A state of the art on urban freight distribution at European scale

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1. Introduction
The transport of goods assumes a role of great importance in the transport system and, in general, in the economic system, because it represents a component of particular relief in the process of development of the economy.
So, a research in depth is needed to know its peculiarities to reduce to the maximum the negative effects of the transport.
Today the European transport system must solve several major difficulties:
• unequal growth in the different transportation modes; road haulage now makes up 44% of the goods transport market compared with 41% for short sea shipping, 8% for rail and 4% for inland waterways;
• congestion on the main road and rail routes, in towns, and at airports;
• harmful effects on the environment and public health, and the heavy toll of road accidents (White Paper, 2001).
In recent years, in the industrialized countries, studies on urban freight movements have increased because freight transport is a major source of traffic congestion and nuisance including air and noise pollution and have adopted several approaches. In France, the emphasis has been on large-scale data collection exercises (Routhier et alii, 2001); in Germany emphasis has been placed on piloting city logistics schemes (Kohler, 1999; Meimbresse and Sonntag, 2000); in the United Kingdom recent studies are directed to define a methodological framework to comprehend the urban goods movements and a specific study was carried out to investigate the policy measures and company initiatives and how they can change the goods flows and goods vehicle activities in different types of
urban distribution operations (Allen et alii, 2003, Browne et alii, 2001); in Japan the research focus has been on investigating the use of computer routing and scheduling systems in conjunction with dynamic flow simulation to improve the efficiency of operations (Taniguchi and Thompson, 1999).

To manage and control the urban freight transport it is very important to have models and tools to simulate the system. One of the first studies on urban freight movements is provided by Ogden (Ogden, 1992). He presents the first classification of urban freight models, reviewing models which have been actually developed for each freight type. He also reports the first results of some case studies in many cities of the world, especially cities in the USA and Australia.

A general framework for freight demand models is given by Garrido and Regan (2000); an international comparison of methods developed and results obtained in urban goods movements is made by Routhier et alii (2001).

The models for analysing the demand for urban freight transport could be classified into several classes: gravitational models, similar to those used for urban passenger travel analysis (Hutchinson, 1974; Ogden, 1992; List and Turnquist, 1994; Taylor, 1997; Fridstrom, 1998; He and Crainic, 1998; Gorys and Hausmanis, 1999); input-output models by Harris and Liu (1998); spatial equilibrium of the prices (Oppenheim, 1994).

These models have not a connection with measures and are not integrated with urban passenger models that have had a great development.

In the paper, three main states of the art are developed. The first main state of the art regards the projects developed in Europe. The second main state of art regards the measures developed in different cities and dimensions. The third regards the models and tools developed in Europe to analyse urban freight transport.
2. Projects

In the 1998 the Fifth Framework Programme (FP5) set out the priorities for the European Union's research, technological development and demonstration (RTD) activities for the following four years.

Within the key Action “Sustainable Mobility and Intermodality” the European Commission (EC) established the thematic network on Best Urban Freight Solution (BESTUFS) in January 2000 with a duration of 4 years. The initiative wanted to make a collection of all initiatives and projects already existing and all their results in Europe rather than starting new research activities.

The main objectives of BESTUFS are:

- to create a permanent and dynamic concentration activity during the period of the 5th Framework Programme;
- to identify and structure the various themes which build the urban freight solutions (UFS) domain and which have relations and influence to it;
- to present projects and best practices;
- to support the clustering of projects on European level and to integrate projects and clusters into the network;
- to collect, compare and summarise available experiences and results of projects and initiatives in the UFS domain mainly for Europe but also if easily obtainable - for the USA and other countries;
- to identify and describe best practices and success criteria within the UFS domain;
- to disseminate experiences, project relations, best practices and success criteria to a broad public of interested actors, thereby aiming at the transferability of solutions;
- to establish links and co-operations with relevant other thematic networks (treating different themes) on European level in order to share and integrate the results (regarding overlapping themes) and to avoid duplication of work;
- to establish links and co-operations with national thematic networks (treating the UFS domain) in order to share and integrate results;
- to support the co-operation between actors in the UFS domain by providing information and by providing contacts (Egger and Ruesch, 2003).
In 2004 the second edition of BESTUFS will begin. It will increase broad geographic coverage/provision and dissemination of guides about best practices in different languages, quantify urban freight solutions to EU policy objectives, and review existing urban freight transport models and data structures. Thus, it aims to collect the models developed in European countries; from BESTUFS I it emerged that it is necessary to have tools for the design, assessment and control of urban freight transport systems, thus simulating with the use of models what the system state will be once the new scheme/practice is adopted (Wild, 2003).

Within the FP5 in subprogram “Competitive and Sustainable Growth” there are other projects linked to urban goods transport such as “Co-ordinating Urban Pricing Integrated Demonstrations” (CUPID), “Thematic Network on Freight Transfer Points and Terminals” (EUTP II), “MObility management STrategies for the next decades” (MOST), “PRicing REgimes fOr inteGrated SuStainable mobility” (PROGRESS), “Open framework for Simulation of transport STrategies and Assessment” (OSSA), “Remote mEasurement of Vehicle Emissions At Low cost” (REVEAL), “Effects on Transport of Trends in Logistics and Supply Chain Management” (SULOGTRA).

Important projects are included into the CIVITAS Initiative and INTERREG III. Concerning Clean Urban Transport demonstrations will start in 2001 as a result of the CIVITAS Initiative (CIty -VITALity -Sustainability ), which was launched in 2000 by the European Commission. CIVITAS Initiative supports cities in introducing and testing bold and innovative measures to radically improve urban transport. CIVITAS represents an integrated approach to Clean Urban Transport combining: alternative fuels/energy efficient vehicles and urban transport policy measures. Many European cities are participating in CIVITAS pilot projects combating congestion and pollution through technologies and measures that range from the introduction of new information and transport management systems to the promotion of "clean" vehicle fleets for passengers and goods. There are 19 cities involved in the initiative and they cooperate within four projects: VIVALDI, TELLUS, TREND SETTER and MIRACLES.

Now CIVITAS II is starting with many new elements respect to the first initiative.
INTERREG III promotes transnational co-operation on spatial development between national, regional and local authorities and a wide range of non-governmental organisations. The objective is to achieve sustainable, harmonious and balanced development in the Community and better territorial integration. It is directed to have systems more efficient and sustainable, there are some important projects on urban freight transport: City Ports and MEROPE.

The main objects of City Ports is to develop, experiment and diffuse a common methodology for the analysis, design, feasibility evaluation and implementation of integrated “city logistics solutions”, minimizing times of implementation and projects risks, the process will be shared among a wide network of medium size cities of the Central Europe, Adriatic, Danubian, South-Eastern European Space (CADSES), rather than the single technical solutions. Main interest topics are the development of integrated measures and the definition of a general methodology for the evaluation of their feasibility and sustainability. City ports regards the establishment of a network of pilot projects on freight distribution in urban areas. The Country involved are Italy (with the cities of Ancona, Brescia, Lanciano, Lecce, Milan, Padova, Parma, Perugia, Ravenna, Rimini, Taranto, Udine, Venice, Vicenza), Austria (with the cities of Graz and Wien), Greece (with the cities of Athens and Kavala) and Slovenia (with the city of Ljubljana).

The MEROPE projects regards the study and development of models and telematic tools for management and control of mobility and logistics in urban and metropolitan areas. The cities involved have different characteristics in relation to dimension, geographic position and socio-economic aspects. The countries involved are: Italy (with the cities of Siena and San Gimignano, Lucca, Florence, Piacenza, Modena, Genova, Terni, Rome, Pozzuoli, Cosenza), Spain (with the cities of Seville and Maiorca), Marocco (with the city of Marrakech).

An other important European initiative is the Freight Integrator Action Plan. This initiative aims at making full use of the potential of intermodal solutions, and the Commission is considering four areas of action: improve knowledge, awareness and understanding of intermodal transport; simplify intermodal transport through further standardisation; foster the commitment and co-operation of transport users; clarify the responsibility and accountability in intermodal transport.
3. Measures

Like said before and from the analysis of European projects, in these days we have a growth of research on urban distribution but little of these works have been concerned with examining the impact of measures on goods vehicles operations. The measures can be classified into several classes:

- unit of transport, load and handling;
- infrastructure;
- telematics and
- management.

The measures on units of transport are on emissions, weights and space. This has implied the use of no emission vehicles (tram, electric vehicles, etc.).

The infrastructural measures can be classified into three classes: nodal, as Fright Village (focus on bi- or multimodal transport), Freight Platform (areas with different transport related companies) and Urban Distribution Centre (place of transhipment from long distance to short distance traffic).

The main measures on telematics can be aggregated in: traffic information, freight capacity exchange system, route optimisation services, vehicle maintenance management system, other information services through internet access, centralised route planning, route planning.

Finally the measures on management. We can have measures on: access time, heavy vehicles network, road-pricing, maximum parking time, maximum occupied surface.

In some metropolitan cities some of these measures have been implemented, for example in Barcelona the main measures introduced regard the truck weight for city access, Urban Freight Platform, spaces for loading and unloading operations and some roads reserved to truck traffic. A centralised route planning and an access system were developed to manage the freight urban transport. In Paris, the measures regard the definition of space for loading and unloading operations, the maximum occupied surface for city access and the realization of a centralized route planning. In Rome, Urban Freight Platform and a
centralised route planning were implemented. In London a centralised route planning and road-pricing were developed.

4. Models and tools

Freight demand models are one of the key components of transportation planning at the strategic, tactical and operational levels. Public agencies need to forecast future transport needs for both people and commodities in order to provide the infrastructure and human resources that make such movement possible. The private sector needs forecasts of demand for transportation services in order to anticipate future financial commitments, equipment acquisition and labour requirements (Allen et alii, 2003).

About tools to support the urban planner some DSS were developed. These tools were been developed on foreign models and in depth papers are not available.

In France, a statistic-descriptive model, called Freturb®, was developed. It allows the number of vehicles attracted by each traffic zone to be obtained. This model, starting from the socio-economic data of each traffic zone of the study area and using the results of surveys carried out in French cities, allows us to obtain the vehicles required for restocking in each traffic zone (Gerardin et alii, 2000).

In Germany in the cities of Berlin, Munich and Hamburg data acquisition and data analysis regarding urban freight transport were carried out to develop an tool for commercial traffic on roads for city planning calculation. The tool (WIVER®) provides the basis for different scenarios and measures and it recognises the complexity of trip chains for commercial freight traffic. In 2003, the WIVER® approach was transferred by Lohse (Boyce et alii, 2002; Lohse, 2001) to a general framework backed up by a system theory and included in the software program VISEVA® at the Technical University of Dresden (Friedrich, 2003).

In the Netherlands, a tool called GoodTrip® was developed to evaluate urban goods movements. It is a tool to evaluate different steps of urban freight distribution using geographical, economic and logistical data. It is based on logistical chains and estimating goods flows, urban freight traffic and its impacts and was applied in the city of Groningen to evaluate the impacts on the city of different freight distribution alternatives (Boerkamps and Van Binsbergen, 1999).
Regarding urban freight demand models, they appear to have been developed to simulate the restocking process (from warehouse to shop). These models developed have some limitations. They do not start from end-consumer and thus it is impossible to consider the connection with passenger models. Indeed, the models were developed to analyze mainly the restocking process of urban activities and so it is impossible to analyze the complexity of urban transport systems. In Italy, another model system is being developing. The first results have been presented in different contexts and the models needs experimentation in real cases. It starts from end-consumer demand and is integrated with passenger models. This freight transport multi-step model concerns a medium-size city and considers a disaggregated approach for each decisional level (Russo and Comi, 2003a, 2003b).

References


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