



 **CITYPORTS**

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Quaderni del Servizio Pianificazione dei Trasporti e Logistica

CITY PORTS PROJECT Interim Report



Regione Emilia Romagna
ASSESSORATO MOBILITÀ E TRASPORTI



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Technical-Scientific Leadership:

Rino Rosini

Editors:

Milena Panebianco

Monica Zanarini

Translation:

Sergio Grosso

Graphics:

Marco Gandolfi

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Hellenic Institute of Transport (GR).

<div> <div> <div>WORKING GROUP OF THE CITY PORTS PROJECT</div> <div> <div>Project coordinator</div> <div>RINO ROSINI</div> <div>(Regione Emilia-Romagna)</div> </div> <div> <div>Steering Committee</div> <div>GERHARD BURIAN</div> <div>(Federal Ministry of Economy and Labour, Austria)</div> <div>Georgios Giannopoulos (Hellenic Institut of Transport- CERT, Grecia)</div> <div>MARGARITA JANCIC</div> <div>(Ministry of Environment and physical planning, Slovenia)</div> </div> <div> <div>Transnational co-ordination team:</div> <div>ROLAND BEIER - IC consulenten</div> <div>ELSA KOUKOULOUDI-Hit-Tredit</div> <div>SALVATORE MELLUSO-Scs Azioninnova</div> <div>LUCA MESTRONI- Regione Emilia-Romagna</div> </div> <div> <div>Working group</div> <div>Transport Planning and Logistics Dept.</div> <div>Regione Emilia-Romagna</div> <div>SILVIA ARDONDI</div> <div>VALERIA CAMPRINI</div> <div>ANGELA CARBONE</div> <div>GIULIANA CHIODINI</div> <div>MAURO COLOMBO</div> <div>ELISABETTA COSTANZO</div> <div>GUIDO FERILLI</div> <div>PAOLA PACINI</div> <div>MILENA PANEBIANCO</div> <div>ALBERTO PRETI</div> <div>MONICA ZANARINI</div> </div> <div> <div>Methological Developments</div> <div>SCS Azioninnova Spa</div> </div> </div> </div>	<div> <div>INTERNATIONAL GROUP CITY PORTS:</div> <div> <div> <div>Regione Emilia-Romagna</div> <div>Regione Emilia-Romanga (Lead Partner)</div> </div> <div> <div>SCS</div> <div>SCS Azioninnova Spa</div> </div> <div> <div></div> <div>Municipality of Ravenna</div> </div> <div> <div></div> <div>Municipality of Parma</div> </div> <div> <div>INFOMOBILITY</div> <div>Infomobility S.p.A.</div> </div> <div> <div>it.city</div> <div>IT.CITY S.p.A.</div> </div> <div> <div></div> <div>Municipality of Udine</div> </div> <div> <div></div> <div>Municipality of Ancona</div> </div> <div> <div></div> <div>Municipality of Taranto</div> </div> <div> <div></div> <div>Municipality of Vicenza</div> </div> <div> <div></div> <div>BresciaMobilità</div> </div> </div> </div>	<div> <div>Italy</div> <div> <div>Regione Emilia-Romanga (Lead Partner)</div> <div>SCS Azioninnova Spa</div> <div>Municipality of Ravenna</div> <div>Municipality of Parma</div> <div>Infomobility S.p.A.</div> <div>IT.CITY S.p.A.</div> <div>Municipality of Udine</div> <div>Municipality of Ancona</div> <div>Municipality of Taranto</div> <div>Municipality of Vicenza</div> <div>BresciaMobilità</div> </div> </div>
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Vienna



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Centre for Research
and Technology –
Hellas/Hellenic Institute
of Transport



TREDIT - Transeuropean
Consultans for transport,
development and infor-
mation technology,
Tessaloniki

Prefecture of Kavala

Region of Attika

PREFACE

Since several years, Regione Emilia-Romagna is promoting a number of European projects devoted to various transport and logistics issues. With the transnational CITY PORTS project, urban logistics become the focus of a coordinated work promoting the development of effective and efficient interventions for a sustainable distribution of the goods within the cities.

Definition and implementation of city logistics measures require significant background efforts, ranging from investigation on main European experiences, to empirical analysis on the local contexts, to the evaluation of the possible administrative tools and policy instruments.

Regione Emilia-Romagna also started a significant set of parallel initiatives to support concrete interventions in the city logistics sector, within the framework of a Program for Sustainable Mobility defined by a wide institutional agreement: a specific measure of the Program is financing structural and technological interventions which can be shown able to improve the efficiency and to reduce the negative impacts of the urban freight distribution. The approach followed in the implementation of such a measure benefited from the methods and tools developed within the CITY PORTS project, thus confirming the positive, concrete effect that transnational co-operative projects could have on the regional and local systems.

The main features of the CITY PORTS methodology concern the systematic analysis of the supply chains behind the haulage of goods, a careful identification of the most critical conditions within the cities, the identification of specific solutions according to an integrated approach, comprehensive ex-ante evaluation and attention paid to all the stakeholders interested by the policy measures.

This publication, first in the series on European Projects managed by the Transport Planning and Logistics Department, aims at describing and disseminating the approach developed and used within the CITY PORTS project and the project's pilot actions, together with similar actions undertaken in other cities in Emilia-Romagna.

I'm sure that the present work could lead to further fruitful dissemination and applications.

Alfredo Peri

Councilor for Mobility and Transport
Regional Government of Emilia-Romagna

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INTRODUCTION

CITY PORTS is a transnational co-operation project devoted to the topics of the urban goods distribution, which has been developed within the framework and under the financial assistance of the INTERREG IIIB CADSES Community Programme. Under the leadership of Regione Emilia-Romagna, the project actions has been developed by a transnational consortium joining public administrations, public utilities and consulting companies (see table 1).

(TABLE 1) PROJECT PARTNERS

Italy	Regione Emilia-Romagna
	SCS Azioninnova Spa
	Municipality of Udine
	Municipality of Ravenna
	Municipality of Ancona
	Municipality of Taranto
	BresciaMobilità
	Municipality of Vicenza
	Municipality of Parma
	Infomobility S.p.A.
Austria	IT.CITY S.p.A.
	State Government of Vienna
	IC Consulenti Ziviltechniker
	City Courier Service Speditionen
	L.O.B. Logistik - Und Organisationsberatung
Slovenia	Forschungsgesellschaft Mobilität – Austrian Mobility Research (Graz)
	The Agency for Regional Development of Ljubljana Urban Region
Greece	
	Centre for Research and Technology - Hellas/Hellenic Institute of Transport
	TREDIT - Transeuropean Consultants for transport, development and information technology
	Prefecture of Kavala
	Region of Attika

Consortium composition reflects the two main intended project parts: a "desk" component dedicated to analysis and methodological developments, and a strong "field" component represented by a significant set of pilot cities where methods and proposals could be experimented.

City Ports' overall objective is to promote concrete interventions in urban logistics for some European cities in order to reorganize their urban systems. To achieve that, a number of applications of urban logistics are evaluated and tested within pilot projects. These can only be managed at a local level (figure 1). Throughout its development the project has required an assessment of experiences and issues linked to other solutions and the thorough analysis of some issues strictly related to urban logistics. Those features have been analysed in synergy with the work on the tools and procedures created in the methodology produced and directly contribute to achieve the objectives of City Ports in particular by offering to local public administrations a tool for the assessment of the quality of alternative solutions.

The objective of this publication is to present the approach elaborated in City Ports and is divided as summarised in the following.

The *first part* describes those European or Italian experiences which are either completed or under development. This will highlight the main issues related to urban haulage of goods identified locally and will help describing the solutions adopted and when possible their outcomes.

The purpose, here, is to give a general overview of the experiences that have been fostered by a number of governmental policies or actions by private operators with the aim of rationalizing the urban distribution of goods. In order to do that a set of peculiar cases has been analysed and described through sheets.

The policies adopted aim at strengthening the voluntary cooperation between the transport operators providing services of urban haulage, in combination with the creation of urban distribution centres and administrative measures such as licenses and regulations. None of the cases presented here can be considered as an optimal solution. Two elements having great impact on urban haulage of goods are: A progressive tendency towards a regulative framework for the urban distribution of goods and the introduction of new technologies that can support that process.

(FIGURE 1) ALLOCATION OF THE PROJECT'S PILOT SITES



In the *second part*, the methodology defined for the setting up of the experiences directly promoted by the City Ports project will be illustrated.

The City Ports project has had the objective of tackling the problem of urban haulage of goods by implementing “on the field” actions which are based upon shared and confrontable approaches. In order to achieve that, first a common methodology in terms of analysis tools and assessment procedures was devised to identify the feasibility of an intervention in the logistics field.

The methodology is based upon three key concepts:

- a good intervention of city logistics must consider the peculiarities of the urban context it is applied to;
- cities represent complex systems: the intervention cannot then focus only on technical matters;
- a good solution must take into account costs, by quantifying them and by defining who should be paying, for a medium to long term sustainability.

In line with the previous points, three main phases have been identified in a feasibility study:

1. the analysis, for the collection of key information regarding the critical issues in the delivery of goods in the urban environment where an intervention is foreseen;
2. the identification of an integrated solution, which is the central phase of the study, where the intervention to apply is defined; being the approach an integrated one, the solution must be dealing with the three key issues: technical/logistic, political/administrative and involvement of stakeholders;
3. the cost-benefit analysis where external costs and benefits are taken into account for a preliminary assessment of possible additional costs deriving from the solution adopted and how to share those among stakeholders. This passage proves to be fundamental for the economic sustainability of the solution.

The *third part* reports a revision of the administrative measures which are at the disposal of the local administrations for the creation of sets of measures that together with technical/logistics solutions constitute the “integrated solution” defined in the City Ports methodology.

In order to properly understand how local public administrators tackle the impacts of the haulage of goods in urban areas, the measures (acts) undertaken by some Italian cities have been analysed.

The acts collected relate in general to interventions on mobility with indirect influence on haulage of goods.

The examples reported here show on one hand how the cities reviewed are trying, although with different speeds, to promote actions for a sustainable mobility of goods, on the other hand they have evidenced the lack of a coherent and homogeneous approach in the regulation of the processes of urban distribution of goods. This lack of homogeneity is cause of confusion in particular for those who operate outside urban boundaries. It is therefore indispensable a regional approach to the policies of management of urban haulage in order to harmonize the regulative policies.

In the *fourth part* the pilot projects of City Ports are presented with a description of the framework of urban logistics projects undertaken in the cities of Emilia Romagna, which are set up and endorsed by the Region.

This part is particularly relevant because it takes into account the concrete effects of the project in the policies started in several cities, in particular in Emilia-Romagna.

The urban distribution of goods is a theme very much at heart for Emilia-Romagna. The Region in fact in addition to promoting European projects that study and do research on the subject, has started action policies in their own cities to address and co-finance both the studies (through L. R. 30/98 and European funds), and the accomplishment of interventions aiming at limiting or eliminating altogether the problems that can arise in the various contexts (through measure 5 of the Framework Programme for Sustainable Mobility 2003-2005)¹.

1) To refer to Volume n. 2 of the series "Quaderni del Servizio di Pianificazione dei Trasporti e Logistica" (Publication Transport Planning and Logistics Dept.), titles "Linee Guida per una strategia regionale di LOGISTICA URBANA" [Guidelines for a Regional Strategy on URBAN LOGISTICS]. Bologna, 2003.

**EXPERIENCES OF CITY
LOGISTICS IN ITALY
AND IN EUROPE**

1 URBAN DISTRIBUTION OF GOODS: MAIN ISSUES

The growing concern for the environmental and social effects of the increase in urban haulage of goods has led local and national authorities as well as companies and transport operators to promote actions for an improvement of the associate logistics. Actions in the shape of studies, research activities and pilot projects have followed in order to try and minimize the negative impact of urban haulage of goods and its inefficiencies on the standard of living (Da Rios, Gattuso, 2003).

Several ways to tackle the problem have been conceived. The analysis presented here, which does not necessarily cover all possible solutions, aims:

- **to identify trends emerged** both within the City Ports Project (Benchmarking City Ports – by HIT), and from research targeting this problem carried out by the Emilia-Romagna region in order to assess the actions of city logistics promoted (by the set of co-financed interventions relating to the ‘regional government act 1432/03’ and to the ‘Accordi di Programma per la mobilità sostenibile 2003-2005’ – Agreed platform for a sustainable mobility 2003-2005);
- **to provide a set of milestones as a result of the actions undertaken in**

different contexts for use by the local administrations.

The identification of the actions required for an optimal solution is in itself a complex problem because any initiative leading to a rationalization and possibly reorganization of the system is bound to interfere with the interests of the large number of stakeholders. These pertain both to the request for haulage, that can be associated to those clients requiring the goods and eventually all the citizens ‘consuming’ them, and the actual provision through transport operators, couriers, logistic operators, suppliers, private operators, etc.

The situation of the urban distribution system stems in fact from the relationship between the demand for movement of goods exerted by a number of business activities and the constraints due to the supply side of the transport system. The management of the fleet becomes complicated because it is difficult to conciliate economic efficiency with environmental and social sustainability (Malgeri, Galli, 2002).

Following the above, city logistics can be defined as the set of measures for the management of urban haulage of goods that, by pursuing the goal of maximizing the loading factor and minimizing the distance travelled per vehicle, aims at a

more environmental sustainability transport system (Maggi, 2001).

However the problem cannot be only reduced to management issues such as the efficiency of the system or environmental ones such as those affecting the health.

Differing models for the distribution of goods do not necessarily share the same social and economic basis, thus often producing different and possibly opposing effects on citizens' lives.

In addition to the complexity of the transport system as a whole, due to the number of interacting elements who play a part in it, further complications are due to the following constraints:

- the structure of the urban network and the spreading across the region of retail outlets, which is typical of Italy;
- the existence of supply chain whereby it is often the case that it is the recipient of the goods who makes decisions about the 'last mile';
- the risk that any intervention for a greater rationalization might cause instead adverse effects.

Moreover it must be pointed out that:

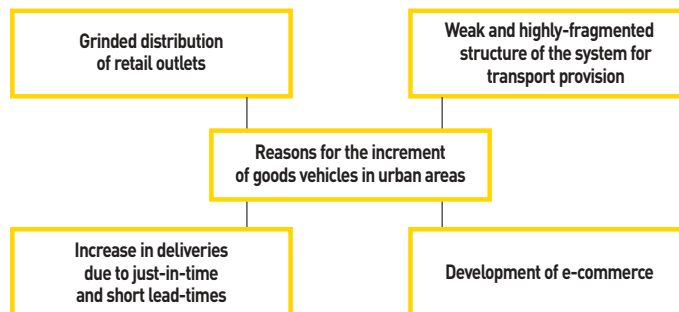
- the goal of making goods vehicles carrying their load at full capacity can only be achieved by limiting the frequency of deliveries, and it worsens the level of service in 'just in time' environments, which is often linked to

limited or no capacity at the warehouses and short lead-times;

- the development of alternative methods of selling goods to the public such as shopping from home, implies higher flows of vehicles because of the highly fragmented set of destination points in the network;
- the low incidence of the 'last mile' transport on the price of the products (1-2% on average – EC, 1998), determines the difficulty in sustaining reorganization supply chain not appropriately coordinated and supported. This is mainly due to the high number of haulers and the competitiveness of the service offered, as well as the fact that the costs of travel are as yet not being internalized to the transport system itself;

- the inherent weaknesses of the distribution system and the high competitiveness among operators, who rarely own an adequate technical, organizational and managerial structure, lead to a scarcely rationalized (in terms of routes used and loading factors) distribution of goods in the cities. This is also often characterized by vehicles returning empty to their depot. Furthermore, there is the added complication that, given the limited income produced by these activities, it is often the case that old vehicles are used and when new ones are bought those are of traditional type rather than ecologically-friendly ones, typically more expensive.

(FIGURE 2)



2. MAIN AREAS OF INTERVENTION

From the analysis of some past and current European trials, it can be deduced that **strategies of intervention** leading to a management of the demand for urban haulage of goods and its supply can be associated to two major typologies.

1. **Political-Administrative** interventions (traffic regulations) leading to the definition of:
 - **regulations in the access** to the city centre in terms of:
 - restrictions on the **road network** usable in terms of routes for goods haulage, areas for loading/unloading vehicles etc.;
 - restrictions on the **times** of the day when the road network is usable;
 - restrictions on the **vehicles** usable to access those parts of road network as a function of vehicle dimension, loading capacity and emission factors;
 - restrictions on the **efficiency of transport** whereby the access to those parts of road network is based on loading factors of the goods vehicles;
 - **economic regulations** that can be translated into the introduction of:
 - **access charge** (road pricing) for the city centre (or for specific roads or areas in the city) or parking pricing, often differentiated according to the type of vehicle, time of the

day (peak or off-peak hours, congestion charging), day of the week (weekday or weekend), and of the area;

- **regulations fostering** the purchase of environmental friendly vehicles and responsible behaviour in the urban distribution of goods such as tax relief or special traffic regulations for the operators using environmental friendly technologies or collaborating between them.

2. **Operative or logistic** interventions promoting a more efficient distribution model through the creation of **urban distribution centres** (UDC), where goods to be distributed in the city transferred on small vehicles organized for the local distribution by optimizing loads and delivery trips. Those solutions can be obtained through cooperation between the transport operators, in particular between the different transport carriers, but also through voluntary agreements between public authorities and private companies.

In parallel to the strategies mentioned above a range of supporting **technologies** is envisaged to be used to include **informatics/telematics systems** and a progressive improvement of the fleet.

The former will facilitate the management of the transport activities and deliveries, thus contributing to the optimization of loads and routes taken, the latter will contribute to an increase in the percentage of environmental friendly vehicles.

It is also important to stress that a fundamental requirement for the organization of urban distribution policies lies either in the development of urban distribution **observers** (something currently not existing), and **concertation tables** that bring together all the main local actors who, whether directly or indirectly, have an interest into the distribution process. Bodies working with the logistics sector as haulers and unions, industrial associations, craftsmen, local shopkeepers (either people or union representatives), technicians and politicians must combine their thoughts into a common set of actions leading to concrete and sustainable results.

The outcome of the pilots in terms of logistics is in line with what was suggested at the European conference of ministers for transport (ECMT, 1984), which has provided guidance on the most important management actions to explore:

- **charging measures** in terms of fees to access the city for commercial vehi-

cles. This fee should be calibrated on the basis of parameters such as space, time, characteristics of vehicles and/or loads, etc.;

- **traffic management measures** to ban the access of vehicles to certain streets or areas or as a function of time of the day, day of the week or type of vehicle;
- **infrastructural measures** aiming to improve the fluidity of traffic, e.g. a radial network topology, or transport corridors, or areas designed for the loading/unloading of goods, whose dimensions are a function of the demand;
- **technological measures** such as the introduction of more environmental friendly vehicles, and the use of informatics systems for the management and control of the fleet and the routes;
- **planning measures** for a better organization of economic activities; the creation of industrial districts, for example, in compact areas can facilitate the operations of aggregation of the deliveries allowing both the formation of economies of scale and the reduction of negative externalities.

The optimal solution lies probably in the identification of a set of integrated strategies which have to be developed on the basis of the peculiarity of each single local reality. Although the number of measures adoptable can be extremely

high, none of them can be considered the optimum solution by itself. The difficulty therefore resides in fact in the identification of the right mix of coordinated solutions which of course depend on the urban context in which they are applied.

2.1. Regulative or indirect policies

One of the main contributions of the City Ports project is the analysis of cases, synthetically reported in the attached sheets, relating to experiences where there was an initial action or thrust due to public policies finalized towards the rationalization of the urban distribution of goods.

The experiences reported highlight issues and approaches to urban logistics which are both different for certain aspects and similar for others. Two developments are evident though, which have a lot of influence in the organization of the urban haulage: A progressive tendency towards a regulative framework for the urban distribution of goods process and the introduction of new technologies to support the process.

The policies that are based mainly on issuing public regulations are, generally, constituted by low cost actions aiming to rationalize the traffic by changing the

operators' behavior. Usually they try and regulate the access of the freight fleet or the standing of commercial vehicles according to a number of criteria (see hereof the third part); they represent the kind of action more easily undertaken by the administrations, but that most of the times results into not too incisive actions. It is undeniable however that undertaking strong regulative policies requires, due to the variety of interests, very complex sharing and concertation supply chain.

It is also undeniable that the type of regulation must be chosen as a result of the city planning, of the networks, of the type and consistency of the existing economical activities and should not ignore the verification of the efficiency of the urban corridors for traffic and the loading/unloading areas in relation to the requirements of the context.

The choice and formulation of a specific regulation must essentially be shared and carefully studied and planned, just like an infrastructural investment. In addition, its creation requires often interventions of adjustment to the road infrastructure finalized to improving traffic fluidity, such as: redesign of intersections, increase in capacity, separations of traffic flows per type of vehicles, reorganization of the rules of circulation, planning again of loading/unloading areas as a function of the density of the delivery points and frequency.

Moreover, the importance of the actions aiming to guarantee the respect of the regulations, also in terms of technological equipment, must be stressed.

The different regulative forms aim to make more sustainable the urban freight transport, but their application in trial experiences has raised the problem that some have critical points and constraints, others make sense only in some contexts or if accompanied by other measures, others again are difficult to control and can even induce negative effects.

Thus the necessity, in order to have an effective policy of urban transport management, to know in detail the features and the risks of each measure, so as to apply it correctly and according to an adequate mix with other measures, thus responding to the requirements of the context.

The traffic management measures can also provoke harmful effects on the economy, by causing high costs on the community, if not counterbalanced by noteworthy and appreciable enhancements of the environment. It is also necessary to avoid the risk that traffic congestion shifts from the areas with regulation to neighboring areas without.

The application of the road pricing measure, for example, has raised some critical questions (Maggi, 2001) as:

- it is difficult to define the right amount to

charge; if the price asked for the use of the infrastructure is too high this could force the operators to relocate the economical activities, if it is too low it has no effect;

- if applied according to time windows it can improve the congestion effects due to the overlapping with the peak hours of the private traffic, but does not influence the air quality;
- If applied according to the capacity of commercial vehicles by tier it could generate an increase in the use of smaller vehicles;
- If it is not accompanied by measures of delivery rationalization, it fosters an increase in the number of trips and therefore congestion, thus canceling out the beneficial effects on the quality of the environment;
- if applied per vehicle loading factor it generates positive effects, as it discourages empty trips, but it is hard to control and sanction for.

The cases of European experiences relating to the adoption of **road pricing policies** examined respond to three different objectives:

- the London experience is of great importance as an example of "strong policy" (the scheme "London Congestion Charging" imposes the payment of 5 pounds to whoever enters the London centre with a motorized vehicle). It can

be classified as an example of introducing road pricing for a **policy of reduction of the congestion levels of the network**;

- the Norwegian cities of **Bergen, Oslo and Trondheim** have now ten-year experiences (the relevant initiatives go back respectively to 1986, 1990 and 1991) taken forward with the objective of **recovering resources to finance new road infrastructures and to strengthen the public transport systems**;
- the **Stockholm** experience involves the definition of "environmental zones", that is to say geographic zones inside which special traffic regulations are in force, with the aim to reduce the environmental pollution (zones, that is to protect from the negative effects of the vehicular traffic). The regulation imposes that vehicles that do not belong to a specific "environmental category" are not allowed to enter in the environmental zones (identified in terms of noise and polluting emissions); in this case the introduction of the road pricing policy is seen as an **instrument to obtain environmental benefits**.

In **Copenhagen** a **parking pricing policy** was adopted (parking charge) as a sole regulation to improve the environmental quality in the historic part of the city. Such policy was addressing traffic from commercial vehicles that carry out loa-

ding/unloading operations in the medieval part of the city with the following aims:

- to increase the loading factors of the commercial vehicles;
- to induce a goods distribution with smaller vehicles and of better technology.

The freight vehicles in transit, obviously, are not included in the measure. The Copenhagen case is very unique because the adoption of the regulation happened at the end of a gradual process articulated through a number of phases:

- creation of an initial working group constituted by: representatives of logistics and local transport operators, unions, the University of Business of Copenhagen and the Municipality;
- set up of an experimental phase, in which the scheme regulating the loading/unloading areas through the issuing of certificates with differing costs, validity and operative procedures has been tested on transport companies that have participated spontaneously to the initiative;
- final introduction of an obligatory scheme for all haulers that do distribution of goods in the medieval part of the city.

A key element, which became obvious with the experience, is that the charging of the spaces for operations of loading/unloading goods, must be accompanied by support measures in order to be

functional. Social and political acceptance of the taxation measures represent the major problem to tackle for their implementation. To boost the adherence to the initiative parallel measures were promoted, such as:

- identification in the medieval part of the city of 10 areas for loading/unloading goods reserved to the participants of the initiative;
- publication of the adherence to the initiative by naming on the web site all the participating companies.

In the **Amsterdam** and **Barcelona** cases the regulative policies undertaken constitute only one of the actions of the set of measures (**integrated policies**) chosen to decrease the congestion and the pollution and to rationalize the freight transport in the city centre.

The regulations adopted for the city centre (Zone with Limited Traffic- LTZ and Pedestrian Area - PA) grant access only if criteria relating to the total laden weight of the vehicles, their length, loading factors and standards of emissions are met.

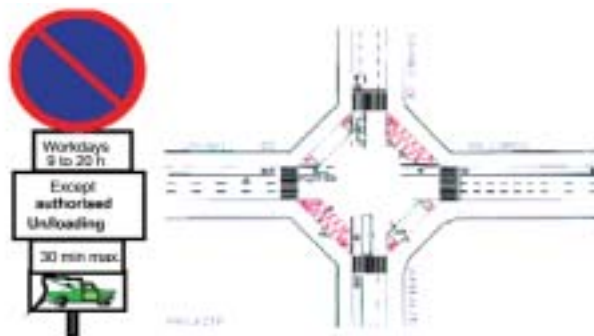
In Amsterdam, in fact, the regulation of the LTZ allows the progressive exclusion of commercial vehicles from the centre and it is accompanied by actions aiming at encouraging the grouping of haulers for the delivery in the "last mile" and favoring reorganization supply chain around one or more UDC.

(FIGURE 3)

BARCELONA (BALMES ST.). DIFFERENTIATED USE OF ROADS AND AREAS FOR STANDING AND LOADING/UNLOADING (RAMON JULIO GARCIA, 2001)

**(FIGURE 4)**

BARCELONA. STOPPING REGULATION AT ROAD JUNCTIONS (RAMON JULIO GARCIA, 2001)



In Barcelona the regulation of the Pedestrian Areas, which is managed through electronic control systems, was supported by other measures such as:

- the determination of "multifunctional roads", whose utilization changes during the day (long duration parking at night, traffic of private vehicles during the rush hours of the day and goods delivery at off peak times): the change in regulation is shown through variable message signs (figure 3);
- the creation of 700 areas for loading and unloading with specific regulations at the main road junctions (reserved for loading/unloading goods from 08:00 until 14:00, or at 20:00, and with an allowed maximum time for the operations of 30 minutes) (figure 4);
- the determination of areas both for standing and as reserved spaces for goods loading and unloading, which are managed automatically (figure 5);
- the organization and rationalization of urban deliveries through two urban distribution centres.

The expected interventions, innovative under many respects, require large investments in order to be applied.

The systems involving the combined utilization of roads and platforms require the installation of very expensive equipment. It must be stressed though that

there are also limits on the transferability of such measures to Italian cases where, for example, the creation of standing spaces at the road crossings is not a solution easily adoptable, due to the special laws related to those areas.

The cases of Amsterdam and Barcelona show that the regulative policies can have more success if fostering the use of UDC to consolidate the goods. Nevertheless, as it will be seen also in the experiences of city logistics described in the following, the success and the good operation of an initiative of reorganization of the urban distribution of goods based on the creation of one or more UDC cannot ignore the adoption of supporting regulative measures.

(FIGURE 5)

BARCELONA. A MINIATURE PRODUCED BY THE SOFTWARE USED TO PLAN TRIPS FROM UDC TO DELIVERY POINT. THE SOFTWARE ALLOWS ALSO TO BOOK THE SPACES RESERVED FOR LOADING/UNLOADING.
(RAMON JULIO GARCIA, 2001)



2.2. Structural or direct policies

A special attention deserve both for their complexity and the greater investment that they require the city logistics interventions that have adopted as main instrument the creation of urban distribution centres (UDC) which are close to the city thus influencing directly the organization of the freight transport.

A UDC is considered like a logistics hub that can collect goods from and to the city, and consolidate the loads and send them to their destinations, whilst planning the best routes and loads of the vehicles.

In several European cities city logistic projects have been undertaken where one or more UDC are planned. These experiences are notably grouped into three typologies that characterize the different forms of UDC management (table 2).

1. Issuing licenses of urban distribution by the Public Administration.

Some Dutch administrations (see the cases of **Amsterdam, Leiden and Utrecht**), adopting tight regulations in the central areas of the city based on a system of permits and licenses allocated according to specific standards of environmental and logistics efficiency and, sometimes, according to measures of promotion to the haulers, have favoured the configuration of a system

of urban distribution using one or more UDC. Those were created either as a private initiative or in partnership with the chambers of Commerce and Municipalities involved.

The experiences have also raised some issues that often make it very difficult to achieve economical stability for a UDC and that, therefore, must be assessed carefully. The Leiden case, for example, has been a failure because of the scarce financial profitability and the strong opposition of the haulers who were against the policies that were seen as meant to create a monopoly in the urban distribution of goods service. At Utrecht, instead, the number of companies that entrusted their own deliveries to the authorized company were not sufficient to achieve the economical sustainability of the initiative, for a series of reasons (EFLLC, 1997 reported in Maggi 2001):

- non applicability of the centralized distribution to some supply chain (perishable, high value, bulky etc.);
- distrust of the operators in cooperating with the competition;
- limited controls of the municipal police on the application of the regulations on goods relating to a management of the distribution with passage through the UDC;
- loading factor for vehicles returning to the UDC too low with frequent empty returns.

2. Voluntary cooperation of the haulers

in the urban goods distribution born spontaneously or with the initial thrust of the administration.

Such a scheme for urban distribution of goods has been applied in different realities, mainly German, exploiting as UDC the seats or the logistic bases of the haulers already systematically operating in the interested situations (see for example the cases of **Berlin, Bremen, Cologne, Freiburg, Kassel and Nuremberg**). The groups of haulers in cooperation have given rise to different organizational schemes based on distribution criteria of the treated supply chain and of the geographic areas to serve. The types of delivery used are different too: the deliveries can be carried out by a third operator, outside the local group of haulers in cooperation but paid by the same group, who collects the goods from everybody and distributes them, or by one of the members of the group, using a rotational system. On the whole the initiatives are not accompanied by regulative policies especially stringent in support of the reorganization supply chain. The transfer and transport services for the "last mile" delivery are paid by the very same transport operators who carry out directly the deliveries in the rotation system or pay for the service on the

basis of a specific tariff related to urban logistics. The results achieved with the different organizational solutions were all in general positive.

3. Direct management by the Public Administration or contracted to a private company (Principality of Monaco).

The urban distribution system of goods is in this case supported by regulative policies that facilitate the distribution through UDC; the delivery service is charged to the recipient of the goods who pay a tariff. However incomes are not sufficient to cover the costs, so the Monegasque government pays some financial subsidy to the manager. The government, following an approach in steps, intends to lower down progressively the weight limit for the access of the vehicles in town, so as to organize the delivery system into the UDC.

After this summary of cases of UDC developed abroad, it is considered opportune to remind of the unique situation of **Stockholm**, where a **temporary UDC** in the centre of the town was organized to resolve the environmental and congestion problems induced by the building yard open for the construction of the residential complex Hammarby Sjöstad. The initiative has proven to be especially effective from the point of view of costs and environmental quality.

The policy of rationalization of the urban distribution of goods through the creation of one or more UDC is a procedure towards which many Italian cities are heading. There are many initiatives at a feasibility study level, but there are also several operative cases, such as in **Genoa, Padua and Ferrara**, or initiatives that are about to start (**Vicenza, Parma and Siena**).

Being these experiences still very new it is not possible to compare results, but it is possible however to identify some important points from each experience.

The Ferrara case is characterized by the exclusive initiative of a transport operator who started an approach aiming to combine business profit and distribution of loads over the territory, effective handling of the goods and social development, to move towards the realization of a platform using ecological vehicles with no public contribution benefits.

In Genoa the initiative M.E.R.Ci. (Ecological mobility Resource for the City) operates by matching the supplementary costs due to load breakdown with public (also European) funds, but it seems that the increment in the number of deliveries recorded in this second experimental phase could make it possible to reach an economic stability of the management (figure 6).

In Padova the City Ports project has just started (service active from 21.04.2004) and the business plan forecasts to reach

the break-even point within 4 years (figure 7 and table 2).

2.3. Urban distribution centres:

Success factors

The setting up of city logistics policies to use one or more UDC to serve an urban area inevitably requires an efficient utilization of the structure, which is a condition essential to reaching financial auto-sustainability within an acceptable time frame. A better organization of the distribution process will lead to an improvement of the quality of the environment, which is one of the objectives for setting up UDC. This is achievable only if the UDC becomes the **reference point of the logistics operators** working in the urban area.

The trial experience of Utrecht has failed, for example, because the number of operators using the UDC was stood low, thus making the centre not financially sustainable.

There are several critical factors in the introduction of a UDC: **added costs** due to the load breakdown, contractual continuity with the recipient of the goods and **supply chain for which it is not easily applicable the centralized distribution** since they require special treatments (fresh, cold, valuables, medicines, etc.), **distrust by operators** in cooperating with the competition and **refusal in**

(FIGURE 6)

DISTRIBUTION OF GOODS IN THE HISTORIC CENTRE OF GENOA WITH VEHICLES WITH LOW OR NO ENVIRONMENTAL IMPACT
(SOURCE: CONTURSI V. M., PRESENTATION AT THE WORKSHOP "CITY LOGISTICS IN ITALY – A CONFRONTATION OF EXPERIENCES AND EVALUATION METHODS", 22 JULY 2004, BOLOGNA)



(FIGURE 7)

DISTRIBUTION OF GOODS IN THE HISTORIC CENTRE OF PADUA WITH ECOLOGICAL VEHICLES.
(SOURCE: CITYPORTO PROJECT - INTERPORTO OF PADUA SPA 2004)



[TABLE 2] SOME EXPERIENCES AND INITIATIVES AT EUROPEAN LEVEL FOR THE RATIONALIZATION OF THE URBAN DISTRIBUTION OF GOODS THROUGH UDC.

Year	City	Type-Contents	Factors of economic sustainability	Progress
1996	Amsterdam	9 UDC owned by the transport operators and managed by a partnership between the local Chamber of Commerce and the Municipality	The Municipality contributes to meet the costs	operative
1997-2000	Leiden	Municipal UDC managed by mixed-company	The efficiency of the logistics did not suffice to cover the extra costs due to load breakdown	failed
1994-1996	Utrecht	UDC owned by haulers; licences for urban distribution issued by the public administration	Low number of companies have entrusted the authorized company with their goods	failed
1995	Berlin	3 GVZs managed by haulers in voluntary cooperation	The federal government contributes up to 38% of the investment but only to companies that make the logistics centres their base	operative
1995	Bremen	GVZ managed by a company (GTCDC) composed of 9 businesses	The management company is partially financed by the Administration	operative
1998	Cologne	Platform managed by a private	Sustainability deemed satisfactory	operative
1993- 1997	Freiburg	4 UDC specilized on supply chain; cooperation among private operators	Costs endorsed by private bodies; Sustainability deemed satisfactory	trial phase concluded in 1997
1994	Kassel	Cooperation among couriers	No further load breakdown required; the efficiency of the logistics covers the extra costs of the distribution	operative
1996	Nuremberg	Cooperation among haulers	Costs met by monthly payment of haulers and shopkeepers who are part of the ISOLDE European project	operative
1989	Monaco	Managed by the Monegasque government and passed on to a private company under a concession	The final recipient participates to the costs of the delivery	operative
2002	La Rochelle	UDC Elcidis managed by public body with ecological distribution	Partly sustained with public and EU funds	under trial phase
1993	Basle	Municipal UDC managed privately	The municipality has contrinbuted ato meet the overcosts	failed (empty bid)
2002	Stockholm	Temporary platform managed by private bodies	sustainability considered satisfactory	operative

(TABLE 3) CITYPORTO CHARGES. (SOURCE: CITYPORTO PROJECT - INTERPORTO OF PADUA SPA 2004)

THE CHARGES OF CITYPORTO				
Deliveries on Saturday	€ 20.00/hour/person			
Deliveries at fixed time	Increase of charge by 50%			
Special deliveries (with size exceeding standard)	From 3 to 5 metres – increase of the charge by 100% (beyond to be agreed upon on request)			
Deliveries with previous phone call	€ 1.00 for telephone call			
Deliveries inside buildings / higher floors	No extra charge up to 30 kg; € 0.5/item from 30 to 100 kg; Objectively difficult deliveries are not included and must be agreed upon with the recipient, as well as all deliveries weighing more than 100 kg.			
Deliveries of goods with large shape	Cost of vehicle appropriate to task times number of hours			
Tokens	1% on income, minimum € 5.00			
CHARGES FOR COLLECTION/DELIVERY				
Year 2004 - urban area	Fixed amount per delivery	0-25kg	25.1-100kg	100.1-oltre kg
	€ 1	€ 0.015/kg	€ 0.040/kg	€ 0.045/kg
Rounding		5 kg higher	10 kg higher	20 kg higher

monopoly conditions for the management of the "last mile". It is necessary to accompany such policy with indirect measures that facilitate and help the new organizational set up.

The experiences of those cities that led the most significant experiments, with results sometime positive and other times bankruptcy, highlighted some of the necessary requirements for the policies related to the UDC:

- it is necessary to promote forms of cooperation and collaboration among the local transport operators who might be potential users of the UDC, in a way that possible mechanisms of competition are bypassed;
- it is necessary to promote forms of integration of the demand of urban transport (for example of shopkeepers working with the same type of process or supply chain that can be delivered together), so as to agree delivery days and the hourly time windows, thing that contributes to the razionalization of the distributive process;
- in order to protect the quality of life of the citizens the Administrations of the municipality should endorse regulative and fostering measures, aimed at facilitating and make less onerous the operations of the UDC;
- it is necessary to agree and to share with the interested users the traffic regulations which are more suitable to

support a reorganization of the urban distribution. For instance the experience of the UDC of Paris was bankruptcy since it was not accompanied by supportive measures such as the traffic prohibition for heavy goods vehicles;

- the control of the respect of the regulative measures applied is fundamental for the success of the reorganisational policy. For instance the experience of the UDC of Utrecht was bankruptcy also for the poor controls of the urban police on the application of the traffic prohibition to heavy vehicles;
- the operation area of the UDC should not be limited to the historic centre only, but must be organized in a way suitable to serve an area where the volumes carried can produce the necessary economies of scale required for self-sustainability;
- the policies should be accompanied by infrastructural interventions to improve the accessibility to the UDC towards the outside (connection with large networks and rail) and the inside of the urban area (by creating preferential itineraries and attending to the requirements and deficiencies of loading/unloading areas);
- it is necessary to guarantee in the UDC, in addition to the spaces for the breakdown and aggregation of the goods, also stocking spaces for the shopkeepers who decide to use them

at a lower cost than that of the warehouses located in more central areas;

- the introduction of a UDC generates inevitably a greater distributive cost due to the required load breakdown; so it is necessary to estimate accurately the total cost of the logistics that will have a distributive cost component that on one hand will be greater because of the load breakdown and on the other hand will decrease because of the improved productivity, if an efficient reorganization is made. For instance, logistics experiment of the city of Bremen has produced an increase of the average loading factor of 28% and a reduction of the number of trips per day of 13%. In Kassel the loading factor increase was estimated to be equal to 100%, if measured in volume, and to 150%, if measured in weight;
- it is very important to provide the UDC with an environmentally compatible fleet of vehicles for the urban distribution to guarantee, in addition to the rationalization, also environmental quality;
- the management of the flows of the "last mile" should be passed on one operator only (either to a cooperative or to a consortium) in a centralized and neutral manner;
- it is essential to provide the UDC with data transmission systems, supported

by satellite networks for the localization of the vehicles, in order to manage the orders in a centralized manner, to optimize the routes, the deliveries, the fleets and the loads, and so as to improve simultaneously the efficiency and the operational capabilities of the distributive system and to recover the cost of the load breakdown;

- it is necessary to optimize the productivity of the fleet by managing also the movements due to reverse logistics, that is the collection of packings back to the UDC.

To conclude, it is deemed appropriate to emphasize some of the issues which need facing in a very decisive manner from the beginning of any experience:

- how to develop a feasible cooperation between public and private in order for the urban haulage of goods to be efficient;
- how to obtain an efficient cooperation among transport companies for the management of the logistics process;
- how to support the creation of policies with efficient regulative instruments;
- how to develop and implement the technology necessary to support adequately the innovation process of the urban logistics.

The risk of failure of the integrated policies of urban logistics is very high: it can nevertheless be reduced considerably if

the administration that undertakes the policies is adequately prepared from the beginning to move in the right direction.

The first step, possibly the more important as ever, is to set up a detailed assessment of the reality in which to operate: goods typologies, urban structure, vehicle flows, distribution of activities on the territory, characteristics of the transport operators and so on.

It appears particularly important that the administrations pay a lot of attention to a modality of analysis linked to the context and ensure to obtain an in-deep knowledge of the urban phenomena while spending time on the planning solution.

The assessment must be carefully planned in order to highlight the actual opportunities and possible risks.

Making available to some Public Administrations an instrument for the planning and control of the activities of analysis and for the evaluation of the effectiveness of alternative solutions is among the main objectives of the City Ports project.

ANNEX I

PART A

Experiences where a regulative
or indirect policy framework prevails

1. AMSTERDAM
2. COPENHAGEN
3. GRAZ
4. LONDON
5. OSLO, BERGEN AND TRONDHEIM
6. STOCKHOLM



Organizing the LTZ in order to operate a ‘filter system’ for a progressive exclusion of commercial vehicles from the city centre

Country: Netherlands

City: Amsterdam

Type of intervention	Regulation of the access to parts of the city based on capacity, length, loading factor and emissions of the vehicle.
Objectives	<ul style="list-style-type: none"> - Rationalize the haulage of goods within the city centre - Decrease congestion due to traffic - Decrease the environmental impact of loading/unloading operations within the city centre
Main actors involved	<p>Promoter: Municipality of Amsterdam in collaboration with association of local haulers and the Chamber of Commerce.</p> <p>Manager: local haulers in partnership with Chamber of Commerce and the Municipality.</p> <p>The coordinator of the system is paid by the Municipality.</p>
Description of the intervention	<p>Following the referendum of 1993, the local administration has decided to create a LTZ in the city centre in which the access is forbidden to heavy good vehicles whose capacity is greater than 7.5 tons and whose length is greater than 9 metres. Those vehicles, whose loading factor must be at least 80% for them to use the urban network, are distributed on the main arterials outside the LTZ. In a first phase of implementation the break down of the load directed towards the city centre was done at logistic hubs situated at the periphery of the city, with vehicles Euro 2 and 3 being used for the last part of the trip. This solution has been named ‘filter system’.</p> <p>It has been decided afterwards that heavy good vehicles would cross loading/unloading points and then use vehicles at low environmental impact such as small vehicles, bicycles equipped in a way to facilitate the delivery of small items and documents, plus boats positioned at various points in the channels (Floating Distribution Centre project).</p> <p>This way heavy good vehicles have been increasingly excluded from the central part of the city and, at the same time, there has been a rationalization of the loading factors of those vehicles that distribute the goods through the aggregation of items by destination.</p> <p>The intervention pertains to all the commercial outlets situated within the LTZ. The goods moved are 20% of the total. Specialist haulage and mass-distribution are excluded.</p>

Costs	<p>All costs have been paid by the local administration of Amsterdam and include:</p> <ul style="list-style-type: none"> - 75000 Euro for project implementation; - 18000 Euro for investments on road signs;
Results	<p>Overall the results of the intervention can be considered positive.</p> <p>The local administration in the attempt to quantify the degree of consensus o this initiative has devised questionnaires for transport operators, shopkeepers and residents.</p> <p>The results of this initiative are reported in the following:</p> <ul style="list-style-type: none"> - 50% of inhabitants have noted a decrease of the problems due to heavy goods vehicles in the city centre whilst 100% of the interviewed was keen to see a further application of access restrictions for heavy goods vehicles in the city centre; - the shopkeepers have not noticed negative effects on the distribution supply chain and on the accessibility to the city centre; they are also in favour of further trial phases; - the transport operators confirm that they work with high efficiency standards; some of them have reduced the number of trips towards the city centre and all of them suggest to have further trial periods, oriented however towards the use of vehicles with low environmental impact as opposed to other limitations on vehicle length and weight; - the members of the working groups f the project are satisfied. They have confirmed that the trialing approach with progressive phases to be agreed upon is the action model more appropriate to tackle the issues under consideration.
Issues emerged	<p>The main difficulties encountered in the implementation of the filter system are due to those transport operators who have greater problems in the load breakdown operations with passage of the goods into smaller vehicles (for example the haulers of building material for houses). Some of these operators in fact have requested the possibility to do only 1 trip per week to the LTZ in order to avoid the problems linked to the use of smaller vehicles.</p>
Sources	<p>www.bestufs.it</p> <p>www.eltis.org/it/indexcse.htm</p> <p>www.transport-merchandises-en-ville.org</p> <p>Regione Emilia-Romagna (2002), "Attività di studio e ricognizione, a livello nazionale ed internazionale, delle migliori esperienze di logistica urbana e di servizi di logistica a imprese produttrici e di trasporti" (Study and Analysis, both at National and International Level, of the Best Experiences of Urban Logistics and of Services Linked to Logistics for Production and Transport Companies), Volumes 1-3, not published, ERVET.</p>



Setting up, after a first experimental phase, of a regulation for the parking to load/unload goods.

Country: Denmark

City: Copenhagen – Distribution of goods in the historic centre (Medieval City)

Type of intervention	<ul style="list-style-type: none"> - Regulation of the loading/unloading areas based on to the loading factor of the vehicles. - Supporting policies.
Objectives	<p>The main objective of the project is to improve the environmental quality in the Medieval City of Copenhagen through a better use of the loading factor of the vehicles that carry out loading and unloading operations and also inducing a better practice in distributing with smaller vehicles.</p> <p>The type of goods in transit are not included in the measure. The loading factor of the vehicles depends on the characteristics of the goods carried. In fact for heavy goods it refers to the weight carried, whilst for bulky goods it refers to the volume (in relation to the weight/maximum volume possible for the vehicle).</p>
Main actors involved	<p>Promoter: Municipality of Copenhagen.</p> <p>Working Group constituted in 1996 with a voluntary agreement, and composed by: representatives of logistics and local transport operators, unions (transport, logistics and shopkeepers), the Business University of Copenhagen and the Municipality of Copenhagen.</p>
Description of the intervention	<p>In 1996, a Working Group was created (Voluntary Agreement - 1996), in order to make environmentally sustainable the urban distribution of goods.</p> <p>About 6000 trips/day (for a total of about 3500 vehicles between lorries and trucks) have as origin or destination the city centre of Copenhagen ("Middelalderbyen"); of these, about 55% uses less than 20% of their loading capacity (15% only is over the 60% of loading capacity – data from 1996).</p> <p>In a first experimental phase, lasted a year and a half (1998-2000), the transport companies willing to participate in the initiative were asked to sign a voluntary agreement involving the following commitments:</p> <ul style="list-style-type: none"> - to use an average of 60% of loading capacity for single vehicles; - to record all vehicles with capacity between 2 and 18 tonnes that carry out trips with origin or destination inside the city centre; - to use vehicles with engines not more than 8 years old; - to send quarterly to the Council a relation on the use of their own vehicle capacities. <p>In order to stimulate the adherence to the initiative of the transport companies, some parallel measures have been promoted:</p> <ul style="list-style-type: none"> - determination, in the Medieval City, of 10 goods loading and unloading areas reserved to the participants of the

TO CONTINUE

Description of the intervention

initiative (with sanction to all of those using those areas without showing the adhesive of the initiative on the windshield);

- possibility of showing one's adherence to the initiative;
- report on website of all companies participating in the initiative;
- possibility to participate in the following definition of a mandatory scheme.

The **control** of the compliance with the rules is carried out on the basis of the quarterly report.

In the loading and unloading areas, in addition to checking only the vehicles adhering to the initiative, the municipal police checks the load carried in order to verify the exactness of the information supplied by the companies on the loading factor. The report to complete quarterly on the use of the vehicles capacity is constituted by daily recordings for each vehicle to include:

- the routes taken in the medieval area;
- the number of deliveries carried out and the quantity of goods loaded/unloaded.

Obligatory scheme (2002/2003): City Goods Ordinance ("City Goods Ordningen")

In the period between the February 1st 2002 and October 31st 2003 the Municipality of Copenhagen has started an experimental phase that follows an obligatory scheme introducing a decree stating that all vehicles with capacity over 2.5 tonnes should buy a certificate to be able to stop in the Medieval City.

In addition the vehicles weighing over 18 tonnes should have a supplementary special permission in order to stop. 3 types of certificates are available with differing costs and operative procedures:

- Green Certificate (costing 325 Danish Crowns corresponding to about 44 Euro)

It is valid for the experimentation period and it gives the right to utilizing the dedicated loading/unloading areas. It can be obtained by vehicles with engines whose technology dates after 1.1.1995, with total laden weight between 2.5 tonnes and 18 tonnes and for which the haulers should guarantee:

- to use 60% of the loading capacity of the vehicle (where 60% is calculated as a loading average value for the quarter);
- to send quarterly to the Municipality a report on the use of the capacity of their own vehicles;
- to fill in a registration module when the certificate is purchased.

- Yellow Certificate (cost of 325 Danish Crowns corresponding to about 44 Euro)

It was valid until July 31st 2002, it was to be renewed every 6 months and served as an alternative for those who could not abide by the limitations imposed by the green certificate.

The haulers had to fill in an enrolment form when purchasing the certificate. Such certificate was some sort of exemption from the green one and helped the municipality monitoring the existence of special conditions for the companies and, at the same time, assessing how to make possible the adoption of the green certificate.

- Red Certificate (cost of 50 Danish Crowns corresponding to about 7 Euro)

It is valid for 1 day only and serves as option for those haulers who are not regular visitors of the Medieval Town.

The experimental phase of the City Goods Ordinance that lasted 21 months (February 1st 2002 - October 31st 2003)

TO CONTINUE

Dimension of the intervention	has had the objective of estimating if the restrictive policy undertaken could be an effective instrument to reduce the number, capacity and age of the freight vehicles circulating.
Costs	Medieval City of Copenhagen, with a surface of about 1 km ² in the central part of the city. About 27000 Euro (2 million Danish Crowns) to sustain personnel costs (3/4 people dedicated to the initiative) and necessary equipment.
Results	<p>Results obtained in the period 1998/2000.</p> <p>The first period of experimentation is finished in February 2000. The experience of the trial was a positive one:</p> <ul style="list-style-type: none"> - participation of 80 companies for a total of 300 vehicles: 64% with capacity over 3.5 tonnes (about 78% of which, with capacity between 12 and 18 tonnes), 34% with capacity between 2 and 3.5 tonnes and the remaining 2% with capacity lower than 2 tonnes; - during the experimental phase most of the vehicles have utilized more than 60% of the loading capacity whilst some problems have been recorded with goods of certain categories (for example, frozen products); - the participants have found it easy and quick to fill in the quarterly report; 20% of the haulers brought some alterations to the organization of the delivery diary and the 86% has deemed appropriate the introduction of an obligatory scheme. <p>Given the extremely good results obtained, a second trial phase was agreed upon, with compulsory scheme.</p> <p><u>First results after the adoption of the mandatory scheme (June 2002).</u></p> <ul style="list-style-type: none"> - Assigned about 900 Green certificates (for about 39600 Euro) to vehicles with an average capacity of 7.0 tonnes. - Assigned about 3100 Yellow certificates (for about 136400 Euro) to vehicles with an average capacity of 4.8 tonnes. - Sold about 10000 Red certificates (for about 70000 Euro) - Assigned about 2500 sanctions. - In the first 6 months, revenues have matched costs. - Increase of the number of vehicles with capacity between 2.5 and 3.5 tonnes, compared to vehicles with capacity over 3.5 tonnes. <p><u>Results reported in the "Progress report for the City Goods Experiment - September 2003"</u></p> <p>The "Progress report for the City Goods Experiment - September 2003" emphasizes the effects and the consequences of the City Goods intervention so as to estimate the possible corrective actions to adopt.</p> <p>Through the analysis of the traffic surveys carried out in the periods 1999, 2002, April 2003 and August 2003, the cognitive questionnaires with residents and shopkeepers of the medioeval area, the questionnaires to the haulers under contract who were subject to the regulative action and the collection of the data obtained from the reports filled in quarterly by the haulers on the use of the loading capacity of their own vehicles (City Goods data base) some results emerged (for quantitative data please refer to the Progress report for The City Goods Experiment - September 2003, pp. 6-11):</p> <ul style="list-style-type: none"> - the traffic (moving and standing) with vehicles between 2.5 and 18 tonnes is only slightly decreased after the start of the experimental period; the experimental phase of City Goods did not therefore contribute substantially to the reduction in the number of vehicles with total laden weight between 2.5 and 18 tonnes; - the majority of the commercial vehicles with total laden weight over 2.5 tonnes, that need to stand in the

Results

- medieval city have purchased green or yellow City Goods certificates;
- the vehicles with green certificates show an average loading factor of about 70%;
- the average age of the vehicles remained unchanged and the reduction in the polluting emissions consequent to the experimental phase is considered marginal.

Besides, carriers under contract find it difficult to fill in reports on the loading ratio utilized.

The apparently limited effect of the measure emerges in particular when in combination with a number of bureaucratic problems: this type of intervention does not appear to be feasible enough for a limitation of traffic in the city of Copenhagen.

Issues emerged

The issues emerged during the pilot phase are (Progress Report for the City Goods Experiment, 2003):

- information and validation of the data relating to loading factors;
- the possibility of obtaining an exemption from the measure by using 'the red certificate';
- the exemption from 'going through the medieval city without stopping phase';
- the lack of measurable success indicators that can be used to assess the effect of the pilot phase.

It is possible, however, to tackle those issues by reinforcing the potential benefits of the City Goods measure as a measure to foster sustainable mobility through concrete measures as reported below.

- The actual use of loading factors as an indicator can lead to ambiguity but it is possible to verify the validity of the data stored by:

1. electronic computerization of the loading factor through GPS and barcode;
2. creating a database of loading factors and reporting procedures with verification and amendment of the data collected.

- The possibility of exemption through red certificates can be limited by:

1. increasing the price of the red certificates so that those vehicles that have not joined the City Goods scheme would not stop in the medieval part of the city;
2. establishing a maximum number of red certificates, for example 5, that can be requested every year;
3. completely abolishing the possibility to obtain red certificates.

- The through traffic for the medieval city can be limited by:

1. adding to the standing prohibition for vehicles not adhering to the City Goods scheme also the access prohibition;
2. changing where possible the traffic direction of the road in the areas where the scheme is in operation so that it becomes difficult to go through.

- The formulation of measurable success indicators to assess the effects of the scheme by:

1. setting up an annual traffic survey in the area under the scheme;
2. regularly recording the increase in the loading factors (monthly, quarterly, and yearly).

Sources

- BESTUFS, Best Urban Freight Solutions - Best Practice Handbook Year 1 (2000), (www.bestufs.net), 2000.

- Kjaergaard S. (City of Copenhagen), Inner city distribution in Copenhagen, Conference Manaenergy "Sustainable Transport Good practice at local and regional level", (<http://www.managenery.net>), Bruxelles, 13 June 2002. Kjaergaard S., 2002.

- Vej & Park og Parkering ◊ KØbenhavn, Bygge- og Teknikforvaltningen e The Municipality of Copenhagen (2003), Progress report for the City Goods Experiment, September 2003 (http://www.citygoods.kk.dk/english_summary.html).



Different parking tariffs in order to improve air quality

Country: Austria

City: Graz

Type of intervention

Objectives

Main actors involved

Description of the intervention

Special tariff/environmental parking

Manage access to the inner city area for all users and offer incentives for buying environmental friendly cars.

Initiator: Municipality of Graz – Department for urban development in a EU-CIVITAS initiative, supported by FGM- Austrian Mobility Research

Promoter: Municipality of Graz. The measure is co-ordinated amongst the departments for Parking Slot Management and Traffic planning.

Access to the pedestrian zones is limited for loading to a certain time period and there is video based enforcement in some areas which is able to recognise number plates (also able to exclude taxis having special extensions). Graz has introduced 13 zones in the city centre and outer city centre where parking fees are mandatory. There are three types of zones:

- covering the whole area 9am-7pm
- covering the whole area 9am-9pm
- covering only some streets 9am-7pm

This should not only guarantee sufficient parking space for clients, but also for city logistics (which also may use special loading zones reserved for loading/unloading). There are special regulations for business which reside in those zones and business having “rolling workshops” and electrically driven vehicles.



Description of the intervention

For **low-pollution** vehicles, there is a special tariff.

For these low-pollution vehicles, the park fee amounts to **€ 0.40** (minimum charge) for a half hour. Beyond that, the park fee goes up to **€ 2.40** in 10 cent increments (depending upon the maximum park duration), which can be arranged individually.

The savings for 3 hours in contrast to the normal park fee payer amounts to **€ 1.20**.

Low-pollution vehicles are those, which correspond to the pollutant standard euro IV (according to guideline 98/69/EG of 13.10.1998) and whose CO₂-emission per driven kilometre does not exceed the following limit values:

A) for gasoline vehicles: **140g**

b) for vehicles, which are operated exclusively with gas: **140g**

C) for diesel engine vehicles **with particle filter: 130g**

These vehicles are to be marked by an authorization license issued by the city of Graz on request for the maximum duration of two years.



Road pricing as a policy for the reduction of the level of congestion in the traffic network

Country: Great Britain

City: London - City congestion charging

Type of intervention	Despite the official name, the scheme is configured in such a way that the access is paid for irrespectively of the time of day.
Objectives	<ul style="list-style-type: none">- To decrease internal and through traffic.- To change the inhabitants' habits by encouraging the use of public transport in the city centre.- To decrease the congestion due to commercial traffic by reducing the total number of vehicles through the network and by optimizing loads and routes.- To facilitate movements on foot or by bicycle, thus improving mobility for tourists and residents.
Main actors involved	<p>Promoter: Mayor of London. The initiative was initiated as part of the 10-year Mayor's Transport Strategy, approved in July 2001.</p> <p>Manager: Transport for London (TfL), the integrated body responsible for the capital's transport system. TfL is directed by a management board appointed by the Mayor of London, who also chairs the TfL Board.</p>
Description of the intervention	<p>In July 2001, when the Mayor's Transport Strategy was published, which was raising a number of issues relating to transport, a first draft of the act defining the access scheme was issued and followed by a public consultation that lasted until January 2002.</p> <p>That strategy which was proposed by the Mayor of London Ken Livingston is called 'Central London Congestion Charging scheme' and was an attempt to solve the growing concern for the increase in levels of congestion in the city centre. These problems can be summarized as follows:</p> <ul style="list-style-type: none">- more than 1 million people commute to London each morning, and 75% of them use public transport;- 30000 vehicles use daily the London's main arterial roads;- nearly 2.8 million vehicles were registered in London in 1999;- the average travel time for a journey to work by car is 53 minutes;- the average speed of traffic in the city centre is lower than 10 miles per hour. <p>The version of the act dated March 2002, reviewed after the set of recommendations proposed in the consultation phase and become operative from February 2003, involves the following operational steps:</p> <ul style="list-style-type: none">- payment of an access charge for the city centre (inner ring road) from Monday to Friday (excluding festivities)

Description of the intervention

from 7:00 to 18:30; the charge is applied indistinctively of whether the vehicle is for passenger or goods transport, despite an initial proposal to charge freight vehicles 15 £ per trip, which was then reduced to 5 £ as for private vehicles, after a strong opposition by the haulers;

- payment methods, either on the day of travel or before, include telephone, post, Internet or in person by visiting any sale point displaying the congestion charge logo. This involves the registration of the number plate. Neither tolls nor barriers are used to enforce the charge but rather a network of cameras, which is in use since the early 90s for security reasons, with the LPR (Licence Plate Recognition) technology to detect number plates at the boundaries of the zone and throughout. There are 174 entry/exit points to/from the charging zone, some of which are one-way streets. As a result of the recognition process there is an automatic check of the registration of the number plate and a fine should one not pay the charge within the same day;
- there are a range of exemptions and discounts available to certain categories of drivers and certain categories of vehicles and individuals. These are highlighted below.
 - The following are exempt from paying the congestion charge and from registering the number plate with TFL: all two-wheelers, London licensed Taxis and minicabs, all public service vehicles/buses and coaches with 9 or more seats which are licensed with the Driver and Vehicle Licensing Agency (DVLA) as either in taxation class 'buses' or 'reduced pollution buses', private hire mini buses, etc.
 - The following are exempt from paying the congestion charge if they have the necessary license [and they have registered with TFL in the case of vehicles from Northern Ireland]: certain operational vehicles used by the emergency services such as ambulances, police fire engines and fire service vehicles, lifeboat vehicles, Health Service vehicles or vehicles for disabled people or institutions for disabled people (though a one-off charge of 16 Euro is required in these cases). The same applies to all vehicles registered within the European Union (EU) that belong to the latter type of vehicles and ambulance services.
 - The following are exempt from paying the congestion charge but must register with TFL: other vehicles/buses and coaches with 9 or more seats registered within the EU, vehicles for public services (postal, hygiene, cleaning and waste collection services, service for the parks and gardens, mobile libraries, road servicing, food catering and school transport), Municipality vehicles and certain categories of military vehicles.
 - The following are exempt from paying the congestion charge but must register with TFL and pay an annual fee of 16 Euro: Vehicles for towing away or breakdown services in use to provide roadside assistance or recovery services operated by independently accredited organisations and electric or the cleanest alternative fuel vehicles (with capacity >3.5 tonnes if their emission factors are equal or better than the standards of Euro 3, with capacity <3.5 tonnes if their emission factors are 30% higher than the standards of Euro 4 or superior).
 - The reimbursement of the charges can be obtained in case of private vehicles carrying ill people to hospital or comparable NHS structure and who is clinically assessed as too ill, weak or disabled (with a compromised immune systems, requiring regular therapy or assessment or recurrent surgical intervention) to travel to an appointment on public transport. Same applies to vehicles used by NHS staff on journeys carrying bulky, heavy or fragile equipment as well as on-call for services in an emergency.

- Further exemptions include the residents of the central zone under road pricing who own a parking permit for their zone of residence as long as they do not travel during the time interval when the charge is applied. To those residents of the central zone (with parking permit) who travel to the zone under road charging, a discount of 90% on the cost of the yearly permit is applied: the yearly permit costs 200 Euro (plus 16 Euro of yearly tax). Each resident can ask for the exemption or the discount for one vehicle only they own.

Daily (payment before 22:00)	8 €
Daily (payment from 22:00 to 24:00)	16 €
Weekly permit (5 consecutive days)	40 €
Monthly permit (20 consecutive days)	158 €
Yearly permit (252 consecutive days)	1995 €

Payment within 14 days	63 €
Payment within 28 days	127 €
Payment after 28 days	190 €
Number of tickets not paid greater than 3: removal or clamping of the car if parked on public soil	

Dimension of the intervention

Costs

Results

Within the road charging area:

- Traffic: -10/15%;
- queue reduction: -20/30%;
- increase in average speed: + 10/15%.

- increase in traffic on the ring roads: + 5%;
- reduction of traffic on radial roads: - 5/10%;
- reduction of total traffic: - 1/2%.

Results

Modal shift:

- shift of about 20000 people from private car to public transport: about 5000 of them to use the underground and the remaining 15000 other public transport means.

Economic results:

- Initial investment: about 320 million Euro.

- Yearly net income: about 206 million Euro.

Issues emerged

The majority of transport operators assert that the road pricing project is not well designed because of the limitations imposed on their work and thus they ask that the same exemption from paying applied to buses should be used with freight vehicles, the logic being that the latter are a public utility service as well as the former.

The access fee is considered as an unjust tax as transport operators cannot avoid it (they have no alternative choice as opposed to private transport that can shift to public transport).

Sources

<http://www.london.gov.uk/mayor/congest/index.jsp>

<http://www.cclondon.com/>

http://www.london.gov.uk/view_press_release.jsp?releaseid=1630

<http://www.roadtraffic-technology.com/projects/congestion/>

	<p>Road pricing as a system to collect revenues to be used for new road infrastructure and strengthening of public transport system.</p> <p>Country: Norway</p> <p>Cities: Bergen, Oslo and Trondheim</p>
Type of intervention	Road pricing as a function of vehicle capacity
Objectives	To finance new road infrastructure by redirecting, in the case of Oslo and Trondheim, part of the revenues towards the strengthening of local public transport (about 20% of the revenues in Oslo; about 18% in Trondheim, to also include actions for a more widespread sustainable mobility and greater road safety).
Main actors involved	<p>BERGEN</p> <p>Manager: Bro&Tunnelselskapet AS (The Bridge and Tunnel Company Ltd., 51% owned by the municipality of Bergen and unitary authorities, 49% from banks, industries and insurance companies).</p> <p>OSLO</p> <p>Promoter: Municipality of Oslo</p> <p>Manager: Fjellinjen AS (60% owned by the Municipality of Oslo and 40% owned by the Municipality of Akershus)</p> <p>TRONDHEIM</p> <p>Promoter: Municipality of Trondheim</p> <p>The Norwegian cities of Bergen, Oslo and Trondheim have a similar tolling system with payment on access.</p>



Description of the intervention

Size of the intervention

The toll fee is paid at one of the toll entry points placed along a cordon that delimits respectively the chargeable central part of the cities of Beren and Oslo, and the different charging zones for the city of Trondheim.

For Oslo, a fee is levied for 24 hours a day, over te whole week.

For the other 2 cities the access is free at night (from 22:00 to 6:00 in Trondheim) and at weekends.

BERGEN (220000 inhabitants)

About 10% of the inhabitants live within the chargeable central zone. The experimentation of the access payment system in the central part of the city has been introduced in 1986.

The initial investment was in the range of 1980000 Euro; the yearly income in 1999 was about 9245000 Euro, 70% of which has been directed towards the construction of new road infrastructure, 20% towards operative costs and 10% towards the creation of a fund.

The payment of a toll fee (manually or automatically with coins) is done at one of the 7 toll points along the ring road delimiting the payment area. Vehicles owning seasonal tickets can pass through without stopping.

TOLLING CHARGES BERGEN (APPLIED FROM 1999)

	Capacity <= 3.5 tonnes	Capacity > 3.5 tonnes
Toll charge	0.7 €	1.3 €
Monthly pass	13 €	26 €
Six-monthly pass	76 €	152 €
Yearly pass	145 €	291 €
Carnet 20 entries	12 €	24 €

OSLO (508000 inhabitants)

About 50% of inhabitants live outside the chargeable central zone. The experiment of the tolling system with payment in the central part of the city, introduced in 1990, should end, according to the initial project, in 2007.

The payment of the toll fee can be done automatically, either electronically or manually, at one of the 19 toll points, with lanes dedicated to each type of payment, along the ring road delimiting the city centre.

TOLLING CHARGES OSLO (APPLIED FROM 1.11.2001)

	Capacity <= 3.5 tonnes	Capacity > 3.5 tonnes
Toll charge	2 €	4 €
Monthly pass	53 €	106 €
Six-monthly pass	257 €	594 €
Yearly pass	542 €	1083 €
Carnet 25 entries	45 €	90 €
Carnet 175 entries	291 €	581 €
Carnet 350 entries	528 €	1057 €
Deposit for electric chip	26 €	26 €

Dimension of the intervention

TRONDHEIM (145.000 inhabitants)

The introduction of the payment on access has been preceded by a dissemination and promotion campaign to the citizens in order to advertise the project and its objectives thus making it more acceptable.

The first fee on access scheme, introduced in 1991, has been reviewed and extended to the whole city in 1998; the city has been divided into 6 zones with payment on transit between the zones. Two different charging tiers depending on the time of day have been introduced.

The payment can be done automatically, either electronically or manually, at one of the 19 toll points (with lanes dedicated to each payment type) along the cordons that delimit the zones.

TOLLING CHARGES TRONDHEIM (FEE PER TRANSIT)

	Capacity ≤ 3.5 tonnes		Capacity > 3.5 tonnes	
	6:00 - 10:00	10:00 - 18:00	6:00 - 10:00	10:00 - 18:00
Toll charge	1.6 €	1.6 €	3.2 €	3.2 €
Carnet of tickets type 1, Euro 66	1.3 €	1.0 €	2.5 €	1.9 €
Carnet of tickets type 2, Euro 330	1.1 €	0.8 €	2.2 €	1.6 €
Carnet of tickets type 3, Euro 660	1.0 €	0.6 €	1.9 €	1.3 €
Payment after the transit < 5 trips	1.6 €	1.3 €	3.2 €	2.5 €
Payment after the transit < 10 trips	1.4 €	1.1 €	2.9 €	2.2 €
Payment after the transit > 11 trips	1.3 €	1.0 €	2.5 €	1.9 €

Results

BERGEN

Results and future developments (1999): as from initial project, the road network of Bergen has been financed wit part of the income from toll fees.

Surveys carried out on the inhabitants the year before and after the introduction of the tolling system have detected a compliance rate of respectively about 46% and 63%.

The possibility of extending the tolling scheme for a further 15 years is being evaluated, the aim being congestion charging (seen as management of the demand with variable prices reflecting the pressure for access) and financing public transport.

TRONDHEIM

Results: Surveys carried out on the inhabitants the year before and after the introduction of the tolling system have detected a compliance rate of respectively about 28% and 52%. Surveys following the introduction of the new system have detected an increment in the acceptability (about 62% of the interviewed were in favour).

Results

OSLO

Results (2002): despite early surveys showing a low degree of acceptability of the fee to enter system (the year before 70% of those interviewed declared their opposition to the introduction of the scheme), more recent ones have shown greater acceptability (about half of the interviewed were in favour).

Identified a limited effect of vehicle flows: Oslo estimates that only an increment in the fee (to 3-5 times the current price) can produce significative effects on the demand and modal shift.

Discussions are ongoing on whether the payment on access system should be maintained, with the objective of reduce the problems due to congestion in the access routes to the city centre. A further option being evaluated is the introduction of a new system involving demand management at peak times (like congestion pricing).

Possible future development for Bergen and Oslo: introduction of a payment system which is differentiated according to demand (like congestion charging).

Sources

Oslo: www.fjellinjen.no

Bergen: www.brotunnel.no

Trondheim: www.progress-project.org

- BESTUFS, Best Urban Freight Solutions - Best Practice Handbook Year 3 (2002), draft, (www.bestufs.net), 2002.

- Odeck J., Brathen S., Toll financing of roads – The Norwegian experiences, 14th Congress of the International Road Federation, Paris, 2001.

- Trevik T., Urban road pricing in Norway: Public acceptability and travel behavior, Conference MC ICAM (Marginal Cost pricing in transport project – Integrated Conceptual and Applied Model analysis) "Acceptability of Transport pricing strategies", Dresden, 23-24 May 2002



Road pricing as an instrument to obtain environmental benefits

Country: Sweden

City: Stockholm – identification of the LEZ (Low Emission Zones) Zones

Type of intervention	Road pricing in relation to the environmental impact of vehicles
Objectives	To reduce the problems of environmental pollution
Main actors involved	Municipality of Stockholm
Description of intervention	<p>On April 1st 1996, in the Stockholm central area, a project was launched that endorsed the definition of “environmental zones”, so called because representing geographical zones inside which special traffic regulations are in force to reduce the environmental pollution. Those zones are to be protected from the negative impact of vehicular traffic and cannot be entered by vehicles that do not belong to a specific “environmental category” which is characterized in terms of noise and polluting emissions.</p> <p>In such zones the Municipality prevents commercial vehicles from circulating if their weight is over 3.5 tonnes and diesel buses that are not included at least in the EURO 3 class.</p> <p>There are however special exceptions.</p> <p>Exceptions in Stockholm as from 1.01.2002 (zone in the Stockholm centre).</p> <ul style="list-style-type: none">- Vehicles with particularly low emissions: vehicles that can be certified to belong to the Euro 4 class or more can enter in the environmental zone for a year upon request.- Vehicles equipped with filter for emissions control: vehicles that are more than eight years old can enter the environmental zone if equipped with filter for emissions control.- Change of engine: if the vehicle has been mounted a new Euro 3 engine, it can obtain the permit to circulate in the environmental zone for some years. <p>In the urban centre of Stockholm the following regulation is in force:</p> <ul style="list-style-type: none">- the commercial vehicles with load over 3.5 tonnes cannot circulate at night (from 22:00 to 6:00);- the commercial vehicles with length over 12 m are not authorized to enter the urban centre;- the traffic of all motor vehicles is allowed from 6:00 to 11:00 (except taxis);- heavy goods vehicles with diesel engine do not have to be more than 8 years old in order to enter the city center.
Dimension of the intervention	The environmental zone of Stockholm has roughly a dimension of 5 x 7 km with about 250000 inhabitants and 280000 work places.

Results

The project lead to a significant reduction in polluting emissions (in the period 1996-2000 particulate matters have increased from 15% to 20%, hydrocarbons from 5% to 10% and NOx from 1% to all'8%)

Sources

Landborn J. (2003), "National Research Programmes Addressing. Commercial Urban Trasport", Joint Workshop BESTUFS (Best Urban Freight Solutions), 28/29 April in Dublin, Ireland, (www.bestufs.net), 2003
www.trendsetter-europe.org
www.stockholm.se
www.miljobilar.stockholm.se

PART B

Experiences where a structural
or direct policy framework
prevails

1. AMSTERDAM
2. LEIDEN
3. UTRECHT
4. BERLIN
5. BREMEN
6. COLOGNE
7. FREIBURG
8. KASSEL
9. NUREMBERG
10. PRINCIPALITY OF MONACO
11. LA ROCHELLE
12. BARCELONA
13. BASLE
14. STOCKHOLM
15. FERRARA
16. GENOA
17. PADUA
18. SIENA



Dutch Model:

Regulation of the urban distribution through a system of permits and licenses, issued according to specific environmental standards and logistics efficiency

Country: Netherlands

City: Amsterdam

Name of structure

Type of structure

Origin of initiative

Funds

State of the project

Municipal regulations

Membership conditions

Organisation and management

Operations

Objectives

Sources

City Distribution Center

Urban Distribution Center - UDC

Private initiative of the haulers in partnership with the Chamber of Commerce and the municipality.

The costs sustained by the local administration of Amsterdam are:

- 75000 Euro for the implementation of the project;
- 18000 Euro for investments on traffic signs

Started in 1996.

Since 1996 one can enter the LTZ if three requirements are met (**filter system**):

- total capacity lower than 7.5 tonnes;
- length lower than 9 meters;
- vehicle at least 80% laden with goods to deliver to or to collect from the LTZ;
- compliance with Euro 2 emission standards, since 1998.

A system of permits and distribution licenses which are issued to haulers (with a maximum of 1800 permits are issued) exists plus measures to endorse their aggregation.

Optional.

The breakdown of goods which are directed towards the city centre happens in 9 logistic centres located in the periphery that coincide with existing logistics platforms of the haulers who provide the final part of the journey. Manager: local haulers group in partnership with the Chamber of Commerce and the Municipality. The system coordinator is paid by the Municipality.

Handling of 20% of the total amount of goods distributed in the centre.

Specialized transport is excluded as well as the service to large warehouses.

To rationalize the freight transport in the city centre.

To decrease the traffic congestion.

To decrease the environmental effects caused by loading/unloading operations in the city centre.

www.transports-marchandises-en-ville.org

www.eltis.org



A bankruptcy case for the scarce financial profitability and the strong oppositions of the haulers, who were against the policy of the administration that was aiming to create a monopoly in the service of urban distribution of goods.

Country: Netherlands

City: Leiden

Name of structure

Type of structure

Origin of initiative

Funds

State of project

Municipal regulations

Membership conditions

Organisation and management

Operations

Objectives

Sources

UDC located in the periphery

Centro di Distribuzione Urbana (UDC - Urban Distribution Center)

The administration established an urban distribution system based on the issue of specific distribution permits, and favored an organization linked to a UDC.

European funding for the purchase of 5 electric vehicles

Initiative started in 1997, but suspended in 2000

The regulation of the centre allows the access to freight vehicles from 5:30 to 11:00.

For the operators who do not support the UDC the permissions relate to the interval 6:00-10:00.

The licensing system issued by the municipality was a function of several criteria such as: vehicle load, number of deliveries per day, etc.

The creation of a UDC was envisaged as well as the creation of a management company for the centre (UDC Company) with participation of:

- the municipality of Leiden;
- the freight company Mostert, that made available their own existing platform and dealt with the operative management of the centre and with the urban distribution;
- company De Zijl Bedrijvlev, controlled by the municipality, with the task of supplying the necessary manpower to the UDC.

The distribution was carried out with 5 electric vehicles obtained with European Commission funds.

The goods on arrival to Leiden and with destination the centre should converge towards the UDC, which is located in the outskirts. In the UDC the goods were aggregated and loaded on vehicles owned either by the management company or by the haulers with distribution license.

To decrease the congestion derived by commercial traffic through a reduction of the total number of circulating vehicles and the optimization of loads and routing.

To decrease the distribution costs.

www.transports-marchandises-en-ville.org

Progetrasporti Associati (2001), Breve analisi delle esperienze di City Logistics in Europa, commissionato da FILT-CGIL, Milano



A bankruptcy case because of the low number of companies passing their own deliveries on to the authorized company

Country: Netherlands

City: Utrecht

Name of structure

Urban Distribution Center

Type of structure

UDC (Urban Distribution Center)

Origin of initiative

The Administration established in 1994 a system of urban distribution based on the issuing of specific distribution permits.

The "urban distribution permits" system was granted by the "urban distribution Council" to all haulers who were abiding by the following conditions:

- to own vehicles with total load per wheel not over 2 tonnes (or 1 tonne for some roads);
- to carry out a minimum of 100 deliveries per day, with at least 25 delivery points for each vehicle at each exit;
- to have access and use a UDC for goods collection, which is located in the proximity of the city.

Source of funds

The distribution system that used three UDC was started by the haulers without neither public contribution nor subsidy.

State of the project

Operation in the period 1994-1996 only.

Municipal regulations

In the urban centre deliveries can be carried out only in the time windows 6:00-11:00 and 18:00-19:00. In addition, laden vehicles cannot exceed 2 tonnes for wheel (or 1 tonne for some roads) and should be equipped with radiotelephone.

For the vehicles with the Urban Distribution Centre permit the circulation timetable was less restrictive with up to 16 hours per day of allowance.

Membership conditions

The two companies that obtained the license have merged into a company (SDC Stadsvracht) and have used some centres for the urban distribution (Stadsvracht, Dentex and SDC-Utrecht).

Organisation and management

The companies Nedloyd and PTT Post obtained the distribution license and constituted the joint venture SDC Stadsvracht.

Operations

The centres did not work eventually, few goods were conveyed and the haulers found it hard to pass on their loads to the UDC.

Objectives

Reduction of trucks in the centre of the town from 1500 to 400 vehicles per day

Sources

www.transports-marchandises-en-ville.org

Whiteing A. E., Edwards S. J., "Urban freight trans-shipment facilities: a European comparative study", Department of Transport and Logistics, The University of Huddersfield.

Van Bisbergen A., Visser J. (2001), "Innovation Steps towards efficient Goods Distribution Systems for urban Areas", TRAIL, Delft University Press



A disastrous case because of the low number of companies that have entrusted their own deliveries to the authorized company

Country: Germany

City: Berlin

Name of structure

GVZ (Güterverkehrszentren – Goods Traffic Centers)

Type of structure

Three UDC at the boundaries of the urban area

Positions of the facilities

Wurstermark in the West

Großbeeren in the South

Freienbrink in the South-East

The three sites have a high accessibility both by rail and by road

Origin of initiative

Joint venture between the Senate Department of Urban Development of Berlin and the Landesentwicklungsgesellschaft für Städtebau, Wohnen und Verkehr des Landes Brandenburg mbH

Sources of funds

The federal state of Brandenburg contributes up to 38% of the investment in case the companies are located into one of the logistics centres.

In 1998 the companies located in one of three GVZs have received about 90 millions DM of funds

State of the project

A membership of 72 companies

1705 hectares occupied

3794 jobs contractually guaranteed

Municipal regulations

There isn't a regulation specifically to facilitate the distribution related to the UDC.

Membership conditions

Optional for the haulers, with financial incentives by the federal state.

Organisation and management

Managed with the voluntary cooperation of haulers.

The UDC offers also supplementary services such as workshops for reparations and washing.

Operations

Within 2010 the GVZs will handle about 500000 goods items and 8 million tons of goods using environmental friendly procedures

Objectives

Intermodality between long distance and local traffic and between train-road-water (in the case of Wurstermark)
On a steady-state regime the GVZ is expected to generate 7000-8000 jobs

Sources

www.stadtentwicklung.berlin.de

www.leg-brandenburg.de



GVZ managed by a company (GTCDC) partially financed by the Administration

Country: Germany

City: Bremen

Name of structure

City Logistik

Type of structure

GVZ [Güterverkehrszentrum, goods distribution centre]

Sites of structure

200 hectares of land close to the port property of the municipality

Origin of initiative

The GVZ started in 1985

Source of funds

The total cost of the initiative is of about DM 600 millions

State of project

Started in 1995

Municipal regulations

Within the PIT framework (Integrated Transport Plan) started in 1991 a number of actions leading to a definition of recommended routes for freight vehicles have been defined and a regulation of the circulation during the day and at night, with differentiations based on vehicle capacities.

Membership conditions

The participation is voluntary.

The companies that use City Logistik are shareholders of GTCDC (the development company for the structure), which works as a coordinator and neutral allocation manager, partially financed by the Administration.

Organisation and management

Different companies using the GVZ platform made an agreement to coordinate the urban deliveries and to split the delivery of their own goods.

9 companies cooperate regularly and 3 occasionally to carry out the deliveries to 20 destinations (to 3 districts of the city and in the nearby Oldenburg).

GTCDC pledges a supervision coordinator for the distribution of the deliveries among the companies.

Operations

The initiative has lead to an increase in the average loading rate by 28% and a reduction of the number of trips per day of 13%

Objectives

To plan smaller City Terminals and closer to the city centre

Sources

www.transports-marchandises-en-ville.org

Whiteing A. E., Edwards S. J., "Urban freight trans-shipment facilities: a European comparative study", Department of Transport and Logistics, The University of Huddersfield.



Platform managed by a large rail-based freight operator.

Country: Germany

City: Cologne

Name of structure

Eifeltr City Logistics

Sites of structure

Logistic platform adjacent to the public platform Eifeltr

Origin of initiative

Municipal initiative of 1993, which is part of a general programme of the city concerning freight transport

Source of funds

Entirely private

State of project

Started in 1998

Municipal regulations

Within the PIT framework (Integrated Transport Plan) started in 1991 a number of actions leading to a definition of recommended routes for freight vehicles have been defined and a regulation of the circulation during the day and at night, with differentiations based on vehicle capacities.

Membership conditions

Managed by a private operator

Organisation and management

Private management of an important rail-based freight operator outside Deutsche Bahn.

Products of small and middle retail companies are moved, with the exclusion of the large warehouses. A part of the site is dedicated to the storage of dangerous goods

Operations

The system must guarantee 10% of city centre deliveries

Objectives

To shift the deliveries rush hour in town from 11:00 to 17:00

To reduce of at least 30% the journeys of delivery

To increase vehicles load rate to up to 70%

Sources

www.transports-marchandises-en-ville.org

Whiteing A. E., Edwards S. J., "Urban freight trans-shipment facilities: a European comparative study", Department of Transport and Logistics, The University of Huddersfield



Experimentation of a goods distribution system optimized for the city centre shopkeepers, which was elaborated on the basis of informal agreements among the transport companies

Country: Germany

City: Freiburg

Name of structure

Type of structure

Origin of initiative

Funds

State of project

Municipal regulations

Freiburger City-Logistik

The distribution system did not use a unique warehouse, but was using the different seats of the various companies adhering to the initiative.

Private initiative of haulers, with the impulse for the centralized management of deliveries of the Chamber of Commerce and Industry.

Neither subsidy for the UDC haulers, nor regulative help

Operations of the experiment: 1993-1997

The LTZ regulation involves:

- the possibility to deliver in the time window 8:00-12:00;
- access allowed only to vehicles with laden capacity not over 7.5 tonnes.

In the Pedestrian Areas the regulation involves:

- possibility of delivering in the time windows: 5:00-10:30, 19:00-22:00 from Monday to Friday and 5:00-9:00 and 19:00-22:00 on Saturday;
- access allowed only to vehicles with laden weight not over 7.5 tonnes.

Membership conditions

Organisation and management

The participation is voluntary. It is meant to be a goods distribution system optimized for the shopkeepers of the city centre, and elaborated on the basis of informal agreements among the companies that adhered to the initiative.

Four cooperation groups were constituted, each composed of various companies joined together on the basis of the geographic position of their seats and to the related production supply chain. Every group has defined their own organizational model for the deliveries: the deliveries are carried out by a third operator outside the group (paid by the same group) who collects the goods from each company and distributes them or from one of the group components on a rotational basis.

Operations

Recorded results on 1993 (Energies-Cités and ADEME, 1997):

- 50% reduction in the number of vehicles travelling per day for deliveries in the city centre;
- increase of load rate for the vehicles delivering in the centre (from 45% to 70%);
- reduction of the average distance travelled for deliveries (from 10 km to 5 km).

Objectives

To decrease the congestion deriving from the commercial traffic by reducing the total number of the vehicles travelling and the loads and by optimizing routes.

To decrease the distribution costs.

Sources

www.transports-marchandises-en-ville.org

Energie-Cités e ADEME (1997), Gestion du trafic commercial de livraison



The delivery of goods in the urban area is carried out on the basis of a specific urban logistics tariff

Country: Germany

City: Kassel

Name of structure

City Logistik

Type of structure

UDC (Urban Distribution Center) serving the historic centre area

Origin of initiative

The creation of an urban distribution centre was an integral part of the urban logistics approach required by the forwarding agents association and by the Chamber of Industry and Commerce of Kassel.

Source of funds

None

State of project

The project, still ongoing, started in 1994

Municipal regulations

Specific institutional measures were not foreseen to support this type of approach.

Membership conditions

Voluntary cooperation of 7 forwarding agents that are grouped in a cooperation to carry out the deliveries in the city centre of Kassel.

Organisation and management

A cooperative has been created, which is composed of 7 forwarding agents who, in order to carry out the deliveries in the city centre of Kassel, use a neutral operator.

The neutral operator every morning at 6:00 collects the goods left in the warehouses during the night by the forwarding agents with 5 vehicles, splits the goods in the UDC depending on the recipients' address and, obviously of the corresponding routes.

The deliveries start approximately at 10:00 in the morning, with two or three 7.5 tonne vehicles and are usually carried out in two rounds per day, with an average load carried of 5 to 6 tonnes per day.

RESULTS OF THE UDC OF KASSEL

	Without city logistics	With city logistics	Difference
Kilometers traveled towards the city	31000	18000	-42%
Kilometers traveled inside the city	6500	2600	-60%
Average distance between stops (m)	670	260	-61%
Weight delivered (kg) at each stop	170	195	+15%
Utilization of vehicle capacity (volume)	40%	80%	+100%
Utilization of vehicle capacity (weight)	25%	60%	+140%
Number of trucks per retailer (number of vehicles per year)	300	260	-13%

Costs	The services that the neutral operator of the distribution centre guarantees (transport and transfer) are paid on the basis of a specific urban logistics tariff. According to some surveys carried out, the approach is not bearing significant variations of cost for the forwarding companies involved (there are neither profits nor additional costs with respect to the traditional delivery services).
Objectives	<div>To decrease the congestion derived from commercial traffic by reducing the total number of travelling vehicles and by optimizing loads and routes.</div> <div>To save energy.</div> <div>To decrease the costs of distribution.</div>
Source	Kohler U., New ideas for City Logistics Project in Kassel, University of Kassel



UDC managed by a cooperative of haulers

Country: Germany

City: Nuremberg

Name of structure	GVZ Hafen Nürnberg Project ISOLDE
Type of structure	UDC large in dimension with logistics services optimized for the businesses of the city centre
Site of structure	Centre of 1.6 km ²
Origin of initiative	Joint action amongst the shopkeepers of the city centre
Source of funds	Public participation in the Directional Committee of ISOLDE
State of project	Operative since 1996
Municipal regulations	The majority of deliveries take place in a pedestrian-only area
Membership conditions	The participation is voluntary. The haulers and shopkeepers who have joined ISOLDE have set up a company and pay a monthly fee as a function of the surface of the warehouse used
Organisation and management	The UDC provides 4 main services: delivery to dealers, stocking, management of packings and special shopkeepers. Within the structure there is a platform for goods aggregation and distribution. The fleet of the UDC is made of 4 vehicles, 1 of which is electric.
Operations	10% of the total traffic volume for the city centre, which amounts to 5000 tonnes and 750000 items
Objectives	The number of diesel vehicles per km has gone down from 250 to 104 per day To decrease the congestion due to commercial traffic by reducing the total number of vehicles traveling in the network and by optimizing loads and routes. To decrease the costs of distribution.
Source	www.transports-marchandises-en-ville.org



Name of structure	The UDC is owned by the local administration which is managing it as a public service and run by a private company
Site of structure	The fee paid by the recipient of the goods for the delivery is not high enough and as a result, the Monegasque government provides extra funds to the service manager.
Origin of initiative	
Source of funds	Country: Principality of Monaco
State of project	City: Monaco
Municipal regulations	
	Logistics platform of Fontvieille
	Logistics platforms situated within the industrial and commercial area of Fonvielle, South-West of the Principality
	The UDC owned by the Monegasque Government was created in 1989. Until 1999, the government concession for the public service of goods distribution was allocated to the company Office Maritime Monégasque SA. From 2000, the concession has been allocated to the company Monaco Logistique (ML).
	The Monegasque Government offers the UDC rooms and funds to the operative manager of the service.
	Operative
	In 1989 a ban was introduced on circulation, standing and loading/unloading operations for vehicles whose capacity is higher than 8.5 tonnes except for the transport with refrigeration, of isothermic products, some components for informatics and perishable goods for which derogations were made. The ban has been extended to the whole Principality.
	Vehicles with lower capacity can circulate within the time slots 7:45-8:15, 11:30-12:30 and 13:45-14:45.
	Deliveries are allowed within the time slots 8:30-11:30, 12:30-13:45 and 14:15-16:30.
	When the circulation is not allowed, it is instead possible to stand at loading/unloading areas.
Membership conditions	The manager has had in concession the use of the logistics platform.
Organization and management	Vehicles with capacity higher than 8.5 tonnes must deliver the goods at the logistics platform which is situated in the industrial and commercial part of Fontvieille (Souh-West of the Principality). Those goods are then either distributed by the ML company (using vehicles with 6.5 tonnes capacity), costing to the recipient about 1.52 Euro/100 kg [1995 data] or it is the recipients themselves who collect the goods.
Objectives	Reducing the traffic congestion in the city and improving the distribution of goods.
	The government has the intention to progressively lower down the weight limit for vehicles needing to enter the city in order to endorse a delivery method which only uses the UDC.
Source	www.transport-merchandises-en-ville.org



Pilot UDC using electric vehicles. Over costs of the UDC distribution system are partly covered by public funds.
The regulation for the access to the city centre has been used as a supporting measure for the UDC and is only based on vehicle capacity.

Country: France

City: La Rochelle

Name of structure

Site of structure

Origin of initiative

Source of funds

State of the project

Municipal regulations

Membership conditions

Organization and management

Operative dimension

Objectives

Source

City Freight Distribution

The UDC is situated 1 km apart from the medieval centre, beside the rail station, and serves an area with 1300 businesses

Start of the project/initiative: 2001

Promoter and coordinator: Communauté d'Agglomération de La Rochelle.

Partner: Chamber of Commerce, Craftsmen Associations, shopkeepers and Haulers

Funds provided by the local administration for the infrastructure (covering 750 m²) and of ELCIDIS (Electric Vehicle City Distribution Systems) for the management software, equipment and vehicles (9 electric vehicles, 2 of which with controlled temperature for the delivery of perishables)

Experimentation (2001-2005)

From 2001 a limitation is imposed on the available time slots for deliveries with vehicles whose capacity is higher than 3.5 tonnes (deliveries allowed only from 6:30 to 7:00)

The use of the platform is not mandatory and therefore those who want can deliver the goods within the above specified time slot

The manager of the service, who has won a bid to provide it, is a private transport company (Genty) operating with the help of public funds: The EU provides funds, based on number of items and pallets delivered by the platform, for up to 0.7 €/item (initially it was 2.08 €/item) against an average delivery cost of 3.75 €/item.

The UDC is involved in about the 30% of total deliveries in the city centre (450 items/day, and between 5 and 10 pallets per day)

To reduce traffic congestion and pollution

To rationalize the urban distribution of goods

Given the economic issues created by the breakdown of the load, in order for the initiative of urban distribution of goods to continue, the total volume of goods moved must raise from the current 450 items to 600 items per day
www.elcidis.org



Name of structure

Type of structure

Origin of initiative

State of the project

Municipal regulations

Organisation and management

Operations

UDC set up through the Urban Freight Management in Barcelona, initiative fostering integrated intervention policies on urban distribution of goods.

Country: Spain

City: Barcelona

Mercabarna and Parc Logistic Zone

Logistics platforms

The setting up of the two platforms is based on the **Urban Freight Management** initiative started by the Municipality of Barcelona.

Started in 1997

The initiative has endorsed a number of measures running in parallel:

- 5 Pedestrian Zones have been identified whose access is regulated by an electronic access system with 50 entry paths via an electronic map. For vehicles delivering the goods the access is allowed only at specific time intervals and, in order to avoid misuse, cameras are positioned at the entry points;
- 700 areas for loading/unloading goods have been identified at the main intersections as follows:
 - zones reserved to loading/unloading of goods from 8:00 till 14:00 (or to 20:00) within the city centre;
 - maximum time for operations: 30 minutes;
- “multifunctional roads” have been identified, whose utilization depends on the time of day (long duration standing at night, private vehicle circulation at peak times during the day, and goods delivery at off peaks), and advertised through Variable Message Signs (VMSs).

The access to the two UDC is restricted and checked centrally with different equipment.

In particular the Mercabarna transit point is provided with an access control system whereby a fee is levied via a smartcard at the entrance.

At the Parc Logistic Zone transit point however, the payment is based on smartcard or magnetic ticket and a digital video allows for the movements in and out to be checked.

The system is compatible with different formats and it is possible to acquire a monthly pass for both transit points.

Currently 10000 vehicles use the Mercabarna one (opened in 1998) every day whilst for the Parc Logistic Zone (opened in February 2001), 100% of the foreseen monthly tickets have been sold.

Objectives

- To decrease the congestion deriving from commercial traffic by reducing the total number of vehicles circulating and by optimizing loads and routes.
- To obtain a greater flexibility in the management of the distribution
- To rationalize the distribution of goods to obtain a more efficient distribution system.
- To increase the safety for pedestrian traffic and thus the usability of the city for tourists and residents.
- To experiment advanced technologies.

Results

The first period of application of the "Urban Freight Management" system, has led to the following assessment:

- the political willingness is crucial for the project to succeed;
- the allowed standing time is set to 30 minutes; surveys have identified this time to be sufficient for any type of delivery. The removal of the vehicle follows the infringement of the new laws. An automatic system for the control of the time spent on the parking bays is necessary in order to cope with the difficulty of surveying those spaces;
- the installation of all the equipment is a fairly expensive operation (in particular the diversified use of the roads has cost approximately 0.5 million of Euro per itinerary);
- the utilization of the roads shared among several users has been successful. The measure is accepted by the users and could also improve the innovative image of the city;
- the quality of life has increased;
- the automatic collection of the fee (with classification beforehand and automatic storage of the information on the registration plate) reduces waiting times, increases the efficiency of the measures and could also be used to regulate the access to the city.

In the future it is foreseen an extension of the services to the whole city and an implementation of the system with:

- development of software for trip planning from transit points to delivery points, allowing also for the booking of reserved spaces for loading/unloading;
- creation of special zones called "clean zones" whose access is reserved to low emission vehicles.
- insurance for the last part of the trip chain for the goods that could break because of the transit through the logistics platforms.

Source

Ramon Julio Garcia (2001), Best Urban Freight Distribution in Barcelona, Conference BELSTUFS, 30th March 2001



The "Basel City Logistiek" did not take off, to also involve other transport operators, mainly because of the low income generated.

Country: Switzerland

City: Basle

Name of structure

Type of structure

Origin of the initiative

Source of funds

State of project

Municipal regulations

Pilot project "Basel City Logistiek"

5 UDC offered by transport companies

The pilot project has been launched within the national action framework "Energie 2000" of the "Office Fédéral de l'Energie"

The municipality has contributed to cover overheads;

Started in 1993; taken forward only at experimental level and then discontinued when in steady-state.

The total authorized fully laden weight for commercial vehicles circulating in the city cannot be higher than 28 tonnes.

Vehicles with fully laden weight higher than 3.5 tonnes cannot circulate between 22:00 and 6:00.

Pedestrian zones can only be accessed by vehicles whose total fully laden weight is not higher than 18 tonnes and only between 6:00 and 10:30.

The participation to the scheme is voluntary.

The reorganization has been managed by three transport companies that grouped together and by offering their own terminals, the vehicles and the manpower for the deliveries in the city, were charging for their work the companies wishing to transfer the goods (except for temperature-controlled ones) onto one of the 5 UDC.

Deliveries were carried out with 3 vehicles (one of eco-diesel type, one bi-fuel and one propelled by natural gas) with capacity of 3.5 tonnes

Operations

These are the results registered in 1993 (Energie-Cités and ADEME, 1997):

- increase in the loading factor for vehicles (from 28% to 47%);
- increase of the number of daily deliveries per vehicle (from 8 to 15);
- reduction in energy consumption (for diesel vehicles from 17 l/100 km to 15 l/100 km, for petrol ones from 18.8 l/100 km to 18.6 l/100 km).

Objectives

Rationalization and optimization of the movement of goods in the city

Source

Energie-Cités e ADEME (1997), Gestion du trafic commercial de livraison



A unique case of a temporary UDC

Country: Sweden

City: Stockholm

Name of structure

Type of structure

Origin of the initiative

Source of funds

State of project

Municipal regulations

Membership conditions

Organization and management

Hammarby Sjöstad is also the name of the building project at the heart of Stockholm for which the UDC was set up
Logistics centre to optimize the delivery of building materials to a building yard

The creation of a temporary centre by private operators has been endorsed by the Stockholm Administration to help towards traffic problems

None

Continuing until 2010 when it is foreseen that the whole built-up area will be included

(See appropriate sheet about Stockholm's regulative policy)

All the companies operating in the building yard take part (10 managers of the building project and the investors).
In order to solve the logistics problem due to the creation of the built-up area, the Stockholm Administration has gathered together the various stakeholders and assigned to the Logistics Group of Hammarby Sjöstad the management of the project.

The centre offers services of shared transport of items, temporary warehousing and intelligent control of traffic; an electronic booking system for deliveries has been set up, where those are agreed upon well in advance and finely planned in order to avoid to get stuck in traffic and trip overlapping.

Every day Hammarby Sjöstad receives in total 700 tonnes of building material.

Avoid the traffic induced by inefficient logistics solutions for the building yard

www.trendsetter-europe.org www.bestufs.net

Operations

Objectives

Source



Starting up a logistics platform aiming to achieve economic profit together with efficiency in the distribution of goods across a region and social development.

Country: Italy

City: Ferrara

Name of structure

Type of structure

Origin of the initiative

Source of funds

State of project

Municipal regulations

Organisation and management

Operations

Objectives

Source

EcoPorto

20000 m² of which 7500 built up, with 2500-3000 m² been assigned to refrigerator depots.

Promotion and development due to the private company CoopSer, which has invested 6.7 million of Euro to purchase the area, building up on it and acquire methane propelled vehicles.

There has been no public contribution but the Municipality has progressively adopted regulative measures to favour transport with ecological-friendly vehicles.

Operative from June 2002

The Council has put together a number of regulations fostering the use of ecological-friendly vehicles for distribution of goods (see Ferrara act in Part 3)

CoopSer uses 60 vehicles within the Ferrara area alone, 30 of which are methane propelled. The company owns its own methane provision.

In 2001 alone, the use of a methane-gas propelled fleet has contributed to a reduction in the emissions due to urban distribution by 9%.

To organize new generation logistics that respects the environment without denting the profits.

Ondaverde September/October 2002



CDU with environmental friendly fleet

Country: Italy

City: Genoa

Name of structure

Type of structure

Origin of the initiative

Source of funds

M.E.R.Ci. (Mobilità Ecologica Risorsa per la Città – Environmental Friendly Resource for the City)

UDC (HUB), privately owned, which is situated 1.5 km apart from the motorway and 5 km apart from the historic centre. It is used for the distribution of goods through methane gas and electrically propelled vehicles.

Started on March 1st 2003, ongoing.

The plan has been financed within the Draft Plan for a Sustainable Environment by the Ministry for the Environment and by the Merope EU project.

Total value amounts to 1549371 Euro (3 billion lire), with tasks of:

- feasibility, coordination and management plan;
- HW acquisition;
- acquisition of limited or no environmental impact vehicles;
- acquisition of SW and simulation tools necessary for the creation of the telematics management system;
- definition, assessment and acquisition of the goods distribution hub;
- installation, inspection and experimentation;
- data dissemination;
- upgrade of the communications software, in particular the passage from GSM to GPRS.

State of project

In a first demonstration phase (March 2003 – June 2004), deliveries were made only in an area around 25000 m² of the historic centre, the so called "Pilot Area". This covers about 17% of the historic centre, with 328 retail points.

In a second phase from June 2003, the deliveries were extended to the historic centre (2000 retail points), in order to achieve the 1000 deliveries/day forecasted for this phase, as opposed to 150 deliveries/day of phase one.

Please see Part 3.

Municipal regulations

Organisation and management

The manager is Genoa-Eco Distribuzione Merci Srl, joining together the Chamber of Commerce, Unions and Municipality of Genoa.

The UDC is built upon an area of 1400 m², 700 m² of which are roofed-over.

The distribution fleet is composed of 8 electric vehicles and 2 methane propelled ones.

Objectives

Operations

Issues

Source

- To decrease the congestion derived from commercial traffic through a reduction of the overall number of vehicles traveling, the optimization of loads and routes.

- To rationalize the distribution of goods, in order to achieve a more efficient distribution system.

In the second semester of 2003, a positive feedback has been noted from those couriers/shopkeepers belonging to the scheme with an increased share of goods delivered (as detailed in the following table).

WORKING DAYS	MONTHS	ITEMS	FREIGHT BILLS	WEIGHT (QUINTALS)	NUMBER OF TRIPS
21	Mar.	1425	366	184.7	64
20	Apr.	2682	732	294.1	116
20	Mag.	3244	888	426.5	176
17	Giu.	3145	666	498.2	120
23	Lug.	5355	1196	853.5	178
10	Ago.	1405	429	245.5	69
22	Sett.	9856	2620	1409.7	242
23	Ott.	12562	3320	1851.3	293
20	Nov.	9131	2372	1525.4	274
18	Dic.	6383	1606	1153.4	293
18	Gen.	4126	705	798.8	92
20	Feb.	4936	1033	1104.4	137
23	Mar.	5970	1516	1230.9	129
21	Apr.	4890	1261	943.1	153
276	13 months	75110	18710	12519.5	2336

Legend: 'Number of trips' refers to round trips required for the delivery of goods, which have been carried out in the time period specified.

'Items' refers to both single items to be delivered and sets of items, within which a variable number of single items are present (the number of sets weights for about 3-5% in the number shown in the column).

Issues found relate to:

- achieving an agreement among all the companies interested in the scheme;

- identification of a well-suited area for the Hub;

- resolution of the problems linked to the use of electrical vehicles;

- difficulties in obtaining an economic stability for the project, irrespective of the funds obtained from the Municipality.

This sheet has been written using inputs kindly provided by the Municipality of Genoa.

www.genovamerici.it/



UDC with environmental friendly vehicles
According to the Business Plan, 4 years are required to break even

Country: Italy

City: Padua

Name of structure

Type of structure

Origin of the initiative

CITYPORTO

UDC of 1000 m² inside the Interport.

Protocol of agreement for the renewal of the commercial vehicles for an improvement of air quality in Padua and neighbouring towns signed in February 2003 between Municipality and Unions.

Agreement subscribed in April 2004 by Municipality, Province, Chamber of Commerce, Padua Interport Spa, APS Holding Spa, over the plan for the reorganization of the urban distribution of goods and for the activation of a logistics platform.

Source of funds

Veneto region: 193000 Euro

Municipality: 370000 Euro

Province: 60000 Euro

Chamber of Commerce: 90000 Euro

State of project

Service active from 21/04/2004, it will have a first pilot phase in 2004-2005 and a second phase with the expected creation of a company.

Municipal regulations

The Council's regulations have been modified in order to allow for a 24-hour access of the City Ports vehicles to the LTZ and to bus-only lanes.

Membership conditions

It is free to join the scheme (so far 13 couriers/operators have joined it).

Organization and management

The UDC uses 4 methane propelled vehicles that will become 17 in steady-state (covering also temperature-controlled transport) and software tools for the management of deliveries. These are made by CITYPORTO while maintaining the courier's logo on the freight bills.

Operations

Simulations show that, in order to delivery the same amount of goods, 1/5 of the vehicles used for the existing demand for transport without UDC would be sufficient. The operative plan includes a forecast to be even financially on the 4th year of management.

Objectives

To rationalize the distribution of goods in urban environment.

To reduce pollution and increase circulation of vehicles.

To maintain the urban activities of production and commerce in order to maintain the city's dynamism and vitality.

To solve the difficulties tackled by the transport and commerce companies involved in the distribution of goods.

To improve the working conditions for those people dealing with goods haulage and distribution.

Source

This sheet has been drawn with information kindly provided by the Office Mobility Manager for the Padua's municipality area.



UDC of the project ALIFE, to produce integrated intervention policies in the urban distribution of goods

Country: Italy

City: Siena

Name of structure

Creation of two UDC (as part of the interventions of the ALIFE Project, which is integral part of the pilot project Ecommerce of the Ministry of Transport)

Origin of the initiative

Main actors involved: Local Administration, public private partnerships, transport operators and ENEA.

Source of funds

Total expenses:

- 1st year 1330000 Euro;
- 2nd year 484000 Euro.

Annual costs in a steady-state (to the net of the investments amortizations): 144600 Euro

Started in 1999 with:

- constitution and start up of the company for urban logistics;
- creation and operative start for the automatic System of access control.

State of the project

The Project ALIFE (Another Life in a Future Environment) endorses a series of interventions aiming at a more efficient urban distribution of goods. These are reported in the following.

Municipal regulations and Organisation and management

- **Constitution of the Company of Logistics and Services S. r. l** (limited company) with the task of managing and coordinating in an unambiguous manner all various aspects of the service: automatic control of the accesses, operative centre (technological platform), operating platforms for the collection and optimized redistribution of goods, utilization of innovative vehicles, management of orders and of deliveries, etc.
- **Traffic restriction measures inside the LTZ**, which are based on a subdivision of goods by category (from 6:00 to 13:00 and from 14:30 to 19:30 for pharmaceutical products and fresh groceries, from 6:00 to 10:00 and from 15:30 to 17:00 for other goods).
- The automatic control of the accesses to the historical centre, based on **Telepass** technology that, applied to 9 access passages to the LTZ (physically coinciding with the historical doors of the city) allows to monitor continuously the vehicles entering and exiting as well as their standing time, allowing to fine unequivocally possible infringements, and to apply flexible and differentiated control schemes.
- **Creation of two logistic bases** outside the walls, that can rationalize routes and compact orders heading to businesses inside the LTZ for different customers.

Municipal regulations and Organisation and management

Operations

Objectives

Sources

- **Technological Platform** for the coordination between the operating bases and the mobility operators. The informatics station allows to connect the distributive structures and make them communicate, to manage the freight traffic coming from outside and distribute it to the platforms and, thus rationalize the use of structures and coordinate the flows of haulers (couriers, forwarders, etc.).

- The equipment of a **fleet of environmental friendly vehicles**: The Urban Logistics Company has foreseen the purchase of 12 3.5 tonnes ecological vehicles (methane and LPG) and 6 electric 3.5 tonnes electric ones. These vehicles can guarantee an average of 4 trips per day each to cover the distribution requirements for the historic centre with a 37% reduction in the number of freight vehicles travelling (from the current 450 to the expected 280). That is made possible by the development of an organized distributive system (with optimization of routes and loads for the vehicles involved in the urban distribution of goods) and by the resizing of vehicles and structures to comply with the actual requirements of the urban delivery system.

37% reduction of the freight vehicles travelling in the historic centre (from 450 to 280) with the objective of reaching a 60% of goods carried.

- To increase the observance of the legislation related to the prohibition of vehicular traffic in the LTZ thus also optimizing the use of personnel of the Municipal Police.

- To decrease the congestion deriving from commercial traffic by reducing the total number of circulating vehicles and optimizing the routing.

- To decrease the environmental impact caused by loading/unloading operations in the city centre.

- To increase the safety of pedestrian traffic and therefore the usability of the city by tourists and residents.

- To test advanced technologies.

- To create new highly professional employment opportunities in the area of innovative activities.

www.comune.siena.it

<http://pi.ijs.si/ProjectIntelligence.Exe?Cm=Org&Org=SIENA+PARCHEGGI+SPA>

<http://linus.flecta.org/w2d3/v3/view/sienainnovazione/attualita/news/schede--2015/dettaglio.html>

<http://srv-sia-01.softeco.it/edrul/siena.html>

FROM ANALYSIS
TO EVALUATION:
METHODOLOGY

3. ANALYSIS OF THE OPERATING FRAMEWORK: OBJECTIVES AND MAIN CONCEPTS

The City Ports project has concentrated since the beginning in particular on the technical and organizational components of the preliminary surveys to carry out in each urban environment. The reason was, in fact, to characterize and propose to all partners the fundamental elements that an intervention of city logistics should acquire at an initial stage in order to maximize the possibilities of success.

Subsequently those elements were linked to the route leading to solutions. In particular steps and tools to determine the technical requirements, the necessary administrative actions of support and the procedure of stakeholder involvement were defined to share the objectives of the intervention.

This component was called "City Ports Methodology". The methodology was developed by "SCS Azioninnova", a management and administrative consultancy company.

It was clear though that it was not a matter of inventing new procedures but rather composing a patchwork, by reading through several relevant European experiences and assembling elements of greater interest and practical impact.

The methodology aims specifically to:

- build a common vision:

- of the operating mechanisms of urban logistics;
- of the modeling criteria;
- of the evaluation criteria;
- supply guidelines and tools for:
 - the reconstruction and the study of the haulage of goods;
 - the determination of solutions coherent to the context;
 - the development of feasibility studies.

Given the strong operating character of the project, it was necessary to define some basic propositions:

- *the temporal horizon for actuation*: the solutions sought must be accomplished within the middle - short term (1-3 years), temporal horizon consistent with the time period that industrial, commercial and service companies require to take usually their management and production decisions;
- *the city planning situation*: factors as the positioning of the industrial areas and shopping centres or road design have obviously a strong impact on the logistic flows. These are not though modifiable with short-middle term interventions.

This proposition does not want however to introduce a "short sighted" viewpoint of the problem: in reality the solutions, simply using short term tools, should be part of a wider ranging set of interventions;

- *the temporal horizon of sustainability*: to pursue the achievement of results of sufficient stability, the sustainability of the city logistics solutions to be implemented should be assessed on a horizon of at least 3-5 years from their activation;
- *the mobility of the persons and the interaction between freight transport and passengers transport*: these are considered constants within the limits of the actions to be activated with the City Ports project (the impacts on passenger flows deriving from the application of specific regulations or interventions on goods flows will have to be evaluated though).

3.1. The key concepts

The key concepts on which the whole methodology is based are:

1. *the approach should be based on the background context*: a city logistics solution has to be calibrated based on the characteristics of the context in which it is to be implemented. Particularly, the following features should be considered:
 - city planning and economy of the territory;
 - supply chain involved in the solution;
2. *the solution must be integrated*: city logistics solutions should not concentrate on one aspect only (for example the only ICT component, the only

organizational component, etc.), but should combine a number of different aspects:

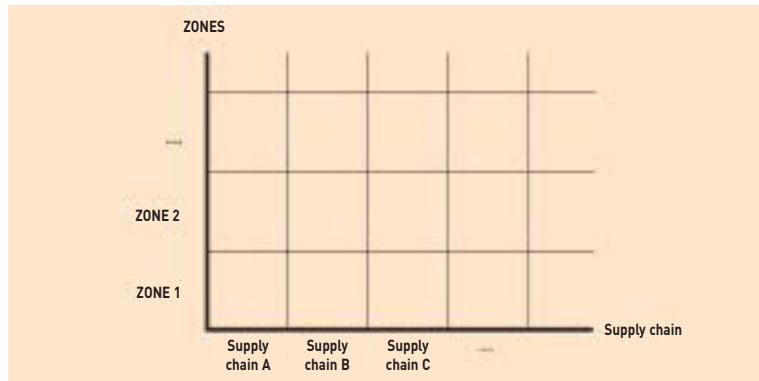
- logistics and technologies (logistics, ICT, transport technologies);
- political (regulations, planning systems, communication and support technologies);
- organizational and of stakeholders involvement;

3. *the solution must be economically sustainable*: city logistics solutions must be economically sustainable in order to last in time. It is therefore appropriate to identify as much as possible the external costs (social and environmental) in the evaluation of the economical sustainability, in order to:
 - increase stakeholders awareness and commitment;
 - compensate for, at least partially, the over costs of the solution;
 - foster over time the adopted measures in terms of city logistics.

3.2. The zones-supply chain matrix

The main tool of the administration for the control of operations is the study of feasibility. The phases that compose the feasibility study are:

1. *analysis*: it is the collection phase of input information for a logistics solution based on the context;
2. *determination of an integrated solu-*

(FIGURE 8) THE ZONE-SUPPLY CHAIN MATRIX

tion, articulated into three ways: technical- logistics, politic and of stakeholder involvement;

3. *cost-benefit analysis*: it is the phase in which the over costs associated to the solution are considered, external costs included, and it is attributed to the various stakeholders; this step is fundamental to guarantee the economical sustainability of the solution.

For each of these phases the methodology supplies the reference model and the necessary operative tools.

The link between the analysis and the determination of the integrated solution is the splitting of the phenomena under investigation and its assessment in terms of:

- city zones;
- logistics supply chain.

Both the analysis and the search for the solution have as basic element the cells of the matrix where the zones are crossed with the city supply chain (figure 8). It can be useful to think about the zones and supply chain as functional elements whose features and dynamics have to be known to identify a solution applicable in reality, that could address correctly the problems of urban logistics.

3.2.1. The zoning system for the city

A "zone" is a portion the city whose planning and economical characteristics are relatively homogenous and that represents the territorial unity of observation. The understanding of the urbanistic- economical context of a city is important for two reasons:

1. differing urban features between zones of the city imply different levers for the success of the city logistics solution;
2. the transfer of a solution from a reality to another has greater possibility of success if performed between portions of the city with similar features.

The parameters applied to characterize the zones of an urban reality can be subdivided into four groups:

- *general characteristics*: parameters describing the more general city planning characteristics (density of population, features of the buildings, importance of the architectural property, etc.);
- *infrastructural characteristics*: parameters that describe the infrastructural endowment (type of road network, congestion levels, presence of parking, etc.);
- *economical characteristics*: parameters that describe the features of the economical activities present in the intervention zone (the density and the surface of production, commercial, handicraft activities, etc.);
- *regulative characteristics*: parameters that describe the regulative - administrative measures in force (access, parking regulations, etc.)

The "zoning" of the city is made based on these parameters. In this activity two opposite requirements have to be balanced:

- on the one hand it is necessary to sub-

divide the city in order to create sufficiently homogenous zones with respect to the parameters highlighted above;

- on the other one the zones are the basic element for the surveys on the field, and as such a very detailed but too fragmented division would be very demanding in the survey phase.

3.2.2. Supply chain

A process can be defined as an operating formal **procedure for the service and management of goods**. For this reason a process might not coincide with a special kind of goods; for example, the goods "fresh food products" (meat, dairy products and sausages, etc.) can relate to more supply chain such as:

- the fresh retail supply chain, intended for large food distribution areas (either hypermarkets or supermarkets) or to smaller areas associated to a large distributive chain, is characterized by an upstream optimization of the deliveries and by greater constraints in terms of service (time schedule and number of deliveries) for the recipient of the goods;
- the traditional fresh supply chain, intended for sale areas of food products generally of small dimensions (the so-called neighbourhood commerce), is characterized by a greater incidence of deliveries from wholesalers or of self provision.

An economical activity can be involved into more supply chain as well; for example, on a hypermarket converge supply chain such as:

- dry retail, for foodstuffs at middle or long expiry dates, not bound to specific preservation conditions (paste, oil, canned food, etc.), and household products (detergents and soaps for the personal hygiene, for woven, for dishes, etc.);
- fresh retails, for fresh foodstuffs with close expiry date and bound by special preservation conditions;
- frozen retails, for frozen foodstuffs;
- non food retail, for non food products (electronic consumables, household appliances, etc.);

The activity of "processing" has therefore the purpose to identify and classify the main supply chain that operate in urban environment on the basis of their operating procedures and goods management. The variables characterizing those processes are:

- *logistics variables*, that characterize the transport service related to the process, in particular:
 - *frequency*: delivery frequency;
 - *load unit*: shape in which the goods are usually grouped and loaded on vehicles (pallet, roll, box, etc.);
- *technological and organizational variables*, that characterize the technical organization of the transport, particularly:
 - *typology of vehicles*: dimensions and

technical features (for example refrigeration, insulation, etc.) of the vehicles;

- *delivery period*: period of the day in which the delivery of the goods is usually carried out;
- *other*: other transport features, for example necessity to respect hygienic rules (HACCP), necessity of staff training, etc;
- *level of logistics optimization*, the optimization of the process is here understood as capacity utilization of the vehicle (in weight and/or volume);
- *logistics management*, which is the formal procedure of goods delivery, let us say who sends goods to whom and who decides how and when to do it (for example "free departure", "postage paid", etc.). Sometimes it is necessary to distinguish between those who manage the transport (how) from those who instead manage the flows (when);
- *carriers typology*, which are the type of carriers used for the transport (couriers, special transport, etc.); under this heading the possibility of work on own account is also indicated;
- *"nodes" of the supply chain*, are the departure points (producers, suppliers, warehouses of wholesalers, etc.) and arrival (retail shops, final consumers, etc.) of the goods;
- *secondary flows*, which are the flows connected to the process but part of it.

One example is represented by the flow of technical material (pallet, roll, etc.) that, once goods are unloaded, returns back. Another example is the flow tied up to the "given back" of the goods (newspapers, clothes, etc.);

- *contact requirement with the customer*, which is the necessity to have a contact with the customer during the accomplishment of the transport service (typically at the delivery moment). This can happen for different reasons: attempted sale, payment retrieval, assistance and assembly of the delivered goods, etc. The necessity of the contact with the customer represents a possible tie to the accomplishment of solutions such as logistic platforms.

The methodology proposes a classification of the supply chain on the basis of these parameters. At an operative stage however the consistency and the contextual coherence of the proposed supply chain must be verified.

3.3. The analysis model

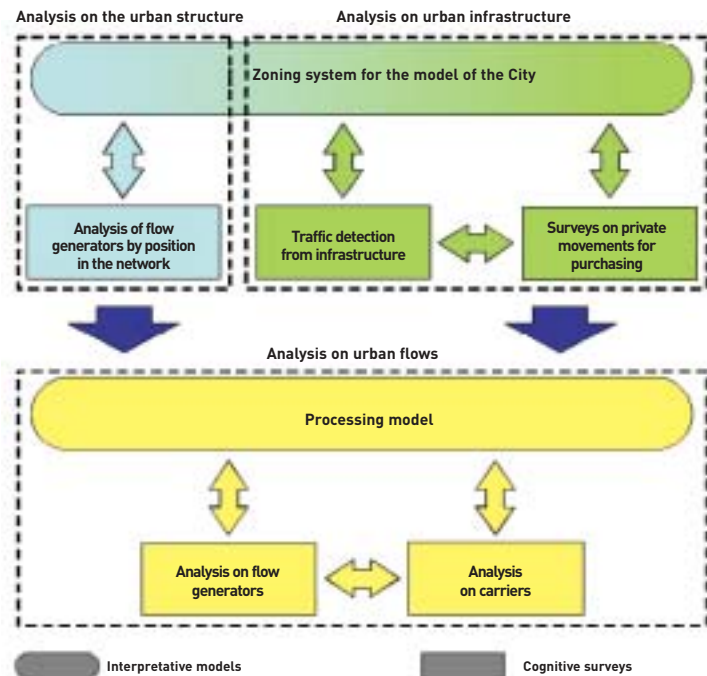
The analysis phase has the objective to collect the information on the context necessary to the successive project phases. More in detail the functional objectives are:

- to include the goods delivery phenomenon in urban environment from the qualitative point of view and, where possible, quantitative:

- to model the flows, individualizing the general features of the goods movements. Such movements have to be analyzed near the points of flow generation, by considering the characteristics of the activity generating them and the volumes of vehicular and goods flows to the different logistic chains;

- to identify the activities generating the movements of goods;
- to determine the operating formal procedures;
- to drive the solutions, supplying the elements to evaluate the priority of intervention in the cities:
- to verify the comparability of the model with other urban contexts;

(FIGURE 9) THE ANALYSIS MODEL



- to endorse the supply chain and projectual tools of the methodology;
- to try and find feasible solutions in the short - medium term;
- to measure the impact of these solutions (in terms of feasibility and experimentation):
 - to identify constraints and falls;
 - to determine links with other phenomena related to mobility.

In figure 9 the diagram of the analysis model is reported.

The survey procedures depend upon the requirements and the contextual peculiarities, such as: the execution times, the involvement capacity of stakeholders in the survey, the available resources for the development, etc.

The key surveys on which to focus are the following:

- *the analysis of flow generators*, that is on the economical activities that require loading and unloading operations;
- *the analysis of local companies/local transport branches*, for a detailed reconstruction of goods movements in urban environment;
- *the analysis of carriers*, done through interviews, at the main access points of the city, to a sample of the carriers entering and exiting the urban area;
- *the analysis of the urban traffic*, in order to define the organization of vehicles flows on the road infrastructure.

For the first three types of analyses questionnaires have been prepared. Those questionnaires are based on a high level of detail in order to collect a variety of data for the project; as a result, they have been thought through considering the filling in was as assisted. Contingent conditions can make it difficult to use the questionnaires in their more complete form. In that case one can consider a number of solutions, for example:

- it is possible to simplify the questionnaires, collecting part of the answers in other ways (focus groups with the stakeholders, previous studies focusing on the urban context under study, etc.);
- it is possible to operate on samples from various tiers with objectives of different focalization. In other words one can define a wide sample, on which to extract only some general information, and a more concentrated sample, from which more specific information (to overlap on the wider sample) can be obtained. Depending on the sample tier different formal procedures of carrying out the survey can be chosen (postal, telephone, direct interview).

It is important to underline that the involvement and support of category associations can simplify the management of the analysis and improve the quality of the collected information.

4. DETERMINATION OF THE INTEGRATED SOLUTION AND EVALUATION OF FEASIBILITY

This phase has the objective to choose a solution for urban logistics, using the integrated approach and taking into account the reference context. For this purpose one of the tools offered by the methodology is a path (reported in the figure 10) articulated in a series of logical and operative steps.

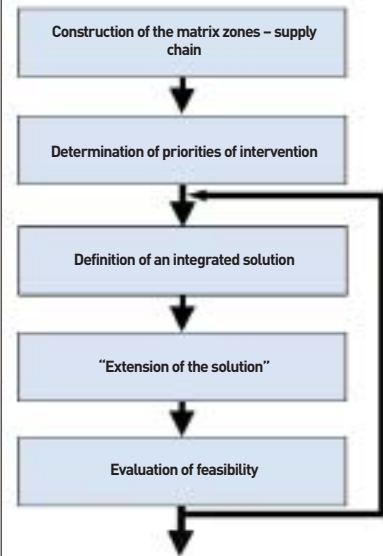
4.1. Generation of the Zones-Supply chain Matrix

A city logistics solution is linked to the context in which it should be implemented, namely to the city planning and economical characteristics of the area under intervention and to the supply chain that are working in that area. For example, it is improbable that a city logistics solution set out to rationalize home deliveries of household appliances in the city centre will be the same as one created for the haulage of frozen food to supermarkets of the outskirts.

For this reason, the definition of a solution must use the tool that emphasizes these "dimensions": the zone – supply chain matrix (figure 11), in which:

- every row represents a different urban area, each of which with their own city planning and economical characteristics;
- every column represents a process, each of which has its own constraints and criticalities.

(FIGURA 10) THE PROCESS OF THE DEFINITION OF AN INTEGRATED SOLUTION



The objective of this phase is to define, for every crossing of the zones – supply chain matrix, the importance of the phenomena connected to the freight transport, measuring it and estimating it through an unambiguous reference parameter called "leading indicator", that allows to compare easily several situations/contexts.

For this purpose, the leading indicator advised by the methodology is the *absolute number of loading/unloading opera-*

tions. The choice of this indicator was made considering:

- that is readily available and usable for comparison;
- that is highly valid and unambiguous (it is representative in a lot of cases);
- that gives the possibility to use an "absolute" number offering greater guarantees to consider crossings of a certain importance as opposed to crossings which are not;
- that it would be economically very onerous to obtain punctual vehicle data per km per process (such survey was not therefore foreseen in the analysis model of City Ports);
- the existence of a direct correlation among number of operations, number of local units and number of moving vehicles;
- The large experience with that indicator, already used by other models as ascertained from the literature review.

4.2. Determination of the priorities of intervention

The purpose of this phase is to define, for every zone supply chain crossing, the level of priority in relation to the city logistics interventions. Those priorities must necessarily refer to the guidelines on strategy previously agreed upon for the whole urban area with the stakeholders, on the objectives of congestion and

pollution reduction, and to the availability of resources assigned to the project itself.

From the analysis of the priorities it can emerge how they are concentrated on a process, or on a zone, or mixed between zones and supply chain.

In figure 11 an example of zones - processes matrix with the relevant areas of intervention is reported.

4.3. Definition of the integrated solution of the project

The objective of this phase is to define the city logistics solution that better adapts to the characteristics of the context in which the intervention takes place.

The chosen approach derives from the combination of different elements:

- technical-logistic solutions;

- politics and administratives measures;
- involvement of stakeholders.

4.3.1. Determination of the optimal operative solutions for each zone

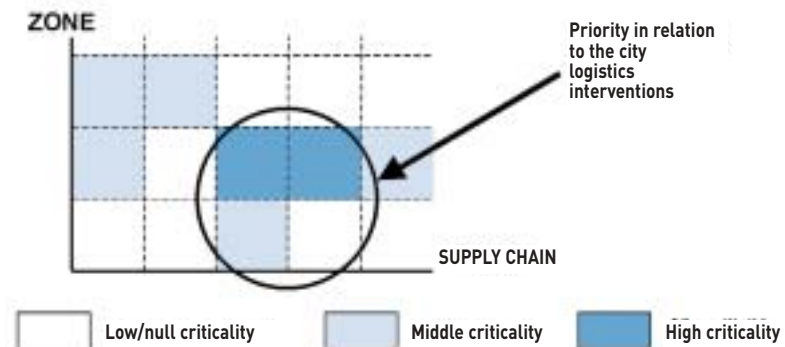
By technical-logistics solution it is meant the organizational choice and the consequent formal procedures with which a delivery is carried out from a supplier to a customer, through conveyors and other logistics operators.

The technical-logistic solutions taken into consideration are listed in table 4, whilst table 5 reports their main features.

The different solutions can be classified according to the objectives that can be achieved with them (table 6):

- *increase in capacity utilization for the vehicles* (and consequently reduction in the number of circulating vehicles);

(FIGURE 11) THE MATRIX ZONE - SUPPLY CHAIN



(TABLE 4) THE MAIN OPERATING TYPOLOGIES OF URBAN LOGISTICS SOLUTIONS

OPERATIVE SOLUTION	DESCRIPTION	CAUTION POINTS
Direct delivery	<ul style="list-style-type: none"> • Delivery characterized by having a sole supplier and a sole recipient 	<ul style="list-style-type: none"> • Suitable solution only for full loads or with a good level of saturation • In case heavy good vehicles are utilized, high occupation of the road space
Multipick	<ul style="list-style-type: none"> • Delivery sent to unique point consolidating the load while en route from several pick up points 	<ul style="list-style-type: none"> • Geographic distribution of the producers • It is convenient that producers operate in the same process range • Possible solution for large customers • Sharing of cost among various producers • Direction of operations
Multidrop	<ul style="list-style-type: none"> • Delivery at several delivery points of goods loaded at a unique pick up point 	<ul style="list-style-type: none"> • Geographic distribution of customers • Possible solution for large customers or for departure points constituted by consolidation points • Necessity of cooperation among concurrent customers (for example presence of temporal windows to be met for deliveries)
Merging of hauliers	<ul style="list-style-type: none"> • Coordination activity of reorganization, from the customer's side, of a group of suppliers, to consolidate volumes that are delivered from the same hauler in a unique delivery 	<ul style="list-style-type: none"> • Necessity to create critical mass from both the producers and clients sides • Necessity of strong collaboration
Cross-dock	<ul style="list-style-type: none"> • Transit platform where goods of different suppliers are redirected and delivered within a short time (without stocking them and without "grounding" them): the platform consolidates goods coming from more suppliers and already arranged in unities of load (pallets, packages, etc.), each of which relative to a specific final destination. 	<ul style="list-style-type: none"> • Necessity to reach a minimum value of delivery to economize the transit through the platform
UDC (Urban Distribution Center)	<ul style="list-style-type: none"> • Logistics Platform where the goods coming from suppliers are consolidated to be then delivered to the various customers. As opposed to the cross-dock, in the UDC: <ul style="list-style-type: none"> - Flows entering and exiting the platform are represented by packages; - The delivery lead time is not necessarily short; - The goods in entrance are "grounded" and stocked (even also for a short period). • The UDC is characterized by being "open" both at the entrance and exit: any supplier or customer is able/should make use of its services. 	<ul style="list-style-type: none"> • Economical sustainability not always achieved (necessity of "raising mass") • For the multi-company UDC, it is necessary a real collaboration among the various subjects operating in the UDC.

TO CONTINUE

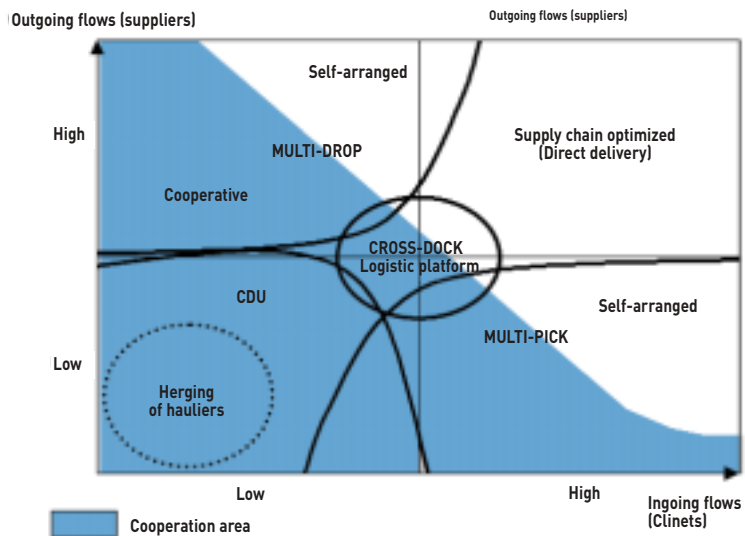
OPERATIVE SOLUTION	DESCRIPTION	CAUTION POINTS
Logistics platform	<ul style="list-style-type: none"> It is meant to be a structure working like a UDC with the difference that customers that do use its services are in limited and steady number (logistics solution being "closed" downstream). 	<ul style="list-style-type: none"> Solution specific for large distribution companies or however involved in considerable flows of goods
"Control cabin"	<ul style="list-style-type: none"> Solution of centralization of the information related to deliveries in the urban area for then programming formal procedures and rules (for example, access timetable, stopping platforms to use, etc.). This typology includes for example solutions like the allocation systems of one delivery "slot" (temporal window, stopping platform, other others) upon reservation by the conveyors not necessarily associated or "unified". 	<ul style="list-style-type: none"> Formal Procedure of accreditation and booking by the conveyors and management of the answers to the bookings Specificity of the different supply chain

- change of formal procedure to favour vehicles of low environmental impact (goods are loaded on vehicles with reduced emissions for the delivery to the "last mile");
- better utilization of the infrastructure (for example, of the road network, stopping platforms, etc., with a consequent reduction of congestion levels).

The operative solutions should be integrated. Their choice can be made by considering three types of factors characterizing the different situations of zones of the city and supply chain:

- logistics factors: the different operating solutions work in an optimal manner in connection to specific flow volumes only (on departure and on arrival, in figure 12), that must be therefore carefully estimated;

(FIGURE 12) CONNECTION BETWEEN OPERATIVE SOLUTIONS OF URBAN LOGISTICS AND TYPES OF FLOWS



(TABLE 5) FEATURES OF THE MAIN OPERATIVE SOLUTIONS OF URBAN LOGISTICS

OPERATIVE SOLUTIONS	ADVANTAGES FOR THE SUPPLY CHAIN	ADVANTAGES FOR CITY LOGISTICS
Direct delivery	<ul style="list-style-type: none"> • Transparency of costs • Reduced lead time 	<ul style="list-style-type: none"> • Reduction in the number of circulating vehicles (provided vehicles are travelling with good level of saturation)
Multipick	<ul style="list-style-type: none"> • Reduction of costs (higher level of saturation) • Potential increase in service level (increase in service frequency) 	<ul style="list-style-type: none"> • Reduction of the number of circulating vehicles (higher saturation levels)
Multidrop	<ul style="list-style-type: none"> • Reduction of costs (higher level of saturation, by-passing of suburban depots) • Potential increase of the service levels (increase of the service frequency) 	<ul style="list-style-type: none"> • Reduction of the number of circulating vehicles (higher saturation levels)
Merging of maoliers	<ul style="list-style-type: none"> • Reduction of costs • Increase of the service level (increase of the service frequency) 	<ul style="list-style-type: none"> • Reduction of the number of circulating vehicles (greater saturation levels)
Cross-dock	<ul style="list-style-type: none"> • Reduction of costs (smaller stock levels at sales point, by-passing of suburban depots) • Increase of service levels (decrease of lead times) • Reduction in supply cycle 	<ul style="list-style-type: none"> • Reduction of the number of circulating vehicles (higher saturation levels)
UDC (Urban Distribution Center)	<ul style="list-style-type: none"> • Possibility to offer value added services for customers (stocking, etc.) 	<ul style="list-style-type: none"> • Consolidation of flows (transport with higher saturation): <ul style="list-style-type: none"> - Greater simplicity in carrying out checks on deliveries - Reduced impact on environment and on traffic congestion
Logistics platform	<ul style="list-style-type: none"> • Reduction of costs (higher level of saturation) • Potential increase in level of service (increase in service frequency) 	<ul style="list-style-type: none"> • Reduction of the number of circulating vehicles (higher saturation levels)
"Control cabin"	<ul style="list-style-type: none"> • The information relevant to deliveries on the urban area is centralized • The formal procedure and rules for goods delivery are programmed centrally • By coupling the direction cabin with a UDC system one haulers the control and credit activity for the haulers: the centralization of the transport planning in urban environment is in fact coinciding with the centralization of the flows of goods 	<ul style="list-style-type: none"> • Optimal use of the infrastructure

- *organizational factors*: the choice of the operative solution cannot ignore different stability features in relation to the interested parties;
- *economical factors*: it is necessary to carry out a first evaluation to understand if the solution creates higher or lower economical costs for the different interested parties.

4.3.2. Administrative measures and their economical effect

The transport systems for passengers and freight in urban areas create a variety of economical, environmental and social impacts. In some circumstances, efficiency in the transport operations and reduced environmental impact proceed together; in other cases, instead, individual freight hauliers are not in a position to set up by themselves systems that

contribute to improve efficiency of the urban freight transport. Administrative measures that force or encourage the companies to change their own actions and behaviors become therefore necessary and thus becoming also more efficient from the environmental and social point of view.

For these reasons an intervention on urban logistics has a fundamental component in the formulation of a "package" of administrative measures. Such package must be studied in a manner coordinated and contextual to the technical solution.

Once identified a package, that should be appraised based on three features:

- *impacts*: the integrated solutions must be durable, namely should answer the requirements of the present without compromising beforehand in economical environmental and social terms the

satisfaction of the future requirements. For this reason it is necessary to appraise the impacts on environment, society and economy of the measures that create the integrated solution;

- *barriers to the implementation*: these are possible obstacles that can be in the way of a measure; they can be:
 - Legal barriers;
 - Financial barriers (insufficient funds);
 - Political and cultural barriers (insufficient approval by stakeholders);
- *economical sustainability*: it is necessary to do the appraisal even if the measures are economically sustainable to the involved parties:
 - sender (who sends the goods);
 - haulier (who carries the goods);
 - recipient (who receives the goods);

In qualitative terms an answer must be given to questions such as: "which is the

(TABLE 6) THE RESULTS OBTAINABLE WITH DIFFERENT OPERATIVE SOLUTIONS OF URBAN LOGISTICS

OPERATIVE SOLUTION	INCREASE IN CAPACITY UTILIZATION OF VEHICLES	MODAL CHANGE	IMPROVED UTILIZATION OF INFRASTRUCTURE
Direct delivery	X		
Multipick	X		
Multidrop	X		
Merging of hauliers	X	X	
Cross-dock	X	X	
UDC	X	X	
Logistics platform	X	X	
"Control cabin"			X

initial investment? What are the steady state costs? Who will be charged?"

4.3.3. Involvement of stakeholders

The involvement of stakeholders is fundamental for the success of a city logistics project and it is a process that must go in parallel to both the technical and the administrative component of the integrated solution. In fact, for a technical solution and a package of administrative measures to succeed it is necessary to achieve:

- *approval* on results and decisions;
- adequate and tailored *information* from the various stakeholders.

To obtain these objectives a number of steps have been identified in order to define and implement the involvement strategy:

- *definition of the objectives and scope of involvement*; this is to define what it is awaited for from the stakeholders (whether only information, whether share and support the results of the project, etc.) and consequently the relevant involvement level;
- *stakeholders mapping*; it is the phase in which the typologies of stakeholders to be involved are defined (shopkeepers, suppliers, transport operators, etc.) and then the people are identified on time to be involved for each typology;
- *activation of the involvement tools*; it is

here that a involvement plan of the stakeholders is defined, in connection to the required involvement level, to identify the operative objectives, the tools, the timing, the subjects responsible for the activity and which stakeholders to address;

- *process development*; it is the phase in which the definite plan of involvement is being acted upon and the defined activities are realized;
- *evaluation and redefinition of the strategy*; it is the activity of continuous check of the adequacy of the strategy and the involvement plan with respect to the objectives and their possible amendment.

4.4. Extension of the solution

At this point of the project one or more solutions available for the priorities of intervention should be defined, that is for a specific process in a specific area of the city.

In this phase the intention is to evaluate if the solution identified is usable in other zones of the city or to other supply chain that operate in that zone with marginal adaptations. In this manner the broadening of the benefits connected to the solution is sought and in the meantime the reduction of costs "spreading" them over a larger number of bodies.

In order to appraise the usability of the

solution it is necessary to identify other combinations zones supply chain with homogenous features or, however, compatible with the reference case. It is necessary therefore to obtain at least the following information, qualitative and quantitative, on the features of the process (generally derived from the activity of analysis, if well conducted):

- typology of goods;
- level of logistics service (time schedule, formal delivery procedure - individual/multidrop - lead time order/delivery, etc.);
- prevailing typology of used vehicles;
- share of "own account" vehicles;
- standing times;
- infrastructure;
- recipients;
- costs.

4.5. Evaluation of the effectiveness of the solution

The assessment of the solution allows to:

- supply a first feedback to appraise in what measure the impact of the solution reaches the predefined objectives;
- to choose the optimal solution, in case two or more possible options are evaluated.

To achieve these objectives, it is necessary a larger number of parameters than the single leading indicator used for the definition of the solutions.

These parameters are defined guide para-

meters. The main ones are:

- number of loading/unloading operations (per day/week/month);
- number loading/unloading packages (per day/week/month);
- number of equivalent vehicles (per dimensions and/or emissions);
- average percentage of capacity non utilized by the vehicles;
- incidence of own account (on vehicles; on operations);
- prevailing typology of standing;
- kilometers traveled in urban environment;
- "lost time" (calculated subtracting the average time required for the route plus stopping time to the total travel time).

Obviously such parameters should refer to zone and supply chain. As a result in practice a number of zone-supply chain matrices are produced, one per parameter. In operative terms, in order to measure the effectiveness of the solution it is necessary to appraise how is affecting the value of the primary parameters: for each of them it is necessary to calculate (to estimate) the variation (Δ) of its value from "before" and "after" the introduction of the solution (in case of solutions whose scope extends over more crossings of the matrix zones supply chain, the collective value of the indicator is considered, which is calculated as the sum of the single values produced by each crossing touched by the solution).

Regarding an individual solution, two cases are possible:

- the solution found is nevertheless effective if all the variations produce a positive impact (that is decreasing the equivalent vehicles, decreasing "lost time", etc.);
- if the variations Δ are "conflicting" (for example if decreases to "lost time" are associated to increases in the "number of the equivalent vehicles"), it is necessary to evaluate:
 - if the solution is still in line to its own objectives;
 - if it is possible to change the solution.

In the second of these cases, that is conflicting variations, a "weight p " coefficient can be attributed to every primary parameter (intended as effectiveness coefficient); so, the comprehensive "delta" of a solution is given by the weighted average of the variations of the primary parameters:

$$\Delta \text{ compl} = \sum_k p_k \Delta_k$$

(Where p_k and Δ_k are respectively the weight and variation of the k^{th} indicator). Then it is possible to evaluate the comprehensive impact of the solution. The assignment of weights is a "political" choice and has to be defined depending on the critical issues of the local context (for example, for a city the level of emissions could be more critical than the congestion level) and of the level of sharing/approval

(it is important to clarify to the stakeholders the reasons leading to the choice of the different weights).

By doing so, in case of no alternative solutions to compare, all elements required to decide the suitability for the only identified solution are in place.

In case of several different and possibly conflicting solutions to compare, it is important to verify whether some solutions are dominated by others, in other words inferior to other solutions on all the variation values Δ of the primary parameters: in this case they have to be discarded. Then:

- if there is a solution dominating the others on all the variations Δ of the primary parameters, it is clearly the more effective solution among all;
- if there is a dominating solution set, each of which however dominating the others for one or more variations Δ of the primary parameters but not for all, then it is necessary to calculate the overall deltas of each solution in order to confront them.

Obviously the technique presented ought to be an aid and induce a discussion on possible benefits and issues of the single solutions accounted for rather than an automatic calculation for the choice of a solution relating above all to the political-regulative situation of the entity needing to promote the intervention of urban logistics.

5. COST-BENEFIT ANALYSIS

The subject of the cost-benefit analysis was not treated adequately in the projects of urban logistics. This is comprehensible given the complexity of the subject, which is not yet fully consolidated in the real experience and in the literature. It is necessary to face this deficiency though.

The demand for transport at the moment is artificially high. The European Union identifies in the lack of transparency in the transport costs as a whole one of the reasons for this distortion. The "White Book - The European transport policy till 2010", (2001) underlines that making the user aware of the costs is a fundamental passage to rebalance the demand. The importance of the analysis of the extra costs in the transport policies cannot be under question.

This is especially true for the last mile transport which is specifically of interest for urban logistics. Besides in this context it is necessary to identify the extra costs by altering the operating conditions in which the logistic actors operate by:

- increasing consciousness and commitment of stakeholders;
- fostering virtuous behaviors;
- compensating at least in part the over costs.

The urban context "attacked" by a solu-

tion of city logistics is often a "micro-cosm" compared to the complexity of the supply chain (in general goods depart from city A and are delivered to cities B, C, etc., in addition to city the X promoting the intervention of urban logistics); as the recipients of the goods in the last mile are not the decision makers concerning the logistic solutions, subjects that can take decisions on the costs have to be identified within the urban system, so that they can effectively be involved.

Even though the urban logistics interventions produce benefits in terms of reduction in pollution and traffic congestion, they do not always result self sustainable economically in a stable manner. For example, the introduction of a UDC in the transport cycle leads to an increase in costs (structure management, stocking and handling, etc.) that should be supported by the local actors and that is not always economically compensated by logistics benefits (greater utilization of vehicle capacity, etc.).

The objective of the cost-benefit analysis is to supply useful tools to:

- clarify the direct and indirect costs connected to the new operative solution;
- assign to stakeholders possible over costs.

For the interventions to have stability it is necessary, in fact, to move from a public support view to a view of cost allocation

to those directly interested. In fact, the first approach was not in the past in the position to guarantee stability to the solution, as it assumes in general out of the ordinary funds by some bodies, typically by the Public Administration. The second point instead aims at a stable reallocation of the necessary resources for the economical sustainability of the project in the middle term.

5.1. Methodological settings

In the literature various typologies of cost are distinguished, but there does not always be unification of definitions among the different authors. In agreement with the solution proposed by Danielis-Rotarìs¹, here reference to the breakdown of costs into private, social and external ones will be used. A useful premise to such an approach is that the type of cost is defined in a functional manner according to its utilization:

- the private costs are those costs, either of monetary nature and non monetary, that an individual sustain directly as a result of its transport decision;
- the external costs are instead the costs caused to others and generated by the absence of a compensation/payment equal to the benefits and/or brought damages, which an individual does not consider while deciding on

transport. Added to the private costs, these allow to appraise the static efficiency to assign to a transport solution;

- the social cost contains:
 - a private part, monetary (assets and services for which there is a direct monetary payment, assets and services for which there is an indirect monetary payment in the goods purchased, services supplied by the Country, at least partially paid by the transport users) or non monetary;
 - an outside part consisting of the costs levied to third parties (calculated also ex-post).

Depending on the specific objectives, it is necessary to consider different configurations of costs; in particular for studies of efficiency of "allocation" such as those here analysed for the city logistics, it is necessary to only refer to outside and private costs (in agreement with Danielis-Rotarìs).

5.2. Breakdown of economical costs for the different categories of actors

The breakdown of the economical costs starts from the collection of the general information on the urban context of reference; it is also about the information collected during the activity of analysis.

(1) Romeo Danielis and Lucia Rotaris, "La stima dei costi esterni dei trasporti: difficoltà teoriche e applicative" (The assessment of external costs in transport: theoretical and applicative difficulties).

This information can help “resizing” and estimating the features of the solution identified (for example, for a UDC the number of people working there, the number of used vehicles, etc.) and therefore the associated monetary costs-benefits, both for the private and public sector. For instance, in table 7 an example is reported of determination of the economical costs sustained by private bodies in order to set up a UDC, while in table 8 a similar example is reported for the public sector. Figure 13 shows how the over costs connected to the adoption of a certain innovative solution of urban logistic are extracted.

5.3. Breakdown of over costs among interested parties

When an increase in costs associated to the introduction of a new city logistics solution is not compensated by economical benefits, it is necessary above all to identify and to exploit as much as possible the value of externalities in terms of costs and benefits (in the situation previous to the intervention of urban logistics and in the successive one, even if only estimated). Their assessment is complex because it is based on estimation of impacts; Despite such uncertainties it is however necessary to determine the size of the external costs. Table 9 has been produced

(TABLE 7) AN EXAMPLE OF THE DETERMINATION OF THE COSTS TO “PRIVATE” BODIES

Current logistics costs	
Costs of the innovative solution	Benefits of the innovative solution
+ costs for breakdown of the goods (labour)	- benefits of flow optimization (if directly quantifiable by the actors)
+ UDC management costs (including amortizations, consumptions, rents and other financial burdens)	- benefits from further services (stocking goods, parcelling of deliveries)
+ costs for Hardware and Software for the management of the UDC	
+ increase in cost due to the utilization of low impact vehicles (> cost; < capacity utilization)	
+ cost of service standardization (lead time, frequency, time schedule etc.)	
Over costs of “private” sector	
=	
Total economic costs of “private” sector	

(TABELLA 8) AN EXAMPLE OF THE DETERMINATION OF THE COSTS TO THE “PUBLIC”

Current logistics costs	
Costs of the innovative solution	Benefits of the innovative solution
+ possible contributions for the direct support of the solution in the UDC set up	- benefits for more limited use of infrastructure and management costs due to overall improvements to the traffic situation thanks to the solution
+ possible contributions for systems for the management of entries / flows	- revenues from fees or road pricing due to possible policies supporting the solution
+ possible contributions for systems for the management of the stopping platforms for loading/unloading	
+ possible contributions to support the city logistic policies (for example contributions for the purchase of vehicles at low impact)	
Over costs to the “public” sector	
=	
Total economic costs to the “public” sector	

in order to do that, to allow therefore the process of identification of the right information and its collection from studies on the subject and research activities to eventually classify and correlate potential sources of the required information.

For the extrapolation of estimates related to the quantification of external costs, one can also refer to the results of studies elaborated at national level.

Those studies, though, have sometimes conflicting results as far as the different components of cost considered, methodologies followed and evaluations used; for example, table 10 shows the results of the more recently developed research by the "Amici della Terra" (Friends of the Earth) in Italy on behalf of Enea- Minamb concerning quantification of the total

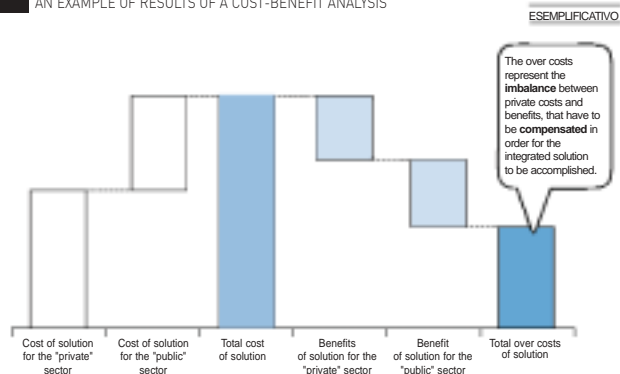
external costs of transport in urban environment². Using these or similar tools the administration promoting the city logistics interventions is in a position to identify how to compensate the possible imbalances between benefits and estimated costs.

Through an institutional action of involvement and negotiation with the stakeholders, the local administration will be able to:

- raise awareness and involve the different and economically interested social groups on the weight of the external costs;
- compensate with administrative measures the over costs to some stakeholders or induce them to pay for them thus rebalancing the market.

(2) P. Lombard and L. Cutaia: "Valutazione del vantaggio, in termini di minori costi ambientali e sociali, di un forte sviluppo del trasporto collettivo in ambito urbano" (Evaluation of the advantage, in terms of minor environmental and social costs, of a strong development of the collective transport in urban environment - Rome 2003). ENEA-Miniamb Programme: Project for the rationalization of the urban mobility. By Amici della Terra (Friends of the Earth)

(FIGURA 13) AN EXAMPLE OF RESULTS OF A COST-BENEFIT ANALYSIS



(TABELLA 9) EVALUATION OF SIDE EFFECTS: DATA TO COLLECT AND SOURCES

	Value	Detail	Data Source	Category		
				Original data	Estimation derived from national data	Estimation derived from simulation models
Quantification of traffic volumes	Vehicle fleet (units)	than 3,5 tonnes (light and heavy) diesel/ petrol	SI	Urban Area Operator Supply chain		
	Trip lengths (Km/year)	Urban Extraurban	SI	Urban Area Operator Supply chain	X	
	Average Occupancy (tonnes/vehicle)	vehicles >/< than 3.5 tonnes (light and heavy) diesel/ petrol	SI	Operator Supply chain	X	
Quantification of energy consumption	Total energy consumption	vehicles >/< than 3.5 tonnes (light and heavy) diesel/ petrol	SI	Operator Supply chain	X	
	Consumption per kilometre (gep/km)	Trip length Urban Extraurban			X	
Greenhouse gases (Gas Serra – GS)	Total Emissions					
	Emissions per vehicle category	vehicles >/< than 3.5 tonnes (light and heavy) diesel/ petrol			X	
	Damage per tonnes of di CO ₂ emitted					X
Atmospheric pollution (IA)	Pollutant emissions (SO ₂ , NO _x , PM ₁₀ , CO, COVNM)	Vehicles in categories (by age, technology and engine size) Trip length Urban Extraurban	SI	Operator Supply chain	X	
	Population exposed in the various zones to pollutant emissions	Density of the population exposed (urban and extraurban; small and medium cities (20000 ÷ 250000 inhabitants) and large >250000 inhabitants)	SI	Urban Area		
	Unit damage as a function of the type of emission (Euro/tonnes)					X
Noise	Population in different zones with different exposure to noise	Population exposed to different noise levels (leq dB(A) 55-60, 60-65, 65-70, 70-75, >75) in the different zones	SI	Urban Area		

TO CONTINUE

[TABLE 10] EXTERNAL COSTS OF MOBILITY IN URBAN ENVIRONMENT	
Category	Value
1. Air pollution	...
2. Noise	...
3. Congestion	...
4. Accidents	...
5. Land use	...
6. Other	...

TOTAL EXTERNAL COSTS OF MOBILITY IN URBAN ENVIRONMENT IN ITALY IN 1999 (MILLION €)								
	Total	Passenger transport	Goods transport			Goods transport (% of overall cost)		
			Total number of vehicles	Light goods vehicles	Heavy goods vehicles	Total number of vehicles	Light goods vehicles	heavy goods vehicles
GS	2785	2231	554	262	292	20%	9%	10%
IA	17163	9196	7967	3720	4247	46%	22%	25%
R	6545	4841	1704	869	835	26%	13%	13%
I	10851	10109	742	501	241	7%	5%	2%
C	11601	8136	3465	1573	1892	30%	14%	16%
Total	48945	34513	14432	6925	7507	29%	14%	15%
Legend:	GS	Gas Serra (Greenhouse gas - CO ₂ , CH ₄ , N ₂ O)						
	IA	Atmospheric pollution (CO, COVNM, SO ₂ , NO _x , PM ₁₀)						
	R	Noise (Leq dB (A))						
	I	Accidents (Number of Accidents, killed and injured)						
	C	Congestion (Total time lost)						

**REGULATIVE POLICIES:
REVIEW OF THE
ADMINISTRATIVE ACTS
IN FORCE IN SOME
ITALIAN CITIES**

6.
THE CLASSIFICATION
OF THE MEASURES RELATED
TO THE URBAN
TRANSPORTATION OF GOODS

The transportation of goods inside cities is an important and fundamental component of the urban life, level indicator of the economical and social development of the very city. The traffic generated by the urban distribution of goods has an average 50% impact on particulate matters emissions and 20% on flows (using PCUs – Passenger Car Units): table 11 shows the percentage incidence of the commercial vehicles on the total moving fleet for some European cities.

[TABLE 11]
(SOURCE CURI S.; "TRANSPORT AND LOGISTICS" MASTER, PIACENZA 2002).

City	Percentage of commercial vehicles per city over whole moving fleet
Rome	22%
Milan	15-20%
Bologna	25%
Basle	18-24%
Hanover	12%
Nuremberg	15%%
London	11%

Moreover in the past years there has been a growth in the quantity of goods requested inside cities and, as a result, a growth in vehicle movements from and to the city. These facts are thus drawing the attention on negative externalities produ-

ced, whose negative effects fall onto urban centres. In the previous Publication of the Transportation and Logistics Services Planning "Guidelines for a regional strategy on Urban Logistics" the following negative impacts of goods transport on urban centres were identified:

- increment in passenger/truck traffic congestion in the urban areas;
- worsening in the quality of life for residents, with serious and increasing health risks for the population;
- reduction in tourist and commercial activities in the cities;
- reduction in the accessibility to historic centres;
- worsening of the operative efficiency of commercial as well as logistics and transport operators;
- increase in environmental pollution.

As a result, in the majority of the cases, the transport policies adopted by the cities are mainly concerned with improving the transport component related to passengers (users of private vehicles and public transport), impacting only indirectly on the problems spurring from goods haulage. It is instead necessary to intervene on the organization of the distribution process in its entirety, in an attempt to balance the requirements of the operators dealing with the request for trans-

port (position of the commercial activities, collection and home delivery, etc.) with the structure of the transport supply either as independent (on own account), or for the outside (on behalf of third parties).

Moreover careful consideration is required in the imposition of the required traffic restrictions in the most sensitive areas such as historic centres.

With the objective of providing a valid support tool for technicians and policy makers, in the development of the regulations concerning the transportation of goods in the cities and in particular in historic centres, the Regione Emilia-Romagna collected and classified some administrative actions (union orders, decisions of the Council, etc.) that directly or indirectly interfere on the operations of the urban distribution.

The survey was carried out initially by inviting the cities of Emilia-Romagna and the rest of Italy which are part of the European projects Merope and City Ports (where the Regione Emilia-Romagna is an active partner) to collect the acts considered significant for the outcome of the work. A search on the web sites of the same cities followed¹.

The list of the cities analyzed is reported in table 12.

In total 55 administrative acts were collected and analyzed: mostly union

(TABLE 12) ANALYZED CITIES

CITY	REGIONE EMILIA-ROMAGNA	PARTNER OF CITY PORTS	PARTNER OF MEROPÉ
Bologna	X		
Modena	X		X
Parma	X	X	
Reggio Emilia	X		
Ravenna	X	X	
Ferrara	X		
Rimini	X		
Forlì	X		
Piacenza	X		X
Cesena	X		
Rome			X
Genoa			X
Florence			X
Taranto		X	
Brescia		X	
Vicenza		X	
Terni			X
Ancona		X	
Udine		X	
Lucca			X
Cosenza			X
Siena			X

orders, but also reports from the councils and the committee.

Based on this possibly partial response of the local administrations, the survey cannot be considered exhaustive.

(1) A part of the administrative acts analyzed was provided by Infomobility, partner of City Ports and working on the Parma pilot.

For an as systematic as possible analysis of this heterogeneous material, a **classification** derived from studies on the same subject was introduced. Among these it is possible to quote in particular the following contributions:

- "A Framework for considering policies to encourage sustainable urban freight traffic and goods/service flows" (2000), by the Transport Studies Group of the University of Westminster;
- PROSPECTS ("Procedures for recommending optimal sustainable planning of European city transport systems" completed in January 2003), European project coordinated by the Institute for Transport Studies of the University of Leeds and funded within the Fifth Framework Programme.

The proposed classification is based on the combination of two criteria:

1. **what is regulated**, that is:
 - infrastructure (roads, parking, etc);
 - logistics platforms (Urban distribution Centres);
 - operative times;
 - vehicles (physical features, emissions, etc.);
 - transport efficiency;
2. **how to regulate**; by ordering the measures according to a more or less "interventionist" style:
 - by restrictive measures;
 - by pricing measures;

- by permissive measures;
- by exchange of information between Public Administrations and those who actually are providing the transport services;
- by the setting up or management of certain services/infrastructures (e.g. the urban distribution centres);
- by incentive measures.

These criteria allow for the creation of a grid inside which it is possible to classify the measures:

Every cross point corresponds to a cluster of regulative measures which are comparably homogenous among them (figure 14).

In the following paragraphs, the measures available to local administrators are described, which were previously defined through the grid of figure 14, particularly focusing on how they interact with goods haulage.

Moreover, some examples of their application in the cities considered are reported.

WHAT IT IS REGULATED	TRANSPORT EFFICIENCY	Restrictions on vehicle occupancy						Incentives for the adoption of fleet management systems Incentives for the adoption of ICT communication systems
	VEHICLES	Restrictions on vehicle emissions						
		Restrictions on vehicle weight			Slackening of restrictions on the vehicle weight			
		Restrictions on vehicle dimensions	Changes in vehicle tax to vehicles using environmental friendly petrol	Slackening of restrictions on vehicle dimensions			Incentives for the adoption of vehicles at low environmental impact	
	OPERATIVE TIMETABLE	Restrictions on access times		Slackening of access times for freight vehicles				
		Restrictions on loading/unloading times		Increase in loading/unloading times				
	URBAN LOGISTIC PLATFORMS					Participation in the management of platforms		
					Setting up of distribution platforms	Incentives for the utilization of platforms		
INFRASTRUCTURE	Creation and/or widening of PA and/or LTZ							
	Speed limits			Parking destinations usable by freight vehicles		Synchronisation of traffic signals		
	Mandatory construction of loading/unloading equipment in the planning of buildings			Dedicated lanes for freight vehicles		New car parks for freight vehicles		
	Restrictions on loading/unloading areas	Parking pricing	Permit for the utilization of preferential lanes for freight vehicles	Variable Message Signs (VMSs)	Park and ride			
	Restrictions on parking for trucks	Road pricing	Permit for the access to ZTL/AP for freight vehicles	Conventional traffic signals	Improvement of loading/unloading areas along roads	Incentives towards a better accessibility for local operators		
	RESTRICTIVE POLICIES	PRICING ACTS	PERMISSIVE ACTS	INFORMATION TO USERS	ACTS FOR THE CREATION OR MANAGEMENT	INCENTIVE POLICIES		
HOW IT IS REGULATED								

7. RESTRICTIONS

7.1. Restrictions on the use of infrastructure

This category pertains to those measures imposing some kind of limitation in the use of road infrastructure, whether roads, parking lots, etc.

Restrictions on truck parking

These are restrictions on parking (in terms of time, dimension and weight), in particular affecting trucks.

Restrictions on loading/unloading areas

These are restrictions on the utilization of loading/unloading areas and are usually linked to the type of vehicle wanting to use them, as well as to the time of day.

In **Bologna** the act P. G. N. 167229/2003 introduces a restriction on the categories that can use the platforms reserved to loading/unloading in the LTZ. Stopping in fact is only allowed to vehicles that are carrying goods on own account or on behalf of third parties, for a maximum time of 20 minutes using a parking disc to guarantee greater rotation.

Vehicles from shopkeepers and craftsmen are therefore not allowed to use loading/unloading areas.

This act ought to guarantee the use of

loading/unloading areas, often occupied by other vehicles that stop or park without permission, for the operators of freight transport.

However some sentences have stated that the use of those areas is possible for passenger vehicles wanting to do loading/unloading of own goods.

For those vehicles with DSI ticket (plant companies, installation and maintenance, building enterprises, craftsmen and cleanliness enterprises) which are excluded from the possibility to stop in the loading/unloading areas, the short free stop in the LTZ is possible on "blue strips" but for half an hour only.

In order for them to use this facility it is necessary that the companies get themselves a ticketing system that, based on the appropriate tariff, calculates automatically the first free half an hour.

In **Cosenza** the order No 90 of 2000 establishes that "the loading and unloading of goods should be only carried out in the areas equipped on purpose and only by those vehicles whose laden weight is not over 35 quintals".

The same act establishes also the times in which it is possible to do loading and unloading operations: in the morning from 6:30 to 7:30 and in the afternoon from 14:30 to 15:30

Imposition on the construction of tools for loading/unloading goods in the planning of buildings

In this case the restriction should impose the construction of buildings that follow predefined guidelines in terms of instrumentation for loading and unloading of goods for specific economic activities (for example for the supermarkets).

Speed limits

The restriction relates to the maximum speed on roads.

In a number of the cities considered this measure was applied within Limited Traffic Zones with a maximum speed of 30 km/h. Within Pedestrian Zones the maximum speed applied is walking speed.

The measure, in addition to improving safety in the inner parts of the cities, where the majority of pedestrian movements take place, has also a positive impact on the environment. Some further considerations are required on environmental impact though.

In fact, if on one hand the presence of an inverse correlation between emissions and speed, would lead to conclusions of inefficacy of the speed reduction policy in terms of environmental impact reduction, on the other end a more careful analysis of the interaction between traffic and consumptions/emissions leads

to different conclusions. The environmental statistical (emissions) and consumption indicators compared with the parameters that define the ECE urban drive cycle (average speed, standard deviation of the acceleration and maximum load per hour) emphasize how lower speeds (within between 15 km/h and 30 km/h) and more moderate driving condition (reduction of the maximum acceleration to 0.50 m/s²) result in the minimum possible level of either emissions and consumptions (ENEA 1998).

Creation/widening of PA and/or LTZ and access pass management

This is the measure most commonly used by Italian and European cities to protect the historic centres from the negative effects of traffic (congestion, noise and pollution and road space allocation).

For the delimitation of Pedestrian Zones and Limited Traffic Zones the art. 7, subsection 9 of the Italian Traffic Code establishes that a Council order is necessary:

"The municipalities, after deliberation of the Municipality, will define Pedestrian Zones and limited traffic zones by taking into account the effects of traffic on the freedom to travel, health, public order, environment and cultural heritage, landscape.

In case of urgency the measure can be adopted following the mayor's act, even when implying an amendment or integration of the decision of the council."

The adoption of this measure requires the setting up of only normative acts and the installation of the necessary traffic signs, as well as the distribution of permits to those categories that are not banned from the access.

The creation or extension of the Limited Traffic Zones should be done in parallel to complementary measures, such as parking charging outside the LTZ and the strengthening alternative ways to travel into the regulated areas, in order to avoid that the outcome of the measure is the shift of congestion towards external zones as opposed to modal shift.

A brief description of the features of the Limit Traffic Zones for some of the cities examined follows. Only those factors that influence the transport of goods are reported, thus omitting the implications that they have on residents and other users of the historic centre. Being tightly linked the two measures of setting up the Limited Traffic Zone and the release of the access permits to the freight vehicles are treated together.

LTZ of Bologna



In the figure, the LTZ is shown with green, the PA with magenta and the "T" with light blue

Via Zamboni's pedestrian zone which is controlled by rising bollard



BOLOGNA

Via Zamboni's Pedestrian Zone which is controlled by rising bollard. In the picture green relates to the LTZ, magenta to the PAs and light blue for the "T".

In the Limited Traffic Zone there are limitations to the vehicular traffic from 7:00 to 20:00 all days, Sundays included.

The access to the LTZ is not subject to a charge, but inside the zone stopping requires a fee from 08:00 to 20:00

The zero-emission vehicles (electric) can enter the LTZ without any permission and for those vehicles stopping is free. Goods vehicles can enter with no restrictions if holding a permit. No authorization is required to vehicles with weight between 35 and 80 quintals, but the Traffic and Transport Area department must be notified. Vehicles with weights over 80 quintals and special goods vehicles should hold proper authorizations.

There is an area inside the LTZ (the so called "T") where there are traffic restrictions to vehicles from 00:00 to 24:00 and more restrictive criteria are in place (See page 129).

Some Pedestrian Zones in Bologna are controlled by rising bollards that stop the access to vehicles not holding a "smart card", functioning as both permit and pass to enter. The "smart card" is provided to residents and to businesses situated inside the area. Vehicles of operators, acting on behalf of third parties, who supply the shops of those Pedestrian Zones, can access only from 6:00 to 10:30 and from 15:30 to 16:30, when the rising bollards are lowered down. The vehicles of businesses residing in those Pedestrian Zones and in possess of regular access permits for the LTZ can perform the loading/unloading operations inside the 6:00 to 22:00 time window.

LTZ of Modena



MODENA

In the Limited Traffic Zone and in Pedestrian Zones there are traffic limitations to the vehicular traffic from 0:00 to 24:00 of all days, Sundays included.

The access to the LTZ for goods vehicles is not subject to any tariff (the craftsmen pay 100 Euro only for an annual authorization).

The activities of loading and unloading goods and more in general supply are allowed within the following time intervals: 7:30 to 10:30 and 13:30 to 16:30.

Alternatively loading and unloading can only be done from 13:30 to 18:00 as long as the first period 7:30 to 10:30 is given up.

It is forbidden to carry out loading/unloading operations from 10:30 on Saturday to 7:30 on Monday and during Sundays except upon specific exceptions.

It is possible that some categories of activities can deviate from the allowed time intervals, upon authorization. These activities include: mail delivery and agencies for express or package delivery, owners of grocery shops, of public services, shopkeepers in catering activities based in the LTZ, shopkeepers in catering activities based outside the LTZ, commercial businesses doing also craftsman activity based outside the LTZ, owners of businesses also involved in handicraft activities whose laboratory is in the, craftsmen providing emergency services to house and to tertiary activities, pharmaceutical products supply firms and florists.

The allowed categories can stop for a maximum of 30 minutes (emergency vehicles 90 minutes) with the obligation to show the parking disc.

LTZ of Parma



PARMA

The historic centre of Parma is divided into three areas:

Environmental Zone where the Access prohibition to unauthorized vehicles is in place from 0:00 to 24:00 all days Sundays included. In this part of the city freight vehicles can enter and use the appropriate areas for loading and unloading operations if they hold an appropriate permit and in the following hours:

1. Restricted environmental zone: from 9:00 to 10:30;

2. Environmental zone: from 9:00 to 10:30 and from 15:00 to 15:30

Within the environmental zone the maximum stopping time for loading and unloading operations is 30 minutes using a parking disc.

Limited Traffic Zone where the access prohibition to unauthorized vehicles is in place from 7:30. to 20:30 all days, Sundays included (a part of the LTZ is linked to different time windows).

In such area the freight vehicles can enter if they hold an appropriate permit and can occupy the appropriate platforms for loading and unloading operations in the following hours only: 9:00 -10:30 14:30 - 16:30 19:30 - 20:30 The maximum stopping time for loading and unloading operations is 30 minutes using a parking disc.

Pay parking zones (ZPRU) freight vehicles are allowed to occupy the appropriate areas for loading and unloading operations if they hold an appropriate permit and from 9:00 to 16:30 only. The maximum stopping time for such operations is 30 minutes using a parking disc.

In all these zones electric vehicles can enter without time restrictions, while LPG and methane vehicles have a access time windows, the one in the morning, wider (7:30 - 10:30) than that used by traditionally fuelled vehicles. The permission for loading and unloading operations allows also stopping, not only in the appropriate areas, but also in the pay stop spaces (blue stripes). Goods vehicles weighing over 3.5 tonnes can enter such zones only if holding a specific permit (in which it is indicated the route to follow), which is provided by the relevant office for a period of not over three months (renewable). Transit and stop tickets which have to accompany the permissions are of three types: monthly (30 Euro), daily (5 Euro) or by time of day (variable tariff depending on the zone).

LTZ of Reggio Emilia



In the figure, the LTZ is shown with a pink dotted line whilst the PA is shown in black.

REGGIO EMILIA

In the Reggio Emilia's LTZ there are restrictions to traffic from 6:00 to 8:00, including Sundays.

The permits to access the LTZ are given to vehicles weighing less than 5 tonnes (up to 7.5 tonnes for refrigerating cells). For vehicles with a weight over 5 tonnes only temporary permits are released.

The authorizations for goods haulage allows for the access at certain hours and days depending on whether the access refers to the LTZ or to the Pedestrian Zones:

Freight transport on own account:

Pedestrian Zones: 6:00-10:00 (Monday, Wednesday and Thursday) and 14:00 16:00 (Monday, Tuesday, Thursday and Saturday).

LTZ: 6:00-10:00 (Monday, Wednesday, Thursday and Saturday) and 14:00 16:00 (Monday to Friday).

Freight transport on behalf on third parties:

Pedestrian Zones: 6:00-10:00 (Monday, Wednesday and Thursday) and 14:00 16:00 (Monday, Tuesday, Thursday and Friday).

LTZ: 6:00-10:00 and 14:00 16:00

Vehicles for goods haulage requiring access at different times and days can do so by paying an access fee (see pag. 134).

For electric vehicles there are no limitations in term of access time nor there are fees to pay. The permits provided allow for loading/unloading operations at specified parking bays for a maximum 30-minute period while a parking disk must be shown during the stop.

LTZ of Ravenna



In the figure, light blue indicates the PA, green and red show the LTZ.

RAVENNA

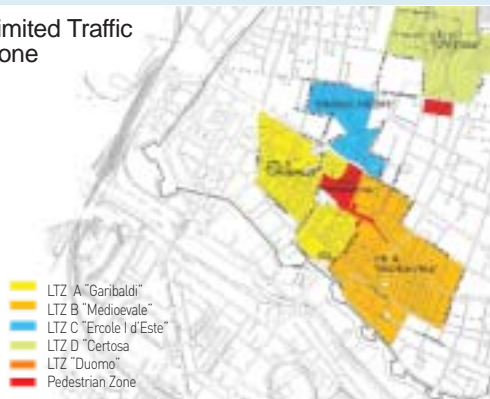
The Limited Traffic Zone is composed of two parts: in one there are restrictions to vehicular traffic from 0:00 to 24:00, all days, including Sundays (green area in the figure), in the other part the restrictions apply from 7:30 to 20:30 every day, including Sundays (red area in the figure).

The access to the LTZ is not subject to any tariff. Loading and unloading operations are allowed as follows:

8:30-10:30, 14:30-16:00 and 0:00-7:00

Vehicles are allowed to stop for a maximum of 30 minutes with the obligation to show the parking disk.

LTZ of Ferrara

Limited Traffic
Zone

FERRARA

In the Limited Traffic Zone and in the Pedestrian Zones of Ferrara there are restrictions to vehicular traffic from 0:00 to 24:00 every day, including Sundays.

Access to the LTZ is subject to a tariff differentiated according to the type of developed activity and the type of vehicle used: for vehicles carrying goods on behalf of third parties and for those with low environmental impact there is a discounted fee (50% and 80% respectively). Permits for goods haulage allow for accessing the LTZ at different times:

Transport on behalf of third parties: 6:00-11:00 and 15:30-17:30. Electric, methane, LPG or hybrid propelled vehicles: 6:00-17:30. Vehicles are allowed to stop for a maximum of 60 minutes with the obligation to show the parking disk;

Transport of medical supply: 9:00-12:30 e 15:30-19:30;

Home deliveries: 11:30-14:00 e 18:30-20:00. Vehicles are allowed to stop for a maximum of 45 minutes with the obligation to show the parking disk;

Credit institutions and movements of valuables: 8:00-14:00. Vehicles are allowed to stop for a maximum of 45 minutes with the obligation to show the parking disk.

Transport of goods on own account: 6:00-10:30 and 15:30-17:00 with limits of two tiers of 90 minutes each, chosen by the retailer. Vehicles are allowed to stop for a maximum of 45 minutes with the obligation to show the parking disk.

Transport of food and derived: 6:00-10:30 for a maximum duration of 120 minutes, as chosen by the shop owner and 15:30-17:00 for a maximum duration of 90 minutes, as chosen by the shop owner. Vehicles are allowed to stop for a maximum of 45 minutes with the obligation to show the parking disk.

LTZ of Forlì



RIMINI

In the LTZ there are restrictions to the vehicular traffic from 8:30 to 12:30 and from 16:00 to 20:00 every day. In the Pedestrian Zones the restrictions are in force from 8:30 to 20:00

Permissions for goods vehicles are released without any time restrictions.

FORLÌ

In the Pedestrian Zones there are restrictions to vehicular traffic from 0:00 to 24:00 every day, including Sundays.

The restricted traffic zone consists of three parts which have different access times:

- ZTL 7:00-19:00 (orange area in the figure)
- C.so Garibaldi - LTZ 0:00-24:00 (light blue area)
- Via G. Regnoli - LTZ 22:00-7:00 (light blue area)

The access to the LTZ is not subject to a charge.

In the Pedestrian Zones (green area in the figure) the access for vehicles usable for loading/unloading is allowed within the time intervals 6:30-9:00, 13:00-15:00 and 20:00-21:00. Routes are predefined. Stopping is allowed only for the time required for loading and unloading operations and for a maximum of one hour with the obligation to show the parking disk. Stopped vehicles must not be of impediment to the other traffic.

In the **Limited Traffic Zone** the access for vehicles usable for loading/unloading is allowed within the time intervals 6:00-10:00 and 13:00-17:00 only for the time required for loading and unloading operations and for a maximum of half an hour.

Vehicles for home delivery of perishable foodstuffs, those for specific activities such as transport valuables to banks, delivery packages and correspondence, urgent delivery of medicines, maintenance of private/public buildings, sales representatives carrying large samples or attempting to sell, can access the LTZ from 7:00 to 19:00, only for the time required for loading and unloading operations.

LTZ of Piacenza



PIACENZA

In the Limited Traffic Zone there are restrictions to vehicular traffic from 08:00 to 19:00 every day, including Sundays.

The access to the LTZ is not subject to a charge.

Trucks not wider than 2.20 metres can enter and travel through the LTZ.

In the LTZ there are time restrictions for the transit of goods vehicles. Operations of loading and unloading goods are allowed within the following time slots: 9:00-11:30 and 13:30-17:00 (except Wednesday and Saturday morning).

Freight vehicles are allowed to stop only for the time needed for the loading/unloading operations, also outside the areas specifically reserved for that purpose, as long as they do not impede the other traffic.

A dispensation from the time schedule set up for loading/unloading operations can be obtained for transit only reasons if the vehicle belongs to one of those categories either requiring doing continuous deliveries or urgent ones, possibly outside the predefined time slots. These include: bakers, florists, lifters, greengrocers, milk/cheese products, pharmaceutical products, pastry products, boiler assistance, interventions where a 24-hour availability is required for technological installations, press delivery and distribution.

LTZ of Cesena



Yellow indicates the area of the historic centre.

CESENA

There are three types of zones:

LTZ A: transit forbidden from 3:00 to 5:00 (green area in the figure)

LTZ B: transit forbidden between 0:00-24:00 (light blue area in the figure)

LTZ C: transit forbidden between 0:00-24:00 with stopping not allowed outside the time slots 7:00-10:00 and 14:00 17:00. The access to this area is allowed only to people entering private properties and emergency services (pink area in the figure)

PA: transit and stop forbidden from 0:00 to 24:00 (red area in the figure)

Goods vehicles are allowed to enter the LTZ in the hours between 7:00 and 10:00, and between 14:00 and 17:00 without any pass. Outside those times freight vehicles must be authorized in order to both circulate and stop and an annual pass is required at a cost of 155,00 Euro.

For businesses situated within the LTZ the pass allows to access goods loading/unloading areas at any time provided a parking disk for 30 minutes only is shown.

Zero-emission vehicles, hybrids, or ecological-fuel propelled ones can access at any time.

Within the whole historic centre there is the ban for vehicles with loading capacity higher than 3.5 tonnes. In several parts of the built-up area of Cesena freight vehicles whose capacity is higher than 8 tonnes are not allowed to enter, in order to avoid them going through the city. For emergency vehicles (only those trucks weighing no more than 3.5 tonnes) passes can be obtained for the transit and permanent stop within the historic area at a cost of 155,00 €. All the stopping areas within the Cesena district which are associated to operations of goods loading/unloading are reserved exclusively to vehicles used for those activities.

LTZ of Roma



The figure shows the LTZ sectors (yellow perimeter) and the 23 electronic arcs installed (numbered points)

ROME

In the LTZ there are restrictions to vehicle traffic on weekdays from 6:30 to 18:00 and on Saturdays from 14:00 to 18:00.

In general the area is accessible with a pass obtained upon a fee (see pag. 135 for more details).

Electric, LPG, methane vehicles can circulate in the LTZ without the pass, and therefore for free.

Permits are obtainable by vehicles abiding by the emissions limits of Euro 1. Trucks with fully laden weight higher than 35 quintals can circulate in the LTZ without the pass and they can park at specific bays for the time required to carry out the loading/unloading operations from 20:00 to 7:00. Trucks for goods haulage whose fully laden weight is lower than 35 quintals can instead circulate in the LTZ and stand at the specific loading/unloading bays only if accompanied by a pass and within the intervals

I Tier from 20:00 to 10:00;

II Tier from 14:00 to 16:00.

Trucks included in the following categories can access the LTZ and park in the loading/unloading bays for the time they require and at the time of the day they require as long as they possess a pass:

up to 35 quintals: transport of perishable foodstuffs, medicines, press distribution, haulage of valuables (when the vehicle is owned by the retail, stores or laboratories of valuables it is not required that the vehicle belongs to the goods haulage category), delivery trucks and transport companies working on behalf of third parties in order to facilitate the common distribution of goods, trucks for which, as a result of very specific working conditions, it is objectively demonstrable that they cannot distribute the goods inside the LTZ within the time windows specified;

over 35 quintals: trucks requiring to circulate outside the time window 8:00pm - 7:00am. In this case a request must be made with a valid case for the exception. The itinerary assigned will be based on the type of vehicle and the roads where it is expected to travel;

Without weight limit: haulage of valuables by armoured vehicles and of food with refrigerator vans.

The permit to access the LTZ for goods haulage is provided to vehicles registered for transport of items (trucks, vans, and mixed use); it is also given to cars (only with people on board) only if they carry valuables.

FLORENCE

The Limited Traffic Zone is subdivided into five sectors A, B, C, D and E and is in operation from Monday to Friday from 7:30 to 19:30 and Saturday from 7:30 to 18:00. Pedestrian zones apply 24 hours per day. A payment is required to enter [for more details see p.135]

Goods vehicles with a total fully laden weight less than 35 quintals, owned by companies based outside the LTZ, can circulate in all sectors of the LTZ and in the Pedestrian Zone until 10:00 (until 11:30 if the transport refers to foodstuffs, drinks, ice creams and frozen goods and until 8:30 if the vehicle has a fully laden weight over 35 quintals). On a sector only the circulation is also allowed from 15:00 to 16:30. In order for the timetable to be abided for, the telepass (allowing the recognition of the vehicle as authorized) technology is used to monitor the access only during the specified time windows.

The commercial activities based in the LTZ have the right to access the sector they belong to at any time and other sectors within the time windows 7:30 - 10:00.

The vehicles carrying either medicines, valuables or owned by companies carrying goods on behalf of third parties (with trucks weighing less than 35 q), can move in the whole LTZ without temporal restrictions.

Parking is only allowed for the time needed to load and unload the goods.

LTZ of Brescia



BRESCIA

In the Limited Traffic Zone (light blue in the figure) and in Pedestrian Zones (red in figure) round the clock restrictions are in place for vehicular traffic, seven days a week.

Access to the LTZ is not subject to a charge.

Freight transport vehicles (trucks, "N" type in the Italian coding) and those for mixed things/persons transport, for the supply of commercial services, can enter the LTZ and Pedestrian Zones without permit from 6:00 to 10:00 and from 13:00 to 17:00 each weekday and on Saturday mornings.

Standing is allowed for the time needed to loading/unloading within the areas designated for these operations.

Vehicles for medicinal transport can enter without a permit and without time restrictions.

The vehicles of the owners of commercial services based in the LTZ or PA can enter the zone for loading/unloading operations only.

15-minute stops are allowed in the areas reserved for loading and unloading goods in the time window between the 6:00 and the 20:00 on weekdays, Saturday included. This extends to Sundays if shops are open provided a parking disk is shown.

The vehicles of business representatives with samples of heavy and/or bulky goods can enter the LTZ between 9:00 to 13:00 and from 15:00 to 19:00 on weekdays, with the possibility of parking for one hour.

LTZ of Vicenza



VICENZA

In the Limited Traffic Zone (orange area in the figure) and in the Pedestrian Zone (blue area in the figure) there are restrictions to vehicular traffic 24 hours per day for all weekdays.

Goods vehicles, with total laden weight lower than 7.5 tonnes, can enter the LTZ from 7:00 a.m. to 9:30 and from 14:30 to 16:00 every day.

Vehicles of pharmaceutical companies carrying urgent medicines can travel in the LTZ with a pass limited to a time period, which has to be agreed upon with the Administration of the Council.

TERNI

In the Limited Traffic Zones and Pedestrian Zones there are restrictions to vehicular traffic between 0:00 and 24:00 every day including Sundays.

In both areas the access is allowed, with a permit, only to catalyze or diesel vehicles registered as per CE nr. 91/441 or following ones, and to LPG or methane propelled vehicles.

Goods vehicles (fully laden with a weight less than 35 q) can transit or stop in PA, provided authorization, in the time window between 8:30 and 10:30 on working days.

Company owned vehicles may enter and transit in the restricted zone only if they have parking availability in a private area.

Authorized vehicles that can carry goods with capacity up to 35 quintals, can enter the LTZ in the following time windows:

- from 8:30 to 10:30
- from 14:00 to 16:00

Vehicles included in following categories can enter the LTZ with no hourly band limit:

- trucks assigned to transport of perishable foodstuffs, medicines, plasma, haulage of valuables with armoured vehicles and press distribution;
- trucks in use to delivery agencies and transport companies working on behalf of third parties to facilitate the common distribution of goods;
- trucks destined to transport of valuables that can circulate and park also in a forbidden place as long as this does not hamper or cause disruption to free traffic;
- trucks for which, in connection to special working conditions, it is objectively clear the impossibility to distribute the goods within the LTZ in the above specified time windows.

UDINE

In the Limited Traffic Zone and Pedestrian Zone there are restrictions to vehicular traffic from 0:00 to 24:00 the access to the LTZ is without charge.

Vehicles with loading capacity up to 35 quintals are authorized to enter in the LTZ and those at low environmental impact (methane, LPG, electric and eco-diesel).

The haulers and couriers for delivery and/or goods collection have the right to have a permanent permit with transit and short stop possibility (60 minutes).

Furthermore, it is possible to enter the restricted zones for loading and unloading operations, without a permit, from 7:30 to 9:30 and from 14:00 to 16:00. Outside those times, permits issued for similar activities and with appropriate motivations are usable at specific hourly bands only.

L TZ of Ancona



ANCONA

In the Limited Traffic Zone (red in the figure) there are restrictions to vehicular traffic from 7:00 to 20:00

The access to the LTZ is not subject to a fee.

The haulers with vehicles assigned to goods transport can carry out loading and unloading operations on working days only with no authorization, provided that the driver has with himself the freight bills related to the goods transported. Parking can only be allowed for the time needed to carry out the mentioned operations above.

Owners of commercial activities and public services based in the limited traffic zone can do loading and unloading operations on working days as long as they are in possess of a permit.

LTZ of Lucca



LUCCA

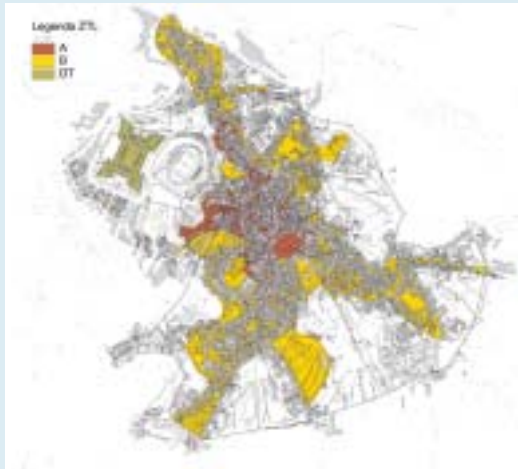
In the Limited Traffic Zone there are restrictions to vehicular traffic from 7:00 to 20:00.

Access to the LTZ is not subject to a charge.

Freight transport vehicles on own account with activity situated in the LTZ or PA or for freight transport on behalf of third parties can enter the LTZ without temporal restrictions and within hourly bands 7:00 - 10:00 and 14:00 - 15:30 on working days, in the Pedestrian Zones.

Transport of alterable and/or perishable goods can be carried out in the time windows between 7:00 and 10:00, 14:00 and 16:00 and 18:30 and 20:00; Medical transports can be done within the time windows between 8:30 and 9:30, 12:00 and 13:00 and 16:00 and 17:00.

LTZ of Siena



SIENA

In the Limited Traffic Zone there are restrictions to vehicular traffic from 0:00 to 24:00 every day including Sundays.

The access to the LTZ is not subject to a charge.

The authorizations for goods transport allow for the access in the LTZ during different time bands depending on the activity one is involved in:

- haulers, couriers, wholesalers, foodstuffs distributors (drinks and frozen goods included), companies that transport goods and bulky equipments, services doing home deliveries of bulky materials, other services based in the LTZ that require to get the goods themselves: 6:00 - 10:00 and 15:30 - 17:00 or alternatively for the only activities situated in the LTZ 6:00 - 10:00 and 19:00 - 20:30
- fresh products distributors (bread, pasta, sweets etc.), on-site catering services, pharmacies and distributors of medicines, retailers of bottled gas, craftsmen company operating in activity sectors requiring urgent interventions, car retail, car repairs, car workshops: 6:00 - 13:00 and 14:30 - 19:00
- building companies - travelling vendors - fish products vendors - newspapers distributors: 6:00 - 12:00 - 13:00 - 18:00
- florists: 6:00 - 9:00 and 12:00 - 14:00 and 18:00 - 20:00

There are no temporal restrictions as long as the transport of goods is done by electric vehicles.

The standing for loading/unloading operations is allowed, also outside appropriately reserved areas, in case of no induced hamper to the circulation.

In the following tables and figures the chief data of the cities under consideration are reported:

(TABLE 13) TIME TABLE OF LIMITED TRAFFIC ZONES AND ACCESS TIMES FOR GOODS VEHICLES

CITY	LTZ TIMETABLE	ACCESS TIMETABLE ON "THIRD-PARTY"	ACCESS TIMETABLE ON "OWN ACCOUNT"
Bologna	LTZ: 7:00-20:00	those in possess of a permit can enter without time restrictions	
	"T": 0:00-24:00	<ul style="list-style-type: none">• 6:00-7:30 and 14:30-16:30 for vehicles that do not conform to CE and EEC directives;• 6:00-10:30 and 14:00-17:00 for vehicles conforming to CE and EEC directives;• 6:00-12:30 and 14:00-17:00 for methane propelled vehicles.	
	PA: 0:00-24:00	in the Pedestrian Zones with rising bollards; "on behalf on third parties" trips can use the 6:00 to 10:30 and 15:30 to 16:30 time slots;	Pedestrian Zones (PA) controlled by rising bollards "can be accessed by "on own account" vehicles from 6:00 to 10pm.
Modena	LTZ: 0:00-24:00 PA: 0:00-24:00	0:00-24:00	
Parma	LTZ: 7:30-20:30	9:00-10:30	14:30-16:30 19:30-20:30
	PA: 0:00-24:00	9:00-10:30	15:00-15:30
Reggio-Emilia	LTZ: 6:00-20:00	6:00-10:00 e 14:00-16:00	6:00-10:00 (Monday, Wednesday, Thursday and Saturday) 14:00-16:00 (Monday, Tuesday, Wednesday, Thursday and Friday)
	PA: 0:00-24:00	6:00-10:00 (Monday, Wednesday and Thursday) 14:00-16:00 (Monday, Tuesday, Thursday and Friday)	
Ravenna	LTZ1: 0:00-24:00	8:30-10:30, 14:30-16:00 e 0:00-7:00	
	LTZ2: 7:30-20:30		
Ferrara	LTZ: 0:00-24:00 PA: 0:00-24:00	6:00-11:00 e 15:30-17:30	6:00-10:30 e 15:30-17:00
Rimini	LTZ: 8:30-12:30 e 16:00-20:00	8:30-12:30 e 16:00-20:00	
Forlì	LTZ1: 0:00-24:00	6:00-10:00 e 13:00-17:00	
	LTZ2: 7:00-19:00		
	LTZ3: 22:00-7:00		
	PA: 0:00-24:00	6:00-10:00 15:00-17:00 e 20:00-21:00	

CITY	LTZ TIMETABLE	ACCESS TIMETABLE ON "THIRD-PARTY"	ACCESS TIMETABLE ON "OWN ACCOUNT"
Piacenza	LTZ: 8:00-19:00	9:00-11:30 e 13:30-17:00 (except Wednesday and Saturday mornings)	
Cesena	LTZ: 0:00-24:00	7:00-10:00 e 14:00-17:00 (outside these time slots the permit is charged for)	
Roma	LTZ: 6:30-18:00	there is no access time limit for those with a permit	20:00-10:00 e 14:00-16:00
Firenze	LTZ: 7:30-19:30	there is no access time limit for those with a permit	there is no access time limit to one's sector for those with a permit. For other sectors access is possible from 7:30 to 10:30
Brescia	LTZ: 0:00-24:00	6:00-10:00 e 13:00-17:00	
Vicenza	LTZ: 0:00-24:00	7:00-9:30 e 14:30-16:00	
	PA: 0:00-24:00	7:00-9:30	
Terni	LTZ: 0:00-24:00	8:30-10:30 e 14:00-16:00	
	PA: 0:00-24:00	there is no access time limit for those with a permit	8:30-10:30
Ancona	LTZ: 7:00-20:00	a permit is not required if holding a shipping note for the goods carried	there is no access time limit for those with a permit
	PA: 7:00-20:00		
Udine	LTZ: 0:00-24:00	there is no access time limit for those with a permit	7:30 alle 9:30 e dalle 14:00 alle 16:00
	PA: 0:00-24:00		
Lucca	LTZ: 7:00-20:00	there is no access time limit for those with a permit	
Siena	LTZ: 0:00-24:00	6:00-10:00 e 15:30-17:00	

As shown in table 13 and figure 15, the hourly restrictions applied are different depending on the local realities: some cities prefer to close the centre to the commercial vehicles from late morning until mid-afternoon to promote tourism

(for example Ferrara, Parma, Siena, Ravenna, Vicenza), in other cities it is preferred to apply restrictions at peak times or in the mornings (Piacenza, Parma, Rimini), for others again the access time slots are spread across all

day (Bologna, Roma, Firenze, Lucca). The regional coordination could prove useful in order to reach to a consistent distribution of temporal windows. The application of homogenous measures, at least at regional level, could be

[FIGURE 15] ACCESS TIMES TO LIMITED TRAFFIC ZONE FOR THIRD PARTY GOODS VEHICLES (FROM MONDAY TO FRIDAY)

	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-01	01-02	02-03	03-04	04-05	05-06	
Bologna																									Bologna
Modena																									Modena
Parma																									Parma
Reggio-Emilia																									Reggio-Emilia
Ravenna																									Ravenna
Ferrara																									Ferrara
Rimini																									Rimini
Forlì																									Forlì
Piacenza*																									Piacenza
Cesena**																									Cesena
Rome																									Rome
Florence																									Florence
Brescia																									Brescia
Vicenza																									Vicenza
Terni																									Terni
Ancona																									Ancona
Udine																									Udine
Lucca																									Lucca
Siena																									Siena

Temporal traffic restrictions (limited traffic zone in force)

Times when goods vehicles on behalf on third parties are allowed to access the LTZ

* Piacenza: loading and unloading operations are not allowed on Wednesday and Saturday mornings
** Cesena: outside the time windows from 7:00 to 10:00 and from 14:00 to 17:00 access is only possible with pass costing 155 Euro/year

(TABLE 14) COMPARISON BETWEEN VARIOUS LIMITED TRAFFIC ZONES

CITY	DISTRICT AREA Km ² (ISTAT 2001)	INHABITANTS (ISTAT 2001)	EXTENSION OF BUILT-UP AREA	AREA OF LTZ (m ²)	AREA OF PA (m ²)	PERCENTAGE COVERED BY AREA SUBJECT TO RESTRICTIONS (LTZ+PA) (m ²)	% OF AREA SUBJECT TO RESTRICTIONS COMPARED TO BUILT-UP AREA
Bologna	141	371217	69.29	3150000	151000	3301000	4.76%
Modena	183	175502	31.33	689141	25963	715105	2.28%
Parma	261	163457	29.50	1046811	217165	1263976	4.28%
Reggio-Emilia	232	141877	23.56	684401	73158	757559	3.22%
Ravenna	653	134631	20.70	489690	13348	503038	2.43%
Ferrara	404	130992	35.25	1264000	64000	1328000	3.77%
Forlì	228	108335	data not available	160000	13000	173000	-
Piacenza*	118	95594	19.55	494000	-	494000	2.53%
Cesena	249	90948	13.54	400000	2500	402500	2.97%
Rome	1285	2546804	500.00	5814128	361901	6176029	1.24%
Florence	102	356118	data not available	data not available	data not available	-	-
Vicenza	81	107223	27.48	350000	16150	366150	1.33%
Ancona	124	100507	28.23	17128	8520	25648	0.09%
Udine	57	95030	22.40	138065	127554	265619	1.19%
Lucca	186	81862	12.88	80000	127000	207000	1.61%
Siena	119	52625	3.58	1667000	6480	1673480	46.69%

The data relevant to the size of the built-up area, of the LTZ and of the PA were supplied from the interested municipalities

*For Piacenza the Pedestrian Zone has not considered in the calculation of the indicator (% LTZ + PA with respect to city centre), and as a result, the value is lower than in reality.

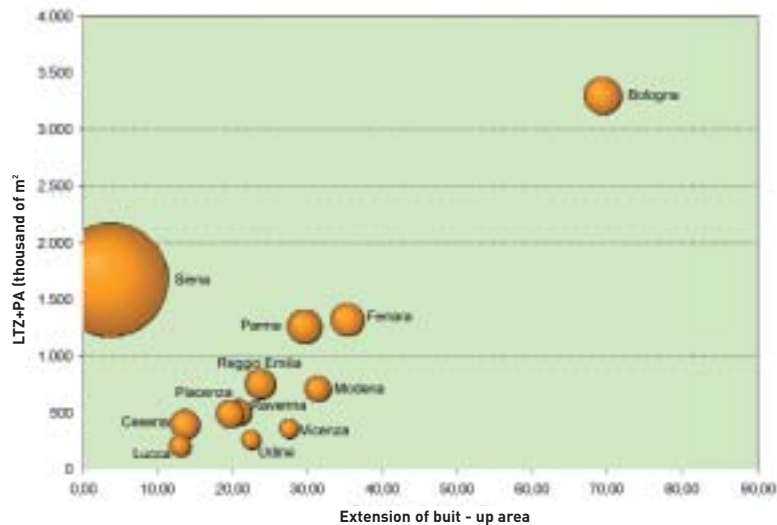
advantageous for the operators working on a regional scale, as they would find a more homogeneous set of restrictions for the districts, leading to an easier management of their own activity.

Table 14 shows some indicators either

reported or calculated which are relevant to the cities analysed. In particular, an indicator with the ratio LTZ plus PA to the whole city centre area allows the comparison of the various zones which are under the restriction.

Figure 16 shows, for each city, the size

of the built-up area (value on X-axis) versus the size of the areas under restriction (LTZ + PA), ordinates value). The area of the bubbles is equivalent to the indicator "% area subject to restrictions with respect to the built-up area". Rome and to Ancona are not shown in

(FIGURE 16) COMPARISON BETWEEN AREAS OF THE LIMITED TRAFFIC ZONES

[2] Rome has a built-up area a lot more extended than the other cities (500 km²) and Ancona has a low value of the indicator (0.09%).

the graph, because of uncomparability of their data.

Qualitatively it can be said that a growing built-up area will be followed by a growing limited traffic zone. The indicator “% area subject to restrictions with respect to built-up area” is in all the cities under 5%.

For Siena the size of the Limited Traffic Zone is nearly half that of the built-up area (47%), which is however small compared to that of the other cities (this is why its “bubble” is so close to the y axis).

7.2. Restrictions on operative times

Restrictions on loading/unloading times

These are specific restrictions on loading/unloading times in relation to the time windows when the stopping platform is usable or to the time of operation.

Restrictions on access times (for example possibility to access only at night)

A measure for a better utilization of the road infrastructure is the introduction of the permission to deliver goods at night only. The measure, that on one hand has the potential to reduce the daily congestion, on the other hand could lead to noise problems and also commercial operators are reluctant to organize themselves in nightly shifts.

One of the mandatory conditions for this measure to apply is the utilization of low-noise vehicles and equipment for loading and unloading operations.

In **Rome** trucks over 35 quintals can deliver in the LTZ from 20:00 to 7:00 without any kind of authorization. For daily access, however, they must obtain a pass (which has to be paid for) obtainable upon a substantiated demand; the route is assigned according to the type of vehicle and the destination.

7.3. Restrictions based on vehicle characteristics

The restrictions that regulate the access of vehicles to the city centres according to size and weight depend on the various contexts. This measure causes problems to non-local transport operators who, when organizing journeys between cities, have to work out a solution among non homogeneous measures.

Also in this case a regional coordination could help defining a harmonic regulation.

Restrictions based on vehicle dimensions

The measures of this type forbid transit to vehicles over a certain dimension (the dimension can be measured as height, length or width of the vehicle) in some roads or urban area zones.

Usually the measure is applied when there are transit difficulties due to road topology for instance: the passage under or above a bridge, the passage in very tight alleys, etc.

In some cases these restrictions aim to reduce the visual impact of large vehicles in urban centres.

In **Piacenza** order N. 28 of the 9.6.03, which regulates the traffic in the Limited Traffic Zone, establishes that

trucks whose width does not exceed 2.20 meters can enter the same.

The motivation behind the act is "that the road network of the "centro Antico" (old centre) is mainly constituted of roads with reduced cross-sections, with footpath if any largely on same plan of road and of reduced dimensions, and as such pedestrian movements are difficult for the presence of transit vehicles".

Restrictions on vehicle weight

These act ban transit for vehicles weighing more than a certain amount in some streets or areas of the city, with the intention of redirect them towards more suitable routes.

The objective is to reduce the physical damage to infrastructure produced by the vibrations that large lorries cause to the road. This measure can also help reducing the noise levels thus limiting situations of conflict between lorries and other road users.

In **Modena** this act has been adopted on grounds of road circulation security (P.G. IX\21186).

In some streets transit is banned for vehicles with fully laden weight higher than 6 tonnes. In order to guarantee the access by productive activities into the streets of interest exceptions have been made relating to vehicles whose desti-

nation are businesses based in the same streets.

In **Ferrara** the PG n. 85288 of November 11th 2003 bans the transit in front of the railway station to vehicles whose capacity is higher than 11.5 tonnes, in order to avoid conflicts between lorries and the numerous pedestrians and cyclists using the area. Exemptions relate to lorries that have to do loading/unloading operations inside the banned area, and that possess the appropriate documentation for the exemption and the lorries of residents who can demonstrate that they will park the vehicle inside a private space.

In **Taranto**, the restrictions based on weight imposed in the urban area to vehicles are rather complex, the Union act n. 187 states in fact:

- Up to 35 quintals carrying "FRESH" or "PERISHABLE" products (bread, milk and derivatives, etc);
- Free circulation and loading/unloading of goods for the entire day;
- Up to 35 quintals carrying other goods: free circulation and loading/unloading of goods for the entire day except for time slots 6:00-9:00 and 12:00-15:00;
- Up to 135 quintals: free circulation and loading/unloading of goods from 9:00 to 12:00, from 15:00 to 18:00 and from 21:00 to 6:00.

acts or regulations defining the modality of access for vehicles to Limited Traffic Zone often pose limitations on vehicles weight. In table 15 some examples of these restrictions are reported:

(TABLE 15) ACCESS RESTRICTIONS TO AREAS OF THE LIMITED TRAFFIC ZONE BASED ON VEHICLES WEIGHT

CITY	RESTRICTIONS IN THE LTZ TO VEHICLES WEIGHING MORE THAN:	TYPE OF RESTRICTIONS
Bologna	80 quintals	Vehicles over 80 quintals and vehicles with special goods must ask for appropriate permits in order to enter the LTZ.
Modena	60 quintals	Above this laden weight, only temporary permits are possible showing the route and conditions of transit and standing.
Parma	35 quintals	Freight vehicles whose laden weight is greater than 35 quintals can access the LTZ only with appropriate permit with indicated the route to use, issued by the relevant office with a validity of up to 3 months (renewable).
Reggio Emilia	50 quintals or up to 75 quintals for refrigerators	Vehicles with laden weight above 80 quintals can only be issued temporary permits – given a previous verification of usability for the routes required.
Ravenna	25 quintals	A special permit is required for larger weights – type A – issued upon demonstration of effective and proven requirement
Ferrara	80 quintals	Access allowed pending authorization of the Corpo Polizia Municipale (local Police).
Forlì	35 quintals	Inside the boulevards, freight vehicles with laden weight above 3.5 tonnes must load/unload in the time slots from 6:00 to 10:00 and from 13:00 to 17:00; the operations must happen within a maximum time of 30 minutes.
	75 quintals	Vehicles can access if issued a permit from the Department of Public Works.
Cesena	35 quintals	Vehicles with laden weight above 3.5 tonnes must request a permit which depends upon the assessment of the Roads Sector and of the Road Furnishing Sector, using a modality indicated by them.
Rome	35 quintals	Vehicles can circulate in the LTZ without the ticket, and therefore for free, only from 20:00 to 7:00. The free access without time limits requires having the ticket.

CITY	RESTRICTIONS IN THE LTZ TO VEHICLES WEIGHING MORE THAN:	TYPE OF RESTRICTIONS
Florence	35 quintals	They can circulate in the LTZ until 8:30 (other vehicles until 10:00)
Terni	35 quintals	A permit is necessary to enter the LTZ
Udine	35 quintals	Couriers with vehicles over 35 quintals can be authorized only if they demonstrate special needs.
Lucca	35 quintals	For vehicles with laden weight over 35 q but lower than 100 quintals the applicant must fill in an appropriate form set up by the Permits Office and by the Urban Police. The applicant must undertake responsibility for possible damages caused to persons and/or things and the permit will be provided upon verification of the itinerary, and authorization of the Operative Unit for Roads. For vehicles whose full laden weight is over 100 quintals per axis, access and transit could be granted based on estimated technical opinion to be required at the Roads Office subject to undertaking a suitable insurance for civil responsibility or other equivalent guarantee related to the type of haulage to do and the itinerary.
Siena	60 quintals	For vehicles exceeding those limits temporary permits can be issued upon verification by the Operative Unit for Roads that the roads can actually carry those weights.

The majority of the cities apply restrictions to the accesses to the Limited Traffic Zones for vehicles over 35 quintals. However, restrictions are also in place for vehicles with different loading capacity.

Restrictions on vehicle emissions

Traffic represents one of the chief causes of atmospheric pollution and, in particular

in the zones where a lot of activities are based such as historic centres, the effects are evident.

Many Italian cities have adopted measures to limit the access either to the whole territory or in some zones only, to vehicles that do not abide by limits established by the rules on emissions.

The Regione Emilia-Romagna and

Provinces have signed a memorandum of understanding, on emissions control for motor vehicles, introducing an eco-pass named "Bollino Blu".

All motor vehicles owned by persons, companies or agencies having residence or with offices in the Regione Emilia-Romagna and registered from at least one year must attest, from 01/01/2003, the compliance of the technical rules defined by the current legislation (art. 2 DM 5/02/1996 and DM 28/02/1994) by exhibiting the "Bollino Blu", which is valid across all the national territory, and the possession of the emissions control certificate.

The "Bollino Blu" and the documentation attesting the compliance with the emissions limits has a validity of 12 months for all the vehicles registered after January 1st 1988 whilst, for vehicles registered before, the documentation in the matter has a validity of six months. "Bollino Blu" is in force in all Italian regions, but Trentino Alto Adige.

Inside the **Bologna** LTZ an area was identified (so-called "T", constituted by the Ugo Bassi and Rizzoli Streets together with the stretch of Indipendenza Street situated between Falegnami Street and Rizzoli Street) in which the motorized traffic is even more restricted than in the LTZ, being the hourly bands shorter and reserved only to a specific

[FIGURE 17] TRAFFIC SIGN PLACED IN CORRESPONDANCE TO THE ACCESS OF THE "T" ZONE IN BOLOGNA



subset of those authorized to the LTZ. The restrictions in the "T", enforced from 0:00 to 24:00, ban therefore the majority of the vehicles, from crossing in the east-west and south-north directions using the more central part of the city (Maggiore Square). Telematics access control is in force in the "T".

Alterations to the hourly bands of access have happened over time in this particular zone for freight vehicles wanting to complete loading/unloading operations: from simple widening (P. G. N. 183421/2001) up to an hourly differentiation on the basis of the fuelling system of the vehicle (PG. N. 12672/2004); at present the most "rewarded" vehicles are those polluting less.

Today in the "T" the access schedule for freight vehicles are the following:

- 6:00-7:30 and 14:30-16:30 for vehicles that do not abide by the CE and EEC directives
- 6:00-10:30 and 14:00-17:00 for vehicles abiding by CE and EEC directives
- 6:00-12:30 and 14:00-17:00 for methane propelled vehicles.

(Figure 17)

7.4. Restrictions to increase transport efficiency

Restrictions relating to capacity utilization of vehicles.

The "Associazione Amici della Terra"

(Association Friends of the Earth) associates 50% of the road traffic to the goods transport.

In the Regione Emilia-Romagna, at present, the average load percentage of the vehicles that carry goods does not exceed 30% with similar values result in the other Italian regions.

We therefore witness a large amount of vehicles travelling with little load and adding to an existing congestion and pollution problem which is not justified by the quantity of goods carried.

One of the causes of this phenomenon is surely the atomization of motor transport companies: 75.6% of the motor transport companies in Emilia-Romagna has only one employee and 95% has up to 5 employees to include the owners (source Emilia-Romagna regional transport plan - PRIT '98).

The situation is not going to improve without intervention in particular within the urban environment where the e-commerce, the just in time and the progressive reduction of private warehouses will inevitably lead to an increase in the circulation of commercial vehicles , with less and less cargo, in the streets of the historical centres.

A possible intervention could be banning vehicles that do not guarantee a predefined capacity utilization from entering historic centres. This measure could contribute to a more rational system of goods

delivery in urban centres.

Goods heading towards the zones under the ban could be unloaded by the various operators into an urban distribution centre and subsequently aggregated in vehicles that enter fully laden in the urban centre.

For the restriction measure on the capacity utilization of vehicles to be effective efficient controls must be carried out by the municipal police.

On the other hand, the objective of an increase in vehicle capacity utilization can be achieved with incentives rather than enforcement measures.

Incentive capable of increasing the filling up of the vehicles could include the introduction of a "quality" brand associated to those carriers showing that they are reaching minimum levels of load to capacity ratio and the possibility for those with the brand to enter the LTZ at wider hourly bands, to access favourable loading/unloading areas, to use preferential routes forbidden to those who do not have the brand, or to stop for free in the chargeable areas.

8. PRICING MEASURES

8.1. Pricing on infrastructure

This type of measures includes the **road pricing** (payment for the access in particular zones) and the **parking pricing** (or stopping plan or stopping tariff).

The introduction of pricing measures on structures has the objectives of:

- to charge vehicle users at least for part of the external costs, generally high, linked to the use of urban roads (congestion costs, pollution and use of limited public space);
- to reduce the use of private cars;
- to promote a rationalization of the traffic of commercial vehicles in urban areas;
- to find substantial additional resources to make more frequent, widespread, of better quality and comfort and at better fees the local public transport.

It is crucial, for the acceptance of the act by the users that the administration explicitly declares what is the use of the revenue derived from the introduced tariff. Possibilities include the utilization of the funds to improve the public transport and/or freight transport (creation of loading/unloading platforms, etc.).

The introduction of pricing measures should be accompanied by enforcement measures: the user must feel as advan-

tageous the payment of the tariff compared to the chance of getting fined.

Road pricing

From the standpoint of the definitions of road pricing already used in the European Project PRIMA³, two typologies of road pricing are here proposed:

Single road pricing

The payment happened when entering or exiting a single road and it is usually related to funding new road infrastructure.

The success of this form of road pricing is linked to the road being one with circulation flows (typical example are motorways). If in fact the user has the choice among alternative roads, with a comparable level of service and whose transit is not paid for, the risk is that the traffic pour onto those causing congestion and pollution.

This typology is not relevant for urban logistics, but makes sense if applied to infrastructure based on long distances being travelled or to extraurban context anyway.

Area pricing

This type of road pricing has not the inconvenience of possible rerouting onto alternative routes: those who enter the area are subject to a payment that can happen at the entrance or exit.

[3] PRIMA: PRICing Measures Acceptance.

In order to prevent price distortions among the buildings inside or outside the area subject to the payment, the perimeter should be identified with reference to strong elements independently of the regulated intervention (for example the walls of the medieval part of the city).

A variant of the area pricing is the *Complex area pricing*: in this case the access tariff varies based on distance, day and time in which the access takes place.

This type of road pricing can only be organized with electronic instruments for access detection and calculation of variable fees.

Road pricing could be particularly effective in influencing choices that happen in the freight transport because, as opposed to those relating to the use of cars by private citizens, transportation that happens for commercial reasons is mainly based on economical grounds.

Through differing fees, which depend on time, distance, weight, dimensions of the vehicles and load factor, individual transport strategies can be influenced.

It must also be pointed out that it is the freight transport to mostly receive the "beneficial" effects of the road pricing: the value of the time in business trips is

generally higher than in private trips. As a result the introduction of a generic tariff for all users reduces mainly the private vehicle trips, thus decreasing the congestion and increasing the efficiency of the commercial trips (reduction of travel times, improvement of service reliability and reduction of vehicles' operating costs).

As opposed to what happens in London where the administration imposes a payment to whoever wants to enter the centre with a motorized vehicle (only some categories are exempted or subject to discounts), in the Italian cities analyzed road pricing is only used to enter the Limited Traffic Zone. Access permits are issued to users that have specific requirements (residence, place of activity, type of activity, etc.).

As far as access fees are concerned they are usually annual fees to be paid for in connection with the collection or renewal of the traffic permit for the LTZ. Temporary authorizations are usually treated as daily fees.

Among the cities analyzed those that have adopted this measure are Parma, Reggio-Emilia, Ferrara, Cesena, Florence and Rome.

In the following are reported the elements of the measure concerning freight transport.

Reggio Emilia

Freight transport vehicles stops happening outside areas assigned to loading and unloading operations and outside days and times established for these operations (see pag. 105), require the payment of the following tariffs that allow access and stop in the LTZ:

Daily at specific times	Daily	Weekly	Monthly	Annually
1.03 Euro per hour	5.16 Euro	20.66 Euro	51.65 Euro	309.87 Euro

Parma

Freight vehicles should obtain a permit to circulate in the Limited Traffic Zone, which allows for both transit and stopping. The three type are:

hourly title	daily title	monthly title
variable tariff depending on the zone	5€	30€

Ferrara

In the autumn of 2002 the Ferrara Municipality adopted a new access and traffic regulation for the vehicles in the Limited Traffic Zone and in the Pedestrian Zones.

The greater novelty consists in the request for payment of a tariff to acquire the right to enter the LTZ, according to diversified procedures based on different types of users.

Operative stoken (those issued to shopkeepers, craftsmen, haulers who carry out delivery and/or collection of goods, servicemen and plants installers and agents of commerce) are **paid for** (table 16).

For some permission an **80% reduction** of the tariff is expected if the **vehicle used is at low environmental impact** that is **electric** traction, **methane, LPG** or also **hybrid** (vehicles with electric engines and a thermal engine).

The tariff, which should account for the costs of congestion, pollution and the use of limited public space, justifies the fact that the access is not free even for vehicles with low environmental impact because the component relating to the utilization of public space has to be accounted for as well as the contribution of these vehicles to congestion.

Cesena

The freight vehicles that have necessity to enter the Limited Traffic Zone outside the time intervals 7:00-10:00 and 14:00-17:00 should be authorized and the annual ticket costs 155 Euro.

Also the access of vehicles for prompt intervention activities requires a payment (155 Euro per year) (only trucks weighing no more than 3.5 tonnes). Vehicles at low environmental impact do not need a permit to enter the LTZ and can therefore access it for free.

Rome

The road pricing area is the LTZ in which a system named IRIDE is active that covers the 23 corridors of the central part of the Limited Traffic Zone. The system, based on the Telepass technology (Società Autostrade), involves the employment of a unit on board of the authorized vehicles, in which a "smart card" is introduced, that contains all data relevant to the access permissions. In the case of a violation, ascertained through the communication between the on-board unit and the beacon at the passage, the system detects with a camera the license plate of the vehicle that committed the violation and in the absence of an authorization, the procedure of fining the transgressor is activated according to the law. Vehicles that are at least at Euro 1 rule can enter LTZ.

Florence

The area in which the road pricing is applied is the Limited Traffic Zone which is surrounded by a cordon of 15 telematic doors managed by an operating station located at the Società Autostrade. The system to control accesses is called "Telepass LTZ".

Vehicles in transit through one of the telematic doors are recognized as authorized if holding the motorway Telepass with added qualification to also enter the LTZ.

Non-authorized vehicles or those lacking equipment on board and therefore not identifiable, are "photographed" by a video camera and the registration plate is transmitted to the control centre at the Municipal Police which is in charge of registration plate recognition and of application of possible sanctions.

The tariff for freight vehicles of companies that are located outside the LTZ is subdivided between the purchase of the telepass (48 Euro), if the user is not already in possession, and a contribution for the management and the maintenance of the service equal to 65 Euro per year. The telepass for these vehicles is qualified to enter the LTZ until 10:00.

The vehicles of companies carrying goods on behalf of third parties or that are situated within the LTZ, should pay in addition to the costs seen above, also the cost for the purchase of the ticket (25 Euro), but are qualified to enter the LTZ without time restrictions.

Electric vehicles are excluded from payment.

TABLE 16] COMPARISON BETWEEN ANNUAL FEES APPLIED TO GOODS DISTRIBUTION VEHICLES FOR ENTERING THE LTZ:

City	Own Account		On behalf on third parties	
	Petrol or diesel vehicles	Environmental friendly vehicles (electric, LPG and methane propelled)	Petrol or diesel vehicles	Environmental friendly vehicles (electric, LPG and methane propelled)
Reggio Emilia	309.87 €/year is standing does not take place either in the loading/unloading areas or in days/times established for these operations	Electric vehicles do not have to pay	309.87 €/year is standing does not take place either in the loading/unloading areas or in days/times established for these operations	Electric vehicles do not have to pay
Parma	30 €/month	Electric vehicles do not have to pay	30 €/month	Electric vehicles do not have to pay
Ferrara	100 €/year Access is allowed for 2 hours per day	20 €/year Access is allowed for 2 hours per day	50 €/year Access is allowed for 7 hours per day	10 €/year Access is allowed for 11 hours per day
Cesena	155 €/year access is free if in time slots 7:00-10:00 and between 14:00 and 17:00	A permit is not required and as such the entrance is free	155 €/year access is free in time slots 7:00-10:00 and between 14:00 and 17:00	A permit is not required and as such the entrance is free
Rome	28.41 €/year access is free if in time slots 20:00 and 10:00 and between 14:00 and 16:00 for class Euro I vehicles and newer	A permit is not required and as such the entrance is free	28.41 €/year without any time limit	A permit is not required and as such the entrance is free
Florence	90 €/year activities based in the LTZ without time limits; 65 €/year for activities based outside the LTZ, with possibility of access for 2.5 hours per day	Electric vehicles do not have to pay	90 €/year without any time limit	Electric vehicles do not have to pay

Administrative fees are not included in the fees reported in the table.

As shown in table 16, in general cities have set up tiers for access fees to "reward" the utilization of eco-compatible vehicles.

Only Ferrara has fees differentiated also on the basis of transport regime (own account or on behalf of third parties), and in fact has halved the fee for vehicles carrying goods transport on behalf of third parties, in addition to extending the period of time in which the vehicle is authorized to enter: 7 hours against 2 hours for those on own account.

The reason for this is twofold:

1. the freight transport on behalf of third parties, being an organized transport and servicing several operators, contributes to reduce the number of circulating vehicles;
2. normally the vehicles used on behalf of third parties are undergoing renewal and regular maintenance to a greater extent and therefore the polluting emissions are lower.

Parking pricing

The parking pricing is a tariff measure on infrastructure that presents good levels of social and political acceptance, low costs of implementation and needs technologies largely consolidated already. These features made it possible that the measure, started in Italy with great delay compared to other European countries, has rapidly spread in a large number of

cities starting from those of larger dimensions.

The purposes of parking pricing policies can be highlighted as follows:

- *they offer rationalization.* Through tariff enforcement a larger amount of rotation in the stopping is possible, to be destined to the operations of business activities in the areas under control (trade, services) and to residents' standing, with a reduced availability for commuters. This is important in particular in places where the possible acquisition of supplementary offer presents high difficulty and costs. The level of the fees has to be such to discourage the long time parking and as a result improve rotation. It should also increase as the distance to the places that have higher attraction decreases;
- *control of [car] demand.* The increase in costs perceived to complete a journey by car makes this transport mode less competitive than other transport methods. In economical terms, this means to adopt efficiency prices that eliminate the movements whose value for the driver results inferior to the cost that represents for the community, given by the sum of direct costs and extras (pollution, congestion, etc.). The very short trips that represent arguably a small share of urban traffic but yet having a not too small

impact, are as a result penalized. This also implies the introduction of changes either in destination, or in the modal choice with a larger share of trip makers to be served by public transport. It must be pointed out that the former is bound to also influence the economic activities and in the long term the choices of where to base one's businesses.

- *financial criteria.* Among objectives related to these measures the increase of the city income and the destination of these funds to the enhancement of the mobility in general must not be forgotten. In fact these can lead to the construction of parking lots, enhancement to public transport, etc.)

8.2. Pricing on vehicles

Increased taxation of the vehicles that use fuels at high environmental impact

This measure does not quite have the same emphasis of those analyzed in this chapter because it can only be undertaken at a national level.

Indirectly, because the tax is applied to the fuels rather than the vehicles, one example can be reported, the so called "carbon tax" (introduced in Italy with law No. 448/1998) that tries to quantify the external costs derived from CO₂ emissions.

9. PERMISSIVE MEASURES

9.1. Permissions on infrastructure

Access permission to LTZ/PA for goods vehicles

The measures that, after the set up of the LTZ and PA were classified in this manner relate to the permission to freight vehicles to enter the same areas at particular times.

The analysis of these measures was carried out in parallel to the creation/ widening of PA and/or LTZ .

Permission to freight vehicles to use preferential lanes

In some cases, in order to promote some types of freight vehicles in the access to high commercial density areas or to shorten the routes for goods distribution, the use of preferential lanes for public transport is allowed to vehicles carrying out the distribution.

Two examples of this type of measure are applied in Bologna and Genoa.

In **Bologna** the act P. G. N. 167229/2003 allows vehicles for the transportation of goods on behalf of third parties to use some reserved lanes which are inside the Limited Traffic Zone.

In **Genoa**, following the setting up of the Urban Distribution Centre the act N° 214 of 2003 has been issued that allows the vehicles coming from the goods dis-

tribution platforms to use the lanes reserved to public transport that are en route of the Limited Traffic Zone.

These vehicles are at low or zero environmental impact and so they are compatible with the urban area of the historic centre, which has high landscape and environmental quality.

Preferential lanes for freight vehicles

The measure identifies routes that commercial vehicles should preferentially use in order access the zones where goods should be distributed. Along these routes, that are reserved to freight vehicles and therefore free from congestion, a greater number of loading and unloading areas can be positioned.

Association of existing parking lots to freight vehicles

Some parking infrastructure can be allocated completely or in part to freight vehicles.

9.2. Permissions on operative times

Increase of loading/unloading times and slackening of access times for freight vehicles

In order to accomplish a certain solution, it could be useful to increase the times for loading/unloading of goods, both as temporal access window, and as available time for the "operation".

9.3. Permissions linked to the characteristics of the vehicles

Relaxation of restrictions on vehicle weight (dimensions)

The restrictive rules concerning the weight (dimensions) of the vehicles can be modified to allow the transit to vehicles within wider weight (dimension) bands.

In **Parma** act N. 96458/2003 Rep. 573 establishes exceptions to the transit prohibition to vehicles with laden weight over 3.5 tonnes.

"It is allowed the circulation to the vehicles whose laden weight is over 3.5 tonnes that are about to do load/unload operations, which must hold a "transport document" for goods (freight bill or order document) confirming the actual requirement to load/unload in banned areas. Such authorization is subordinated to the condition that the transit inside the banned zone follows, among all possible routes, the shortest one between the destination and the motorway bypass or the closest extraurban main road (and viceversa).

It is allowed the transit to vehicles over 3.5 tonnes registered to activities based in areas under the ban to allow the same to reach their places as long as their transit within banned area follows, among all possible routes, the shortest one between the destination and the motorway bypass

or the closest extraurban main road (and viceversa).

The transit of the other vehicles whose fully laden weight is over 3.5 tonnes is allowed in exemption to the currently enforced orders exceptionally and for motivated requirements, upon the issuing by competent Municipality Offices of a licence ".

10. INFORMATION TO THE USERS

Conventional road signs

Road signs could be used to pass information from the Public Administration to vehicles that are carrying out the transport service. The information could relate to access rights to the various zones of the city and the parking lots.

Variable message signs to alert on roadwork or heavy traffic

The measure requires the installation along major corridors of variable message panels that inform users of reduced

speed areas in advance, in order for them to possibly change route. The panels are the terminal component of a complex system that includes traffic monitoring at detection stations (magnetic loops or other sensorization system) which are positioned across the city, the evaluation of traffic variables and their forecast over time.

As a consequence of this, the control station will produce the most appropriate message for the situation, which will be shown on the panels (figure 18).

(FIGURE 18) VARIABLE MESSAGE SIGN PANEL



11. CREATION OR OR MANAGEMENT MEASURES

11.1. Creation and management of infrastructure

To improve loading/unloading areas along roads

The lack of loading/unloading areas along roads, where greater is the request for stops by private vehicles and at the same times highest the concentration of shops, could have negative effects on the real vehicular capacity of the road, due to the freight vehicles standing on the double line. It becomes important therefore to create suitable stopping lay-bye areas to be reserved for the loading/unloading of goods. **The location** of these areas on the territory should be studied starting from the knowledge of the spread of the points requiring goods supply and from the frequency of deliveries.

The dimension of the platforms should be evaluated in relation to the typology of the vehicles more likely to use them. Without a plan it is risky to answer the specific request of the person requiring a dedicated area for loading/unloading operations near their activities, thus leading to situations difficult to handle and not rational.

The normative instruments imply that the stopping area can be reserved to the vehicles that carry out loading and unloading only in some **hourly bands** and to be destined to other vehicle categories in the remaining bands. This possibility requires a

careful evaluation of horizontal road signs that should not transmit to users contrasting messages.

In **Rome** some stopping platforms near a market were reserved to three typologies of users in the arc of the day (figure 19): from 0:00 to 8:00 stopping is reserved to the vehicles that carry out loading/unloading operations, from 8:00 to 14:00 stopping is paid for by all, while from 14:00 to 19:00 it is paid for by all except residents of the Esquilino district.

As far as the horizontal road signs are concerned the Administration of the city chose to only use the yellow strip for loading and unloading.

(FIGURE 19) ROME: ROAD SIGN FOR STOPPING



Loading/unloading areas can be organized by a computer system that manages the bookings based on arrivals and/or specific priorities of the commercial vehicles. The creation of this system requires an operating station to manage the bookings on the arrival of the vehicles (through the mobile phone, with sms only too). It is also necessary to install stop pervention systems for vehicles not allowed, for example rising bollards, managed in remote by the operating station, that lower themselves only at the arrival of the vehicle that has booked the platform.

The telebooking system reduces the time required for searching the area in which to stop for loading/unloading operations and decreases double line stopping.

Park and ride

Park and ride ("Parcheggias e gira" in Italian) is the measure to organize a parking zone for private vehicles, in the proximity of the historic centre, from where public transport vehicles and other sustainable means of travel depart towards attractive zones.

The success of the measure is to be researched among a series of factors such as:

- the distance between the parking area and the stop of the public transport system (about 100 meters);
- the protection of the path between par-

king and public transport stop from atmospheric agents;

- the high frequency of the public transport service;
- the good illumination of the zone used for parking and setting up of surveillance systems in order for people to feel safe.

The measure, that obviously has a direct impact on private mobility, has also indirect positive implications on freight transport. In fact the decrease in congestion created by private vehicles searching for a parking space in the historic centre and the larger presence of free parking places contribute to faster and less invasive (because not carried out while on the second lane) the operations of goods supply.

Creation of new parking lots for goods vehicles

The creation of parking zones where trucks can park during the night to wait for the shops to open, in addition to guarantee rest to the drivers, it allows to have an available area where if necessary goods can be loaded on vehicles of reduced dimensions, which will enter the historic centre area. These parking zones, equipped with hygienic services, can be made inside urban distribution platforms and constitute a supplementary service that motivates their utilization.

Organization of synchronized traffic lights

Synchronized traffic lights are program-

med in such a manner that their changes into green and red along an arterial road makes it possible for a car travelling at a constant speed to proceed without interruptions (so called "green wave").

If the arterial road in which traffic signals are synchronized is a road used by freight vehicles, this measure contributes, obviously, to decrease the times of the commercial distribution.

11.2. Urban logistic platforms

Creation of distribution platforms

The distribution platforms (also called Urban Distribution Centres) have the main function to receive goods from forwarders or from the suppliers and to organize and carry out the deliveries to the final customers of the distribution chain located in the urban area.

With the appropriate software loads and routing are optimized in order to reduce the total distance travelled and the total number of distribution stops.

The final delivery of the goods, from platform to urban area, the so called "last mile", is carried out with vehicles at low or no environmental impact and with optimal dimensions as far as the load level and the characteristics of the area served is concerned.

The easiness with that the platform can be reached by carriers is a fundamental requirement to guarantee in the time its

utilization. The platform should be located in strategic position for goods on arrival, either for those in entry in the historic centre, therefore should have flowing connections with the highways, the bypasses routes, the greater flow roads, the airports and harbours knots, as well as with the railroad nets presents on the territory. The possibility of success of the intervention are connected also to the presence of supplementary services addressed to the different operators (in own account conveyors and on behalf of third parties coming from long and short distances and trade operators) and that give to the platform a pole of attraction of the distributive logistics of the urban market. The platform is able, in this sense, to act also from stocking place and goods warehousing to face the physical lack of physical places where to preserve the shops stocks of the shops situated inside the historic centres.

To these benefits correspond however investment and management high costs that an infrastructure of this type requires. Above all is to consider the inevitable cost due to the further load breaking in the distributive chain and the consequent necessity to identify the subject or the subjects that will have to take over.

At **Genoa** a UDC born from the project M.E.R.Ci exists and is operative (for more

details see the sheet relative to Genoa in the part I).

Also in **Ferrara** a private UDC (named Ecoporto) is working, mainly for the fresh goods management; the City Administration is intentioned to verify the feasibility of a second UDC, open to all operators, that would take care of the distribution of non-fresh goods .

Participation in the platform management (for example public-private partnership)

The management of the urban distribution platform can be entrusted to a public-private company. Above all in the beginning phase, in which are necessary high financings and a careful organization and promotion of the structure, the presence of the Public Administration is fundamental. The creation of a centre claims funds that can come from the public, either from the private as partnership. The public sector can supply, furthermore, those supplementary services that give to the platform a pole of attraction of the distributive logistics of the urban market.

At **Vicenza**, a limited responsibility company was created named "Vicenza Logistic City Center S.r.l." whose objective is the organization and management of distributive activities, the formulation of studies

and plans, the supply of informative and formative services, basically the innovation and identification of the goods logistics system within the urban traffic situation.

The company is owned by up to 49% by privates with the remaining stake from public participation. The company will manage the urban platform that the city intends to set up.

According to the statute the company will develop the following activities:

- "1. the presentation of logistics services and business organization in its productive shape, of storing and distributing, therein included operations of packing, of finishing and whatever other secondary operation required by the tasks;
2. the haulage of items on behalf of third parties, the movement from the retailer to the customer's residence of bulky goods or valuables, the industrial and special transport; the transport and the forwarding via land, air and water with every vehicle, ship and aircraft, intermodal and combined either in Italy or abroad, with ecological motor vehicles and with vehicles at low environmental impact;
3. The stocking, storing and the internal handling of all goods, to include chemical products, foodstuffs and generic perishable products, as well as their refrigeration;
4. The physical integrated distribution of

goods also with the "just in time" system, either through own ecological vehicles, or via chartered, small owners, couriers and in general haulers, as long as they possess ecological and at low environmental impact vehicles;

5. The forwarding and shipping activities in every possible shape it might take moving out and every other carrying, disposal and moving of goods, activity furnishings, waste and scrapping, courier delivery and rentals.

In order to pursue those purposes the Company, although acting in the exclusive capacity and with relating powers of private law rights, it is inspired to pursue the public interest by appealing to the aims set up at both national and regional community level".

12. INCENTIVES

All the initiatives aiming to stimulate virtuous behaviour which is consistent with the objectives of the Public Administration are included.

Incentives to local operators for an improved access

The incentive in this case could relate to the enhancement of the access conditions for locals that operate in the goods delivery context in the city.

Incentives for platform utilization

The measures attached to this heading are those that stimulate the utilization of the distribution platforms when the city has those.

The **Genoa** Municipality, in order to promote the utilization of the "Hub platform exchange at the historic Centre", has endorsed some exceptions to the transit and parking prohibition that is in force in an area of the historic centre called "Banchi", thus allowing the circulation to the vehicles arriving from the goods distribution centre. In this area the same vehicles can also stop outside the platforms reserved to loading/unloading operations if doing so they impede the circulation of the traffic. Another measure undertaken by Genoa to stimulate the utilization of the platform is the permission for certain vehicles to use dedicated lanes, as mentioned earlier.

Incentives for the adoption of vehicles at low environmental impact

Over 62% of the commercial vehicles circulating in the Regione Emilia-Romagna was registered before 1994. The average PM_{10} emission factors in urban environment for these vehicles are of 0.4987 g/vehs*km against 0.11 g/vehs*km of the vehicles Euro III registered after 2001. Moreover commercial vehicles still find in diesel propelled engines the best compromise between service and operation costs, but these are responsible for 53% of the emissions of particulate matters (PM_{10}) and of 50% of the emissions of nitrogen oxides (NO_x) generated by transport vehicles in urban environment. It is therefore clear that rejuvenating the freight fleet and promoting environmental friendly vehicles, contributes to decreasing the atmospheric pollution in urban centres. Environmental friendly vehicles are those propelled with LPG, methane, or propelled by electric traction. The incentives are of economical nature with the public authority helping out with the purchase of the vehicle at low environmental impact thus closing the gap between its cost and the cost of a traditional vehicle (the so called extra cost). Another form of incentive is when the Municipal administration adopts (and enforces) measures to limit the access of the most polluting vehicles to the

historic centres by "rewarding" environmental friendly vehicles with:

- discounts on fees, when road pricing is in force;
- allowing access at wider time windows;
- allowing access in some areas only to these vehicles.

The figure shows the average value of the available data, collected over 18 months (from April 2003 to October 2004) of the nitrogen dioxide levels in the atmosphere.

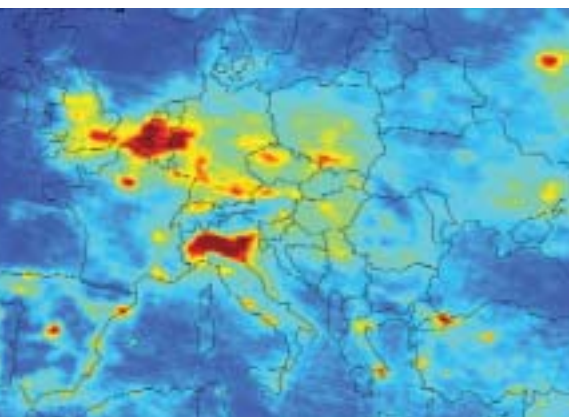
The source of the data is Envisat, the largest satellite in the world which is dedicated to monitoring the environmental and was launched by the European

Space Agency in February 2002. Nitrogen dioxide (NO_2) is produced in the emissions of the electric stations, of the heavy industries and of the road transport, in addition to the biomass combustion. Also natural events such as lightning in the atmosphere create nitrogen dioxide, as it happens in the microbiotic activity at the ground level. The data collection over long periods allows reducing the effect of the seasonal variations due both to biomass combustion, and to the variation of anthropic activities during the year. The gas, which is produced in large part by humankind, can cause damages to the lungs and respiratory problems in case of excessive exposure.

- allow booking of trips (via internet);
- book goods loading and unloading parking bays;
- do vehicle tracking (to know at each moment where each vehicle of the fleet is);
- check the platform access;
- be in the position to check the access to specific areas of the urban environment (for instance the LTZ).

These systems integrate between them informatics technologies, telecommunications and satellite radio localization.

(FIGURE 20) NO_2 LEVELS IN THE ATMOSPHERE
SOURCE: WEB SITE ESA (EUROPEAN SPACE AGENCY). WEB ADDRESS:
[HTTP://WWW.ESA.INT/EXPORT/ESACP/SEMSLHZ990E_ITALY_0.HTML](http://www.esa.int/EXPORT/ESACP/SEMSLHZ990E_ITALY_0.HTML)



Zones with greater NO_2 are highlighted in red.

Incentives for the use of ICT systems for communication fleets management

The use of ICT systems (Information and Communications Technologies) is essential to increase the efficiency of the freight transport. These systems are an integral part of a UDC. In fact the software in use at the platform should create a system that, in the most complete version, should be directed to:

- manage connections between suppliers and customers;
- inform conveyors on traffic disruptions, on roadwork in progress and on other special events (shows, fairs, etc.);
- optimize routing;
- optimize cargoes;

13. INCENTIVES FOR THE PURCHASE OF ECO-COMPATIBLE COMMERCIAL VEHICLES: LIMITS OF APPLICABILITY

The distribution of incentives for the purchase of eco-compatible commercial vehicles is a concrete action absolutely central to fight the environmental pollution provoked by goods haulage in the city.

In this respect numerous administrations, from the Ministry of the Environment, to some Regions and Municipalities, have started programs with different weights and effectiveness. Nevertheless, to be really incisive, this action should be promoted in favour of all actors of the offer, included conveyors on behalf of third parties.

The current EU normative framework excludes practically the possibility to distribute incentives to the transport operators doing the job on behalf of third parties, although, in the majority of the cases in urban context, that category of operators is in charge of the greatest share of demand for distribution.

The Community norm of the Country Support for the Protection of the Environment (2001/C 37/03) is the only

one that can be referred to avoid the constraints imposed to those who intend to distribute incentives of whatever nature to transport professional operators. This legislation determines the allowed help to a part of the only overhead (difference between the costs sustained by the company for the purchase of an eco-compatible vehicle as opposed to what it would have paid to purchase a traditional one). The acceptable costs have therefore to be calculated net of the:

- Advantages derivable from the possible increment in transport capacity that the operator will be able to enjoy thanks to the purchase of the new vehicle;
- Expense savings obtained in the first 5 years of the vehicle life.

So, the incentive legitimately usable according to the community legislation 2001/C 37/03 assigns to haulers on behalf of third parties an amount of 30% of the overhead in case of large companies, which can be incremented to 40% of the overhead in case of small and medium companies (table 17).

(TABLE 17) MAXIMUM HELP TO INVESTMENT AS A PERCENTAGE OF THE ACCEPTABLE COSTS (2001/C37/03).

TYPES OF HELP TO THE INVESTMENTS	LARGE COMPANIES	PMI
- Support to companies wishing to abide by new compulsory rules:	-	15%.
- Support for actions helping to obtain a compatibility with the environmental higher than what expected according to compulsory environmental norms:	30%	40%

(TABLE 18) AMOUNT CONTRIBUTED FOR DIFFERENT TYPOLOGIES OF VEHICLES WITH ELECTRIC TRACTION OR HYBRID
(SOURCE: DECREE OF MAY 24 2004 OF THE MINISTRY OF THE ENVIRONMENT AND LAND PROTECTION)

CATEGORIES	FUELLING/ PROPULSION	DEFINITIONS - NOTES	VEHICLE CODE	AMOUNT OF THE CONTRIBUTION (ON PRICE VAT (TAX) EXCLUDED)	MAXIMUM CONTRIBUTION (EURO)
Bicycle with assisted pedalling	Electric	with two wheels and a maximum speed up to 25 km/h	A	30%	309.87
Motor bicycle and motor vehicles	Electric	with two or three wheels and a maximum speed up to 45 km/h	B	30%	826.33
		with three wheels with a maximum speed over 45 km/h	C	30%	4131.66
		with four wheels:		35%	5134.57
		• Light four-wheel cycles (motorbikes)	D		
		• Motorvehicles	E		
Vehicles: cars	Electric	up to 5 seats including the driver	F	65%	15493.71
		From 5 to 9 seats including the driver	G	65%	36151.98
	Hybrid	with autonomous selectable electric propulsion and a range on electric power only of up to 15 km	H	60%	41316.55
		without electric autonomous operation	I	35%	7746.85
Other vehicles for the transport of items or mixed	Electric	up to 9 seats including the driver and weighing up to 3,5 tonnes	L	65%	20658.28
		more than 9 seats including the driver and weighing not more than 3,5 tonnes	M	65%	41316.55
	Hybrid	with autonomous selectable electric propulsion	N	60%	41316.55
		without autonomous selectable electric propulsion	O	35%	7746.85
Operating machines	Electric	Operating Machines	P	50%	41316.55

The amount of such incentive is in fact very limited, and so it is not actually an incentive to haulers to renew their own fleet.

For the businesses holding licence for own account haulage, instead, there does not exist such limitation, as they are not considered as transport companies and can therefore make use of incentives in the limits of the rule of the "de minimis", that fixes in Euro 100.000 in the arc of 3 years the threshold under which the support is not anymore tied to the obligation of previous notification to the European Commission (it is known that the transport sector is excluded from the application of the de minimis regime).

Despite being minimum the benefit that professional operators receive with this legislation when they choose to buy a non polluting new vehicle, the Administration wanting to take the matter forward will be facing further limitations. Legislation 2001/C 37/03 requires in fact also to show also that the support that is to be granted does not actually interfere with the rules and the principles of **free competition for the market**. It must in substance be demonstrated that the benefited operators cannot use the obtained support

to guarantee themselves some advantage against other operators acting in the regional and national market. Despite being obvious, this results quite difficult to verify and sustain with data in a notification procedure of a public measure to the European Commission.

Urban logistics, even though developed in a microcosm on which all negative environmental effects of sometimes terrible choices forced by the market fall, is the result of the actions of a plurality of actors, among whom those who are not tied to an individual urban process. It is obvious therefore that a collision has arisen from the urban distribution of goods, so far unsolved, between the necessity to undertake fundamental actions for the protection of the environment and the necessity, supported in a very abstract manner in this case, to abide by the public norms defined at Community level for the protection of free competition.

In the Italian case, a solution, even though partial, to the problem is provided by Decree May 24 2004 of the Ministry of the Environment and Land Protection, in accomplishment of the law no. 166/02, in the hypothesis that the urban distribution can be seen as a service of public usefulness.

Funds (table 18) can be granted to "regions, local authorities, their agencies, to joint-stock and limited companies with prevailing public local capital providing services of public benefit, to joint-stock companies providing services of public benefit at a national level, and other legal persons managing based on a specific service contract, with either legal or operative basis on the territory of cities with over 25 thousand inhabitants [...]". (Art 4. Recipient subjects, Decree 24 May 2004).

In the case of organizing the distribution through a UDC open to all operators that carry out deliveries/collections in the urban area, the manager, in case he is public or is a mixed company with public majority, can have access to the funds distributed with such Decree. The Decree issues norms relating for the provision of contributions to be used for the substitution of traditionally propelled vehicles with other types at minimum environmental impact.

The amount of the contributions covers a substantial part of the price. In the case of commercial vehicles, in fact, the contribution varies between 35 and 65% of the price VAT (tax) excluded for vehicles with electric traction and hybrid (table 18) and between 20 and

30% for those using either natural gas or LPG or bifuel (table 19). Moreover, the calculation of the maximum funds that can be granted for the purchase of every individual vehicle must also take into account the possibility that it could result from cumulating further sources to make the entire cost up.

[TABLE 19] ENTITY OF THE CONTRIBUTION FOR THE DIFFERENT TYPOLOGIES OF VEHICLES PROPELLED WITH NATURAL GAS OR LPG
[SOURCE: DECREE MAY 24TH 2004 OF THE MINISTRY OF THE ENVIRONMENT AND LAND PROTECTION]

CATEGORIES	FUELLING/ PROPULSION	DEFINITIONS - NOTES	VEHICLE CODE	AMOUNT OF THE CONTRIBUTION (ON PRICE VAT (TAX) EXCLUDED)	MAXIMUM CONTRIBUTION (EURO)
Vehicles	Methane or LPG	Vehicles propelled with natural gas or LPG only	R	30%	4131.66
	Bifuel	"Biofuell" vehicles except minibuses	Q	20%	2582.28

14. SOME POINTS OF REFLECTION

Together with the technical-logistic solutions, the so-called "regulations" constitute one of the fundamental elements for an integrated solution of city logistics. By integrated solution it is meant in fact the combination of different measures that deploy contemporary actions on more fronts with a "push and pull" logic (set of restriction, regulative and endorsing initiatives).

The creation of an urban platform, key in the greater part of the urban logistics projects, has to be therefore accompanied by the adoption of administrative measures that stimulate or enforce its utilization.

As seen in paragraph 5.2, the creation of a UDC leads inevitably to over costs which derive from the difference between the sum of the private and public costs minus the sum of the private and public benefits. It is because of this imbalance between costs and benefits that the individual operators of goods haulage are not favourable to modify their own behaviour and use the platform.

The local Administration, in order to persuade the operators to use the UDC, must then intervene and adopt administrative measures that bans and/or restriction, and apply fees to the goods distribution inside the city.

In parallel to the starting up of a UDC union orders should then be sent out to create a protected area at the core of the

city where it is forbidden the access to vehicles of large dimensions, to the vehicles that not eco-compatible or to vehicles that do not have an high loading factor. These limitations stimulate the utilization of the distributive centre by transport operators, who can find of little advantage the renewal of their own vehicular fleet or the modification of their own behaviour in terms of accessing the city, centre and carry out urban deliveries. Meanwhile the orders have "to reward" the utilization of the platform by guaranteeing hourly "windows", which have to be wider for eco-compatible vehicles with high loading factor to enter the city centre.

Road pricing policies to the Limited Traffic Zone contribute also to foster the utilization of the platform by increasing the cost of trips to those vehicles that are not "virtuous".

The analysis of the administrative acts has highlighted the lack of coherence and of homogeneity in the measures.

We have seen situations such as every city applying a different timetable for the access to Limited Traffic Zones for freight vehicles, using different restrictions either on weights or on dimensions of the vehicles or yet establishing different access restrictions to vehicles based on the emissions produced.

This lack of a homogeneous approach is

cause of confusion in particular for those transport operators who do goods haulage to outside the urban boundaries. It is therefore indispensable a **regional approach to the management** of urban mobility of goods through a harmonization of the regulative policies.

The proliferation of measures very different among them could lead in fact, to inefficiencies for the supply chain having to adapt their organization to the individual local rules as opposed to a global optimization, which is advisable in complex systems.

It is also necessary to be aware of the fact that decisions taken inside the (urban) supply chains do not necessarily operate locally.

On one hand it is true that every city presents intrinsic differences due to the different city context, and therefore the actual application of measures should be left to the local Administration, but on the other hand the Regions should have a leading role in providing objectives and convergence of efforts.

ANNEX II

EFFICIENCY OF POSSIBLE CITY LOGISTICS MEASURES: EXPERT JUDGEMENTS

Within the framework of its initiative towards a sustainable freight mobility, Regione Emilia-Romagna carried out an international survey among a number of transport experts to collect (ex ante) judgements on costs, benefits and feasibility associated with a defined set of possible city logistics measures.

A particular focus was added to the survey, to evaluate also the possible added value of a regional approach, as a fortifying factor for the effectiveness and the efficiency of a city logistics policy, with reference to mere local (un-coordinated) actions.

The general aim was to produce a sort of overall efficiency ranking of the identified measures. Main outcomes of such a survey are here summarized.

Twenty possible city logistics measures

Before starting the survey, a coherent set of possible city logistics measures has been defined, the main purpose being to have distinguished different components or alternatives of a general city logistics policy. Nonetheless, it can be argued (and it was, even by the contacted experts) that relations and cross effects between some of the proposed measures should be specifically considered.

Here follows the operational definitions of the twenty policy measures proposed.

1. *Access restrictions to city centres for vehicles having defined characteristics (weight, dimensions, emissions, age, different origin as a transit point).* Measure is meant as grouping the various access bans addressed to freight vehicles, depending on their specific characteristics like age, polluting emissions (e.g. with reference to the "EURO" emissions standard), or depending on the optimization of their cargo (i.e. whether the origin of the transit is in a consolidation centre or not).

2. *Access restrictions to city-centres on defined time-windows (measures regulating night-deliveries are included as well).*

Measure is meant as grouping all regulatory acts aimed at (freight) traffic control in given time-windows during the day (e.g. rush hours, to reduce congestion) and the night (e.g. night distribution of specific goods).

3. *Access regulation with road pricing (prices depending on type of vehicle and time-windows).*

Measure intended to discourage the circulation of polluting and large vehicles especially during the time-windows where traffic congestion is higher. Basically, the measure should be implemented through the installa-

tion of some access control systems (electronic gates) combined with on-board units or other reading/transponder technologies (OCR, barcodes, RFID, etc.).

4. *Incentives for operators using vehicles with higher load factor: discount in road pricing, flexible time-windows for loading/unloading and access to dedicated lanes and parking lots.*

The measure includes various possible actions to privilege operators assuring an high average load factor (e.g. more than 50% of cargo capacity); implementation could be based on certificates and specific (windscreen) labels. Privileges for certified/labelled operators could include discounts in road pricing, flexible time-windows for loading/unloading, access to dedicated lanes/roads and to parking areas. Checks on the effective cargo capacity usage should be planned in order to avoid abuses, and to assure the benefit only to operators who make actual efforts for the consolidation of goods.

5. *Regional incentives for the replacement of polluting freight vehicles with environment- friendly vehicle.*

Financial measure promoting and supporting the replacement of old polluting vehicles with new ones featur-

ring low- or zero-emissions engines. Grants should be determined under the boundaries set by the state aid and fair competition rules (e.g. limited co-financing of the price difference between polluting and non-polluting new vehicles).

6. *Reorganization and creation of regional distribution centres (serving 2 or 3 cities) for the rationalization of transport flows at regional level.*

Regional distribution platforms could be created in ideal locations to be determined through an analysis of freight flows at regional level. Such platforms will be used for consolidation of deliveries and for route optimization, being also connected to the railway system to exploit intermodality.

7. *Reorganization and setting up of new transit points for the consolidation of goods to be delivered in city centres.*

The reorganization or the setting up of one or more transit points for each of the biggest cities could be financed by a regional government. In general, a transit points is intended as a consolidation centre where certain goods to be delivered in the city centre should pass through. Consolidated and route-optimized deliveries will then be actuated using environment-

friendly vehicles. Supporting and enforcing measures should be integrated, to ensure the needed benefits to vehicles entering the city from the transit point (with the option to treat in the same way also other vehicles which are comparable in terms of loading factor and emission features, i.e. a selective policy based on requirements instead of a policy privileging exclusively the transit point fleet).

8. *Centralized acquisition of environment-friendly vehicles made by a regional purchasing centre on demand of the single municipalities.*

Low- or zero-emission vehicles are in general expensive; a centralized acquisition made by at the regional level should benefit from economies of scale. Vehicles this way acquired could be available for the transport of goods from transit points to city centres.

9. *Setting up of public-private partnership in order to manage freight transport within the city centres.*

After the realization and the implementation of transit points outside the city centres, opportunity of cooperation between public and private arise in order to better manage all logistics and transportation related to the urban deliveries.

10. *Implementation of tools like VMS (variable message system), dedicated traffic lights and monitoring stations for the control of traffic flows (includes combined use of streets) in order to regulate traffic flows (e.g. diverting freight traffic on high capacity streets with low impact on residents).*

Traffic monitoring systems together with VMSs (variable message systems) should be used both for passengers and for freight traffic management.

Through a continuous monitoring of traffic flows it will be possible to divert vehicles on roads where there is lower congestion or where the negative impacts on residents should be less relevant. A traffic monitoring system should be developed homogeneously in the different urban areas; infrastructural investments are required.

11. *Development of on-line booking systems for loading/unloading parking lots within city centres.*

Through the development of this electronic solution, transport operators should book loading lots via internet or sms (wireless), coherently with their trip schedule. Loading lots have to be provided with some equipment suitable for on site management of the booking (e.g. time list and IDs of the vehicles which booked the place).

Enforcement measures have to be applied in order to make this solution feasible. With booked loading lots drivers can save the time for parking search and avoid illegal and obstructing parking.

12. *Operators competing for contracts with the public Institutions within a region, where usage of vehicles is necessary, will be required to use low-emission vehicles.*

The measure aims to force operators to use low-emission freight vehicles if they want to be admitted to public contracts.

13. *Incentives for the development of home deliveries and e-commerce initiatives, in order to reduce traffic congestion caused by private "shopping" traffic.*

A high number of home deliveries allows a stronger reduction of private vehicles used for shopping activities (it is estimated that in some time-windows 20% of private traffic is caused by shopping activities). Fiscal incentives could be foreseen to shops, supermarkets and malls offering low cost, optimized and environment-friendly home deliveries.

14. *Financing and incentives for the setting up and the development of coope-*

ration among logistic operators (e.g. consortia or cooperatives for an integrated offer of intermodal services).

Low cargo capacity usage is often a consequence –among other reasons– of fragmentation in the market supply of the freight transport sector. With this respect, a first policy measure could be aimed to support the creation and maintenance of consortia of transport operators, through fiscal incentives able to overcome well-known difficulties in obtaining actual co-operation, information sharing, real logistics optimization and an overall improved efficiency of the freight distribution. Controls should be planned in order to check the actuality of cooperation in terms of optimized cargo capacity usage.

15. *Flexible time-windows for loading/unloading and access to dedicated lanes and parking lots for operators who are members of consortia where deliveries are coordinated.*

A second policy measure –connected with the previous one– is intended to provide a series of facilitations for operators who are members of a consortium or are working in an inter-business co-operative framework. Identification and control systems should be foreseen for the implementation.

16. *Regional supply of services to consortia in order to facilitate their development (legal advice, location support, ...).*

Consortia need support for their development and survival. In this context, a regional measure could address the offer of various professional support to consortia and their operators, including advice on fiscal, legal, organizational and location matters.

17. *Creation and management of a regional institute for city logistics able to collect data and information and organizing training courses for logistic and transport operators.*

The hypothesized measure would create a competence centre able to support municipalities and operators with a series of knowledge-based and learning services for improvement of city logistics.

18. *Incentives for the participation to training courses on transport and logistics for a more efficient freight transport organization and a lower impact on the environment (for operators of consortia).*

A more efficient freight transport in terms of usage of cargo capacity and optimization of routes may also be achieved through appropriate training courses. Courses on driving styles

could also be offered, stressing fuel consumption, emissions, noise, accidents. Participation to said courses could be reimbursement to consortia operators.

19. *Reorganization of the fuel stations network for low emissions vehicles.*

One of the main constraints to a stronger diffusion of low emission vehicles is an inadequate network of suitable service stations (LPG, methane, electricity) Fiscal benefits should be offered to operators investing in new fuel stations or in the adaptation of existing ones.

20. *Initiatives for the reorganization of the urban planning of cities.*

This measure can have great benefits in the long term. Local Public Authorities should realize initiatives in order to renew their approach to urban planning with reference to city logistics issues (e.g. concentration of specific commercial premises in some areas having dedicated routes and parking places and concentration of offices or residential areas in different city zones).

Costs, benefits, feasibility

Adopting a multi-criteria approach, through the survey experts were asked to express quantitative and qualitative evaluations on a list of criteria, for any of the proposed measures. An indication

was given to consider the possible application in a context of medium-size cities. Criteria to be judged were the articulation of the three main evaluation elements adopted by the survey: costs, benefits and feasibility of the possible policy measures.

From the perspective of the public administration, direct and indirect costs for measure implementation have been distinguished:

- direct costs: investment required: Includes costs of purchase and implementation of technologies and infrastructures and further management and maintenance costs (1 year).

- indirect costs:

- for freight operators- Includes costs connected to: extension of travelling times; extension of distances to cover; interruption of transport chain; replacement of polluting vehicles; road pricing; overall worsening of working conditions;

- for citizens (social costs)- Includes costs connected to: extension of travelling times; reduction of parking areas for private passenger vehicles; road pricing; possible increase of prices connected to higher logistic costs;

- for the economic system- Includes costs connected to: reduction of clients in city centres; closure of some shops; increase of prices for commercial distribution; etc. Please

indicate in the notes the specific impacts on the different categories involved.

Benefits have been broken down into the following:

- reduction of traffic congestion (circulating vehicles);
- reduction of pollution (PM10 particulate matter, NOx emissions);
- benefits (also indirect) on the regional logistic system (i.e. better organization of regional logistic freight traffic flows);
- benefits on the economic and social system (e.g. positive impacts on health and environment, reduction in diseases, energy savings).

Feasibility was considered through the following criteria:

- realization complexity:
 - technical constraints/difficulties referring to technology (degree of current development, availability and reliability of the identified solutions) and implementation (practical set up and start up of the solutions);
 - normative constraints, having reference to European, national, regional and local rules;
 - financial constraints/difficulties;
- approval:
 - degree of agreement, including risks of legal disputes and other opposition initiatives (e.g. strikes) promoted by the different stakeholders;
 - impact or cross-effects with other

policy measures already adopted;

- work in progress (whether the measure has been already adopted/experimented);
- usefulness of a regional approach (added value deriving from a co-ordinated, regional implementation in comparison with self-defined, uncoordinated local initiatives).

For any of the judgement criteria, experts was also asked to declare the degree of knowledge they feel to have, ranging from inability to express a judgement, to mere literature knowledge, to various levels of direct experience in the matter.

Overall evaluation of the city logistics measures

Firstly, overall scores associated with each measure have been calculated with respect to the judgements expressed by the single experts. This scores -somehow expressing the global efficiency of the measure as evaluated by the single experts- have been obtained by a weighted sum of costs, benefit and feasibility judgement, where the weight is represented by the respective degree of knowledge.

Then, a single global score for each policy measure has been determined as the average of the scores calculated for any expert (see operational details at the end of the annex).

Main outcomes of the survey are summarized in the following tables.

The average global efficiency obtained by all the measures amounts to a score of 51.29, where standard deviation is 5.24.

The average degree of knowledge, as expressed by all the experts over all the measures, is equals to 1.83, within a scale of 0 to 4. This finding should be referred mainly to some scarcity of results and data coming from direct or disseminated experiences of similar measures.

Under the requested prudence, main outcomes could be synthesized as expressing a significant appraisal (in term of expected efficiency) given by the panel to measures dealing with access restrictions (excluding road pricing) and incentives and support to transport operators for cooperation and training. Incentives aiming at improvements in load factors and supporting (optimized) home deliveries are rated as quite efficient as well.

- Last positions in the ranking could suggest that initiatives requiring huge investments and/or requiring strong organizational efforts are getting low appraisal, maybe due to uncertain or low levels of the expected benefits compared with the public efforts for implementation.

[TABLE 20] GLOBAL EFFICIENCY APPRAISAL OF THE PROPOSED CITY LOGISTICS MEASURES

CITY LOGISTICS POLICY MEASURES	GLOBAL EFFICIENCY SCORE Mk
1 Access restrictions to city centres for vehicles having defined characteristics (weight, dimensions, emissions age, different origin as a transit point)	56.84
2 Access restrictions to city-centres on defined time-windows (measures regulating night-deliveries are included as well)	60.24
3 Access regulation with road pricing (prices depending on type of vehicle and time-windows)	46.71
4 Incentives for operators using vehicles with higher load factor: discount in road pricing, flexible time-windows for loading/unloading and access to dedicated lanes and parking lots	56.74
5 Regional incentives for the replacement of polluting freight vehicles with environment-friendly vehicles	49.94
6 Reorganization and creation of regional distribution centres (serving 2 or 3 cities) for the rationalization of transport flows at regional level	47.20
7 Reorganization and setting up of new transit points for the consolidation of goods to be delivered in city centres	45.30
8 Centralized acquisition of environment-friendly vehicles made by a regional purchasing centre on demand of the single municipalities; vehicles will be available for the transport of goods from transit points to city centres	42.05
9 Setting up of public-private partnership in order to manage freight transport within the city centres.	51.49
10 Implementation of tools like VMS (variable message system), dedicated traffic lights and monitoring stations for the control of traffic flows (includes combined use of streets) in order to regulate traffic flows (divert freight traffic on high capacity streets with low impact on residents)	47.02
11 Development of on-line booking systems for loading/unloading parking lots within city centres	42.04
12 Operators competing for contracts with the public Institutions within the region, where the usage of vehicles is necessary, will be required to use low-emission vehicles	50.74
13 Incentives for the development of home deliveries and e-commerce initiatives, in order to reduce traffic congestion caused by private "shopping" traffic	56.28
14 Financing and incentives for the setting up and the development of cooperation among logistic operators (eg. consortia or cooperatives for an integrated offering of intermodal services)	57.40
15 Flexible time-windows for loading/unloading and access to dedicated lanes and parking lots for operators which are members of consortia where deliveries are coordinated	52.10
16 Regional supply of services to consortia in order to facilitate their development (legal advice, location support, ...)	54.38
17 Creation and management of a regional Institute for city logistics able to collect data and information and organize training courses for logistic and transport operators	55.52
18 Incentives for the participation to training courses on transport and logistics for a more efficient freight transport organization and a lower impact on the environment (for operators of consortia)	57.24
19 Reorganization of the fuel stations network for low emissions vehicles	48.37
20 Initiatives for the reorganization of the urban planning of cities	48.14

[TABLE 21] SORT OF THE MEASURE ACCORDING TO THE OBTAINED RANKING

RANKING	CITY LOGISTICS POLICY MEASURES	GLOBAL EFFICIENCY SCORE Mk	AVERAGE DEGREE OF KNOWLEDGE (Ek)
1	2 Access restrictions to city-centres on defined time-windows (measures regulating night-deliveries are included as well)	60.24	2.25
2	14 Financing and incentives for the setting up and the development of cooperation among logistic operators (eg. consortia or cooperatives for an integrated offering of intermodal services)	57.40	1.72
3	18 Incentives for the participation to training courses on transport and logistics for a more efficient freight transport organization and a lower impact on the environment (for operators of consortia)	57.24	1.56
4	1 Access restrictions to city centres for vehicles having defined characteristics (weight, dimensions, emissions age, different origin as a transit point)	56.84	2.21
5	4 Incentives for operators using vehicles with higher load factor: discount in road pricing, flexible time-windows for loading/unloading and access to dedicated lanes and parking lots	56.74	1.84
6	13 Incentives for the development of home deliveries and e-commerce initiatives, in order to reduce traffic congestion caused by private "shopping" traffic	56.28	1.72
7	17 Creation and management of a regional Institute for city logistics able to collect data and information and organize training courses for logistic and transport operators	55.52	1.69
8	16 Regional supply of services to consortia in order to facilitate their development (legal advice, location support, ...)	54.38	1.49
9	15 Flexible time-windows for loading/unloading and access to dedicated lanes and parking lots for operators which are members of consortia where deliveries are coordinated	52.10	1.57
10	9 Setting up of public-private partnership in order to manage freight transport within the city centres.	51.49	1.82
11	12 Operators competing for contracts with the public Institutions within the region, where the usage of vehicles is necessary, will be required to use low-emission vehicles	50,74	1.70
12	5 Regional incentives for the replacement of polluting freight vehicles with environment-friendly vehicles	49.94	2.16
13	19 Reorganization of the fuel stations network for low emissions vehicles	48.37	1.58
14	20 Initiatives for the reorganization of the urban planning of cities	48.14	1.59
15	6 Reorganization and creation of regional distribution centres (serving 2 or 3 cities) for the rationalization of transport flows at regional level	47.20	1.95

TO CONTINUE

RANKING	CITY LOGISTICS POLICY MEASURES	GLOBAL EFFICIENCY SCORE Mk	AVERAGE DEGREE OF KNOWLEDGE (Ek)
16	10 Implementation of tools like VMS (variable message system), dedicated traffic lights and monitoring stations for the control of traffic flows (includes combined use of streets) in order to regulate traffic flows (divert freight traffic on high capacity streets with low impact on residents)	47.02	2.07
17	3 Access regulation with road pricing (prices depending on type of vehicle and time-windows)	46.71	2.11
18	7 Reorganization and setting up of new transit points for the consolidation of goods to be delivered in city centres	45.30	2.12
19	8 Centralized acquisition of environment-friendly vehicles made by a regional purchasing centre on demand of the single municipalities; vehicles will be available for the transport of goods from transit points to city centres	42.05	1.75
20	11 Development of on-line booking systems for loading/uploading parking lots within city centres	42.04	1.68

(FIGURE 21) GLOBAL EFFICIENCY SCORES AND AVERAGE DEGREE OF KNOWLEDGE OF THE POLICY MEASURES

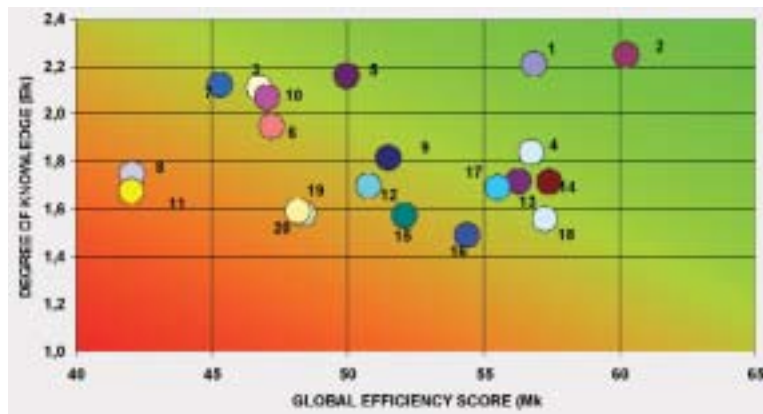


Figure 21 shows a diagram where any measure is positioned according to either the global efficiency score and the average degree of knowledge. The green area is the background for measures which seem to be efficient and well known in terms of connected costs/impacts; measures over the red area should be taken as likely unsuccessful, but also a stated lack of information or experience has to be considered.

The picture shows clearly that restrictive measures seem to be the more appreciated and known from the panel.

The panel of expert

The survey have been performed thanks to the kind contribution of the following experts:

Roland Beier (IPE – AT)
 Michael Browne (University of Westminster – UK)
 Agostino Cappelli (University IUAV – IT)
 Alessandro De Donno (SCUE – IT)
 Hans Hermann Enders (KLOK – DE)
 Alberto Frondaroli (CSST – IT)
 Giovanni Leonida (CONFETRA – IT)
 Elena Maggi (Politecnico di Milano – IT)
 Patrizia Malgieri (TRT Trasporti e Territorio – IT)
 Gojcic Matej (Municipality of Ljubljana– SI)
 Carlo Michelacci (Transport consultant – IT)
 Sigrid Oblak (Municipality of Vienna – AT)
 Giovanni Ruberti (CSST – IT)
 Martin Ruesch (RAPP – CH)
 Luigi Sardi (Transport consultant – IT)
 Jürgen Schrampf (ECONSULT – AT)
 Flavia Scisciò (CSST – IT)
 Rudolf Sebastnik (IPE – AT)
 Manos Shinakis (TREDIT – GR)
 YannisTyrinopoulos (Hellenic Institute of Transport – GR)
 Maria Pia Valentini (ENEA – IT)
 Dieter Wild (BESTUFF – DE)
 Jaakko Ylinampa (Municipalità of OULU – FI)

Operational definitions of synthesis indicators (as shown in the results tables)

indexes:

i= generic interviewee; range: i= 1 to n ; n= 22

j= generic evaluation criteria for any measure; range j =1 to m ; m= 15

k = generic city logistics measure; range k= 1 to q; q= 20

S_{ik} =weighted average score assigned to measure **k** by the interviewee **i**

$$S_{ik} = \frac{25 \times \sum_{j=1}^m a_{ijk} e_{ijk} w_j}{\sum_{j=1}^m e_{ijk} w_j}$$

where:

a_{ijk} = evaluation expressed by the interviewee **i** on the criteria **j** of measure **k** (a_{ijk} range = 0 to 4)

e_{ijk} = “degree of knowledge” stated by the interviewee **i** on criteria **j** with respect to measure **k** (e_{ijk} = 0,1,2,3,4)

w_j = weight assigned to evaluation criteria **j** by the survey editors

(25 = scaling factor)

note: S_{ik} has been calculated excluding the following criteria, which was finally considered not enough focussed and valuable:

- “benefits on the logistic system”
- “benefits on economic and social system”
- “indirect costs for economic systems”

E_{ik} = average degree of knowledge of the interviewee **i** on the measure **k**

$$E_{ik} = \left(\sum_{j=1}^m e_{ijk} \right) / 15$$

E_k = average degree of knowledge of all the interviewees on the measure **k**

$$E_{k*} = \left(\sum_{i=1}^n E_{ik} \right) / 22$$

E = average degree of all the interviewees all over measures

$$E = \left(\sum_{i=1}^n E_i \right) / 20$$

M_k = arithmetic mean of the average scores (S_{ik}) resulting for the measure **k** by all the 22 interviewees

$$M_k = \sum_{i=1}^n S_{ik} / 22$$

d_k = standard deviation of the scores (S_{ik}) resulting for the measure **k** by all the 22 interviewees

$$d_k = \sqrt{\frac{\sum_{i=1}^n (S_{ik} - M_k)^2}{22}}$$

D_k = deviation of the mean overall appreciation of measure k with respect to the mean overall appreciation of all the 20 measures

$$D_k = \left(M_k - \frac{\left(\sum_{i=1}^n M_i \right)}{20} \right)$$

D = standard deviation on the average overall appreciation of the 20 measures

$$D = \sqrt{\frac{\sum_{i=1}^n (D_i)^2}{20}}$$

THE EFFECTS
OF THE CITY PORTS
PROJECT
ON REGIONAL AND
URBAN POLICIES

15. THE EFFECTS OF THE CITY PORTS PROJECT ON REGIONAL AND URBAN POLICIES

A certain number of experiences on the urban distribution of goods have now been accumulated in some European countries (especially in Germany, France and England). These will provide useful information for the consolidation of analogous policies in countries such as Italy, Greece and Austria. Further experiment will follow also in countries recently added to the EU.

The City Ports project intends to expand this process both by setting up procedures as well as technical-administrative models, and by checking those models in a substantial number of cities.

The effects of this involvement are further expanded by the contemporary participation of the same Regione Emilia-Romagna into the Merope project (Interreg IIIB MEDOCC – the Regione Toscana is the leader), with other cities of the Mediterranean region interested in too. This dissemination activity is being fully developed.

One aspect stands out as particularly important: in addition to the activation of several cities in different European regions, the City Ports projects effectively use the regional dimension.

The Regione Emilia-Romagna has in fact seized on time the opportunity to lead a European project on a subject that has always appeared to be exclusively of competence of the Council.

Starting from the knowledge and of method acquired within the City Ports project, the Regione Emilia-Romagna, in addition to activate the two Emilia-Romagna cities (Parma and Ravenna) that partners in the project, has endorsed a new regional policy of urban logistics by promoting interventions in all middle-large size cities belonging to the region.

There are four main funding sources for the actions of urban logistics concretely activated by the Regione Emilia-Romagna as a result of the policy described above (table 22):

1. funds for the City Ports and Merope European projects, involving four cities of the region;
2. funds granted through regional deliberation (n.2504/1999 in accomplishment of law n.30/1998), allowing for an extension of the work derived from the European projects to the other cities of the region too;
3. funds for interventions to improve the environmental and transport efficiency of freight vehicles (measure 5 and related deliberations);
4. funds for the creation of infrastructures for the reorganization of the urban distribution of goods in cities (measure 5 and related deliverables).

These actions, in addition to providing direct knowledge and tangible results on the measures adopted, allow for the set-

ting up and perfect true local and international Networks of Excellences (NOEs), through which best practices and innovative solutions can be compared. In the accomplishment of the interventions the Regione Emilia-Romagna will

however continue to adopt, as done so far, a joint approach, in order to involve all the actors who are potentially competent/interested in transports and logistics. The regional intervention will in fact be

directed towards coordinating the initiatives of the individual local authorities, in the complete respect of the municipal autonomies, to try and concentrate the efforts rather than dispersing resources and knowledge acquired.

TABLE 22 REGIONAL PROGRAMME OF CITY LOGISTICS INTERVENTIONS DURING THE PERIOD 2003-2005 IN EMILIA-ROMAGNA (UPDATED OCTOBER 2004)

Regional Programme of interventions of City logistics for the three-year period 2003-2005 (Euro)

	PROJECT			Interventions to improve environmental and transport efficiency of goods vehicles	Realisation of interventions of urban logistics	Total
	City Ports	Merope	Total cost of project (funded with L 30/98)			
CESENA			147560.00	332500.00	1650000.00	2130060.00
FORLI'			included in the figure reported for the Cesena Municipality	332500.00	1500000.00	1832500.00
MODENA		150432.00		390000.00	550000.00	1090432.00
SASSUOLO				included in the figure reported for the Modena Municipality	200000.00	200000.00
RAVENNA	150400.00			480248.00	20000.00	830648.00
FAENZA			150000.00	166752.00	757000.00	1073752.00
RIMINI			85720.00	220000.00	1470000.00	1775720.00
PIACENZA		150432.00		490000.00	1900000.00	2540432.00
BOLOGNA			147000.00	1624214.29	1652000.00	3423214.29
IMOLA			145000.00	included in the figure reported for the Bologna Municipality	60000.00	745000.00
PARMA	150000.00			445000.00	1300000.00	1895000.00
FERRARA			147560.00		2700000.00	2847560.00
REGGIO EMILIA			148000.00	335000.00	3532500.00	4015500.00
TOTAL	300400.00	300864.00	970840.00	4816214.29	18011500.00	24399818.29

NOTE: For Sassuolo an intervention of monitoring, regulation and control of flows is set up.

16. PRESENTATION OF THE EXPERIENCES STARTED WITH THE CITY PORTS AND MEROPE PROJECTS

The annex shows synthetic sheets on:

- the city pilots of City Ports for which it is possible to gather enough information to describe the route taken to face urban logistics and to trace the main outcomes, as well as the future developments;
- the city pilots of the Merope project, that have partially used the approach elaborated in City Ports.

In particular the experiences of the following cities are presented:

- Brescia, Parma, Vicenza, Vienna e-Trans and Vienna City Courier Systems, already in a phase of accomplishment, which in a previous phase of know-how assessment, have followed different approaches in terms of analysis of demand and supply. Despite the universally acknowledged and used principles being followed, those cities did not strictly stick to the City Ports methodology but rather focused on the implementation of the solutions thus providing a reference point for the other cities;
- Graz, Kavala, Taranto and Udine, which are testing the methodology elaborated in City Ports;
- Modena and Piacenza, experiences developed during the Merope European project, yet similar to the pilots of City Ports, given that they have mainly adopted its methodology also because of a specific request at regional level.

In general the course undertaken by each of these cities is different and each of them has developed their **own features**, quite unique compared to the others.

Brescia has followed a phased approach starting from the analysis of the current problems, which was conducted also thanks to the collaboration of the stakeholder, followed by a careful study of requirements/deficiencies of a **pilot identified** in the South-West area of the historic centre. The deepening of the verified problems in the study area lead to a seeking solutions phase through the planning of **infrastructural interventions** and the study of a **new regulation policy for traffic and parking**.

In particular the proposed interventions are:

- **new plan for loading/unloading areas**, with modular project standard conceived for vehicles with lengths up to 6 meters, whose number and positions were defined in relation to the distance from the commercial activities, to the available spaces and to the demand, that is to the commercial number of vehicles circulating in the areas assuming delivery times of about 30 minutes;
- **enhancement of accessibility to commercial services**, that is facilitation of pedestrian routes from the loa-

- ding/unloading areas to the final point of delivery;
- definition of **specific routes for freight traffic**, as a function of the new position of loading/unloading areas (transit and service routings), considering also the possibility to close to freight traffic roads outside the foreseen routes;
- **redefinition of timetable for goods loading and unloading.**

Parma in the first instance foresaw to reorganization of the urban distribution of goods through existing platforms dedicated to specific types of goods, and intended to arrange a **new act to regulate the traffic and stops of goods** and to implement a **management software for the optimization of routes and the booking of areas for loading/unloading** by setting up "intelligent platforms" and a network of verification and control. In the most recent phase, also because of requests from local businesses, it is heading towards the creation of a unique UDC.

Vicenza has paid greater attention to the cooperation and aggregation of stakeholders, by shaping up a system configuration centred around a unique UDC, and has carried out a long inception phase leading to the creation of the management company of the UDC (**Vicenza Logistics**).

The company is constituted for the majority (55%) by public capital and for 45% by equal contributions of 5 associations of local categories (Industrial Associations- API, Trade Tourism and Services Association- ASCOM, Handycraft and Small and Medium Enterprises National Confederation- CNA, Craftsmen Association).

Furthermore work is being carried out to set up a **new regulative policy** (that facilitates the urban distribution through the UDC) and to deploy an **informatics architecture that supports the handling of goods haulage**.

In **Vienna** two pilot studies are ongoing:

1. **e-Trans** which is a project working on the identification of a logistics solution to the current problem of home delivery of products bought online. The proposed solution aims to resolve the problem of conditioning the delivery of items to the customer's presence at home at the time established by the couriers and foresees the setting up of boxes connected to a computer system for the management of the transport service, delivery and collection of purchases made through a specific web portal.
2. **City Courier Systems** which is a project working on the identification of a logistics solution for the current state

of goods distribution's inside the city of Vienna. The planned system concentrates the flow of goods on a main route along which some depots is positioned, which are the barycentre to the final distribution points. The users of the service will collect the goods at the closest depot.

The possibility of integrating the two projects is under consideration so as to multiply the positives of the logistic solutions through the synergy of their coordination.

The **Graz** pilot aims at structuring a collection system of packing and material to recycle through a system managing a fleet of hybrid and electric vehicles, routes and loads of which are optimized.

At **Kavala** cognitive surveys were conducted in order to build the know-how on the emerging requirements, as from the City Ports methodology and at present a discussion is ongoing about the strategy to follow for the most appropriate solution for urban logistics.

At **Udine** and **Taranto** cognitive surveys are carried out for the background analysis, in agreement with the guidelines on methodology set up by the City Ports project, leading to the execution of three types of ad hoc analyses (on flow generators, on local transport companies/branches and carriers).

Udine foresees a rationalization of the urban distribution of goods through the use of one UDC, also exploiting the existence of a platform for the "fresh" type of goods that distributes both in urban area, and in the province and outside.

Taranto foresees a rationalization of the problems of urban haulage of goods, which have a strong component due to the activity of the harbour, through the creation of platforms and a technological system for the regulation and control of flows (developed by the Polytechnic of Taranto).

Modena and Piacenza have conducted the analysis for the comprehension of the state of the art in goods distribution through studies funded by the European project Merope. From those a number of features were identified, which are reported in the enclosed sheets. From a first qualitative comparison it seems to emerge that the two cities show different behaviour regarding the origins of the goods, the type of deliveries, the average dimensions of the orders and the cost of transport, whilst homogeneity has been verified in terms of frequency and timetable of deliveries and for the scarce number of warehouses near the sales points.

In particular:

- at Modena large component of goods are entering from outside the province, whilst for Piacenza the handling of

- goods happens within a short radius;
- there is not a day in which a greater number of deliveries of goods take place and deliveries happen essentially in the morning hours for both cities;
- Modena is characterized by a strong component of couriers for goods deliveries/collections (in particular in the historic centre and suburbs), whilst in Piacenza there is a strong component of businesses self-supplying;
- concerning the transport cost for Modena the sender is charged for about 55% and the recipient 45%, whereas for Piacenza the sender pays for it two times out of three;
- regarding the average dimensions of the orders, a prevalence of card boards and packing preparations (not palletized) is registered in Modena, whilst in Piacenza a prevalence of cases/boxes;
- a low number of warehouses are situated near the sales points, in particular in the historic centres of both cities.

17. THE EFFECTS OF THE PROJECT ON OTHER CITIES: THE CASE OF EMILIA ROMAGNA

As detailed in table 23, the Emilia-Romagna cities adhering to the Regional Agreements, to also include those pilot sites in the European projects Merope and City Ports, have reached different degree of advancement: some have started off the rationalization of goods project a long time ago, whilst others have just started this approach and thus could benefit from the findings and experiences of the others.

All the cities dealt with in here have in a way or another adopted the experience of the City Ports EU project.

The logistic strategies being developed in the various cities are the result of a similar methodological approach:

1. **know-how framework**, where the definition of demand management policies for the urban distribution of goods requires the creation of a very detailed analytical knowledge of the characteristics of the urban haulage of goods. The methodological approach followed has made use of the outputs of the City Ports project both in terms of analysis required to comprehend the urban mobility of goods with quantification of its components, and for the identification and implementation of the city logistic solution compatible with the situation of the city;

2. **system project**, defined by Deliverable 1432/03 that, in agreement with the City Ports methodology and as a result of the research carried out based on the experiences of many other cities, includes a set of measures and interventions requiring the utmost care for the local situation;

3. **measures on infrastructure and/or interventions of technological innovation**, to include a number of feasible interventions because financed based on objectives, strategies and priorities, stemmed from in-deep technical-economic analysis and that constitute possible solutions for the various scenarios. In particular the interventions have been classified within the Regional Agreements cited above in:

- **long-term** interventions, finalized to an improvement of urban logistics through the creation of infrastructure such as urban hubs;
- **short-term** interventions leading to an increase in the environmental and transport efficiency of the fleet;
 - improvement of the environmental efficiency of the fleet used for the distribution of goods with actions favouring both operators working on their own and professional ones;
 - installation of electric charging stations for auto traction;

- interventions on traffic signs and street furniture for those areas assigned (or in some way related) to the commercial distribution;
- introduction of information systems aiming at a reduction in the travel times for delivery of goods and therefore at a more energy efficient fleet.

The presentation of the ongoing expe-

riences should contribute to the creation, promotion, dissemination of know-how that can foster the success of new initiatives. It is also planned the creation of a permanent observatory of the results obtained in various cities allowing, thanks to a unified elaboration of data produced at each site, to reflect on the experiences in order to better direct them in the future. It will also increase the chance of success of new

initiatives. It must also be addressed the possibility of exploring the likely synergetic effects with an approach supporting the harmonization and sharing of the various actions. This can be very important in order to maximize the chance of success in a field such as city logistics where there does not yet exist, if it will ever, a standard, an off-the-shelf methodology to guide in any possible framework.

[TABLE 23]

TYPE OF PROJECT		STATE OF PROGRESS OF THE PROJECT						FUNDS				YEAR OF CREATION	
		Assignment of the work		Know-how framework		System project	Infrastruc project	REGIONE EMILIA ROMAGNA	EUROPEAN PROJECT	MUNICIPALITY	DISTRICT		
		analysis of facts	being assigned	already assigned	surveys								
PC	UDC regulation bays loading/unloading telematics infrastructure								MEROPE			2005	PC
PR	Sw programming loads and routes System to check bays loading/unloading								CITY PORTS			2004/05	PR
RE	UDC							70%			30%	2005	RE
MO	UDC								MEROPE			2004/5	MO
BO	UDC Bays regulation loading/unloading							70%		15%	15%	2005	BO
IMO	UDC Bays regulation loading/unloading							70%		30%		2005	IMO
FE	UDC Bays regulation loading/unloading							70%		30%		2005	FE
RA	UDC								CITY PORTS			2004/05	RA
FA	UDC							70%		30%		2004/05	FA
FO	UDC							70%		30%		2005	FO
CES	UDC							70%		30%		2005	CES
RN	UDC Bays regulation loading/unloading							70%			30%	2005	RN

ANNEX III

Brescia

Project: City Logistics Project for the historic centre of Brescia

Operative Phases of the Work plan:

PHASE 1: Analysis

(not included in City Ports)
 Benchmarking and case studies (Basle, Bremen, Utrecht, Zurich, Siena, Freiburg and Berlin)
 Creation of a permanent concertation table
 Analysis of the current situation in terms of mobility of goods by their type and current issues (quantitative and qualitative information on current situation regarding distribution)
 Surveys and traffic detection

PHASE 2: Feasibility of Pilot Area

Urban infrastructures of pilot area (South West of the historic centre)
 New policy for the regulation of traffic and stops

PHASE 3: Feasibility for the whole Historic Centre

Urban infrastructure of the historic centre
 Planning of supporting telematic architecture

Brescia has completed the expected activities in the City Ports project; in particular the feasibility study for the whole historic centre as well as the preliminary executive plan expected for a pilot area referred to in PHASE 2. Following steps include: the completion of the executive part with the development of the final executive plan, the experimentation for the pilot area and a following extension and calibration for the whole historical centre.

PHASE 1 - Analysis Phase

The first stage of the work has been dedicated to the analysis of all issues of the current urban distribution of goods and the cooperation of all stakeholders has been sought.

The approach followed in the assessment stage is mainly based on "face to face" interviews to the chief representatives of the operators involved. The methodology used is strongly linked to the demand, thus to all the issues of the current system, as it is the requirements in terms of demand that define the shape of the market.

All the information has been obtained from:

- focus groups held with haulers and retailers of the historic centre, that agreed to collect qualitative information containing critical analysis and clues on the current situation of the distribution:

- an analysis of surveys carried out on board of the vehicles in charge of the delivered in the historic centre;
- "face to face" interviews with a significant sample of retailers.

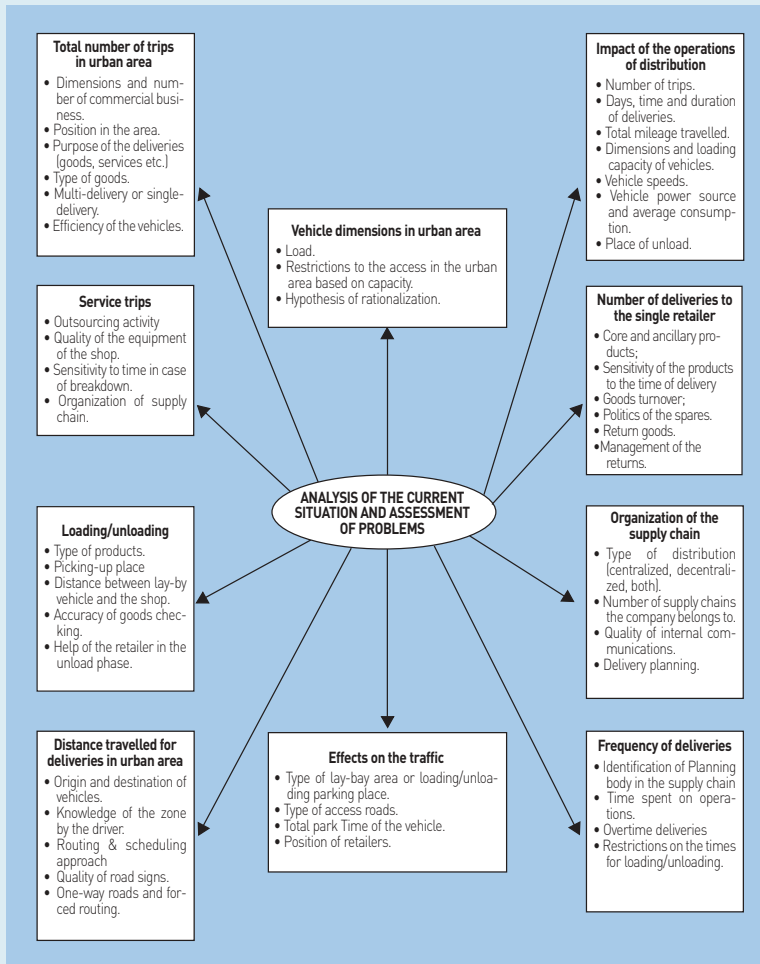
Figure 22 emphasizes the variables used for the analysis of the supply chain for the three prevailing type of goods in the market: clothing-textile-footwear, public shops and household appliances- large parcels.

In order to define a common action plan a concertation table was established to include: Retailing Associations (Confesercenti and Ascom), Craftsmen (Confederazione Nazionale dell'Artigianato di Brescia), FAI (Italian Hauliers Federation), ACI Brescia, Brescia City Council (Mobility and Traffic Sector), Regione Lombardia (Infrastructure and Mobility Directorate - UO Airport Infrastructures and Logistics interested in the development of the work in Brescia), Brescia Transports (managing company for public transport), Steer Davies Gleave (technical consultants in charge of the project) and Brescia Mobilità (Corporate Directorate and Metrobus - Mobility Study Area).

The cognitive framework has allowed identifying the fundamental activities to further develop into a feasibility study.

Those have undergone concertation in order to have a synergy in the actions and collect suggestions.

(FIGURE 22)



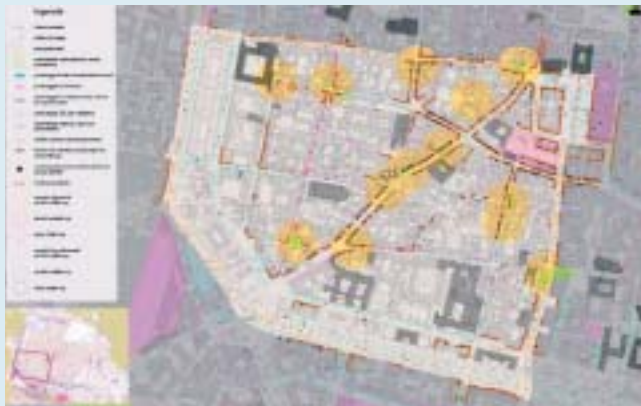
PHASE 2 - Feasibility Study for the pilot

The experimental phase was conceived for a pilot area located in the south-western part of the historic centre whose features, as emerged from a in-deep analysis of the cognitive framework, can be synthesised as follows:

- the 37 existing areas for loading/unloading goods are concentrated in 13 points;
- the existing commercial activity (286 practices with less than 250 m² and 6 practices over 250 m²) is mainly concentrated along three roads (Martiri della Libertà Road, F.lli Porcellaga Street and Palestro Road);
- 90 practices, of which 2 have a surface of over 250 m². are inside 40-50 m of the loading/unloading areas;
- the areas arranged for the loading/unloading of goods are of mainly mixed used and are often occupied by private vehicles;
- the vehicles used for the haulage of goods are of different types and their size/shape is often not compatible with the one of the loading/unloading areas;
- a wide-spread double-lane parking and parking in other forbidden areas has been noted;
- difficulty for some categories of vehicles with lay-bay areas that are not easily accessible and usable;
- the preferential route for the public transport on tyre are illegally used by haulers to load/unload vehicles.

[FIGURA 23]

PILOT AREA AND THE INFLUENCE OF THE EXISTING LOAD/UNLOAD AREAS
(SOURCE: FINAL REPORT PHASE 2)

**[FIGURA 24]**

PILOT AREA AND THE INFLUENCE OF THE EXISTING CURRENT AND PLANNED LOAD/UNLOAD AREAS
WITH PLANNED ROUTING (SOURCE: FINAL REPORT PHASE 2)



The interventions proposed for the pilot area are:

- new plan for loading/unloading areas according to specific parameters and by considering the type of commercial activities in the roads of interest (figure 23);
- enhancement in the accessibility to retailers (simplification of pedestrian routing from loading/unloading areas the delivery points);
- definition of specific itineraries for the transportation of goods as a function of the new loading/unloading areas (Walking path and delivery service path); roads outside planned itineraries to be closed to the haulage of goods (figure 24);
- redefinition of timetable for loading/unloading of goods.

The plan for the interventions on infrastructure was accompanied by the assessment of a new policy for the regulation of the traffic and stops.

The Origin Destination matrix for the traffic simulation model was updated at the beginning (Brescia Mobilità has been using the TRIPS model for years for the optimization of the private/public transport network and for strategic studies of the local mobility), paying particular attention to the component of commercial traffic: in order to do that both manual and automatic traffic surveys were carried out at the boundaries of the Brescia network.

Such work has led to a better understanding of the routes used by commercial traffic inside the historic centre and to simulate the effects of the project on traffic within the municipality as reported in tables 26 and 27.

The proposal for the newly developed **policy for traffic and stops** refers obviously to the historic centre as a whole and has been conceived, at a feasibility planning level, according to the following criteria:

- the **limitations** to traffic inside the historical centre with possibility of stops (for a maximum of 15, 30 or 60 minutes, depending on the category of the vehicle) refer to the size of the vehicles rather than to the loading capacity; in other words, the policy refers to a classification

of commercial vehicles into 5 categories for as many types of operators and each category has been further subdivided into classes linked to the length of the vehicles (table 28);

- the access is not allowed in the peak hours to non-ecological commercial vehicles (table 24);
- the transit in the historic centre requires a **permit** (either free or charged for with duration of either 6 or 12 months) for all categories of vehicles in order to allow for the monitoring and calibration of the system;
- opening of the nightly shift (from 20:00 to 6:30) to commercial traffic.

To meet the requirements of the different operators the plan, is based upon:

- the definition of a planning standard for

loading/unloading areas, which is a function of the vehicles and the areas used; the plan of the infrastructure required for loading/unloading, whose dimensions of 7x2.5m was decided together with the haulers in order to be usable not by all commercial vehicles but only to those up 6-metre long (that is for 6-metre long light-medium goods vehicles whose loading capacity can reach 6000 kg);

- the identification of the number of loading/unloading bays and their positioning in relation to their distance from commercial activities, available space and demand, that is the number of commercial vehicles circulating in the area also considering a standing time for loading/unloading operations of about 30

[TABELLA 24] SCHEME OF TIME WINDOWS FOR LOAD/UNLOAD OF GOODS

[illegible]

minutes (the new areas foreseen for loading/unloading are 22 on the ring road and 77 inside it)

Outside the predefined time windows **alternative solutions** for the areas otherwise used for loading/unloading were considered both based on their function and on some form of rotation of their functionality in order to set up a system regulation checking purposes.

Possible alternative functions include in particular that outside the time windows, some of those areas that cannot be used because of limited road space or to avoid a negative impact on traffic at peak times must remain empty whilst others could be used for parking of residents (30 places), parking with parking ticket (21 places), as a pedestrian zone (23 places) or open to traffic (24 places).

The corresponding “pertinent” routes have been proposed in a way compatible with the positions of the park areas and to allow vehicles to get back to their routes after servicing without having to go through areas where no commercial activities are situated.

The simulation of the new regulative policies has led to the following conclusions:

- **at peak times (7:30-9:30)**, if 90% of commercial vehicles were banned from accessing the area, the South

West part of the city would benefit most, also because of the definition of the new constrained routes for commercial vehicles resulting in:

- a 10.16% decrease in mileage travelled and 20.74% decrease in time spent in the network;
- an average speed increase of 10.16%;
- with **off peak** traffic and the same percentage of commercial vehicles entering the network (using a uniform distribution over time), the traffic situation improves as follows:
 - a 16.11% decrease in mileage travelled in the pilot area with an 28.14% decrease in time spent in the city centre. The average speed increases by 32.46% in the city centre.

PHASE 3 - Feasibility study for the entire historic centre

This phase pertains to the extension to all historic centre of the infrastructural interventions (new planning of load and unload areas), of the definition of preferential routes for freight and policies for the regulation of traffic (timetable, limitations, etc.) and the planning of a telematic architecture.

The proposed solutions relating to the telematic architecture, which were discussed at the Concertation Table, are implemented gradually, with a low initial impact, starting from a simple video surveillance of parking vehicles in the loading/unloading areas up to the final scenario of a Centralized tech-

(TABLE 25)

THE FRAMEWORK FOR THE PILOT: CURRENT SITUATION AND PLANNING SCENARIOS		
Existing situation:	Scenario using the loading/unloading time windows:	Scenario not using the loading/unloading time windows:
<ul style="list-style-type: none">• Existing paying car parks: 486 (367 of which on the ring road);• Existing residents' car parks in the city centre: 451• Existing park bays for goods loading/unloading only: 37	<ul style="list-style-type: none">• Foreseen paying car parks: 450 (349 of which on the ring road); - 36 park bays• Foreseen paying car parks in the historic centre: 428; 23 park bays• Foreseen park bays for goods loading/unloading: 96; + 59 park bays	<ul style="list-style-type: none">• Foreseen paying car parks: 476 (364 of which on the ring road); - 10 park bays• Foreseen residents' car parks in the historic centre: 461; + 10 park bays• Foreseen park bays for goods loading/unloading: 0

nological platform. In particular the following is proposed:

- to develop the video surveillance expected in the Historic Center, increasing the number of expected video cameras and the technic capacities of the operating station, and to verify at the same time the

control system for the access to the LTZ, thus favoring the verification of the new access regulation phase (hourly time windows and management of passes);

- to define, in a second phase, solutions allowing the real time communication to haulers of the availability of stopping

areas and, if necessary, also the possibility to book those. These interventions will however be studied more in detail being very limited in terms of operational flexibility and they are possibly more advantageous to the implementation of a centralized hub for the distribution.

(TABLE 26) SIMULATION OF PEAK HOURS FOR PROJECT SCENARIO [SOURCE: ANALYSIS BY MODELLING PHASE 2]

VARIATIONS OF HYPOTHESIS-OVERALL SITUATION	CENTRAL NETWORK	CENTRE	SOUTH WEST SECTOR
Total distance travelled by cars (veh/Km)	-1.05%	-5.80%	-10.16%
Total travel time (veh/h)	-1.90%	-13.53%	-20.74%
Average speed cars (Km/h)	0.87%	8.94%	13.35%

(TABLE 27) SIMULATION FOR OFF -PEAK HOURS OF THE PROJECT SCENARIO [SOURCE: MODELING ANALYSIS PHASE 2]

VARIATIONS OF HYPOTHESIS-OVERALL SITUATION	CENTRAL NETWORK	CENTRE	SOUTH WEST SECTOR
Total distance travelled by cars (veh/Km)	-0.74%	-4.81%	-16.11%
Total travel time (veh/h)	-21.03%	-28.14%	-19.50%
Average speed Cars (Km/h)	25.70%	32.46%	4.22%

TABLE 28) [SOURCE: FINAL REPORT PHASE 2]

CAT. A:	<p>TRANSPORTATION ON BEHALF OF A THIRD PARTY</p> <p><u>Class 0 - 6 meters:</u> allowed from 9:30 to 13:00, from 15:30 to 18:00 and from 20:00 to 7:30 of all weekdays and Saturday morning, with possibility of stopping for 15 - 30 minutes within the set up areas (a free permit to be used to enter);</p> <p><u>Class 6 - 10 meters:</u> same hourly windows of the previous class. The permission could be free in the nightly shift but a fee could be levied during the daily time windows;</p> <p><u>Class over 10 meters:</u> the only hourly windows when entrance is allowed are at night and it will require a permit, either given for free or upon a payment;</p> <p><u>Electric vehicles, methane or LPG and hybrids:</u> traffic allowed from 00:00 to 24:00, but dependent upon the provision of a free permit;</p> <p><u>Medical supply:</u> under the same rules as for entrance and parking/standing for vehicles of category A.</p>
CAT. B:	<p>HOME DELIVERIES</p> <p><u>Class 0 - 6 meters:</u> allowed from 11:00 to 14:00 and from 18:00 to 7:30 in the weekdays and Sundays (except when the retail shop is closed). The permit will either be free or based upon the payment of a fee. It will be possible to use areas for loading/unloading of goods for up to 15 minutes, in the absence of parking places for residents;</p> <p><u>Electric vehicles, methane or LPG and hybrids:</u> allowed from 0:00 to 24:00, but based on the provision of a free permission;</p>
CAT. C:	<p>MAINTENANCE CRAFTMEN</p> <p><u>Class 0 - 6 meters:</u> allowed from 9:30 to 7:30 on weekdays. Possibility to use goods loading/unloading areas from 13:00 to 15:30 and from 18:00 to 7:30 for a maximum standing time of 1 hour (permit to be paid for);</p> <p><u>Electric vehicles, methane or LPG and hybrids:</u> allowed from 0:00 to 24:00, but based on the issuing of a free permission;</p>
CAT. D:	<p>BUSINESS REPRESENTATIVES</p> <p><u>Class 0 - 6 meters:</u> traffic from 9:30 to 13:00 and from 15:30 to 18:00 is granted during weekdays. Possibility of a charge for standing in the spaces for residents and authorized with max duration of 1 hour (in case of stop billing the permission will be free);</p> <p><u>Electric vehicles, methane or LPG and hybrids:</u> traffic allowed from 0:00 to 24:00, but subordinated to the release of a free permission, but subject to the same stop billing rules (if necessary with inferior fees).</p>
CAT. E:	<p>VEHICLES OF RETAILERS FOR LOADING/UNLOADING GOODS</p> <p>They undergo the same rules of category A. The permit could be paid for.</p>

Parma

Project: within the framework of the City Ports project the Parma Municipality, in cooperation with Infomobility (company for the sustainable mobility in Parma) and IT.City Spa (informatics company from Parma), is working on the project Transit Point Merci (Goods Transit Point), aiming at a reorganization and regulation of the haulage of goods in the city.

In parallel to that project the Council has defined the strategic plan for interventions in urban logistics with the construction of the "logistic town" to include:

- facilities for the distribution of goods arriving from various sources;
- warehousing facilities for quick rotation of goods;
- software support for the real time routing and optimization of: entry and exit flows, customer orders, availability of vehicles and their load and working times.

Operative phases of the work plan

Activities carried out

- Creation of the concertation table with **10 unions associations** to present the project and to share the objectives and the results.
- Overall assessment based on:
 - **5 focus groups** to involve stakeholders and in cooperation with Unions;
 - elaboration of **360 questionnaires**, for a 10% sampling, containing 16 questions for the collection of information on procedures and times of delivery, characteristics of the carrier and suggestions from retailers.
- **Collection of acts** regulating the distribution of goods in 35 Italian towns, that has allowed to rebuild an overview of the administrative procedures in terms of entry times and special permits for the distribution of goods in urban centres; the methodology adopted was based on environmental and sanitary criteria (cities belonging to annex III of the 21 April 1999 ACT n. 163) and extending the survey as a result of the new executive law n. 60 of 2/4/02.

Ongoing activities

- Production of a draft decree.
- Definition of the architecture of the

centralized system for the control of the platforms and the management of the bookings.

- Definition of penalties and controls.
- Production of crediting procedures and of specifications for transit points.
- Software monitoring and updating with extension to the district of the prototypical experimentation.

The main results of the inquiry and concertation activity with the stakeholders follow.

- The delivery of goods occurs mainly by haulers on behalf of third parties, 30% only are on their own account.
- Standing for delivery operations mostly occurs beside the road (80% of the cases). It can therefore be deduced that load and unload platforms do not satisfy the necessity of the haulers.
- The majority of retailers are serviced by 2 or 3 different haulers (about 50%), slightly different situation is for the food provision sector, for which over 30% is supplied by more than 5 different haulers.
- A non negligible quantity of retailers provides home delivery.
- For the food sector, 45% of deliveries must occur in hours outside those stated in the decree.
- The deliveries occur in the majority of

the cases at least once a day (food sector) or less than once a day (other sectors), whilst the delivery of goods is nearly constant from Monday to Friday.

- It has estimated that the total number of daily deliveries taking place in the historic centre is quantifiable around 3300.
- The duration of goods loading/unloading requires usually less than 15 minutes, except for the food sector for which parkings can last up to 30 minutes. Only a low percentage of deliveries requires more than 30 minutes.
- Over 80% of deliveries, irrespectively of the sector the retail operates in, are carried out by van and the component of vehicles whose loading capacity are over 3.5 tons and are almost insignificant.
- Diesel is the predominant fuelling modality for the vehicles delivering goods.
- 50% of retailers are satisfied with the present method of delivery; retailers believe that an enhancement could be obtained by adding new lay-by areas, greater control over them, by widening the hourly windows for loading/unloading and by distributing a larger number of permits.

Expected outcomes:

- Detailed System architecture, that could be reproduced
- Software products
- Results from the pilot (with issues and problems encountered)

Vicenza

Project: City Logistics Project – Web Portal for access to LCC informative systems

History:

The first attempt to solve the urban distribution of goods problem goes back to 1997, when the Municipality asked Poster to study the problem of urban distribution of goods.

The job was then passed on to the Buffa Studio (Studio Office) (firstly approved in 1999) leading to the Project of Logistics City Center (LCC) partly funded by the Regione Veneto (L. R. 32/98) both for the planning and the creation of the LCC.

The study went through:

- The creation of one unique hub at the entrance of the city serving the urban distribution of some types of goods (excluding valuables and perishable ones) for the whole densely urbanized area; it was located inside the fruit and vegetable market, area used also by large supermarkets;
- The use of ecological vehicles.

After the receiving the funds, it became clear that a company for the management of the LCC should have been set up. This happened not before October 2003 though, when a Limited company was created under the premises that it would have managed the Lcc: Vicenza Logistics, whose main source of funding was public

money (55%), 45% by shares of 5 local unions (Industrial Associations, API, ASCOM, CNA, Craftsmen Association).

The LCC uses equipment owned by the Municipality and currently in use in the market (300m² under the roof and 1000 m² outside).

The platform will serve all types of goods, except armored and frozen products that have different management problems.

Background analysis of the context

The survey programme (started in 2001) aiming at assessing the demand for mobility within the district and the spatial distribution of traffic movements, has followed the steps detailed below.

- Interviews to trade operators (shopping centres, supermarkets and shops).
Shops were grouped in 8 large categories: groceries, newspapers and magazines, large distribution, building materials, furniture and house furnishing, clothes and fabrics, vehicle sales and accessories, anything else.

From the 1.365 commercial shops currently in the city (of whom 312 in the historic centre) the companies and the commercial entities which were considered the most important were chosen in order to build a random sample representing uniform distribution over the territory.

243 direct interviews were made, 32% of which addressing directly the operators of the historic centre.

- Interviews to operators of industrial and craftsman production.

The companies registered with the Artigiani (Crafts) organization are 2525 in the whole city of Vicenza: among those 670 local entities were initially chosen without considering those not involved in the movement of large quantities of goods.

The activities considered are: **furniture or carpenter laboratories, clothing, household repairs, bakeries** and the haulers operating as "little owners" (177 of the craftsmen belong to this category).

- Interviews addressed **to operators of the distribution.**

This survey was conducted on 19 mail/forwarding agents who constantly deliver in the city centre.

- Survey on the goods at screen line sections, providing an estimated 30% sample.

The questionnaires used in the interviews are different from those elaborated in the City Ports project, in that the reorganization problem of the urban distribution of goods, as the history shows, has already been dealt with in the past. The main findings of the questionnaires are reported in the table 29.

Main results of questionnaires.

Questionnaire on business activities.

- The average surface of the activity is 168 m², while in the historic centre such value is reduced to 68 m².
- Among the 213 shops of the centre: 7% carries out the unloading of the goods operations on their own, only 7% of the activities is utilizing loading/unloading areas, whilst the remainder declares to carry out such operations on the road.
- About 60% of the activities own a stocking warehouse of goods, as opposed to other cities where deliveries happen with very high frequency because of the lack of room for warehousing within the shop.
- The type of vehicles used are mainly (about 67%) of a loading capacity lower than 35 quintals.
- The loading and unloading operations of the goods happen mainly in the hourly window 9:00-12:00.
- There does not exist a prevalent frequency of goods provision.
- The time of the operation is lower than 15 minutes.

Questionnaire on production agencies.

- Among the 177 craftsmen who carry out activity as "little owners", the majority owns 1 or 2 vehicles < 35 quintals and do not own warehouses for goods stocking.

- The majority of the haulers interviewed have declared to use a Logistics Centre own by a third party and to make on average 6 trips per vehicle towards the city, whilst the number of trips becomes 2 for areas outside Vicenza.
- All interviewees have declared that the park times for load and unload inside the city centre are particularly high because of lack of platforms built for that purpose.
- The majority of the operators for the distribution of goods interviewed have at their disposal enough room for their activities: the available average surface space turns is in fact 190 m² and 94% of the companies have space available to carry out the load and unload of goods at their own premises. More than 60% own at least one own vehicle for the haulage of goods and, as far as the goods warehousing are concerned, 53% of the interviewees have declared to have it available at their own centres.
- 41% use couriers or forwarders for the delivery of their own products whilst the percentage reduces greatly for semi-finished goods (18%).

Survey on forwarders and couriers.

- 79% of the companies declare to have a warehouse for goods stocking.
- Approximately 47% of them uses their

own vehicles or rely on single small owners.

- The activity of the companies is distributed in enough fair way among contracts of exclusive character for groups of fixed customers or rotational and specific contracts for single shipment or groups of shipments.
- Deliveries and collections are mainly on request, which demonstrates the difficulty in trying to plan this type of activity.
- It can be emphasized that, due to the type of activities, more than 70% carries out the deliveries/collections at the customer's premises: the deliveries mostly occur in the morning between 8:00 and 12:00 (63%), whilst the collection of the goods is done in the afternoon between 12:00 and 18:00. Furthermore more than 60% of the companies declare to deliver at fixed locations.

Ongoing or future activities.

- A survey is being carried out on the LTZ with the aim of knowing in detail the actual dimensions of the haulage of goods phenomenon.

It has been a postal survey that it was addressed to 40 people chosen among the transport companies which more active in the LTZ.

The questionnaire was structured by a mail courier.

The survey aimed also at testing whether the distribution in the LTZ can be carried out using 3 electric vehicles only (loading capacity = 3.5 tonnes)

- 3 tenders will be offered, respectively, for vehicles, hardware and software, in order for the pilot to start by the end of 2004 and to test it for 1 year.
- Moreover the Administration of the Council has planned:
 - to establish a control system for the entrances through cameras and a Telepass kind of system, in order to regulate the entrances into the area of interest: the objective being to give access to vehicles with low environmental impact that come from the distribution hub, and restrict the access to other vehicles;
 - to set up a management group made of 4 people;
 - to offer the service of urban goods distribution at a cost which has still to be established, by calculating the savings in the delivery process.
- In a following phase, after the project has started and its economic viability is proven, the local Administration would pull out the management company.
- A Web Portal to be situated inside the Council is planned aiming at a dissemination of the activities of the Lcc; it is thought in future to realise also a a

booking system for the hubs is planned for the future.

Expected outcomes.

- Organizational Architecture of the Lcc and its Management Plan.
- Regulation decrees to support a distribution process using the Lcc.
- Informatics architectures supporting the organization of the Lcc.

TABLE 29)

MAIN INFORMATION GATHERED FROM THE QUESTIONNAIRE SET UP FOR THE SURVEY AT THE SALE POINTS

The first section relates to generic information about the company: name, address, type of activity, surface used, opening times and days; vehicle equipment for the transport of goods, stocking warehouses, customer parking; information on loading/unloading of goods to include presence of parking platforms, regulation, etc.

The second section relates to information concerning the supply of goods: organization of the transport of goods from the producer to the sale unity; type, packing and quantity of the goods received; place of origin of the goods; frequency, distribution hours; time and vehicle used for the delivery; information relating to the order: type, time elapsed between order and delivery, etc.

The third section relates to information concerning the sale (type, sale time; type of users: average number of users, home delivery etc.; type of vehicles used for the transport)

MAIN INFORMATION GATHERED FROM
THE QUESTIONNAIRE SET UP FOR THE SURVEY CARRIED OUT AT THE COMPANY PRODUCTION POINTS (CRAFTSMEN AND HAULIERS)

The first section relates to generic information about the company: name, address, type of activity, surface used, availability of stopping areas for loading/unloading of goods, possible regulation for their use, type and number of the vehicles used for the collection/distribution of goods, stocking warehouses, information on goods handling such as whether forwarding, collection, both.

The second section relates to information concerning the organization of the distribution of goods: vehicles used for goods forwarding; type of goods forwarding method; frequency and prevailing times for dispatching the goods; destination of the goods dispatched; possible indication of routes used and zones served.

The third section relates to information concerning the collection of goods: vehicles used for the collection of goods; type of goods received and formal procedure of acquisition; frequency and prevailing times for the deliveries; origin of goods received; possible indication of routes used and zones served.

In the fourth and fifth sections the prevailing zones of origin and destination are indicated for the dispatch and collection of goods respectively and the type of vehicles used.

MAIN INFORMATION GATHERED FROM THE QUESTIONNAIRE SET UP FOR
THE SURVEY CARRIED OUT ON COURIES AND FORWARDING AGENTS

- The first section relates to generic information about the company: name, address, surface used, type and number of vehicles used, stocking warehouses.
- The second section contains the information relating to the organization of delivery/collection of goods: own vehicles used or through cooperatives, small owners; type of contract used; frequency of deliveries/collection.
- The third section relates to information concerning the organization of the delivery of goods: type of transport; duration of delivery; destinations and prevailing times; issues caused by the lack of stopping platforms at the customer premises; possible indication of routes and zones served; if delivery to be in Vicenza, the number of used vehicles and the number of trips for each vehicles.

Vienna e-Trans

Project: Shopping boxes designed for large housing areas e-trans is an electronic system which is operative in the Vienna region to organize and manage the transport, deliver and collection of the purchases carried out by consumers through a specific web portal.

Operating phases of the work plan:

PHASE 1 (January 2001 - September 2002)

Planning of the hardware and software architecture for the system management. Assessment and adaptation of the project solution to the working environment. Setting up a pilot project in Forsthausgasse

PHASE 2 (September 2002- June 2006)

Extension of the project to the whole city of Vienna.

Coordination of the knowledge exchange process among mail couriers.

The project identifies a logistic solution for the ongoing problem of home delivery of products bought online. The home deliveries process is affected by the inflexible plans imposed by the routes of the scheduled deliveries planned by transport operators and by work schedules of couriers. Consumers must be themselves reachable on the day and at the time of delivery of the acquired products and,

as a result, they will have to adjust their own schedule to the requirement of being themselves at home at the time of delivery; such inconvenience is even bigger in case of online purchases from several "distributors".

Figure 25 shows the scheme of two possible alternatives for home delivery:

- alternative A, allows for the optimization of deliveries by courier, but consumers are inconvenienced by having to stay at home from 9:00 to 16:00;
- alternative B, is a more consumer-friendly approach to delivery as delivery times are more compacted, the downside being however that itineraries for the delivery are bound to the respect of the agreed times as oppo-

sed to being based on an optimized routing policy. This determines disequilibrium.

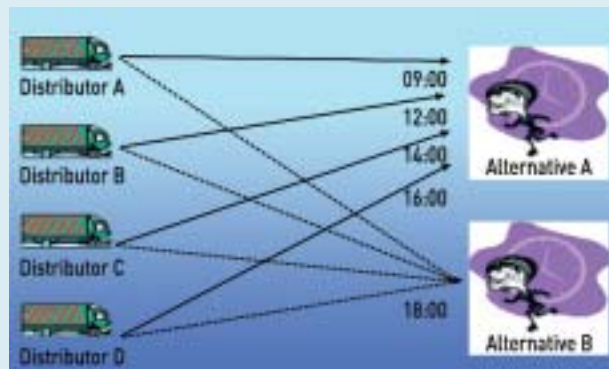
The solution proposed by e-Trans aims to resolve the problem caused by the requirement of the consumer to be at home at the time of the delivery decided by the couriers and thus tries to satisfy both the need for the former to be at home and the willingness of optimized itineraries and times for the latter.

The project involves the organization of boxes connected to a computer system to manage orders. The system allows the match of demand and supply in a virtual market via a web portal (figure 26):

- the consumer, by buying a product onli-

(FIGURE 25)

THE REAL PROBLEM OF HOME DELIVERY [SOURCE: LOB, PRESENTATION STATUS QUO, NATIONAL MEETING, FEBRUARY 2003, GRAZ]



- ne, books automatically a temporal slot of a box;
- the system forwards the order of the products to the sales points and communicates to the haulers where to collect the products and in what boxes to deliver them;
 - haulers, on the basis of the list of the places for collection and delivery of the orders, optimize routes and loads in the various itineraries, and confirm the delivery to the central system after leaving the products in the boxes;

- the consumers collect the ordered products by opening the boxes with the appropriate code received (figure 27).
- The cost of the delivery, to include of utilization of the box, varies between 4 Euros to 6 Euro.
- The experimentation of the pilot project has raised the following points:
- the users of the service belong to a certain age, education and income category;
 - the choice of the positions of the boxes should be based on demographic density

and the accessibility to transport infrastructure.

The products that can be delivered through the procedure experimented within the e-trans project are:

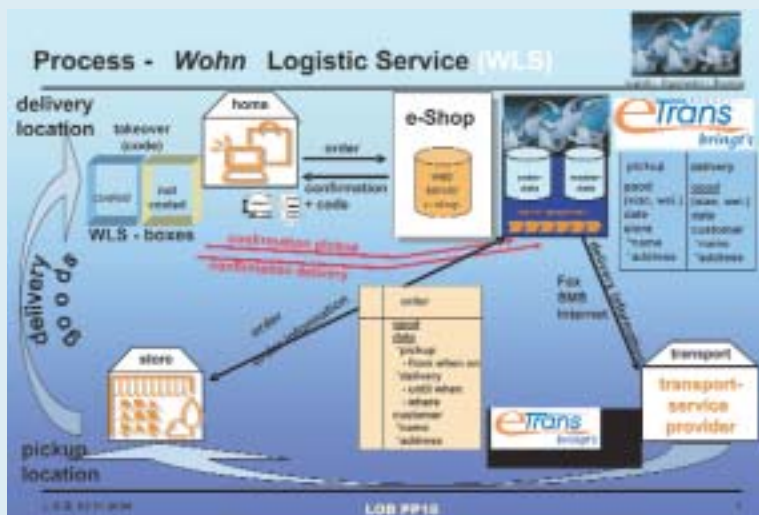
- combined shipments;
- foodstuffs;
- parcels and documents;
- plants and flowers;
- ready meals.

The crucial point for the economical success of the e-Trans project is the selection of the sites in which to locate the boxes. This would have to be a compromise between total coverage of the urban area and financial options.

This project could be integrated with that handled by City Courier Systems in order to multiply the effects of the logistic solutions through synergy and coordination between the two projects.

(FIGURE 26)

THE SERVICE OFFERED WITH e-TRANS PROJECT
[SOURCE: LOB, PRESENTATION STATUS QUO, NATIONAL MEETING, FEBRUARY 2003, GRAZ]



(FIGURE 27)

BOXES OF e-TRANS PROJECT [SOURCE: LOB, PRESENTATION STATUS QUO, NATIONAL MEETING, FEBRUARY 2003, GRAZ]



Vienna City Courier Systems (CCS)

Project: Multi-interface ICT for parcel transport within a city

Operative phases on the work plan:

PHASES

Theoretical approach developed by the University of Business Studies of Vienna to solve the problem.

Identification of hardware type and necessary software.

Identification of depot positions along the main traffic corridors.

Hardware and software acquisition (March 2004)

Identification of the transport operators that participate to the initiative identification of the users adhering to the first phase of experimentation.

The project identifies a logistic solution for the current distribution of goods inside the city of Vienna (figure 28). The scheme of the planned system concentrates the flow of goods on a main corridor along which some depots are positioned, which are located at the barycentre of the final points of delivery (figures 29 and 30). The users of the service will collect the goods at the nearest depot.

Future Developments

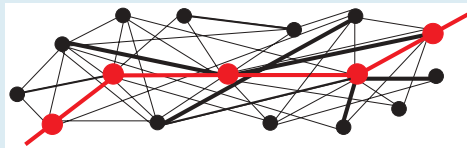
The project has been conceived for b2b (business to business) relationships, but it is foreseen a b2c (business to consumer) use as well.

Expected results

According to the study of the University for Business Studies every day 1,3 millions of deliveries are carried out from and to Vienna; the project's expectation is to limit those by 1% within 2 years, corresponding to a saving of 2 million kilometres per year.

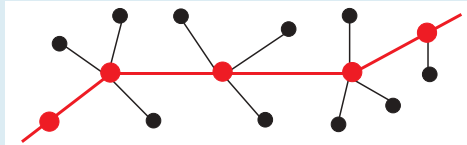
[FIGURE 28]

DIAGRAM OF CURRENT GOODS DISTRIBUTION INSIDE THE CITY OF VIENNA
[SOURCE: CCS DELIVERY GMBH, PRESENTATION OF THE PILOT VIENNA, JUNE 2003]



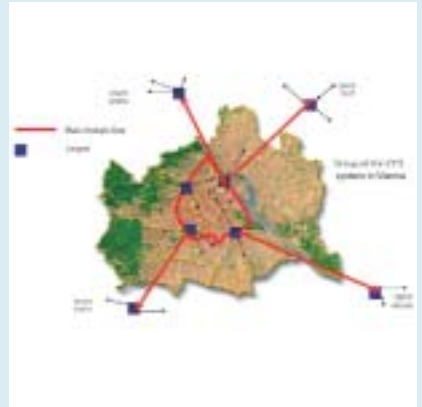
[FIGURE 29]

DIAGRAM OF GOODS DISTRIBUTION PROJECT INSIDE THE CITY OF VIENNA
[SOURCE: CCS DELIVERY GMBH, PRESENTATION OF THE PILOT VIENNA, JUNE 2003]



[FIGURE 30]

DIAGRAM OF GOODS DISTRIBUTION PROJECT INSIDE THE CITY OF VIENNA
[SOURCE: CCS DELIVERY GMBH, PRESENTATION OF THE PILOT VIENNA, JUNE 2003]



Graz

Project: Integrated Reverse and Recycling Logistics

Operative phases of the work plan:

PHASES

The two subprojects share part of the phase concept. Since the subprojects' dynamic routing requires technological support (ICT information and communication technologies), there is detailed specification and preparation of the procurement, whereas the strategic routing subprojects have extended benchmarking:

- Analysis
 - Data/Benchmarking (km/m_ or km/t)
 - Functional/organisational requirements
- Development
 - Action model: solutions to improve collecting efficiency to minimize impacts on traffic & neighbourhoods
 - System specification
- Assessment
 - Cost/Benefits
 - Feasibility
- Planning Implementation
 - Procurement
 - Procurement plan
 - Test plan functional- & integration testing
 - Evaluation plan

Both subprojects were based on the working hypothesis: Efficient Flexible Services require flexible planning and telematics (ICT) support.

a) Dynamic routing

The focus is on optimisation during the trip – this is given the title **dynamic routing**. The goods collected are industrial and domestic waste.

The components are comprised of:

On Board units – interfaced with the on board systems

Tracking & tracing

Monitoring of Driver behaviour

The validation procedure uses mini scanners to verify savings.



b) Strategic routing City of Graz

The second subproject focuses on high quality **ex ante optimisation of the fixed routes** for the collection of domestic waste and is thus called strategic routing.

The calculation of indicators with the help of the tachograph disc and client database was the first step, and a GPS based data acquisition was undertaken for the benchmarking.

A GIS based Route optimisation validated the theoretical potential for optimisation.

Increased Vehicle capacity will allow for a larger service area per route (time restraint) and optimised fixed routes.

Future developments

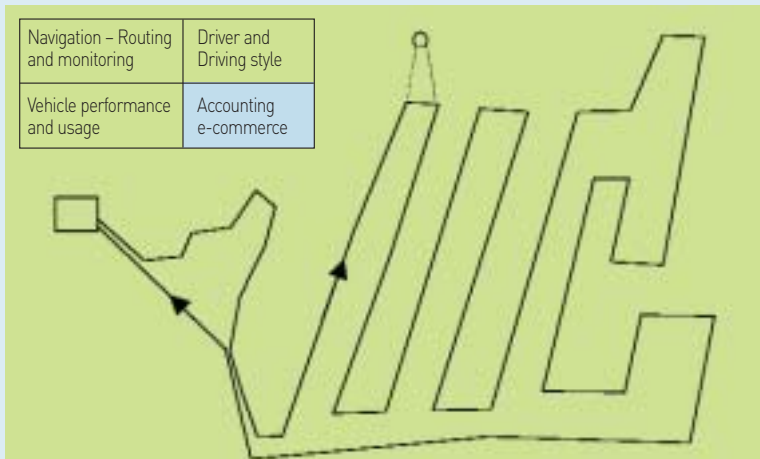
a) Dynamic routing Saubermacher

Since the system is specified as a multilingual and open system, there is room for further developments. They basically include automated interaction with the bins, remote maintenance and improved actuality of the predefined routes and maps.

b) Strategic routing City of Graz

Since the changes are now on an operational basis and do not include information and communication technologies in the vehicles, there is room to implement a fleet management system.

(FIGURE 31)



(FIGURE 32)



Expected results

The improved efficiency in terms of km/m will lead to decreased fuel consumption, and reduced emissions from operation.

a) Dynamic routing Saubermacher

Previous trials with an Ecodriving incentive suggest that the fuel and CO₂ savings would be about 7% for the whole fleet. Since detailed analysis of the work time of the driver is underway, one can only estimate how many service trips may be avoided if they can be attached to existing routes and how many trips may be saved due to quality control, i.e. the ability of the driver to see if he/she has served the whole area. In total, there should be savings of approx. 3-5%. This amounts to a total savings of approx. 10% with regard to fuel, i.e. CO₂. Because of the side effects of the driving style on wear and tear, there will also be savings in this area. The overall effect will be beneficial for the area served reducing traffic jams and improving city logistics.

b) Strategic routing City of Graz

The new strategic routing shall improve the overall efficiency of the system. If we assume that 50% of the routes now have intermediate discharging returns, the new type of vehicle will

help to avoid them totally. Additionally, the time saved for the intermediate returns may be used for enlarging the routes, thus avoiding one of the routes totally. The savings in terms of km travelled and fuel saved are much lower compared to the dynamic routing, which is applied more often for suburban and rural areas. We expect 2.5%. On the other hand, we expect a larger relief with regards to congestion, since heavy trucks have a negative influence on the capacity of roads.

Kavala

Project: City logistics solutions linked to the completion of the current infrastructure projects

Operative phases of the work plan:

PHASE 1 (January 2004 - September 2004)

Evaluation of the current situation.
Evaluation of the main projects and plans that interact with the city logistics.
Formulation of the requirements and constraints framework.
Benchmarking of experiences of city logistics in Greece and in other countries.

PHASE 2 (October 2004 - February 2005)

Formulation of the city logistics solutions.
Indicative reference topics:

- vehicles demand management;
- vehicle access restrictions at the centre of the city, with parallel reinforcement of public transport (buses) fleet;
- organisation management of parking lots;
- road Signs for parking lots;
- alteration of the supply chains from the old to the new port.

Cost-benefit analysis of the city logistic solutions.

Implementation of the actions of the project.

Selection of software tools to facilitate

the implementation of the city logistics solutions.

Definition of the applicability of the strategy and of its endorsement by stakeholders, partners and cities.

PHASE 3 (March 2005 - July 2005)

Evaluation of the current situation.
Planning of the development of the pilot project and of supporting tools.
Management of to-do actions.
Setting up an evaluation system for the proposed logistic solutions.

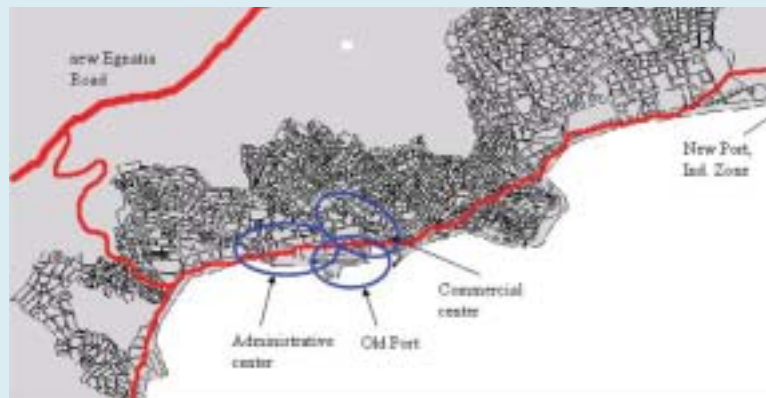
The project aims to identify the issues related to the urban distribution of goods in Kavala, in order to choose and develop the more appropriate solution for urban logistics.

Following the City Ports methodology surveys have been carried out to build an informative framework on emerging requirements, and at present the strategy to follow is being discussed, which will afterwards undergo a feasibility study.

The concentration of the population of the province of Kavala in coastal areas generates a development in the economical activity, but also an increase in people's and assets' movements. The planning and setting up of infrastructural projects in the transport sector, which has been going on for some time and will continue, will help the development of the region. These projects are mainly related to the following sectors:

- road infrastructure: the new Egnatia Road (motorway) going through the

(FIGURE 33)



province of Kavala (a part of which, the ring road, was completed in 2002);

- port infrastructure (completion of the new port, near Kavala);
- railroad infrastructure (to connect Kavala and the new port to the railroad and, as a result, to Thessaloniki and Bulgaria).

Despite the attempt of these infrastructural projects to improve the traffic problems of the region, the morphology of the ground for the city of Kavala, which is squeezed between mountain and coast, with strong differences in height, requires further clever solutions for the management of urban traffic and logistics in order to integrate those projects with in the urban framework.

Issues found

- Through flows of heavy and light vehicles.

After the completion of the Kavala ring road, traffic problems caused by trucks crossing the urban centre were eliminated, except for a small number of heavy trucks that leave the port and reach Egnatia Road.

- Urban traffic congestion, caused by the morphology of the city and by the small historic centre.
- The city of Kavala is built between mountains and the coastal line; this resolves into a limited choice in the localization of services and businesses,

the factors generating traffic and congestion.

- Parking problems.

The parking problem is critical. Stopping is regulated only on one road of the city centre. Besides the number of parking lots available amounts to only 6.

Taranto

Project: City Logistics project

Parallel initiatives exist that accompany the City Ports pilot and relate to:

- investments to set up 3 logistics platforms (through CIPE – Inter-Ministerial Economic Planning Committee – funds);
- a monitoring system with a new technology built by the Polytechnic of Taranto.

Operative phases of the work plan:

Ongoing PHASE

Assessment of the demand for goods haulage and its impact on environment and urban system.

Ongoing activities

- Analysis on traffic generators and on transport companies.
- Drafting up of a plan for the realization of deterrent parking in the outskirts of the city (through CIPE – Inter-ministerial Economic Planning Committee – funds).
- In collaboration with the Department of Engineering (based in Taranto), the Totem is being planned for access control.

Background analysis of the context

The methodological approach adopted foresees three types of ad hoc surveys to be carried out, in line with what established in the document on methodology produced in City Ports: on the commercial activities (traffic flow generators), on the transport operators and on the logistics operators. Past surveys on the carriers are followed by those on the generators and on the transport companies.

The interviews to the carriers were carried out at 27 access points to the city in the time interval 7:00-17:00. The city has been subdivided into 7 zones so as to facilitate the identification of delivery and collection sites.

Udine

Project: within the City Ports project the Udine Municipality is leading a series of activities necessary to the experimentation and creation of a "Urban Plan for Commercial Infrastructure and Transports Networks".

Operative phases of the work plan:

Institution of a working framework with the production categories (service users), logistics operators and neighboring municipalities.

Building of the know-how framework.

Surveys (with the cooperation of the production categories and of logistics operators)

Elaboration of the data and assessment of the current situation of demand and supply.

Definition of project alternatives

Economical and financial analysis

Planning of the system

Background analysis of the context

The methodological approach adopted foresees three types of ad hoc surveys to be carried out, in line with what established in the document on methodology produced in City Ports: on the traffic flow generators, on the local transport companies/branches and on the carriers.

The surveys on the traffic flow generators have not yet been conducted and it is expected that simplified questionnaires will be used and filled in with the help of the companies. It appears that the lack of detailed information obtained from those simplified questionnaires is compensated by the fact that 70% of the haulers who are active in the urban area have been interviewed.

The surveys on the local transport companies/branches were conducted with the involvement of the category associations; it has been possible to interview 70%-75% of haulers (the procedure consisted in distribution followed by the recipient filling in the questionnaire).

The surveys on the carriers were carried out at 3 sites (one inside and two at cordon points) of the much more urbanized zone (area equal to about 2.25km²), in parallel to traffic count measurements performed at 7 sites of the wider urban area, coinciding with the major corridors for entering/exi-

ting the city. It is believed that the traffic measured at the 7 sections is about 80% of the total.

Some peculiarities

- Joint approach: a Working Group with productive categories (service users) and logistics operators was constituted.
- The project that aims to rationalize the urban distribution of goods also by using an urban distribution centre, refers initially to an extended LTZ, but yet foresees to expand the intervention to the whole urban area (delimited, between other, by avenues).
- A platform exists for fresh food, that distributes both at urban/district level, at a wider range. This activity, managed by a mixed company, is in a phase of expansion and the related framework for logistics is being reinforced.
- The survey was carried by the Traffic and Mobility Operative Unit of the Municipality with a working group of 5 people and an outside consultant is involved to support the work.

Main outcomes of ongoing surveys

The survey on carriers has shown a predominance of self-owned companies.

Expected outcomes

1. The establishment of a Working Group with productive categories (service users), logistics operators and neighboring councils.

2. Setting up of the know-how framework.
3. Surveys (with the cooperation of the productive categories and logistics operators).
4. Data processing and reconstruction of the current situation for demand and supply.
6. Financial and economic analysis
7. System planning.

Modena

Project: within the framework of the Merope Project the Municipality of Modena has endorsed a number of activities for the planning and experimentation of an "innovative organizational model for the delivery of goods to commercial activities residing in the city centre".

Working plan operative phase

PHASE 1 (September-December 2003)

Examination of the most important aspects of the local situation, analysis of some case studies, evaluation of the issues on which further knowledge is required and definition of an articulated assessment plan.

PHASE 2 (January-March 2004)

Setting up of surveys to traffic flow generators, transport and logistics operators, warehouses situated in the city and the carriers.

Following the surveys, identification of a possible reorganization model for logistics.

In this phase the technical group is supported by logistics operators in order to more effectively characterize and estimate the operative/managerial and economical/financial implications of the planned intervention measures.

PHASE 3 (from April 2004)

Experimentation of the model defined in the previous phase by activating the necessary, needed and agreed upon evaluation procedures for efficacy and efficiency, as per parameters identified locally and that follow the generic evaluation criteria defined within the Merope project.

Background analysis of the context

The methodological approach adopted foresees four types of surveys: on the traffic flow generators, intended as commercial entities, on the transport operators and on the active warehouses in the city.

The questionnaires on flow generators were carried out according to three procedures for decreasing levels of complexity, each corresponding to a questionnaire:

1. **23 direct interviews** (0.7%), using the questionnaire defined by the Regione Emilia-Romagna within the City Ports project;
2. **159 telephone interviews**, with a synthetic questionnaire (using the one from City Ports as a basis). The sample was extracted from the whole set of 3.200 commercial entities (5% of the lot) according to:
 - zone, by distinguishing among three concentric zones: historic centre, inner district, with extension coinciding with area where traffic on "alternate number plates" is in operation, and the rest of the district;
 - goods categories, distinguishing six macro-classes: foodstuffs (whose distinction between specialized and not is obtained by the successive stratification for dimensional classes), clothing and accessories (including footwear

and leather articles), person care (cosmetics, perfumeries, medical and orthopaedic articles), household (textile products and linen, hardware, paints, gardening, etc.), furniture and furnishing articles, appliances (household appliances, etc.), other (newspapers, stationery shops, pharmacies, etc.);

- dimensions, by distinguishing between neighbouring shop (up to 250 m² of sales area), middle-small sales area (sales area between 250 and 1500 m²) and middle-large sales area (sales area above 1500 m²);
- 3160 interviews carried out by the commercial associations who distributed a synthetic and simplified questionnaire (5% of the whole set).

The surveys on the **active warehouses** in the district were articulated through **50 telephone interviews** on a total number of 219 units with surfaces over 250 m².

30 in-depth interviews have been carried out on transport operators with the questionnaire set up according to the City Ports methodology.

Finally some further interviews (7 meetings altogether) have been carried out **with 10 privileged testimonials of the world of the transport and logistics companies**. At those meetings some "open

questions" were asked in order to verify the feasibility of reorganizing measures.

All the operative phases of the work have involved a cooperative approach: a Working Group was set up (constituted by Municipality members, ProMo and technical group, businesses association, craftsmen-industrial categories association, transport operators associations) that has had an active role throughout the surveys (within which matters regarding the surveys and the structure of the questionnaires have been discussed) and on the definition of the new measures for the distribution of goods in urban area.

Synthesis of main outcomes

As a result of the survey phase, a synthetic picture of the current goods distribution system for the city and related trends (through the S. W. O. T. analysis) has been drawn.

Strengths

- The delivery by third party mail couriers constitutes the prevailing delivery procedure in the historic centre area (60% of goods deliveries) and on the outside ring (50%).
- Availability of the people interviewed (shopkeepers) to alterations to the current situation as a result of a greater supply in services.
- Dimensions (physical) of the historic

centre and of the suburbs ring fit the low cost of electric vehicles.

- Low percentage of non-programmable deliveries.
- Concentration of sales points in specific areas or along some corridors to the city centre (Via Emilia centre and neighbouring zones; Via Gramsci, Via Emilia East, Via Giardini, Barchetta zone).
- The direct delivery is not particularly popular in the central areas of the city (14.4% in the historic centre, 21.8% outside ring); this can contribute to limit one of the concomitant causes of the failure of the UDC.
- The majority of the goods arriving in the historic centre and in the outside ring come from outside the district (respectively 71% and 69%) and therefore could converge towards a transit point.

Weaknesses

- Goods distribution centres (for transit point) represent an interruption of the transport chain. Moreover they mean costs to the distribution businesses (costs for splitting and aggregation of goods)
- Reduced size of the deliveries.
- High fragmentation of the deliveries in the arc of the week.
- Absence of a logistic broker/skilled hauler for the distribution in the historic centre.

Opportunities

Setting up of the Marzaglia intermodal centre (proportioned for a capacity of 6-8 million tonnes/year, provided with goods hub managed by RFI).

The characteristics of Modena's city plan allow having a rail network, which is also very close to the urban centre.

Private logistics platforms are located in the Northern part of Modena's area that has substantial distribution activities in the city (TNT, DHL, etc.)

Technological evolution allowing for the haulage of different goods with a unique trip.

Risks

Growth of just-in-time and e-commerce with corresponding reduction of warehouse requirements (reduction in middle orders).

Measures adoptable over the short time horizon:

- extension of the zone under regulation of goods traffic: not anymore "the area within avenues", but progressively the urban area inside the by-pass ring;
- introduction of new access requirements for the regulated zones:
 - average loading ratio of the vehicles not less than the 60% of the capacity;
 - average daily number of goods delivered (or average number of shipments) not less than ... and average

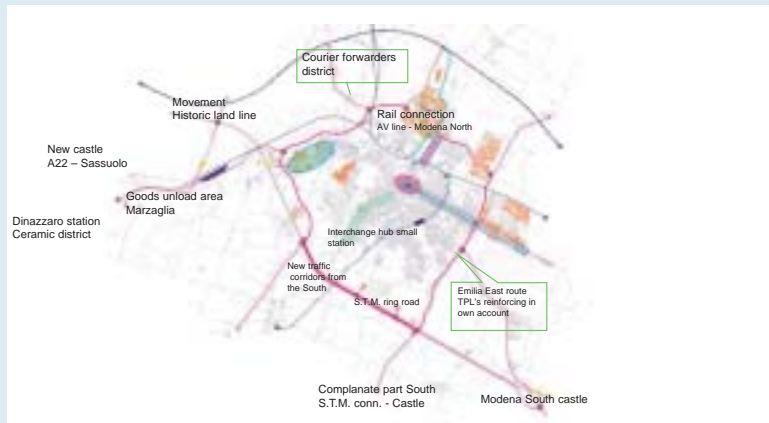
number of drop off points not less than...;

- compliance to the EU standards (for instance the Euro 3 emission rules);
- minimum degree of exploitation of the return trips (reverse logistic) equal to ...;
- carrying out a small number of deliveries also at off peak times;
- origin of trips from platforms located in proximity of the regulated zone;
- definition of a facilitation system tied up to the compliance of the requirements for access:
 - utilization of new time slots for the access to the regulated area which are differentiated by zone;

- differentiated application and/or reduction of the access charge;
- introduction of an "initiative trademark";
- exclusive use of stopping platforms for loading/unloading located in the central zones;
- use of public transport reserved lanes and/or definition of "exclusive" routes;
- contributions for wider spread of software tools that promote cooperation and coordination among operators in the goods flow management;
- contributions for the renewal of the fleet (to electric and methane propelled vehicles).

(FIGURA 34)

[SOURCE: THE GOODS DISTRIBUTION IN THE URBAN AREA OF MODENA. NEW ORGANIZATIONAL AND STRUCTURAL METHODS. PRESENTATION OF THE STATE OF ART FOR THE MEROPE PROJECT, 18 MARCH 2003]



Measures applicable on the short-term

- Aggregation of the flows of goods entering the city towards one or more points.
- Utilization of only electric, methane or on rail means of travel.
- Utilization of the public transport carriers for the transportation of the combined shipment.

Measures applicable in the trial phase (as from September 2004)

It is intended for the trial to start in one of the zones characterized by concentration of sale points and by parts of the transport network which are critical because of the presence of high levels of congestion in order to evaluate the variations on congestion levels and also the degree of improper use of road and stoppage space

Among the measures that ought to be tried, there is the modification of the schedule for goods delivery/collection; it is believed, in fact, that a different distribution of the time of delivery could have a positive impact on the levels of congestion of urban traffic at peak hours.

The main aspects of the trial are:

- **"ante operam" monitoring:** traffic flow detection at the cordon of the chosen area with evaluation of a congestion indicator and survey of improper road and stoppage areas use;

- **ongoing detection** the variation in noise levels, the variation in levels of particulate matters and other major atmospheric pollutants connected to road traffic (Benzene, NO₂, CO), taking also into account the meteorological and climate conditions.

Piacenza

Project: Area programme for Piacenza's urban logistics" within the Merope Project has as main partner the Regione Emilia-Romagna and as local partners the Province and the Municipality of Piacenza

Operative phases of the work plan:

PHASE 1 (October 2003 - March 2004)

Assessment of the demand for goods and its impacts on the environment and on the urban system

PHASE 2 (January - July 2004)

Identification of the potentiality and constraints of the policy actions. Elaboration of the urban logistics Plan.

PHASE 3 (March - August 2004)

Selection and elaboration of the pilot project.

PHASE 1

The results on the first phase are illustrated in the "Final Report" by TRT, and one is referred to it for more detailed technical information about the various cognitive aspects of the context.

The First Phase has been articulated into two main actions:

project start-up, with the setting up of a Leading Committee for the Merope project (composed by: Public Administrations such as the Regione Emilia-Romagna, Province of Piacenza and Municipality of Piacenza; Agencies such as Agenzia tempi, ARPA; Associations such as, Manufactures Association, CCIAA, CNA, Confesercenti, Area PIP Le Mose Consortium, Free Artisans Association; Free Businessmen Association, Artisans Union, Traders Union) to which a role of leadership and coordination is assigned for the activities of the three phases and that, therefore, aims to foster the participation into and sharing of the actions to undertake;

Assessment of know-how, obtained through planning and setting up of sample surveys and construction of a "data base".

Background analysis of the context

The adopted methodological approach has seen the execution of **three types of ad hoc surveys:** on **flow generators** (business activities), on transport operators and on logistics operators.

The interviews to flow generators have been conducted by telephone, in the months of December 2003 and January 2004, using the questionnaire organized by the Emilia-Romagna Region within the City Ports project, but with some modifications and aggregations necessary for its adaptation to the specific requirements of the Piacenza context. The sample (320 local units), which is representative of 11.2% of the local commercial entities (2,858) localized in the Piacenza area, includes business activities relating to small, medium, and large distribution as well as public businesses, such as bars and restaurants. The 320 local units have been aggregated at a macro level based on category of goods (wear and fixings, foodstuffs, others at specialized retail, house and electric households, wholesale, public businesses, pharmacies, fresh products, large organized distribution (GDO), non specialized products) and for localization (LTZ-historic centre, no LTZ-historic centre, outside city walls).

The surveys on transport operators have been carried out by direct interview at the locations of goods collection and delivery, which are localized in the provincial area of Piacenza, by using the questionnaire City Ports with some modifications. The sample size has been determined foreseeing interviews at 40 survey points: 20 of the large organized distribution and

20 goods supplying units (warehouses, stocking centres, depots). 219 interviews have been carried out (113 to logistics operators and 106 to the GDO).

The surveys to **logistics operators** have been conducted with direct interviews using an ad hoc questionnaire. The operators interviewed were 17, 14 of whom based in Piacenza and wider area whilst the remaining ones in the province. The survey was addressing mostly qualitative aspects, having been designed to obtain managerial and strategic details.

Synthesis of the main results of the surveys

Flow generators:

- 3 commercial vehicles are circulating daily for each UL;
- 29% of the businesses do not exceed 50 m²;
- 32% of businesses do not owe a warehouse;
- 55% of businesses do not owe any dedicated stopping area for loading/unloading goods;
- there does not exist a day in which a greater number of deliveries is registered (the goods delivery process is randomly distributed);
- 88% of the businesses receive goods between 8:00 and 13:00, which overlaps therefore with vehicular flows;

- 55% of them are self-supplying for their businesses;
- 44% of those who do self-supply do it less than once a week except for fresh daily products, for which the self-supply happens daily;
- only the "wholesale commerce " and "GDO" entrust third parties for the deliveries;
- irregular stopping concerns the 34% of the vehicles doing deliveries to the sales points; the value rises to 61% for sales points in the historic centre (not LTZ).

Haulers:

- the capacity utilization of the vehicles is high (linked possibly to the fact that the interviews were carried out at the local logistics points; the capacity utilization was not therefore verified at the entrance of the urban area);
- loads departing or arriving the GDO are optimized;
- the vehicle fleet is quite new but mostly diesel-propelled;
- 44% of the deliveries have Origin/Destination inside the province of Piacenza.

Logistics operators:

- the software in use is good;
- customers are, in the majority of cases, manufacturing companies of medium/large dimensions;

- the market of reference is both national and international.

Data base

Tool through which the project organizes and provides quantitative and qualitative information acquired in the first phase of activities. It has been split with 4 sections (ENVIRONMENT- TRADE- MOBILITY- TERRITORY) into which the flow of information is conveyed from the sample surveys and acquired from different private and public entities (Municipality Offices, ARPA, Chamber of Commerce, Province, Unions).

PHASE 2

All the activities directed towards the elaboration of the "Logistics Plan" belong to phase 2:

- benchmarking of the Italian and European experiences of city logistics;
- activation of 3 focus groups (Shopkeepers, Transport and Logistics Operators) and creation of direct interviews to individuals of the Public Administration;
- selection of city logistics measures and integration with mobility demand (goods and passengers) management measures.

This second phase will return a shared and updated analysis of the starting scenario for the city to then identify short and long terms objectives, build the corresponding indicators and appraise the potential and

issues of the city logistics tools (S.W.O.T. analysis).

PHASE 3

Pilot project implementation: planning and setting up of a dynamic web site supporting urban logistics activity.

The portal will be subdivided into two sections:

- public, with free access to the data base rebuilt during the first phase of the project which will contain maps of the transport network, regulations for the access to the LTZ, documentation relevant to incentives for vehicles renewal, etc.;
- private, with access to interactive services allowed only for registered users, aiming at a rationalization in the demand for services and the supply and exploit the mobility resources of the Piacenza area.

A prototype of the web site has currently been set up.

BIBLIOGRAPHY

AA.VV. (2002), Environmental Zones in Europe", Trendsetter Internal Deliverable No 5.4.1 and 5.4.2, June 2002, Stockholm (<http://www.trendsettereurope.org>).

BESTUFS (2000), Best Urban Freight Solutions - Best Practice Handbook Year 1 (2000), (www.bestufs.net).

BESTUFS (2002), Best Urban Freight Solutions - Best Practice Handbook Year 3 (2002), draft, (www.bestufs.net).

Da Rios G., Gattuso D. (2003), "La mobilità delle merci nell'area metropolitana milanese" (The mobility of goods inside the Milan metropolitan area), Franco Angeli, Milan.

EC, European Commission, Directorate General Transport (1998), COST 321. Urban Goods Transport, Office for official publications of the European Communities, Luxembourg.

ECMT, European Conference of Ministers of Transport (1984), Goods Distribution System in Urban Areas, Round Table 61, Paris.

EFLLC, European Freight & Logistics Leaders Club (1997), Freight distribution

into large European cities, internal publication.

ENEA (1998), "Contributi per il Libro verde. Usi sostenibili dell'energia nei trasporti", Conferenza Nazionale Energia e Ambiente (National Conference Energy and Environment), 30 October 1998, Milan.

Energie-Cités e ADEME (1997), Gestion du trafic commercial de livraison.

Kjaergaard S. (2002), Inner city distribution in Copenhagen, Conferenza Manaenergy "Sustainable Transport Good practice at local and regional level", Bruxelles, 13 June 2002 (<http://www.managenergy.net>).

Landborn J. (2003), "National Research Programmes Addressing. Commercial Urban Transport", Joint Workshop BESTUFS, (Best Urban Freight Solutions), 28/29 April 2003 in Dublin, Ireland, (www.bestufs.net).

Maggi E. (2001), La logistica merci urbana: criticità e prospettive di soluzione" (Urban Goods Logistics: Issues and Potential Solutions), Acts of the XXII Conferenza Italiana di Scienze Regionali (AISRe - Italian Conference of Regional Sciences): "Scienze Regionali e strategie per la città e il Territorio" (Regional Sciences and Strategies for City and Land), Venice, 10-12 October 2001.

Malgari P., Galli G. (2002), La distribuzione delle merci in città, Notebook TRT n.3

Odeck J., Brathen S. (2001), Toll financing of roads - The Norwegian experiences, 14th Congress of the International Road Federation, Paris

OECD, Organisation for Economic Co-operation and Development (2003), Delivering the Goods. 21st Century Challenges to Urban Goods Transport, OECD Publications

Progetrasporti Associati (2001), 'Breve analisi delle esperienze di "City Logistics" in Europa' (Brief Analysis of the Experiences of City Logistics in Europe), Commissioned by FILT-CGIL, Milan.

Ramon Julio Garcia (2001), Best Urban Freight Distribution in Barcelona, Conference BELSTUFS, 30th March 2001

Regione Emilia-Romagna (2002), "Attività di studio e ricognizione, a livello nazionale ed internazionale, delle migliori esperienze di logistica urbana e di servizi di logistica a imprese produttrici e di trasporti" (Study and Analysis, both at National and International Level, of the Best Experiences of Urban Logistics and of Services Linked to Logistics for Production and Transport Companies), Volumes 1-3, not published, ERVET.

Regione Emilia-Romagna (2003), "Linee Guida per una strategia regionale di LOGISTICA URBANA" (Guidelines for a Regional Strategy of URBAN LOGISTICS) , Notes of the Transport and Logistics Planning Service, Vol. 2, Bologna

Regione Emilia-Romagna (2003), Accordi di Programma per la mobilità sostenibile per il 2003-2005 e per i servizi minimi autofilotranviari per 2004-2006 relativi ai bacini di Piacenza, Parma, Reggio Emilia, Modena, Bologna, Ferrara, Ravenna, Forlì-Cesena, Rimini. (Framework agreements for a sustainable mobility for 2003-2005 and for the minimum trolley bus services on offer for 2004-2006 for the areas of Piacenza, Parma, Reggio Emilia, Modena, Bologna, Ferrara, Ravenna, Forlì-Cesena, Rimini).

Righetti F., REDAS (2001), "Studio per la quantificazione e la caratterizzazione, in base alla movimentazione, della domanda di spostamento indotta e gravitante sul territorio comunale di Vicenza, Bologna" (Study for the identification and quantification of the demand for travel induced and possible on the districts of Vicenza and Bologna).

Trevik T. (2002), Urban road pricing in Norway: Public acceptability and travel behaviour, Conference MC ICAM (Marginal Cost pricing in transport project -

Integrated Conceptual and Applied Model analysis) "Acceptability of Transport pricing strategies", Dresden, 23-24 May 2002

Van Bisbergen A., Visser J. "Innovation Steps towards efficient Goods Distribution Systems for urban Areas", TRAIL, Delft University Press

Vej & Park og Parkering København, Bygge- og Teknikforvaltningen e The Municipality of Copenhagen (2003), Progress report for the City Goods Experiment, September 2003 (http://www.city-gods.kk.dk/english_summary.html).

Whiteing A. E., Edwards S. J., "Urban freight trans-shipment facilities: a European comparative study", Department of Transport and Logistics, The University of Huddersfield.

Main visited sites

www.alter-europe.org.uk/index.htm
www.bestufts.net
www.brotunnel.no
www.cclondon.com
www.citygods.kk.dk/
www.clearzones.org
www.comune.ancona.it/ancona/

www.comune.bologna.it/
www.comune.brescia.it/default1200.asp
www.comune.cesena.fc.it/cesena/info-news/index.asp
www.comune.cosenza.it
www.comune.ferrara.it/
www.comune.firenze.it
www.comune.forli.fo.it/
www.comune.genova.it/index.jsp
www.comune.lucca.it
www.comune.modena.it/
www.comune.parma.it/
www.comune.piacenza.it
www.comune.ravenna.it/1024.htm
www.comune.rimini.it/
www.comune.roma.it
www.comune.siena.it
www.comune.taranto.it
www.comune.terni.it/home.asp
www.comune.udine.it/opencms/opencms/release/ComuneUdine/index.html
www.comune.vicenza.it
www.eltis.org
www.eurocities.org
www.fjellinjen.no
www.leg-brandenburg.de
www.london.gov.uk
www.miljobilar.stockholm.se
www.municipio.re.it/retecivica/urp/home.nsf
www.progress-project.org
www.roadtraffic-tecnology.com
www.stadtentwicklung.berlin.de
www.stockholm.se
www.transport-marchandises-en-ville.org
www.trendsetter-europe.org
www.ivv.tuwien.ac.at/projects/prospects.ht