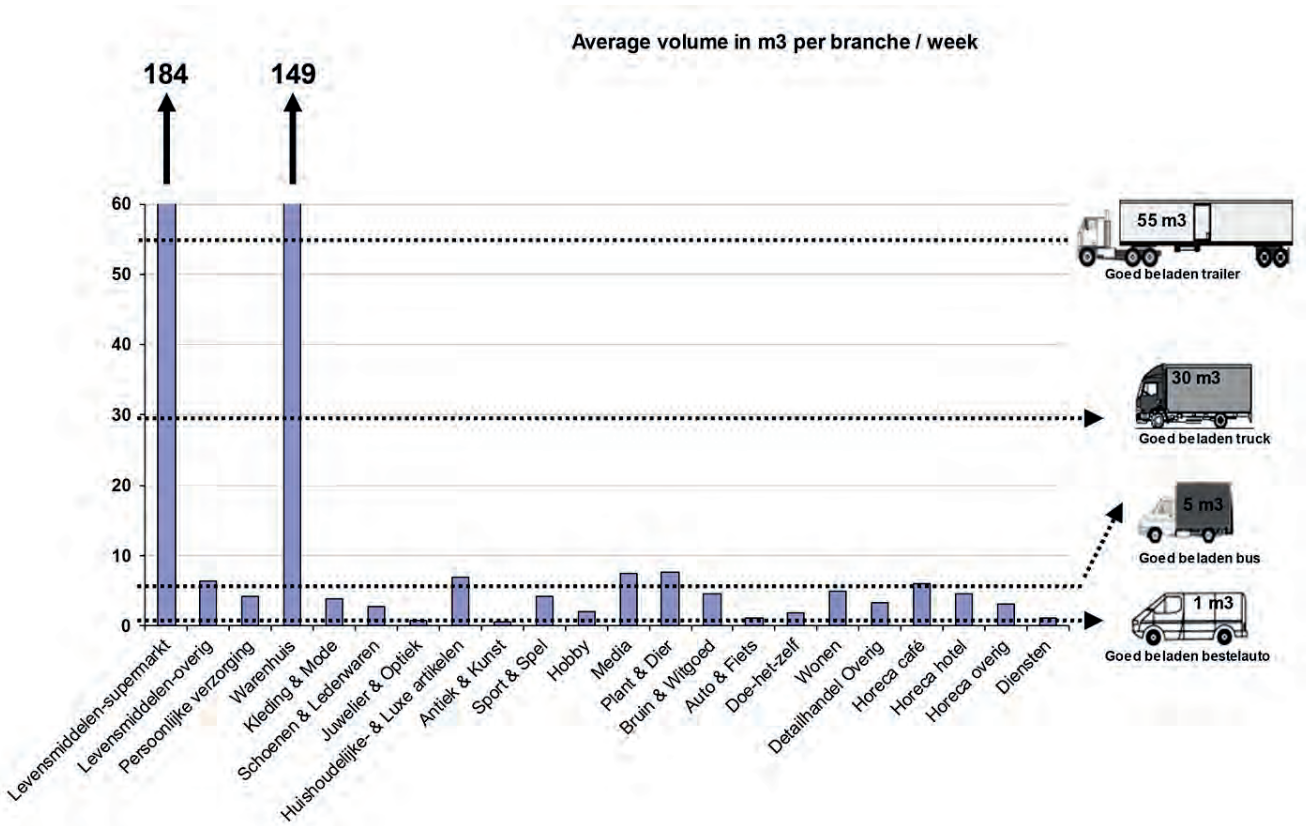
Satisfaction on accessibility (shopkeepers and drivers)

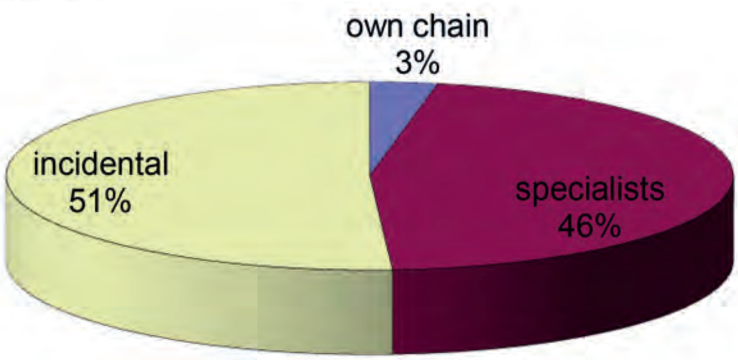


3. LOGISTICS BASELINE









Division of delivery's	%	# deliveries (per week)	# stops per run city centre	# runs (per week)	Runs (per day)
Chain	3%	151	1,2	126	25
Incidental	46%	2320	1,2	1933	387
Specialists	51%	2572	10	257	51
					463

83 % of the runs not consolidated

Over 50% of the shops delivery's are not consolidated

4. LOGISTICS SOLUTIONS OVERVIEW

4.1 Measures, services and schemes

In the city of 's-Hertogenbosch several measures are being considered. None of them can be used as a single solution. In this chapter these measures are being evaluated.

Furthermore the 's-Hertogenbosch approach strongly believes in cooperation and co- creation with entrepreneurs. This is done on street level or small area's within the city-center. Solutions for one area may not be effective for others. Furthermore city logistics are seen within the context of other challenges in the city. This community approach very much relies on the outcome of an interactive process rather than on implementation of pre-determined solutions. The advantage here is that:

- Local knowledge is used by defining solutions;
- Solutions are more comprehensive;
- Support is more evident since these are solutions brought up by stakeholders themselves.

In the city of 's-Hertogenbosch several measures are considered.
Heffen van access fee's om eventueel stadsdistributie mee te financieren;
Doelen stellen ten aanzien van emissie en verkeer; voor de binnenstad en per project;
Efficiëncy-verbetering afvalinzameling
Versterken stadsdistributie (aanpak)
Afspraken op straatniveau
Versterken transferia en verschonen van de bussen
Boodschappenservices (icm transferia)
ITS
Cargo-bikes
Laad-en los plaatsen
Handhaving (venstertijden en load factor regulations)
Load-factor
Touristische elektrische deelauto's
E-commerce deliveries

Pick-up points E commerce , rol E commere in Nederland, effect op binnenstad, relatie Stadsdistributie
Lucca hehet UDC van ucca is in eigendom bvan is owned by the municipality and operated by a municipal company.
E-commerce
85% van de Nederlanders koopt via internet, 10% van de omzet voor de detailhandel (B2C) komt van E commerce activities. Growth is about 10% annually. Clothing is one of the main catogories of retail that is of great importance to s-Hertogenbosch.
leefbaarheid

- Reducing number of vehicles;
- Use low- or zero emission delivery vehicles;
- Improved distribution schemes
- Collective contracts (garbage collection)

	CO2	Air quality	Attractiveness
Reduction No.vehicles	+++	+++	+++
Use of clean vehicles	+	+	+

Measure	Specification
Low emission zone	Expansion to smaller vehicles
Reinforcement	Existing regulations on load factor and time windows
Improve city distribution	
Community approach on street-level	Agreements among entreneurs
Park & Ride facilities	Increase number of low emission vehicles Improve added services like Park & buy
	· Make public transport, garbage collection en school-transport more sustainable · ....
Introduce acces fee's	
Increasing efficiency garbage collection	· Promote collective contracts waste collection; · Cooperation between waste companies

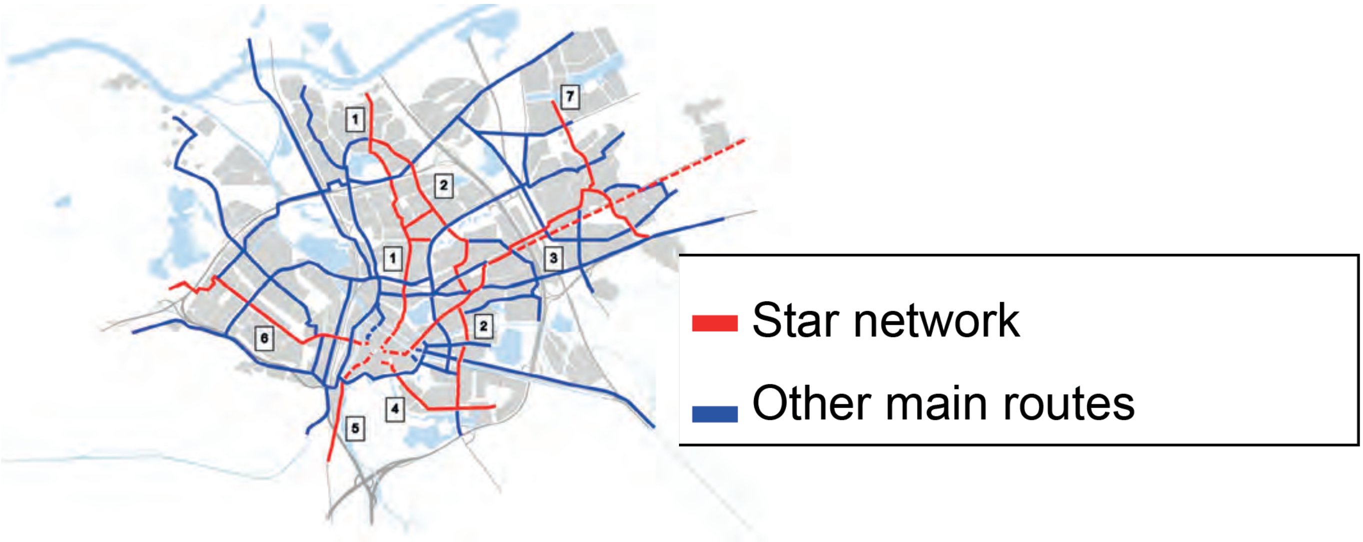
No single issue solutions
Pedestrian safety & attractiveness of the city centre
Awareness raising, not to a broad public but on specific target groups (transport companies, visitors, residents, shopkeepers etc.) and as a support other measures.
Implementatieplan:
Vaststellen nul-situatie (aantal voertuigen, load factor, buiten venstertijden, euro categorie)etc
Proces: koppelen aan (breder gemeenschappelijke belangen)
Convenanten

4.2 Main support regulation

4.3 Support infrastructures

4.4 Main relations with the strategic lines and objectives

in a community approach. (exchanging keys, afstemmen van levertijden, leveranciers, transporteurs, afvalinzameling, boodschappenservices etc).
Ontheffingen venstertijden
Shared space



4.5 Garbage collection

In 's-Hertogenbosch 28% van de verpakkingsmaterialen (karton en plastic) retour genomen door de leverancier. Dit is een hoog percentage in vergelijking met andere steden waar het percentage rond de 15-20% ligt. De rest wordt afgevoerd door afvalinzamelaars.
In the Netherlands waste collection for residents is a responsibility for the local governments. Waste collection for companies is privatised. This means in the city centre, shopkeepers choose their own waste company. Daarom rijden er in de stad ca. 4 verschillende afvalinzamelaars rond. Daarnaast wordt afval met eigen vervoer afgevoerd.
Voor de inzameling van afvalstoffen zijn de

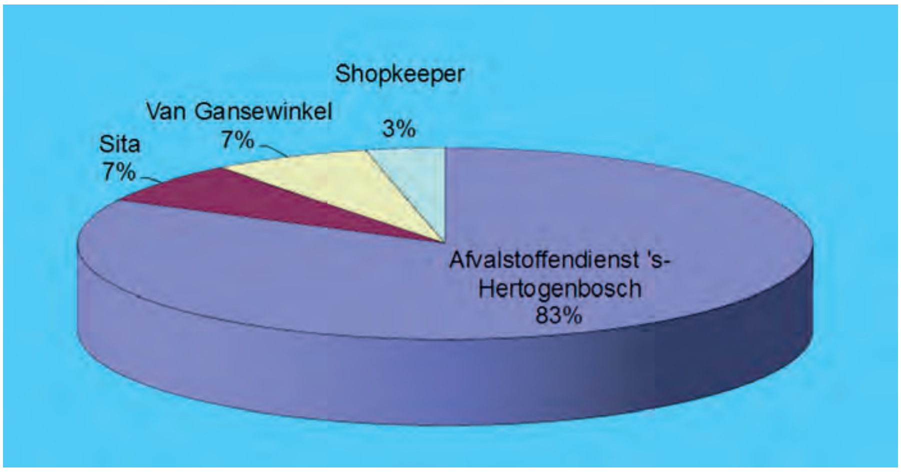
ondernemers verplicht om een contract te sluiten
met een inzamelaar, waarbij gebruik kan worden gemaakt van de diensten van de vele
bedrijven die op deze markt actief zijn.

In 's-Hertogenbosch the public owned company "Afvalstoffendienst" has both a commercial and a public branche. It has a turnover of € 32 mln / year, collects garbage from 110.000 households and 3000 companies. They use 65 vehicles, in the city centre only biogas vehicles are used. De afvalstoffendienst beheert tevens de ondergrondse containers in de binnenstad.

De afvalstoffendienst heeft ca. 80% marktaandeel in de inzameling van het afval in de binnenstad.

Het marktaandeel van ruim 80% van de afvalstoffendienst wijst op een behoorlijke bundeling. Ook het gebruik van ondergrondse containers heeft het aantal ritten met ruim 50% verminderd.

De aanwezigheid van meerdere afvalinzamelaars in de binnenstad blijft echter een inefficiënt. Hierdoor rijden afvalwagens achter elkaar de stad in. Geschat wordt dat 14% van het afval verantwoordelijk is voor ca. 25% van de ritten. Relatief weinig afval zorgt dus voor relatief veel vervoersbewegingen.



4.6Urban Distribution Centre (UDC)

In 's-Hertogenbosch, a commercially run UDC is in already in operation.

In general the physical infrastructure (i.e warehouse) as a primary component (indicated also as Logistics Base) connected with a range of organization and service measures. Main reference point is rationalizing urban logistics processes and providing logistics services that can significantly improve the environmental sustainability of freight delivery in urban areas and city centres.

Freight consolidation management is the key activity of UCC. The expression "Freight consolidation" refers to a group of operation models and commercial relationships among the UCC and different logistics operators or between the UCC and shop owners, aiming at reducing the number of freight delivery trips within the urban area.

The UCC will act as base for gathering goods of different operators (groupage) and implementing "last mile" delivery services managed by UCC fleet. The next figure shows the operation model of the UCC solutions.

Normally the UCC can result from a private (i.e. an operator or a consortium of operators) or, more frequently, a public enterprise (i.e. Municipality or other Local Authority). In 's-Hertogenbosch three companies were selected to present their plans and compete for a start-up grant. The competing parties were mainly selected on the credibility and sustainability of their business-case.

The UDC can operate, from the commercial point of view, basing on two different approaches:

1. the UCC makes an agreement with the main long range transport operators that often prefer avoiding to enter the inner city centre for delivering low volumes of freight. In this case the transport operator goes directly to the UCC bases leaving the parcels to be delivered in the city centre by the UCC fleet. The operator bears the cost of these last mile transport service. This scheme was implemented in several European cities (with different characteristics and dimensions), such as Berlin, Bremen, Bristol, La Rochelle, Malmo, Parma, Vicenza, Siena, Barcelona, Lucca, etc.
2. the UCC makes an agreement with the owners/responsibles of the main commercial activities located in the city centre or urban area (shops, restaurants, cafés, minimarkets, etc.). This agreement foresees that the delivery of the ordered freight is to be made directly to the UCC address. In this case the shop bears the cost of last mile service but, at the same time, can also benefit from a lower delivery price applied by the freight operator, thanks to the agreement that guarantees significant quantities of freight to deliver during the year.

In addition, shopkeepers do also benefit from added advantages, due that they can avoid the costs for other related logistics activities e.g storage management, reverse logistics processes (i.e. cartonboxes, pallets, plastics), etc. Moreover additional benefits can also be represented by the possible lower delivery prices thanks to the possibility for the shopkeepers to order larger quantity of goods without any problem of storage. This last scheme adopted initially in 's-Hertogenbosch (NL) by the private company Eco2city/Binnenstadsservice..

The two different schemes detailed above highlight the fundamental characteristic of a successful UCC: for operators not having a logistics centre in the reference city the delivery of freight to UCC, upon payment of a fare, shall be more convenient than to overcome the difficulties for its-own vehicles to entre in the city centre.

Such a convenience can either be "pushed" by the Municipality (i.e Vicenza, Lucca, etc.) imposing tight city access restrictions (i.e. time windows, parking time on l/u lots, vehicles sizes, vehicle emissions, one way streets, pedestrian areas, etc.), or be already present in the city morphology itself (i.e. Siena), where the characteristics of the historic centre, with narrow and steep streets and alleys, are a first deterrent for entering in the inner centre along with regulations and restrictions.

In general the UDC is based on significant investments on infrastructures, fleet and organization, therefore this solution can be only the final step of a process aiming to identify the most suitable solutions and it can only result from a strong political willingness and from the capability to evaluate the different benefits and costs (directly and indirectly). For this reason UCC are normally viable solutions for big cities or metropolitan areas, where these usually play the role of urban interports. As regards small/medium size cities these structures should, if possible, be based on existing infrastructures and operators. This is the case in 's-Hertogenbosch.

The experience of two ENCLOSE towns can be used to enhance the UDC in 's-Hertogenbosch.

– Lucca, where the Municipality, taking advantage of significant European and National co-funding, realized its UCC (infrastructures and vehicles fleet) after a long process lasted 8-10 years, adopting as logistics base (during the experimental phase) an existing minor public warehouse;
– Trondheim where the system implemented by Posten Norge is composed by two hubs at the opposite sides of the city. Large vehicles bring freight to the hubs, from where electric vehicles collect goods to be delivered to the city centre.

Moreover, an interesting solution is given by the possibility to adopt a logistic "cross docking" approach consisting of a service operated by the UCC where the freights where collected by the UCC vehicles directly at national operators warehouses and delivered to the shops in the city center for last mile distribution.

Whatever the chosen solution is, the implementation of a UCC usually produces several advantages, mainly dealing with freight flows and environmental sustainability of the logistics system. Among these, the most important are:

- Enhancement of the loading factor and so reduction of runs;
- Reduction of fuel consumption (energy savings) and of polluting emissions (air and noise);
- Possibility to use low impact vehicles – electric, CNG or hybrid – for last mile deliveries management;
- Compatibility with economic-, environmental-, accessibility- and social policies.

Moreover, logistics operators can also benefit from significant advantages by using UDC services, such as:

- Reduction of kms covered by freight vehicles;
- Reduction of time waste due to traffic congestions;
- Reduction of delivery times.

Shop owners enjoy positive advantages by using new delivery services:

- Less traffic / improvement of shopping environment;
- Possibility to enjoy other added-value logistics services based on UCC infrastructure such as warehousing services, packaging collection, E commerce services.

The main problem concerning UDC dealing with economic sustainability. There are two main issues that need attention:

- Willingness of shopkeepers to pay extra for the last mile and added services;
- Willingness of the national transport operators to allows deliver operation of "their" freight.

To reach an economically sustainable UDC and so all the other potential benefits, a critical mass should be reached. In small- and medium sized cities, as in in 's-Hertogenbosch, this can be a challenge. A combination of (supporting) measures can improve the feasibility such as:

1. Supportive (local) legislation and reinforcement;
2. Cost reduction;
3. Promotion;
4. Motivated local logistics-entrepeneurs;
5. Embedding of the service in an overall logistics plan (and broader).

The city of 's-Hertogenbosch counts about 500 shops. The critical mass for a business-case in this situation is estimated about 10%; 50 participating shops. This number depends on volumes, frequencies and fees etc. Participation of a big retailer (chain) could strongly improve the bussiness-case. During the ENCLOSE project and according to the surveys performed, the use of a UDC for big retails companies seemed not feasible because, on a company level, efficiency seemed already high. Nevertheless now two big retailers (i.e. a big drugstore chain) have indicated to see benefits in using the UDC services and are now investigating the possibilities in 's-Hertogenbosch.

4.7 Park & Buy

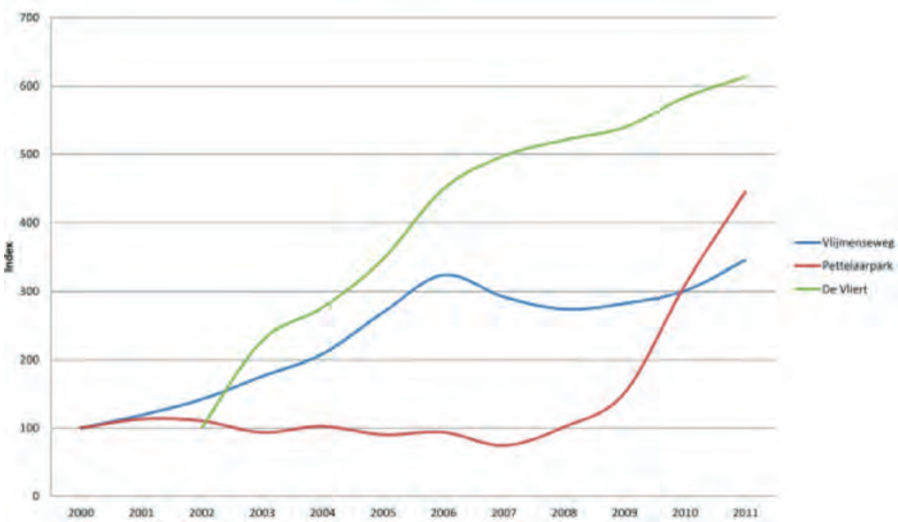
In general "Park and buy" - P&B service is applicable to any tourist city having parking infrastructures (like P&R or parkinghouses) with presence of operators. The tourist who leaves his car in parking houses, usually at the border of the city centre, is not willing to buy bulky items as carrying such kind of goods during the visit is uncomfortable. Carrying purchases around limits the opportunity for more / longer shopping. In order to solve this problem a P&B service allows tourists to make shopping and find

the purchased items later at the P&R or parking-house.
This service is based on an operative scheme allowing the shopkeeper to alert the P&B transport operator to collect the goods and to deliver it to the specific parking indicated by the client. Once the delivery is done an sms is sent to the customer for informing that the parcel is at the parking house.
The following figure is related to park-buy scheme demonstrated in the Italian historic city of Siena some years ago.
The results of the service demonstration implemented in Siena showed that the dedicated infrastructure and organization for the parking house are relevant (security boxes, electric van, booking system, personnel presence, goods insurances, etc.) and can be successful faced only if this service is one of several logistics services provided by a transport operator or is one of the services provided by an UCC.
In 's-Hertogenbosch a similar solution could be implemented using the existing P&R infrastructure.
's-Hertogenbosch heeft drie Tansferia (P&R facilities) met een capaciteit van 1.700 parkeerplaatsen.
Dat is ca. 40% van de parkeercapaciteit voor de binnenstad. Jaarlijks worden 0,5 miljoen kaartjes verkocht. Het gebruik groeit met 10 tot 20% per jaar.

De transferia geven de bezoeker van de binnenstad de kans om langer te parkeren tegen een laag tarief. Een dag parkeren op een transferium is even duur als een uur parkeren in de binnenstad.
Daardoor blijft bezoeker langer in de Bossche binnenstad. Dat is gunstig voor de economie van de stad.
Uit onderzoek blijkt dat gebruikers en ondernemers zeer tevreden zijn over de transferia.

's-Hertogenbosch onderscheidt zich hiermee in positieve zin van de andere Brabantse en zelfs Nederlandse steden.
De P&R's zijn inmiddels regelmatig vol. Daarom wordt gewerkt aan meer en grotere P&R's. Onderzoek is uitgevoerd naar motivaties om te parkeren in de binnenstad. Eén van de motivaties is het vervoer van boodschappen. Op dit moment rijden de een groot aantal buslijnen nog dwars door de binnenstad. Vanaf december 2014 zullen alle lijndiensten langs de rand van de binnenstad worden geleid. Daarmee is de binnenstad vrij van grote bussen. Uitzondering daarop zijn de P&R shuttles. Deze lijnen blijven tot in de binnenstad komen om een snelle verbinding tussen winkelgebied en P&R te garanderen. Omdat de P&R shuttles daarmee de laatste bussen zijn die in de binnenstad blijven rijden wordt sinds 2009 gewerkt aan de inzet van stille emissie-loze voertuigen. Verschillende pilots zijn uitgevoerd met nulemissie vervoer. Hieruit blijkt dat inzet van nul-emissie voertuigen haalbaar is.
De maatregel combineert een boodschappenservice met nul emissie P&R shuttles.

- Boodschappen service
  Intensiever gebruik van P&R shuttles voor het vervoer van boodschappen. Hierdoor wordt parkeren op de Transferia interessanter en vermindert de behoefte aan parkeren in de binnenstad. Dat leidt tot minder ritten en minder uitstoot.
- Zero emission shuttles
  P&R shuttles naar de binnenstad worden stil en schoon. Het vervoer van bezoekers en boodschappen wordt daarmee stil en schoon uitgevoerd. Negatieve effecten van groei van het P&R vervoer in de toekomst zal daarom weinig negatieve effecten veroorzaken.



"Baggy Boys"

Uitwerking boodschappendienst

@@@@@@@@@@@@@@zie Burgos@@@@@@@@@

Zero Emission Park, Ride & Buy

Clean carbon free transportation fits in broader local and regional policies. De doelstelling is om in 2025 alle openbaar vervoer zonder emissies te laten rijden. Regionaal wordt ook het bedrijfsleven gestimuleerd op het gebied van elektrisch rijden (met name bussen en vrachtwagens). Dit wordt gefaseerd ingevoerd. In de fasering wordt begonnen met de inzet van schoon en stil materieel op plaatsen waar dat het meeste "maatschappelijke rendement" oplevert. Dat leidt tot de voorkeursvolgorde:

1. Vervoer dat de binnenstad in rijdt (transferiumlijnen);
2. Vervoer dat de randen van de binnenstad aandoet;
3. Overige stadslijnen;
4. Regionale lijnen.

Vanuit Transferium Vlijmenseweg (lijn 60), De Vliert (lijn 70), en Pettelaarpark (lijn 80) rijden transferiumlijnen naar de binnenstad met voor elke lijn een eigen halte. Op elke lijn rijden 3 bussen.

De eerste pilots zijn/worden uitgevoerd op lijn 80. Met de uitvoering van de pilots is veel ervaring opgedaan met elektrisch openbaar vervoer. De gemeente 's-Hertogenbosch kan dan ook zonder terughoudendheid als koploper worden aangemerkt en wil dan ook graag verder met schoon (elektrisch) openbaar vervoer. De gemeente wil graag zo snel mogelijk voortbouwen op de bestaande initiatieven en ervaringen. Nul emissie betekent waarschijnlijk dat gebruik gemaakt wordt van elektrisch aangedreven voertuigen.

De huidige dienstregeling wordt uitgevoerd door een combinatie van voertuigen en chauffeurs die op verschillende lijnen gerouleerd worden. De situatie van één bus die de gehele dag op één route rijdt komt dus niet voor. De keuze voor inzet van elektrische bussen op enkel de transferiumlijnen betekent dus een meer specifieke inzet van materieel.

Op basis van de huidige dienstregeling is

een reconstructie gemaakt voor deze situatie. Voor de inzet zijn 3 scenario's
Hieruit komt naar voren dat op alle lijnen 3 bussen gelijktijdig ingezet worden, met uitzondering van werkdagen buiten vakanties (2 bussen) en op zaterdagen (lijn 60 – 4 bussen).
Scenario's:

1. Volledig: Vanuit het standpunt van uniformiteit (altijd een elektrische bus op elke lijn):
   10 elektrische bussen.
2. Optimaal: Op alle lijnen een elektrische bus, met uitzondering van de "vierde bus" zaterdag lijn 60
   9 elektrische bussen.
3. Minimaal: Op alle lijnen rijden 2 elektrische bussen:
   6 elektrische bussen.

De scenario's zijn dus vooralsnog gebaseerd op de huidige dienstregeling. Daarbij zij opgemerkt dat op lijn 60 binnen afzienbare tijd rekening moet worden gehouden met een verdubbeling van de capaciteit wat weer andere mogelijkheden biedt elektrisch openbaar vervoer.
De ideale situatie is dat altijd op alle drie de lijnen een elektrische bus rijdt (scenario Volledig). Hierbij is de impact op de leefbaarheid en vermindering van CO2 in de stad het grootst en is met deze uniformiteit (altijd een elektrische bus) het signaal het meest duidelijk. Wanneer naar een optimale balans tussen maatschappelijke baten en investeringen wordt gekeken is scenario "Optimaal" het meest voor de hand liggend. De investering in een 4e elektrische bus op lijn 60 die alleen op zaterdagen rijdt valt hier af. Ook de impact op CO2-reductie valt mee; de bus rijdt over 13 "omlopen" totaal 61 km.
Met het scenario "Minimaal" van 2 bussen per lijn is de verhouding tussen investeringen en inzet van voertuigen optimaal. De investering in (openbare) laadinfrastructuur wordt echter niet volledig benut. Ook worden in de vakanties en op zaterdag en zondag op alle lijnen ook conventionele (diesel-) bussen ingezet. Op lijn 60 betekent dit dat 50% van de bussen diesel blijven. De impact op CO2-reductie is de stad is het minst.
In het volgende hoofdstuk wordt een korte uitwerking van het scenario "optimaal" gegeven.

Resultaten marktverkenning

Om een indruk te krijgen van de mogelijkheden en beperkingen van elektrische bussen is in samenwerking met de huidige vervoerder een nadere analyse gemaakt van de transferiumlijnen. Aantal voertuigen, "beladings"graad en aantal kilometers per dag zijn parameters die van invloed zijn op de mogelijkheden en techniekkeuze.

Lijn	totaal km/dag/bus			
ma/vr	1	2	3	4
60 131	157			
70 143	210			
80 225	209			
ma/vr vakantie				
60 149	140	79		
70 181	214	122		
80 183	267	194		
zaterdag				
60 92	79	144	61	
70 130	210	88		
80 146	256	131		
koopzondag				
60 70	66	66		
70 88	84	84		
80 110	105	105		

Vanuit de huidige ervaringen met elektrische bussen in de binnenstad is contact gezocht met marktpartijen om inzicht te krijgen in de implicaties van onze doelstelling. In de vraagstelling is tevens gezocht naar een antwoord op de vraag welke keuzes voor laad -en batterijtechniek er zijn wanneer de transferiumlijnen volgens de huidige dienstregeling met 12 meter elektrisch materieel uitgerust worden.

Technologie

Een 12 meter bus heeft een totaal gewicht (GVW) van ca. 18000 kg. Om deze massa voort te bewegen is veel energie nodig. Voor de beeldvorming: een conventionele dieselbus rijdt circa 1 op 3 (l/km). Voor een elektrische bus is dus een forse batterij noodzakelijk, wil de bus de gehele dag kunnen rijden. Op routes waar de afstand beperkt is kan de gehele dag op de batterij gereden worden – zonder dat daar een concessie ten aanzien van passagiersaantal gedaan wordt. Op langere routes zal tussentijds geladen moeten worden.

Op transferiumlijn 60 rijden de bussen relatief beperkt aantal kilometers. Eén bus rijdt maximaal 157 km per dag. Daarmee lijkt deze lijn geschikt voor batterij-elektrische bussen. Mocht dit daadwerkelijk zo zijn, kan op de aanleg van openbare laadinfrastructuur worden bespaard.

De bussen die op lijn 70 en 80 rijden, maken meer kilometers per dag tot boven de 250 km. Om zo ver te kunnen rijden zijn grote batterijpakketten nodig die de bus zwaar maken. Het gewicht van de batterijen zal de passagierscapaciteit inperken. Om toch volgens de huidige dienstregeling elektrisch te kunnen rijden zal tussentijds energie bijgeladen moeten worden. Dit kan op verschillende manieren: inductief, conductief of batterijwissel. In de bijlagen wordt als achtergrondinformatie verder op deze technieken ingegaan.

Het voordeel van tussentijds bijladen (zoals bij de bestaande bus op lijn 80) is dat de grote actieradius, nadeel is de gebondenheid aan een laadstation. Voordeel van de batterij-elektrische bussen is de grotere flexibiliteit omdat de bus niet gebonden is aan een laadstation. Inzet van deze bussen op andere lijnen (korte) lijnen behoort daarmee tot de mogelijkheden.

Batterijwissel lijkt voor de transferiumlijnen niet aan de orde omdat e.e.a. gevolgen zal hebben voor de dienstregeling en vanwege de hoge kosten.

De keuze tussen technieken is dus maatwerk. Daarbij kan worden ingezet op batterij elektrische bussen waar dat kan en op langere routes gebruik maken van tussentijds laden. Daarbij kan wellicht gebruik gemaakt worden van het bestaande laadstation op het Pettelaarpark.

Looptijd & fasering

Het Provinciale elektrische bussen programma heeft de wens geuit om het 1e kwartaal 2013 de eerste bussen geïmplementeerd te zien. De verwachting is dat 2015 een nieuwe concessie voor het OV in de Meijerij ingaat voor 10 jaar en dat succesvolle pilots in de nieuwe aanbesteding overgenomen worden. Dit voorstel gaat uit van een totale looptijd van (8+2=) 10 jaar voor voertuigen. Voor infrastructuur is 15 jaar de afschrijvingstermijn, vergelijkbaar met de termijn van trolleybus infrastructuur.

Huidige situatie transferiumlijnen 60, 70 en 80.

Met de doelstelling nul-emissie en op basis van de technologische marktverkenning kan een suggestie aangedragen worden om in dit plan op de volgende onderdelen te faseren:

1. Uitbreiding inzet met 2 extra draadloze oplaadbare bussen (totaal 3) op lijn 80, IPT laadstation Pettelaarpark beter benutten;
2. Inzet 3 batterij elektrische bussen op lijn 60 waarmee de gehele omloop zonder bijladen gereden kan worden;
3. Inzet 3 IPT elektrische bussen op lijn 70, koppeling met lijn 80 en gebruik maken van laadstation Pettelaarpark;

The existing electric mini-buses in 's-Hertogenbosch charge at night. For them, overnight charging is sufficient for a day schedule. Big 12 metres busses would demand much more battery-capacity. This would make them heavy and expensive. By recharging while in service, less batteries are required but still guarantee operation from early morning until late evening. In practice the bus receives a fast and powerfull recharge while boarding passengers at the busstop. This way the recharging has been fitted into the existing timetable.

The city of 's-Hertogenbosch is working towards cleaner air, is reducing greenhouse gase and also actively participating in innovative solutions that make the city more attractive and sustainable.

Zero emission public transport and electric transportation in general are part of these innovations. The city is working closely together with local and regional enterprises.

What's next?

Many lessons have been learned from the project concerning technical and financial issues as well as and how to organise electric public transportation. We currently use these lessons in the planning of additional lines, vehicles and charging stations. Knowledge is also used as input for the next tender for public transportation.

5. DESIGN OF THE IDENTIFIED SERVICE/MEASURE

5.1 Improving garbage collection

Om te komen tot een meer efficiënte afvalinzameling zijn twee soorten oplossingen:

1. Samenwerking tussen afvalinzamelaars. Door het maken van afspraken worden ritten van elkaar overgenomen. Hierdoor verminderd het aantal vuilniswagens in de binnenstad.
2. Winkeliers gaan de afvalinzameling gezamenlijk regelen. Hierdoor wordt een straat of gebied nog maar door één afvalinzamelaar bediend.

Beide oplossingsrichtingen vragen nader onderzoek.

Ad1. De afvalbranche kenmerkt zich door een felle concurrentie. Samenwerking is daarom in eerste instantie geen natuurlijke beweging. Toch wordt bijvoorbeeld al gebruik gemaakt van elkaars inzamelstations. Verder levert deze samenwerking forse kostenvoordelen op.

Ad2. Om effect te hebben vraagt een collectieve afspraak tussen ondernemers over afvalinzameling om een bijna 100% deelname. Als een beperkt aantal ondernemers niet zou deelnemen blijven verschillende inzamelaars de stad inrijden.

De maatregelen gaat dus vooral over samenwerking en het komen tot (bindende) afspraken.

5.1.1. Structures

Alle fysieke structuren voor optimalisatie van de afvalzameling zijn beschikbaar en operationeel. Het gaat dan om containers, vuilniswagens en overlaadstations. Het bestaande overlaadstation van de Afvalstoffendienst werkt al klimaatneutraal. Aan verdere verbeteringen wordt gewerkt zoals de verdere uitbreiding van nul-emissie voertuigen.

5.1.2 Normative/rules and legal constraints

Afvalinzameling voor bedrijven is geprivatiseerd. Als (lokale) overheid kan niet worden ingegrepen in deze markt. Het aanwijzen/beperken van inzamelaars in bijvoorbeeld de toegang tot de binnenstad of het recht om in te zamelen behoort niet tot de mogelijkheden. Maatregelen moeten passen binnen de regels van de vrije markt.

Mogelijk kan wel een vergelijkbare regeling worden geïntroduceerd als bij leveringen van goederen buiten de venstertijden. Daarbij dient een minimaal aantal adressen te worden aangedaan. Onderzocht gaat worden of dit ook mogelijk is voor afvalstromen. Om marktwerking niet te verstoren wordt vooralsnog niet ingezet op regelgeving.

Ook voor de ondernemers geldt dat zij vrij zijn in het contracteren van een afvalinzamelaar. Voor het gebruik van de ondergrondse containers kan alleen met de Afvalstoffendienst zaken worden gedaan.

5.1.3 Fleet typology

De afvalstoffendienst is eigendom van de lokale overheid en heeft naast een commerciële doelstelling ook een maatschappelijke doelstelling. De dienst werkt onder meer klimaatneutraal. Om die reden worden zeker in de binnenstad, schone voertuigen ingezet. Voertuigen op biogas reduceren de CO_2 uitstoot tot vrijwel nul. Emissies van voertuigen van de overige inzamelaars worden bepaald door de landelijke wettelijke / Europese eisen en eigen beleid. De milieuzone zorgt wel voor een ondergrens van Euro 4 voertuigen.

5.1.4 ICT support tools/systems

ICT speelt al een belangrijke rol in de optimalisatie van de afvalinzameling. De nieuwste planning software wordt toegepast om ritten zo efficiënt mogelijk te laten verlopen. Dat geldt in meerdere en mindere mate voor alle inzamelaars. Ook wordt ICT gebruikt om ondergrondse afvalcontainers te monitoren en zo onnodige of inefficiënte ritten te voorkomen.

Hoewel niet bekend voor iedere inzamelaar, lijkt er op bedrijfsniveau een hoge mate van efficiency. Door koppeling van de diverse planningssystemen kan worden gekomen tot een optimalisatie op het niveau van de binnenstad.

5.1.5 Organization/operation dimension

In eerste instantie wordt niet in eerste instantie ingezet op regelgeving, gaat het vooral om het vormgeven van een proces tussen ondernemers onderling. Hetzelfde geldt voor afvalinzamelaars.

Ondernemers

Hier wordt gebruik gemaakt van de community benadering. De doelgroep is ondernemers in een beperkt geografisch gebied met een gemeenschappelijk doel of probleem. Binnen de drie pilotgebieden (Vughterstraat, Fonteinplein en Orthenstraat) wordt samen met ondernemers. Gebruik wordt gemaakt van bestaande samenwerkingsverbanden.

Samen met de ondernemers wordt een traject uitgezet om te komen tot collectieve afvalinzameling.

Afvalinzamelaars

Een eerste scan leert dat er mogelijkheden zijn om te komen tot samenwerking tussen de inzamelaars. De scan leert ook dat er sprake is van hevige concurrentie, smalle marges en een krimpende markt.

Het initiatief wordt door de gemeente ingebracht bij de ondernemers. Samen worden dan mogelijkheden verkend. Het eerste doel is een intentieverklaring tussen de afvalinzamelaars. Indien nodig en mogelijk kan alsnog aanvullende regelgeving worden ingesteld.

5.1.6 Actor Role and responsibility

Ondernemers
Overheid
Inzamelaars

5.1.7 Rough estimation of Cost and impact dimensions

De kosten voor de maatregel gaan vooral om:

- Onderzoek;
- Procesbegeleiding;
- Communicatie
- Monitoring

De totale kosten worden geschat op € 50.000,--
De volgende stappen zullen worden gezet.

5.1.8 Rough energy and environmental impacts estimation

Verwacht wordt dat de combinatie van beide maatregelen zal leiden tot een significante afname. Het directe effect op het aantal ritten kan oplopen tot ca. 20 %.

jaar	kwartaal	
1	Q2	.
	Q2	
	Q2	
	Q3-Q4	
2	Q5	
		Contractvorming & communicatie

PERIODE	1st YEAR	2nd YEAR
Verder specificeren van de afvalstromen en inzamelaars	■ ■ □ □	□ □ □ □
Inventariseren juridische mogelijkheden voor collectieve afvalcontracten	□ ■ ■ □	□ □ □ □
Inventariseren juridische mogelijkheden voor samenwerking inzameling	□ □ □ ■	■ ■ □ □
Onderhandelingen	□ □ □ □	□ □ ■ ■
Formaliseren afspraken afvalinzamelaars	□ □ □ □	□ □ □ □
Formaliseren afspraken afvalinzamelaars	□ □ □ □	■ ■ □ □
Afspraken met winkeliers Uitwerken en formaliseren van afspraken.	□ □ □ □	□ □ □ □

6. REALIZATION PRIORITY

- The overall realization timing and constraints
- Services /Measures priority for 2015
- Services/Measures for the 2020
- Estimation of energy and emissions saving impacts

7 PROMOTION AND COMMUNICATION PROCESS

- Promotion plan
- Media and tools and planned dissemination campaign
- Timing and Monitoring procedures

7.1 Road map to the SULP adoption

7.1.1 CONSENSUS PROCESS

In general in the Netherlands there's a strong culture of reaching consensus with stakeholders before implementing measures. Although this so called "polder-model" can be time consuming, it is often considered as an important "investment" in creating support and so saving time during the implementation phase.
At the same time and in line with the transition theories,
Macro, meso, micro niveau
Veranderingsgezinde regime spelers verbinden de onderstroom (microniveau).
The ENCLOSE
Professional

- (Extremely) informal;
- little hierarchy,
- responsibilities as low as possible
- Elaborate and detailed legislation (NL)

  - Meetings with Stakeholders, Association, Citizen
  - Analysis and discussion of identified solution with the different stakeholders
  - Main problems and timing for adopting the solution

7.1.2 MAIN MUNICIPALITY STRATEGIES

- Local administrative culture

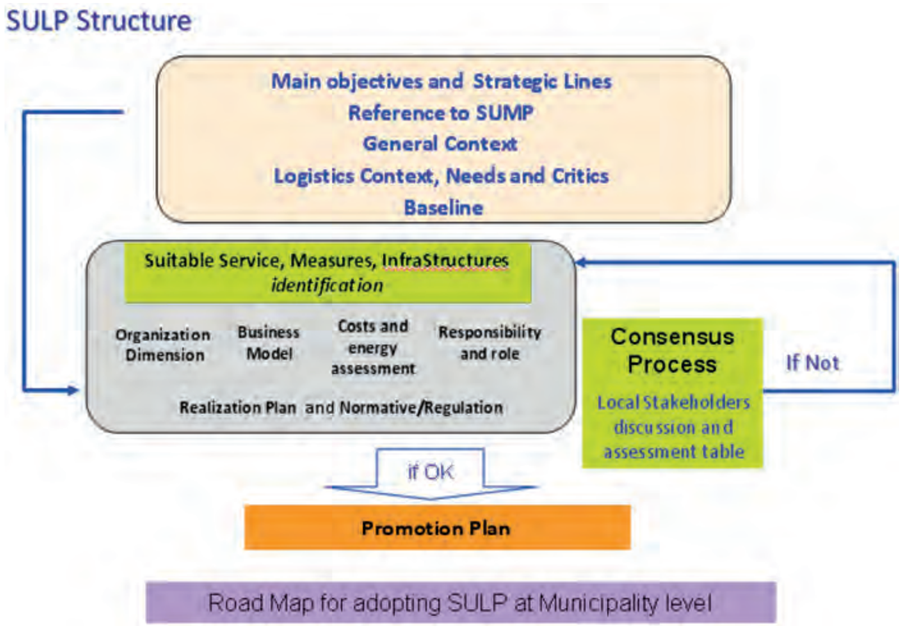
Professional

- (Extremely) informal;
- little hierarchy,
- responsibilities as low as possible
- Elaborate and detailed legislation (NL)

  - strongly working on concensus and support; NL "polder model" ("talk until you drop")
  - Consolidation of the solutions and priorities
  - Local Authority commitments (decisions and acts) schedule acts for possible SULP adoption
  - Main problems and challenges for the SULP adoption

7.2 Overall SULP scheme

The following scheme summarizes the indications provided in the above sect. 2.1 and 2.2.
(shire, region etc.).



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ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe Programme of the European Union

LUCCA

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project

Deliverable 3.6

SULP "Sustainable Urban Logistics Plan"

WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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Circulation

Public

Date

30.10.2014

Città di Lucca

LUCCA

SUSTAINABLE URBAN LOGISTICS PLAN

FOREWORD

EU confers to urban areas an important role in achieving the objectives of the EU strategy for sustainable development. Indeed, it is in urban areas that environmental, economic and social issues are more interconnected. Urban areas' environmental condition is even more important considering that, on the average, about 80% of European citizens live in urban areas. A high quality urban environment is a priority goal in the context of the Lisbon strategy, including the objective of "making Europe a more attractive place to invest and work." Once more, attractive European cities will enhance their potential for growth and creation of jobs; they are therefore central to the achievement of the Lisbon Agenda ("Communication from the Commission to the Council and the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Towards a Thematic Strategy on the Urban Environment. Brussels, 2004). Moreover these objectives are in line with Europe 2020 objectives, wherein urban accessibility issues are defined as a "set of spatial, distributive, organizational and managerial characteristics able to allow the mobility and easy use, within conditions of security and autonomy, of urban spaces and infrastructure by any person" and now central in the planning of the mobility system. The system of urban mobility, including goods mobility, should enable citizens and organisations to exercise their right to move, without burdening to the greatest extent possible on the community, in terms of air pollution, noise, congestion and accidents, while promoting a reduction in energy consumption and in GHGs emissions.

The current regulations for transportation of goods to cities and within them, is a fundamental theme of the more general concept of urban mobility as a factor of cities competitiveness, able to determine relevant impact on the quality of the urban environment, on the increase of transport efficiency and, in parallel, on its costs.

Protecting and developing the economic and social life of the city, also by optimising the distribution of goods to the cities as relevant points of production and consumption of goods and services, requires identifying and implementing appropriate measures to allow and facilitate the movement of goods. According to this principle, the European Commission identified a series of specific measures and objectives for the urban mobility of goods (the so-called "last-mile transport"), which aim to have a positive impact not only on the quality of 'air but also on the efficiency of the method of distribution (the transport White Paper of 2011). To achieve the goal of reducing 60% of emissions into the atmosphere by 2050, the White Paper identifies, among the numerous actions, the use of technologically advanced tools for the management of transport infrastructures and devices to support mobility, in addition to the use of more sustainable fuel and power systems (such as LPG, natural gas, electricity etc...). Furthermore, the European Agency for the Environment (www.eea.europa.eu) emphasises the key role of freight transport in urban areas both in economic and social terms (TERM 2013). However, the Agency highlights a number of potential adverse effects associated with both the environment and the quality of life, due to the impacts on air quality and noise pollution, traffic accidents, and to the contribution to climate change. The vehicles for goods transportation, and in particular diesel vehicles, are in fact an important cause of emission of PM and NOx in urban areas, contributing to the exposure of a high percentage of the population to levels of atmospheric pollutants exceeding standards of air quality set by the EU and the WHO.

EU policies, together with national and local ones, operate to mitigate this impacts. In particular, the European Commission communication COM (2008) 433 of 08 July 2008 "Making transport greener", COM (2009), n. 279 of 17 June 2009 "A sustainable future for transport: Towards an integrated, technology-led and user friendly system" and COM (2011) n. 144 of 28 March 2011 "White Paper - Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport," prompt member states and European cities toward a more efficient distribution of goods in urban areas in order to improve air quality in the urban environment and significantly reduce CO_2 emissions with the aim of achieving a CO_2-free city logistics ("CO_2-free logistics") by 2030.

In Italy, the strategic importance of the logistics sector has prompted the government to enable interventions to promote sustainable development at all levels. At local level, it can be noted that almost all medium to large municipalities have developed systems to regulate the transport of goods, introducing specific rules to regulate traffic flows and more generally the organisation of the distribution of goods. In recent years a growing attention to the issue has developed, even in some provinces and regions, while at the central level, the theme has been recently revived by the National Logistics Plan 2011-2020.

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THE URBAN CONTEXT OF LUCCA

1.1. THE TERRITORIAL AND SOCIO-ECONOMIC CONTEXT

The city of Lucca has a population of about 80,000 inhabitants and an area of slightly over 185 km^2 with an average density of approximately 430 inhabitants per square kilometer. The city of Lucca is a limited part of the territorial extension of the municipality and shows in its structure distinct traces of its history, initially Roman, then medieval, a fact that includes Lucca among Tuscany's best preserved historic towns. The core of the city is enclosed by the Renaissance walls, the city most representative monument, running for about 4.2 km, with a series of bastions. The Walls have allowed the historic centre to maintain a specific homogeneity and a balanced appearance. In the nineteenth century the walls lost their defensive function and were subsequently transformed into an urban park. They now represent an appreciated destination for citizens, as well as for tourists and visitors. The economic system of Lucca is historically determined, with a strong propensity for entrepreneurship. The traditional commercial vocation combined with the typical dynamics of outsourcing of the contemporary city, makes the services sector the prevalent one, as also demonstrated by data on produced added value (69.7% Source: Lucca Promos. "Productive structure and the territory of Lucca ", 2007). This business, present especially in the area of the historic city centre, within the ancient walls, is represented mostly by shops; clothing and footwear; personal services and, in descending order, by hotels, food, companies and specific commercial sectors services (eg. car; ICT; pharmaceutical, sundries). The historic centre of Lucca and surrounding areas nowadays represent a system of "natural" commercial centres (the historic centre, San Concordio, Arancio, Borgo Giannotti and Sant'Anna) expressing a wide variety of economic activities: commercial, artisanal, professional, etc. in which 10% of businesses were established prior to 1960. Data collection and analysis of the business activities of the historical centre and of the neighborhood interested by the services of urban logistics have been recently developed. The research carried out (mainly through the projects MEROPE, LIFE CEDM, LUSLIN and LOVELUCCA) and confirmed by studies of the Chamber of Commerce of Lucca (Lucca Economia: bullettin for business, No. 11/06 - December 2006), identified in this area about 1500 shop windows corresponding to more than 1,400 commercial or artisanal activity. The several categories and numbers are listed in the following table, which, in addition to the data relating to commercial and artisanal activities, also reports the number of activities carried out by professional businesses (source: SEAT), rising the total number of economic activities that can potentially be served by urban logistics services to about 1,900. The activities surveyed were classified according to SEAT macro-categories, with the aim of obtaining data on average weight and average frequency of deliveries to major macro product categories and activities.

List of the analyzed commodities sectors
(data provided by the Chamber of Commerce of Lucca - Lucca Economia: notiziario per le imprese, n° 11/06, december 2006)

Commercial category	Historic centre	Other places	Total
Clothes	243	65	308
Food	228	112	340
Furniture	53	32	85
Cars, transport, packaging	3	25	28
Paper and printing	29	12	41
Chemistry, plastic materials	-	2	2
Culture, art, publishing	64	17	81
Ecology, heat engineering	2	3	5
Public mainentance and construction	2	8	10
Electronics, electrotechnics	8	12	20
Public authority, community	10	3	13
Finance, insurance	27	35	62
Supply for companies and offices	1	5	6
Information technology and telecommunications	9	15	24
Mechanics	7	6	13
Medicals and cosmetology	73	52	125
Watches, jewels, gifts	52	7	59
Professionals, counseling	185	280	465
Advertisement, services for companies	4	7	11
Sport	46	24	70
Tourism	115	43	158
Total	**1161**	**765**	**1926**

In the local context of Lucca, a relevant issue for the purpose of this plan is related to the low air quality that Lucca, like many Italian and European cities, faces. In particular, due to the local low thermodynamic activity and to mild winds, the rather static atmosphere contributes substantially to amplify the impact of human activities, causing a high level of local air pollutants. During the last 10 years, Lucca has always been among the top ten cities in Italy with the highest number of PM10 limit exceedances (in 2010, 100 exceedances). In the specific, these limits exeedances are related to the local density of traffic, domestic heating and industrial activities. In recent years, the Municipality of Lucca has recognised the urgent need to improve air quality and has implemented new measures to reduce the level of pollutants caused by urban mobility, including the strengthening of the Limited Traffic Zone (LTZ), the development of services for goods delivery by electric vehicles (Luccaport), the extension of the network of cycle paths, the improvement of the public transport, etc... The Municipality of Lucca has also recognised the importance of the reduction of climate-altering gases by providing for specific measures in the Action Plan for Sustainable Energy (PAES), among which some are related to mobility.

1.2 ENVIRONMENTAL CONTEXT

In recent years, the Administration has carried out many activities in order to evaluate and assess the impact of interventions concerning mitigation of climate change in the urban environment. In particular, with a specific Action Plan for Sustainable Energy (PAES, November 2013), the data on CO_2 emissions in the territory were analysed in relation to the final energy use attributable to activities within the direct and / or indirect municipal authority. The indirect jurisdiction activities include the emissions of private buildings, the service sector, small and medium-sized enterprises not subjected to the Emissions Trading Scheme, and the urban transport in areas governed by the planning of the municipal administration.

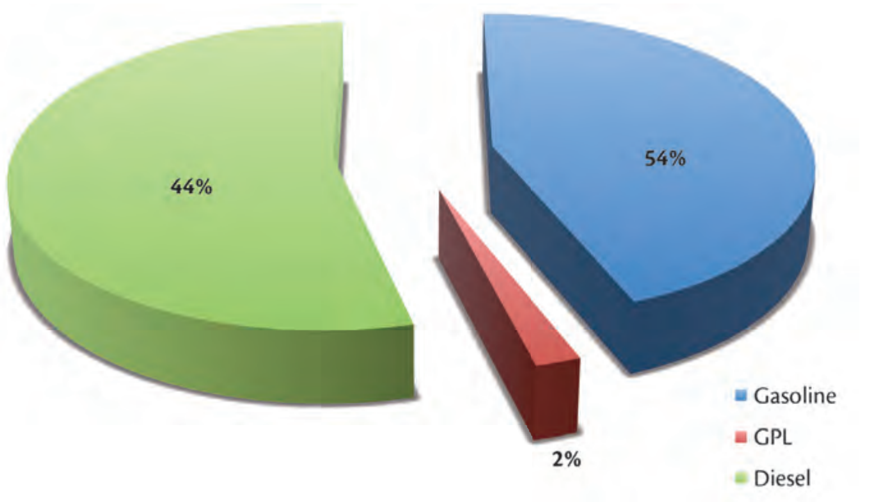
In particular, CO_2 emissions in 2005 (which was taken as the base year for the PAES of the City of Lucca) amounted to approximately 468,182.61 t, for an emission of 5.41 t. per capita. The situation described for energy consumption can be seen also in the distribution of annual CO_2 emissions (2005), although with slight differences.

From the analysis of macro-sector emissions contribution, the building sector is confirmed to have the greatest weight equal to 63%, followed by the transport sector that accounts for 35%. Of great importance is also the energy consumption related to transport, diesel and gasoline, equal to 35%, with 19% and 16% respectively.

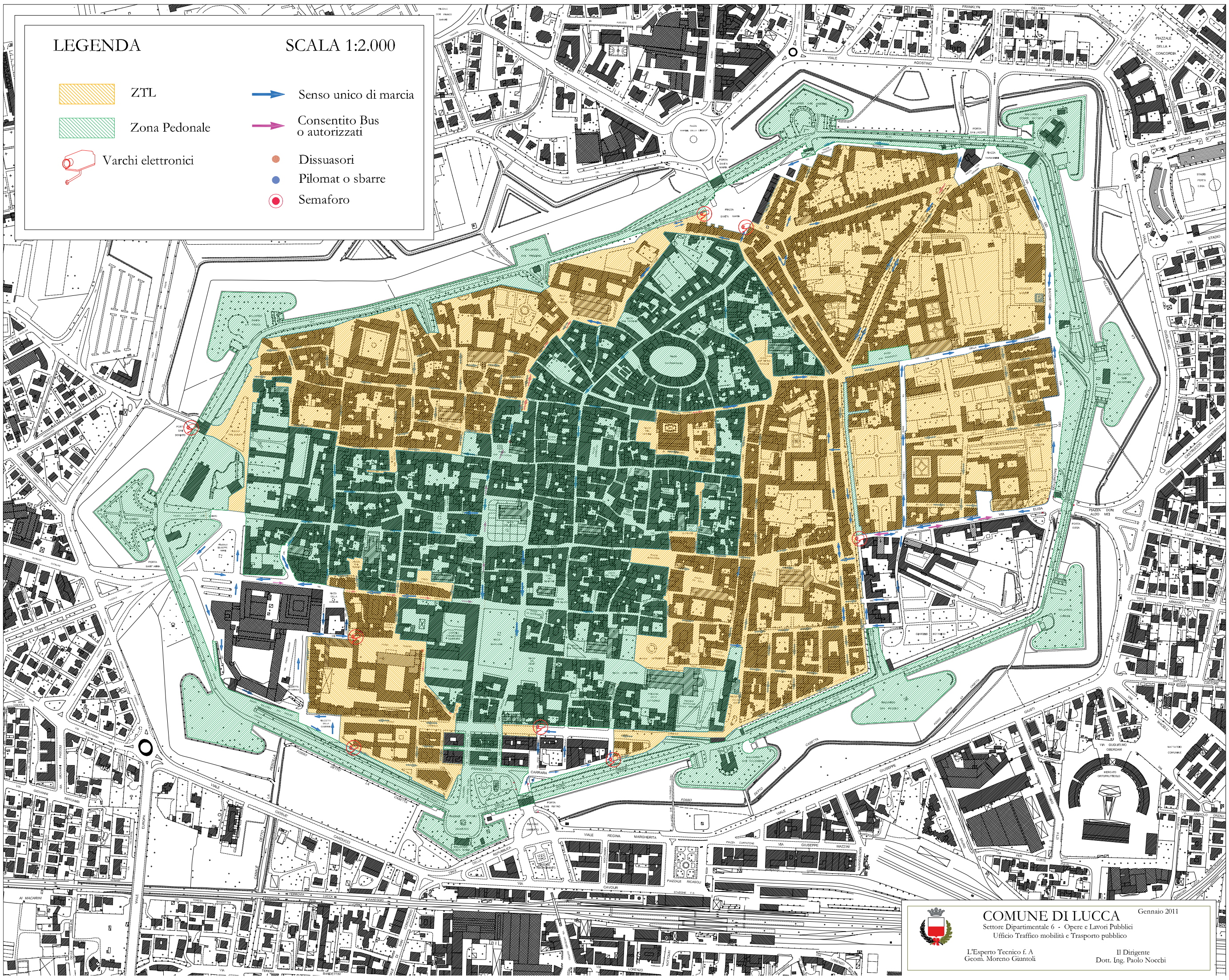
2005 emissions for public, private and commercial transport are approximately 166,248.17 tons of CO_2. However, emissions associated to private and commercial transport are clearly prevalent being the 98% of total emissions in the transport sector. Diesel, besides being the most widely used fuel, is also the fuel that contributes more in terms of emissions (54%), while gasoline contributes to 44%, and LPG contributes to 2% of total emissions.

As already mentioned, the lack of local thermodynamic activity and mild winds in Lucca generate a static atmosphere that helps to boost the impact of human activities, causing a high level of air pollutants. Over the past 10 years, Lucca has always been among the top ten cities in Italy with the highest number of exceedances of the PM10 limit (in 2010, 100 cases exceeded). In particular, the exceedances of air quality are related to a high level of traffic, domestic heating and industrial activities in the surrounding areas. In recent years, the local government has recognised the urgent need to improve air quality and has implemented new measures to reduce the level of pollutants. In particular, in 2010, the daily average values recorded were as follows:

NO2:	35 mg / m^3
NOx:	55 mg / m^3
PM10:	31 mg / m^3
SO2:	2 mg / m^3
O3:	60 mg / m^3



Evaluation of relative contributions in terms of transport emissions per vehicle (ref. 2005)

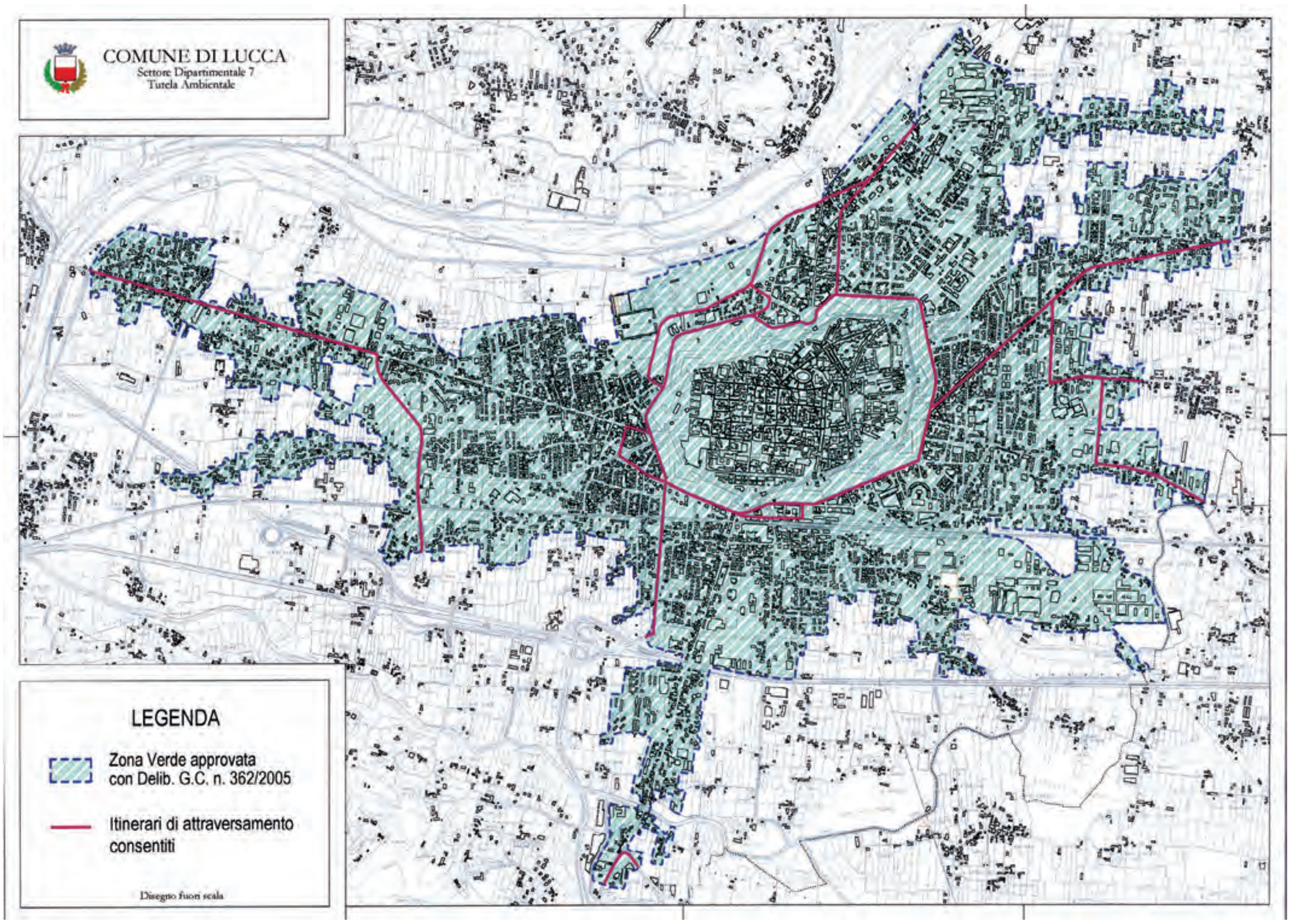


1.3. THE ROAD SYSTEM AND MOBILITY IN LUCCA: GENERAL ASPECTS

As an updated Traffic Plan (PUT) prepared in accordance with the directives of the Highway Code is not currently available, the following description focuses on the historic centre and the surrounding area, which are also the areas of interest with regard to most of the goods distribution processes.

Access to the historical centre of Lucca is available through the six Doors located along the Walls, connecting the external road network with the internal one, characterised by its medieval footprint. Traffic and parking in the historic centre are strongly influenced by the structure of the roads and access structure that required the definition of an articulated road regulations within the historic centre. The first pedestrian zone was established in 1967. Since then, the law has evolved up to the present configuration which states that the area included within the perimeter of the city walls (Old Town) is divided into:

a) Unrestricted access Area, in which entry is forbidden only to vehicles with mass loaded exceeding 3.5 tons and with overall dimensions exceeding 6.50 meters long and 2.20 meters wide. Authorised vehicles are permitted to park in the yellow stalls reserved for them and where not in conflict with the rules of the Highway Code. All other vehicles must be parked in the blue spaces for a fee in respect of the ordinances;
b) Limited Traffic Zone (LTZ), in which the access is allowed only to authorised vehicles with the dedicated badge, parking is allowed in yellow reserved spaces when not in conflict with the rules of the Highway Code.
c) Pedestrian Area, in which the access is forbidden, except for authorised vehicles with the dedicated badge, the parking is permitted in accordance with these provisions. Transit, both for authorised motor vehicles and cycles, is subject to the following provisions and regulations:



- The driver of the vehicle must proceed at a snail's pace;
- The driver of the vehicle must proceed with the utmost caution so as to avoid artifacts that may be present on the roadway and pedestrians, keeping in mind that vehicles must give way to pedestrians.

Access permits are issued to residents, business operators (shop owners, craftsmen, etc.) that run their business in the city centre and to transport operators. Accessibility to the historic centre influences the mobility of people, which is difficult due to the limited number of stalls available for parking. In this regard, outside of the walls have been realised some park an ride systems, also providing a shuttle service to get to the centre, which is served by a widespread network of local public transport, which comprehends a fleet of electric buses. The road network outside the walls, for historical reasons, converge in its main lines towards the city centre, and thus the traffic of the main lines of communication east-west and north-south flows on the ring road, causing frequent congestion in the local circulation.

In addition, the mobility in the historic centre comes into the broader context of the so-called Green Zone, which includes the urban area south of the river Serchio and north of the motorway network, as shown in the map below. This area, from the beginning of 2010 mainly includes restrictions on transit to vehicles with Euro 0 emission standards. However, the environmental benefits arising from the introduction of the Green Zone are strongly reduced by the need to ensure the vehicle traffic to flow along the north-south and east-west routes, by the establishment of specific crossing corridors, in red on the map.

1.4 REGULATORY ASPECTS: CURRENT REGULATIONS, GENERAL PROVISIONS OF ACCESS, CAR ACCESS AND PARKING IN THE URBAN AREA

Together with the rules of the Traffic Law, the city of Lucca has been given an articulated access regulation to the historic city centre, including specific rules for commercial vehicles for goods distribution. These regulations have been put in place over the years having as main objective to achieve a substantial limitation of both private and commercial/industrial vehicles in the historic centre, in order to reduce related traffic congestion and energy consumption, noise and air pollution, as well as to minimise the costs of externalities of traffic, to increase the safety of pedestrians thus achieving an overall improvement of the urban environment. Since 1967, when the pedestrian zone was established, the regulation has evolved to the present configuration described above. In the historical centre of Lucca the maximum speed limit of 30 kilometers per hour and the maximum gross vehicle mass (GVM) of 3.5 tones with maximum dimensions of 6.50 m long and 2.20 m width are in force for all vehicles.

In order to define the normative for access, transit and parking in the Historic Centre of the City of Lucca, a system of permits, which is currently managed by an in house company of the City of Lucca, Metro Srl, has been defined. Permits are organised into categories, with reference to the characteristics of the vehicle, owner and purpose for which the permit is issued. The transit and parking of vehicles within the city centre is governed by special rules for each type of permit.

The main categories of permission are summarised in alphabetical order in the following table.

It is not possible to make an exact comparison between the numbers of permits granted in different years for type of users because of the following factors: changes to permit categories in the last 10 years, waivers granted - significantly regarding permits for freight distribution- and the use of “temporary” permits make the comparison unfeasible. However, a growing trend in the number of permits can be observed in the period 2004-2014, with not less than 10% rise. A more accurate collection and analysis of data would allow an overall view of the phenomenon, certainly relevant to the planning of mobility.

In addition, the City Administration grant temporary permits (daily or extended) in accordance with the same requirements above described. Permits for vehicles having size and weight higher than those determined by these provisions (eg for bulky transport) are released under a specific regulation.

Category according to resolutions GC GC n. 17 of 07/02/2012	Generic description (new categories set out in resolution GC - n ° 246 of 12/03/2013)	Number of permits in 2014
A	A Residents (A1-A2) dwelling (A3), apartment owners (not in the order of 2012, now A4), garage residents (A5),	4965
D	D Artisans and cleaning companies and those engaged in similar activities (DA), walking (DM, former temporary permit)	1149
E	Freight (EC), Transport newspapers (EG), Wholesale based in the Old Town (EI), Movers (ET, former temporary permit), conveyors of values (EV, ex cat D)	294
E/S	E / S owners of hotels and guest houses (EA), perishable goods transport (ED) medicines transport (EM), sales representatives (ER), owners or partners of a business in retail trade	294
F	Disable parking permit	2003
F/S	F / S People with impaired walking ability (FS, temporary disabled)	temporary
	Dwelling and residents in neighbouring areas (G1-G6)	-
H	Doctors H (H)	100
I	Funeral agencies (I), Funerals (IF, former temporary permit), Weddings (IM, former temporary permit)	30 beside those temporary
M	M Services of public interest, public services, social and postal services sectors (M)	420
N	N Garage, garages, car parks (N)	961
O	Elderly residents O (O)	115
P	Public administrators P (P)	61
R	R Chroniclers and print media – radio, telephone service, radio, television (R)	12
T	T Schools and kindergartens and ground schools (companion: T)	206
U	Full electric vehicles	14

A specific regulation is in force for access to the LTZ and pedestrian areas for the following types of vehicles.
The current access regulation, including permits for residents and economic operators for transit and parking within the city centre is under revision.
It is worth to note that the City Council has adopted action plans for containment and prevention of acute episodes of air pollution in specific areas of the city centre, including measures related to vehicle emissions, industrial anthropogenic and activities and reference to different types of fuel.
For regulation and policies related to goods flows, see paragraph 2.2.

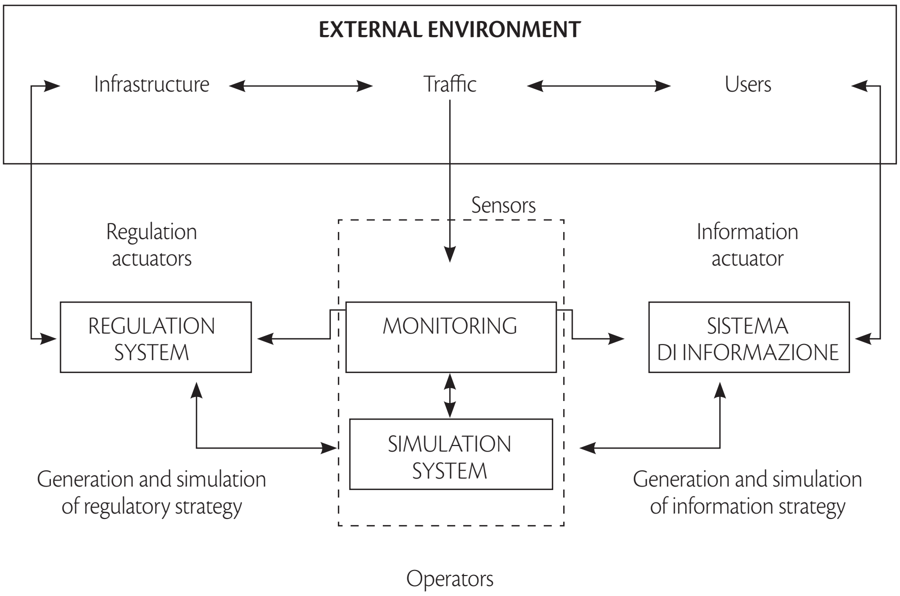
1.5. EXISTING TECHNOLOGICAL CONTEXT FOR MOBILITY IN LUCCA

The Intelligent Transportation Systems, or ITS, are the integration of knowledge in the field of telecommunications, electronics, information technology (in short, telematics) with transport engineering, planning, design, operation, maintenance and management of transport systems. ITS consist today in tools and technologies, products and systems for the management of mobility and transport as a whole. ITS offer a wide spectrum of possibilities of implementation to operators/Authorities (whether public or private, planners or managers, users or providers of added value services) virtually affecting all areas of urban and/or suburban mobility. Some examples are systems for the management of traffic (acquisition of traffic data, traffic light control, access control, parking management, variable message signs, supervision centres and integrated control, etc..), systems for users information (signposted path routing and parking lots, pre-trip information through different technologies - via internet, RDS-TMC, etc. - centres of transport information services - Call Centre, etc.), systems for the management of public transport (fleets monitoring and tracking, automation of deposits, call services, etc..), systems for modal integration and logistics platforms (e.g. Park and Ride systems, smart-card payment systems, system for distribution of goods, mixed systems for both freight and passenger, etc..).
ITS are characterised by interactions between the different components that, working together, are adaptable to other functional areas of ITS.
Cities harbouring valuable historic centres as Lucca show numerous architectural and landscape constraints, as well as functional aspects making technology infrastructure and ITS very useful for a rational, flexible and coordinated use of existing roads and transport system. In fact, ITS application is one of the possible interventions allowing addressing in the short term the increasingly diverse and growing demand for mobility, including mobility of goods. It is therefore essential that the City of Lucca, in the framework of the already existing initiatives addressed by the Region of Tuscany in the field of infomobility, initiates a process for improving the technological framework supporting mobility processes in order to take advantage of results in terms of organisation, operation and information assets, systems of control and monitoring of urban services (in particular, access control and parking management).
All the main subjects involved in the mobility system and acting in the transport network (e.g. Municipality, transport company, parking management operators, etc.) will take advantage from this approach.
The technological systems currently in operation on the urban territory of Lucca are:

- Management of permits and access control to the Limited Traffic Zone;
- Management, control and transit to parking areas;
- Monitoring of Environmental Conditions.

The company Metro Srl in Lucca (www.metrosrl.it) manages the first two systems, while the Provincial Department ARPAT of Lucca is responsible for the third.

VEHICLE TYPE / USER	PRESCRIPTION
Animal-drawn vehicles	Not permitted unless exceptions
Bikes	Allowed in accordance with special regulations
Mopeds and motorcycles	Admitted in ZTL; in Pedestrian Area only for residents with limitations
Coach of the urban and suburban bus, tour buses	Allowed in accordance with special regulations
Motorhomes, caravans, trucks, articulated buses, articulated vehicles, trailers and car trailers	Not permitted, unless exceptions
Taxi and vehicles for hire with driver	Allowed
Vehicles of the City of Lucca, the State, the Region, the Province, military vehicles and police forces, emergency preparedness and emergency response.	Allowed
Customers of hotels and guest houses	Allowed
Nursing homes and retirement homes	Allowed



1.5.1 PERMIT MANAGEMENT SYSTEM AND LTZ ACCESS CONTROL SYSTEM

The granting of permit to access the LTZ, for the categories detailed above, is delegated by the City of Lucca to Metro Srl. The company makes available to city users all the documentation through its web portal, for applying for the grant of an access and parking permit to the LTZ. The Permits Office is located at the headquarters of Luccaport in via delle Città Gemelle, n.162.

Since January 2011, an automated access control system to the LTZ has entered in force: seven automatic control gates have been activated to record access of vehicles to the LTZ. The borderline of this zone, the pedestrian zone and the location of the controlled passages are shown in the map. In order to integrate the current infrastructure, a system of variable message signs (VMS) will be provided by 2015 to inform the public about the perimeter and restrictions within the ZTL, thanks to the project LuccaMo (co-financed by the Region of Tuscany in the programme Por Creo 2007-2013).

1.5.2 MANAGEMENT AND CONTROL SYSTEM OF PARKING AREAS

As already mentioned the management of the parking system in Lucca has been assigned to the Company Metro Srl. Metro provides prepaid cards to be used for local parking or subscriptions for parking including those using parking meters. The “€ Park” system was also recently introduced: a single ticketing system, that can be recharged with prepaid cards and can be used in all metered parking spaces, both inside and outside the Walls, adaptable to all types of fare.

A specific Parking Management System (PMS) manages both parking areas along the road (managed with parking meters) and car parks infrastructures in Lucca. PMS, besides making information about the occupancy status of parking lots available, also online, informs users through dedicated variable message signs placed along the main entrance arteries to the urban area.

1.5.3 AIR QUALITY MONITORING SYSTEM

Since the beginning of 2011 air quality has been monitored through the new regional network detection, managed by ARPAT, which has replaced the previous Province’s networks.

The whole system is based on the following regulations:

- Community level: Directive 2008/50/EC;
- National level: Legislative Decree no. 155/2010;
- Regional level: L.R. 9/2010 and DGRT 1025/2010.

Such regulations aim to ensure that the evaluation and management of air quality is managed on a regional rather than on a provincial basis. The above-mentioned Regional regulations resulted in the need for a reorganisation of the system for air quality monitoring. The new monitoring network consists in 32 stations, replacing the existing regional networks of PM10 (DGRT 377/06), PM2.5 (DGRT / 2008) and O3 (DGRT / 2006), and becoming the reference network at regional level since 1 January 2011.

One of the main benefits introduced by the new system is the assessment of air quality without rigid administrative boundaries, favouring a system based on the division of the territory into homogeneous areas from the point of view of pollution sources, orographic and climatic features and degree of urbanisation. To this purpose, by DGRT 1025/2010, Tuscany Region identified 5 zones (coastal zone, Valdarno area, Pisa and Lucca plain, Prato-Pistoia area, Valdarno and Valdichiana area) and one agglomeration (Florence and the nearby municipalities), which involve monitoring stations for all relevant pollutants (PM10, PM2.5, NO2, SO2, CO, Benzene, IPA, O3 and metals), taking into account threshold on the basis of population, on recorded levels, and on all the critical aspects of each individual zone.

For each area, there is a number of monitoring stations, which depends on the resident population and the previous measurements performed in the area. Data related to pollutants measured by each control units are processed daily by ARPAT and made available to the community through the publication of the daily air quality bulletin. A report describing the status of air quality in the province of Lucca and in the city centre in particular is presented annually.

Stations measuring the main environmental parameters for the city of Lucca are located in:

- Carignano;
- Lucca Viale Carducci;
- Lucca S. Micheletto, that will be relocated as provided by All. 3 and 6 of DGRT of 1025/201.

The following table shows pollutants detected by each of the measurement stations.

Train station	SO2	NOX	PM10	O3	CO
Piazza San Micheletto	X	X	X		
Viale Carducci	X		X		X
Carignano				X	

THE CONTEXT OF LOGISTICS PROCESSES IN LUCCA

2.1. GENERAL ASPECTS

The transport system that ensures the distribution in the city centre of Lucca is a complex system made up of a large number of stakeholders that move in a wider scenario than the city distribution. In fact, on one hand transport companies listed in the Companies Register of Lucca (Province of Lucca) are about a thousand, of which more than a half is made up of individual professionals (owner-operators). On the other hand, the investigations conducted through the projects MEROPE, LIFE-CEDM, LUSLIN have confirmed that the share of freight traffic directed to the city centre is managed largely by a limited number of subjects (cooperatives, individual companies, large and medium-sized transport companies).

A very high number of subjects access daily the historic centre and the surrounding areas, while making a limited number of deliveries. In addition, incoming goods usually come directly from suppliers with legal or operational headquarters outside the province of Lucca. Finally, the analysis showed that many traders and shop owners make freight transport on their own account (in agreement with similar investigations conducted by the Italian Ministry of Transport).

2.2. FREIGHT FLOWS REGULATORY POLICIES

Access and parking for goods transport is regulated through a complex system of permits, which was introduced with the following changes and updates over the last fifteen years.

In the historic centre, the limit of loaded mass of 3.5 tons with maximum dimensions of 6.50 meters in length and 2.20 meters in width is applied for commercial vehicles, and is derogable only in special cases.

This system takes into account the needs of potential users, including transport professionals , and is based on specific restrictions, which differ on the basis of permits categories, access areas usage and time windows. Although in place for a number of years, the current regulation is not sufficient to ensure a significant reduction in commercial traffic.

As mentioned above, permits to enter the LTZ, in particular dedicated to freight transport, are category E, E/S and M, defined as follows by the GC n. 17 of 07/02/2012 and further articulated by the GC - n ° 246 of 12/03/2013.

Category E "Circulation Permits for freight, newspapers transport" includes vehicles owned by:

- Holders or members of a wholesale business based in the city centre.

Vehicle access to and transit through the ZTL and Pedestrian Areas is allowed from Monday to Friday during the following time windows: 6.30 am to 10.30 am and from 1.30 pm to 3.00 pm, with the obligation to follow the route indicated by the local Traffic Office on the permit to reach the destination point only.

Stopping in the LTZ and in Pedestrian Areas is only permitted near to the destination point, with the engine off without causing hindrance to movement, and for loading and unloading operations only, anyhow not exceeding 30 minutes.

- Couriers for third parties and transporters in general

The access and transit of vehicles is permitted:

a) In the LTZ from Monday to Saturday from 6.30 am to 10.45 am and from 3.30 pm to 4.00 pm, excluding newspapers deliveries that can be done even during holidays. Parking is only permitted near to the destination point, with the engine off without causing hindrance to movement and for loading and unloading operations only, anyhow not exceeding 30 minutes;
b) In Pedestrian Areas from Monday to Saturday from 6.30 am to 10.45 am and from 3.30 pm to 4.00 pm, excluding newspapers deliveries that can be done even during holidays. Parking is only

permitted near to the destination point, with the engine off without causing hindrance to movement and for loading and unloading operations only, anyhow not exceeding 15 minutes.

The maximum annual permits limit is two per company.

Category E/S: "Permits to medicines transport, perishable freight, owners or partners of a business and retail shops for perishable goods, salesmen, owners of hotels and bed and breakfast"

The maximum annual permits limit is two per company.

For the permit Category E/S the following provisions are in force:

Medical transportation: access allowed to the LTZ and Pedestrian Areas without limitations in time, with the exception of certain streets subject to a high pedestrian flow, in which the transit is forbidden between 5.00 pm and 8.00 pm. Stopping is only permitted near to the destination point, with the engine off without causing hindrance to movement and for loading and unloading operations only, anyhow not exceeding 15 minutes.

Perishable freight: access and transit is allowed in the ZTL and the Pedestrian Areas without limitations in time with the exception of certain streets subject to a high pedestrian flow, in which the transit is forbidden between 5.00 pm and 8.00 pm. Stopping is only permitted near to the destination point, with the engine off without causing hindrance to movement and for loading and unloading operations only, anyhow not exceeding 15 minutes.

Category M: "Services of public interest, public services, for social purposes and postal services"

Among the vehicles using the category M permit for logistics activities are companies that have permission to operate postal services. In Italy, as in other European countries, the postal market was run by the State until a few years ago. However, as a result of directives for postal liberalisation, the sector was opened to private competition and now, together with Poste Italiane, other operators can provide postal services. Among professional operators, the fastest to acquire new market segments have been express couriers, characterised by addedd value services, such as increased speed, shipment tracking, delivery confirmation and the delivery at a predefined time.

The authorisation to perform postal service is widely spread in the world of transport and is often used for goods and deliveries that often are not actual postal services, in order to bypass local regulations and access restrictions to urban centres. This practice has become common in many Italian cities as evidenced by the growing number of operators qualifying themselves as postal service operators, and applying for the related permits (often less onerous) to provide transport of goods, also with significant volumes (groupage delivery, boxes, pallets, etc.). This is the case of express couriers, which, apart from postal services, deliver all the types of goods above mentioned.

Access and transit with permits is allowed in the LTZ and the Pedestrian Areas with no time restrictions. Parking is always forbidden with the exception of vehicles and motorcycles that can stand up to the collection or delivery.

The above regulation is currently under review, as permits and E/S as outlined in section 2 (GC-No. 246 of 12/3/2013). Moreover, the regulation of 2012 is the subject of a substantial review-resolution No. 106 of 5/16/2014 "Creation of load/unload bays -approved experimental phase". Its most important elements are as follows:

- Creation of 12 load/unload areas for holders of residence permits to access the LTZ;
- Definition of predetermined routes for reaching specific areas for loading and unloading goods;
- Changing of the time windows for reaching such areas and parking for loading and unloading, as well as for the entire restricted traffic zone with anticipation of morning entrance from 6:30 am to 05:00 am, the postponement of the release time from 10:30 am to 11:00 am and to the postponement of afternoon release time from 3:30 pm to 4:00 pm;
- Extension of entry days including Saturdays;
- Eccess to the whole area of the city centre 0/24 hours for businesses with laboratories – meaning exclusively bakeries, pastries and caterings services. To these activities, the new category permit EL is granted for the sole time corresponding to the period of experimentation.

2.3. LOGISTICS SERVICES AND INFRASTRUCTURES

Alongside logistics services and infrastructures of private operators active in the area of Lucca (DHL, GLS, SDA, BRT, etc.), the local Administration has invested considerable resources to develop specific infrastructures and to enable dedicated services contributing to the rationalisation of logistics processes in urban areas, ensuring greater sustainability. In addition to the technological infrastructure for automated access control, described above, another infrastructure is listed below: Luccaport services and the system of loading and unloading areas, which has been already put into practice, albeit in experimental phase, in 2014.

The essential components of Luccaport urban consolidation centre that are crucial for the performance of its services are:

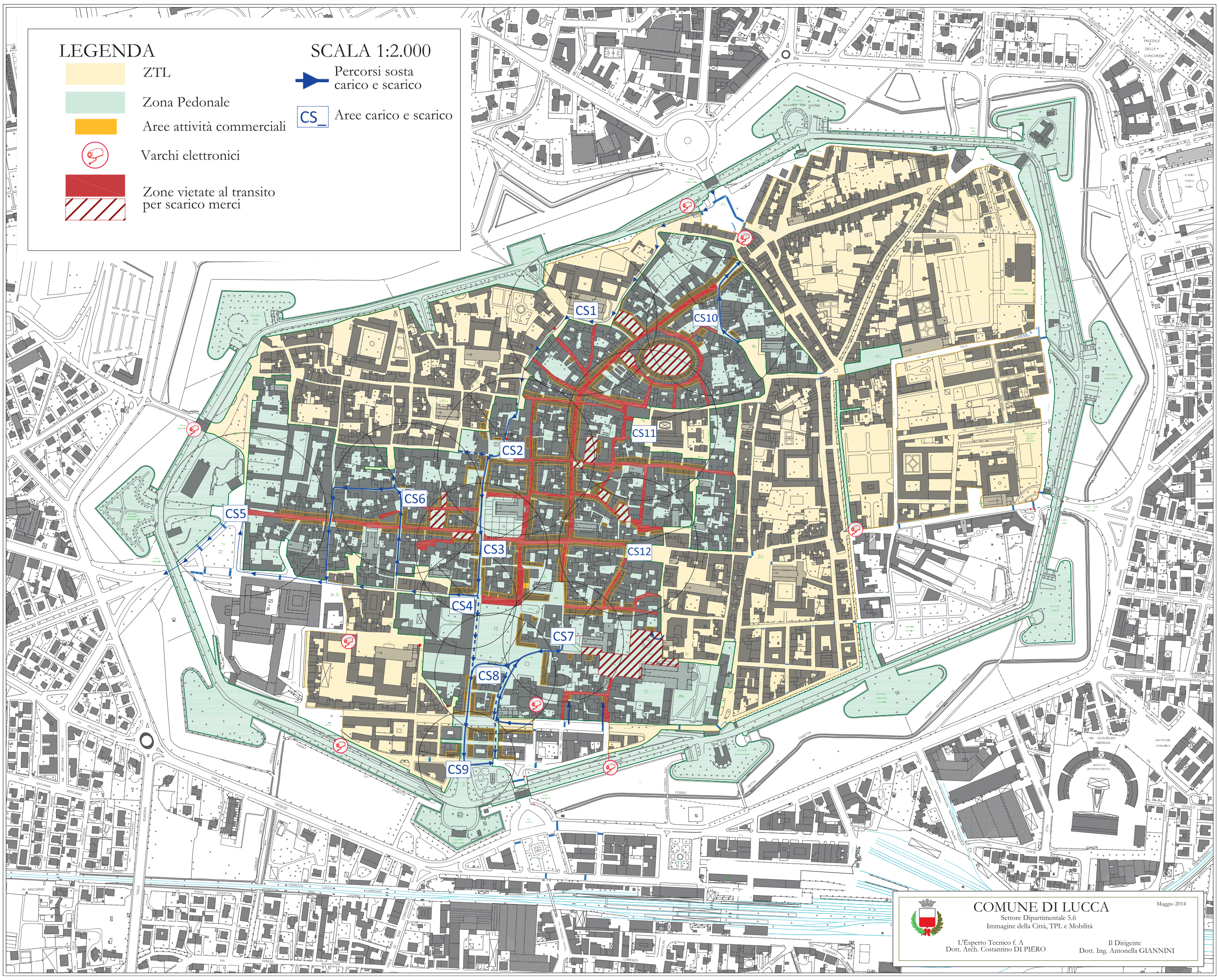
- The logistics base is located in optimal position both in relation to the urban centre and commercial area and to the road and motorway network: the base serves as a transfer and consolidation point for inbound and outbound goods from the urban area and as a structure for the management of additional logistics services for the city of Lucca. The logistics base of Luccaport is located in via delle Città Gemelle n. 162, approximately 1000 meters far from both the toll Highway A11 Firenze-mare and the city walls. The operative parts of the building consist of:

- A covered area for loading/unloading of goods (about 1,000 square meters, with the possibility of future increase through the installation of a mezzanine floor, taking advantage of the high ceiling;
- Two uncovered areas for reception of incoming goods and for loading of environmentally friendly vehicles. The first is approximately 600 square meters, with 4 outlets for unloading goods from up to 4 heavy trucks at the same time; the second is about 300 square meters, since the bulk of electric vehicles are smaller and require less space for manoeuvre.

- The technological platform, designed for the management of logistics services;

Load/ unload Bays	Localization
CS1	Via san Frediano, southern side of Chiesa di San Frediano
CS2	Piazza del Salvatore
CS3	Via Vittorio Veneto at the corner of piazza S Michele
CS4	Via Vittorio Emanuele, at the corner of via Vittorio Veneto
CS5	Piazzale Verdi at the corner of via San Paolino
CS6	Via Burlamacchi, at the corner of Via di Poggio seconda

Load/ unload Bays	Localization
CS7	Via San Giovanni, at the corner of Via Duomo, at the front of Basilica San Giovanni
CS8	Piazza Napoleone, southern side
CS9	Porta San Pietro
CS10	Via Busdraghi, at the corner of via del Portico
CS11	Piazza del Carmine
CS12	Piazza Bernardini, western side



network that is formed also by alleys and narrow streets.

The fleet currently includes:

- 2 Ducato 35 q. electrified Micro-Vett;
- 1 Ducato 35 q. electrified Enerblu;
- 1 ISUZU 35 q. electrified Micro-Vett;
- 1 Piaggio Porter 16 2 q. electrified Micro-Vett

The logistics base LuccaPort is also strongly characterised by marked attention to environmental and energy issues as it is designed to accommodate a large photovoltaic power system allowing a considerable reduction of the environmental impact of the structure itself. The extension of the cover with solar panels has been designed and dimensioned in advance on the basis of the energy required both by the building and by the fleet, in such a way that the logistics base will be fully self-sufficient regarding energy needs.

The evolution of urban logistics measures in the city of Lucca took over 10 years to build an infrastructure to support a delivery service with fully electric vehicles in the historical centre of Lucca. Luccaport currently provides a range of services for different users such as

- Dedicated services for residents: small removals, transport of bulky objects, door-to-door delivery, shipping, temporary storage, etc. In the future, new services for the elderly and disadvantaged users will be activated;
- Services for tradesmen, artisans, organisations and service agencies: delivery and withdrawal of goods and documents, porterage, raised floors or deliveries from stock, temporary storage, retirement packages, etc.;
- Dedicated services for hotels, restaurants and tourists: deliveries and pick-up of goods and documents, porterage, raised floors or deliveries from stock, temporary storage, luggage transfer, wholesale distribution, deliveries in urban areas, etc.;
- Transportation agencies and operators of logistics: deliveries and pick-up of goods and documents, dedicated delivery programs, etc.

A series of added value services are being provided, including temporary storage, delivery services, reverse logistics, freight consolidation and recovery yields, packaging, etc. LuccaPort's objective is to extend and customise its services, in collaboration with transport operators and with the main stakeholders.

With regard to the areas of loading and unloading, it is a project that contributes to the rationalisation of the distribution of goods in urban areas, reducing pollution and land use in the most prestigious shopping street, famous for their historic, architectural and touristic features.

The project is currently in an experimental phase, GC No. 106 of 5/16/2014, and consists of 12 load/unload areas (some of which can be reached with a defined route) located at the addresses in the table in the previous page.

CURRENT STATUS OF THE LOGISTICS PROCESSES IN THE HISTORIC CENTRE OF LUCCA

The current system of logistics processes that ensures the distribution in the city centre of Lucca is a complex system made up of a large number of stakeholders who move also in a wider scenario than the urban distribution. Since 2003, numerous studies have been conducted, helping to identify the key actors and the relevance of the main factors involved, as described hereafter.

3.1. THE DEMAND

The demand for urban logistics services comes from and is represented by the several actors that provide and acquire goods in the area of interest: traders, retailers, manufacturers, artisans, Ho.Re.Ca. (Hotel, Restaurants, Catering) and citizens (as recipients of goods purchased online), tourists and visitors. In addition to these, also the area-related companies of the tertiary sector operating in different sectors of the service sector, as the numerous public bodies with offices based in the historic centre demand for logistic services.

The demand for goods from the actors mentioned above has become increasingly complex in recent years, as a result, for example, of the spread of a policy of "Just In Time" strategy, driven by the need to reduce the costs for the maintenance of warehouses, that require increasingly more frequent and smaller deliveries. Furthermore, the availability of narrow time windows for the delivery / receipt of goods has led to an increase in the number of vehicles used for transporting small consignments of goods. In this way, scale economy vanishes, resulting in increased transportation costs, while the attention to quality, reliability, security and flexibility, requiring investments in sophisticated systems of management systems and control techniques, disappear.

Even private citizens are involved in the process as recipients of goods purchased online: together with the development of e-commerce, in fact, the demand for transport to meet a distribution process from door to door for small loads rises. As users of the service, individuals are interested in quick and on time deliveries.

A quantification of the demand for logistics services in the area of interest (the historic centre and surrounding areas), limited to the main economic activities and only to the delivery service is reported in the following table.

The data concern the average delivery rate. The main economic activities located in the city centre and in the surrounding areas are illustrated in the following table, showing the avarage deliveries by product category..

Average delivery rate for different commodities sectors
(year 2011 – LOVELUCCA Project)

Commercial category	Average number of deliveries per week
Clothes	2,71
Food	14,33
Furniture	6,38
Cars, transport, packaging	7,72
Paper and printing	5,49
Chemistry, plastic materials	4,00
Culture, art, publishing	7,37
Ecology, heat engineering	n.d
Public mainentance and construction	0,83
Electronics, electrotechnics	6,13
Public authority, community	n.d
Finance, insurance	n.d
Supply for companies and offices	6,00
Information technology and telecommunications	6,33
Mechanics	8,64
Medicals and cosmetology	6,88
Watches, jewels, gifts	3,95
Professionals, counseling	n.d
Advertisement, services for companies	8.50
Sport	9,42
Tourism	3,97

We also hereby report the distribution of the average delivery rate per week,depending on the supply chain and based on the behaviour of local economic operators. The graph reports the distribution of supply in the different days of the week, showing a fairly uniform number of deliveries, with slight increases on Tuesdays and Fridays. The table highlights that each store is open on average 300 days a year, 50 weeks per 6 days a week.

Distribution of the average number of deliveries during the week
(year 2011)

Day	%
Monday	15,7
Tuesday	18,2
Wednesday	16,8
Thuesday	17,3
Friday	18,2
Saturday	13,8
TOTAL	100

Distribution of the average number of deliveries at different time slots during the day
(year 2011)

Time slot	%
06.00 – 08.00	8,8
08.00 – 10.00	26,9
10.00 – 12.00	26,9
12.00 – 14.00	6,5
14.00 – 16.00	9,2
16.00 – 18.00	15,7
18.00 – 20.00	3,9
TOTAL	100

3.2. FLOWS AND MAIN TYPES OF VEHICLES

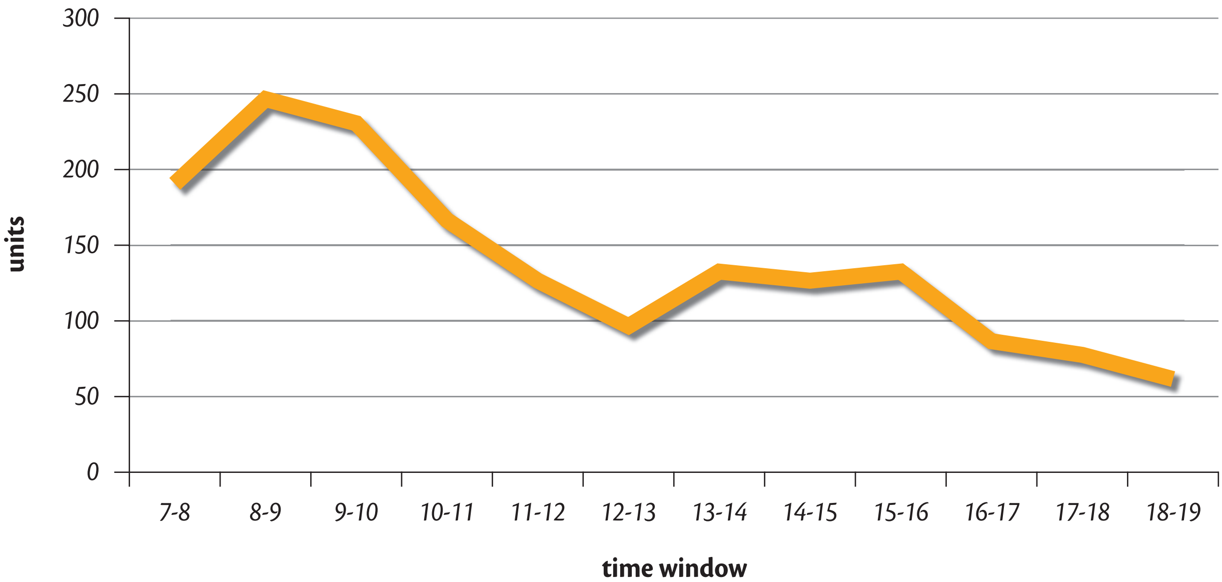
In the historic centre and in its immediate surroundings outside the city walls, there are about two thousand business and professional activities, which are the main points of destination of goods flows. The commercial vehicle flow, including those determined by craft activities, involves an estimated number of accesses to the historic centre of approximately 1700 vehicles / day. In particular, data acquired from previous surveys have been verified with specific surveys carried out at the gates to the old town. From these surveys, certain categories of motor vehicles were excluded (private cars, two-wheeled motor vehicles, buses, public transport services, trucks, taxis, etc.). Researches conducted since 2003 have surveyed 1680 inbound vehicles/day in the time window 8.00 a.m. - 8.00 p.m. The more consistent flow in the inbound traffic, when 247 vehicles entered the historical centre.

The following table shows the details of goods vehicles' flows, broken down by time slot and type of vehicle, while the following chart highlights the total data per time slot. The recorded data show that, with the current replenishment habits (even in the presence of limitations of time windows for delivery) the entrance of trucks into the city is practically free and concentrates (for more than 56%) during the hours from 08:00 to 12:00 am, with considerable disturbance to pedestrian residents and tourists (about 30% of deliveries takes place between 10.00 and 12.00 am). About a quarter of the shops (27,2%) uses its own means of delivery; the rest is served by carriers, shippers and other logistics operators. In addition, in general, the studies have shown a very fragmented freight distribution system, which shows a reduced use of the load capacity of vehicles (< 30%).

Number of commercial vehicles accessing the historic centre per time slot and per type of vehicle

	7:8	8:9	9:10	10:11	11:12	12:13	13:14	14:15	15:16	16:17	17:18	18:19	Tot.
Three-wheeled vehicles	21	25	20	27	8	4	7	7	8	5	5	1	**138**
City vans	63	115	82	63	53	50	62	56	62	38	39	28	**711**
Vans	94	98	124	74	64	41	57	51	49	34	31	29	**746**
Trucks (35 q.)	13	9	5	3	2	2	7	13	14	10	3	4	**85**
Total	**191**	**247**	**231**	**167**	**127**	**97**	**133**	**127**	**133**	**87**	**78**	**62**	**1680**

Total number of accesses of freight vehicles in different time slots



Based on the findings of these studies, the vehicles used in the delivery of goods in the historical centre of Lucca were subdivided in different categories, as reported in the following table. For fuel supply, the vast majority of vehicles has diesel engines.

Light commercial vehicles in Lucca county divided by emission standards *(year 2011)*

EURO 0	EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6	TOTAL
13%	8%	19%	30%	28%	2%	0%	100%

Number of vehicles, absolute and percentage, subdivided by type of vehicle

Veichle type	N.	%
Three-wheeled vehicles	138	8%
City vans	711	42%
Vans	746	44%
Trucks (35 q.)	85	5%
Total	**1680**	**100%**

Emission standards for light commercial vehicles between 1760 kg and 3500 kg Categories N1-III & N2

	Date	CO (g/km)	THC (g/km)	NMHC (g/km)	NOx (g/km)	HC+NOx (g/km)	PM (g/km)
Diesel	(g/km)	NMHC					
Euro 1	(g/km)	NOx	-	-	-	1,7	0,25
Euro 2	(g/km)	HC+NOx	-	-	-	1,2	0,17
Euro 3	(g/km)	PM	-	-	0,78	0,86	0,1
Euro 4	(g/km)	0,74	-	-	0,39	0,46	0,06
Euro 5	Sept-10	0,74	-	-	0,28	0,35	0,005
Euro 6	Sept-15	0,74	-	-	0,125	0,215	0,005
Gasoline							
Euro 1	Oct-94	6,9	-	-	-	1,7	-
Euro 2	Jan-98	5	-	-	-	0,7	-
Euro 3	Jan-01	5,22	0,29	-	0,21	-	-
Euro 4	Jan-06	2,27	0,16	-	0,11	-	-
Euro 5	Sept-10	2,27	0,16	0,108	0,082	-	0,005*
Euro 6	Sept-15	2,27	0,16	0,108	0,082	-	0,005*

3.3. TRANSPORT OPERATORS: THE SUPPLY

The number of transportation companies registered with the Companies Register of Lucca (Province of Lucca) is about one thousand, of which more than a half is made up of individual firms (padroncini). The share of goods directed to the city centre is handled in large part by a limited number of authorised operators (cooperatives, individual firms, large and medium-sized transport companies), although there is also a very high number of operators accessing the historic centre and the surrounding areas to make a limited number of deliveries. In addition, incoming goods in the city come as well directly from suppliers without legal or operational headquarters in the province of Lucca. Finally, many operators provide transport on their own account. Overall, about a quarter of the deliveries made in the historical centre of Lucca is constituted by express delivery.

Synthesis of the average number of last mile deliveries in Lucca historic centre and surrounding areas

Type of delivery	Week	Year	Day
EXPRESS DELIVERIES	2797,2	139859,2	559,4
OTHER DELIVERIES	7031,0	365047,8	1460,2
TOTAL	10098,1	504907,0	2019,6

The goods distributed in urban areas may follow different paths (distribution channels) that imply different impacts on mobility. By following the flow of goods from producer to consumer, the following downflows can be identified:

- Distribution centres, nodes of the logistics system mostly for activites related to storage and sorting of goods: here large lots from producers are received, which are then allocated on the basis of orders received from customers, consisting of different articles, for the supply of stores;
- Wholesalers, organised as commercial companies, that generally buy in large lots from different manufacturers and resell in smaller lots to retailers at an increased price to cover the management costs and with a profit margin (mark-up);
- Transport companies that, with the support of their own structure, ensure the operations of transport, the delivery of goods flows and the execution of numerous other logistics services.

Taking into account the presence of these intermediate structures, the different distribution strategies can be distinguished in:

- Direct transport from producer to consumer, with delivery in small lots with numerous travels, widespread on the territory;
- Supply of small retailers: retailers, artisans, accommodations, restaurants and catering (Ho.Re.Ca), with medium-size lots and frequent deliveries to the city centre;
- Supply of large retail chains, with few deliveries with significant volumes of goods and the use of vehicles of medium and large size, even outside the city centre.

The atomisation of the transport services supply sector, and in particular the large quantity of transports, generally produce a poor optimisation of the distribution, both in terms of load consolidation of the vehicles and in terms of route optimisation, and slows down the diffusion of shared information systems that enable the optimisation of loads, route planning and vehicles' optimal routes.

Logistics operators engaged in freight transport services are mainly managers of logistics areas adjacent to urban centres, transport operators and haulage contractors.

Managers of logistics areas located outside the city centre are interested in a greater involvement in the planning of urban logistics and in the provision of areas for freight management and the consolidation of logistics services. Transport operators, both working on their own account or for third parties, are interested in the possibility of increasing the efficiency of the service and of reducing management costs. In fact, in many cities, parked vehicles often restrict the space of passage and contribute to the delay in deliveries, and the bad condition of road surfaces can increase the costs of distribution, adding safety issues and deteriorating the quality of transport (e.g. risks to damage the goods). In addition, many commercial areas of the city centre often suffer from a lack of adequate facilities for loading and unloading, or, when present, of inefficient management of them.

3.4. ESTIMATE OF ENERGY CONSUMPTION AND QUALITATIVE CONSIDERATIONS

The definition of reference indicators is the prerequisite to properly assess the effectiveness of the actions envisaged by a sustainable urban logistics plan and the achievement of its objectives. The use of indicators allows to carry out an ex ante assessment on the potential impacts of actions, i.e. the effects expected for each individual action; to verify the results of ongoing actions introduced, the trend of the overall policy identified by the plan and its compliance with the objectives set; to identify actions poorly incisive and implement any corrective actions.

In urban areas, freight distribution accounts for about 26% of the total emissions related to transport[1]. The exact calculation of the level of pollutant emissions from freight transport is difficult to achieve. However, the studies carried out over the urban area of the city of Lucca and in particular on its historic centre allow a rough estimate of the emission level of the major pollutants related to logistics processes within the city walls.

This estimate, shown in the following table, was made on the basis of the data of the accesses to the historic centre and the population of commercial vehicles, divided by load capacity and emission standards. These values are also strongly linked to the Lucca context, in terms of road network and traffic and type and characteristics of businesses and deliveries, as described in the previous sections.

It is also important to emphasise that part of these emissions, estimated at around 15 %, has already been reduced thanks to the activity of Luccaport and regulatory policies put in place by the city of Lucca in recent years.

Estimation of emissions of main pollutants

Pollutant					
NOx	HC + NOx	CO	PM	CO_2	Energy
2950 kg/year	3200 kg/year	9100 kg/year	390 kg/year	1300 Ton/year	5700 MWh/year

1 European Commission, White paper 2011 – Roadmap to a Single European Transport Area. Towards a competitive and resource efficient transport system. Impact assessment

3.5. MAIN ISSUES AND RATIONALE OF THE PLAN

In Lucca, as in other Italian cities, freight transport and distribution are, together with private transport, a major cause of energy consumption, greenhouse gas emissions and increased levels of noise, and contribute to the well-known negative impacts on quality of life and urban environment, also taking into account that Lucca economic activities are, like many Italian and European cities, mainly related to services, commerce and tourism.

In this sense, the Municipality of Lucca has invested, in recent years, increasing resources in interventions aimed at the overall sustainability of the urban mobility system, and has put in place real measures / actions to improve urban logistics services, reducing environmental and social impacts and directing them towards full sustainability and development.

The improvement of the urban environment and, ultimately, of the quality of life of residents and visitors, is the main motivation that underlies the rationalisation of freight distribution processes in urban areas, together with the increasingly pressing needs for upgrading and developing the economic structures of town centres, often severely compromised by the negative effects of motorised traffic.

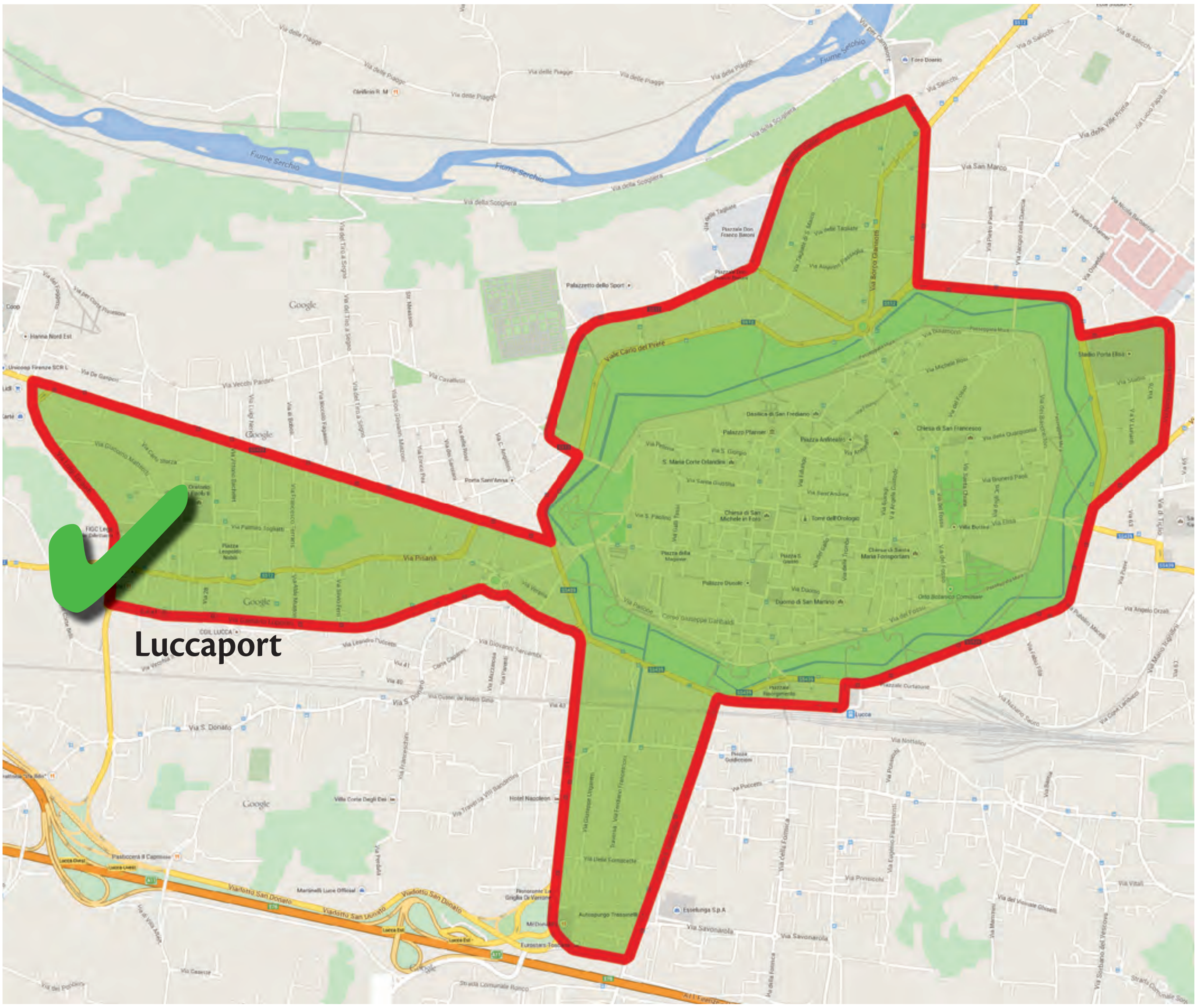
It is well known that, in addition to direct impacts such as pollution and occupation of public land, the road freight transport produces negative externalities (social and environmental costs) of various kinds, due to emissions of air pollutants, greenhouse gas emissions and noise, also linked to congestion and accidents. Especially with regard to pollution (air and noise) and congestion, urban environments are particularly vulnerable, due to the combined effect of high traffic density and of high concentrations of population. Moreover, in art cities such as Lucca, to these adverse effects must be added the considerable damage caused by air pollution to the artistic heritage. There are many estimates of the social and environmental costs associated with such externalities. The estimates made by various research institutes, both Italian and European, which have recently been collected in a document of the European Commission (Handbook on estimation of external cost in the transport sector), agree to ascribe an extremely high economic value to the externalities arising from the distribution of goods in urban areas,.The full internalisation of social and environmental costs might constitute by itself a sufficient measure to discourage most motorised traffic entering the historical centres of cities. However, it appears clear that, nowadays, no European city has had the strength to fully implement the "polluter pays" principle.

The planning of logistics processes is part of a larger and broader planning activity of mobility, which essentially has a vision of planning infrastructure and transport networks in urban areas and represents a real opportunity of city development with a strategic vision, that coordinates all the components of the complex system of mobility (systemic plan), which has visions planned trough time (process-plan), whose effects are measurable in the course of implementation. The sustainable urban logistics plan is an important part of this and in order to make it possible and to prevent that the actions of the Plan do not produce the expected effects, it is essential to structure a monitoring system capable of testing the effectiveness of and compliance with the schedule, and/or that might highlight the need to review, or introduce new and more effective actions to achieve its goals.

Starting from the results of the analyses and assessments developed in recent years by the municipality, describing the current state of the system of logistics processes, it will be possible to develop monitoring activities that will accompany the various phases of the development of the plan. The systematised collection of information will define a framework, as much representative as possible of the current system, divided into statistical and spatial data (population, employees, number of freight vehicles, number of deliveries), demand for quality logistics services and transport of goods, obtained on the basis of sample surveys, measurements and simulations, data on supply logistics, environmental data (air quality, noise levels, ...), traffic data and network load (road traffic flows, modeling assignment, data on accidents, ...). The data, properly interconnected, will constitute the starting reference indicators (ex ante evaluation); these must be associated with the indicators of the expected results achievable with the implementation of the plan, according to a set of shared objectives and confrontations with the various stakeholders. The indicators will allow periodic verifications of the effectiveness of the interventions and of the implemented measures (ongoing evaluation).

Beyond the data analysis, labour associations will be directly involved in discussions, in order to make them actively participate in the definition of the plan's actions. The plan reference is the 2030 scenario, with an intermediate scenario in 2020. The plan has as its reference territory the historic centre and some areas of the first urban outskirts, constituting a natural system of shopping malls (historical centre, San Concordio, Arancio, Borgo Giannotti and Sant'Anna) expressing a wide variety of economic activities: trade, craft, professional, etc.

The strategy behind the plan is to rationalise freight distribution processes in urban areas, within the context of the overall mobility, by increasing the level of sustainability of logistics services, enabling a hard-hitting policy of low environmental impact transportation, encouraging the use of electric vehicles and the transport of goods with vehicles alternative to high-emission vehicles, pursuing transport sustainability, in respect of health, safety and environmental protection.



Luccaport operation area

OBJECTIVES OF THE SULP OF LUCCA

The objective of this Sustainable Urban Logistics Plan is to create a smarter urban freight distribution system in the urban area of Lucca, for a better quality of life for residents, tourists and visitors, actively pursuing the improvement of the urban environment of the city.

The SULP promotes an integrated urban transport of goods. In this direction, we define the following guidelines (priority objectives of the plan).
The policy directives, on which the Urban Logistics Sustainable Plan of Lucca will develop, are closely related:

- *Improving air quality and urban environment, consistent with environmental standards promoted reducing emissions, noise;*
- *Reducing the carbon footprint of freight transport in the urban context, with a consequent reduction in emissions of climate-altering gases, in accordance with the objectives of the SEAP;*
- *Minimising the negative impacts of distribution activities on the livability of cities;*
- *Ensuring the efficiency and effectiveness of freight transport, by reducing the number of delivery trips and maximizing the load capacity of the vehicles;*
- *Improving the quality of logistics services available to the city of Lucca;*
- *Ensuring and improving the accessibility of the territory through the reduction of traffic congestion;*
- *Encouraging the use of low-emission vehicles and electric vehicles for deliveries in the historic centre;*
- *Ensuring efficiency and safety in the roads and transport system;*
- *Reducing externalities due to heavy traffic (health effects, damage to the historic and architectural heritage, etc.);*
- *Governing mobility through innovative technologies and info-mobility.*

The strategic objectives will descend, from the policy directives, with the identification of the actions for their achievement and the definition of indicators to measure the effectiveness of such actions during the implementation of the Plan.
In prospect, thanks to the implementation of the Sustainable Urban logistics Plan, Lucca will strengthen its role as best practice of sustainable urban logistics at European level, achieved through significant investments by the Public Administration over the past 10 years.

SOLUTIONS FOR A SUSTAINABLE URBAN LOGISTICS

5.1. MEASURES, SCHEMES AND SERVICES

In order to rationalise the goods mobility system in the urban area of Lucca, the Plan foresees the following measures:

1. Reinforcing the services provided by Luccaport;
2. Introducing a technological approach to loading and unloading bays;
3. Reinforcing the LTZ access regulation, following the principle "polluter pays";
4. Enhancing the technologies supporting mobility, focusing on the implementation of an ICT solution for LTZ access and exit control;
5. Agreements with transport operators;
6. Cargo bikes.

5.1.1. REINFORCING THE SERVICES PROVIDED BY LUCCAPORT

Luccaport is an important asset for the rationalisation of the urban logistics processes of Lucca. The reinforcing strategy for Luccaport's services is structured in three phases, the scheduling of each could partially lay over the others.

PHASE 1 - Granting of concession to a private operator

The granting of concession of Luccaport to a private operator, awarded by public tender, will allow the development of the services achieving relevant market shares and the development of new and innovative services that will benefit the city. Some of these services have been already foreseen in the public tender rules. Among the others are:

- *Development of the third party transport activities (first and last mile)*

Trade relations with economic operators should be intensified upstream and downstream of the transport chain. In particular, given that the pool of potential customers for the main business of transportation and / or logistics activities relevant to the city centre is over a hundred units, it is necessary to ensure that operators will increasingly turn to Luccaport in order to reduce the number of polluting vehicles circulating in the city centre.

- *Eco Third party deposit*

Luccaport is also able to activate a third party goods deposit service towards the economic categories of the historic centre of Lucca and the other operators that distribute in the historical centre and in the nearby areas, distributing then the goods stored by the Luccaport electric vehicles fleet. This type of service has been frequently referred to as a service of interest to many businesses settled in the centre of the city and their associations. In addition, several wholesalers have already shown interest in using a storage area next to the city for distribution activities. The development of this type of activity needs firstly an adaptation of the logistics base with the addition of a mezzanine level, already foreseen in the initial design of the depot, to increase the surface area. The space that could be made available will be integrated by handling services and specific delivery plans. The ICT management system will allow subscribed users to interact with the logistic base through specific management tools available online or via App.

- *Photovoltaic system installation*

In order to further characterise the environmental attitude of Luccaport activity, the installation of a photovoltaic system is foreseen, from which Luccaport and its activities could benefit. It would improve the company and its services image and give an important economic benefit in carrying out the activities.

PHASE 2 - Projects with the interested economic categories

It is necessary to develop shared projects with the interested economic categories. Some projects of common interest were discussed in the technical tables, e.g., pick up of parcels with daily periodicity and development of activities of third party goods deposit for the economic operators of the city centre.

The service contract with the Luccaport concessionaire includes a worktable with the categories, which could be a permanent tool for the definition and development of new joint projects. An example could be the "Smart packaging pick up". With its electric vehicles, Luccaport is able to provide a service of collection of empty cardboard packaging to dispose of, produced by commercial activities in the city centre, integrating the service already offered by Sistema Ambiente. This activity, requested several times by economic categories to avoid retaining packaging in the store until the periodic collection by Sistema Ambiente, could be carried out by Luccaport electric vehicles with a frequent and organised collection.

PHASE 3 - Communication at the appropriate territorial level

The implementation of an effective communication of the services offered in the Lucca area is an important lever for the development of Luccaport activities. Investment in the communication activities has been very low so far, as experimentation and demonstration have been favoured. It is therefore necessary to initiate a more effective communication in order to raise awareness of the initiative among citizens and economic operators, including its benefits and the services provided by LuccaPort. Starting from the tools that have been developed for LuccaPort during 2012 (flyers, brochures, services and website, etc.), specific communication activities should be built, both in respect of citizenship (e.g., communication-oriented such as the promotion of the initiative in schools), and to the economic operators and stakeholders.

Despite the limited local visibility, the initiative is more and more popular, both in Italy and abroad, and arises increasing interest from many local administrations, also because of the establishment by the local government of the International Association Città Logica - Logical Town, for the promotion of sustainable urban logistics.

5.1.2. INTRODUCING A TECHNOLOGICAL APPROACH TO LOADING AND UNLOADING BAYS

Loading and unloading bays are going to be the subject of an experiment that would contribute to rationalise the distribution of goods in the urban area, reducing pollution, and the occupation of public land by goods transport vehicles in the most commercial touristic and historical-architectural valuable streets.

The limited space on the streets of the historic centre imposes a limit to the realisation of new loading and unloading bays. Therefore, the availability of a bay may represent a problem for the operator concerned. Moreover, both the number of operators potentially interested and the time windows of the bays accessibility are variables not yet analysed. The project foresees 12 loading and unloading bays, some of which reachable by a set route, and a trial period, which will provide useful information to better, define these issues. Nevertheless, the experience of other Italian local administrations showed that the use of the bays can be optimised with a technological approach.

From a technological point of view, the Plan foresees that the loading and unloading bays will be equipped with detection sensors (ultrasonic or induction) of vehicles allowing to identify the transition from the free stall condition to the occupied stall and vice versa, thus determining the dwell time for each vehicle on each stall. This action is coherent with the Lucca PAES objectives (line of action B4).

The system of control and management of parking for loading and unloading goods will be composed of:

1) A peripheral infrastructure (loading and unloading areas) with sensors and a concentrator for each area communicating by mean of a wireless connection with the sensors and connected by UMTS network;
2) A station with a specific software that collects information about the occupation status of the stalls sending it to handheld devices in use at the municipal police, that will be able to view the status of singular stalls, in order to check, in a second step, only those for which there were no changes from "occupied stall" to "free stall".

The information about the state of occupation of the loading and unloading bays (busy / free) will be made available in real time for transport operators via online services, and especially by a specific App for Smartphone. Loading and unloading bays could therefore be booked by operators that will be sure of their availability at the time of their arrival. The management system could generate statistics regarding the use of parking areas useful for further development or for their optimisation.

5.1.3. REINFORCING THE REGULATION TO ACCESS THE LTZ FOLLOWING THE PRINCIPLE OF "POLLUTER PAYS"

The current regulation for commercial vehicles to access the LTZ foresees the need of a specific permission and temporal constraints and is linked to the type of vehicle (size and emission standards in relation to the green zone). In other words, Euro 0 and Euro 1 diesel vehicles cannot circulate in the city centre.

In Lucca, also in reason of the activity of the goods distribution centre Luccaport, it is possible to subsidise access to the centre by zero-emission vehicles and with a fixed minimum percentage of loads. The regulation for the management of freight traffic could therefore be significantly revised. In this regard, the City Council has many opportunities to intervene in the review of the regulatory policies of freight flows and the definition of rules facilitating the development of Luccaport. Keeping the collaborative approach distinguishing Luccaport and its governance toward the various stakeholder groups, it is possible to predict that the regulatory incentives, not intending to make a complete closure of the historic centre to freight vehicles, will make use of a variety of technical measures discouraging the access to the historic centre and encouraging the use of the services of the distribution centre Luccaport. These can be based on vehicle characteristics (EURO 1-5, methane, hybrid, electric, etc..), on the differentiation of access fees , and then they may evolve, once introduced the access control system, in Pigovian policies based on dynamic fees based on the number of accesses and the length of stay, green certificates, etc.

These solutions are based on the principles recognised at EC level, establishing a framework for environmental responsibilities, the "polluter pays", to prevent and repair damages to the environment (Directive 2004/35 / EC, White Paper on Environmental Liability, 2000), and on the need to interiorise in the policies the necessity to charge the costs of externalities from traffic, and apply fees proportionate to the length of stay in the LTZ, to the number of accesses and to the type of vehicles used for transporting goods. From the national legislation point of view, these measures are justified as part of the rules of the road (in part. Art. 7 and 9), which allow municipalities to restrict the movement of all or certain categories of vehicles ,to prescribe time slots, and reserve spaces for vehicles used for the loading and unloading of goods. In addition, the Code foresees the possibility for municipalities to subordinate the access or the circulation of motor vehicles into the LTZ to the payment of a fee. Such a pricing policy would in any case face the problem of granting the access to public or public interest services, which now have complete access to LTZ, justified by the very nature of the services provided.

The specific rules for the transport of goods will be outlined in a specific regulation called "ZTL Goods" that includes a qualification of the vehicles circulating and their reduction through the gradual suppression of the time window in the afternoon and the opening of the morning one to less polluting vehicles, as defined according to the standard emission of the vehicle. An access restriction to EURO 3 and subsequently to EURO 4 vehicles would operate in a very favourable way to less polluting transport modalities, in particular electric vehicles transport, in case the current annual subscriptions fees for access would also be revised. These are in fact much lower than the average of the most advanced experiences in Italy (see Committee resolution n. 158/2010). A differentiation of the rate based on the emission standards, which is proportional to the pollution caused, should be foreseen (eg. A EURO 3 vehicle pollutes about 4 times more than a EURO 5). After the enforcement of the rules specifically related to freight services, also the completion of the revision of the remaining parts of the rules to access the ZTL may allow a further upgrading of the commercial vehicles circulating in the city, through a revision of the different special conditions granting the access. A regulation for the access to the ZTL incentivising freight transport by mean of electric vehicles is also appropriate to support the development of Luccaport activities described in section 5.1.1. The foreseen interventions are coherent with the Lucca PAES objectives (lines of action B2 and B3).

5.1.4. ENHANCING THE TECHNOLOGIES SUPPORTING THE MOBILITY FOCUSING ON THE IMPLEMENTATION OF AN ICT SOLUTION FOR LTZ ACCESS AND EXIT CONTROL

Currently the system of access control to the LTZ can determine if the access of a certain vehicle takes place within the right time window and if it has the required authorisation. The system is not however able to determine the time of exit of the vehicle from the LTZ. With regard to goods transport, not being able to automatically fine the offender when he does not comply with the time limits established by the current regulation determines an illicit extension of the stay of freight vehicles into the LTZ, since only the Local Police is entrusted to verify.

The adoption of a radio frequency based system for the recording of the entry and exit from the limited traffic zone (LTZ) of commercial vehicles will obviate this problem. It will be possible to determine the time of exit from the LTZ and possibly fine the offender automatically. The control system, which will be imperceptibly integrated to the one used by the LTZ, will consist of an automatic identification system of tags (RFID) placed in the permit card allowing the access that each vehicle must expose, and will allow to monitor the stay in the LTZ and verify compliance with the time windows. The system will be implemented with the installation of readers on several gates of entry and exit routes to and from the LTZ. The measure also foresees a management software that will be made available to the subjects currently authorised to operate on the LTZ access control and verification software (eg METRO and Local Police), and this will allow to perform a systematic data collection and subsequent analysis of the freight traffic in order to better define the future planning and related regulations of the local administration.

The system could scale up including new functions, as:

- Adding further identification portals inside the LTZ in order to trace a certain vehicle;
- Allowing the control body (Local Police) to verify the lawfulness of the presence of vehicles into the LTZ by mean of a handheld device able to "read" the RFID included in the permit card exposed in the vehicle and exchange data with the control station;
- Integration with the access system to the load/unload bays;
- Possibility of creating an access control "light" to prestigious areas of the historic centre.

5.1.5. AGREEMENTS WITH TRANSPORT OPERATORS

The contribution that the largest companies in the transport sector operating in the area can offer is important in order to rationalise the distribution system. With the assistance of their trade associations (eg. AICAI) and other stakeholders concerned, specific agreements will be made with major industry players active in the distribution of goods in the historic centre to mitigate the effects caused by their activities over the urban area. In particular, examples of such agreements are those made between the trade associations of transport and municipalities of the metropolitan areas with the support of the Ministry of Infrastructure and Transport. These voluntary agreements that may be subscribed by operators in exchange of flexible access policies and shared principles of corporate social responsibility, will contribute to the rationalisation of the distribution system. Such agreements may for example relate to the use of less polluting vehicles, according to the PAES line of action B2 or restrictions on access to specific areas and shall involve traders who make a large number of logistics operations on the territory, above a certain threshold to be determined, or which are equipped with logistics platforms in the proximity of the city centre, thus ensuring a greater consolidation of goods.

5.1.6. CARGO BIKES

Subsidising more sustainable methods of transport is an essential action to rationalise the distribution of goods in urban areas. Rethinking urban mobility in terms of sustainability is in fact also to consider unconventional solutions to needs historically linked to urban living. This is particularly true in a city like Lucca in which transport by bicycles is developed as demonstrated by the investment of the Administration in the extension of the network of bike lanes. For some types of goods, as well as some special urban centres or for specific and limited urban areas, it is possible to think of a “light” way to transport by mean of specific trolleys or bicycles, using cargo bikes. The Cargo bike is an efficient means of transportation to make 100% sustainable last mile deliveries. Cargo bikes can carry small loads of goods, with the great advantage of producing no CO_2 or other polluting particles and do not produce noise pollution: cargo bikes are perfect for transporting light loads (80 to 200 kg or more) for short distances and for this reason are ideal for use in town centres and urban areas.

In addition, unlike electric vehicles, Cargo bikes help to reduce urban traffic congestion, and then as a whole, they are a useful means of providing the needed services, while maintaining the environment of the city livable and improving the image of the city.

Their use can be promoted among the operators of freight, if this does not result in a loss of efficiency of the service. For example, a service of cargo bike sharing may be available to operators’ subscribers at the loading and unloading bays so that they can optimise the final stage of the route of delivery or encouraging solutions to operators who have operational bases close to the historic centre.

In 2011, the European Union promoted a study to determine the feasibility of the bicycle as a means of transport for some forms of shipping. A recent project sponsored by the European Union - Cyclelogistics- designed to evaluate scenarios of bike mobility in European cities, has a business plan for a freight logistics, which has its strong point in cycling. CycleLogistics from 2011 to date has managed to motivate several municipalities, which in some cases adopted favorable regulations, evaluating the potential use of cargo bikes for municipal services. For this reasons, the cargo bike is leaving his position of niche market, presenting itself as a real alternative for transporting light goods in city centres.

The use of this method is an interesting opportunity for the development of Luccaport that could integrate this means of transport into the fleet of environmentally friendly vehicles for small deliveries or to develop services for the collection and distribution of goods point to point in the historic centre, such as pony express.

5.2. REGULATORY SUPPORT MEASURES

The measures provided for in this Plan shall be regulated by successive revisions of the regulative “framework” for LTZ access and parking (as defined in resolution GC n. 17 of 07/02/2012 and further articulated by resolution of the GC - n ° 246 of 03.12.2013) and the concession agreement for Luccaport. These rules will subsidise the use of electric vehicles of low environmental impact, including cargo bikes, and then the use of the services offered by Luccaport.

5.3. SUPPORTING INFRASTRUCTURES

The infrastructures needed to support the implementation of this Plan are essentially already in place:

- Luccaport: Lucca ecological goods distribution centre;
- LTZ access control system with entrance tracking system (active) and outgoing (to be activated, already co-financed by the Tuscany Region with the project LuccaMo on the line of action of the IV.4a Por Creo 2007-2013);
- Load-unload goods areas with predetermined access routes (running in the short term);
- Lucca Mobility web Portal (Mobilù) providing information to users on the processes related to mobility (running in the short);
- Cargo bikes sharing system (to be implemented by 2020) in loading and unloading bays.

Some of the measures described above require the integration of some existing infrastructure such as those needed for the new activities planned for Luccaport (loft industrial) and the PV system to power the fleet of electric vehicles.

5.4. RELATIONS WITH MAIN STRATEGIES AND OBJECTIVES

The objectives of streamlining the processes of urban logistics with consequent

benefits for the environment and for the overall mobility are consistent with the major plans and strategic objectives of the Municipality of Lucca already in place or under development. Among these are:
- PAES - Action Plan for Sustainable Energy;
- Forecasting and planning report;
- Subscription of the Covenant of Mayors;
- Climate Change Plan;
- Cycling Plan.

They are also consistent with the content of the Plans that are in progress and will be completed shortly
- Urban Traffic Plan (to be updated);
- Sustainable Mobility Plan (to be completed by 2015);
- City Planning (to be completed by 2015).

In addition, the objectives of this Plan are consistent with the policies of the EU and the national and regional ones working to mitigate the impacts of transport. In particular, the European Commission communications COM (2008) 433 of 08 July 2008 "Greening Transport", COM (2009), n. 279 of 17 June 2009 "A sustainable future for transport: Towards an integrated, technology-led and user friendly system" and COM (2011) n. 144 of 28 March 2011 "White Paper - Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system" invite member states and European cities to a more efficient distribution of goods in urban areas in order to improve air quality in the urban environment and significantly reduce CO_2 emissions with the aim of achieving a CO_2-free city logistics ("CO_2-free logistics") by 2030.

In Italy, the strategic importance of the logistics sector has prompted the government to enable interventions to promote sustainable development at all levels. At the local level, it should be noted that almost all of the municipalities of medium to large size in the course of time have developed systems to regulate the traffic of goods, introducing specific rules to govern the traffic flows and more generally the organisation of the distribution of goods. A growing attention to the issue has developed in recent years, even in Provinces and Regions (Integrated Regional Plan for Infrastructure and Mobility – PRIIM established by LR 55/2011, by Tuscany Region), while at the national level, the theme was recently raised from the National Logistics Plan 2011-2020.

DESIGN OF MEASURES AND IDENTIFIED SERVICES

6.1. REINFORCEMENT OF SERVICES PROVIDED BY LUCCAPORT

Facilities	Luccaport Urban distribution centre - Industrial mezzanine - Photovoltaic system				
Legislation/regulation and legal constrains	Service contract with Luccaport operator (concessionaire)				
Type of fleet, ICT support systems	ICT platform for third-party warehouse management				
Operational dimension and organisation (characteristics, resources and management model)	Integrated into Luccaport management				
Roles and responsibilities	Municipality of Lucca: owner of distribution centre Luccaport operator (concessionaire): responsible for the investments needed for the implementation, management and maintenance				
Costs estimation: main investment costs, operational costs and maintenance	Investment costs at the expense of Luccaport concessionaire: Industrial Mezzanine: 200 € / m² with minimum 100 m² of warehouse surface up to a maximum of 600 m² Photovoltaic system: round 3k€ per KWhp Integration/replacement of the FEV fleet: variable, depending on service levels.				
Estimated completion time	Foreseen by 2020 in the service contract (contact with operator (concessionaire) by 2014)				
Estimate of environmental impacts and energy savings	CO_2 (kg) 28000	NOx + HC (kg) 52	CO (kg) 120	PM (kg) 5,8	Energy (kWh) 110000

6.2. LOADING AND UNLOADING BAYS (TECHNOLOGICAL APPROACH)

Facilities	Already defined, testing of load/unload bays expected by the end of 2014				
Legislation/regulation and legal constrains	Specific ordinance for access to the LTZ for the testing period				
Type of fleet, ICT support systems	ICT booking and management system of parking in loading-unloading bays				
Operational dimension and organisation (characteristics, resources and management model)	Traffic department of Municipality of Lucca, METRO, Local Police				
Roles and responsibilities	As those allocated for the management of access permissions to LTZ				
Costs estimation: main investment costs, operational costs and maintenance	Approximately € 40,000 with annual maintenance costs of approximately € 5,000				
Estimated completion time	By 2020				
Estimate of environmental impacts and energy savings	CO_2 (kg) 12000	NOx + HC (kg) 30	CO (kg) 85	PM (kg) 3,7	Energy (kWh) 53000

6.3. REINFORCEMENT OF LTZ ACCESS REGULATION FOLLOWING THE COMMUNITY PRINCIPLE "POLLUTER PAYS"

Facilities	Automatic access control system to existing LTZ				
Legislation/regulation and legal constrains	Revision of LTZ regulatory framework				
Type of fleet, ICT support systems	ICT access control system already in place				
Operational dimension and organisation (characteristics, resources and management model)	Traffic department of Municipality of Lucca, METRO, Local Police				
Roles and responsibilities	As those allocated for the management of access permissions to LTZ				
Costs estimation: main investment costs, operational costs and maintenance	None				
Estimated completion time	2020				
Esteem of environmental impacts and energy savings	CO_2 (kg) 65000	NOx + HC (kg) 200	CO (kg) 610	PM (kg) 26	Energy (kWh) 285000

6.4. REINFORCEMENT OF TECHNOLOGIES SUPPORTING MOBILITY AND IN PARTICULAR THE TRACKING SYSTEM OF ENTRANCE AND EXIT TO LTZ

Facilities	Entrance and exit tracking system based on RFID system				
Legislation/regulation and legal constraints	Revision of LTZ regulatory framework				
Type of fleet, ICT support systems	ICT access control of RFID tracking system				
Operational dimension and organisation (characteristics, resources and management model)	Traffic department of Municipality of Lucca, METRO, Local Police				
Roles and responsibilities	As those allocated for the management of access permissions to LTZ				
Costs estimation: main investment costs, operational costs and maintenance	200 k€: as in project funded by the Tuscany Region (Lucca info-mobility project)				
Estimated completion time	2018				
Esteem of environmental impacts and energy savings	CO_2 (kg) 19000	NOx + HC (kg) 45	CO (kg) 130	PM (kg) 5,7	Energy (kWh) 80000

6.5. AGREEMENTS WITH TRANSPORT OPERATORS

Facilities	Luccaport Urban distribution centre				
Revision of LTZ regulatory framework	LTZ regulatory framework revision Memorandum of Understanding with operators				
Type of fleet, ICT support systems	N/A				
Operational dimension and organisation (characteristics, resources and management model)	To be defined depending on the agreement with the parties involved				
Roles and responsibilities	Monitored by the municipality				
Costs estimation: main investment costs, operational costs and maintenance	None				
Estimated completion time	2020				
Esteem of environmental impacts and energy savings	None	NOx + HC (kg) 32	CO (kg) 73	PM (kg) 9	Energy (kWh) 0

6.6. CARGO BIKE

Facilities	Cargo bike sharing station				
Legislation/regulation and legal constraints	Revision of LTZ regulatory framework				
Type of fleet, ICT support systems	n. 2 Cargo bikes per load/unload area (for a total of 24 cargo bikes and 12 stations) Cargo bikes booking ICT management system				
Operational dimension and organisation (characteristics, resources and management model)	Traffic department of Municipality of Lucca, METRO, Local Police				
Roles and responsibilities	As those allocated for the access permissions to LTZ management				
Costs estimation: main investment costs, operational costs and maintenance	30 k€ for cargo bikes (n. 24) To be defined for the stations and the ICT management system (about 60k)				
Estimated completion time	2020				
Esteem of environmental impacts and energy savings	CO_2 (kg) 9700	NOx + HC (kg) 24	CO (kg) 68	PM (kg) 3	Energy (kWh) 43000

PRIORITIES FOR THE IMPLEMENTATION PHASE

7.1. TIMETABLE AND CONSTRAINTS TO TIMING OF IMPLEMENTATION

The timetable and the timing constraints are mainly determined by previous Plans and Deeds already approved by the Municipality.

7.2. PRIORITY SERVICES AND MEASURES, TO BE DEVELOPED BY 2015

Priority services and measures of the Plan, to be developed by 2015, are:

- Concession of Luccaport by public tender to a private operator in order to ensure the expansion of the services to achieve significant market shares and the development of new services for the city. The tender will be completed by 2014. Some of the measures to be implemented by 2020 are included in the tender procedure and therefore depend on this action;
- Reinforcement of technologies to support mobility and in particular the tracking system of entrance and exit to the LTZ which will be implemented by 2018.

7.3. SERVICES AND MEASURES TO BE IMPLEMENTED BY 2020

In order to rationalise the system of freight mobility in the urban area of Lucca, the following measures will be implemented by 2020:

- Reinforcement of the services provided by Luccaport, following the concession by public tender:
  - Development of third-party distribution activities (first and last mile);
  - Third-party Eco-deposit;
  - Installation of a photovoltaic system on the LuccaPort building;
  - Projects with interested economic categories;
  - Communication on the territory;
- Load and unload bays (technological approach) – to be developed following the trial on 12 load/unload bays scheduled by the end of 2014;
- Reinforcement of the LTZ access regulation following the Community principle "polluter pays" – Since the new LTZ access regulation might have impacts on other measures listed, the development of the regulatory framework will be implemented in parallel with other measures / services;
- Agreements with logistics operators;
- Cargo bikes.

7.4. ESTIMATE OF ENVIRONMENTAL IMPACTS: ENERGY SAVINGS AND REDUCTION OF POLLUTING EMISSIONS

MEASURE	Estimate of impacts per year				
	CO_2 Ton	NOx + HC Kg	CO Kg	PM Kg	Energy kWh
Reinforcement of services provided by Luccaport	28	52	120	5,8	110000
Loading and unloading bays (technological approach)	12	30	85	3,7	53000
Reinforcement of access regulation to the LTZ following the Community principle "polluter pays"	65	200	610	26	285000
Reinforcement of technologies to support mobility and in particular the tracking system of entrance and exit to LTZ	19	45	130	5,7	80000
Agreements with transport operators	4.4	32	73	9	0
Cargo bike	9,7	24	68	3	43000
TOTAL	138	380	1080	53	620000

PROMOTION AND COMMUNICATION

Communication will be developed following a specific Promotion and Communication Plan with the main strategies to disseminate all the information regarding the various activities and results of the actions and granting the sustainability of the results. An effective dissemination and local promotion is crucial to the success of the measures in order to gain the interest, involvement and confidence of all the interested users and trade associations on services and eco-friendly and sustainable solutions for the distribution of goods in city of Lucca.

In addition, the dissemination of information at national and European level helps to improve networking with other to small / medium-sized European cities, laying the foundation for sharing experiences and best practices and collaboration in future projects that can contribute to a further development and implementation of the measures listed above. In this sense, communication and promotion become a useful tool to support the fundraising for the implementation of the Plan.

"Parking lots close to home, a public transport station, a driving ban may change the daily lives of many people, while a structural intervention aimed at improving the environmental sustainability of urban transport cannot have direct impacts on the single citizen. Strategic planning cannot be entirely understood without a proper communication action."

(Montanari, Zara, Gragnani, Salvarsi dal Traffico. Il Sole 24ORE Trasporti. 2006).

8.1. COMMUNICATION PLAN

The Plan identifies the target audience for both the planning and the execution of communication activities and the communication / promotion materials. Local actors, transport operators, primarily compose the target audience; logistics service providers, operators and trade associations, politicians, citizens and user groups. In addition, the interested parties both at national and European level may be considered: the largest district of actors and stakeholders involved in the innovation of urban logistics and transport, including participants to other initiatives and their networks.

The communication plan includes a number of key elements to be taken into consideration and must be evaluated at the time of implementation of each phase of dissemination. The key elements to implement a coherent and effective a local dissemination and promotion strategy include:

Integration. All activities relating to the dissemination and communication must be integrated in the context of a single communication strategy with objectives and action lines clearly identified.

Coordination. All actions and initiatives related to the sustainable urban logistics plan must be included in the activities of information and communication, and by mean of a continuous coordination, define and identify means, tools and content in order to most effectively develop communication actions.

Identification. It is very important that each message related to the Urban Logistics is immediately identified by the public with clear and direct reference to the action by mean of easily identifiable elements, such as logos, colors, slogans, etc.

Objectivity. Each message must be transmitted 'objectively' to the various stakeholders and users, to avoid being interpreted as a commercial communication, advertising or partial.

Persuasiveness. The messages and actions must be convincing and avoid any imposition or strong statements. Messages and actions should be attractive to the public and interested groups of users: they should suggest correct behaviours, provide assessing and comparison elements and become compelling because of the collective advantages and benefits offered.

Visibility. All information and communication activities must contribute (through integration and coordination) to improve the visibility within the stakeholders of the territory and of the users concerned, giving the highest visibility to measures, activities and achievements (both locally and at national and European level). The visibility could also be the basis of an incentive mechanism to award the most virtuous operators selected on the basis of sustainability and eco-friendly goods distribution processes put in place in the city of Lucca.

Accessibility. The information, messages, and services in general should be characterised by simplicity, clarity and immediacy in order to ensure their accessibility to all types of audience expected and all stakeholders and users.

Interactivity. Communication and promotion initiatives on sustainable urban logistics should encourage interactivity and multi-directionality of messages. The main objective of the plan is to promote the creation of a network between all stakeholders in the distribution processes of the city: the different branches of the Public Administration, shop owners and traders, freight operators, citizens, tourists and visitors.

8.2. MEDIA AND COMMUNICATION SYSTEMS PROVIDED IN THE COMMUNICATION CAMPAIGN

The communication can not be separated from media and systems fostering interactivity and multi-directionality of messages. The growing need for technologies in the media highlights the need to use them to manage in an integrated and interoperable way mobility, parking and urban logistics, providing web services and app for smartphones that allow all interested users to access information in a simple manner.

In particular, web services foreseen by the Plan are:

- For citizens: urban logistics management services and payments;
- For companies: transport operators, artisans: touristic buses;
- For hotels and tour operators: management of specific services;
- Auxiliary and Local Police: verification and sanctioning violations by mean of a specific web portal reserved area;
- System administrators: analysis and reporting by mean of a specific web portal reserved area.

Services available on mobile devices (tablets and smartphones) are:

- Mobility and parking information;
- Pick up, delivery, storage, transportation, services reservations;
- Parking and other services payments;
- LTZ, civil registry, parking meters.

8.3. COMMUNICATING AND MONITORING: TIMING AND METHOD

The challenges set by sustainability principles require deep changes in the overall system of mobility, the way to conceive and practice it, by calling into question widespread and deeply rooted habits and lifestyles: a strategy for sustainable mobility is largely entrusted to a new culture mobility. The PUMS development process, along with the PULS one, must be accompanied by moments of sharing, information and control of the actions put in place. In other words by participation, communication, and monitoring involving all local stakeholders.

Participation: the participatory involvement of the local community and stakeholders with whom sharing the strategic objectives and actions. This is not only a guarantee of transparency and more democratic planning, but also the most effective means to innovate the vision that society has of the crucial problems with which it deals. The choices made will be disclosed with appropriate information campaigns about the different opportunities for mobility of goods, its possibilities and economic advantages.

Communication: to promote and indicate the various methods of distribution of goods within the city and outward becomes almost as much strategic as the activation of a new plan. The implementation process of the plan shall be under constant control, both as regards to the actual implementation of its measures and with regard to their effectiveness and their efficiency in relation to the targets set.

Monitoring: this real-time view of the plan and the results of its ongoing assessment must be publicly available. The updated view of the plan and the public accessibility of information resulting from the monitoring, evaluation and review, are now made possible by the use of the Internet as indicated by the principles of e-government.

ROADMAP FOR THE ADOPTION OF SULP

The city administration has managed with the active collaboration of users and stakeholders the urban logistics experiences of urban logistics made to date, and intends to continue with a process of participation and sharing of these measures. Numerous meetings were held with associations, citizens and stakeholders to arrive to an identification of the measures of the plan, to an analysis and discussion of the solutions with the several actors of the city and to the assessment of key issues and timing for the implementation of the solutions.
Given the given time schedule of the identified measures, the Plan will be submitted to the City Council through a specific resolution of the City Council Committee to be taken by 2014.

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ENERGY EFFICIENCY IN CITY LOGISTICS SERVICES FOR SMALL AND MID-SIZED EUROPEAN HISTORIC TOWNS

Co-funded by the Intelligent Energy Europe Programme of the European Union

SERRES

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project
Deliverable 3.6
SULP "Sustainable Urban Logistics Plan"
WP3 - T3.3 Local assessment of mobility and energy benefits:
development of Sustainable Urban Logistics Plans
in the 9 ENCLOSE towns

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Circulation
Public

Date
October 2014

SERRES

SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. INTRODUCTION

1.1 Study Assignment

The present report is part of the project "Technical consulting services to the Municipality of Serres in the framework of ENCLOSE project (Development & Translation of Serres' Sustainable Urban Logistics Plan)" which has been assigned to the Hellenic Institute of Transport (HIT) of the Centre for Research and Technology Hellas (CERTH) by the Municipality of Serres.

The objective of this project is to support the Municipality of Serres in developing for a Sustainable Urban Logistics Plan that is expected to have a positive effect on energy saving and on the reduction of air pollution caused by traffic.

1.2 General Information about the Project

The project is developed through two distinct technical actions Action 1: Feasibility analysis and implementation of urban logistics measures This activity involves an analysis of the potential application of urban logistics policy measures (candidate measures) and the selection of the measures to be implemented in the city of Serres in order to achieve energy saving and CO2 emissions reduction.

Action 2: Develop a Sustainable Urban Logistics Plan for the city of Serres.

In this action and through two distinct activities, the effects of the proposed urban logistics measures for the city of Serres, which will get implemented in Action 1, will be assessed and a Sustainable Urban Logistics Plan for the city will be developed:

A. Evaluation and assessment of the benefits on mobility and energy during the pilot phase of the soft measures implementation in Serres. The evaluation will cover the pilot implementation of the soft measures and will include estimates of the expected results and benefits from implementing the proposed interventions under the specificities of the city of Serres.
B. Development of a Sustainable Urban Logistics Plan for the city of Serres.

This activity relates to the study in order to develop a Sustainable Urban Logistics Plan for the city of Serres.

The present, eighth deliverable of the project, relates to the first action and more specifically to the final version of Sustainable Urban Mobility Plan for the city of Serres.

1.3 Project Team

The project team consists of project managers and specialists in the fields of Sustainable Urban Mobility, Urban Logistics and Transportation Analysis and Design. The project team is composed by:

- Georgia Aifadopoulou, PhD. Civil - Transportation Engineer, Senior Researcher B at HIT, expert on freight and passenger transport networks.
- Aristides Halatsis, Civil - Transportation Engineer MSc, Senior Project Manager at HIT, expert on Urban Freight Transport and Logistics.
- Maria Morfoulaki, PhD. Civil - Transportation Engineer, Research Scientist B, HIT, expert on Sustainable Urban Mobility.
- Katerina Chrysostomou, Civil - Transportation Engineer MSc, Associate Researcher at HIT.
- Nilia Kotoula, Surveying - Transportation Engineer MSc, Associate Researcher at HIT

1.4 Outline of the Final SULP Study

The final study includes the following five main chapters:

1. Serres context (presentation of the study area, the road network characteristics and results of traffic surveys conducted).
2. General logistics context (presentation of the current situation of urban freight transport and logistics in the city of Serres)
3. Setting logistics baseline (presentation of results of the questionnaire survey addressed to shop owners and transporters)
4. Presentation of the results of the best practices benchmarking analysis of the preliminary SULP study. Selection of the candidate measures that can be implemented in the city of Serres. Presentation of the measures including costs, timeschedules and environmental impacts.
5. Presentation of the road map to the SULP adoption, including the consensus process, the analysis and discussion of identified solution with different stakeholders and the acts for the implementation of the solution.

2. SERRES CONTEXT

2.1 Study Area

2.1.1 CURRENT SOCIO-ECONOMIC STRUCTURE

The Municipality of Serres is one of the Municipalities of the Region of Central Macedonia. It covers an area of 601.49 km2 and, according to the 2011 census, has a population of 75,233 inhabitants. The current composition of the municipality was formed at the 2011 local government reform ("Kallikratis" Law) by the merger of the following 6 former municipalities, that became municipal units; Ano Vrontou, Kapetan Mitrousi, Lefkonas, Oreini, Serres and Skoutari. [1]

The capital of the Municipality is the city of Serres (Map 2.1), which according to the 2011 census has 60,254 inhabitants. It is located 80 km away from Thessaloniki and 587 km from Athens. [2]

The economy of the region of Serres is closely associated with agricultural and livestock activities. Agricultural and livestock products such as cereals, tobacco, rice, cotton, corn, vegetables, fruits, dairy products and others are extensively produced in the area.

The local industry is based mainly on agricultural products' processing but also on textiles and other industrial products. The most active sector seems to be food and wood products' industry.

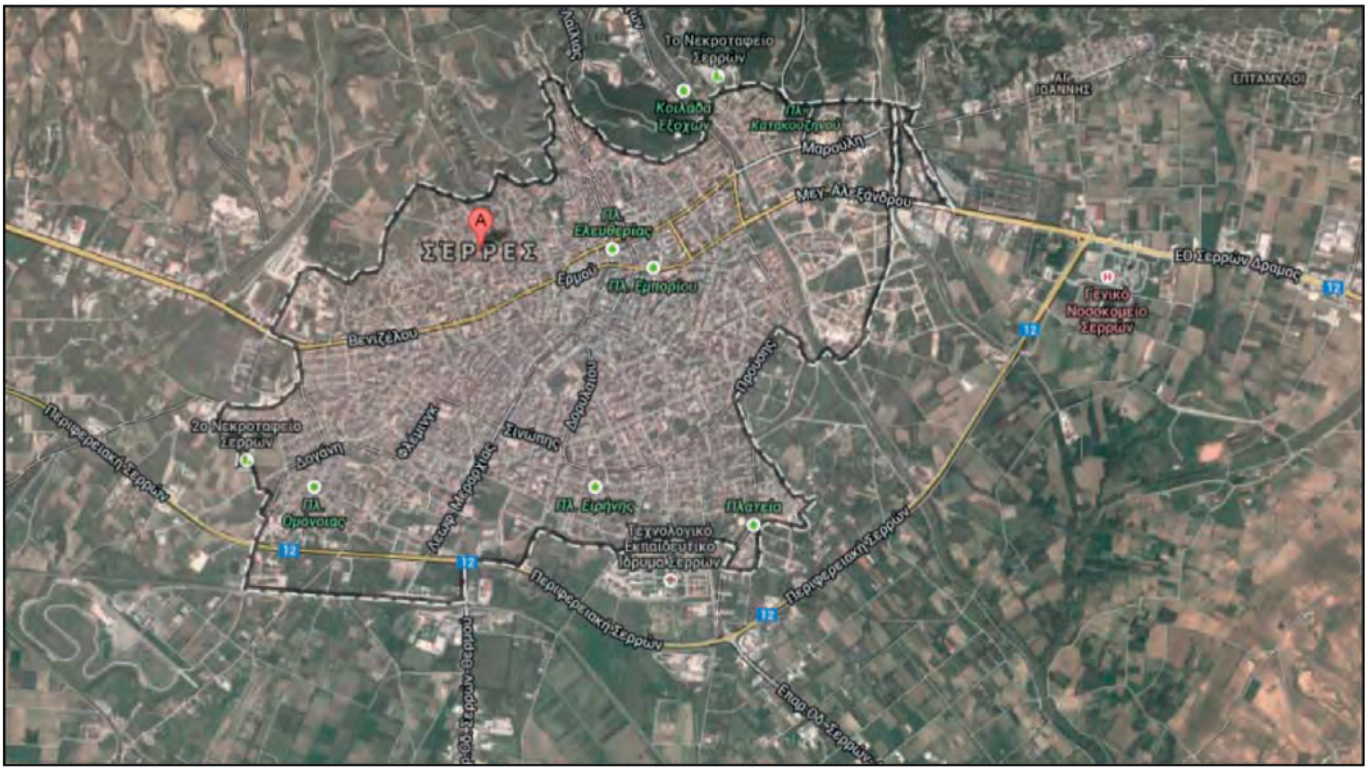
On the outskirts of the city, 7 kilometres from the city centre and close to the vertical axis of Egnatia Odos, there is an industrial area, covering 1.2 square kilometres, where residential and office furniture, plastic production,agricultural equipment, beauty products, construction materials, etc. industries are located [4].

Also an important asset is the Technological Educational Institute (T.E.I.) of Central Macedonia that is located in the area, an institution which comprises of three faculties, seven departments and has more than 14,000 students. [5]

2.1.2 MAIN ROAD NETWORK AND IDENTIFICATION OF THE STUDY AREA

Since the seventies, the city of Serres faced intense urbanization, especially in the city centre. Open spaces were replaced by apartment buildings and a sharp increase in the ratio of private car ownership has been observed.

Today, due to the number of activities that are served in the area of the city centre (administrative, commercial and leisure activities), congestion problems are faced in most or part of the road network of the



Source: [3]

Map 2.1: The city of Serres

city and the city's ring road cannot effectively serve the traffic that is being generated.

The mobility conditions are getting even worse as a result of increased travel demand, lack of parking spaces and lack of space for other users of the network, such as pedestrians and cyclists. In this context, freight transport is being carried out with significant obstacles, due to lack of coordination. All these, together with the increasing traffic of private vehicles, contribute to the urban environment burdening, energy consumption and air pollutants increase, visual and noise pollution.

Also, urban freight transport is responsible for occupying space, accidents' increase and pollution in urban areas. The lack of coordination of urban freight transport seems to intensify all these negative impacts.

All the above highlight the need to organize an optimal urban freight logistics management system implementing best practices, in accordance with the European vision for sustainable development.

The study area is located within the commercial city centre, where most commercial activities take place (e.g. hotels, restaurants, cafes, shops etc.). The exact study area is defined by the following streets: Dutikis Thrakis, Megalou Alexandrou, 20 Septemvriou, Ethnikis Antistaseos, Vasileos Vasiliou, Venizelou, Komninon, Thessaloniki and Kerasountos (Map 2.2).

2.2 Traffic Conditions of the Study Area

For the completion of the feasibility study, an identification of the freight transport system's problems in the city of Serres was conducted through a threestep procedure. At first, freight vehicles traffic volumes were measured in certain selected locations (junctions) of the region in order to gather information about how urban freight transport affects the road network of the study area.

Subsequently, a specific central axis of the city with intense commercial activity and required loading/unloading infrastructure was selected, in order all needs and requirements of the region of influence to be defined.

Finally, traffic measurements and parking characteristics survey were conducted, in order to derive useful conclusions regarding the operation of the road network, the congestion that the loading /unloading procedure can create as well as the problems occur from the occupation of the relative loading/unloading places from private cars. The steps above are described in detail in the following sections.

2.2.1 FREIGHT VOLUMES MEASUREMENTS

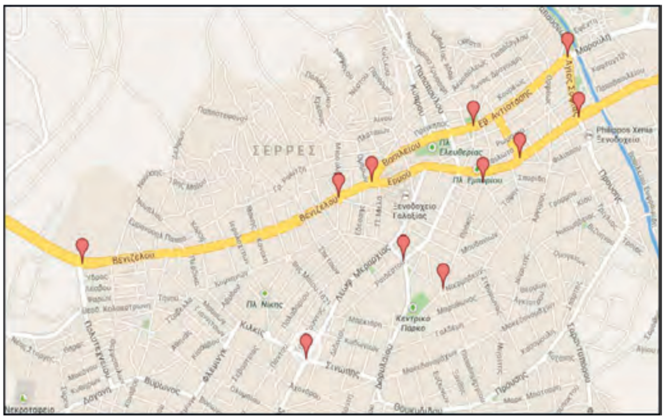
Freight vehicles volumes measurements were conducted in November 2012during a typical day and during periods 7:00 to 9:00 and 13:00 to 15:00 which arethe peak hours, as these time periods coincide with operation hours of bothpublic sector and shops. The following table (Table 2.1) presents the results ofthe measurements.

Map 2.2: The study area in the centre of the city of Serres

FREIGHT VEHICLES VOLUMES MEASUREMENTS IN SPECIFIC JUNCTIONS OF THE CITY OF SERRES			
		07:00-09:00	13:00-15:00
JUNCTION 1: AGIAS SOFIAS-ETHN. ANTISTASIS	Commercial vehicles	38	39
	Pickups >1,1tn	34	34
	Trucks >3,5tn	13	9
	Trucks >6tn	-	-
JUNCTION 2: ETHN. ANTISTASIS - KONSTANTINOUPOLEOS	Commercial vehicles	123	163
	Pickups >1,1tn	87	115
	Trucks >3,5tn	19	11
	Trucks >6tn	2	0
JUNCTION 3: AGIAS SOFIAS-MEG. ALEXANDROU	Commercial vehicles	67	80
	Pickups >1,1tn	29	30
	Trucks >3,5tn	14	12
	Trucks >6tn	4	3
JUNCTION 4: MEG. ALEXANDROU – 20 SEPTEMVRIOU	Commercial vehicles	89	87
	Pickups >1,1tn	46	58
	Trucks >3,5tn	35	21
	Trucks >6tn	14	1
JUNCTION 5: DIT.THRAKIS - KERASOUNTOS	Commercial vehicles	52	51
	Pickups >1,1tn	20	28
	Trucks >3,5tn	5	4
	Trucks >6tn	-	-
JUNCTION 6: DIT.THRAKIS-ANAT. THRAKIS	Commercial vehicles	43	52
	Pickups >1,1tn	42	27
	Trucks >3,5tn	11	5
	Trucks >6tn	-	-
JUNCTION 7: VAS.VASILEIOU-ERMOU	Commercial vehicles	40	124
	Pickups >1,1tn	22	70
	Trucks >3,5tn	22	9
	Trucks >6tn	19	4
JUNCTION 8: VENIZELOU -29 IOUNIOU	Commercial vehicles	12	74
	Pickups >1,1tn	27	40
	Trucks >3,5tn	15	13
	Trucks >6tn	2	0
JUNCTION 9: THESSALONIKIS-REDESTOU	Commercial vehicles	18	25
	Pickups >1,1tn	12	8
	Trucks >3,5tn	14	21
	Trucks >6tn	-	-
JUNCTION 10: MERARCHIAS-KILKIS	Commercial vehicles	10	10
	Pickups >1,1tn	39	38
	Trucks >3,5tn	27	31
	Trucks >6tn	5	
JUNCTION 11: VENIZELOU-POLITEXNEIOU	Commercial vehicles	51	73
	Pickups >1,1tn	40	47
	Trucks >3,5tn	20	8
	Trucks >6tn	13	5

Table 2.1 - Freight vehicles volumes

The points selected for the measurements are also presented in the map below.



Map 2.3: Freight vehicles measuring locations

Figure 2.1 - Measurement Point 1: Ermou-Pavlou Mela

Figure 2.2 - Measurement Point 2: Ermou- M. Andronikou

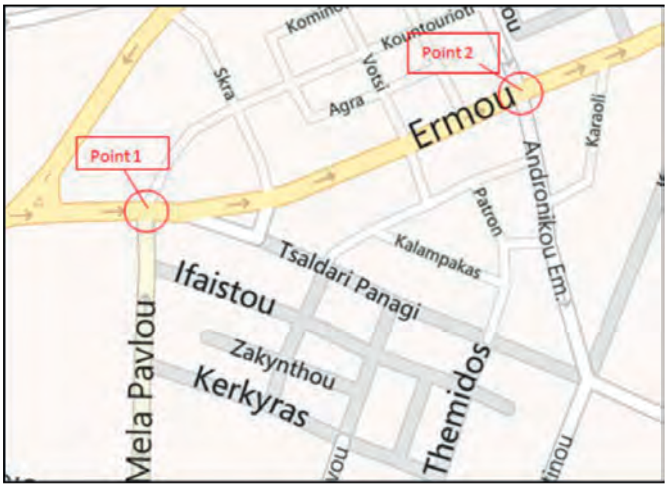
From the data above, it has been observed that most freight traffic passes through the streets: Ethnikis Antistasis, Megalou Alexandrou, Venizelou, Vasileos Vasiliou and Ermou.

2.2.2 TRAFFIC VOLUMES MEASUREMENTS

During the investigation about the main road network in the reference area, traffic volume measurements were conducted by the Hellenic Institute of Transport (HIT) staff during a typical day and more specifically on Thursday, October 24th, 2013 and for the period from 7:00 to 21:00. Measurements were conducted in two shifts, in the morning from 07:00 am to 14:00 pm and in the afternoon from 14:00 pm to 21:00 pm, at two specific points of Ermou Street.

Ermou Street was selected for the traffic surveys conducted, as it is one of the most important axis of the city because of its location and its interface with the network of pedestrian streets that has been recently developed and continues to expand, as part of the policy for sustainable mobility that has been adopted by the Municipality of Serres and its citizens. It is a shopping street, along and near which, there are plenty of shops. In addition, in different sections of the street, there is infrastructure of roadside parking zone whose status is not "clear" at the moment, due to lack of policing. Ermou street was selected as a typical example of a commercial road in Serres and the profile of traffic can be expanded for all the main axes of the city center.

The measurement points are shown in the following Figures 2.1, 2.2 as well as in Map 2.3.



Map 2.4: Location of the traffic volumes measurement points on Ermou Street

For each measurement point the movements shown below in Diagram 2.1 and Diagram 2.2 were studied upon. At each point three moves were recorded.

The measurements were made using a special form and traffic volumes were recorded every quarter of hour. From the measurements, hourly totals by category of vehicle were calculated and then they were converted in Passenger Car Units (PCU). Traffic volumes measurements are included in Annex A of the present deliverable.

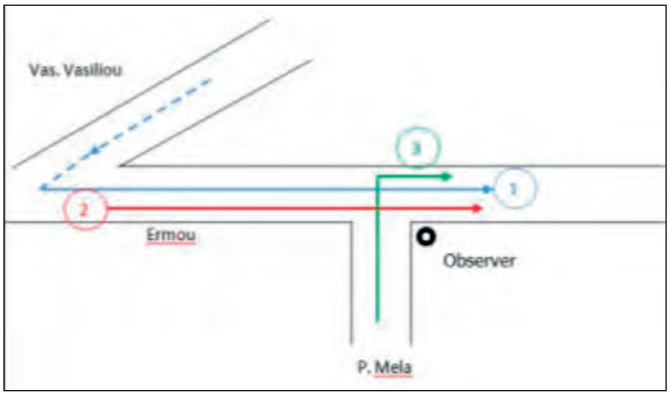


Diagram 2.1: Point 1: Ermou-Pavlou Mela

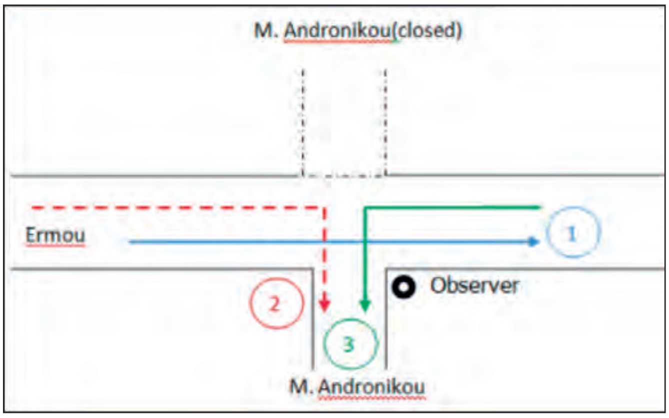


Diagram 2.2: Point 2: Ermou- M. Andronikou

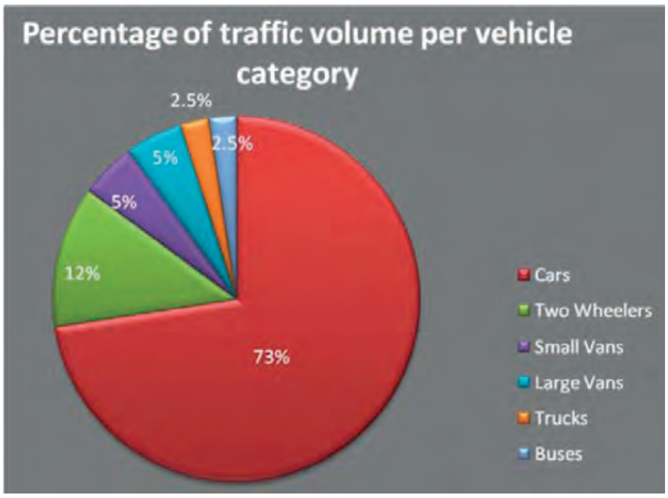


Diagram 2.3: Percentage of traffic Volume per vehicle category

According to the measurements (Diagram 2.3), most cars passing through Ermou street are private cars (73%). Motorcycles follow with 12% and vans (small and large) are each 5% of the total traffic

volume. Finally, 2.5% of the vehicles are trucks and buses. In total, freight vehicles (large/small vans and trucks)
constitute 12.5%.

Diagram 2.4 presents traffic volumes, as measured during periods 9:00 to 14:00 and 14:00 to 21:00 (morning and afternoon shifts respectively). As shown in the diagram, the percentage of private cars and motorcycles are higher in the afternoon split, whereas freight vehicles are more during the morning shift (17% versus 8% during the afternoon shift) as most distribution of goods is made during the morning.

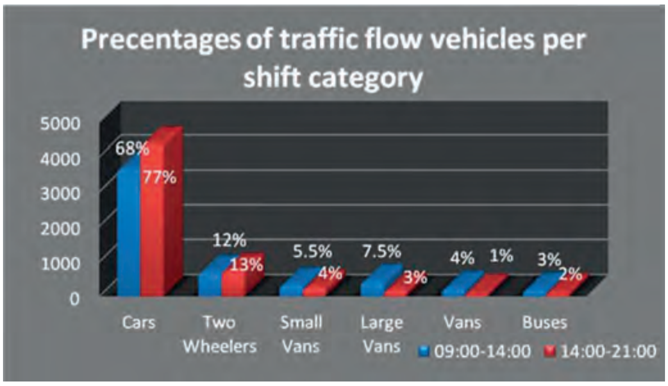


Diagram 2.4: Percentage of traffic volume per vehicle category and shift

An analysis of traffic volume counts resulted to the graphs that follow showing the hourly variation of traffic volume in both locations studied. In particular, diagrams 2.5 and 2.6 depict the hourly variation of traffic volume at measurement point 1: Ermou-Pavlou Mela and measurement point 2: Ermou- M. Andronikou respectively.

As shown in both diagrams, higher congestion levels have been observed in intervals 8:00 to 9:00 in the morning (shops opening hour), 14:00 to 15:00, when the shops close and owners and clients return to their homes and during 18:00-19:00 in the evening when the market afternoon shift starts. The lower traffic volume was observed during 15:00 to 17:00 when shops remain closed; while after eight in the evening traffic is considerably reduced.

Diagrams 2.7 and 2.8 depict the hourly variation of traffic volume of freight vehicles at measurement points 1 and 2 respectively. Small Vans, Large Vans and Trucks have been considered and hourly totals have been converted to Car Passenger Units (CPU).

As presented in Diagram 2.7 the peak hour for freight vehicles in the beginning of Ermou Street is between 9:00 to 11:00 am. Further increase is observed on movement 1 referring to vehicles entering Ermou Street from Vasileos Vasileiou during the periods 12:00 to 13:00 and 14:00 to 15:00. During midday, traffic is considerably reduced since stores are closed and during the afternoon shift,

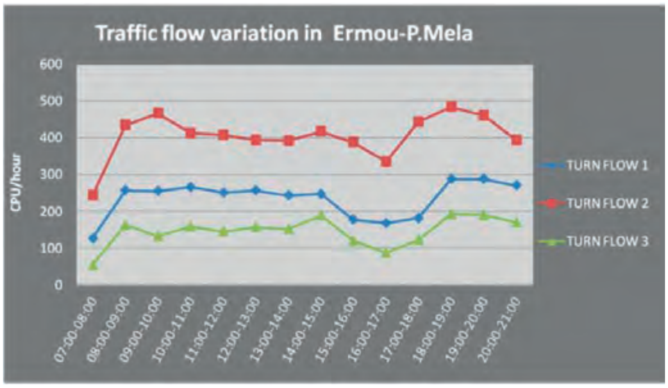


Diagram 2.5: Traffic Volume Variation in Ermou - P. Mela

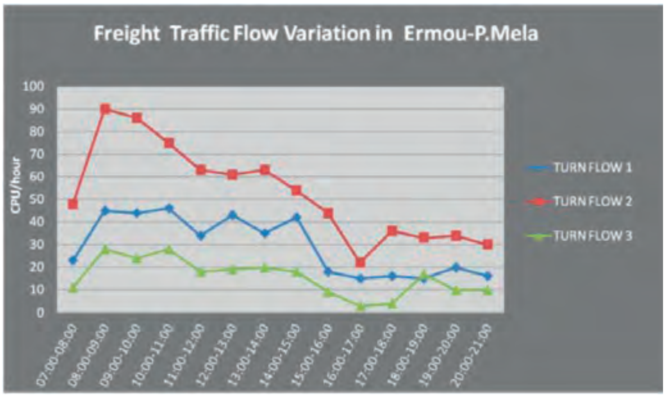


Diagram 2.7: Freight Traffic Volume Variation in Ermou-P.Mela

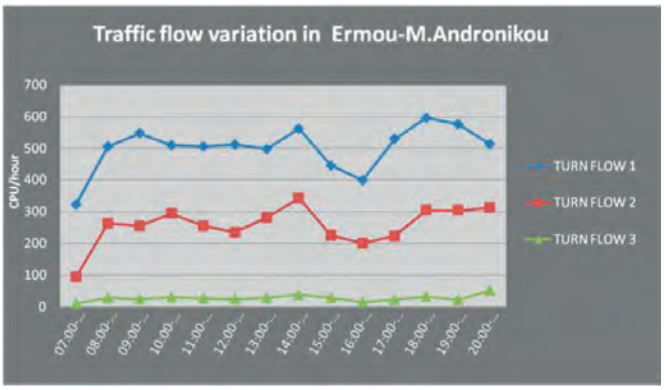


Diagram 2.6: Traffic Volume Variation in Ermou - M. Andronikou

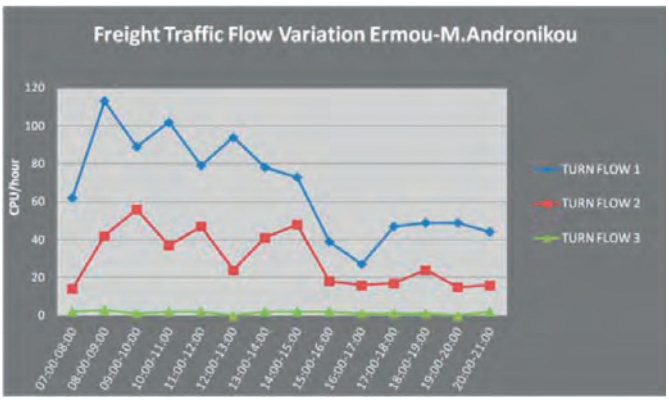


Diagram 2.8: Freight Traffic Volume Variation in Ermou-M.Andronikou

volumes stay at very low levels, since the largest part of distribution of goods is made during the morning.
Likewise, in diagram 2.8 the peak of freight traffic volume is during morning, while an increase in freight vehicles traffic volume that is observed for movement 2 during periods 11:00-12:00 and 13:00 -15:00. The vehicles involved in this movement are those that serve the pedestrian area and as loading and unloading spaces in Ermou Street are not sufficient, they enter the pedestrian streets to carry out distributions.
As regards congestion flow, it is expressed in Volume / Capacity ratio and determines the degree of congestion on a road section. For values higher than 1, the road segment is considered to be congested while values lower than 0.5 correspond to no particular problems. The capacity value of Ermou street calculated according to the Highway Capacity Manual is 800 vehicles / hour.
Table 2.2 presents the variation of the saturation flow in measurement points 1 and 2 respectively. According to the measurements and for the peak periods, the saturation flow is higher than 1 which leads to the conclusion that Ermou street is congested, the specific peak hours.

2.2.3 PARKING CHARACTERISTICS OF THE STUDY AREA

Foridentifying parking characteristics in the study area, a parking characteristics survey was conducted by the Hellenic Institute of Transport (HIT) staff, along with the traffic volumes measurements. The survey took place in two shifts, in the morning from 07:00 am to 14:00 pm and in the afternoon from 14:00 pm to 21:00 pm, along Ermou Street. The first step was current parking situation recording. All steps of data collection and parking characteristics analysis are presented in Diagram 2.9 and discussed below.

Point 1: Ermou-Pavlou Mela	
Peak hours	Saturation flow
08:00-10:00	1.04-1.06
13:00-14:00	0.98-1.06
18:00-19:00	1.17-1.20
Point 2: Ermou- M. Andronikou	
Peak hours	Saturation flow
09:00-10:00	1.03-1.04
13:00-14:00	1.00-1.17
18:00-19:00	1.12-1.16

Table 2.2 - Saturation flow in Ermou street

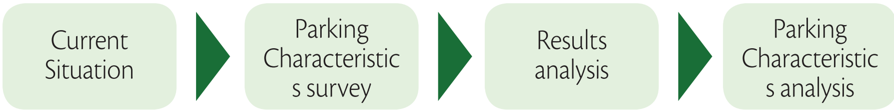


Diagram 2.9: Parking characteristics identification steps

For recording of the current parking situation along Ermou Street, the following actions were taken:

1. Street encoding.
The recording of data was made per block side. The street was studied and coded per block, and block side.

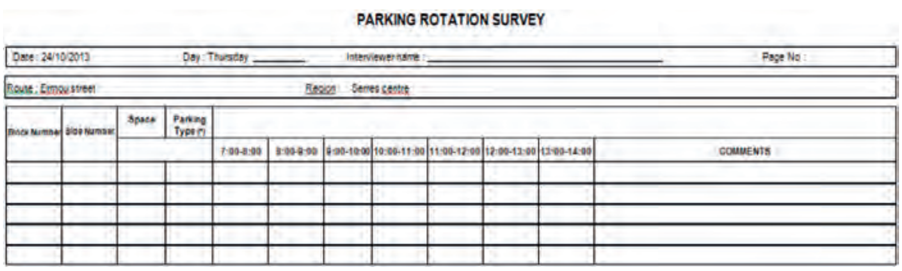
2. Recording of existing parking regulations.
For the most accurate recording of the current possible existing parking spaces were recorded according to the following classification:
- Illegal parking spaces
- Controlled parking spaces
- Loading and unloading spaces
- Special spaces (for vehicles of the Municipality of Serres)

3. Recording of the existing parking spaces along the street.
The recording was carried out by an experienced person who recorded with full detail all available spaces along the street, according to the Highway Code regulations. Table 2.3 presents the parking spaces per category.

EXISTING PARKING SPACES ALONG THE STREET	
CATEGORY	NUMBER
Controlled Parking Spaces	13
Illegal Parking Spaces	43
Spaces for vehicles of the Municipality of Serres	3
Loading and Unloading Spaces	2

Table 2.3 - Existing parking Spaces along Ermou street

4. Recording of current parking demand.
Current parking demand is determined by the occupation of the available legal parking Spaces and the number of illegal parked vehicles. For this reason, the recording of parked vehicles during peak hours and working open hours of shops, offices, banks and public & municipal services.
All data were recorded on a form, as shown in Table 2.4.
More specifically, the following elements were recorded:
- Parking restrictions per block side
- Number of Controlled Parking spaces
- Number of Special spaces (for vehicles of the Municipality of Serres)


PARKING ROTATION SURVEY

Date : 24/10/2013 Day : Thursday ______ Interviewer name : ______________ Page No :

Route : Ermou street Region : Serres centre

Block Number	Side Number	Space	Parking Type (*)	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	COMMENTS

Table 2.4: Existing parking situation form

- Number of Loading and Unloading spaces
- Number of illegally parked vehicles by category of prohibition:
  - o Parking restriction
  - o Parking in front of bin
  - o Pedestrian street Entrance/Exit
  - o Parking, Gas station, etc. Entrance/Exit
  - o 5m from pedestrian crossing
  - o 10m from junction
  - o 12m from STOP sign
  - o 12m from bus stop
  - o 20m from traffic light

Having completed the recording of current parking demand, along Ermou Street, the recording of parking characteristics survey followed.

The survey was based on recording in special forms the last three numbers of the license plate of parked vehicles. The recording was made every one hour starting at 07:00 am till 20:00 pm. The survey was conducted during a typical day, namely Thursday, October 24th, 2013; when the stores were open also in the afternoon.

Analysis of the data recorded followed in order to extract information about parking characteristics. For the analysis the following data used and calculated:

- Number of vehicles per parking category.
- Rotation index (vehicles/parking space).
- Average parking duration
- Duration with higher incidence
- Maximum accumulation

Vehicles parked in the study area are divided into two categories:

- "Continuous Presence" (vehicles that did not move during the data collection period).
- "Passing vehicles" (vehicles that arrived and left during the data collection period).

Thus, for the street studied the parking characteristics are presented below.

More specifically the following are presented:

- Summary tables of the street's parking characteristics
- A diagram of the distribution of accumulation.

Based on the above, a correlation can be made between the parking characteristics and other elements that will lead to conclusions, related to the relationship between land use of the study area and parking rotation, or parking duration and accumulation of legal and illegal parking.

In the following tables (2.5 and 2.6) the general characteristics of the route along Ermou Street are presented.

General Parking Characteristics of Ermou str	Controlled parking	Illegal parking	Double parking	Special parking	Loading and unloading parking
Total Number of spaces	13	43	-	3	2
Total number of recorded vehicles	53	123	38	10	6
Number of vehicles that did not move	1	-	-	-	-
Percentage (%)	1,89%	0%	0%	0%	0%
Number of vehicles arrived and left (Passing vehicles)	32	123	38	10	6
Percentage (%)	60,38%	100%	100%	100%	100%
Number of recorded vehicles with a fine	-	-	-	-	-
Parking Duration					
Average parking duration (h)	2,92	1,86	1,29	1,3	1,5
Parking duration with higher incidence (h)	1	1	1	1	2
Percentage (%)	43,4%	66,67%	92,11%	80%	50%
Parking duration with the second higher incidence (h)	3	2	2	3	1
Percentage (%)	16,98%	12,2%	5,26%	10%	50%
Parking duration with the third higher incidence (h)	2	3	10	2	0
Percentage (%)	16,98%	8,94%	2,63%	10%	0%

Table2.5: General parking characteristics of Ermou street

Parking accumulation and rotation characteristics in Ermou str.	Controlled parking	Illegal parking	Double parking	Special spaces	Loading and unloading spaces
Vehicle accumulation					
Time period with themaximum accumulation (h)	08:00	20:00	0:00	08:00/ 19 :00	10:00/11: 00/ 13:00/14:00/ 16: 00/19:00
Maximum accumulation (veh)	10	16	7	2	1
Parking rotation according to the number of available parking spaces					
Rotation index (vehicles/parking space)	4,08	2,86	-	3,33	3
Hourly rotation index (vehicles/parking space/h)	0,29	0,2	-	0,24	0,21

Table 2.6: Parking accumulation and rotation characteristics in Ermou street

From the analysis of the parking situation along Ermou Street, the initial conclusion that emerged was the lack of policing. Controlled parking spaces are used illegally (without the necessary ticket) as shown by the results of the survey. The duration parking on the controlled parking spaces is on average three hours.

Similarly, the average duration of illegal parking is 2 hours and of double- parking 1.5 hour. The loading and unloading spaces are occupied by vehicles not distributing goods as out of the 6 vehicles that were recorded only one was legal, while five were illegal. Respectively, special parking spaces, where only vehicles of the Municipality of Serres are allowed to park, were occupied by other vehicles.

Rotation index was 4.08 for controlled parking spaces, 2.86 for illegal spaces and 3 for loading and unloading spaces.

The accumulation diagram shows that there are morning and afternoon peak hours. According to the accumulation of illegally parked and double-parked vehicles demand is high at specific times, namely 8:00 to 10:00 am, 13:00 -15:00 pm and 17:00 to 19:00 mm. A number of double-parked vehicles refer to trucks for loading and unloading since dedicated spaces were continuously occupied.

2.3 Highlight Traffic Problems

The three step procedure followed above revealed some significant problems concerning the city's road network functioning.

The freight vehicles traffic volumes measured in certain selected locations of the reference region revealed that there is a significant number of freight vehicles affecting all main axis of the city's road network. There are time periods during the day where low speeds and time delays are observed due to the distribution procedure. These periods are between 7:00-11:00 in the morning. Traffic volume measurements showed that the higher congestion levels are observed between 8:00-9:00 in the morning, 14:00-15:00 and 18:00-19:00 in the afternoon. These time periods correspond with the city's commercial activities.

As regards the congestion flow, the Volume / Capacity ratio which determines the degree of congestion on a road section, is higher than 1 during the peak hours, leading to the conclusion that main axis of the road network are congested during these hours.

The analysis of the parking situation revealed that there is an immediate need for the enforcement of strict policy measures to both controlled parking spaces and loading/unloading spaces, as phenomena of illegally parked vehicles and of double parked vehicles (including vans and trucks) along the streets are observed all the time.

The occupation of the relative loading/unloading spaces from private vehicles prevents the proper functioning of the road network, as transporters are forced to cover extra distances within the city centre, until they find a free place to park.

Finally, drivers' behaviour and illegally parking in the loading and unloading spaces highlight the lack of public's information on the importance of the proper operation of these spaces without restrictions, the need to raise awareness on sustainable mobility issues and to realize the problems they pose with their illegal behaviour

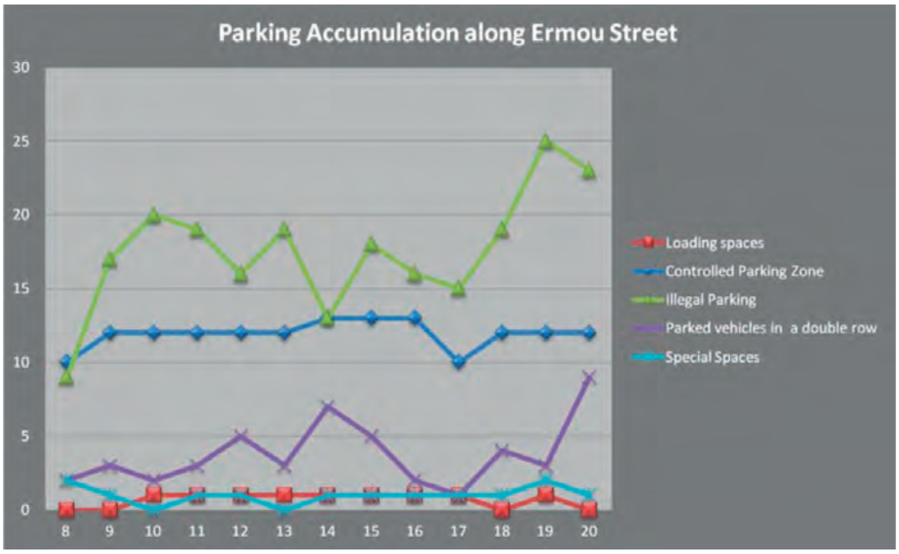


Diagram 2.10: Parking accumulation along Ermou Street

3. SETTING LOGISTICS BASELINE

3.1 Current Situation of Urban Freight Transport and Logistics in the City of Serres

Urban freight transport is considered to be essential for the proper functioning of a city, and to facilitate it, the Municipality of Serres has assigned specific loading and unloading places within the commercial centre of Serres with the intention
to be used only for this purpose. Thus, less than 30 loading/unloading places are being upgraded (the exact locations are presented in Map 3.1.) while in the near future, more are expected to be constructed in the framework of a study of urban
and bioclimatic reconstruction near the city centre.

According to 619/2002 Regulatory Decision of the Municipality, places in pedestrian zones can be used by freight vehicles distributing goods during 7:00 to 10:00 in the morning and 14:30 to 17:00 in the afternoon (14:30-18:00 during summer). The maximum load allowed is 3.5 tons. Under other regulatory decisions (e.g. 902/2009), loading and unloading places have been also assigned to private companies for specific time intervals (7:20 to 7:45 and 19:10 to 19:30).

In addition, previously among the plans of the Municipality was the establishment of a logistics centre that could be located inside a "Large Vehicles' Parking Lot" owned by the Municipality that is located by the new suburban road and more specifically at Krinos junction. In this location, the Municipality aimed to create, among others, organized storage spaces by building a warehouse of about 1,000 square meters to serve carriers. In the context of these plans the company AFETIRIA SA was founded.

The decision of the municipality, to establish this business, was a result of an effort to achieve security, improve aesthetics and reduce pollutants in the city centre by reducing the number of large vehicles circulating in the city.

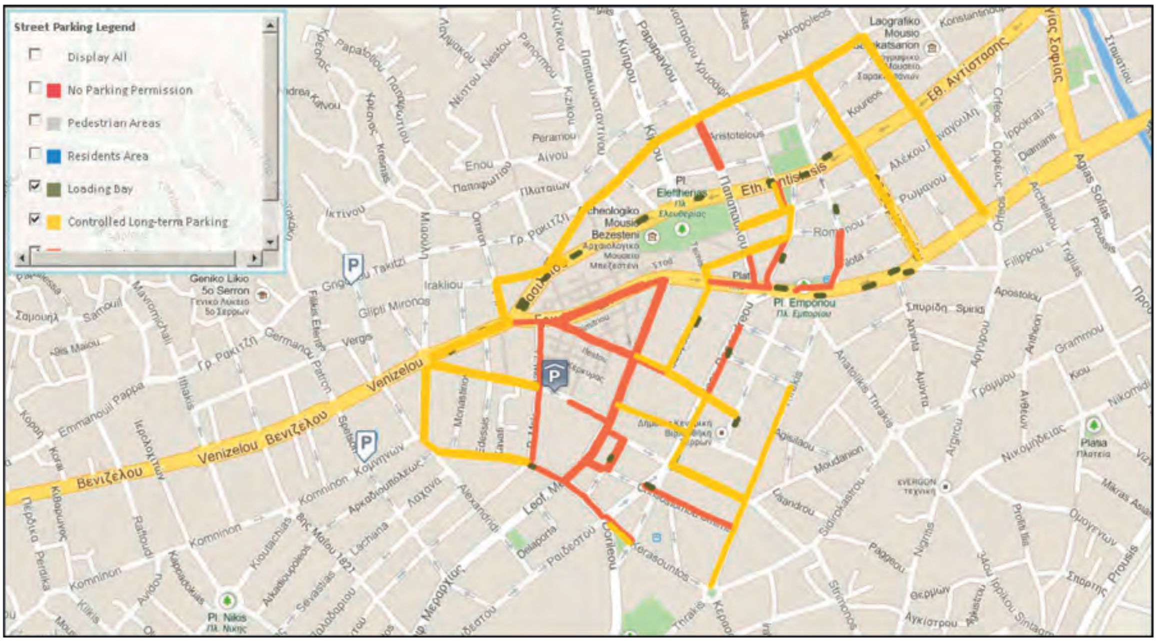
Unfortunately, various circumstances lead to a problem performance and currently financial checks take place while even the dissolution of the company, is being considered. The infrastructure, however, exists and is remarkable. Through a Sustainable Urban Logistics Plan a proposal for exploitation is imposed.

3.2 Existing Logistics Services

Distribution of goods within the city, is being carried out by small vans (freight taxis) which tranship all products reaching from Athens, Thessaloniki and other regions of Greece in the existing warehouses of Serres. Generally, Serres' freight transport system can be divided into two categories. The delivery of products produced in local industries (eg SERGAL, KRI - KRI etc.), or the supply of super markets and the delivery concerning small local stores.

The first one is being carried out by big trucks that start early in the morning and have completed all deliveries until 9:00 a.m. when the morning peak hour is observed.

The second includes all products reaching the city of Serres from Athens and Thessaloniki between 9:00 and 11:00 a.m, reload at freight-taxis and finally arrive in local stores from 10:00 until 15:00p.m or until early in the afternoon. In total 45 freight-



Source: [6]

Map 3.1: Loading and unloading places in Serres city centre taxis (gross weight up to 10 tons) are used every day, according to the representative of the Association of freight-taxis in order to complete the city's distribution needs.

3.3 Questionnaire Survey Addressed to Shopkeepers

In order to identify the best measures to be undertaken within the project's context, a questionnaire survey was conducted to the shopkeepers of Ermou Street. According to the recording, the shops can be categorized as shown in Table 3.1 below.

The questionnaire that was used aimed at capturing the key problems in loadingand unloading procedure. Shopkeepers were asked to assess the existing methods of products' distribution and the loading and unloading system of Ermou Street, to explain their daily problems and give their views on measures and actions which could contribute to upgrading the process and improving the situation. In addition, the survey explored whether shopkeepers are aware of sustainable urban mobility and sustainable urban logistics issues and whether they are willing to participate in a joint action in order not only to upgrade the road network of the city but also to improve the quality of their lives.

Out of the 68 stores located in Ermou Street, 49 completed the questionnaire. Fast Food and Coffee/Bar stores (9 in total), were not included in the sample as there are differences in their opening hours. Also 10 stores either refused to participate in the survey or heavy workload did not allow them complete the questionnaire. The questionnaire is included in Annex B of this deliverable. The analysis of the questionnaire survey is presented below.

According to diagrams 3.1 and 3.2 most stores of Ermou Street are sole properties (88%) and most stores are rented (73 %).

As regards products' distribution, as shown in the following diagrams, the busiest time-period is between 07:00 and 09:00 in the morning (37%) while also many shopkeepers state that there is no specific time of delivery of goods (31%). Regarding delivery method, most shops are served by transport companies (68%), 15% transfer goods using their own means and 'other' mainly refers to courier companies that deliver small packages and mail.

75% of vehicles used are conventional closed-vans and 18% motorcycles (according to the answers in the 'other' category), while duration does not exceed 5-10 minutes, according to diagrams 3.5 and 3.6.

To the question "How often do you experience problems related to loading/unloading spaces being illegally occupied by other vehicles" 84% of respondents answered daily and 12% fairly often (in total 96 % of respondents identify this as an important problem). In order to support loading/unloading spaces 44% of the respondents be-

TYPE OF STORE	NUMBER/PERCENTAGE		TYPE OF STORE	NUMBER/PERCENTAGE	
Clothes	20	29%	Fast Food	7	10%
Footwear	10	45%	Jewel	7	10%
Household Items	5	7%	Cosmetics /Fragrances	2	3%
Optical Goods	3	4%	Café / Bar	2	3%
Linens-Pottery & Glass	2	3%	Travel agency	1	2%
Fruit and vegetables	1	2%	Sewing		2%
Headgear	3	4%	Gifts	1	2%
Nuts / Coffee	3	4%	TOTAL NUMBER	68	

Table 3.1: Distribution of Ermou Street stores per category

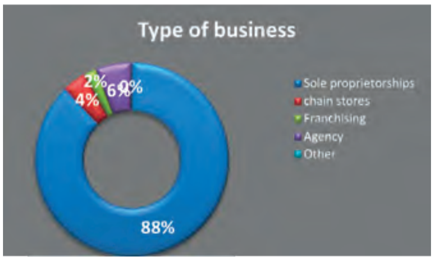


Diagram 3.1:Type of business

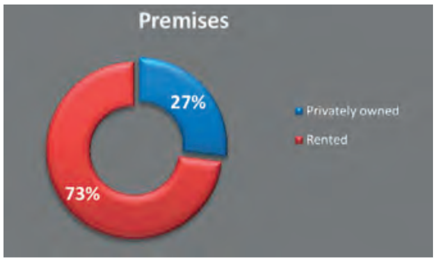


Diagram 3.2:Premises status

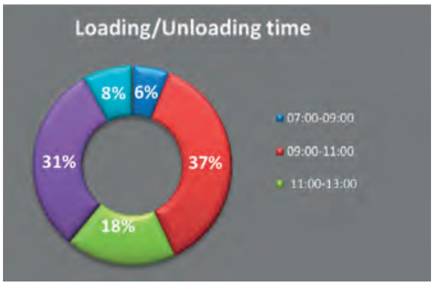


Diagram 3.3: Loading/Unloading time

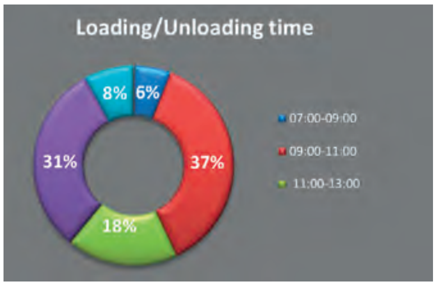


Diagram 3.4: Delivery method

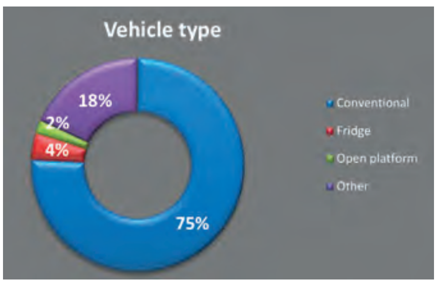


Diagram 3.5:
Loading and unloading vehicle type

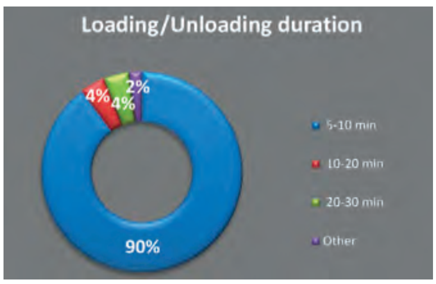


Diagram 3.6 :
Loading and unloading duration

lieve that better signage would be important and 33% believe that strengthening policing would generate positive results.
Finally, reducing parking cost is a factor that would better support the adequate use of loading/unloading spaces (diagrams 3.7 and 3. 8).
As to the degree of familiarity with technology, according to the answers of the respondents, 26% is very familiar, 31% is fairly familiar, 15% not that familiar and a big percentage of around 28% is not familiar at all.
To the question "Would you be interested in an online platform through which you could book loading/unloading space for specific duration" the vast majority is negative (75% is not interested at all and 10% is not that interested), whereas only 5% answered that they would be very interested in using an e-booking system. Moreover, 43% believes that such a system would bring positive results on products' distribution while the remaining 57% is totally negative.
As for respondents' preferred transport mode, (Diagram 3.9 and 3.10), 47% prefer walking, 36% uses private cars as driver and 13% motorbikes. The remaining 4% prefers other modes of transport (bicycle, private vehicle as passenger). Out of the 64% of respondents travelling by car, motorbike or bicycle, 92% say that the main problem they face is finding a parking space (92%).
To the question "Where do you park your car" (Diagram 3.11), 49% answered in 'legally on nearby streets' and 26% 'legally on Ermou street', while nobody uses the parking stations. And the main reason for this is, according to 85% of the respondents, is the very expensive price (Diagram 3.12).
Nevertheless, to the question "Would you be interested in parking in a private / public parking station with favourable payment terms" 54% is positive while the remaining 46% answered negatively. To the question "what amount would you be willing to pay for parking in a parking station" the few respondents reported an amount ranging from 20 to 30 € per month.
The overall conclusions of the questionnaire survey is that shopkeepers do not believe that there is lack of loading/unloading spaces and do not consider the creation and use of an e-booking system necessary while they suggest strict policing of existing spaces. Last, was highlighted the need to inform road users about loading/unloading parking spaces operation and regulations.

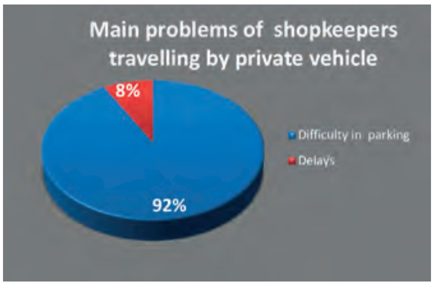


Diagram 3.7: Illegally parked vehicles on loading/unloading spaces

Diagram 3.8: Support of loading/unloading spaces

Diagram 3.9: Transport mode

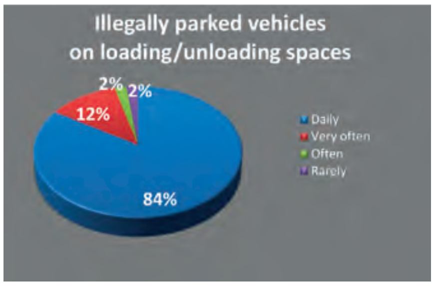


Diagram 3.10: Main problems of shopkeepers travelling by private vehicle

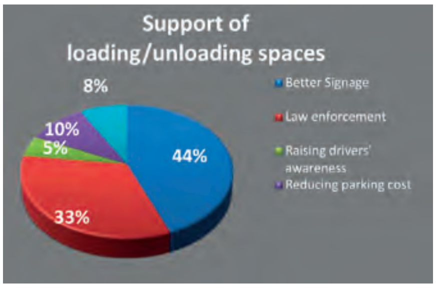


Diagram 3.11: Where shopkeepers park their vehicles

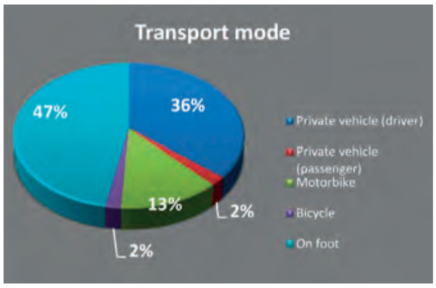


Diagram 3.12: Main reasons for not using the parking stations

3.4 Questionnaire Survey Addressed to the Association of Transporters (freight-taxis owners) in Serres

The recording of transporters' needs and opinions, distributing products to local stores within the city centre, showed the basic problems that they daily face. It also revealed in what way the existing infrastructure and institutions in force affect sustainable urban mobility. In total five main transporters were interviewed and answered the questions depicted in the table 3.2.
According to data collected from the main five freight transport companies, the total distance (km) covered daily from warehouses to the main loading/unloading places of the city centre ranges from 7 to 30 km (Diagram 3.13).
The number of kilometers above rises according to the transporter's estimation, due to the extra distance they have to cover as the loading/unloading places are usually illegally occupied by private cars and they

Transporter	1	2	3	4	5
Fleet (number ofvehicles)	2	1	1	3	3
Vehicle type	Mercedes 208,307	Mercedes, 1023	Ford Ranger	Volvo man	Mitsubishi cander, Veco euro cargo
Year	1981,1991	2000	2005	2004-2006	1998-2004
Engine			2500		4000
Euro category		II, III, IV		0	III
Covered distance (km) from warehouses to the main loading/unloading places of the city centre	7	11	18	5	30
Total distance (km) covered as transporters can't find the loading/unloading places free to park	14	13,75	22	7	33
Total distance (km) covered daily in Ermou Street due to the occupation of the loading/unloading place	3	4	3	2	3

Table 3.2: Distribution of Ermou Street stores per category

are forced to drive for a long time until they find one place free to park. The extra distance (km) covered ranges from 7 to 33 km (Diagram 3.14).

Regarding Ermou Street, one of the most commercial streets of the city centre, transporters who daily serve the stores there, estimate that the extra distance they cover for the delivery of goods along the street, ranges from 2 to 4 km, when the overall length is 250 meters (Diagram 3.15).

3.5 Highlight Logistics Problems

The system of freight transport in the city of Serres can be divided into two categories. Supply of stores with products produced in local industries (e.g. milk industries like SERGAL, KRI-KRI etc.) or related to large super markets and supply of small local stores.

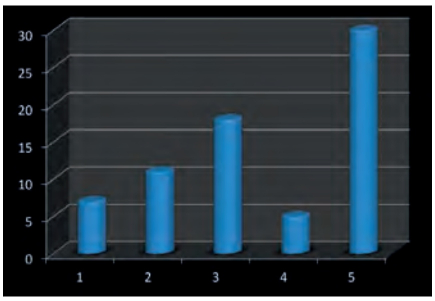


Diagram 3.13: Covered distance (km) from warehouses to the main loading/unloading places of the city centre

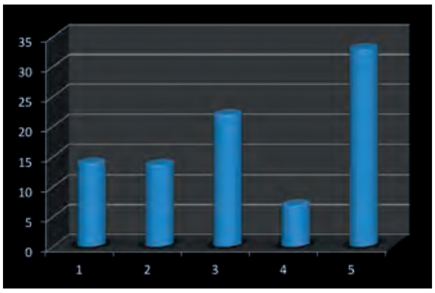


Diagram 3.14: Total distance (km) covered as transporters can't find the loading/unloading places free to park

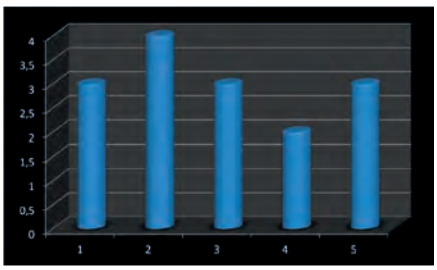


Diagram 3.15: Total distance (km) covered daily in Ermou Street due to the occupation of the loading/unloading place

The first kind of supplies is carried out by big trucks that start early in the morning and complete distributions before 9:00 when commercial activities and inevitably traffic begin.

The second is related to distribution of products that arrive from Athens and Thessaloniki between 9:00 and 11:00 in the morning, get reloaded to small vans (freight taxis) and then get delivered to stores from 10:00 till 15:00 and often during the afternoon as well. This supply category, burdens with 45-50 freight vans the city network furthermore and calls for dedicated parking spaces to avoid problems in road capacity due to double parking for loading and unloading activities or unnecessary circulation of freight vehicles until they find a parking space.

Today in the city of Serres and for freight vehicles' convenience, approximately 30 loading/unloading places are in operation. Due to the continuous change of land uses and the urban reform that is taking place in the city, many of these spaces have been abolished or are not valid anymore.

Moreover there is no policing reinforcement. One of the most important problems carriers face in the city centre is the illegal parking of cars on loading and unloading spaces. The parking characteristics survey along Ermou Street confirmed the statement that had been made to the project team by the president of the association of freight taxi owners of Serres, in a meeting that took place in Serres on 1/11/2013.

Additionally, apart from policing, additional effort needs to be made to exclude private cars' access by using special protective equipment (stakes, bars, etc.).

Finally, drivers' behaviour, illegally parking in the loading and unloading spaces, highlight the lack of public's information on the importance of the proper operation of these spaces without restrictions, the need to raise awareness on sustainable mobility issues and to realize the problems they pose with their illegal behaviour.

4 BEST PRACTICES AND SOFT MEASURES BENCHMARKING to promote sustainable urban logistics in the City of Serres

4.1 Urban Freight Transport Best Practices

Urban freight transport affects the operation of the urban environment both economically, socially and environmentally.
The economic impacts refer to congested roads and waste of resources, the social ones to the implications of pollutants to public health, accidents' increase, visual pollution, urban green and open space shrinkage and finally environmental emissions and waste increase etc.
To mitigate all these negative effects as well as to improve freight transport in cities, several measures and policies have been proposed and are nowadays being implemented. Measures and policies for sustainable urban freight transport are described below in order to conclude to the measures that could directly and efficiently be applied in a specific axis of Serres and then get evaluated for their effectiveness.

4.1.1 USERS' AWARENESS RAISING AND INFORMATION ON SUSTAINABLE URBAN FREIGHT TRANSPORT

The effect of city logistics on the way a city operates is not particularly known to citizens. For this reason various awareness and information raising activities are required including:

- Distribution of dissemination material informing citizens about environmentally friendly transportation in the city, leading to decongestion of roads and the upgrade of environmental conditions and citizens' quality of life.
- Distribution of dissemination material to shops and citizens informing them about loading and unloading places, permitted hours and any other restrictions (such as maximum load allowed etc)
- Training seminars on sustainable urban freight transport focused on citizens, transport companies and shopkeepers
- Incentives to transporters and shopkeepers who suggest and implement practices that support sustainable urban freight transport
- Organization of workshops addressed to all stakeholders for exchange of views, problem solving and proposals that may lead to more efficient city logistics

Figure 4.1: Dissemination material from a campaign [7]

4.1.2 SPATIAL AND TEMPORAL RESTRICTIONS

Measures of spatial and temporal restrictions include restrictions relating to time constraints (e.g. freight transport permitted hours, specific routes, night routes etc.) or specific locations, regions or areas where loading and unloading
takes place. These restrictions are being adopted by the authorities mainly for safety and environmental protection reasons and apply to sensitive to traffic areas (mainly in the city centers).
Urban authorities may define loading and unloading places in areas that attract or generate traffic but do not have adequate infrastructure. These places may be available with or without time constraints and their design may fit one or more vehicles depending on the size of vehicles that are allowed to use them.
It is important to note that for the successful use of the places, signage should be clear and distinct. This requires use of modern signage methods and correct and adequate of information transmission.

Stocholm

In the capital of Sweden, the following regulations are in force:

- Commercial vehicles weighing more than 3.5 tonnes are not allowed to cir-

Source: [8]

Figure 4.2: Loading and unloading signs

culate around the city during the night (20:00 to 6:00)
- Freight vehicles, longer than 12 meters, are not allowed to enter the city center.
- Heavy vehicles' age must be less than 8 years [7]

Hertogenbosch

In Hertogenbosch city, in the Netherlands, specific regulations regulating freight vehicles' access in the city center after 12:00 noon have been introduced.

Access permission is only given to carriers:

a. whose fleet consists of environmentally friendly vehicles and that have their own logistics centre. Every vehicle should have scheduled deliveries in at least 60 regions and 20 delivery points per route.

b. who use quiet trucks, reducing the number of routes. [9]

Aalborg

In Aalborg, loading and unloading zones have been established in narrow pedestrian streets and each zone serves many vehicles, allowing the passage of other trucks, reducing congestion during morning distribution hours. Local shops have also agreed to place on the road signs and their goods only after 11:00 [8]

4.1.3 URBAN LOGISTICS CENTRES

Bordeaux

The city of Bordeaux faces intense commercial activity and the distribution of goods in the city center is prohibited from

Figure 4.5: Freight bicycles Source:[9]

10 am onwards as at that time the congestion problems are particularly severe. Moreover, the construction of a tramline since 2000 is an additional burden on the roads.

In 2003, in an effort to improve this situation, special parking areas for loading and unloading have been created (Espace de livraison de proximité - ELP). This approach also included the installation of a transhipment platform where trained staff provides assistance in urban distributions.

Goods are transhipped from trucks to carts, electric vehicles and bikes (tricycles) for the last part of the delivery. For deliveries carried out by bicycles packages are not allowed to be heavier that 30 kilos, while heavy goods are transported by electric vehicles. [10]

ELP is located in an area with plenty of space and is only addressed to trucks that load/unload goods for the nearby shops. The facility serves 3 to 5 trucks at a time and operates Monday to Friday from 09.00 to 17.00 and Saturday from 09.00 to 11.00.

The first results after its operation show that the ELP system is popular to transport companies because it guarantees a safe unloading area near the commercial areas of the city center. In addition the environmental benefits are also important as it has been estimated that the replacement of a truck with a tricycle leads to 6 tons per year CO^2 emissions reduction and noise levels decrease. [8]

Figure 4.6: Urban logistics centre in the city of Lucca, Italy Source:[10]

Lucca

The Municipality of Lucca decided to construct a warehouse and logistics center using electric vehicles that is functional since 2005 (Lucca Port). Goods are either stored in a special area or transhipped from trucks to electric vehicles that are allowed to access the historic city center of the city for the last mile delivery.

Moreover, services that enable collaboration among stakeholders (carriers, shop-

Figure 4.3: Loading and unloading zone in Aalborg Source:[8]

Figure 4.4: Local area delivery in Bordeaux (Espace de livraison de proximité - ELP) Source:[8]

keepers) and organization of freight transport are also provided.

The four electric vehicles that are being used have resulted in 12% CO^2 emissions and 15.4% energy consumption reduction. [9]

4.1.4 NEW TECHNOLOGY VEHICLES

Rouen

In Rouen, tricycles are used for the last mile delivery of urban freight transport. [7]

Hertogenbosch

To stimulate the implementation of sustainable solutions for urban freight transport, the Municipality of Hertogenbosch, in the Netherlands has adopted measures relating to:

- The creation of an environmental zone area in the city center where only 'clean vehicles' (electric or diesel/gas powered vehicles) are allowed to enter
- The development of a specific service that aims to serve the delivery of bulky and heavy cargo using small buses that are operating in the city. [9]

Trondheim

In Trondheim, Norway, electric vehicles of various capacity, length and speed are used for urban deliveries, depending on the load that needs to be distributed (Figure 4.7)

Padova

As part of a program in Italy, 7 methane powered trucks, deliver goods in the city center on behalf of all transport companies, except courier companies. The trucks begin the deliveries from a 1000 sq.m area near the port and deliveries are made all day long using specific lanes and dedicated unloading places. [7]

Stockholm

Since 1996, a program in Stockholm promotes the identification ofenvironmental zones in the city center. In these zones and according to the regulations, only vehicles of a specific "environmentally friendly category" and diesel vehicles over 3.5 tones are allowed to enter [7].

4.1.5 ICT E-PLATFORMS AND COLLABORATION BETWEEN STAKEHOLDERS IN URBAN FREIGHT TRANSPORT

Siena

In the framework of eDRUL project, an online platform to better manage urban freight transport has been developed. The following scenarios have been included:

1. B2B Services (Business to Business) for the distribution of goods in the restricted traffic area through special permissions.

Access to the restricted traffic area is only allowed to commercial vehicles that are authorized (vehicles that meet certain standards) and to licensed urban fleet 'commercial taxis', or to vehicles that do not pollute the environment

2. "Park and Buy" Service (B2C)

Citizens purchasing items or goods from an area that is not accessible to cars, can receive them from a certain car parking location of the city.

3. B2B services for the distribution of goods with the collaboration among transport services providers and the use of a logistics centre.

This scenario serves the following logistics functions:

- Cooperation between long-distance carriers and companies that distribute goods, solving last mile problem
- Cooperation between long-distance carriers for freight in order to cope with access restrictions.
- Cooperation between long-distance carriers and companies that distribute goods for returned goods management [7]

4.1.6 REAL-TIME ROUTES' OPTIMIZATION

There are several supporting technologies available such as ITS vehicletelematics (in-vehicle units), GPS, smart cards and message screens connectedwith traffic or transportation management systems.

These systems are used to improve routes and travel planning as well as the services provided to customers (e.g. estimated time of arrival).

Figure 4.7: Last mile delivery bicycles

Figure 4.8: Environmentally friendly vehicles used for urban freight transport

Source:[9]

Freight transportation management systems offer:

- Automatic route calculation with optimal vehicle load and number of trips for carriers.
- Navigation and information on vehicle location, traffic and changes in customers' requirements.
- Driver and company or customer communication
- Internet booking system by coordinating and planning arrivals of trucks in central areas with heavy traffic [8]

4.1.7 NIGHT ROUTES

PIEK project in the Netherlands

Deliveries in stores are usually made in the afternoon, early in the morning or during the night. Many people in Dutch cities reside near or over stores, and as a result they are exposed to noise due to delivery activities. According to the law about noise pollution, the noise produced by freight transport must comply with strict standards.

A study showed that many loading and unloading activities exceed the limits of 60 and 65 dB (A) that have been proposed for the afternoon and night.

For this reason, the Dutch government cooperated with the PIEK project to help the market develop techniques and purchase equipment to meet the noise standards.

PIEK project includes the following activities:

i transfer of knowledge to urban freight transport companies
ii encouragement of noiseless activities
iii adequate loading/unloading places
iv quiet delivery vehicles up to 7.5 tones
v quiet delivery vehicles over 7.5 tones
vi quiet coolers facilities
vii quietly forklifts,
viii reduction of containers, pallets and other noise (ix)
ix reduction of shopping trolleys in stores noise
x electric or hybrid electric and diesel or gas powered vehicles [8]

4.2 Candidate Measures/Services Identification and Selection

All the measures/practices mentioned above aim at supporting sustainable urban freight transport and could potentially find application in the city of Serres.

However, for this study a SWOT analysis follows separately for each measure including major strengths, major weaknesses, key opportunities and threats, while in the Sustainable Urban Logistics Plan (SULP) de-

Measure 1: Users' awareness raising and information on sustainable urban freight transport	
Strengths • Directly applicable • Low cost • Involvement of both stakeholders and citizens in policy issues on urban freight transport	Weaknesses • The results are not direct • It takes time to gather citizens' feedback
Opportunities • Behavior change of stakeholders and citizens • Existing initiatives that support urban freight transport • Understanding benefits from the creation of collaborative schemes • Sustainable Urban Mobility awareness exploitation • Modal shift to alternative modes of transport (bus, bicycles, on foot) • Loading/unloading places will serve only the distribution procedure	Threats • Unsatisfactory participation and audience's response • Short duration of the action

Measure 2: Spatial and temporal restrictions	
Strengths • Soft measure, easily applicable • Reduction of environmental impact • Effective management of roadside parking • Congestion reduction • Accidents prevention	Weaknesses • Compliance with regulations • Bureaucracy • Possible damage of signage equipment
Opportunities • Use of the awareness raising campaigns for informing the public about spatial restrictions • Environmental upgrade of the area • Acceptance and implementation of additional measures and practices for promoting sustainable urban mobility • Acceptance and implementation of additional measures and practices to facilitate urban freight transport • Effective use of road infrastructure in the city center • Proper management of Loading/unloading places • Reduction of total distance covered by transporters • Reduction of traffic congestion • Reduction in CO_2 emissions • Energy savings	Threats • Possible violation of the measure

liverable a multi- objective analysis will be conducted. The SWOT analysis will result to the measures that are directly applicable at the least cost.
The measures are:

- Users' awareness raising and information on sustainable urban freight transport
- Spatial and temporal restrictions
- Urban logistics centres
- New technology vehicles
- ICT E-platforms and collaboration between stakeholders in urban freight transport
- Real-time routes' optimization
- Night routes

Measure 3: Urban logistics centers	
Strengths • Exclusion of large vehicles • Economies of scale • Safe unloading areas • Use of alternative (environmentally friendly) means of transport	Weaknesses • High investment costs • High operating costs • Difficulty in developing collaborative schemes • Potential inefficiency • No direct contact between customers and carriers • Possible increase in freight transport costs
Opportunities • New jobs • Environmental upgrade of the area • Possibility to use low impact vehicles for last mile deliveries	Threats • The recession in the supply chain industry

Measure 4: New technology vehicles	
Strengths • Emissions reduction • Reduction of vehicles' operating costs • Reduction of transportation costs • Benefits in transport companies' profile	Weaknesses • High cost of purchase • High operating costs • Low efficiency of electric vehicles (frequent recharges, limited range) • Limited market availability
Opportunities • Need for new technologies vehicles use • Tax cuts and benefits for the use of new technologies vehicle • Funding and support measures • A combination of incentives and constraints	Threats • Inadequate infrastructure (eg charging stations)

Measure 5: ICT E-platforms and collaboration between stakeholders in urban freight transport	
Strengths • Better of urban freight transportation management • Synchronization of transport operators in loading and unloading areas and better service • Improvement of reliability • Coordination and planning of arrivals of trucks in heavy traffic areas • Congestion reduction	Weaknesses • Flexibility for simultaneous customer service • Reduced use in case the use of the platform is free of charge • Familiarity with information technologies and an internet connection is a prerequisite
Opportunities • Exploitation of increasing carriers and customers familiarity with new technologies • Better exploitation of loading/unloading places • Better organization for shopkeepers and transporters • Better planning and coordination of trucks' arrivals in the center of the city • Reduction of traffic flows • Reduction of noise and air pollution	Threats • Limited level of carriers organization • Technical system problems • Requirement for cooperation of stakeholders • Users non-acceptance of the system

Measure 6: Routes' optimization	
Strengths • Improvement of reliability • Support to truck drivers and vehicle kilometers reduction • Travel time reduction • Congestion reduction	Weaknesses • Significant cost for information provision (real-time road traffic conditions, volumes, speed etc)
Opportunities • Promotion of sustainable urban mobility • Improvement of time and service reliability • Reduction of operating costs for transporters • Reduction of traffic flows	Threats • Reduced use in case the use of the platform is free of charge • Familiarity with information technologies is a prerequisite

Measure 7: Night routes	
Strengths • Improvement of reliability (travel-time reduction) • Emissions reduction • Accidents' reduction • Congestion reduction • Fuel consumption reduction	Weaknesses • Security problems (eg for transport of high value goods) • Additional staff to receive goods when the shops are closed • Personnel costs increase in order to work during night hours
Opportunities • New jobs • Reduction of traffic flows during the day • Possibility to use low impact vehicles in order to reduce noise	Threats • Low level of citizens' acceptance

Based on the characteristics of Serres study area and according to the SWOT analysis conducted above, all candidate measures examined could be implemented in the city of Serres in order to enhance sustainable urban mobility. Some of them are directly applicable and could be implemented quickly and at a relatively low cost (Measures 1, 2, 5, 6) while others are quite costly or require more time for planning, implementation and final application (Measures 3, 4, 7).

From the seven in total candidate measures a selection of the most suitable ones was made, including two short-term measures (1,2) two medium-term (5,6) and one long-term (3). The selected measures are described and further analyzed below.

4.3 Short Term Measures

4.3.1 USERS' AWARENESS RAISING AND INFORMATION

Requirements for the implementation of the measure

The measure of users' awareness raising, aims at reaching interest of all stakeholders in order to foster further behavioural patterns of responsible citizens. More specifically, the aim of this measure is to inform citizens about the way urban freight transport affect both their daily life and the urban environment, in order to understand that the infrastructure available for exclusive use by the fleet of trucks delivering goods within the city (loading/unloading places), should not be violated by private cars. Of course, freight transport as part of the general traffic situation of an urban area affects and is affected by it. The reinforcement of sustainable mobility and the respect of rules governing traffic and parking in a road network, can bring great improvement concerning urban freight transport system efficiency. Information and awareness of citizens therefore on the above issues, can be achieved through various actions relating to the preparation and production of leaflets, events open to the public (open days), organized workshops with stakeholder involvement, etc. Regarding the requirements that should be met by the implementation of the selected soft measure, those are discussed below:

Infrastructure requirements

The measure does not require the construction of new infrastructure as it is an easily applicable measure.

Regulations and legal framework

The distribution of leaflets and the organization of events open to the public should always follow the relevant legislation. Specific legal framework on transparency should be followed in the case of establishing reward policies to transporters and shopkeepers who implement practices to support sustainable urban freight transport. This concerns lottery procedures, benchmarking etc.

Required technological equipment

Technology equipment is not required to implement this measure. However, the use of computer applications or services are common tools for informing the public, such as the use of special web pages, e-learning, promotion through information platforms etc. For this case the use of related equipment is required such as the EASYTRIP electronic services platform available by the Municipality of Serres, Municipality's webpage, relevant announcements to existing VMS, etc.

Key factors involved in the measure's implementation

The main key actor involved in the measure's implementation is the Municipality of Serres, who will be responsible for the design and the implementation of information campaigns and the uploading of the related content to the Municipality's website and the EASYTRIP platform. The Municipality of Serres could also cooperate with actors that can influence and can be influenced by an upgraded freight transport system in the city such as the Association of Transport companies, the Commercial Association and the Chamber of Commerce of the city.

Organisational and managerial context

Municipality of Serres will have the central organization of the measure and will co-operate with the Commercial Association and the Chamber of Commerce of the city in order to design and use the appropriate material for an optimal result.

Basic financial requirements for the implementation of the measure The financial requirements of the measure are related to the cost of graphic design, the printing of material that will be distributed at various events (e.g. open days), the organization of the 2nd ARE. These costs will be covered by ENCLOSE funding. However, on the occasion of specific events, if additional material is to be produced, relevant professionals or their Associations who will benefit directly from the final results of this measure, could also sponsor related expenses.

Announcements posted on the Municipality's website and the platform of EASYTRIP project, where Serres took part, do not require extra cost.

For the best possible result, all the above actions should be repeated at regular intervals, while evaluation of their impact on the general public should be assessed. The results of the evaluation will then be used for discussion and decision -making in meetings were all stakeholders will be involved. The evaluation process should follow specific indicators and should use specific type of questionnaires for the survey. In case that the evaluation process is designed and carried out by the Municipality of Serres it could have no cost if all the mentioned electronic instruments will be used (Website, EASYTRIP Platform).

The efficiency of the measure depends on the planning and organization of events and workshops, but also on the synergy of all stakeholders to update periodically all data included to the dissemination material.

The results expected from the implementation of the measure, are directly related with the citizens' attitude change. Information and awareness on issues related to Sustainable Urban Mobility and Sustainable Urban Freight Transportation is an issue that requires both effort and time.

The Table below depicts the cost estimation of the measure.

Energy and environmental impacts

It can be estimated that after the information campaign, transporters will be able to better organize the freight distribution procedure by optimizing both the loads and trips of their vehicles. Moreover, shopkeepers and citizens having been informed about the positive effects of sustainable urban mobility and the way it affects both their daily life and the urban environment, may choose alternative transport modes for their trips, such as PuT, bicycles, etc. Thus, a great improvement in sustainable urban mobility schemes is expected, which will also bring positive results in terms of reduced environmental impact and energy savings.

Assuming that after the campaign, transporters will reduce the number of trips executed for the completion of the freight distribution procedure within the city centre (and subsequently the km travelled) by 10% due to an efficient use of the vehicles' loading capacity, a rough estimation of the

	Short description	Quantity	Price per unit	Cost
1	Large Brochure (50x70)	10	6.5	65
2	Small brochure (A3)	20	0.75	15
3	Banner (0.8x2 m)	2	50	100
4	4-page leaflet of the Enclose project (A5)	250	0.32	80
5	Informative leaflet of the Enclose project (A4)	250	0.32	80
6	Informative leaflet of the campaign	400	0.5	200
		Net value		540
		VAT		124.20
		Total Cost		664.20

Regarding the time needed for the implementation of the measure, open days should be organized at least four times a year and for a period of three years.

Time schedule for the implementation of the measure					
	1st month	2nd month	1st year	2nd year	3rd year
Creation of informative material			Update	Update	Update
Creation of optical material			Update	Update	Update
Open Days			1 every 3 months	1 every 3 months	1 every 3 months
Workshops			1 every 3 months	1 every 3 months	1 every 3 months

reduction of km travelled annually can be calculated.

According to the transporters' estimation, the km covered daily for the completion of the freight distribution procedure within the city centre are approximately 70 and therefore the overall yearly distance (for 300 work days per year) is 21.000km.

Regarding CO^2 emissions, for diesel vans and for an average speed of around 30km / h (distance km covered both in urban and interurban area) these are calculated based on the software COPERT (252gr/Km/vehicle).

Covered distance (km) from warehouses to the main loading/unloading places of the city centre:

21.000km x 252 gr/Km/vehicle = 5.29ton/year

Covered distance after the campaign's implementation (reduction in vehicle/km covered estimated at 10%):

18900km x 252 gr/Km/vehicle = 4.76 ton/year (0.53 ton CO^2 less)

Energy savings

Considering that light diesel vans normally consume 16 lit/100km we can calculate the number of lit freight vehicles consume yearly and the energy consumption.

Covered distance (per year) from warehouses to the main loading/unloading-places of the city centre:

21.000km x 0.16 lit/Km/vehicle = 3360 lit/year

The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption from the total km covered from warehouses to the city centre:

3360 lit x 35 MJ/lit =117.600 MJ/lit

After the measure's implementation and for a reduction of 10% in vehicle/km covered annually:

18.900km x 0.16 lit/Km/vehicle = 3024 lit/year
Estimated energy consumption: 3024 lit x 35 MJ/lit =105.840 MJ/lit (11760 MJ/lit less)

4.3.2 SPATIAL AND TEMPORAL RESTRICTIONS

The measure aims to establish temporal and spatial restrictions in order to increase effective use of road infrastructure, to reduce traffic congestion in the city centre, to protect the environment and finally to increase safety for commuters.

Infrastructure requirements

The infrastructure required is either constructed or under construction loading/unloading places equipped with the appropriate signage (horizontal stripping, vertical signs etc). The signage should be sufficient, clear, in excellent condition and should communicate all the necessary information for parking and loading regulations.

Regulations and legal framework

Both temporal and spatial restrictions (which places are considered as loading/unloading places, operating hours, etc) should follow all the relevant Regulatory Decisions of the Municipality. These decisions will be taken considering the actual needs both in terms of number of seats that should be constructed in each axis and in the processing time for the loading/unloading procedure.

Required technological equipment

No special technical equipment is required for the implementation of this measure. However, it should be noted that the spatial segregation could use advanced technological applications with bars that go up and down or columns getting up and sink or even with special sensors that record the occupation of loading/unloading places by freight vans. These technical solutions of course, should be considered within an overall investment plan of the Municipality in controlled parking systems due to the high cost.

Key factors involved in the measure's implementation

Only the City Council and the Technical Services of the Municipality have the jurisdiction for the operation of the specific loading/unloading places and the operating hours. For the optimization of spatial and temporal constraints a synergy between the Commercial Association of Serres is required.

Organisational and managerial context

The organization of the measure will be held by the civil authorities in close cooperation with transporters and shopkeepers of the city while the management will be carried out by the Municipality of Serres.

Basic financial requirements for the implementation of the measure

The financial requirements of the measure relate to the supply and installation of sign and information plates (e.g. weight and size regulations, time duration etc.), the paint striping and special constructions for the determination of each place.

The viability of the measure depends on the compliance with the spatial and temporal constraints as well as with policing reinforcement in the loading/unloading places. According to the expected results regulations compliance will reduce illegal parking and traffic congestion, will facilitate access to loading/unloading places and finally will facilitate the whole freight distribution procedure.

The Table below depicts the cost estimation of the measure.

	Short description	Quantity	Price /unit	Cost
1	Vertical sign of the project	28	22	616
2	Support frame for signs	28	33	924
3	Regulator Plate (small size)	15	25	375
4	Support post for signs	15	22	330
5	Horizontal stripping	10	30	300
		Net value		2.545 €
		VAT		585.35
		Total Cost		3130.35

Regarding the time needed for the implementation of the measure, it is depicted in the Table below:

Time schedule for the implementation of the measure				
	1st month	2nd month	3rd month	4th month
Decisions of City Council				
Purchase and installation of signage signs				
Striping loading/unloading places				

Energy and environmental impacts

According to the transporters' answers (Table below) the extra km covered daily as they can't find the loading/unloading places free to park are in total 19km and the overall yearly distance (for 300 work days per year) is 19x300days= 5.700km.

The short term measures analyzed above are expected to bring positive effects concerning the loading/unloading places' functionality, as illegally parking phenomena are expected to be reduced. Therefore, transporters will not be forced to cover extra distances until they can park their vans in the significant places, as most of the time those places will be free.

Transporter	1	2	3	4	5
Fleet (number of vehicles)	2	1	1	3	3
Vehicle type	Mercedes 208 - 307	Mercedes 1023	Ford Ranger	Volvo man	1 Mitsubishi cander, 2 Iveco euro cargo
Year	1981,1991	2000	2005	1998- 2004	
Engine			2500		4000
Euro category		II, III, IV		V	III
Covered distance (km) from warehouses to the main loading/unloading places of the city centre	7	11	18	5	30 (10 Mitsubishi + 10x2 Iveco)
Extra distance (km) covered as transporters can't find the loading/unloading places free to park	7		4	2	3 (1 Mitsubishi +1x2 Iveco)

In order to estimate the reduction of CO^2 emissions expected from the reduction of the total distance covered from transporters, the below assumptions were taken into account, based on data provided by the transporters.

Transporter's vans are categorized depending on vehicle type. Thus 3 vans (Mercedes 207, 308 and Ford ranger) are vans <3,5 ton, 5 vans (Mercedes 1023, 3 Volvo Man and 1 Mitsubishi cander) are vans between 7,5ton-12,5 ton and 2 vans (Iveco euro) are vans <7,5 ton.

Regarding CO^2 emissions, for diesel vans <3,5 ton and for an average speed of around 30km / h (distance km covered both in urban and interurban area) these are calculated based on the software CO-PERT (252gr/Km/vehicle) while for vans 7,5ton-12,5 ton the relevant number of CO^2 is (510 gr/Km/vehicle) and for vans <7,5 ton (330 gr/Km/vehicle).

Calculations are further analyzed below:

3 vans <3.5 ton:

Covered distance (km) from warehouses to the main loading/unloading places of the city centre:

25km x 252 gr/Km/vehicle = 0.0063 ton/day
0.0063 x 300 days = 1.89 ton/year

Extra km covered from transporters as they can't find a free loading/unloading place to park:

11km x 252 gr/Km/vehicle = 0.0028 ton/day
0.0028 x 300 days = 0.83 ton/ year

5 vans <7.5 – 12.5 ton:

Covered distance (km) from warehouses to the main loading/unloading places of the city centre:

26km x 510 gr/Km/vehicle = 0.013 ton/day
0.0013 x 300 days = 3.98 ton/year

Extra km covered from transporters as they can't find a free loading/unloading place to park:

6km x 510gr/Km/vehicle = 0.0030 ton/day
0.0030 x 300 days = 0.90 ton/ year

2 vans <7.5 ton:

Covered distance (km) from warehouses to the main loading/unloading places of the city centre:

20km x 330 gr/Km/vehicle = 0.0066 ton/day 0.0066 x 300 days = 1.98 ton/year

Extra km covered from transporters as they can't find a free loading/unloading place to park:

2km x 330gr/Km/vehicle = 0.00066 ton/day
0.00066 x 300 days = 0.198 ton/ year

CO^2 emissions produced yearly from the total covered distance:

1.89+3.98+1.98 = 7.85 ton /year

Extra CO^2 emissions produced yearly from the extra covered distance:

0.83+0.90+0.198 = 1.93 ton /year

The CO^2 emissions reduction is estimated to 20%

Energy savings

Considering that a 3.5 ton light van normally consumes 16 lit/100km we can calculate the number of lit the three vans consume yearly and the energy consumption.

3 vans <3.5 ton:

Covered distance (km) from warehouses to the main loading/unloading places of the city centre:

25km x 0.16 lit/Km/vehicle = 4 lit/day
4 x 300 days = 1200 lit/year

The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption from the total km covered from warehouses to the city centre:
1200 lit x 35 MJ/lit =42000 MJ/lit
Extra km covered from transporters as they can't find a free loading/unloading place to park:
11km x 0.16 lit/Km/vehicle = 1.76 lit/day
1.76 x 300 days = 528 lit/year

Yearly energy consumption for the extra km covered as transporters can't find the loading/unloading places free:
528 lit x 35 MJ/lit =18480 MJ/lit

Considering that a 7.5 -12.5 ton van normally consumes 30 lit/100km we can calculate the number of lit the five vans consume yearly and the energy consumption.

5 vans <7.5 – 12.5 ton:
Covered distance (km) from warehouses to the main loading/unloading places of the city centre:
26km x 0.3 lit/Km/vehicle =7.8 lit/day 7.8 x 300 days = 2340 lit/year

The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption from the total km covered from warehouses to the city centre:
2340 lit x 35 MJ/lit =81900 MJ/lit
Extra km covered from transporters as they can't find a free loading/unloading place to park:
6km x 0.3 lit/Km/vehicle =1.8 lit/day
1.8 x 300 days = 540 lit/year

Yearly energy consumption for the extra km covered as transporters can't find the loading/unloading places free: 540 lit x 35 MJ/lit =18900 MJ/lit
Considering that a 7.5ton van normally consumes 25 lit/100km we can calculate the number of lit the two vans consume yearly and the energy consumption

2 vans <7.5 ton:
Covered distance (km) from warehouses to the main loading/unloading places of the city centre:
20km x 0.25 lit/Km/vehicle = 5 lit/day
5 x 300 days = 1500 lit/year
The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption from the total km covered from warehouses to the city centre:
1500 lit x 35 MJ/lit =52500MJ/lit

Extra km covered from transporters as they can't find a free loading/unloading place to park:
2km x 0.25 lit/Km/vehicle = 0.5 lit/day
0.5 x 300 days = 150 lit/year

Yearly energy consumption for the extra km covered as transporters can't find the loading/unloading places free:
150 lit x 35 MJ/lit =5250MJ/lit

Yearly energy consumption (total covered distance):
42000+81900+52500 = 176400 MJ/lit

Extra yearly energy consumption:
18480+18900+5250 = 42630 MJ/lit
The reduction in energy consumption is estimated to 20%

4.4 Medium Term Measures

4.4.1 ICT E-PLATFORMS AND COLLABORATION BETWEEN STAKEHOLDERS IN URBAN FREIGHT TRANSPORT

Requirements for the implementation of the measure
The aim of this measure is to inform users about the exact location of all loading/unloading places, their capacities and the system's operating hours.
Additionally, through the use of an electronic system - platform an exploitation of all loading/unloading places in the best possible way is expected to derive, as shopkeepers and transporters have the possibility to organize the freight distribution system by booking a specific loading/unloading place for a specific time. The reservation system in this case contributes to the coordination and planning of trucks' arrivals in central areas with large flows. Therefore, a significant reduce is expected to traffic congestion, noise and air environmental pollution.

Infrastructure requirements
The measure does not require the construction of new infrastructure as it is an easily applicable measure.

Regulations and legal framework
The information provided through the electronic platform should follow all the relevant Regulatory Decisions regarding the functionality of loading/unloading places (operating hours, weight and size restrictions, access hours for freight distribution etc)

Required technological equipment
Technology equipment is not required to implement this measure, as the available by the Municipality of Serres Easytrip electronic platform, can fully meet the above requirements.

Key factors involved in the measure's implementation
The key players involved in the implementation of the measure is the Municipality of Serres who will be responsible for managing the loading/unloading reservation system, and potential users of the system such as transport companies and shopkeepers.

Organisational and managerial context
Responsible for the organization and managing of the platform will be the Municipality of Serres.

Basic financial requirements for the implementation of the measure
The online platform could be used with no extra charge. The measure's efficiency depends on the availability of stakeholders to cooperate in order to develop a new, more automated freight distribution model in the city. The participation in an online reservation system will contribute to the smooth functioning of the delivery system, as the rate of freight vehicles traveling in central axes of the city's road network will be reduced significantly.
Regarding the time schedule, the measure can be directly applicable, as the electronic

platform is already in use. However, more time for all participants is needed in order to be properly organized.

Energy and environmental impacts

It can be estimated that after the measure's implementation, shopkeepers and transporters will be able to better organize the daily freight distribution system by booking a specific loading/unloading place for a specific time. The reservation system in this case will contribute to the coordination and planning of trucks' arrivals within the city centre, resulting inevitably to a significant reduce of traffic congestion, noise and air environmental pollution. According to the transporters' answers (Table below) the extra km covered daily as they can't find the loading/unloading places free to park are in total 19km and In order to estimate the reduction of CO^2 emissions expected from the reduction of the distance (km) covered from transporters due to the reservation system, the below assumptions were taken into account.

Transporter	1	2	3	4	5
Fleet (number of vehicles)	2	1	1	3	3
Vehicle type	Mercedes 208 307	Mercedes 1023	Ford Ranger	Volvo man	1 Mitsubishi cander, 2 Iveco euro cargo
Extra distance covered as transporters can't find the loading places free to park	7	3	4	2	3 (1 Mitsubishi + 1x2 Iveco)

Transporter's vans are categorized depending on vehicle type. Thus 3 vans (Mercedes 208, 307 and Ford ranger) are vans <3,5 ton, 5 vans (Mercedes 1023, 3 Volvo Man and 1 Mitsubishi cander) are vans between 7,5ton-12,5 ton and 2 vans (Iveco euro) are vans <7,5 ton.

Regarding CO2 emissions, for diesel vans <3,5 ton and for an average speed of around 30km / h (distance km covered both in urban and interurban area) these are calculated based on the software COPERT (252gr/Km/vehicle) while for vans 7,5ton-12,5 ton the relevant number of CO2 is (510 gr/Km/vehicle) and for vans <7,5 ton (330 gr/Km/vehicle).

Calculations are further analyzed below:

3 vans <3.5 ton:

Extra km covered from transporters as they can't find a free loading/unloading place to park:

11km x 252 gr/Km/vehicle = 0.0028 ton/day

0.0028 x 300 days = 0.83 ton/ year

5 vans <7.5 – 12.5 ton:

6km x 510gr/Km/vehicle = 0.0030 ton/day

0.0030 x 300 days = 0.90 ton/ year

2 vans <7.5 ton:

2km x 330gr/Km/vehicle = 0.00066 ton/day

0.00066 x 300 days = 0.198 ton/ year

Extra CO^2 emissions produced yearly from the extra covered distance:

0.83+0.90+0.198 = 1.928 ton /year

Based on estimations resulting to a reduction of 30% on the extra km covered, due to the use of the reservation system and therefore due to a better use of the loading/unloading places, the reduction of CO2 emissions can be calculated below:

3 vans <3.5 ton:

7.7km x 252 gr/Km/vehicle = 0.0019ton/day

0.0019 x 300 days = 0.57 ton/ year

5 vans <7.5 – 12.5 ton:

4.2km x 510gr/Km/vehicle = 0.0021 ton/day

0.0021 x 300 days = 0.63 ton/ year

2 vans <7.5 ton:

1.4km x 330gr/Km/vehicle = 0.00046 ton/day

0.00046 x 300 days = 0.138 ton/ year

Estimated emissions produced yearly from the reduction of the distance (km) covered:

0.57+0.63+0.138 = 1.338 ton/year (590 ton/ year CO^2 emissions less)

Energy savings

Considering that a 3.5 ton light van normally consumes 16 lit/100km we can calculate the number of lit the three vans consume yearly and the energy consumption.

3 vans <3.5 ton:

Extra km covered from transporters as they can't find a free loading/unloading place to park:

11km x 0.16 lit/Km/vehicle = 1.76 lit/day

1.76 x 300 days = 528 lit/year

The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption for the extra km covered:

528 lit x 35 MJ/lit =18480 MJ/lit

For a 30% reduction of the distance covered, the perspective numbers are:

7.7km x 0.16 lit/Km/vehicle = 1232 lit/day

1232 x 300 days = 369.60 lit/year

Estimated yearly energy consumption after the measure's implementation:

369.60 lit x 35 MJ/lit =12936 MJ/lit

Considering that a 7.5 -12.5 ton van normally consumes 30 lit/100km we can calculate the number of lit the five vans consume yearly and the energy consumption.

5 vans <7.5 – 12.5 ton:

Extra km covered from transporters as they can't find a free loading/unloading place to park:

6km x 0.3 lit/Km/vehicle =1.8 lit/day

1.8 x 300 days = 540 lit/year

Yearly energy consumption for the extra km covered:

540 lit x 35 MJ/lit =18900 MJ/lit

For a 30% reduction of the distance covered, the perspective numbers are:

4.2km x 0.16 lit/Km/vehicle = 0.672 lit/day

0.672 x 300 days = 201.60 lit/year

Estimated yearly energy consumption after the measure's implementation:

201.60 lit x 35 MJ/lit =7056 MJ/lit

Considering that a 7.5ton van normally consumes 25 lit/100km we can calculate the number of lit the two vans consume yearly and the energy consumption

2 vans <7.5 ton:
Extra km covered from transporters as they can't find a free loading/unloading place to park:
2km x 0.25 lit/Km/vehicle = 0.5 lit/day
0.5 x 300 days = 150 lit/year

Yearly energy consumption for the extra km covered:
150 lit x 35 MJ/lit =5250MJ/lit

For a 30% reduction of the distance covered, the perspective numbers are:
1.4km x 0.16 lit/Km/vehicle = 0.224 lit/day
0.224 x 300 days = 67.20 lit/year

Estimated yearly energy consumption after the measure's implementation:
67.20 lit x 35 MJ/lit =2352 MJ/lit

Extra yearly energy consumption:
18480+18900+5250 = 42630 MJ/lit

Estimated yearly energy consumption after the measure's implementation:
12936+7056+2352 = 22344 MJ/lit (20286 MJ/lit less)

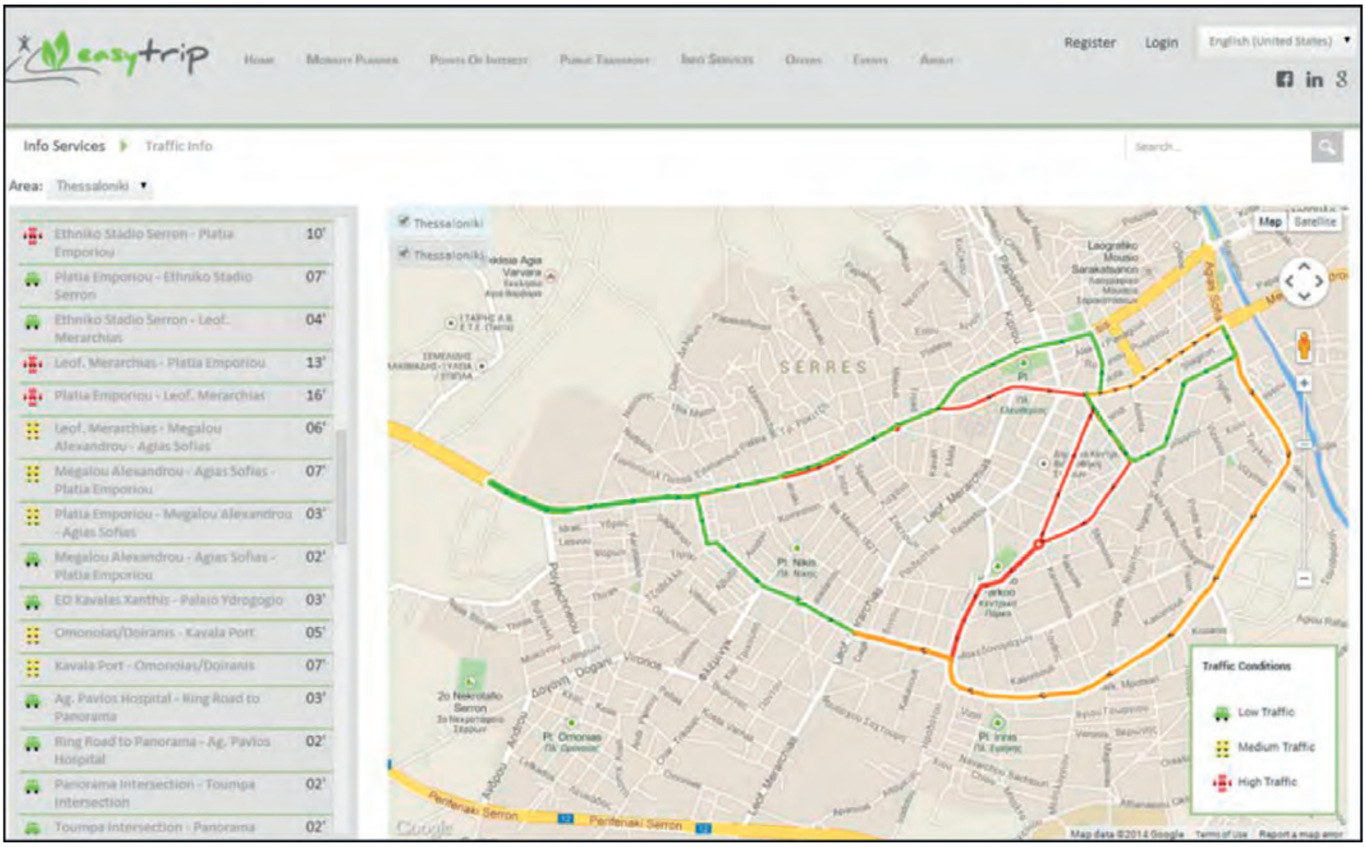
4.4.2 ROUTES' OPTIMIZATION THROUGH THE PROVISION OF REAL TIME TRAFFIC SYSTEM

Requirements for the implementation of the measure The aim of this measure is to improve the time and service reliability and to reduce the operating costs of transport companies. Route optimization systems process a large number of orders, calculating the most efficient way to implement them. Therefore, all these systems estimate time and resources that will be required for the deliveries and follow specific parameters in order to ensure the system's proper functioning. Such parameters may be speed permission on various axes of the road network, the size and weight of the cargo, delivery hours in customers etc.
The Municipality of Serres can contribute to the implementation of such a measure, by providing information regarding real time travel times in specific routes of the city centre. Information is available both through the Easytrip electronic platform (Figure 5.1) and through the VMS sign located outside the city centre. Therefore, transporters will be able to choose the route which is not congested in order to complete all deliveries.

Infrastructure requirements
The measure does not require the construction of new infrastructure.

Regulations and legal framework
The implementation of this measure should take into account all the relevant Regulatory Decisions regarding the functionality of the city's road network.

Required technological equipment
The technology equipment required concludes an electronic-system-platform which is already available by the Municipality of Serres as mentioned above (Easytrip platform) and wireless traffic counters. Today, four in total wireless traffic counters are installed in several road infrastructure segments (traffic lights, VMS sign). Those counters are connected to a server where



after algorithm procedures travel times for specific routes are estimated. This information is either provided through the platform or through the VMS sign. In order the system to be expanded, the purchase and installation of four to six more traffic counters is necessary. In the future an extra VMS sign would be useful.

Key factors involved in the measure's implementation

The key players involved in the implementation of the measure are the Municipality of Serres and potential users of the system such as transport companies and shopkeepers.

Organisational and managerial context

Responsible for the organization and managing of the platform and the wireless traffic counters will be the Municipality of Serres.

Basic financial requirements for the implementation of the measure

For the implementation of the measure the estimated costs are depicted in the table below.

	Short description	Quantity	Price /Unit	Cost
1	Development of algorithms for routing optimization	1	10.000	10.000
2	Purchase and installation of six wireless traffic counters	6	2.000	12.000
		Net value		22.000
		VAT		5.060
		Total Cost		27.060

Regarding the time needed for the implementation of the measure, it is depicted in the Table below:

Time schedule for the implementation of the measure						
	1st month	2nd month	3rd month	4th month	5th month	6th month
Development of algorithms for routing optimization						
Purchase and installation of wireless traffic counters						

Energy and environmental impacts

It can be estimated that after the measure's implementation, transporters will beable to choose the route which is not congested in order to complete the freightdistribution procedure within the city centre, more easily and reliably. The easeof traffic conditions in specific axes of the road network will result to an increaseof the average speed. Moreover, the operating costs of transport companies willbe reduced.

According to the transporters' answers the total km covered daily from thewarehouses to the loading/unloading places in order to complete all deliverieswithin the city centre are approximately 70km and the overall yearly distance(for 300 work days per year) is 21.000 km. Transporters claim that most of the time, all deliveries are being carried out, under difficult traffic conditions, whereextremely low speeds are observed in the city's road network resulting to anincrease of fuel consumption. They all agree that if they had the chance to getinformed about the prevailing traffic conditions in order to choose when and through which road axis to move, they would certainly use such a service in order to avoid time delays and fuel consumption. In order to estimate the reduction of CO_2 emissions expected from the average speed increase due to the provided information for traffic conditions within the city, the below assumptions were taken into account.

Regarding to CO_2 emissions, for light diesel vans and for an average speed of around 25km / h (distance km covered both in urban and interurban area) these are calculated based on the software COPERT (275gr/Km/vehicle).

Yearly CO_2 emissions in a congested road network (average speed 25 km/hour):

21000 km x 275gr/Km/vehicle = 5.775 ton/year

Yearly CO_2 emissions in a less congested road network (average speed 40 km/hour):

21000 km x 217gr/Km/vehicle = 4.557 ton/year (1218 ton/year CO_2 less)

From the above it is obvious that an increase of the average speed (from 25 to 40 km/hour) results to a 21% reduction of CO_2 emissions

4.5 Long Term Measures

4.5.1 URBAN LOGISTIC CENTER

Requirements for the implementation of the measure

Urban Logistics Centres (ULC) are typically "warehouses" concentrating goods that get grouped and transhipped from large trucks to small vans in order to be delivered in an area close to the centre. ULCs enable logistics companies to distribute goods to an urban area without entering the congested parts of the city. They also give the potential of improving their reliability and of using a fleet of environmentally friendly vehicles especially for areas where the use of trucks may not be allowed.

As mentioned above, among the plans of the Municipality was the establishment of a logistics centre that could be located inside a "Large Vehicles' Parking Lot" owned by the Municipality. In this location, the Municipality aimed to create, among others, organized storage spaces by building a warehouse of about 1,000 square meters to serve carriers. In the context of these plans the company AFETIRIA SA was founded. Unfortunately, various circumstances lead to a problem performance and currently financial checks take place while even the dissolution of the company, is being considered. The infrastructure, however, exists and is remarkable.

Infrastructure requirements
Additional infrastructure is required for the construction of a warehouse of about 1,000 square meters.

Regulations and legal framework
The Urban Logistics Centre should meet all the required standards concerning operation and safety.

Required technological equipment
Initially and in case of limited activity, all the transshipment procedures will be carried out manually. However, for the facilitation of all procedures, the centre should be equipped with the appropriate technological equipment (e.g. small cranes, conveyors, forklifts, storage commodity tracking system, bar code readers, etc.).

Key factors involved in the measure's implementation
The implementation of an urban logistics centre requires cooperation between the Municipality of Serres and the private sector (logistics operator), as well as the Association of Commerce and the Association of transporters of the city.

Organisational and managerial context
Municipality of Serres will define the restrictive regulations concerning the last part of the freight distribution process (from the urban logistics centre to the city centre). Management will be held by private companies (e.g. AFETIRIA) in full cooperation with the Association of Transporters.

	Short description	Quantity	Price /Unit	Cost
1	Construction of a warehouse 2 (1000m)	1	260.000	260.000
2	Office furniture and Equipment	1	20.000	20.000
3	Freight handling equipments	1	20.000	20.000
		Net value		300.000
		VAT		69.000
		Total Cost		369.000

Regarding the time needed for the implementation of the measure, it is depicted in the Table below:

Time schedule for the implementation of the measure				
	1st month	….	8th month	12th month
Construction of a warehouse				
Purchase of equipment				
The warehouse starts operating				

Energy and environmental impacts
The Logistics centre is proposed (as mentioned above) to be constructed inside a "Large Vehicles' Parking Lot" owned by the Municipality, which is located approximately 3.5 km far from the city centre. If the freight distribution procedure will be executed by three diesel vans (instead of ten being used now covering 70 km distance daily), then every vehicle will cover around 14 km for executing 2 trips / day. This estimation is also based on the assumption that all vehicles have an optimized load reaching 90% of full capacity.

According to the transporters' answers the yearly distance (km) covered for the completion of the freight distribution procedure within the city is approximately 21000 km.

Regarding CO^2 emissions, for diesel vans and for an average speed of around 30km / h (distance km covered both in urban and interurban area) these are calculated based on the software COPERT (252gr/Km/vehicle).

Covered distance (km) from warehouses to the main loading/unloading places of

the city centre:

21.000km x 252 gr/Km/vehicle = 5.29ton/year

The use of three instead of ten diesel vans will contribute to CO2 emissions

reduction estimated at:

3 vehicles x 14 km = 42km daily

42 km x 300 days = 12600 km.

Regarding CO2 emissions, for light diesel vans and for an average speed of

around 30km / h (distance km covered both in urban and interurban area) these

are calculated based on the software COPERT (252gr/Km/vehicle).

12600km x 252gr/Km/vehicle = 3.17 ton/year (2.12 ton less)

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Energy savings

Considering that light diesel vans normally consume 16 lit/100km we can calculate the number of lit freight vehicles consume yearly and the energy consumption.

Covered distance (per year) from warehouses to the main loading/unloading places of the city centre:

21.000km x 0.16 lit/Km/vehicle = 3360 lit/year

The calorific power / lit for an average type of fuel (petrol and diesel) is equal to 35MJ/lit.

Yearly energy consumption from the total km covered from warehouses to the city centre: 3360 lit x 35 MJ/lit =117.600 MJ/lit

After the measure's implementation:

12.600km x 0.16 lit/Km/vehicle = 2016 lit/year

Estimated energy consumption: 2016 lit x 35 MJ/lit =70.560 MJ/lit (47.040 MJ/lit less)

5 ROAD MAP TO THE SULP ADOPTION

5.1 Consensus Process

5.1.1 MEETINGS WITH STAKEHOLDERS, ASSOCIATION, CITIZEN

ARE1: 19th June 2013

For the consensus process, several meetings have been performed until today in Serres, starting with the ARE1 meeting that took place in 19th of June 2013, in the premises of Serres Chamber of Commerce, 'George Christides' Hall.

The meeting was organized as part of the ENCLOSE project, by the Municipality of Serres in cooperation with the Serres Chamber of Commerce and attended by thirty two in total participants. Twenty six of them were stakeholders. Seven invited speakers informed the audience about issues related to city logistics. The event was covered by three local TV channels and two local newspapers while a press release was uploaded on the Municipal website. The event's objective was the awareness raising about the challenges of energy efficient and environmentally friendly urban mobility.

The list of local stakeholders included the Municipality of Serres – Technical Works Division, Traffic Planning Department, Planning and Development Department, General secretariat and the City Council –, the Chamber of Commerce, the Hellenic Institute of Transport, the Association of Serres Merchants, the Association of Serres radio taxi, Serres Public Transport Operators, Transporters and Delivery companies. Moreover, many of the project's partners attended the meeting, such as the project's coordinator (MemEx, Italy), the city of Den Bosch (Netherlands) and the city of Lucca (Italy).

1st Closed meeting with stakeholders and Associations: 1st November 2013

In November 1st 2013, a second meeting was organized in the framework of the ENCLOSE project in the premises of the city's Town Hall and was attended by representatives from the Municipality of Serres, the Hellenic Institute of Transport, Transport companies and Shopkeepers.

The purpose of the meeting was to establish a basic understanding of the stakeholders' operations, challenges and problems occur due to the existing freight distribution system operating within the city center. Thus, useful solutions were proposed from all possible stakeholders attending the meeting.

Their opinion was of great importance, as they are directly involved in the city's everyday functionality.

2nd Closed meeting with stakeholders and Associations: 9th May 2014

The second closed meeting between stakeholders and relevant Associations took place in the premises of Serres' Town Hall, attended by representatives from the Municipality of Serres, Transport Companies, the Chamber of Commerce of Serres, the Association of Merchants of the city, the Association of Hotel Owners,

Transport Engineers and Logistics Experts from the Hellenic Institute of Transport and the Traffic Police Department of the city.

The main objective of the meeting was a consensus process regarding a new Regulatory framework for city logistics in the city of Serres, based on a General Sustainable Urban Logistics Plan recommended to be elaborated within the next years.

ARE2: 17th June 2014

In June 17th 2014, the second ARE meeting was organized as part of the ENCLOSE project, by the Municipality of Serres in the premises of Serres Chamber of Commerce, 'George Christides' Hall. It was attended by forty in total participants. The event was covered by local TV channels while a press release was uploaded on the Municipal's website http://www.serres.gr/. The event's

objective was the presentation of the project's progress to the public and the benefits expected to arise for the Municipality of Serres.

The list of local stakeholders included the Municipality of Serres -Technical Works Division, Traffic Planning Department, Planning and Development Department, General secretariat and the City Council-, the Hellenic Institute of Transport, the Association of Civil Engineers, the Association of Architects, the Association of Hotel Owners, Serres Public Transport Operators, Transporters, Delivery companies, and citizens interested in issues related to sustainable urban logistics plans.

The meeting was also attended by the project's coordinator (MemEx, Italy). Finally, Pr. A. Naniopoulos from the Aristotle University of Thessaloniki (Division of Transportation, Infrastructure and Regional Planning Engineering), was presented in the meeting as invited speaker.

5.1.2 ANALYSIS AND DISCUSSION OF IDENTIFIED SOLUTION WITH THE DIFFERENT STAKEHOLDERS

During the above mentioned meetings, both the transporters and the shopkeepers determined the problems of the existing freight distribution procedure related to the loading/unloading places and their inappropriate use by other road network users. The fact that the number of existing loading/unloading places is insufficient in relation to the number of cars, and most of the time these places are illegally occupied by other vehicles -especially during the peak hours-force transporters to circulate within the central road network in order to find a free place to park and complete the delivery process, burdening the city network furthermore. In addition the absence of a specific time window for the deliveries makes the distribution procedure even more complicated as traffic congestion-phenomena are observed all the time.

All the relative Authorities and parties in the Municipality of Serres agreed that specific measures have to be taken into account for the re-organization of the city's supply chain, starting for those that are easily applicable in terms of cost and time needed. The enhancement of loading/unloading places by providing the appropriate signage (horizontal stripping, vertical signs etc) is the first step in order to increase effective use of road infrastructure, reduce traffic congestion in the city centre, protect the environment and finally increase safety for commuters. In parallel, stricter policy measures have to be enforced regarding the use of loading/unloading places, while a collaborative effort should be made by all stakeholders, in order citizens to be informed about the importance of the proper function of these places. Both stakeholders and citizens believe that the illegal occupation of loading/unloading places hampers the whole delivery process, burdens the environment furthermore and creates conditions of traffic congestion.

The above mentioned measures were more detailed specified as follows:

- New places should be implemented within central axes of the road network (Ermou str., G. Papandreou str., Venizelou str., Merarchias str.). Simultaneously, a recording of the problematic -due to constructive failures- loading/unloading places should follow in order simple problems to be solved with the appropriate interventions (e.g. incline changes).
- New Regulations should be prepared regarding the operating hours. For that reason, consultation should take place among all stakeholders and citizens.
- Stricter policy measures should be enforced. The abolishment of Municipal Police the summer of 2013, introduced many problems to the appropriate road

network functionality. Its replacement by a corresponding operator is of great importance in order loading/unloading places to preserve their availability. The City Council should explore all scenarios policing (physical presence of traffic police, development of human resources of the former municipal police).

- Citizens should be further informed for the existence of loading/unloading places, their usage and utility.

The above needs led the Municipality to adapt in the framework of the Enclose project five specific measures which are proposed in the Sustainable Urban Logistics Plan for the city of Serres. These measures are:

Short Term Measures

- Users' Awareness Raising and Information
- Spatial and temporal restrictions

Medium Term Measures

- ICT E-platforms and collaboration between stakeholders in urban freight transport
- Routes' optimization through the provision of real time traffic system

Long Term Measures

- Urban logistic center

The public opinion for the implementation of these measures ended up with specific conclusions:

- The measure that seems to be easily applicable is users' awareness raising and information. According to the public opinion in order the measure to be effective a synergy between all stakeholders is required.
- Spatial and temporal constraints could be a solution to facilitate access to loading/unloading places, but needs a collaborative effort in order citizens to be continuously informed about the utility and functionality of these places.
- Route's optimization through the provision of real time traffic system could improve the time and service reliability, reducing at the same time the operating costs of transport companies.
- The use of ICT-platforms could lead to an exploitation of all loading/unloading places in the best possible way and therefore could contribute to the coordination and planning of trucks' arrivals within the city centre, reducing that way traffic congestion, noise and air environmental pollution.
- The construction of an Urban logistics Center concentrating goods that get grouped and transhipped from large trucks to small vans in order to be delivered in an area close to the centre of Serres, is a highly costly measure which requires strong synergy between public and private sector and respective experience.

5.1.3 MAIN PROBLEMS AND TIMING FOR ADOPTING THE SOLUTION

The existing problems for the adoption of the solution according to the Municipality of Serres and the other relevant authorities are:

- The identification of practices and methods that can persuade citizens to change their attitudes and choose alternative ways to move respecting at the same time all rules governing traffic and parking in a road network.

A lot of effort and time is required in order citizens to adopt responsible behavioural patterns which will finally affect both their daily life and the urban environment.

- The lack of competent bodies for policing all loading/unloading places. The abolishment of the Municipal Police which was responsible for the orderly functioning of the parking places within the city centre introduced a lot of problems in everyday road network functioning. Thus, its replacement by a corresponding body is considered necessary.
- The bureaucratic procedures in order new rules to be regulated acquire lots of time to be completed.
- Luck of funds, especially for the Municipality. Moreover, the economic crisis the country faces during the last five years, gives limited opportunities for investments and participation in new projects.
- Difficulty in creating cooperative schemes between the public and private sector.
- Lack of experience in handling issues related to sustainable urban logistics plans.

5.2 Main Municipality strategies

5.2.1 CONSOLIDATION OF THE SOLUTIONS AND PRIORITIES

The solutions and priorities for the Municipality of Serres are consolidated to thebelow main directions:

- Constant updating of citizens regarding the utility of the proper use of loading/unloading places through campaigns, organization and participation in relevant workshops.
- Identification of new loading/unloading places and – where needed – reformation of the existing ones that are nonfunctional, with the appropriate interventions.
- Establishment of a new Regulatory framework regarding the functioning of loading/unloading places, operating hours, policing etc.
- Close cooperation with the Chamber of Commerce, the Association of merchants, the Association of transporters and other possible stakeholders for making joint decisions in order to adopt over time a Sustainable Urban Logistics Plan, suitable for the needs and requirements of the city.

5.2.2 LOCAL AUTHORITY COMMITMENTS (DECISIONS AND ACTS) SCHEDULE ACTS FOR POSSIBLE ADOPTION

In general, the Municipality of Serres display great commitment and positive attitudes towards solving problems in urban distribution and has already committed that in the next time period decisions will be finalized regarding the solution and priorities of the city logistics issues.

After a very careful analysis of the existing loading places and the needs of the market as well as the traffic and parking conditions in the main road network of the city, specific regulatory decision will be taken from the Municipality Board in order to reform the placement and the number of these spaces and also the operating hours.

Municipality's media sources such as its website, its public relationships office, the local media, the local press, events etc will be used in order to continuously inform citizens regarding the utility of the proper use of loading/unloading places.

Funding sources will be sought through National or European calls in order a very efficient and new technology city logistic system to be implemented.

Moreover, the Sustainable Urban Logistics Plan (final version) -elaborated in the framework of the Enclose project- will be introduced in the Municipal Council in the forthcoming September. The respective decisions for the adoption and implementation of the proposed SULP will be taken at this time period.

5.2.3 MAIN PROBLEMS AND CHALLENGES FOR THE SULP ADOPTION

The adoption of the proposed Sustainable Urban Logistics Plan is likely to be a successful story for the city of Serres under specific circumstances. Problems should be overcome and be challenges not only for local authorities but also for citizens, transporters, shopkeepers and all the other possible stakeholders. It is important the concerns of different stakeholders to be recognized and fully be understood in order to successfully implement city logistics policies.

The issue of enforcement should be solved and certain policies should be introduced. Local authorities must take the risks and try to change the embedded behaviour patterns of car and truck drivers without thinking the political costs or the negative reactions.

Regulations concerning freight distributions should be realistic, with clear objectives and procedures and should provide alternatives. Time windows and parking policies should be revised and adapted to the city's needs.

A close coordination between actors in the supply chain is required.

Finally, it is of great importance all the proposed measures to be embedded in a general Sustainable Urban Mobility Plan of the city.

6 CONCLUSIONS

The main objective of the study was to define the potential application of urban logistics soft policy measures in the city of Serres. For this reason, a four step procedure was followed in order all the appropriate data to be contacted and analysed and specific results and next steps to be specified.

The freight vehicles traffic volumes measured in certain selected locations of the reference region revealed that there is a significant number of freight vehicles affecting all main axis of the city's road network. There are time periods during the day where low speeds and time delays are observed due to the distribution procedure. Therefore, noise and air pollution levels increase, degrading the area's environmental quality as well as the residents' life quality.

The main axis of the road network of Serres are congested during the "peak hours" and there is also an immediate need for the enforcement of strict policy measures to both controlled parking spaces and loading/unloading spaces, as phenomena of illegally parked vehicles and of double parked vehicles (including vans and trucks) along the streets are observed all the time.

The occupation of the relative loading/unloading spaces from private vehicles burdens the city network furthermore highlighting also the lack of public's information on the importance of the proper operation of these spaces without restrictions, the need to raise awareness on sustainable mobility issues and to realize the problems they pose with their illegal behaviour

All the above indicated that the freight transport system of Serres needs to be upgraded. Five measures were ranked as very effective and were classified into short, medium and long term for implementation.

The above mentioned measures can provide environmental upgrade of the urban area.

This improvement will be achieved by reducing unnecessary daily distance covered by transporters due to the occupation of loading/unloading places by illegally parked private vehicles and also due to the delays related to traffic congestion and unregulated parking status of the area.

In particular, the raising of citizens' awareness so as to respect the exclusive use of loading/unloading places and the proper marking, signage and policing of these places will clear up their role in the city's road network and will lead to an overall improvement of urban life quality.

Moreover the use of advanced electronic systems such as electronic platforms providing information about the exact location of all loading/unloading places, capacities and operating hours as well as information about traffic congestion in main axes of the city's road network, estimated travel times etc, will give to shopkeepers and transporters the possibility to organize a reliable and safe freight distribution system. Therefore, a significant reduce is expected to traffic congestion, noise and air environmental pollution.

In what regards the urban logistics centre, it is important to highlight that the benefits will be remarkable in terms of environment and energy savings, but needs time and high investments costs for its implementation.

The adoption of the above proposed measures that are also included in the Sustainable Urban Logistics Plan can become a successful story for the city of Serres under specific circumstances. The problems must be overcome and the challenges shall be answered not only for local authorities but also for citizens, transporters, shopkeepers and all the other possible stakeholders. In order achieve this, the problem must be recognized, the political will must be enhanced and the appropriate financial resources must be found.

REFERENCES

[1] http://el.wikipedia.org/wiki Δήμος_Σερρών

[2] http://el.wikipedia.org/wiki/Σέρρες

[3] maps.google.com

[4] ENCLOSE Project Consortium, Deliverable/D2.2/ "Sustainable logistics in European small-/mid-size historic towns: stakeholders goals and User Needs Analysis", 13/11/2012/V.1.0

[5] http://www.teiser.gr/

[6] http://www.easy-trip.eu

[7] http://invenio.lib.auth.gr/record/101105/files/gri-2008-1169.pdf

[8] http://www.bestufs.net/download/BESTUFS_II/good_practice/Greek_BESTUF S_Guide.pdf

[9] ENCLOSE Project Consortium, Deliverable/D3.1/ "Definition of the pilot measures and redefinition of the performance indicators", 11/01/2013/V.2.0

[10] Climate Protection Agency Sweden, O2.1, Case study Bordeaux, France, Urban delivery of goods with cargo cycles, TRAILBLAZER Project, May 2011

[11] http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/22474/1/co2_report_jrc_format_final2.pdf

ANNEX A - TRAFFIC VOLUMES MEASUREMENTS

POINT 1 : ERMOU - P. MELA (MORNING)																		
	TURNING MOVEMENT 1						TURNING MOVEMENT 2						TURNING MOVEMENT 3					
	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses
07:00-07:15	20		2		1		31	5	2	1	3		11	4			1	
07:15-07:30	18	1	5	2		1	36	4	3	6	4	4	9		2	1		
07:30-07:45	18	2	2	1			48	7	4	3		2	6	4		1		
07:45-08:00	38	1	4	3	1	3	47	6	6	3	3	5	12	4	1	2	1	
Hour Volume	**94**	**4**	**13**	**6**	**2**	**4**	**162**	**22**	**15**	**13**	**10**	**11**	**38**	**12**	**3**	**4**	**2**	**0**
CPU	**94**	**2**	**13**	**6**	**4**	**8**	**162**	**11**	**15**	**13**	**20**	**22**	**38**	**6**	**3**	**4**	**4**	**0**
08:00-08:15	48	3	5	3		1	69	22	10	8	3	4	39	8	5	6		
08:15-08:30	42	7	6	6			66	11	7	11	1	3	21	6	1	1		
08:30-08:45	52	10	4	5	1	1	77	15	6	6	4	2	31	8	4	3		
08:45-09:00	49	11	2	8	2	1	78	17	7	9	5	2	27	12	3	5		
Hour Volume	**191**	**31**	**17**	**22**	**3**	**3**	**290**	**65**	**30**	**34**	**13**	**11**	**118**	**34**	**13**	**15**	**0**	**0**
CPU	**191**	**15**	**17**	**22**	**6**	**6**	**290**	**32**	**30**	**34**	**26**	**22**	**118**	**17**	**13**	**15**	**0**	**0**
09:00-09:15	46	12		11	3	1	78	19	7	11	5	2	22	16	1	7		
09:15-09:30	48	7		7	2		86	30	1	8	6	2	20	9		3		
09:30-09:45	38	10	5	3		1	81	21	6	8	2	2	18	7	3	2	1	
09:45-10:00	54	13	4	4			74	19	4	9	3	3	27	12	3	3		
Hour Volume	**186**	**42**	**9**	**25**	**5**	**2**	**319**	**89**	**18**	**36**	**16**	**9**	**87**	**44**	**7**	**15**	**1**	**0**
CPU	**186**	**21**	**9**	**25**	**10**	**4**	**319**	**44**	**18**	**36**	**32**	**18**	**87**	**22**	**7**	**15**	**2**	**0**
10:00-10:15	42	17	2	7		1	64	18	8	7	3	2	26	8	5	3	1	
10:15-10:30	46	23		10			62	32		15	1	3	28	18	1	7		
10:30-10:45	44	19	5	8	1	1	76	20	3	6	5	2	25	18	1	2	1	
10:45-11:00	44	18	5	5	1	0.5	70	27	3	9	3	2	24	13	1	2	1	
Hour Volume	**176**	**77**	**12**	**30**	**2**	**3**	**272**	**97**	**14**	**37**	**12**	**9**	**103**	**57**	**8**	**14**	**3**	**0**
CPU	**176**	**38**	**12**	**30**	**4**	**6**	**272**	**48**	**14**	**37**	**24**	**18**	**103**	**28**	**8**	**14**	**6**	**0**
11:00-11:15	44	17	4	2			63	33	2	12	1	2	22	7	1	1		
11:15-11:30	52	10	7	2			57	24	5	3	1	2	22	19	4	1		
11:30-11:45	41	16	1	2	2	1	78	23	6	5	3	2	30	9		1		
11:45-12:00	43	26	4	2	3		84	15	6	8	3	2	21	29	5	3	1	
Hour Volume	**180**	**69**	**16**	**8**	**5**	**1**	**282**	**95**	**19**	**28**	**8**	**8**	**95**	**64**	**10**	**6**	**1**	**0**
CPU	**180**	**35**	**16**	**8**	**10**	**2**	**282**	**47**	**19**	**28**	**16**	**16**	**95**	**32**	**10**	**6**	**2**	**0**
12:00-12:15	46	20	6	4	1	1	59	30	5	8	3	2	21	20	3	4		
12:15-12:30	38	19	8	1	1		64	20	8	8		2	27	1	1	1		
12:30-12:45	48	27	5	6	1	1	70	41	6	8		3	25	27		4		
12:45-13:00	34	18	1	6		1	66	22	5	3	2	2	29	25	2	4		
Hour Volume	**166**	**84**	**20**	**17**	**3**	**3**	**259**	**113**	**24**	**27**	**5**	**9**	**102**	**73**	**6**	**13**	**0**	**0**
CPU	**166**	**42**	**20**	**17**	**6**	**6**	**259**	**56**	**24**	**27**	**10**	**18**	**102**	**36**	**6**	**13**	**0**	**0**
13:00-13:15	31	23	1		1		61	31	3	6	2	2	16	24	8	1		
13:15-13:30	41	14	4	3	1		57	21	4	9	3	2	24	24	3	3		
13:30-13:45	48	16	4	6		1	72	23	8	7		2	25	15	1	1		
13:45-14:00	47	16	4	7	1	1	71	30	9	5	1	2	26	19	1	2		
Hour Volume	**167**	**69**	**13**	**16**	**3**	**2**	**261**	**105**	**24**	**27**	**6**	**8**	**91**	**82**	**13**	**7**	**0**	**0**
CPU	**167**	**37**	**13**	**16**	**6**	**4**	**261**	**52**	**24**	**27**	**12**	**16**	**91**	**41**	**13**	**7**	**0**	**0**
TOTAL	**1160**	**376**	**100**	**124**	**23**	**18**	**1845**	**586**	**144**	**202**	**70**	**65**	**634**	**366**	**60**	**74**	**7**	**0**
TOTAL CPU	**1160**	**190**	**100**	**124**	**46**	**36**	**1845**	**290**	**144**	**202**	**140**	**130**	**634**	**182**	**60**	**74**	**14**	**0**

POINT 1 : ERMOU - P. MELA (AFTERNOON)																		
	TURNING MOVEMENT 1						TURNING MOVEMENT 2						TURNING MOVEMENT 3					
	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses
14:00-14:15	46	15	3	7	3	1	71	37	11	2	2	3	28	23	1	3	0	0
14:15-14:30	43	25	9	4	0	0	80	16	2	6	2	2	38	16	3	2	0	0
14:30-14:45	39	13	1	4	1	0	66	22	5	5	0	2	37	14	2	2	0	0
14:45-15:00	39	19	3	1	1	0	78	21	7	4	2	3	32	22	1	2	1	0
Hour Volume	**167**	**72**	**16**	**16**	**5**	**1**	**295**	**96**	**25**	**17**	**6**	**10**	**135**	**75**	**7**	**9**	**1**	**0**
CPU	**167**	**36**	**16**	**16**	**10**	**2**	**295**	**48**	**25**	**17**	**12**	**20**	**135**	**37**	**7**	**9**	**2**	**0**
15:00-15:15	35	9	3	2	1	0	74	23	7	2	1	4	27	11	1	1	1	0
15:15-15:30	37	12	2	1	0	0	76	14	5	3	2	1	16	12	3	0	0	0
15:30-15:45	39	3	3	1	0	0	74	17	5	2	2	1	25	13	1	0	0	0
15:45-16:00	34	6	3	1	0	0	72	15	6	2	1	1	20	11	1	0	0	0
Hour Volume	**145**	**30**	**11**	**5**	**1**	**0**	**296**	**69**	**23**	**9**	**6**	**7**	**88**	**47**	**6**	**1**	**1**	**0**
CPU	**145**	**15**	**11**	**5**	**2**	**0**	**296**	**34**	**23**	**9**	**12**	**14**	**88**	**23**	**6**	**1**	**2**	**0**
16:00-16:15	29	9	3	0	0	0	70	12	6	2	0	1	14	9	1	0	0	0
16:15-16:30	39	11	2	2	0	0	61	14	2	2	1	2	17	9	0	0	0	0
16:30-16:45	30	6	1	2	1	0	63	8	2	3	0	1	13	14	0	1	0	0
16:45-17:00	40	5	1	0	1	0	84	16	2	1	0	1	18	12	1	0	0	0
Hour Volume	**138**	**31**	**7**	**4**	**2**	**0**	**278**	**50**	**12**	**8**	**1**	**5**	**62**	**44**	**2**	**1**	**0**	**0**
CPU	**138**	**15**	**7**	**4**	**4**	**0**	**278**	**25**	**12**	**8**	**2**	**10**	**62**	**22**	**2**	**1**	**0**	**0**
17:00-17:15	37	7	3	1	0	0	84	15	8	2	1	1	8	13	1	0	0	0
17:15-17:30	37	7	1	2	1	0	96	17	7	3	0	2	22	7	1	0	0	0
17:30-17:45	32	12	1	2	0	0	83	22	2	3	0	1	34	8	0	0	0	0
17:45-18:00	37	20	1	1	1	0	93	27	3	4	1	2	35	13	1	1	0	0
Hour Volume	**143**	**46**	**6**	**6**	**2**	**0**	**356**	**81**	**20**	**12**	**2**	**6**	**99**	**41**	**3**	**1**	**0**	**0**
CPU	**143**	**23**	**6**	**6**	**4**	**0**	**356**	**40**	**20**	**12**	**4**	**12**	**99**	**20**	**3**	**1**	**0**	**0**
18:00-18:15	41	27	1	1	1	0	102	31	3	4	1	2	36	18	1	2	0	0
18:15-18:30	63	12	0	2	0	0	88	31	5	5	1	1	34	8	1	1	1	0
18:30-18:45	59	20	4	0	0	0	94	33	3	3	0	1	48	14	3	1	0	0
18:45-19:00	72	17	1	4	0	0	84	27	3	3	0	2	24	27	5	1	0	0
Hour Volume	**235**	**76**	**6**	**7**	**1**	**0**	**368**	**122**	**14**	**15**	**2**	**6**	**142**	**67**	**10**	**5**	**1**	**0**
CPU	**235**	**38**	**6**	**7**	**2**	**0**	**368**	**71**	**14**	**15**	**4**	**12**	**142**	**33**	**10**	**5**	**2**	**0**
19:00-19:15	43	15	1	1	0	0	103	28	5	2	1	3	38	18	1	0	0	0
19:15-19:30	76	14	2	1	0	0	98	21	2	2	0	2	30	18	1	2	0	0
19:30-19:45	40	16	1	4	0	0	84	36	9	1	1	2	38	17	4	1	0	0
19:45-20:00	76	21	4	6	0	0	75	17	4	3	1	1	40	17	0	1	0	0
Hour Volume	**235**	**66**	**8**	**12**	**0**	**0**	**360**	**102**	**20**	**8**	**3**	**8**	**146**	**70**	**6**	**4**	**0**	**0**
CPU	**235**	**33**	**8**	**12**	**0**	**0**	**360**	**51**	**20**	**8**	**6**	**16**	**146**	**35**	**6**	**4**	**0**	**0**
20:00-20:15	61	20	3	2	0	0	81	25	5	1	0	2	34	15	0	2	0	0
20:15-20:30	50	16	5	1	0	0	79	31	7	4	1	1	34	21	1	3	0	0
20:30-20:45	54	21	1	0	0	0	67	19	2	0	0	2	28	13	1	0	0	0
20:45-21:00	52	19	3	1	0	0	73	25	5	2	1	2	31	17	1	2	0	0
Hour Volume	**217**	**76**	**12**	**4**	**0**	**0**	**300**	**100**	**19**	**7**	**2**	**7**	**127**	**66**	**3**	**7**	**0**	**0**
CPU	**217**	**38**	**12**	**4**	**0**	**0**	**300**	**50**	**19**	**7**	**4**	**14**	**127**	**33**	**3**	**7**	**0**	**0**
TOTAL	**1280**	**397**	**66**	**54**	**11**	**1**	**2253**	**620**	**133**	**76**	**22**	**49**	**799**	**410**	**37**	**28**	**3**	**0**
TOTAL CPU	**1280**	**198**	**66**	**54**	**22**	**2**	**2253**	**310**	**133**	**76**	**44**	**98**	**799**	**205**	**37**	**28**	**6**	**0**

POINT 2 : ERMOU-M. ANDRONIKOU (MORNING)	TURNING MOVEMENT 1						TURNING MOVEMENT 2						TURNING MOVEMENT 3					
	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses
07:00-07:15	44	8	2	1	1	0	20	0	0	2	1	0	3	0	1	1	0	1
07:15-07:30	46	5	4	5	6	3	12	1	2	2	0	0	0	1	0	0	0	1
07:30-07:45	66	11	9	4	0	3	21	4	1	0	0	1	2	3	1	0	0	1
07:45-08:00	64	9	13	4	3	7	23	1	2	3	0	0	1	1	0	0	0	1
Hour Volume	**220**	**33**	**28**	**14**	**10**	**13**	**76**	**6**	**5**	**7**	**1**	**1**	**6**	**5**	**2**	**1**	**0**	**4**
CPU	**220**	**16**	**28**	**14**	**20**	**26**	**76**	**3**	**5**	**7**	**2**	**2**	**6**	**2**	**2**			
08:00-08:15	68	9	9	8	2	3	37	6	7	3	0	1	0	1	0	0	0	2
08:15-08:30	79	20	20	7	0	3	47	5	5	1	1	0	4	4	0	0	0	1
08:30-08:45	99	19	17	10	4	2	64	5	6	3	0	1	1	3	0	1	0	1
08:45-09:00	94	19	15	9	3	2	55	6	6	5	2	1	2	2	1	1	0	2
Hour Volume	**340**	**67**	**61**	**34**	**9**	**10**	**203**	**22**	**24**	**12**	**3**	**3**	**7**	**10**	**1**	**2**	**0**	**6**
CPU	**340**	**33**	**61**	**34**	**18**	**20**	**203**	**11**	**24**	**12**	**6**	**6**	**7**	**5**	**1**	**2**	**0**	**12**
09:00-09:15	88	19	12	8	2	2	46	7	5	7	3	1	3	1	1	0	0	2
09:15-09:30	107	29	7	7	5	2	46	11	5	3	3	0	2	5	0	0	0	1
09:30-09:45	93	22	9	6	0	2	38	9	4	6	0	1	2	4	0	0	0	1
09:45-10:00	108	23	15	7	2	2	47	7	5	1	4	0	0	3	0	0	0	1
Hour Volume	**396**	**93**	**43**	**28**	**9**	**8**	**177**	**34**	**19**	**17**	**10**	**2**	**7**	**13**	**1**	**0**	**0**	**5**
CPU	**396**	**46**	**43**	**28**	**18**	**16**	**177**	**17**	**19**	**17**	**20**	**4**	**7**	**6**	**1**	**0**	**0**	**10**
10:00-10:15	79	23	13	5	2	2	37	9	9	1	0	1	3	2	0	0	0	1
10:15-10:30	78	35	12	9	5	2	35	13	5	0	0	0	4	4	0	0	0	2
10:30-10:45	87	34	11	6	4	2	55	7	6	2	2	1	3	2	0	1	0	1
10:45-11:00	84	34	12	6	3	2	48	9	5	3	1	1	3	2	0	1	0	1
Hour Volume	**328**	**126**	**48**	**26**	**14**	**8**	**175**	**38**	**25**	**6**	**3**	**3**	**13**	**10**	**0**	**2**	**0**	**5**
CPU	**328**	**63**	**48**	**26**	**28**	**16**	**175**	**76**	**25**	**6**	**6**	**6**	**13**	**5**	**0**	**2**	**0**	**10**
11:00-11:15	80	34	13	6	2	2	40	10	3	3	0	0	2	2	0	1	0	1
11:15-11:30	72	36	9	2	0	2	58	16	9	5	1	0	4	2	0	0	0	1
11:30-11:45	95	22	5	7	5	2	46	10	5	4	2	1	2	2	0	0	0	2
11:45-12:00	96	44	10	9	2	2	37	12	3	3	3	0	2	3	1	0	0	1
Hour Volume	**343**	**136**	**37**	**24**	**9**	**8**	**181**	**48**	**20**	**15**	**6**	**1**	**10**	**9**	**1**	**1**	**0**	**5**
CPU	**343**	**68**	**37**	**24**	**18**	**16**	**181**	**24**	**20**	**15**	**12**	**2**	**10**	**4**	**1**	**1**	**0**	**10**
12:00-12:15	81	31	13	8	5	2	44	12	5	3	0	1	4	3	0	0	0	1
12:15-12:30	87	39	16	6	1	2	37	14	4	0	0	0	2	2	0	0	0	1
12:30-12:45	74	39	14	8	0	3	44	14	2	4	0	1	0	4	0	0	0	1
12:45-13:00	84	37	7	8	1	2	49	20	3	3	0	1	1	5	0	0	0	2
Hour Volume	**326**	**146**	**50**	**30**	**7**	**9**	**174**	**60**	**14**	**10**	**0**	**3**	**7**	**14**	**0**	**0**	**0**	**5**
CPU	**326**	**73**	**50**	**30**	**14**	**18**	**174**	**30**	**14**	**10**	**0**	**6**	**7**	**7**	**0**	**0**	**0**	**10**
13:00-13:15	67	33	9	8	0	2	48	20	6	1	0	0	4	2	0	0	0	1
13:15-13:30	73	35	6	9	4	2	49	14	5	2	1	0	0	6	0	0	0	1
13:30-13:45	93	32	14	4	0	2	48	17	4	6	0	1	2	3	1	0	0	1
13:45-14:00	98	41	13	5	1	3	54	26	5	8	1	1	4	3	1	0	0	1
Hour Volume	**331**	**141**	**42**	**26**	**5**	**9**	**199**	**77**	**20**	**17**	**2**	**2**	**10**	**14**	**2**	**0**	**0**	**4**
CPU	**331**	**70**	**42**	**26**	**10**	**18**	**199**	**37**	**20**	**17**	**4**	**4**	**10**	**7**	**2**	**0**	**0**	**8**
TOTAL	**2284**	**742**	**309**	**182**	**63**	**65**	**1185**	**285**	**127**	**84**	**25**	**15**	**60**	**75**	**7**	**6**	**0**	**34**
TOTAL CPU	**2284**	**369**	**309**	**182**	**126**	**130**	**1185**	**198**	**127**	**84**	**50**	**30**	**60**	**36**	**7**	**6**	**0**	**68**

POINT 2 : ERMOU-M. ANDRONIKOU (AFTERNOON)																		
	TURNING MOVEMENT 1						TURNING MOVEMENT 2						TURNING MOVEMENT 3					
	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses	Private Cars	Two Wheeler Vehicles	Small Vans	Large Vans	Vans	Buses
14:00-14:15	102	50	13	5	1	3	59	35	5	10	2		5	2				1
14:15-14:30	92	38	5	7	3	1	72	27	4	7			2	4			1	2
14:30-14:45	103	47	7	7	1	2	55	25	4	4	2		5	12				1
14:45-15:00	94	25	9	4	3	3	54	24	3	1	1		3	3				1
Hour Volume	**391**	**160**	**34**	**23**	**8**	**9**	**240**	**111**	**16**	**22**	**5**	**0**	**15**	**21**	**0**	**0**	**1**	**5**
CPU	**391**	**80**	**34**	**23**	**16**	**18**	**240**	**55**	**16**	**22**	**10**	**0**	**15**	**10**	**0**	**0**	**2**	**10**
15:00-15:15	100	26	9	4	3	4	39	19	4		1		1	3				1
15:15-15:30	85	20	7	2	2	1	38	22	5		1			3				2
15:30-15:45	91	19	5	1	2	1	49	11	1	1			4	3	1			1
15:45-16:00	86	18	5	2	2	1	46	16	2	1	0	0	4	4	1	0	0	1
Hour Volume	**362**	**83**	**26**	**9**	**9**	**7**	**172**	**68**	**12**	**2**	**2**	**0**	**9**	**13**	**2**	**0**	**0**	**5**
CPU	**362**	**41**	**26**	**9**	**4**	**3**	**172**	**34**	**12**	**2**	**4**	**0**	**9**	**6**	**2**	**0**	**0**	**10**
16:00-16:15	80	17	5	2	1	1	42	20	3	1			3	4	1			1
16:15-16:30	81	15	1	2		2	31	13	3	1	1	1		3				2
16:30-16:45	74	14	5	2		2	35	8	1	1	1	1	1	2				1
16:45-17:00	90	24	5	1	1	1	46	11	1	1			1	1		1		2
Hour Volume	**325**	**70**	**16**	**7**	**2**	**6**	**154**	**52**	**8**	**4**	**2**	**2**	**5**	**10**	**1**	**1**	**0**	**6**
CPU	**325**	**35**	**16**	**7**	**4**	**12**	**154**	**26**	**8**	**4**	**4**	**4**	**5**	**5**	**1**	**1**	**0**	**12**
17:00-17:15	83	21	11	2		1	41	7	2				2	4				1
17:15-17:30	102	18	7	1	2	2	41	11	4		2			5	1			2
17:30-17:45	113	27	3	4	1	1	43	8		2				2				
17:45-18:00	120	38	4	5	2	2	59	17	2	1	1	0	3	4	0	0	0	1
Hour Volume	**418**	**104**	**25**	**12**	**5**	**6**	**184**	**43**	**8**	**3**	**3**	**0**	**5**	**15**	**1**	**0**	**0**	**4**
CPU	**418**	**52**	**25**	**12**	**10**	**12**	**184**	**21**	**8**	**3**	**6**	**0**	**5**	**7**	**1**	**0**	**0**	**8**
18:00-18:15	126	49	5	5	2	2	74	26	3		1		6	5				1
18:15-18:30	101	27	5	7	2	1	63	14	1	1			2	6				2
18:30-18:45	128	38	9	3		1	61	25	4				2	3				1
18:45-19:00	106	34	6	1		2	44	13	6	5	1		1	4	1			1
Hour Volume	**461**	**148**	**25**	**16**	**4**	**6**	**242**	**78**	**14**	**6**	**2**	**0**	**11**	**18**	**1**	**0**	**0**	**5**
CPU	**461**	**74**	**25**	**16**	**8**	**12**	**242**	**38**	**14**	**6**	**4**	**0**	**11**	**9**	**1**	**0**	**0**	**10**
19:00-19:15	118	43	7	1	2	3	66	26	2	1			2	3				1
19:15-19:30	107	28	3	1		2	66	27	4				2	3				1
19:30-19:45	109	53	11	3	1	1	56	20	2	3			1	4				2
19:45-20:00	98	36	9	2	3	2	55	19	2	1				5				1
Hour Volume	**432**	**160**	**30**	**7**	**6**	**8**	**243**	**92**	**10**	**5**	**0**	**0**	**5**	**15**	**0**	**0**	**0**	**5**
CPU	**432**	**80**	**30**	**7**	**12**	**16**	**243**	**46**	**10**	**5**	**0**	**0**	**5**	**7**	**0**	**0**	**0**	**10**
20:00-20:15	98	32	7	3	1	2	84	19	2	1			1	4				1
20:15-20:30	103	33	12	1	1	2	51	16	7	1		1		2				1
20:30-20:45	92	29	5			2	65	19					3	7		1		1
20:45-21:00	98	31	9	1	1	2	58	18	4	1	0	1	1	5	0	1	0	1
Hour Volume	**391**	**125**	**33**	**5**	**3**	**8**	**258**	**72**	**13**	**3**	**0**	**2**	**5**	**18**	**0**	**2**	**0**	**4**
CPU	**391**	**62**	**33**	**5**	**6**	**16**	**258**	**36**	**13**	**3**	**0**	**4**	**5**	**36**	**0**	**2**	**0**	**8**
TOTAL	**2780**	**850**	**189**	**79**	**37**	**50**	**1493**	**516**	**81**	**45**	**14**	**4**	**55**	**110**	**5**	**3**	**1**	**34**
TOTAL CPU	**2780**	**425**	**189**	**79**	**74**	**100**	**1493**	**258**	**81**	**45**	**28**	**8**	**55**	**55**	**5**	**3**	**2**	**68**

ANNEX B - SHOP KEEPERS' QUESTIONNAIRE

QUESTIONNAIRE IN SHOPKEEPERS OF ERMOY STREET

A. COMPANY PROFILE

Company name	
Address	
City	
Postcode	
Tel.number	
Contact name	
E-Mail	

A1. COMPANY TYPE

Personal Company	
Store chain	
Franchising	
Dealership	
Other	

A2. STORE TYPE (e.g. drugstore, bookstore, etc)

……………………………………

A3. PREMISES:

a) Privately own ☐ b) Rented ☐

B. DELIVERY

B1. Frequency and delivery unit

a) Daily	b) 3-4 / week	c) 1-3 / week	d) 1-2 /month	e) Other Please describe: ……………………………………
Delivery unit *a) Boxes* ☐ *b) Pallets* ☐ *c) Other* ☐ *Please describe:* …………………………………………… *Average delivery (pieces)* ……………………………	Delivery unit *a) Boxes* ☐ *b) Pallets* ☐ *c) Other* ☐ *Please describe:* …………………………………………… *Average delivery (pieces)* ……………………………	Delivery unit *a) Boxes* ☐ *b) Pallets* ☐ *c) Other* ☐ *Please describe:* …………………………………………… *Average delivery (pieces)* ……………………………	Delivery unit *a) Boxes* ☐ *b) Pallets* ☐ *c) Other* ☐ *Please describe:* …………………………………………… *Average delivery (pieces)* ……………………………	Delivery unit *a) Boxes* ☐ *b) Pallets* ☐ *c) Other* ☐ *Please describe:* …………………………………………… *Average delivery (pieces)* ……………………………

B2. Loading/Unloading usual time

a) 07:00-09:00 ☐

b) 09:00-11:00 ☐

c) 11:00-13:00 ☐

d) Other ☐

Please describe: ………………………………………….

B3. Delivery transport mean

a) Transport company ☐

b) Suppliers ☐

c) Transfer by own means ☐

d) Other ☐

Please describe: ………………………………………….

B4. Loading/Unloading type of vehicle

a) Conventional ☐

b) Fridge ☐

c) Open platform ☐

d) Other ☐

Please describe: ………………………………………….

B5. Vehicle type per weight

a) Biaxial truck t<3,5 ☐ 

b) Large Biaxial truck ☐ 

c) Triaxial truck ☐ 

d) Multiaxis truck ☐ 

B7. Assessment of Loading/Unloading time

a) 5-10 min ☐

b) 10- 20 min ☐

c) 20- 30 min ☐

d) Other ☐

B8. Capture of loading/unloading spaces by illegally parked vehicles

a) Daily ☐

b) Very often ☐

c) Often ☐

d) Rarely ☐

B9. Factors enhancing loading/unloading spaces

a) Better signage ☐

b) Law enforcement ☐

c) Raising drivers' awareness ☐

d) Reducing parking cost ☐

e) Other ☐

C. USING NEW TECHNOLOGIES

C1. How familiar are you with technology (computers, Internet services on mobile phones, etc.)

a) Too much ☐

b) Enough ☐

c) Few ☐

d) Not at all ☐

C2. Would you be interested in using an online platform through which you could book the loading space for a specified period?

a) Too much ☐

b) Enough ☐

c) Few ☐

d) Not at all ☐

C3. Do you think the use of such a system would bring positive effects throughout the distribution process of products?

a) Yes ☐ b) No ☐

C4. If your answer is "No" please explain why you believe that this system will not yield.

……

……

<u>D. TRAVEL INFORMATION</u>

D1. Way of travel to/from your store

a) Car as a driver ☐

b) Car as a passenger ☐

c) Bus ☐

d) Motorbike ☐

e) Bicycle ☐

f) On foot ☐

g) Other ☐

D2. What are the main problems arising during your trip?

a) Long waiting time ☐

b) Long travel time ☐

c) Many delays ☐

d) Difficulty in finding parking ☐

If you use car or bike go to question D3 otherwise you have completed the questionnaire

D3. Where do you park your vehicle

a) Private/public parking station ☐
b) Legally in front of my store ☐
c) Illegally in front of my store ☐
d) Legally on adjacent streets ☐
e) Illegally on adjacent streets ☐
f) Other……………………………………………………………………………

D4. What are the main reasons for not using parking stations?

a) There isn't any other nearby ☐
b) Too expensive for daily use ☐
c) There are no available spaces ☐

D5. If you were given the opportunity to park in public/ private station with specific payment terms would you choose it?

a) Yes ☐ b) No ☐

If your answer is "No" please explain why:

…………………………………………………………………………………

D6. Up to what amount are you willing to pay for the provision of the above services?

a) 40€/ month ☐
b) 50€/ month ☐
c) 60/ month ☐

d) Other……

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ENergy efficiency in City LOgistics Services for small and mid-sized European historic towns

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TRONDHEIM

SUSTAINABLE URBAN LOGISTICS PLAN

ENCLOSE project
Deliverable 3.6
SULP "Sustainable Urban Logistics Plan"
WP3 - T3.3 Local assessment of mobility and energy benefits: development of Sustainable Urban Logistics Plans in the 9 ENCLOSE towns

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Circulation
Public

Date
19.10.2014

posten

TRONDHEIM

SUSTAINABLE URBAN LOGISTICS PLAN

DOCUMENT STRUCTURE

1. INTRODUCTION

Norway Post, by the region of Mid-Norway and the local Trondheim Post administration, is a partner of the ENCLOSE project. Trondheim, by Posten Norge, are 1 of 9 cities participating the ENCLOSE project, and among these cities Trondheim has as role as a forerunner city to share experiences and knowledge from implemented environmentally services with the follower cities and other stakeholders. The participation of Posten Norge Trondheim in the ENCLOSE project are supported by the Mayor of Trondheim, Rita Ottervik, and over years Trondheim Municipality and Posten have worked as partners to reach ambitious goals for reduction of CO2-emissions in Trondheim.

This Sustainable Urban Logistics Plan is a plan worked out by Posten Trondheim. The plan will be presented for Trondheim Municipality as a contribution to the Municipality to their continuous work to reduce emissions from transport actors.

2. ABOUT TRONDHEIM, ENVIRONMENTAL WORK IN TRONDHEIM MUNICIPALITY AND ENVIRONMENTAL WORK IN NORWAY POST COMPANY

2.1 About Trondheim

Trondheim is the 3trd biggest city in Norway with 180 000 inhabitants (2013). Trondheim is located in the middle of Norway by the Trondheim fjord, and is the regional capital of Trøndelag region. The University in Trondheim (NTNU) is the most important university in Norway for technical studies. Nidaros Cathedral is the biggest cathedral in Norway, and the main tourist attraction in the city. Many tourists visit Trondheim each year by Hurtigruten, a cruise line from Bergen to Kirkenes with daily arrivals to Trondheim.

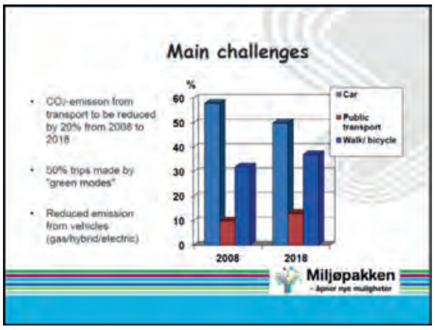
Trondheim Municipality covers an area of 342 m2. The inner city center of Trondheim is surrounded by the river Nidelva and the Trondheim fjord. This area has been the study area for Posten Trondheim in the ENCLOSE project - to make the postal distribution services CO2-free.

2.2 Environmental work in Trondheim Municipality

2.2.1 "MILJØPAKKEN"/GREENER TRONDHEIM

Trondheim Municipality have established an organization, "Miljøpakken", to take actions on several areas in Trondheim to support the overall environmental work. "Miljøpakken" ("Greener Trondheim") is a political agreement between local, regional and national political levels with specific goals, a finance plan and defined areas for actions. The main goals for Miljøpakken related to transport and logistics are:

a) to reduce CO2-emissions from transport with 20 % from 2008 till 2018
b) the proportion traveling by sustainable transportation (walking, cycling and public transport) shall increase to 50% of all trips by 2018 (from 42% in 2008). The proportion traveling by private car shall be reduced to 50% by 2018 (from the current 58%), and a significant portion of vehicle travels shall be conducted with vehicles with low emissions



c) Congestion of public transport should be improved. Average speed should increase by 25% by 2010 in the central city areas. By 2018 the rate should be increased by 15% in other parts of the entire regular grid and the rate will increase further in the central metropolitan areas.
d) Direct greenhouse gas emissions from transport in Trondheim municipality's own business should be reduced by 40%.
e) Trondheim municipality will work hard to ensure that the private sector, public authorities and businesses, public transport providers and the taxi industry to implement measures similar ambitious targets for emissions reduction.

The main action to reduce the CO2-emissions from transport has been to develop the public transport system. The ATB company, who are responsible for the bus public transport in Trondheim, in their annual report for 2012 reported their bus-fleet to have more than 200 LNG-gas buses, 10 hybrid buses and 30 biodiesel buses. In 3 years (2009-2012) the public transport have increased by 22 % in Trondheim, mainly because of road taxes for using private cars, reduction of bus ticket prices and a better bus service.

In April 2013 an evaluation report for the goals in "Miljøpakken" was made. The main conclusions was:

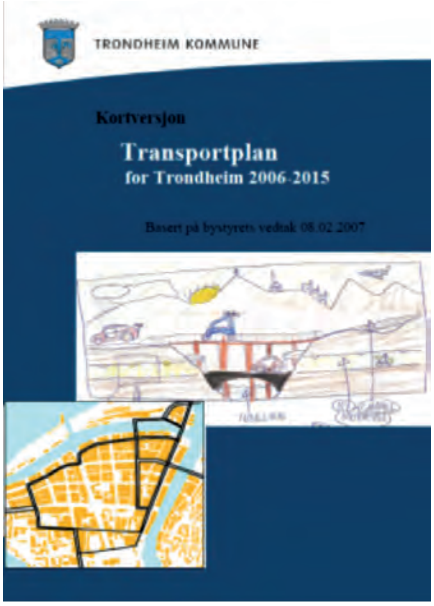
a) Trondheim Municipality are on their way to reduce CO2-emissions from transport with 20 % from 2008 ti ll 2018
b) The proportion travelling by sustainable transportation has not been possible to measure. As mentioned above the public transport has increased by 22 % from 2009 – 2012, but this includes only public transport.
c) Average speed of public transport (buses) in central areas of Trondheim Municipality has increased from 14,5 km/h to 17,5 km/h from 2008 till 2009. The goal for 2018 is 20 km/h. For all bus transports in Trondheim Municipality average speed has increased from 22,2 km/h in 2008 to 23,7 km/h in 2012. The goal for 2018 is 26 km/h.
d) Greenhouse gas emission from transport in Trondheim Municipality's own businesses has increased from 1 t CO2/y/car in 2009 to 1,1 t CO2/y/car in 2011
e) Results are difficult to describe for this goal

The main conclusion from the evaluation report is that there are strong needs to improve report structures and systems to give more correct results. Trondheim Municipality is working at this with other partners. From Norway Post, Trondheim's point of view is the overall impression of the report that Trondheim Municipality are in a good progress to reach several goals in "Miljøpakken". However, the results of CO2-emissions from Trondheim Municipality's own businesses are not good enough.

2.2.2 TRANSPORT PLAN FOR TRONDHEIM 2006 - 2015

In 2007 Trondheim Municipality decided a "Transport plan for Trondheim 2006 – 2015". This plan covers following areas:

- Integrated land use and transport planning



- Completion of main road network
- Prioritize environmentally friendly transport in the inner city
- Competitive public transport system
- A comprehensive bicycle plan
- Safe transport
- An efficient, low polluting transport industry

Traffic regulation, pedestrian areas and unloading/loading zones are a part of the Street plan for the inner city center. This plan was adopted by the City Council as long ago as in 2007. Some parts of the plan has been completed, but still some parts like unloading/loading zones and fulfilling of pedestrian areas are not completed. As a part of developing the public transport system, a new bus Hub has been established, and the first part was opened in December 2012.

The pedestrian areas in Trondheim city center (yellow areas) are open for goods distribution between 8 am to 11 am and 16 to 20 pm. There are still streets that are planned to be a part of the pedestrian area in the inner city that have car traffic.

Numbers of unloading/loading zones will increase in the inner city center of Trondheim. The maximum size of the zones will be a length of 10 m, which will make limitations for the size of vehicles that can be used in the city center.

Private cars have to pay road tax for driving to the city center. The city center are also regulated by parking areas and parking houses with parking fees. Electric cars, both private and company owned, are free from road taxes and parking fees. This is regulated from the National Parliament and will persist to 2017 or until there are more than 70 000 electric cars in Norway. Other incentives for buying electric cars in Norway are reduction of car fees and the yearly road fee for cars.

2.3 Environmental work in Norway Post Company

The Norway Post Company is a is a significant post and logistics provider. From being a traditional postal company in Norway for 365 years, the company now have expanded mainly in the Nordic countries but also have subsidiaries in US, Hong Kong and other countries. In 2013 more than 30 % of total revenue are from countries outside Norway, and about 60 % of total revenue come from logistics services. Incomes from letter mail has decreased from about 70% of total revenue in 2002 till 30 % in 2013.

Norway Post have ambitious goals for CO2-reductions. From 2012 till 2020 the goal is to reduce CO2-emissions with 40 %. Reduction are planned in many areas, and transport related actions are the most important area where the plan is to reduce about 400 000 t/CO2.

Posten Trondheim have their main activities at the Post Terminal at Sluppen, which is located 5 km south of the city center. At this terminal letter mail and parcels are handeled for the whole Trøndelag region, and the areas in and around Trondheim represent about 50 % of the total volume. Most letter mail to the terminal being transported by air with an air freight company from other postal terminals in Norway. As Trondheim airport is located 40 km north of Trondheim, this mail is transported by trucks to and from the airport. Parcels, goods and commercials are transported to and from the terminal by trucks and trains.

In the ENCLOSE project Posten Trondheim have had 3 pilot measures:

1. **Mail distribution** (large and small envelopes) in Trondheim city center by using electric-vehicles replacing 5 diesel vehicles.
2. Parcel distribution in Trondheim city center by using electric and hybrid vehicles replacing 5 diesel vans.
3. **Pallets distribution** in Trondheim city center and transport between Trondheim city center and Trondheim Post terminal by using electric and hybrid vehicles replacing 1 diesel truck.

In the City center of Trondheim there are about 6100 households and businesses which are served by Norway Post 6 days a week. The services are mainly distribution of letter mail, parcels and pallets in a planned route system operated every day, but also special delivery and pick-up service in agreements with customers. The products have features, mainly by delivery and collection at specific time.

3. LOGISTICS MAIN PROBLEMS, CRITICS AND NEEDS

3.1 Main problems and demand aspects

The main challenge for goods transport and distribution in Trondheim city center is the population growth in Trondheim and the following increase transportation needs for goods. This requires measures to achieve the municipality's climate goals, to reduce CO2-emissions with 20% from 2008 till 2018.

The main actions will be:

- An energy and environmentally friendly policy for densification and localization of right business at the right place
- Restrictive measures to reduce private car use

Strengthening of public transport

- Measures and incentives to increase use of ecofriendly vehicles and fuels

A plan for street regulation for Trondheim city center was adopted in 2007. Part of this plan is fulfilled, but increasing of pedestrian areas and a strong regulation of goods transport vehicles have not come through.

3.2 Existing last mile transport operators

Norway Post/Bring is the biggest last mile operator in Trondheim. Other international transport actors like TNT, DHL, Tollpost Globe (Post Nord) and Schenker also operate last mile service. National store chains like Rema 1000, ASKO and Coop have their own distribution service, mainly for their own shops but ie. Rema1000 also cooperate with another local food chain in Trondheim (Bunnpris). Additionally there are several regional transport companies that more or less serve Trondheim city center with last mile service, and a number of local express couriers.

3.3 Existing logistics services in the inner center

The inner city center of Trondheim is regulated with pedestrian areas. The pedestrian area is open from 8 am till 11 am and 16 pm till 20 pm for last/first mile service with cars. As most of the services in the pedestrian areas are shops, the delivery of goods are the biggest service.

There are about 10 food stores in the area which have daily deliveries of food. There are 4 shopping-centers in the inner city area. One of these have an own serviced goods delivery location, which coordinate the deliveries to the shops inside the center. The delivery point take care of parcels and goods to some of the shops, and for others the driver have to deliver directly at the shop. The other 3 shopping centers have loading ramps, but ordinary goods are often delivered inside the shops.

Otherwise there are many smaller shops in many businesses in the city center. There also are many offices for the Municipality administration, the Regional Council administration, Government administration, Districts and appeal court, banks etc. At least there also are apartments, storage warehouses, schools, doctors, dentists etc.

Food stores are mainly served by trucks, businesses and offices by vans. Posten use electric trolleys for letter deliveries, smaller electric and hybrid vans for smaller parcel deliveries and a hybrid truck for bigger parcel and pallets deliveries. For express courier Posten also use bicycle. Other operators in the city center mainly use diesel trucks and vans.

4. NORWAY POST LOGISTICS SERVICE

4.1 Base existing services and schemes

"The Norway Post Company is a Nordic mail and logistics group that develops and delivers complete solutions within postal services, communications and logistics. The Nordic region is the main market. Norway Post has two brands, Posten and Bring. **Posten** covers services to private customers, the post office network and national postal distribution. **Bring** is aimed at business customers within mail and logistics in the Nordic area." www.postennorge.com

Bring consists of specialists who each have key skills within their areas.

Bring Cargo specializes in creating an efficient flow of goods. Bring Cargo offer national and international goods transport by road, sea, air or rail. Bring Cargo deal with deliveries to and from around the globe.

Bring Express is the specialist in express logistics and courier services. Bring Express ensure flexible alternatives for both unforeseen and scheduled deliveries for large and small companies. Bring Express is represented in 31 cities in the Nordic area.

Bring Frigo is a specialist in thermally-regulated logistics for foods. Bring Frigo are among the very best for precise deliveries and safe storage of fresh, chilled and frozen goods. All the way from the producer to the table, in the Nordic region and the rest of the world.

Bring Parcels eases your company's package handling. Bring Parcels offer the Nordic region's most comprehensive package distribution. Every day Bring Parcels deliver hundreds of thousands of packages to and from companies and to private customers in the Nordic region and 193 countries.

Bring Supply Services has global experience with advanced fourth party logistics solutions. Bring Supply Services develop and operate complete supply chains for our customers.

Bring Warehousing is a specialist in optimum warehouse services for most types of product, whether it is all about large volumes, bulk storage or individual pallets. In 2010, Bring Warehousing opened Norway's largest and most technologically advanced third party logistics distribution center at Berger, outside Oslo.

Bring Mail offers companies simple, effective solutions for the distribution of letters, goods and advertising in the local, national or Nordic markets. Customers can either have tailor-made solutions or basic distribution services.

Bring Citymail provides distribution of letters and advertising in Sweden. This means addressed deliveries from companies to other companies or private persons. Bring Citymail reaches approximately 2.3 million households in Sweden.

Bring Dialog helps companies develop and cultivate their customer relations through customer dialogue and CRM. Solutions are based on unique customer insight, the market's best CRM tools and the customer's own experience database (Effect base).

4.2 Fleet typology

Norway Post Group (the Post Division and Logistics Norway Division) have a fleet with many different types of vehicles which use different kind of fuels. Most of the vehicles are leased, and the others are self-owned. The total registered fleet at 31.01.2014 is 5239 vehicles of different types:

- 3822 vans like Ford Transit, Mercedes Vito, VW Caddy, Peugeot Partner, Toyota Hi-Ace, Opel Vivaro
- 588 trucks like Scania MND, Mercedces Atego, Iveco Euro, MAN TGM, Volvo FM. (40 trucks 3,5 t – 7 t and 548 trucks over 7,5 t)
- 665 ATV/Motorcycles like Kyborz DXP, Norsjø Carrier, Commarth Cross,EVT 345, Lloyd Paxster
- 6 other cars

Fuel types of these vehicles are:

- 4277 Diesel (1 Diesel/el Hybrid)
- 629 Electric
- 95 Gas
- 80 lead free

The registered fleet in Trondheim Municipality at 31.01.2014 is 145 vehicles:

- 87 vans like Ford Transit, Mercedes Vito, VW Caddy, Peugeot Partner, Toyota Hi-Ace, Opel Vivaro
- 26 trucks Scania MND, Mercedces Atego, Iveco Euro, MAN TGM, Volvo FM. (1 truck 3,5 t – 7 t and 25 trucks over 7,5 t)
- 32 ATV/Motorcycles like Kyborz DXP, Norsjø Carrier, Commarth Cross,EVT 345, Lloyd Paxster

Fuel types of these cars are:

- 112 Diesel (1 Diesel/el Hybrid)
- 33 Electric

Norway Post, Logistics Nordic Division are also represented in Trondheim. Most of the vehicles they use is by Bring Expres. Bring Expres hire drivers with their car. There at no data of those cars.

4.3 Norway Post - External environment

As one of the Nordic region's biggest transport operators, Norway Post has a particular responsibility to minimize the Group's environmental impact and increase environmental efficiency. The most important measures to reduce the impact on the climate include the use of alternative vehicles and fuels, transport optimization, the moving of freight from air to road and from road to rail, the efficient use of space, and skills-improvement measures among managers and employees. Overall, Norway Post has made the indisputably greatest efforts within environmental vehicles in Norway, including a significant number of biogas vehicles and Norway's first diesel/electric hybrid truck. In Sweden, the Group has taken delivery of the first biogas truck in the world to meet Euro 6 emission regulations in 2013. In the fourth quarter, 20 new biogas trucks were brought into operation in Norway leading to the Group now having 96 biogas trucks in operation, out of a total of 1 068 vehicles using low emissions fuel.

Norway Post was ranked fifth in the International Post Corporation (IPC) environmental programme in which postal companies from 23 countries participated.

4.3.1 BASE INFRASTRUCTURES

Base infrastructure of Norway Post in Trondheim

Trondheim Post Terminal at Sluppen, 5 km. south of city center

- Bring Cargo Terminal at Brattøra, 1 km. north of the city center
- Bring Frigo Terminal at Brattøra
- Bring Warehousing terminal at Brattøra

At Trondheim Post Terminal letters, commercials, small parcels and parcels are handled to and from businesses, offices and households in Trondheim city and the Trøndelag Region. For 2013 the terminal handled 106 500 000 letters/small parcels, 173 000 000 commercials and 4 635 886 parcels. The Bring Cargo Terminal handle parcel and goods to and from the Trøndelag region. The Bring Frigo terminal handle thermally-regulated logistics for foods to and from the Trøndelag region.

The infrastructure of Norway Post for customers are :

- Post office and Post in shops for private and business customers to pick up parcels and letter post in mailboxes. From Post in shops customers also can send letters and parcels inside Norway and to rest of the world
- Pick up and delivery agreements door to door service
- Postmen delivering letter post and small parcels in private mail boxes
- Vans and trucks deliver and pick up from businesses and offices

5. POSSIBLE SERVICES/MEASURES BY MUNICIPALITY (2015-2020)

5.1 Measures in existing plans

In the "Energy and Climate action plan for Trondheim Municipality" (http://miljopakken.no/wp-content/uploads/2011/01/Energi_og_klimahandlingsplan_TK_2010-2020.pdf) are several actions described for transport sector to reach the goal of reduced Co2-emissions with 20% from 2008 till 2018. In 2010 transport sector represented 51 % of total CO2-emissions in Trondheim Municipality. The goal for CO2-reduction from this sector is 98 000 T CO2, where local actions represent 52 000 T CO2 and national actions represent 46 000 T CO2.

The main actions in the local part are restrictions for private cars (18 000 T CO2) and local focus on eco-friendly vehicles and mobility planning (18 000 T CO2).

"Miljøpakken" (Greener Trondheim) is a partnership between 6 political parties on local, regional and national level to reduce CO2-emissions in Trondheim Municipality. One very important part of Greener Trondheim is a toll road system for financing measures like

- Continuous bus lines
- Signal priority for buses
- Better public transport
- Reduced prices on bus tickets
- Replace diesel buses with el-hybrid or buses which use biogas fuel
- Bicycle lane network
- Parking areas around the city

The "Energy and Climate action plan for Trondheim Municipality" also describes a goal that all cars owned by the Municipality should become eco-friendly.

By 31th March 2014 Trondheim Municipality had 40 electric cars in their services. The total number of cars/vehicles in Trondheim Municipality are more than 540 (March 2014).

5.2 Proposal for new measures by the Municipality

Posten Trondheim has over years had talks, meetings and discussions with several representatives from Trondheim Municipality. There have been tight communication and coopertation between Norway Post in Trondheim and the Municipality about several environment issues in the transport sector. Trondheim Municipality and Norway Post Trondheim have common interests in such cases. Following persons have been the most important in Posten Trondheim communication with Trondheim Municipality:

Tore Langmyhr, Merethe Kvidal, Hans Kringstad and Henning Lervåg from City Planning Office.

Bjørn Ove Berthelsen, Helge Fardal, Marianne Langedal, Hans Einar Lundli from Environment Office.

Kjell Inge Stellander from Project Department

5.2.1 ESTABLISH AN INFRASTRUCTURE OF FILLING STATIONS FOR BIOGAS

In Trondheim and surrounding areas have electric cars become very popular. The main reason is economic incentives by the government like toll-free driving on toll roads, lower cars- and road fees, free parking and free to use public transport lanes. Some electric cars or vehicles are also owned by companies. The limitation of electric cars are range, which also means when replacing a diesel/petrol car with an electric car you have to replace a car with a short daily distance driving. This also means that there are a strong need for other kind of fuels which can reduce CO2-emissions more from trucks and vans.

In Trondheim there are no filling stations for biogas. Norway Post are ready to use biogas in several trucks, and there are other transport companies who also are positive for establishing this infrastructure. There are companies (ie. ASKO) like Posten already use biogas trucks another places in Norway. This measure would have reduced CO2 emissions both on local and regional level.

In Trøndelag region there are biogas production by Biokraft compay. The production are limited, and are not enough to be profitable. Political decisions are needed to increase the biogas production by building a new fabric, which have been planned.

Next step will be to build filling station(s) for biogas. Several transport companies want to use biogas for vans and trucks, but it is very important that the bus company Atb will use biogas. They already use natural gas, but as biogas is more expensive than natural gas the bus company are careful not to promise to change from natural gas to biogas.

The role of Norway Post in this measure is to strongly address that we are ready to implement biogas trucks as soon as production and infrastructure are ready. To political level make it clear that we prefer biogas more than natural gas.

This measure has been discussed with the Environment Department in Trondheim Municipality, which confirm that there are common interests with Norway Post for establishing both more production and filling infrastructure for biogas in our region.

Trondheim Municipality, through the EU-supported project Green Highway, also work against a filling infrastructure of biogas at the highway from Trondheim to Sundsvall, Sweden.

The critical issue in this case are political decisions that leads to production of more biogas in the region and to build at least 2 filling stations in Trondheim area.

An ambitious goal is that a new factory for biogas production is ready in 2015, and at least 1 filling station will be at place in 2016.

5.2.2. TESTING HYDROGEN TO FILL IN NATURAL GAS AND BIOGAS AND ESTABLISHING HYDROGEN FILLING STATION

SINTEF, the largest independent research organization in Scandinavia, are an important actor researching on using hydrogen technology as vehicle fuel. Basic in this work is that Norway produce more clean energy than we use. Norway Post, Trondheim have earlier participated Sintef in a preliminary study about "Hydrogen for transportation from renewable energy in Central Norway", and find it interesting to follow the development of this technology. This preliminary study are now continuing with another project about "Hydrogen in buses and other vehicles in the Trondheim region - basis for pilot."

The project focus on both using hydrogen directly and to mix hydrogen into biogas or natural gas.

The role of Norway Post in this project is to be a pilot, firstly to use gas with hydrogen as a fuel in bigger vans and trucks. In a longer term to use hydrogen as fuel in bigger vehicles in the Trondheim area, and be a partner to establish a hydrogen filling station in Trondheim.

This project are planned to lead into another project to build filling station and test hydrogen in Trondheim area. The application is planned to be delivered in November 2014. The earliest possible time for establish a hydrogen filling station based on excess power is 2016.

Trondheim Municipality are also a partner in these projects.

5.2.3. COMMON DISTRIBUTION TO KINDERGARTENS, SCHOOLS, HEALTH INSTITUTIONS AND OTHER OFFICES IN TRONDHEIM MUNICIPALITY

As a measure for Trondheim Municipality is to find logistics solutions to distribute parcel and goods to kindergartens, schools, offices, health institutions and other departements owned by the Municipality in an environment friendly way to reduce CO2-emissions. The idea is to establish a common consolidation center for all deliveries to departments in Trondheim Municipality, and build a distribution structure and schemes to serve all recipients of packages and goods. To find solutions for this Norway post will cooperate with Trondheim Municipality as an experienced transport operator and distributor.

Norway Post, Trondheim share experiences with Trondheim Municipality to discuss possible logistics solutions for this measure. Experiences and knowledge through participation the ENCLOSE project has given Norway Post, Trondheim insight in some possible solutions which are operative in Europe. The main challenge for this measure is to make it profitable for both the Municipality and cooperating partners. CO2-emissions will be reduced by using eco-friendly vehicles and to reduce delivery frequency. Efficiency can be achieved by predictable deliveries from 1 truck at one time instead of several trucks from different operators at different times during a day.

The first workshop with Trondheim Municipality was held in May 2014. A business model will hopefully be developed until December 2014, and a possible start is estimated late 2015.

6. MEASURES FOR NORWAY POST, TRONDHEIM

6.1 75 % of all vehicles use by Norway Post for letter mail distribution in Trondheim Municipality shall be electric until Summer 2015

Norway Post, Trondheim serving the letter mail distribution in Trondheim Municipality with electric trolleys, electric vehicles, electric and diesel cars and vans. In May 2014 more than 50 % of these vehicles are electric driven. The challenge for increasing the number of electric vehicles is that the cars that are not electric drive distances more than 70 kilometers in one route. To meet this goal it is necessary to improve logistics solutions to reduce driving distances for more cars. This can be done by establish 2 – 3 Consolidation Units and by this action reduce driving distance for more cars and vans.

This measure is an ongoing process. It is realistic to reach this goal in spring 2015.

6.2 Fulfilling ENCLOSE project pilot measures

The pilot measures for Trondheim in the ENCLOSE project are:

I. Mail distribution (large and small envelopes) in Trondheim city center by using electric-vehicles replacing 5 diesel vehicles.

II. Parcel distribution in Trondheim city center by using electric and hybrid vehicles replacing 5 diesel vans.

III. Pallets distribution in Trondheim city center and transport between Trondheim city center and Trondheim Post terminal by using electric and hybrid vehicles replacing 1 diesel truck.

Measure 1 is completed.

Completing of Pilot Measure 2 and 3 depends on measure 1 and 2 in this plan.

Ver. 2.0
19.08.2014

www.enclose.eu

Printed in Italy in February 2016

The 9 ENCLOSE towns


LUCCA (IT)


TRONDHEIM (NO)


'S-HERTOGENBOSCH (NL)


BURGOS (ES)


SERRES (GR)


DUNDEE (UK)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