4. Effects

4.1 Results of the projects

In the Vejle project each of the 17 means were evaluated and their environmental effects were calculated. Most of the means proved efficient and viable and would be suitable for important segments of the urban goods transport. On an urban scale, however, each measure showed rather limited environmental effects. One exception was identified, however, namely the co-ordination and consolidation of goods transport, which showed a substantial theoretical potential for reducing goods transport and thereby improving urban environment.

The Aalborg project showed that urban freight transport can be divided into four groups:

- Transports which already are efficient or may be rationalised by the company on its own
- Transports which may be rationalised by means of a City Logistic company
- Transports which only with difficulty may be rationalised
- Transports which cannot be rationalised

Figure 4.1 below shows the distribution of the total freight transport by these four groups.

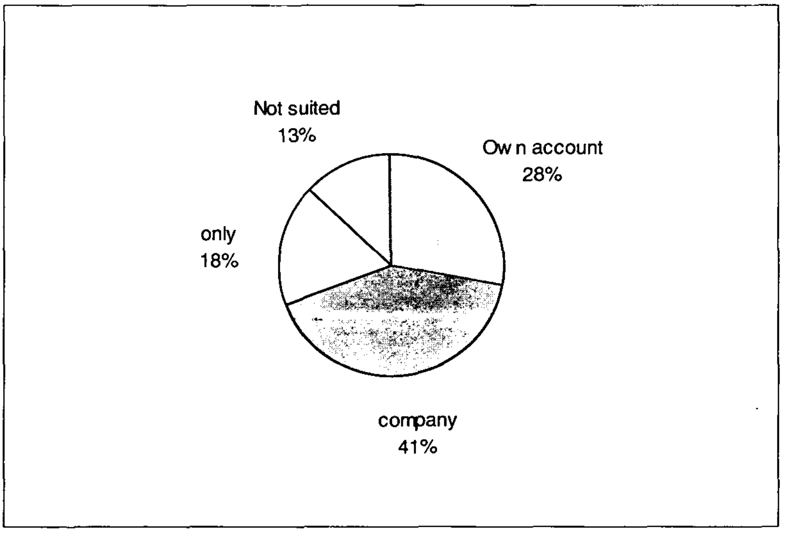


Figure 4.1 Potential for City Logistic in Aalborg

Model calculations showed that if City Logistics is implemented, the emissions from freight transport may be reduced by some 10-20%. In economic terms this corresponds to a benefit to society of ECU 0.8-2.5 million per year, using unit costs established by the Danish Ministry of Transport.

Also the transport companies involved will obtain savings, as the driven distance and the driving costs may be reduced by some 10-20%. For a city of the size of Aalborg this corresponds to a reduction of the annual freight traffic by some 6-13 million kilometres. This involves a reduction in vehicle operating costs of ECU 5-12 million per year. However, this saving is distributed on a large number of companies, each of them obtaining a small benefit.

The Copenhagen project has not provided results yet. However, it has evidently showed that a labelling scheme would need legal measures on a national level. Furthermore, labelling in various cities should be co-ordinated in order to ensure equal criteria for vehicle types.

4.2 Conclusions

The main conclusions of the Danish projects are that there is a considerable potential for reducing the freight transport and its environmental effects. However, many companies are very reluctant to change their transport patterns, even though they can obtain financial benefits. The main concerns of the companies are the competitive and service-related aspects.

Labelling schemes - as defined in the Aalborg project - have not previously been implemented. There is, therefore, the need to test the viability of such scheme through demonstration projects. Through such demonstration the practical, legal, organisational and financial aspects may be explored. Also, the requirements for the companies to document their transports and the required control procedures to be implemented by public authorities could be developed through a demonstration project. The project should be implemented in close collaboration between the city authorities, the shippers and receivers of goods, and the transport companies.

The establishment of adequate City Logistic companies could also be part of the demonstration. Particularly an adequate ownership structure and organisation structure would need to be developed and the market potentials would need to be determined.

The demonstration would require careful planning and preparation, and the local community should be fully involved in the planning process. The duration of the demonstration would probably have to be minimum 3 - 4 years in order to allow the market to adapt to the new conditions.

The demonstration would have to be carefully monitored and evaluated in order to draw experience for the subsequent use in other cities.

COST 321

National Report

FINLAND

Jorma Nummenpää
Plancenter Ltd
Consulting Architects and Engineers
HELSINKI

Table of Contents

1. Introduction 117

2. Development Strategy for Goods Transport in Helsinki 117

3. Viewpoints of the Interest Parties 118

4. Development Measures 121

5. Ongoing Studies of City and Regional Logistics 122

6. Contact Persons 124

7. Appendix
Description of Helsinki City and Region 124

1. Introduction

The City of Helsinki and the Ministry of Transport and Communications of Finland have prepared a development program for various transport modes and goods transport. Description of the transport structure in Helsinki is shown in annex.

Development of goods transport aims at transporting the goods from the producer to the point of arrival with an expedient means of transport through the shortest possible route with lowest possible costs in such a way, that the need of ground area as well as social and environmental costs remain optimally low. The more effective goods transport the lower environmental adverse factors.

Realisation of this aim requires a goods transport development strategy defining those objectives and measures necessary for improving the operational conditions of goods transport and operability of urban environment.

2. Development strategy for goods transport in Helsinki

Development strategy for the goods transport in Helsinki contains the following objectives:

- Sufficient and reasonably transport services are guaranteed to the business sector.
- Everyday environment and goods transport possibilities of the local residents will be improved.
- Economy and effectiveness of transport will be improved.
- Necessary terminal capacity will be provided on the areas needed by the transport sector.
- Goods transport planning will be introduced as a permanent part of zoning and transport planning.
- Control systems improving the total logistics will be developed and cooperation will be increased between the interested parties.

3. Viewpoints of the interested parties

Enterprises need to have available sufficient amount of transport capacity and equipment as well as information required by development of their logistics. Enterprises need to be able to freely select the transport mode and company they will use.

Every enterprise needs goods delivery, at least in some extent. Type of these needs depends on the field of business and location of the enterprise. As seen from the enterprises viewpoint, transport sector is divided into acquisition transport, internal transport and delivery transport. Goods transport is increasingly engaged to the demands of business life. Demand requires fast, frequent and reliable deliveries, real-time information about the progress of the goods, maintenance and instalment services as well as storage space for special needs.

It is important for the customers to have their products and services available, where they feel their existence as necessary. Sufficient services for goods transport needs of private individuals will be organised and maintained.

Local transport holds the greatest significance from the viewpoint of local population. Regional development of shopping possibilities and other services depends largely on local transport. Local population feels it important to have a large scale of alternative shopping services to choose from on such areas, where mobility is as easy as possible.

During urban area planning, purposeful location of residential areas and services must be supplemented by development principles for goods transport.

Goods transport must remain efficiently operable with as low overall costs as possible.

Slightly less than 60 % of deliveries in Finland are taken directly from the industry to the retail stores and the remainder is delivered through wholesale trade. Delivery costs are often included in the price of the product. They don't focus in such cases directly the customers of transport services, which partly increases unbalanced demands of quality and level and does not encourage rationalisation of operation.

Enterprises may rationalise their transport by reducing their frequency, which enhances the size of individual consignments. However, frequency of deliveries is an important competitive factor, which leads into developing the rationalisation with other means; route planning, cooperative usage, selection of transport equipment etc. It is important to keep on negotiating, planning, informing and arranging between the consignee, transporter and consignor.

Sufficient terminal capacity is necessary and it shall be located in the right places. Interchanges with street and road network must be planned with the terms of heavy traffic. Right location of the terminals reduces also the total volume of traffic.

Urban areas are traffic hubs, where complicated goods traffic flows move around. Also various transport modes meet in these hubs: shipping, road, railroad and airborne transport. Different types of transport are parts of multifaceted logistical systems and they form multi-phased operational chains together with terminals and storage operations.

International arrangements have effect to local conditions and problems and vice versa. Urban goods transport is very vulnerable to problems, since it is a fast-growing and space-needing sector in already overflowing cities. Local transport, domestic and international long-distance transport as well as regional and local business lives are seen here as participants with varying interests.

Goods transport planning needs to be a solid part of land use and traffic system planning. Operational requirements of goods transport shall be observed in road and street planning as well as interfaces of terminals and ports to the general traffic network.

Solutions made in land use planning may have essential effects to direct and indirect costs of goods transport. In addition to traditional terminals located on the edge of urban structures, delivery terminals to be located either at the city centre or in the close proximity of the city centre will be necessary.

Among other things, the following facts need to be observed is goods transport planning:
- location and quality of employment
- location of residential areas and other consumer areas
- future of various branches of business life

- interrelationships of the key areas: ports, road transport, railway transport, terminals, storage sites
- urban development strategies
- protection of the environment

We aim to locate the operations in such a way, that the goods transport mileage becomes as low and traffic smooth-running as possible. This way the traffic-related environmental hazards remain as small as possible.

Working control systems of the companies are an essential requirement for an effective management of goods flows between different transport modes and companies. Control systems also help to support flexible and total economy-related development of the companies.

Effective management of material flows of the companies requires still more data processing and assessment of economic alternatives. This total concept has been called since the middle of 1980's as logistics.

Logistics means systematic management and control of material flow entering a company, moving inside it and leaving it as well as related information flow and physical delivery of material flow from the supplier of raw material through the raw material storage, processing phase and storage of completed products to the final consumer.

Increased effectiveness of transport decreases environmental hazards, especially on residential areas. Development towards more environmentally friendly equipment is supported.

Controlling of exhaust gas emissions which has applied to heavy vehicles with diesel engines since the beginning of 1995, as well as more environmental friendly fuels, have decreased the amount of nitrous oxides. The most commonly exceeded maximum standard value defined by the Council of State is the one of aerosol particles. Large particles, such as street dust raised by the traffic, has the greatest effect to these aerosols.

Size of the noise hazards is enhanced by noise emissions from the vehicles, traffic volume, driving speeds, location of traffic routes, qualities of traffic routes and measures to prevent the noise from spreading around. The Council of State made in 1992 a decision on standard values of environmental noise. Standard values apply to noise prevention and safeguarding of the pleasantness of the environment in planning of land use, traffic and construction as well as in granting of construction permits.

Effective goods transport is more environmentally friendly than ineffective transport from the viewpoint of overall effects. Environmental impacts of transport have various levels: developing an environmentally friendly logistical system, constructing environmentally friendly transport chains and using environmentally friendly vehicles.

Continuous cooperation between the different parties is necessary for creating a good total result. Goods transport research and development is a necessary support for planning.

Optimisation of the entire transport system can be carried out only by realising several development measures simultaneously. Impact of a single measure to the goods transport is insignificantly small.

Research and development work require local cooperation, through which information can be delivered, discussions arranged and opinions mapped. Business life people, city authorities and goods transport entrepreneurs should all participate in this cooperation. Working groups, which ought to be founded in cooperation, would support innovative products and development plans. Participation in European cooperative projects on goods transport supports also local cooperation.

4. Development measures

This chapter observes development measures seen as necessary for realisation of the goods transport strategy. Realisation methods of the measures have not been singled out at this phase.

I. Goods transport in urban planning:
Forming of a goods transport planning unit.

II. Goods transport in ports:
Operational conditions of the goods transport in the ports will be improved.

III. Terminals and areas reserved for goods transport:
Conditions will be created for arranging open delivery and long-distance terminals in Helsinki. Stopping and night parking sites for swap bodies and other transport equipment will be zoned.

IV. Route and equipment planning:
A route map serving needs of delivery route planning will be made about the Helsinki Metropolitan area.

V. Coordinated delivery and collection:
Common deliveries shall be encouraged, resulting in reduced traffic volume and transport costs.

VI. Increasing the cooperation:
Dialog procedure and cooperation in developing the operational requirements of goods transport shall be increased.

VII. Goods supply plans:
Applications for construction permit require the real estate to have a goods supply plan.

VIII. Loading and unloading squares:
Practice of using loading and unloading squares by the streets shall be improved.

IX. Vehicle technology:
Use of environmentally friendly "city-vehicles" shall be increased.

5. Ongoing studies of city and regional logistics

Preparations for a development project City and Regional Logistics commenced in September 1996. The final report including a feasibility study and pilot projects will be completed by the end of 1997. The project is financed by the participating organisations: important customers for small lot deliveries, industrial and commercial enterprises, suppliers for data communication and logistic control, cities and regions as well as the Ministry of Transport and the Ministry for Environment.

The aim of the project is the definition and pilot scale implementation of new logistic functions that will reduce traffic and its disadvantages. The new functions should also be cost effective and offer high level of service to the participating organisations. The activities selected are:

- Concentration of the material flows:
  For small lot deliveries trade and industry will use the services of specialised logistic service companies. This will enable the concentration of ordering, delivery and invoicing.

- Development of neighbourhood services and filling of service gaps:
  New modes of logistic services will be offered for special groups in the rural areas and remote suburbs.

- Sustainable development of logistic networks:
  The project concentrates in analysing and modelling the present and alternative logistic transport networks. The topics include non polluting vehicles in city centres, low pollution vehicles for transport between district terminals and city centres and combined road rail transport. New pricing policy for logistic operations is examined in order get a precise cost recovery.

The project aims, through enhancing the cooperation of different actors in distribution, to find new and more sustainable operational procedures. The point of view is that of the customers and consumers. Distribution of goods and services to customer groups and districts will be combined. The logistic operations will be brought closer to the customers and consumers.

The project will concentrate on the 20 percent of flow of materials that cause 80 percent of the traffic measured as number of vehicles and stops for delivery. The smallest material flows will be combined in order to get the benefits of scale. Examples of the neighbourhood services are walking distance collection points for goods ordered by electronic communication, combined limited choice service points including e.g. postal, kiosk, pharmaceutical, household assistance and library services. In rural areas the project includes the regular conveyance of passengers and a collection point for small scale producers.

The main focus will be on foods and perishables. Other important groups are clothing, household appliance and furniture.

The project financiers form a control board, smaller work group meeting are held weekly. The following are examples of the participating organisations; all cities in the Helsinki metropolitan area, a leading dairy enterprise, two large bakery chains and local as well as nation-wide logistic enterprises.

6. For further information, please contact following persons:

Plancenter Ltd
Mr. Jorma Nummenpää
Phone + 358 9 156 41
Direct + 358 9 156 4268
Fax + 358 9 145 150
E-mail int@suunnittelukeskus.fi

ELC Finland - MH-Konsultit Oy
Mr. Erkki Timmerbacka
Phone + 358 9 469 7500
Fax + 358 9 4520 3399
E-mail erkki.timmerbackka@elcfinland.fi

City of Helsinki
Mr. Heikki Salmivaara
Phone + 358 9 1691
Direct + 358 9 169 3456
Fax + 358 9 169 3778

7. Appendix

Description of Helsinki City and region

	Helsinki City	Helsinki Region
Settlement Structure		
Importance of the city for the region	The Capital of Finland, the regional centre	
inhabitants	532 000	906 000
gainfully employed individuals	222 500	381 300
employees	264 500	456 000
surface area (m^2)	185	743
settlement density (inh./km$^{2)}$)	2 873	1 219
ratio between gainfully employed individuals and employees	84	84

Traffic infrastructure		
number of motor vehicles		
cars (high vehicles):	162 000	297 000
trucks/HGV (heavy vehicles)	3 600	6 000
vans	15 000	25 000
traction engine	1 500	2 500
number of cars per head of population (cars per 1 000 inh.)	304	324
length of the road network (km):		
classified road network	65	
urban road network	1 000	
integration in the highway and trunk road network	1, 3, 4, 7, 45, 50, 51	1, 3, 4, 7, 45, 50, 51
level of urban public transport service	local train, underground, tram, bus	local train, bus
integration in the national railway network	+ local train	local train
location of a waterway	Estonia, Russia, Europe, overseas, coastal sea transport	
existence of a port/harbour	sea port	
existence of an airport	national airport	internat.airport
number of passengers per year (mio.)	2.3	5.5
volume of goods transport per year (1 000 t):		
freight	5.5	72.5
mail	3.3	10.0
Transport / Traffic demand structure		
total trip volume per day		
volume of person trips with public transport and private traffic:	500 000	727 000
cars	400 000	1 173 000
trucks/HGV		60 000
Vans		110 000
volume of goods traffic per year (1 000 t):		
road network		48 600
railway		1 100
inland navigation	-	-
ocean navigation	9 600	
aircraft, freight + mail		78.0 + 13.3

motor vehicle kilometres covered in the road network per day:		
car kilometres	5.22	11.00
truck kilometres	1.03	2.2
motor vehicle dwell time in the road network per day:		
dwell time of cars	1 411 100	200 000
dwell time of HGV	27 800	45 000
air pollutant emission due to motor vehicles per day (kg/d):		
fuel consumption	512 000	105 800
CO	52 000	98 800
Particles	1 100	2 200
NOx	17 100	35 600
CH	8 200	23 100
average mobility rate	3.2	3.2
number of in-commuters	115 100	
number of out-commuters	37 500	
in-commuter/out-commuter ratio	3.07	

COST 321

National Report

FRANCE

September 1997

JF. FRITSCHE / CERTU
JG. DUFOUR / DRAST
Ministry of Transport

Tables of contents

1. Introduction 129
1.1 Overview 129
1.2 French contribution to COST 321 130

2. Environment 130
2.1 Reglementary frame 130
2.2 National policies 131
2.3 Local policies 131
2.4 Number and types of cities 132

3. Measures 132
3.1 Projects 132
3.2 Models used and simulation 134

4. Effects 138
4.1 Results of the projects 138
4.2 Conclusions 138

5. Annex 140

6. *Model presentation : Application of the FRETURB model in Bordeaux* 143
6.1 Prelude 143
6.2 Objectives of FRETURB model 144
6.3 Empirical Data necessary for calibration of the model on cities 144
6.4 Structure of the model 145
6.5 Simulation "controls" 145
6.6 Outputs of the model 146
6.7 The specificity of the cities 146
6.8 Current results of realisable simulations 146
6.9 Limits and specificity of the model 147

1 Introduction

1.1 Overview

Urban freight transport is a really important issue, but a very intricate one. Important, because it represents the terminal link of logistic chains, and the highest part of transport costs. It is very complex too, because of the multiplicity of actors, each with conflicting logics, and interfering with nearly all others urban fields (urbanism, traffic, economy, environments...). Complexity is also a result of the « distance » between private economic logics of the private actors (transporters, retailers, shopkeepers...), and the tools available for the public sector actions.

Since the beginning of the '90, a new issue has been coming up upon the impact of goods flows in the organisation and operation of the cities. During the seventies, this problem was studied only in the view of minimising the constrain draw by the deliveries to the private cars traffics. These works were closed in the final years of the '70 by a pessimist but realistic conclusion "If we only endeavour to maximise the flow of private cars by a rationalisation and a regulation of delivery operations, all other things remaining equal, the problem has no solution, and, over all, has no interest at all".

But, in the same time, the cities were faced with a growing strain from the traffic. In that context, the question of urban freight transport is emerging again, with a new problematic, not only focused on trucks flows. The new goal becomes to :

- understand, for a better control, urban flows of people and;
- goods generated by the economic activity of the city.

This problematic allows us to point-out the heavy interdependency between the goods flow and the economic activities of the city. The central point is not the goods flow by itself, but the activities which generate these flows. This problematic obliges us to keep in mind that the very focus of this research is, above all, to allow a fairly good economic development, but respectful of the non-economics functions of the city. And, last but not least, it emphasise the need for comprehension. Indeed, the biggest problem, before any action, was a nearly total absence of data, analysis, and description of urban goods flows. But there is one drawback with this problematic, it doesn't focus on the link between the flows inside an agglomeration, and the modal split of inter-cities flux.

This problematic draw-up several implications. In general, we account for the need to understand the determinants (both internal and external), and the constrains of this system, i.e., to understand why a logistic chain is organised in such a way, and what are the logics underlying this organisation. We need also to understand the "freedom margin" of the different actors, the elements on which a collectivity can acts upon, and what are the consequences (not only on the transport field, but on all the activities and structures of the city life, on short and long term).

1.2. French contribution to COST 321

French contribution to COST 321 program is principally made by :
Participation in the management committee
Brochures and other information
Chairmanship of Study Group A, from July 1996
Participation in study group
French report at the 6th meeting, May 14, 1996: " Surveys and modelling in urban freight transport: a French contribution to simulation tools ".

2. Environment

2.1 Reglementary frame

France presents the particularity to have 4 levels of territorial organisation: The State, the Regions, the Departments, and the Communes. Each level has its own competencies for the organisation of transports. In the very field of urban freight transport, the situation is one of a nearly "invisibility" from the juridical point of view. It is only with the recent law on the quality of the air (Loi sur l'Air et l'utilisation rationnelle de l'Energie), of December 30th, 1996, that the urban freight transport is gaining some specificity, and some legal existence.

The State determines the general frame by editing laws and acts (Code of transport, code of commerce, code of working...), and by economic directives. The State also has a determining action for territorial planning, particularly in the field of transportation infrastructures (Motorways, high speed train...) The State action is also made trough contractualisation (Contrats de Plan) with the others territorial levels, specifically for the building of transportation infrastructures. The Regions are responsible for passengers transport in their territory (trough contracts with the railways corporation -SNCF-). Departments are responsible for local roads, and the

Communes have the responsibility of local policies for traffics and parking ("Pouvoir de Police du Maire" - Mayor Police Power). We must point-out that the Police Power of the Mayor is not transferable. The Mayor of a Commune can't transfers, in anyway, his police power to an other entity (District, or urban community). This fact is a serious drawback for a co-ordinated action in the whole territory of an urban area.

2.2 National policy

French national policy, for the freight transport in general, is characterised by two facts. The first is a will to net the territory, in such a way that no point will be at more than 50 km (or 30') from a Motorways. The second point is a strong support "de facto" for road freight transport, trough a under-taxation of fuel oil. In the topic of urban freight transport, the action of the French State is twofold :

- A direct action, via an ambitious research programme
- Agreements with test cities, for implementing and evaluating experiences, in two principal fields : new organisation for urban freight, and new materials.

2.3 Local policies

In general, the interest of the Communes for urban freight transport is quite new. Until recently, this question was viewed only from a traffic engineering point of view, and the goal was only to limit constraints draw upon the car flows by trucks. It is only since the beginning of the '90 that this question had been widened to others aspects such as urbanism, city planning, Environment. The founding event for a new interrogation was the vote of the act for the quality of the air ("Loi sur l'air et l'utilisation rationnelle de l'energie), by the French Parliament in December 30th, 1996. The law modifies the "travel master plan" (Plan de Déplacements Urbains). Now these plans are mandatory in every urban area with more than 100 000 inhabitants, and must take into account the freight transport flows. This, in turn, induce a new global approach. Cities do not more think only in term of constrains, but more in term of the sharing of a more and more scarce resource, the urban space, between several actors, with conflicting logics. Furthermore, some cities have recently launched test-projects for improving urban freight delivery.

2.4 Number and types of cities

France is quite scattered, with 36.570 Communes, each with its own responsibility for circulation and parking policies. Urban areas in France regroup 43 millions inhabitants (from a grand total of 57 millions), on 29 % of the area (and accounting for 36 % of the total number of Communes) The biggest Commune is Paris, with 2.3 million inhabitants. Of the 361 urban areas (ZPIU), only 73 have more than 100 000 inhabitants, and 9 only more than 500 000 ! Taking in mind the population growth, the most dynamic areas are the suburban Communes. Between the last two census, they grew 50%, from 6 to 9 millions inhabitants. This spatial organisation induces some specificities for passengers and goods flows, with a stagnation of traffics from, and to, centres cities, but with a steep growth of traffics between suburban areas in a same urban area. In the same time, the major part of the new jobs is taking place in these suburban Communes. In this way, French urban growth is much more characterised by a spatial stretch than by an improvement of central functions. An other specificity of French urban areas is the importance of big shopping centres at the periphery of the cities. At first glance, that organisation looks good for it limits the number of trucks entering the cities-centres, but, in reverse, it induces a great number of private cars flows to and from these shopping centres. It seems that, from a traffic and environmental point of view, such an organisation induces negative global effects (in comparison with a development of city-centre commerce).

3. Measures

3.1 Projects

It is only since the 1993 that the State had decided to launch a long term action to improve urban freight transport. This action is incorporated in a major reflection upon the future of the city, and the growing question about environment. This program is a co-operation between the French Ministry of Transports and the French Agency for Environment and Energy Saving (ADEME). It has a threefold aim:

- To establish the more comprehensive data base upon the different aspect of the urban freight question, and to make that the accumulated knowing would be disseminated to the local actors.
- To develop enquiry methods, and to appraise the impacts of actions (impacts not only on the very field of urban flows, but on every aspects of the city life and development).

- To promote and estimate experiences, i.e., concrete actions in the juridical, technical, and economical fields, in tight co-operation with local authorities and actors of the transport (transport companies, retailers, shopkeepers...).

The action of this program is aimed to four categories of actors :
- Government Agencies (transportation, planning, regulation, economy)
- Local authorities (Communes, Departments, Urban Districts)
- Freight olders (transhippers, receivers)
- Transporters (transport companies and own transport)

Five key sectors have been identified for action :
- New organisation of logistic chains (with the development of urban freight platform, consolidation of upstreams, new organisation of the stocks, development of transport companies, by contrast to own transport).
- New urban organisations (densification of urban areas, revitalisation of city-centres, development of areas better fitted to deliveries, street accommodation, development of city-centre shopping).
- New regulations, better fitted for urban freight.
- Development of inter-cities co-operation in a same urban area.
- Development of new technologies (Information technologies, new transport, and manipulation materials).

These sectors are not exclusive one to each others. Unlike that, a efficient action need the integration of various measures from the various fields. One of the most important task of the French national program is, indeed, to assure this integration, to be sure that various measures from various would result in a comprehensive and efficient action, with a real bettering of the city live (and not only a bettering of the freight transport alone). Such a problematic put the strain on the necessary comprehension of mechanisms and determinants of the organisation and evolution of urban logistic. We really need to know how urban freight is working, if we want to bring a better city life. Indeed, the real goal is not so much the bettering of urban freight transport, but much more the promotion of a sustainable way of life.

That is why the French programme is twofold. The State, via the Ministry of Transport and the Agency for Environment, is leading all the research and methodological aspect, but for field application, it relies heavily on local authorities. In this aspect, the State is only a partnership who contributes to local actions by his knowledge, by financing, and made good for the diffusions of the results.
The first point that the French program had to solve, before any experimentation, was the lack of any data, from a quantitative and qualitative point of view. That is

why the first phase of the program was the building of 'heavy surveys in three different cities :

- Marseilles, with more than 1 million inhabitants
- Bordeaux, with 700 000
- Dijon, with 300 000

The first step was to understand the operation of urban freight transport. The second step (which is running now), is to ascertain what elements are invariable (i.e. that don't depend on the local configuration of a city, that are valid in every city in France), and what are not (i.e. depends on local configurations). Indeed, these surveys are very accurate, but very expensive too. So, we can't do them very often, and it is mandatory to develop a urban freight model based upon the first surveys, and that can give us a good global view of how the freight is running in a given urban area.

3.2 Model used and simulation

(for a complete description of the model, cf the COST 321/5/96 report " Survey and modelling tool in urban freight transport : a French contribution to simulation tools " by the Laboratoire d'Economie des Transport, Lyon)

The biggest problem in modelising is to integrate in the same tool various data of really different fields. These difficulties of modelisation are underlined by the complexity and the irregularity of good transport in cities :

- variety of request to satisfy
- variety of goods transported
- variety of vehicles used
- variety of transportation infrastructures
- variety of condition of delivery sites or expedition
- variety of interest of the actors

All this make difficult to control the inconsistency of the rate duration of immobilisation - duration of routes of vehicles, the splitting of the tonnage to transport and the nature of logistic chains. This difficulties are increased by the lack of appropriated data. Before the surveys launched by the national program, the French cities had " enquètes cordon " (traffic surveys at the limits of the city, describing the in-coming and out-going traffics). These surveys provide a photography of the commuting and the transit between the city and the outside. But such a survey provides few real information on internal movements within the city, and much more annoying, does not matter about freight transport. For freight, there were not equivalent study to the ones made for urban passengers (" enquètes ménages "). The analysis of goods traffics flows doesn't allow to define a relevant units for traffic congestion. It explain why we have decided to focus our research on the measure of traffic generated by activities.

For the first phase, a experimental city has been chosen among the most important in France, namely Bordeaux (700 000 inhabitants), and complementary investigations hare carried on a few other cities, offering diversified configurations and features (Dijon and Marseilles, for example). Here we present the quantitative surveys methodology carried, and the firsts results obtained. The technique usually chosen for medium and long haul goods transports are ineffective for the quantity and quality of the flows generated in urban areas. It is this aspect which makes our survey technique different. The methodology chosen is based on the follow-up of the movements of vehicle induced by loading and/or unloading operation in urban zone. This follow-up is carried through three specific surveys :

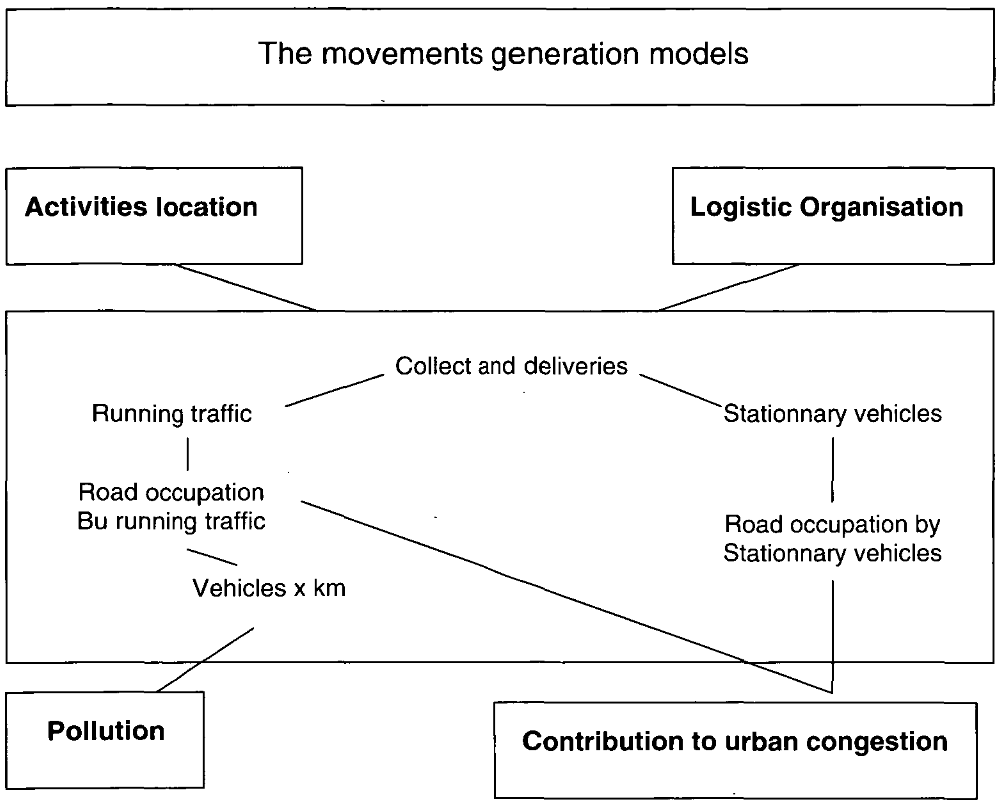
- a survey of the firm (or activity) which turn-out or receive the good (industrial, commercial or tertiary activities), This surveys enables us to describe the activity of the company, and the quantity and timing of goods received or emitted;
- a " driver survey ", of the person having done the loading or unloading, it gives us the " rosters ";
- a transporter survey, of the transport companies. It describes the transportation chain and organisation schemes.

The unit of observation, and the link between the 3 surveys, is the " mouvement ", i.e., the operation of loading or unloading goods. This unit is very important.

These surveys are the basic steep toward a simulation model. First inputs of the global model concern the location of the different activities. Several factors can explain them, proximity of transportation infrastructùres, land planning and land use, environmental disturbance, urban congestion, spatial division of labour, etc... Second input takes into account undertaking logistic transformation : vehicles fleet, number of movements, covered kilometres, rosters organisation, number of transfers centres...

The two out put components are :

- Estimation of urban congestion by knowledge of road network loading conditions in each zone,
- Appraisal of energy consumption by knowledge of vehicle x km.



Estimation of congestion can be considered as the strategic output. It is briefly described as an intensive loading of roads. In a given time, on a given zone, the participation of goods vehicles to congestion results from the number of standing and running vehicles. Standing vehicles are generated by the activities of the zone. Among the running ones, a distinction is made between movements generated by the activities of the zone and the through traffic.

The number of movements in the town (which can be breakdowned in 3 elements : deliveries, collections, mixed operations) is adjusted from the survey according to :

- class of activities
- weight class of vehicles
- kind of operator (own account -shipper or consignee-, carrying company)
- kind of organisation (direct delivery, roster)

and is dependent to :

- location
- timing (week, day, hours)

The model gives us four very important results :

- the numbers of movements generated in each zone,
- the occupancy of a given zone by the vehicles generated by the activities in a given period,
- the occupancy of public road by vehicles through-movements,
- the vehicles*kilometers covered.

The model thus offer the sketch of the generation of the occupancy of public ways by delivery vehicles in the city. The methodology pretended is transferable to other cities, a number of parameters is transferable to other cities submitted to the same condition of organisation and regulation. In France, a protocol for a simpler survey is in flux to adapt the results obtains here to each location. O/D flows of trucks in the city are very sensitive to the management of the roster and to urban planing. The two main interests we found in this shape of generation models for public ways occupancy is that this approach does not need O/D traffic flows, and take into account the parked vehicles. It seems thus easier to simulate the both effects of measures of regulation and of new logistic organisation (rationalisation of rosters, new urban freight centres, new vehicles...).

The most promising prolongation actually, is to contribute to the elaboration of a global model of generating traffic jams in urban zone, which might enable us to introduce goods transportation in city and which must reach a better knowledge of the contribution of the delivery vehicles to urban congestion, and their influence on environment. Such a model could thus constitute a simulation toll for the measures of regulation, as well of urban planning, to be made, in view of a sustainable development.

4 Effects

4.1 Results of the projects

The French program in urban freight transport now has results in the following fields:

Research :
Realisation of three heavy surveys (Bordeaux, Marseilles, Dijon). These surveys give us a really good knowledge of how urban fright flows are working. The key notion is the one of "generating activities".

Development of the "Freturb" model:
A good qualitative knowledge of the mechanisms and determinants of the structuration and evolution of the urban freight transport sector.

Diffusion and communication:
Making of a methodological book for the cities to take into account the urban freight question in their planning.
Various teaching upon the subject, aimed to the professionals, and to the city planners.

Experimentations:
Assistance to cities wishing to establish a urban freight plan.
Development of experiences of urban freight platform (in the North Region, cities of Arras first and next Lille).
Research in the field of new delivery materials, in the frame of the French program for the development of surface transport (PREDIT) 1996-2000.

4.2 Conclusions

In the specific field of modelisation, the French program is based on the socio economical determinants of flows generation. It does not aim at evaluating transport projects, but at contributing to the decision-making, while providing the local and national decision-makers with a framework of reflection about the impact of the various measures suitable for being implemented on an urban area scale. This why the model is fixed on specific surveys to the down-town goods transport, by privileging the production of spatial indicators by area, without prohibiting an "a posteriori" connection with tools of traffic assignment and environmental impacts measurement. Indeed, it proposes a diagnostic of each scenario in terms of street occupation. It allows the comparison of various sets of measures about their efficiency on urban logistic, flows and environment.

As we can see, the French program is an ambitious one, aimed at long term improvement in urban freight transport and city life. The modelisation and simulation tool is only a part of global approach. The first phase, for building up a general knowledge on the working of freight in the city is now done. We are now developing the second phase, much more particle, in tight co-operation with local authorities. The pace of the program can seem slow, but we are building an urban freight transport culture from nothing.

5. Annex

Characteristics of the cities (inventory of fixtures)

Urban structure	Level of information	Unity	*sources* : example of Bordeaux
Regional importance of the city			Town of regional importance, administrative capital of the « Aquitaine » Area
Map to the 1/100000 of the agglomeration			-
Number of inhabitants			*data of census*
	- city - district - agglomeration - perimeter of the urban public services		210 000 inhabitants - 710 000 -
Surface	- city - district - agglomeration		45 km² - 910 km²
Density of population	- city - district - agglomeration		4 700 inhabitant /km² 780 inhabitant /km²
Numbers of employment	- total city - total agglomeration of which : - primary sector - secondary industry - commercial sector - other tertiary sector		150 000 332 000 1 500 66 000 60 000 204 500
Number of working population	- city - agglomeration		80 000 286 000
Ratio employment/ working population	- city - agglomeration		1,9 1,16
Percentage of individual residences	 - city - agglomeration		*Data of census* - 49%
Density of habitat	- city - district - agglomeration	Nb inhabitants/Km²	4700 780
Number of firms (establishments of different localizations)	 - city - agglomeration	 - of < 5 employees - from 6 to 50 - from 51 to 200 - > 200	*Data «INSEE»* city Agglo. 15091 34153 2440 5573 216 595 64 145

Urban equipment	Level of information	Unity	*sources* : example of Bordeaux
Registered fleet vehicle	- VP - Vans (commercial<3,5t) - Trucks		*Administrative data of the vehicles' registration.*
Percentage of the diesel fleet	- VP - Vans (commercial<3,5t) - Trucks		*Idem*
Number of vehicles present in the agglomeration	- VP - Vans (commercial<3,5t) - Trucks		*Air photographs and/or modelized data*
Length of the network (real)	- rapid (urban Motorways and expressways) - other roadway system	in km	*SIG local authorities (district).*
Capacity (of the modelized network)	- rapid (urban motorways and expressways) - another roadway system	in km * number of lanes	*Modelized data*
Waterway	Volume of freight (in MT)		*National statistics*
Fluvial or seaport	Volume of freight (in MT)		*National statistics*
Airport	Volume of freight (in MT)		*National statistics*
Supply level of urban collective transport	- Subway, - tram, - bus, - the RER, regional train.	(seat * km), PKO « « «	*operators on public transport(PT) networks*
Modal split VP-TC	(in number of motorised displacements)		*Survey «households »*
Transport Demand			
Number of shift in the agglomeration on common day (except transit)	- VP - Vans (commercial<3,5t) - Trucks		*« Households » Surveys,* *«UGT[6]» Surveys* *Countings,* *Modelized data.*
Volume of goods traffic in the agglomeration	- transit - exchange of the agglo- - intern	(in tons and T * km)	*National data bank (SITRAM)* *modelized data*
Traffic in the agglomeration by common day (except transit)	- VP - Vans (commercial<3,5t) - Trucks	(vehicles * km)	*Urban model of individual's displacements* *Model Freturb*

6 UGT : Urban Goods Transport

Transport demand	Level of information	Unity	*sources* : example of Bordeaux
Total number of shift hours	- VP - Vans (commercial<3,5t) - Trucks	(vehicles * hour)	*Urban model of individual's Shift* *Model Freturb*
Consumption of energy	- VP - Vans (commercial<3,5t) - Trucks	tons / day	*Model of traffic* *+* *Normative securities* *or environment model*
Issuing of pollutants	- VP - Vans (commercial<3,5t) - Trucks	- CO (kg / day) - Particles - Nox - CH	*Model of traffic* *+* *Normative securities* *or environment model*
Others			
indicators of mobility in the agglomeration	- vehicle ownership rate - number of motorised shift per day - proportion of shift for PURCHASE reason	- Nb vehicles/ individual - by individual (people) - by employment (goods) - people	- *« Households » surveys* 1,95/individuals *« UGT »survey* 0,3/employment *« Households » surveys* 10 %
Pendulars numbers	- entering the city - entering the agglomeration	people residing out of the area	*Data of census* 71 000 35 000
Pendulars numbers	- outgoing of the city - outgoing of the agglomeration	people leaving the area	18 500 7 500
ratio in/out	- city - agglomeration		3,8 4,7

6. Model presentation : application of the FRETURB model in Bordeaux

6.1 Prelude

In order to allow a comparison of various « cities-models » situations thanks to these « characteristics data », it seems essential that we should agreeing on criteria defining each of the two area, on which statistics are to be defined :

- what is a city? (administrative limits or dense area)
- what is an agglomeration?

These two concepts have different concrete significance according to the countries.

It seems also necessary to well state what it is called «Urban Goods Transport» (UGT). For us, it is about what is produced by the whole urban logistic system without taking urban transit and private trips for purchases into account.

We do not pretend to measure in an exhaustive way all the heavy vehicles traffic. Hereafter is a brief summary of what we mean by : « Model presentation » starting from FRETURB model example applied in Bordeaux.

6.2 Objectives of FRETURB model

FERTURB : a simulation's tool of effects regarding :

various city exogenous structural developments (economic growth, changes in the productive system or transport system) ;
city endogenous measures (action on the logistic system, action on the regulation system, action on urban planning).

FERTURB : a simulation's tool of these effects on :

the supplying functioning of economic activities (rationalisation of the logistic practices) ;
the urban transport operation system (effect on the roadway system occupation ; effect on the environment).

6.3. Empirical Data necessary for calibration of the model on cities

Through the specific survey of «Urban Goods Transport », one endeavours to capture traffic generation along three main axis :

the estimation of freight vehicles flow generated by type of commercial or industrial activities and overall occupancy of the roadway system which they generate,
analysis of organisation methods of transport allowing the dispatching of goods downtown (own account or not),
the identification of the goods deliveries or removals conditions compared to firms operating methods.

The cost of such surveys is far from being negligible when statistical consistency is required. Nevertheless some of their results remain essentials to model implementation.

One of our main aims is to try to identify *the occupation of the roadway system by the commercial vehicles* as *stopped* as well as in *circulation*. The observation unity we chose and who is used as a link between each survey is *the operation of delivery or removal* of goods by the establishments, in order to carry out a follow-up of the process of loading or unloading and the routes taken by the vehicle involved in this operation.

This follow-up was carried out through two surveys:

- an « establishments » survey delivering or receiving goods (industrial, commercial or tertiary activities), so as to cover most of the urban activities,
- a « driver-deliverer » survey from people who actually delivered or removed goods, at or from, an establishment, such survey allows to describe the nature of vehicle *shift* in the town.

These data enable us to calculate contrasted functions of distributions according to various qualitative and quantitative criteria.

6.4 Structure of the model

Method used

A model of vehicle flows generation specialised by area according to:
area activities ;
the characteristics of these activities at the logistic level (mode of management, mode of organisation).

Necessary characteristic data (resulting from empirical data) :

the matrix of «*the movements*» according to the area and the type of activity ;
ratios and invariants ;
functional relationships ;
assumptions.

Simplified diagram of the model

generation module of the overall occupation of the roadway system by parked vehicles ;
generation module of the roadway system occupation by running vehicles ;
peak hours module.

6.5. Simulation «controls»

Model outputs react whether :

1 - the firms distribution by type of activity according to area ;
2 - the use by each filed of activity of different vehicle type ;
3 - the part taken by the haulage companies in providing the various fields of activity ;
4 - usual constraints of some vehicles in each area ;
5 - a joint amendment of the logistic practices (2) and logistic system (3) ;
6 - an amendment of the pace of activity of the various economic fields (time, weekly, monthly).

6.6 Outputs of the model

Outputs specialised by areas:

- occupation of the roadway system by the vehicles (4 standards) by the parked vehicles (licit or illicit) in vehicle per hour ;
- occupation of the roadway system by the running vehicles (4 standards) in vehicle per km (generated traffic and transit of area) ;
- occupation of the roadway system by the vehicles in peak hours, either parked or running (vehicle per hour and vehicle per km) ;

These results make possible to feed the models of energetic consumption, emission and emission of pollutants to obtain indicators related to sustainable development of the urban activity : consumption of space, consumption of energy, harmful environmental effects (pollution, noise).

6.7 The specificity of the cities

Preliminary Inventory of fixtures : structure of the « city-model »

A representation of the system of urban supplying is provided by these indicators : the model allows to describe the impact of the activities most involved and to determine the target-actors (generating establishments by field of activity and operators of transport in each area) on which should amend aiming to rationalising the practices of urban supplying.

6.8 Current results of realisable simulations

Measures tested

Once clarified the structure of the system of goods freight of the city, the measures tested can be of two types :

- *test city's exogenous structural developments* (economic growth, changes on the productive system on the transport system). These amendments occur in the phase of generating number of *movements* per area according to the activity type. Results can be produced on the town of Bordeaux.
- *test city's endogenous measures* (actions on the logistic system, actions on the regulation system, actions on the urban planning). Conclusive simulations are

currently being tested on Bordeaux. Their usefulness on the operational level is conditioned by the level of implication of the local actors, institutional as well as economical.

6.9. Limits and specificity of the model

Limits of the modelling approach

The considered measures involve multiple actors (institutional, professional - firms and carriers) whose range of action are not integrated in the model. For example, the impact of such or such regulation measure is strongly conditioned by the reaction of economic actors, from the amendment to the new context, as well as the skirting of the new constraints, and even a pure and simple delocalization of the concerned establishments. *Each considered measure shall thus be accompanied by a series of actors behaviour assumptions, in order to allow the implementation of simulations.*

FRETURB model Specificity

The model is based on the socio-economical determinants of flows generation. It does not aim at evaluating projects of transport but at contributing to the decision-making while providing the local and nationals decision-makers with a framework of reflexion about the impact of the various measures suitable for being implemented on an agglomeration scale. This is why the model is fixed on specific surveys to the downtown goods transport, by privileging the production of specialised indicators by area, without prohibiting *a posteriori* connection with tools of traffic assignment and environmental impacts measurement.

Indeed, it proposes a diagnosis of each scenario in terms of occupation of the roadway system or of vehicles per km. It allows the comparison of various sets of measures about their efficiency on the urban provisioning, the overall dimensions and also the environment. At the end of an iterative process between the various actors, an *ad hoc* approach may be entered on most effective measures.

COST 321

National Report

Germany

IVV-Aachen
Oppenhoffallee 171
D 52066 Aachen

Table of contents

1. Introduction ... 151

2. Environment ... 152
2.1 National Policy ... 152
2.2 Local Policy ... 154

3. German contributions to the COST 321 Action ... 155
3.1 The model cities studied ... 156
3.2 Studied measures ... 159
3.3 Model used ... 160

4. Effects ... 161
4.1 Impacts of measures ... 161
4.2 Conclusions ... 166

Annexes ... 167
Annex I: Checklist to describe the German modelling toolkit VENUS ... 167
Annex II: Checklist to describe the German model cities ... 170
Annex III: Checklist to describe the impacts of the measures ... 177

1 Introduction

Germany is a very close-knit market in the heart of Europe. An efficiently functioning traffic and transport system is essential to its continued economic wellbeing. In the interests of protecting the environment as much as possible, such a system should make sensible use of all available modes of transport.

Statistical analyses[1] reveal that the goods currently (1995) transported in Germany, amounting to some 420 billion ton-kilometres (t-km), can be split up as follows:

- 71 billion t-km = 17% local road transport
- 200 billion t-km = 47% long-distance road haulage
- 70 billion t-km = 17% rail transport
- 64 billion t-km = 15% inland waterways
- 16 billion t-km = 4% pipelines

From the above it can be seen that goods transport by road accounts for some 64%, or almost 2/3, of the total volume of goods carried. The task of mastering these flows of goods is largely concerned with the traffic situation in the road network and the environmental situation in the neighbouring areas (e.g. residential areas, recreational areas, areas of natural beauty). A large proportion of journeys involving transport of goods by road necessarily start, end or pass through densely populated urban areas. This is because many of the goods transported by road originate in or are destined for commercial and industrial centres, and these are usually located in densely populated urban areas or even in city centres. Special significance attaches to local goods transport by road. This usually involves trips of no more than 50 km, and accounts for some 80% of truck journeys. It can therefore be concluded that truck traffic is of overwhelming significance, especially with regard to local traffic.

The recent political developments within Europe have also affected the development of freight transport in Germany. The expansion of the internal market of the European Community in particular, and the effects of German reunion and the opening up of eastern Europe to western European countries, have resulted in an extraordinary increase in freight transport journeys within Germany. Statistics[7] show that, in the period from 1993 to 1995, freight transport volumes (ton-kilometres) increased by about 20% over all modes of transport. While below-average

[7] Verkehr in Zahlen 1996; published by the Federal German Ministry of Transport, Bonn

increases of 10% occurred in the rail and shipping transport sectors, and the pipeline transport sector even experienced zero growth, the road haulage sector experienced significantly above-average growth of almost 30%. As a consequence roads became more crowded, traffic flowed less smoothly and the ecological situation took a turn for the worse.

2 Environment

2.1 National Policy

Under the influence of the recent developments and the results of traffic studies, which predict continued growth in freight traffic, the German government is increasingly attempting to change the freight transport situation by

- aiming at traffic avoidance;
- encouraging a sensible shift towards environmentally friendly means of transport;
- improving the ecological compatibility of transport processes.

In principle priority is given to ensuring that no limitations are placed on the transportation of goods, which is so essential to the continued efficiency of the German economy. This means that national transport and environment policies are aligned to the requirements of economic policy.

In the consciousness of the necessity of exercising a balancing influence on the freight transport situation and of the desirability of encouraging an economically responsible shift towards the carriage of goods by more environmentally friendly forms of transport such as rail and ship, the German government has, in consultation with the Länder, enacted a series of control measures. These include:

- the introduction of road tolls for trucks (from 1.1.1995);
- an increase in the mineral oil tax on diesel fuels;
- support for low-noise and low-emission vehicles in association with the stricter noise thresholds for trucks weighing 3.5 t and more that has applied throughout Europe since 1.10.1996;
- support for vehicles fuelled by natural gas under the local transport financing act ("Gemeindeverkehrsfinanzierungsgesetz" - GVFG) and
- support for measures to improve rail transport (e.g. intermodal transport, express freight transport, "Nachtsprung" (night journeys from goods station to goods station), ring rail traffic).

Besides these technical measures the government has created legal instruments for intervening to influence the transport of freight by road. These include:

- The possibility of restricting or prohibiting access to certain roads or sections of roads at certain times (ban on night trips) or imposing limits on the *permissible total weight of a truck.*
- Granting exemptions for low-noise and/or low-emission vehicles. This inevitably stimulates the purchase of environmentally friendly trucks.

As a result the legal instruments (for restricting or prohibiting access to certain roads) are made doubly effective.

The research policy of the Federal German Government has the aim of reducing the play of forces between traffic growth on the one hand and economy and ecology on the other. In December 1996 the Federal Minister for Education, Science, Research and Technology published a new traffic research framework, which is oriented towards "durable retention of mobility, while tangibly reducing undesirable traffic consequences". For the special field of goods traffic the already existing priorities "intermodal transport" and "logistics in goods transport" are focused on and further developed with the aim of arriving at integrated transport chains covering all traffic carriers. Research projects that have already been carried out in the field of urban goods transport include:

- planning, design and implementation of goods transport centres / service centres (GVZ Bremen);
- information technology in the goods transport sector (development of tools for loading space/loading zone exchanges, logistical optimisation of goods transport chains (LOG));
- city logistics (new model approaches for cooperative planning in local road transport/conurbations)

The necessary national contribution in the context of COST 321 - in this case the further development of simulation tools for measures aimed at the reduction or avoidance of urban goods transport journeys - is also supported by the Research Minister.

This and other research projects fall under the heading "Quantitative transport growth without more traffic" and are intended to ensure that the goods transport sector can contribute to the general reduction or avoidance of traffic.

2.2 Local Policy

Besides the federal government and the Länder, local authorities also seek to influence truck traffic and to ameliorate its negative effects on urban development and the ecological situation. Many cities in Germany are currently studying and, in some cases, have implemented a variety of measures aimed at ameliorating the harmful effects of truck traffic and expediting the smooth transport of goods across the entire freight sector. In this context special importance attaches to:

- the development of logistical concepts in cooperation with the businesses located in the urban areas, with the aim of achieving organisational improvements and reducing unnecessary journey volumes;
- establishing freight transport centres and freight distribution centres with the aim of bundling regional freight traffic flows, encouraging increased use of rail or inland waterways, and encouraging deliveries to urban centres from these transport centres by more efficiently loaded trucks, so that the volume of truck traffic in inner city areas is reduced;
- developing truck routes and networks as a means of directing traffic away from sensitive urban areas (residential areas, hospitals, schools, etc.), and expediting the smoother passage of truck traffic by means of appropriate structural improvements to the road network provided for these vehicles;
- developing delivery zones and parking areas to ensure that trucks and delivery vehicles can load and unload without hindrance;
- reactivating or creating rail connections for existing or new industrial estates and companies;
- introducing traffic restrictions on certain road sections to protect the population of the neighbouring area from the harmful effects of truck traffic, with exemptions for environmentally friendly trucks;
- establishing freight transport groups, in which the problems of freight traffic are discussed between the local authority and the private sector, and worthwhile measure for regulating road haulage traffic are developed.

The objective of all of the goods traffic control measures studied and implemented at national and local level is to reduce the environmental burdens caused by transporting freight by road. However, it is also a basic principle that the restrictions imposed on the economy must not be so radical that economic relationships are disturbed. This means that the traffic measures to be developed and implemented must be in harmony with the requirements deriving from economic processes.

In Germany the described national and local transport policy instruments are currently being used to selectively influence freight transport by road in order to achieve ecologically sensible and economically essential goods traffic flows. The objective is to build on the aims achieved in the initial approaches. It is especially important that the efforts are effectively supported by corresponding regulations on the pan-European level. In addition, industry is called upon to work towards reducing the harmful effects of road freight traffic by

- developing trucks that emit less noise and pollution and consume less fuel;
- developing better logistical systems;
- developing better transhipment technologies and loading and unloading options; and;
- standardising transport equipment.

3 German contributions to the COST 321 Action

In the view of the Federal Republic of Germany, the large number of potential measures that could be introduced in cities and conurbations for the purpose of selectively influencing goods traffic made it necessary to carry out an objective assessment of the transport-related, ecological and economic effectiveness of the individual measures. It should then be possible to identify the most relevant measures or combinations of measures for different cities or city structures. This would help local decision makers to concentrate on those measures that promise to contribute most towards improving the traffic situation in their own districts. It would also help to avoid committing financial resources to measures whose efficacy cannot be demonstrated with any certainty - an important consideration when budgets are already stretched.

Because it could be assumed that individual measures lead to different effects in different cities, the studies would have to be carried out for the largest possible number of model cities, in order to allow conclusions to be drawn about the variability of these effects. On the one hand it was this consideration that caused Germany to initiate the COST 321 research action by the European Union. On the other hand the need to include as many model cities as possible in the study resulted in a division of tasks between national, Land and municipal governments. This provides for the Länder and/or municipalities that participate in the COST 321 Action to contribute to the necessary data, and for the calculation of the effects of specific measures for all model cities to be organised centrally by the national government.

The Federal Republic of Germany calculated the effectiveness of about 20 various measures, each of them in relation to 10 German model cities. The total contribution was financed by the Federal Ministry for Education, Science, Research and Technology, the Bavarian Ministry of Development and the Environment, the Ministry of Urban Development, Housing and Transport of the Land of Brandenburg, the Ministry of Urban Development and Transport of the Land of North Rhine-Westphalia, the Federation of Municipalities of greater Hannover, and the 10 German model cities of Augsburg, Bielefeld, Bremen, Cottbus, Dortmund, Düsseldorf, Hannover, Munich, Nuremberg and Trier. The research costs are estimated at some 2.6 million DM (about 1.3 million ECU).

Moreover, in connection with the COST 321 Action, the following studies were carried out in order to produce a qualitative assessment of the effectiveness of measures in urban goods traffic flows:

- an analysis of the effects of planning and regulatory measures on goods traffic in cities and communities (commissioned by the Federal Ministry of Transport), and
- international development trends towards improving goods traffic in cities and conurbations (commissioned by the Federal Environment Agency (Umweltbundesamt)).

3.1 The model cities studied

In the context of the German contribution to the COST 321 Action, selected measures were studied in 10 German cities (Augsburg, Bielefeld, Bremen, Cottbus, Dortmund, Düsseldorf, Hannover, Munich, Nuremberg and Trier). Simulation calculations were carried out for all of these cities and the results will be published in an independent report (probably in August 1998). This international report contains the simulation results for the cities of Bielefeld, Bremen, Cottbus, Dortmund, and Düsseldorf.

All model cities examined in the German contribution are large cities with over 100,000 inhabitants. Most of the model cities have populations between 500,000 and 600,000. By far the largest city is Munich, with about 1,250,000 inhabitants. The smallest city is Trier, having a population of about 100,000.
The following pages give a brief overview of the German model cities:

- Augsburg:
  The city of Augsburg has about 260,000 inhabitants and covers a surface

area of approx. 150 [km^2]. It is the third largest city in the Free State of Bavaria and the capital of the Bayerisch-Schwaben administrative district.

- Bielefeld:
  With a population of approx. 325,000 inhabitants and a surface area of about 260 [km^2], Bielefeld is by far the largest city in eastern Westphalia and is the region's economic and cultural centre. Bielefeld is classified as a solitary conurbation with the functions of a supra-regional centre. The service area of the city of Bielefeld contains between 1 and 2 million inhabitants.
- Bremen:
  The city of Bremen, together with the city of Bremerhaven, forms the smallest Land of the Federal Republic of Germany. Bremen is the seat of the Land government and is the region's cultural and economic centre. With a population of about 550,000, Bremen also constitutes the most important supra-regional centre in the Weser River basin, comprising a service area with about 1.7 million inhabitants, more than 1 million of whom live in the neighbouring Land of Lower Saxony. Bremen thus holds a special position among the cities considered, since the great majority of its service area inhabitants, although using the facilities provided by the city as a supra-regional centre, do not actually live within the Land. With an area of about 330 [km^2], Bremen is the largest of our model cities in terms of surface area. Of the cities investigated here, Bremen is the only one with its own seaport. Its port facilities rank second after Hamburg in terms of goods volume turnover. In a transport context it is worth mentioning that the supra-regional goods distribution centre is the first of its type in Germany.
- Cottbus:
  The city of Cottbus is the only model city in eastern Germany (the former German Democratic Republic). Situated in the south-east of the Land of Brandenburg on the Spree River, it has about 125,000 inhabitants, making it the second smallest of the cities considered here. However, in terms of its surface area of about 150 [km^2], Cottbus is still slightly larger than Augsburg. Its low population figure makes Cottbus the city with the smallest settlement density (approx. 840 [inhabitants / km^2]). Its proximity to Poland exerts a key influence on the city's traffic situation.
- Dortmund:
  Dortmund has a population of approx. 600,000 and a surface area of approx. 280 [km^2]), making it the second largest of the cities studied. The city of Dortmund is classified as a conurbation core with the functions of a supra-regional centre. Dortmund is the largest city and the cultural and economic

centre of the eastern Ruhr basin. The service area of Dortmund contains more than 2 million people.

- Düsseldorf:

  The city of Düsseldorf is the capital of the Land of North Rhine-Westphalia and is the seat of the administrative district government. With a population of approx. 570,000 and an area of approx. 220 [km^2], a major stock exchange and numerous large companies, Düsseldorf is the industrial administrative centre of the Rhineland and Westphalia. Its importance is partly attributable to Düsseldorf Airport, which, with about 14 million air passengers a year, is Germany's second largest airport after Frankfurt. As a shopping city, Düsseldorf's importance extends beyond the Land of North Rhine-Westphalia. Düsseldorf is classified as a conurbation core with the functions of a supra-regional centre and a service area population of over 2 million.

- Hannover:

  Hannover is the capital of the Land of Lower Saxony and is its largest city, having a population of approx. 530,000 and an area of about 200 [km^2]. Hannover is not only the economic and cultural centre of the region and the Land, but is of international significance as a trade fair venue (Hannover Trade Fair, CeBIT, etc.), a role that will become even more important when it hosts the EXPO 2000 exhibition.

- Munich:

  With more than 1.2 million inhabitants and an area of approx. 310 [km^2], Munich is the third largest city in the Federal Republic of Germany. It is also the largest of the model cities examined and has the highest settlement density (approx. 4000 [inhabitants / km^2]. Munich is the capital of the Free State of Bavaria and is the seat of the government of the District of Upper Bavaria. The city's importance as a cultural centre as well as a service, trade and industrial centre extends far beyond the Land of Bavaria and, indeed, Germany.

- Nuremberg:

  The city of Nuremberg, with a population of just under 500,000 and a surface area of approx. 185 [km^2], is the second largest city in the Free State of Bavaria. It is the economic and cultural centre of the Franken region and the seat of the government of the administrative district of Franconia. Nuremberg is linked to the German and European inland waterway network by the Rhine-Main-Donau Canal.

- Trier :

  The city of Trier has some 100,000 inhabitants and covers an area of about 117 [km^2]. It is therefore the model city with the lowest number of inhabitants and the smallest area. Trier, the fifth largest city in the Land of Rhineland-Palatinate, is the oldest city in Germany. It is the economic and cultural centre of the Mosel-Saar-Ruwer region and the seat of the district government.

A more detailed overview of the key technical and transport data for the studied model cities can be found in checklist in Annex I.

3.2 Studied measures

In the context of the German research contribution, the 60 measures drawn up for the COST 321 Action as being worthy of investigation were examined in terms of their suitability for simulation studies. Twenty of the measures were then selected for model treatment. Each of the measures was to be quantified with regard to its effects on traffic and the environment in each of the above mentioned model cities.

The choice of the measures to be studied was carried out on the basis of the anticipated effects and the possibility of examining these effects with the help of a simulation model. This means that the following aspects were of importance:

- the availability of an adequate data basis for describing the existing modes of transport (networks);
- the availability of an adequate data basis for determining the transport demand situation (O-D matrices) and;
- the availability of information concerning special transport circumstances in the area being studied.

The following 20 measures were chosen from the list of 60 drawn up by Working Group A and were quantitatively studied in the context of the model calculations:

- Transport coordination and cooperation of retailers (1.5)
- Reduction of package volumes (1.6)
- Goods distribution centres (1.9)
- Consolidation by means of "urban" containers (1.10)
- Replacing large trucks by smaller trucks or vans (1.11)
- Tourplanning (1.14)
- Cooperation of carriers on delivery at the city-area (1.15)
- Goods distribution centres with cooperation of carriers located there (1.16)
- Coordination of intermodal transport (2.5)
- Regional rail network in combination with urban distribution centres (2.6)

- Optimisation of distribution systems, including transport centres (4.1)
- Strong expansion of the rail network (4.11)
- Regulation of freight traffic (5.1)
- Guidance and information systems for traffic management (5.2)
- Truck routes / truck networks in cities (5.4)
- Reservation on streets of special sites for truck delivery stops (5.5)
- Speed limits and external speed controls (5.6)
- Banning HGV through-traffic from city centres (5.8)
- Development of silent (low-noise) vehicles and handling equipment: delivery and pick-up during the night (6.8)
- Exploitation of alternative drive concepts for trucks (electrically powered vehicles) (6.9)

3.3 Models used

The German contribution to the COST 321 Action is based on the VENUS trip generation, trip distribution, traffic assignment and traffic effect models developed by IVV-Aachen during the course of previous urban and regional goods traffic studies. These modelling approaches will be subsequently refined and extended in response to the specific requirements of the COST 321 Action. To simulate the effects of individual measures, a time and space related disaggregate traffic model was adopted, which reflects the behaviour of the individual actors involved. This is a macroscopic modelling approach, which determines traffic volumes in a given area (divided into traffic zones) on the basis of the structures present in each zone (e.g., number of inhabitants, number of employees, number of companies, etc.). The originating traffic and the terminating traffic volumes are then processed into source/destination relationships, before being applied to the network models in a further modelling step so as to arrive at a description of the load situation. The calculation of effects for a given traffic situation is then performed on the basis of these traffic loads.

Before the effects of an intended control measure can be estimated, it is necessary to describe the baseline situation in the terms of the model. In other words, the modelling toolkit must first be adjusted to the specific characteristics of the area under study before any reliable assessment of the effects of intended control measures can be obtained.

The changes in urban traffic patterns produced by such control measures and the associated rates of change from the baseline situation can only be determined by means of a model which passes through all stages of the traffic generation process including the required feedback loops.

In view of the multi-layered interconnections and interactions between commercial and passenger transport (and especially passenger *car* transport)[8], the modelling modules used to determine truck trip generation and truck loads must be linked with passenger transport modules.

This need is met by the VENUS Traffic Demand and Assignment System developed by IVV-Aachen. VENUS consists of the following components:

- Passenger trip generation
- Truck trip generation
- Network modification, traffic assignment and representation – public transport
- Network modification, traffic assignment and representation – motor vehicle traffic
- Calculation of road transport effects / impact calculation
- Utility modules

The focus of the short model description in the annex I is placed on the truck traffic description modules; however, the remaining modules will likewise be used within the COST 321 Action work.

4 Effects

4.1 Impacts of measures

The following six effect criteria have been selected for assessing the effects of the measures described in chapter 3.2:

- motor vehicle traffic load situation
- motor vehicle kilometres covered in the road network (cars and trucks)
- motor vehicle dwell time in the road network (cars and trucks)[9]
- fuel consumption

[8] Within the overall volume of urban commercial transport there exist significant substitution potentials between passenger car and truck transport; moreover, the different vehicle types exert a considerable influence on each other when it comes to the selection of routes within the road network.

[9] The dwell time represents the pure running time of the car/HGV in the analysed network. It does not include the duration of the whole trip.

- air pollutant emissions due to motor vehicle traffic
- noise emissions due to motor vehicle traffic (number of people exposed to more than 60 dB(A))
- compatibility potentials

The baseline situation considered in assessing the effects of the examined measures is the current traffic pattern. This baseline situation traffic pattern forms the reference basis for determining the effects of all control measures. In order to render the effects of a given control measure more accurately comparable between the individual model cities, the effects of control measures are standardised using the baseline situation data. The effects of control measures can thus be compared on the basis of their percentage changes both in relation to each other and against the baseline situation.
In order to evaluate the effects of the different measures it has to be mentioned that all results refer to the analysed part of the road network in the municipal area of each town.

With the help of the simulation model it was possible to calculate the effects of all of the measures in all of the cities. This means that the accompanying list of results is complete and reveals not only

- the effects of a measure in different cities

but also

- the most important measures for the individual cities.

The general evaluation of the table of figures permits an initial categorisation of the measures to made with regard to their significance for all cities. The most effective measure for each city can also be identified from the table of results. Even though the many and varied criteria that were examined make it difficult to arrive at a general evaluation of the effectiveness of the individual measures, an attempt is made below to do so, in order to obtain an overview. In very abbreviated form, the results of the individual measures can be outlined as follows.

Measure: Transport coordination and cooperation of retailers (1.5)
In view of the assumption that this measure can only influence the trucks that serve city centres, its low effectiveness at the level of the whole city is easily understandable.

Measure: Reduction of package volumes (1.6)
The introduction of this measure would bring about a clear reduction in HGV-mileage (up to about 6%), and therefore in emissions of noise and pollutants.

Measure: Goods distribution centres (1.9)
The impacts of an distribution centre for serving the city centre depend on its location. In general, there are only minor impacts with a trend of slightly increasing HGV-mileage in some cities.

Measure: Consolidation by means of "urban" containers (1.10)
The introduction of this measure would reduce the dwell time of trucks in the road network, thus potentially saving time in truck traffic handling. The effects on the other criteria, however, are slight.

Measure: Replacing large trucks by smaller trucks or vans (1.11)
The substitution of large trucks by smaller trucks or vans inevitably increases the number of trips and thus the HGV-mileage. This leads to slightly increasing noise- and pollution-levels, although a small HGV produces less emissions than a large one.

Measure: Tourplanning (1.14)
The computerised tour-planning reduces HGV-mileage by 1 - 2 %, accompanied by similar reductions in noise and pollution.

Measure: Cooperation of carriers on delivery at the city-area (1.15)
The necessity to collect the goods at the carriers location before transporting to the city area leads to an increasing HGV-mileage (and thus noise and pollution). These negative impacts for the entire area cannot be compensated by the positive impacts in the city area resulting from the bundled transport from the carriers location to the centre.

Measure: Goods distribution centres with cooperation of carriers located there (1.16)
The combination of measure 1.9 and measure 1.15 prevent the negative effects of the single measure to a large extent. This reveals that a goods distribution centre with a cooperation of carriers should be introduced to serve the city centre.

Measure: Coordination of intermodal transport (2.5)
The delivery of primary and secondary centres by streetcar has been investigated. The reductions in HGV-mileage, noise and pollution are only of minor degree (less than 1 %) due to the limited spatial effects and the limited suitability of goods.

Measure: Regional rail network in combination with urban distribution centres (2.6)
Based on Measure 4.1 the transport centres are connected by rail. This causes reverse effects than Measure 4.1. With the rail network there is a slight decrease of HGV-mileage and environmental impacts in bigger cities.

Measure: Optimisation of distribution systems, including transport centres (4.1)
The introduction of several (decentralised) distribution centres each serving all primary and secondary centres causes similar effects than measure 1.15 (Cooperation of carriers on delivery at the city area), such as a slightly increase in HGV-mileage (0 to +1%) and noise and pollution (+ 1%).

Measure: Strong expansion of the rail network (4.11)
Expanding the rail network by creating or reactivating of connections to industrial areas leads to a decrease of HGV mileage, air pollution and noise.

Measure: Regulation of freight traffic (5.1)
Technical measures such as traffic light systems that are aligned to the volume of traffic and the needs of truck traffic, and structuring the road network to take due account of truck traffic, result in a clear reduction of the load on the secondary road network. As a parallel effect there would be less noise impact on the population. Improvements to the road network would speed up the flow of trucks; the detours associated with the use of the main road network are categorised as minor.

Measure: Guidance and information systems for traffic management (5.2)
The introduction of this measure would cause a reduction in the vehicle-kilometres and dwell time of trucks in the road network and a corresponding reduction in the emission of pollutants into the atmosphere. Moreover the burden on the secondary road network would be lightened.

Measure: Truck routes/truck networks in cities (5.4)
The introduction of a truck network has a very beneficial effect in terms of reducing the load on the secondary road network and the noise nuisance suffered by the resident population. Reductions of more than 50% in the load on the secondary roads and almost 20% in noise levels are achieved. The reduction in truck-kilometres and dwell times within some of the model cities is attributable to the transfer of truck traffic to the road network in the surrounding area. If the network in the surrounding area is taken into account, an increase in vehicle-kilometres and dwell time can be expected for all cities.

Measure: Reservation on streets of special sites for truck delivery stops (5.5)
The effects of this measure are very limited, relative to the total volume of truck traffic. The reason for this is that the measures are usually only applied and fully effective in the smaller core city areas. The value of these measures is usually that the dwell time of the trucks is reduced and the hindrance suffered by cars is therefore reduced.

Measure: Speed limits and external speed controls (5.6)
By introducing speed limits and external speed controls it is supposed that the speed limits are staggered from 120 km/h to 30 km/h corresponding to the function of the different roads (e.g. motorway or minor road). Speed limits and controls result in a considerable reduction in the load on the secondary network and associated reductions in noise levels. The measures inevitably cause a reduction in truck speeds (and car speeds) and therefore cause an increase in dwell time in the road network. Moreover fuel consumption increases, causing emissions of pollutants into the atmosphere to increase.

Measure: Banning HGV through-traffic from city centres (5.8)
Only a relatively small part of the total truck traffic is affected by measures banning trucks from driving through the inner city. The effects on the whole city area are therefore only marginal. Naturally the situation is different if only the inner city is taken into account. In this case more marked changes are to be expected in terms of the various assessment criteria.

Measure: Development of silent (low-noise) vehicles and handling equipment allowing delivery and pick-up during the night (6.8)
If it is assumed that about 80% of the vehicles carrying deliveries to traders can be categorised as low-noise vehicles, and that deliveries can be carried out at night, there is a clear reduction in noise levels.
The displacement of low-noise trips to the night also results in a general lowering of the noise nuisance caused by trucks.

Measure: Exploitation of alternative drive concepts for trucks (electric vehicles) (6.9)
The introduction of battery-powered vehicles causes a marked change in the emission of pollutants into the atmosphere. The biggest change is in emissions of soot, which are mainly attributable to trucks. This measure has a very minor effect on the other criteria.

4.2 Conclusions

The results show that the individual measures that were examined in relation to the different model cities have largely similar effects. Exceptions are observed only rarely, and are - as follow-up research indicated – usually attributable to special local circumstances.

The results also show clearly that the effects of the individual measures on the traffic situation and the environment vary widely. Some measures have only a very weak overall effect, while others have very tangible effects.

Moreover the results show that the strength of the effects of the individual measures varies for the different evaluation criteria.
They also clearly indicate that none of the individually examined measures would be adequate to achieve the desired reductions in the burdens on the cities. This means that several measures would have to be taken to make truck traffic in cities more tolerable. This is the only possible way to achieve significant improvements in all areas (loads, noise levels, pollutant emissions, etc.).

Annexes

Annex I *Checklist to describe the German modelling toolkit VENUS*

Checklist to describe the German modelling toolkit VENUS

The focus of the following short model description is placed on the truck traffic description modules; however, the remaining modules will likewise be used within the COST 321 Action work.

Name of modelling toolkit
VENUS

Aim of building a model
Modelling the effects of several control measures for managing goods traffic in urban areas.

Model approach
Simulation method relating to groups of people to evaluate the traffic in a network.

Classification of the traffic calculation model/method
- Time ánd space related, disaggregate model
- Macroscopic modelling approach
- Typical 4-step model
- Combination of truck traffic with passenger transport

Structure of the model and elements of the modelling toolkit
1) Traffic generation model (truck traffic module)
   - Generation of originating truck traffic and terminating truck traffic for each traffic zone on the basis of the specific behaviour of the different branches, with due consideration being given to specific transport patterns
   - trip distribution is determined by a two-step process:
     a) The originating traffic and the terminating traffic are linked to so-called relations. This is achieved through a gravitation approach
     b) The relations are combined into tours as a function of specific tour parameters

Result: O-D matrices per transport purpose and vehicle type

2) Traffic assignment (motor vehicle traffic)
   Successive traffic assignment (Capacity-Restraint Method). The route search is carried out separately for each type of vehicle, depending on the traffic load situation of all types of vehicles

Result: load determination for each road network element (links and nodes) for each type of vehicle

3) Calculation of road transport effects / impact calculation
   The impact calculation depends on the determined link load and is done on the base of national regulations (noise, air pollution, etc.). The values derived for all individual routes are then added up to give a grand total for the different city areas

Input parameters

- Structural data: inhabitants, employees per branch,
- Transport parameters: generation rates per transport purpose, binding rates per vehicle type,
- Tour parameters per transport purpose and vehicle type: number of stops per tour, trip distance distribution, trip time budget,
- Daily levels of road traffic: time series graph for different vehicle types
- Road network structure: link parameters, node parameters, parking availability,

Surveys required to set up the model parameters

- Polls: companies, driver-deliverer,
- Traffic counts: links, nodes, city areas

Output of the model

- O-D matrices: per transport purpose and vehicle type, times of day,
- Load situation in the road network: per vehicle type, links, nodes,
- Effects: kilometres covered, dwell time, noise emission, air pollutant emissions, accessibility

Specific and characteristic features of the model

- Taking into account the relative user locations and the transport supply sources
- Combination of truck traffic with passenger transport for the determination of the load situation and the effects
- Determination of the relationships between car and truck traffic

Limits of the model and problems of using the model

- Inclusion of the road network with the technical parameters
- Differentiated data basis is needed for settlement and economic structures
- Relatively high expenditure is necessary to build up the baseline situation

Annex II *Checklist to describe the German model cities*

City characteristics	Level	Unit	Augsburg	Bielefeld	Bremen
Settlement structure					
importance of the city for the region			capital of the land administrative district / supra-regional-centre	solitary conurbation / supra-regional-centre	land government / supra-regional-centre
number of inhabitans	city agglomeration		262.110	326.300	554.700
gainfully employed individuals	city agglomeration			140.900	234.200
employees	city agglomeration		157.200	158.900	306.500
number of enterprises	city agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees 1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			
surface area	city agglomeration	[km²]	147,16	257,68	326,78
settlement density	city agglomeration	[inh./km²]	1.781,12	1.266,30	1.697,47
ratio between gainfully employed individuals and employees	city agglomeration			0,89	0,76
Traffic infrastructure					
number of motor vehicles (please fill in the national limits *between cars and* HGV)	cars (light vehicles) trucks / HGV *(heavy vehicles)* traction engine		120.112 5.777 1.011	158.272 7.577 1.627	239.888 12.745 2.321
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks / HGV (heavy vehicles) traction engine				
number of motor vehicles present in the road network					
number of cars per head of population		[cars per 1.000 inh.]	458	485	432
length of the raod network classified road network urban road network		[km] [km] [km]		572 304 268	530 111 429
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway foour-lane carriageway and more	[km] [km] [km] [km]			
length of the road network per head of population		[km per 1.000 inh.]			
integration in the highway and trunk road network			A8, B2, B10, B17, B300	A2, A33, B61, B66, B68	A1, A27, A281, B6, B75

City characteristics	Level	Unit	Augsburg	Bielefeld	Bremen
Traffic infrastructure					
level of urban public transport service			tram, local and regional bus	subway, tram, local and regional bus	tram, local and regional bus
integration in the national railway network			ICE, IC, IR and local traffic	ICE, IC, IR and local traffic	ICE, IC, IR and local traffic
location on a waterway			-	-	Weser
existence of a port/harbour			-	-	seaport and inland port
existence of an airport	number of passengers per year	[Mio./a]	regional airport	-	1,3
	volume of goods traffic per year	[1.000 t/a]			7,6
Transport / Traffic demand structure [10]					
total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic			810.000	1.273.300
	cars			560.000	786.000
	trucks / HGV			69.600	64.100
volume of goods traffic per year	road network	[1.000 t/a]			39.743
	railway	[1.000 t/a]			12.267,1
	inland navigation	[1.000 t/a]			3.114,1
	ocean navigation	[1.000 t/a]			13.373,4
	aircraft	[1.000 t/a]			6,6
volume of consignments per day					
motor vehicle kilometres covered in the road network per day	car kilometres	[car*km/d]		5.263.000	6.149.000
	truck (HGV) kilomtres	[HGV*km/d]		626.000	921.000
motor vehicle dwell time in the road network per day [11]	dwell time of cars	[car*h/d]		118.400	141.000
	dwell time of HGV	[HGV*h/d]		11.800	18.100
fuel consumption due to motor vehicles per day (car + HGV)		[kg/d]		585.200	505.400
air pollutant emissions due to motor vehicles per day (car + HGV)	CO	[kg/d]		48.700	34.400
	Soot / Particles	[kg/d]		210	160
	NOx	[kg/d]		16.900	18.300
	CH	[kg/d]		11.500	8.000
average mobility rate per day (trip rate)		[trip/d]		2,88	3,27
number of in-commuters per day				33.000	80.500
number of out-commuters per day				14.000	15.500
in-commuter / out-commuter ratio per day				2,36	5,19

[10] All results refer to the analysed part of the network in the municipal area of the town.
[11] The dwell time represents the pure running time of the vehicle in the analysed network.

City characteristics	Level	Unit	Cottbus	Dortmund	Düsseldorf
Settlement structure					
importance of the city for the region			*supra-regional-centre*	*Conurbation core / supra-regional-centre*	*capital of the land/ seat of the administrative district gov./ conurbation core/ supra-regional centre*
number of inhabitans	city agglomeration		125.643	600.918	584.100
gainfully employed individuals	city agglomeration				255.900
employees	city agglomeration		71.700	250.900	411.700
number of enterprises	city agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees 1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			
surface area	city agglomeration	[km²]	150,33	280,26	216,99
settlement density	city agglomeration	[inh./km²]	835,78	2.144,14	2.691,83
ratio between gainfully employed individuals and employees	city agglomeration				0,62
Traffic infrastructure					
number of motor vehicles (please fill in the national limits between cars and HGV)	cars (light vehicles) trucks / HGV (heavy vehicles) traction engine		56.392 3.812 406	269.283 12.228 1.745	285.317 14.159 1.328
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks / HGV (heavy vehicles) traction engine				
number of motor vehicles present in the road network					
number of cars per head of population		[cars per 1.000 inh.]	449	448	488
length of the raod network classified road network urban road network		[km] [km] [km]	242 100 142	710 344 366	431 179 252
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway foour-lane carriageway and more	[km] [km] [km] [km]			
length of the road network per head of population		[km per 1.000 inh.]			

City characteristics	Level	Unit	Cottbus	Dortmund	Düsseldorf
Traffic infrastructure					
integration in the highway and trunk road network			A15, B97, B115, B169	A1, A2, A40, A44, A45, B1, B54, B234, B236	A3, A44, A46, A52, A57, A59, B1, B7, B8, B228, B326
level of urban public transport service			tram, local and regional bus	subway, city railway / tram, local and regional bus	subway, city railway /tram, local and regional bus
integration in the national railway network			IR and local traffic	ICE, IC, IR and local traffic	ICE, IC, IR and local traffic
location on a waterway			-	Dortmund-Ems-Kanal	Rhine
existence of a port/harbour			-	inland port	inland port
existence of an airport	number of passengers per year volume of goods traffic per year	[Mio./a] [1.000 t/a]	airfield	regional airport	13,9 55,4
Transport / Traffic demand structure [12]					
total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic cars trucks / HGV		238.400 136.400 10.000	1.517.000 921.600 66.200	1.939.000 1.058.000 79.500
volume of goods traffic per year	road network railway inland navigation ocean navigation aircraft	[1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a]			
volume of consignments per day					
motor vehicle kilometres covered in the road network per day	car kilometres truck (HGV) kilomtres	[car*km/d] [HGV*km/d]	1.383.000 72.000	10.063.00 0 764.000	7.444.000 632.000
motor vehicle dwell time in the road network per day [13]	dwell time of cars dwell time of HGV	[car*h/d] [HGV*h/d]	56.600 2.500	313.200 16.200	119.500 9.500
fuel consumption due to motor vehicles per day (car + HGV)		[kg/d]	189.300	1.844.200	596.100
air pollutant emissions due to motor vehicles per day (car + HGV)	CO Soot / Particles Nox CH	[kg/d] [kg/d] [kg/d] [kg/d]	21.300 40 3.400 4.200	213.500 580 30.500 46.900	41.600 150 22.300 8.600
average mobility rate per day (trip rate)		[trip/d]	3,48	2,92	2,90
number of in-commuters per day					
number of out-commuters per day					
in-commuter / out-commuter ratio per day					

[12] All results refer to the analysed part of the network in the municipal area of the town.
[13] The dwell time represents the pure running time of the vehicle in the analysed network.

City characteristics	Level	Unit	Hanover	Munich	Nuremberg	Trier
Settlement structure						
importance of the city for the region			capital of the land / supra-regional-centre	capital of the land/ seat of the administrative district gov./ supra-regional centre	seat of the admin. district gov./ supra-regional centre	seat of the admin. district gov. supra-regional centre
number of inhabitans	city agglomeration		525.763	1.244.676	495.845	99.602
gainfully employed individuals	city agglomeration					
employees	city agglomeration		356.300	813.300	330.100	58.000
number of enterprises	city	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees				
	agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees				
surface area	city agglomeration	[km²]	204,07	310,47	185,81	117,16
settlement density	city agglomeration	[inh./km²]	2.576,39	4.009,01	2.668,56	850,14
ratio between gainfully employed individuals and employees	city agglomeration					
Traffic infrastructure						
number of motor vehicles	cars (light vehicles)		216.005	632.149	236.875	44.645
(please fill in the national limits between cars and HGV)	trucks / HGV (heavy vehicles)		10.912	28.280	13.417	2.900
	traction engine		1.290	3.571	1.912	651
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks / HGV (heavy vehicles) traction engine					
number of motor vehicles present in the road network						
number of cars per head of population		[cars per 1.000 inh.]	411	508	478	451
length of the raod network classified road network urban road network		[km] [km] [km]				
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway foour-lane carriageway and more	[km] [km] [km] [km]				
length of the road network per head of population		[km per 1.000 inh.]				

City characteristics	Level	Unit	Hanover	Munich	Nuremberg	Trier
Traffic infrastructure integration in the highway and trunk road network			A2, A7, A37, A352, B3, B6, B65,B217, B441, B443, B522	A8, A9, A92, A95, A96, A99, B2, B11, B13, B304	A3, A6, A73 B2, B4, B8, B14	A64, A602, B 49, B51, B52, B53, B422
level of urban public transport service			subway, city railway / tram, local & regional bus	subway, city railway / tram, local and regional bus	subway, city railway / tram, local and regional bus	local and regional bus
integration in the national railway network			ICE, IC, IR and local traffic	ICE, IC, IR and local traffic	ICE, IC, IR and local traffic	IR and local traffic
location on a waterway			Mittelland kanal	-	Main-Donau-Kanal	Mosel
existence of a port/harbour			inland port	-	inland port	inland port
existence of an airport	number of passengers per year volume of goods traffic per year	[Mio./a] [1.000 t/a]	3,8 23	13,4 100,5	1,9 40,9	
Transport / Traffic demand structure [14] total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic cars trucks / HGV					
volume of goods traffic per year	road network railway inland navigation ocean navigation aircraft	[1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a]				
volume of consignments per day						
motor vehicle kilometres covered in the road network per day	car kilometres truck (HGV) kilomtres	[car*km/d] [HGV*km/d]				
motor vehicle dwell time in the road network per day [15]	dwell time of cars dwell time of HGV	[car*h/d] [HGV*h/d]				
fuel consumption due to motor vehicles per day (car + HGV)		[kg/d]				
air pollutant emissions due to motor vehicles per day	CO	[kg/d]				

[14] All results refer to the analysed part of the network in the municipal area of the town.
[15] The dwell time represents the pure running time of the vehicle in the analysed network.

City characteristics	Level	Unit	Hanover	Munich	Nuremberg	Trier
Transport / Traffic demand structure						
(car + HGV)	Soot / Particles NOx CH	[kg/d] [kg/d] [kg/d]				
average mobility rate per day (trip rate)		[trip/d]				
number of in-commuters per day						
number of out-commuters per day						
in-commuter / out-commuter ratio per day						

Bielefeld		**Impacts of measure (Ratio in percent [%])**												
Measure		motor vehicle traffic load *		motor vehicle kilometres		motor vehicle dwell time **		Air pollutant emissions (car + HGV)					noise emission	Compatibility potentials
		Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Fuel cons.	CO	Soot / Particles	NOx	CH	daytime	
1.5	Transport coordination and coopration of retailers	-0,05%	-0,44%	-0,02%	-0,24%	-0,06%	-0,33%	-0,12%	-0,14%	-0,32%	-0,15%	-0,20%	-0,23%	0,00%
1.6	Reduction of package volume	-1,51%	-8,42%	-0,48%	-4,84%	-0,89%	-5,93%	-1,99%	-1,03%	-5,85%	-2,71%	-2,67%	-2,89%	0,51%
1.9	Goods distribution centre	-0,09%	-0,41%	-0,08%	-0,31%	-0,08%	-0,36%	-0,28%	-0,33%	-0,54%	-0,22%	-0,41%	0,54%	-0,49%
1.10	Consolidation by means of "urban" containers	-0,16%	-0,71%	-0,05%	-0,28%	-0,19%	-0,42%	-0,43%	-0,51%	-0,40%	-0,14%	-0,44%	0,03%	0,90%
1.11	Replacing large trucks by smaller trucks or vans	0,05%	2,41%	0,11%	1,04%	0,22%	1,55%	0,08%	0,21%	0,29%	0,00%	0,14%	1,25%	0,34%
1.14	Tourplaning	0,01%	-1,10%	-0,13%	-1,08%	-0,14%	-1,13%	-0,50%	-0,40%	-1,38%	-0,66%	-0,74%	-0,17%	0,09%
1.15	Cooperation of carriers on delivery at the city-area	-0,10%	-0,39%	0,00%	0,11%	0,04%	0,10%	0,45%	0,75%	0,53%	0,13%	0,73%	0,67%	0,26%
1.16	Goods distribution centres with cooperation of carriers	-0,21%	-0,85%	-0,14%	-0,79%	-0,15%	-0,95%	-0,68%	-0,72%	-1,51%	-0,55%	-1,09%	0,50%	0,41%
2.5	Coordination of intermodal transport	-0,63%	-0,66%	-0,05%	-0,09%	-0,06%	-0,17%	-0,22%	-0,39%	-0,27%	-0,11%	-0,36%	-0,15%	0,58%
2.6	Regional rail network in combination with urban distribution centres	0,27%	0,93%	0,06%	0,48%	0,17%	0,52%	0,60%	0,77%	1,12%	0,37%	1,00%	0,62%	0,09%
4.1	Optimization of dristribution systems	0,15%	0,75%	-0,02%	0,15%	0,00%	0,16%	0,09%	0,04%	0,11%	0,05%	0,04%	0,97%	0,40%
4.11	Strong expansion of the rail network	0,11%	1,62%	0,04%	-1,11%	-0,16%	-1,10%	-0,51%	-0,56%	-1,72%	-0,72%	-1,17%	-0,02%	0,32%
5.1	Regulation of freight traffic	-12,92%	-11,20%	0,34%	0,81%	-4,88%	-3,84%	-6,13%	-8,32%	-5,24%	-0,31%	-7,69%	-3,00%	-6,37%
5.2	Guidance and information Systems for goods transport	-0,94%	-0,42%	-0,16%	-0,02%	-1,00%	-0,59%	-6,20%	-9,27%	-6,84%	-1,26%	-9,71%	-1,58%	-1,81%
5.4	Truck routes / truck network in cities	-2,77%	-55,62%	-0,13%	-1,51%	0,11%	-2,49%	1,72%	3,21%	1,11%	-0,20%	3,10%	-17,20%	-1,72%
5.5	Reservation on streets of special sites for truck delivery stops	-1,96%	-1,50%	-0,20%	-0,08%	-0,68%	-0,31%	-2,42%	-3,76%	-2,37%	-0,39%	-3,60%	0,00%	0,09%
5.6	Speed limits and external speed control	-20,51%	-25,75%	-0,92%	-0,29%	8,13%	6,24%	2,32%	27,98%	20,00%	2,38%	28,34%	-15,79%	1,24%
5.8	Banning HGV through-traffic from city centres	0,15%	2,72%	0,05%	1,13%	0,10%	1,31%	0,93%	1,35%	2,16%	0,88%	1,74%	-1,04%	0,86%
6.8	Development of silent vehicles and handling equipment allowing delivery and picking during the night	-1,63%	-3,39%	-0,04%	-0,09%	-0,33%	-1,05%	-0,64%	-1,27%	-2,21%	-0,28%	-1,87%	-3,33%	-0,26%
6.9	Exploitation of alternative drive concepts for trucks (electrically powered vehicles)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	-10,15%	-10,94%	-22,84%	-9,40%	-15,17%	-9,75%	0,00%
		[Vehicle/d]	[HGV/d]	[Vehicle* km/d]	[HGV*km /d]	[Vehicle*h]	[HGV*h]	[t/d]	[t/d]	[t/d]	[t/d]	[t/d]	[Inhabit. at >60dB(A)]	[Inhabitants at crit. streets]
	Base line situation ***	2.600	190	5.889.000	626.000	130.200	11.800	585,2	48,7	0,21	16,9	11,5	130.100	42.600

* Traffic load on minor roads

** The dwell time represents the pure running time of the vehicle (car or HGV) in the analysed network

*** All results refer to the analysed part of the network in the municipal area of the town

Bremen		Impacts of measure (Ratio in percent [%])												
Measure		motor vehicle traffic load *		motor vehicle kilometres		motor vehicle dwell time **		Air pollutant emissions (car + HGV)					noise emission	Compatibility potentials
		Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Fuel cons.	CO	Soot / Particles	NOx	CH	daytime	
1.5	Transport coordination and coopration of retailers	-0,06%	-0,56%	-0,06%	-0,49%	-0,09%	-0,66%	-0,20%	-0,23%	-0,60%	-0,27%	-0,30%	-0,75%	0,47%
1.6	Reduction of package volume	-1,30%	-8,94%	-0,78%	-5,92%	-1,19%	-6,92%	-1,92%	-0,83%	-6,27%	-3,07%	-1,99%	-3,32%	-1,54%
1.9	Goods distribution centre	0,14%	1,25%	-0,04%	-0,10%	-0,02%	-0,08%	-0,04%	0,00%	-0,10%	-0,04%	-0,03%	0,05%	-0,21%
1.10	Consolidation by means of "urban" containers	-0,58%	-1,48%	-0,08%	-0,46%	-0,50%	-0,84%	-0,21%	-0,30%	-0,52%	-0,33%	-0,31%	-0,98%	-0,42%
1.11	Replacing large trucks by smaller trucks or vans	0,15%	2,02%	0,14%	1,03%	0,22%	1,44%	0,02%	0,20%	0,29%	-0,07%	0,08%	0,71%	0,49%
1.14	Tourplaning	-0,09%	-0,36%	-0,19%	-1,24%	-0,21%	-1,38%	-0,41%	-0,16%	-1,33%	-0,62%	-0,43%	0,42%	0,71%
1.15	Cooperation of carriers on delivery at the city-area	0,26%	1,46%	0,02%	0,15%	0,05%	0,31%	0,05%	0,05%	0,19%	0,08%	0,08%	-0,38%	-0,16%
1.16	Goods distribution centres with cooperation of carriers	-0,15%	0,40%	-0,06%	-0,21%	-0,04%	-0,23%	-0,08%	-0,01%	-0,24%	-0,09%	-0,07%	-0,73%	-0,69%
2.5	Coordination of intermodal transport	0,09%	-0,08%	-0,02%	-0,11%	-0,04%	-0,17%	-0,03%	0,00%	-0,14%	-0,03%	-0,04%	-0,83%	-1,35%
2.6	Regional rail network in combination with urban distribution centres	0,02%	2,12%	-0,01%	0,02%	0,02%	0,07%	0,00%	0,01%	-0,03%	0,03%	-0,01%	-0,72%	0,68%
4.1	Optimization of dristribution systems	0,29%	1,50%	0,01%	0,10%	0,03%	0,12%	0,03%	0,03%	0,09%	0,05%	0,04%	-1,19%	-0,54%
4.11	Strong expansion of the rail network	-1,09%	-4,09%	-0,68%	-4,83%	-0,83%	-5,82%	-1,60%	-0,69%	-5,21%	-2,50%	-1,68%	-1,17%	0,37%
5.1	Regulation of freight traffic	-4,45%	-10,27%	0,51%	0,86%	-1,36%	-0,84%	-0,01%	-1,64%	-0,19%	0,38%	-1,26%	-2,36%	-2,39%
5.2	Guidance and information systems for goods transport	0,55%	0,47%	-0,32%	-0,54%	-0,94%	-1,28%	-1,02%	-1,44%	-1,51%	-0,41%	-1,53%	-0,77%	-0,06%
5.4	Truck routes / truck network in cities	-2,99%	-52,88%	0,71%	7,03%	0,23%	2,42%	2,06%	-0,48%	3,48%	3,83%	0,09%	-2,54%	-2,80%
5.5	Reservation on streets of special sites for truck delivery stops	-0,04%	-0,47%	0,03%	0,01%	0,02%	0,01%	0,06%	0,13%	0,05%	0,07%	0,10%	-0,24%	0,31%
5.6	Speed limits and external speed control	-16,43%	-16,00%	0,27%	0,33%	4,88%	4,06%	2,28%	7,84%	3,23%	0,84%	6,74%	-11,57%	-4,15%
5.8	Banning HGV through-traffic from city centres	-0,39%	-4,02%	0,02%	0,26%	0,06%	0,49%	0,05%	-0,03%	0,18%	0,11%	0,01%	-2,49%	-0,67%
6.8	Development of silent vehicles and handling equipment allowing delivery and picking during the night	-0,68%	-3,98%	-0,03%	-0,08%	-0,45%	-1,67%	-0,11%	-0,35%	-0,98%	0,12%	-0,60%	-2,02%	0,71%
6.9	Exploitation of alternative drive concepts for trucks (electrically powered vehicles)	0,01%	0,00%	-0,01%	0,00%	0,00%	0,00%	-5,95%	-2,74%	-19,74%	-9,38%	-6,36%	-10,75%	-0,60%
		[Vehicle/d]	[HGV/d]	[Vehicle*km/d]	[HGV*km/d]	[Vehicle*h]	[HGV*h]	[t/d]	[t/d]	[t/d]	[t/d]	[t/d]	[Inhabit. at >60dB(A)]	[Inhabitants at crit. streets]
	Base line situation ***	3.400	280	7.071.000	921.000	159.000	18.100	505,4	34,4	0,16	18,3	8,00	167.000	79.900

* Traffic load on minor roads

** The dwell time represents the pure running time of the vehicle (car or HGV) in the analysed network

*** All results refer to the analysed part of the network in the municipal area of the town

Cottbus		Impacts of measure (Ratio in percent [%])												
Measure		motor vehicle traffic load *		motor vehicle kilometres		motor vehicle dwell time **		Air pollutant emissions (car + HGV)					noise emission	Compatibility potentials
		Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Fuel cons.	CO	Soot / Particles	NOx	CH	daytime	
1.5	Transport coordination and coopration of retailers	0,32%	-1,37%	-0,05%	-1,19%	-0,14%	-1,44%	-0,06%	0,22%	-1,86%	-0,41%	-0,32%	0,00%	0,00%
1.6	Reduction of package volume	-0,52%	-7,50%	-0,44%	-6,37%	-0,37%	-6,77%	-2,77%	-2,98%	-9,24%	-3,16%	-4,41%	-1,01%	0,07%
1.9	Goods distribution centre	0,34%	0,52%	0,24%	1,76%	0,13%	1,64%	0,69%	0,62%	1,96%	0,76%	0,87%	0,00%	-1,92%
1.10	Consolidation by means of "urban" containers	-0,33%	-2,15%	-0,25%	-1,59%	-0,76%	-2,49%	-1,78%	-2,37%	-3,10%	-1,22%	-2,49%	1,03%	0,41%
1.11	Replacing large trucks by smaller trucks or vans	0,38%	3,50%	0,07%	1,99%	0,17%	2,66%	0,00%	-0,05%	0,34%	-0,05%	-0,06%	0,40%	0,00%
1.14	Tourplaning	0,11%	-0,19%	-0,01%	-0,52%	0,09%	-0,51%	1,35%	1,87%	1,31%	0,25%	1,84%	-0,72%	-1,93%
1.15	Cooperation of carriers on delivery at the city-area	0,04%	0,95%	0,18%	0,77%	0,21%	1,03%	0,61%	0,63%	1,43%	0,47%	0,83%	0,18%	-2,50%
1.16	Goods distribution centres with cooperation of carriers	0,29%	-0,14%	0,18%	0,92%	0,12%	0,47%	1,20%	1,44%	1,74%	0,61%	1,50%	-0,24%	-1,93%
2.5	Coordination of intermodal transport	0,15%	-0,18%	-0,06%	-0,16%	-0,09%	-0,29%	0,21%	0,38%	-0,43%	-0,10%	0,14%	0,00%	0,00%
2.6	Regional rail network in combination with urban distribution centres	-0,03%	-0,02%	0,08%	0,61%	0,37%	1,03%	0,87%	1,01%	1,21%	0,38%	1,05%	0,05%	-0,02%
4.1	Optimization of dristribution systems	0,02%	0,36%	0,12%	1,01%	0,10%	1,01%	0,72%	0,82%	1,36%	0,52%	0,90%	0,00%	-1,92%
4.11	Strong expansion of the rail network	-0,11%	0,42%	0,11%	-0,09%	0,24%	0,59%	0,64%	0,98%	0,68%	0,25%	0,94%	0,45%	0,00%
5.1	Regulation of freight traffic	-0,96%	-2,35%	0,11%	0,09%	-3,35%	-3,85%	-6,53%	-8,81%	-6,29%	-1,46%	-8,20%	0,56%	0,02%
5.2	Guidance and information systems for goods transport	2,13%	0,99%	0,40%	0,18%	-1,49%	-1,36%	-3,14%	-4,11%	-5,56%	-0,84%	-4,72%	3,37%	6,64%
5.4	Truck routes / truck network in cities	-0,50%	-31,26%	0,02%	4,16%	-0,17%	4,73%	0,59%	0,11%	4,76%	1,63%	1,35%	0,09%	2,39%
5.5	Reservation on streets of special sites for truck delivery stops	0,31%	0,23%	0,11%	0,01%	0,00%	-0,04%	-1,50%	-2,04%	-2,24%	-0,37%	-2,13%	1,15%	0,17%
5.6	Speed limits and external speed control	-7,98%	-13,18%	-0,90%	-0,78%	10,40%	10,76%	8,47%	13,26%	10,75%	-1,28%	13,09%	-24,95%	-1,43%
5.8	Banning HGV through-traffic from city centres	0,48%	-2,59%	-0,08%	1,07%	-0,16%	1,36%	-0,25%	-0,42%	-0,10%	0,07%	-0,45%	1,93%	0,28%
6.8	Development of silent vehicles and handling equipment allowing delivery and picking during the night	-0,05%	-1,85%	-0,12%	-0,59%	-0,60%	-3,38%	-1,72%	-2,13%	-7,00%	-1,37%	-3,63%	-2,18%	0,40%
6.9	Exploitation of alternative drive concepts for trucks (electrically powered vehicles)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	-5,63%	-4,98%	-24,45%	-8,39%	-9,02%	-2,37%	0,00%
		[Vehicle/d]	[HGV/d]	[Vehicle*km/d]	[HGV*km/d]	[Vehicle*h]	[HGV*h]	[t/d]	[t/d]	[t/d]	[t/d]	[t/d]	[Inhabit. at >60Db (A)]	[Inhabitants at crit. streets]
	Base line situation ***	3.100	130	1.454.000	72.000	59.100	2.500	189,3	21,3	0,04	3,4	4,2	45.800	30.200

* Traffic load on minor roads

** The dwell time represents the pure running time of the vehicle (car or HGV) in the analysed network

*** All results refer to the analysed part of the network in the municipal area of the town

Dortmund		Impacts of measure (Ratio in percent [%])												
Measure		motor vehicle traffic load *		motor vehicle kilometres		motor vehicle dwell time **		Air pollutant emissions (car + HGV)					noise emission	Compatibility potentials
		Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Fuel cons.	CO	Soot / Particles	NOx	CH	daytime	
1.5	Transport coordination and coopration of retailers	-0,03%	-0,66%	-0,02%	-0,29%	0,02%	-0,41%	-0,21%	0,17%	-0,13%	-0,18%	0,11%	-0,38%	0,55%
1.6	Reduction of package volume	-0,04%	-6,92%	-0,44%	-4,14%	-0,34%	-5,75%	2,41%	-6,46%	-14,25%	-4,45%	-9,70%	-1,50%	0,07%
1.9	Goods distribution centre	0,14%	0,15%	-0,06%	-0,18%	-0,22%	-0,38%	-2,23%	-2,67%	-3,19%	-0,90%	-3,06%	-0,28%	-0,12%
1.10	Consolidation by means of "urban" containers	-0,51%	-0,76%	-0,06%	-0,39%	-0,77%	-1,16%	-0,76%	-0,31%	-0,55%	-0,14%	-0,34%	-1,91%	0,23%
1.11	Replacing large trucks by smaller trucks or vans	-0,11%	2,26%	0,04%	1,08%	0,19%	1,77%	0,06%	-0,27%	-0,09%	0,18%	-0,22%	0,43%	0,06%
1.14	Tourplaning	-0,94%	-3,03%	-0,52%	-2,42%	-0,72%	-2,93%	-3,03%	-3,47%	-5,07%	-2,10%	-4,06%	-0,89%	-0,93%
1.15	Cooperation of carriers on delivery at the city-area	0,18%	0,21%	0,02%	-0,06%	-0,06%	-0,16%	-2,04%	-2,64%	-2,72%	-0,83%	-2,84%	-0,18%	-0,16%
1.16	Goods distribution centres with Cooperation of carriers	-0,03%	-0,06%	-0,04%	-0,25%	-0,17%	-0,44%	-2,80%	-3,41%	-3,84%	-1,06%	-3,78%	-0,54%	-0,85%
2.5	Coordination of intermodal transport	-0,21%	-0,12%	-0,05%	-0,10%	-0,13%	-0,20%	-0,46%	-0,55%	-0,41%	-0,16%	-0,51%	-0,30%	0,25%
2.6	Regional rail network in combination with urban distribution centres	-0,04%	0,32%	-0,03%	-0,25%	0,04%	-0,28%	-0,79%	-0,87%	-1,04%	-0,30%	-0,95%	0,08%	-0,37%
4.1	Optimization of dristribution systems	-0,05%	0,41%	0,00%	-0,01%	-0,04%	-0,02%	-0,63%	-0,78%	-0,41%	-0,15%	-0,67%	-0,48%	-1,79%
4.11	Strong expansion of the rail network	-0,38%	-0,87%	-0,22%	-0,78%	-0,28%	-0,97%	-2,21%	-2,50%	-3,43%	-1,15%	-2,99%	-0,01%	-0,28%
5.1	Regulation of freight traffic	-1,07%	-2,07%	0,40%	0,62%	-1,30%	-1,90%	2,28%	-4,83%	-9,74%	-1,96%	-7,26%	-1,99%	-0,58%
5.2	Guidance and information systems for goods transport	1,71%	3,22%	-0,09%	-0,73%	-1,82%	-1,74%	-5,73%	-6,86%	-16,07%	-4,30%	-11,15%	-0,38%	0,40%
5.4	Truck routes / truck network in cities	-0,06%	-45,19%	-0,26%	-0,20%	-0,55%	-5,25%	-4,97%	-5,86%	-10,82%	-2,62%	-8,27%	-13,24%	-0,24%
5.5	Reservation on streets of special sites for truck delivery stops	-0,42%	-0,27%	-0,03%	-0,03%	-0,66%	-0,30%	0,89%	1,18%	1,52%	0,48%	1,44%	-0,69%	0,16%
5.6	Speed limits and external speed control	-12,14%	-21,14%	-1,94%	-1,44%	18,05%	14,28%	8,32%	13,87%	6,92%	2,35%	13,04%	-24,45%	-1,23%
5.8	Banning HGV through-traffic from city centres	-0,31%	5,62%	0,08%	0,46%	0,14%	0,76%	0,67%	0,94%	0,86%	0,54%	0,93%	0,65%	0,30%
6.8	Development of silent vehicles and handling equipment allowing delivery and picking during the night	-0,20%	-0,76%	-0,27%	-0,29%	-0,56%	-1,46%	-5,70%	-6,29%	-13,03%	-2,88%	-9,45%	-1,71%	-0,28%
6.9	Exploitation of alternative drive concepts for trucks (electrically powered vehicles)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	-6,18%	-6,02%	-16,45%	-7,54%	-9,11%	-6,07%	0,00%
		[Vehicle/d]	[HGV/d]	[Vehicle*km/d]	[HGV*km/d]	[Vehicle*h]	[HGV*h]	[t/d]	[t/d]	[t/d]	[t/d]	[t/d]	[Inhabit. at >60dB(A)]	[Inhabitants at crit. streets]
	Base line situation ***	7.700	350	10.826.000	764.000	329.500	16.200	1844,2	213,5	0,58	30,5	46,9	198.300	137.300

* Traffic load on minor roads

** The dwell time represents the pure running time of the vehicle (car or HGV) in the analysed network

*** All results refer to the analysed part of the network in the municipal area of the town

Düsseldorf		Impacts of measure (Ratio in percent [%])												
Measure		motor vehicle traffic load *		motor vehicle kilometres		motor vehicle dwell time **		Air pollutant emissions (car + HGV)					noise emission	Compatibility potentials
		Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Vehicle (car + HGV)	HGV	Fuel cons.	CO	Soot / Particles	NOx	CH	daytime	
1.5	Transport coordination and coopration of retailers	-0,03%	-0,37%	-0,02%	-0,22%	-0,02%	-0,24%	-0,06%	-0,02%	-0,23%	-0,09%	-0,05%	0,00%	0,00%
1.6	Reduction of package volume	-0,68%	-7,82%	-0,50%	-6,23%	-0,55%	-6,80%	-1,73%	-0,64%	-6,61%	-2,63%	-1,73%	-2,56%	-0,12%
1.9	Goods distribution centre	0,27%	2,60%	0,07%	0,83%	0,09%	1,15%	0,21%	0,06%	0,94%	0,33%	0,23%	0,22%	-0,24%
1.10	Consolidation by means of "urban" containers	-0,06%	-0,73%	-0,05%	-0,62%	-0,08%	-0,71%	-0,15%	0,04%	-0,65%	-0,24%	-0,10%	0,44%	0,00%
1.11	Replacing large trucks by smaller trucks or vans	0,16%	2,83%	0,11%	1,47%	0,15%	1,87%	0,09%	0,20%	0,39%	0,00%	0,12%	0,80%	0,00%
1.14	Tourplaning	0,08%	-0,77%	-0,13%	-1,33%	-0,15%	-1,36%	-0,38%	-0,16%	-1,35%	-0,57%	-0,38%	-0,55%	-0,24%
1.15	Cooperation of carriers on delivery at the city-area	0,05%	0,27%	0,02%	0,29%	0,04%	0,40%	0,07%	0,01%	0,35%	0,11%	0,07%	0,08%	0,00%
1.16	Goods distribution centres with Cooperation of carriers	0,36%	3,01%	0,03%	0,96%	0,04%	1,31%	0,20%	0,02%	1,09%	0,38%	0,21%	0,71%	-0,50%
2.5	Coordination of intermodal transport	-0,15%	-0,49%	-0,06%	-0,16%	-0,07%	-0,21%	-0,09%	-0,10%	-0,23%	-0,08%	-0,13%	-0,58%	1,35%
2.6	Regional rail network in combination with urban distribution centres	013%	0,29%	-0,01%	-0,24%	-0,01%	-0,12%	-0,08%	-0,08%	-0,23%	-0,12%	-0,10%	-0,35%	-0,24%
4.1	Optimization of dristribution systems	0,09%	0,96%	-0,06%	0,08%	-0,05%	0,26%	-0,03%	-0,08%	0,10%	-0,01%	-0,06%	-0,19%	-0,28%
4.11	Strong expansion of the rail network	0,04%	-0,80%	-0,14%	-2,20%	-0,15%	-2,37%	-0,52%	-0,10%	-2,33%	-0,83%	-0,53%	-1,45%	-0,73%
5.1	Regulation of freight traffic	-6,12%	-3,90%	1,44%	3,35%	-1,72%	0,62%	1,06%	-0,23%	2,04%	2,99%	0,05%	-4,12%	-3,32%
5.2	Guidance and information systems for goods transport	5,66%	5,31%	-0,79%	-0,54%	-1,63%	-1,28%	-1,69%	-3,76%	-1,85%	-0,65%	-3,59%	-0,47%	2,89%
5.4	Truck routes / truck network in cities	-2,73%	-56,31%	0,33%	2,78%	-0,06%	-3,76%	1,08%	0,04%	0,46%	1,79%	-0,02%	-12,70%	-0,93%
5.5	Reservation on streets of special sites for truck delivery stops	-0,51%	-0,17%	-0,01%	0,01%	-0,06%	-0,01%	-0,05%	-0,16%	-0,09%	0,00%	-0,16%	0,00%	0,94%
5.6	Speed limits and external speed control	-23,73%	-22,22%	0,07%	-0,73%	3,45%	2,88%	1,48%	3,81%	2,50%	-0,58%	3,87%	-12,61%	-4,79%
5.8	Banning HGV through-traffic from city centres	-0,10%	-1,85%	0,10%	1,46%	0,18%	2,19%	0,37%	0,13%	1,56%	0,56%	0,38%	-0,65%	1,05%
6.8	Development of silent vehicles and handling equipment allowing delivery and picking during the night	-0,07%	-0,54%	0,02%	0,07%	-0,04%	-0,26%	0,01%	-0,10%	-0,52%	0,17%	-0,26%	-1,68%	-0,15%
6.9	Exploitation of alternative drive concepts for trucks (electrically powered vehicles)	0,00%	0,00%	0,00%	0,01%	0,00%	0,01%	-4,65%	-1,72%	-18,40%	-7,01%	-4,83%	-8,21%	0,00%
		[Vehicle/d]	[HGV/d]	[Vehicle*km/d]	[HGV*km/d]	[Vehicle*h]	[HGV*h]	[t/d]	[t/d]	[t/d]	[t/d]	[t/d]	[Inhabit. at >60dB(A)]	[Inhabitants at crit. streets]
	Base line situation ***	5.400	380	8.076.000	632.000	129.000	9.500	596,1	41,6	0,15	22,3	8,6	170.300	109.700

* Traffic load on minor roads

** The dwell time represents the pure running time of the vehicle (car or HGV) in the analysed network

*** All results refer to the analysed part of the network in the municipal area of the town

COST 321

National Report

ITALY

Andrea RICCI
I.S.I.S.
Roma

Table of contents

1.	Introductory remarks.	185
2.	Overall situation and policy trends.	185
2.1.	Goods distribution in Italy	185
2.2.	General policies.	187
2.3.	Sectoral policies in the specific area of freight transport management	188
3.	Two significant city cases.	189
3.1.	Milano.	189
3.1.1	The scale of the issue	190
3.1.2	The simulation of policies	191
3.1.3	Conclusions and recommendations	192
3.2.	Parma.	192
3.2.1.	The scale of the issue	192
3.2.2	Intervention proposals and simulation of the effects.	194
	The reduction of running vehicles	194
	The control of goods transports within the town	196
3.2.3	Conclusions and recommendations	197
	The priorities	197
	The makers of the change	198

1. Introductory remarks.

The contribution of Italy the COST 321 has been limited by the lack of public national resources made available to carry out original work and elaboration, with the exception of the late participation of ENEA, which has allowed, towards the end of the research programme, to gather some basic informative elements upon which - among other - this document is based.

Therefore it should be clear that this National Report does not have the ambition of being exhaustive, especially for what concerns the identification and presentation of all city experiences in Italy in the management of the urban freight traffic issue.

Its scope is in fact limited to:
the illustration of the overall situation and policy trends at the Italian national level
the presentation of two significant examples (or case studies) for which both the past/current experience and the use of modelling tools is meaningful to the Action COST 321.

2. Overall situation and policy trends.

2.1. Goods distribution in Italy

Over the last few years there has been in Italy a great change in the delivery systems, either primary (from industries to central depots and from industries to platforms/to suburban depots), and secondary (from platforms/from suburban depots to points of sale).

With regard to the secondary distribution in particular, one of the most important changes has been the progressive increase in the delivery rate to the points of sale (S.P.) Such a change has been fostered/imposed by the progressive tendency of S.P. to reduce the stock level of the marketed products.

As a rule, suppliers have met the needs of S.P. (or rather, in some cases they promoted such initiatives in order to be more competitive in comparison with their competitors), increasing the delivery rate and therefore decreasing the average size of the single deliveries.

This change has been possible mainly thanks to the fact that as a rule local delivery costs are by far objectively low and affect moderately on the final price of the product. With reference, for example, to the sector of consumer goods (a sector typically characterised by low unit selling prices of the marketed products) the cost of transport to S.P. of the large-scale organised distribution firms doesn't exceed 1-2 % of the final cost of products. As regards retail S.P. this amount can be at the most increased by 50%.

The delivery cost is low for two main reasons:
The competition among haulage firms with the resulting cut in commercial rates, because of excess of supply over demand. This has certainly been caused also by the current lack of any kind of regulations in this sector (either as concerns the practice of this profession and as concerns the quality of the given services), causing a great fragmentation of haulage firms;
The rates of goods transport in general, and of urban transport in particular, do not integrate, if not occasionally, costs connected to:
- pollution and air noise pollution;
- street deterioration;
- time wasted by road users because of traffic jam, tailbacks, etc..

As concerns the effect caused on the urban traffic by the progressively rising role of the self-service sale areas (typically: supermarkets), it can be observed that the increase in S.P. under study causes:
on the one hand, a substantial decrease in the amount of deliveries (and therefore a reduction of trade vehicle traffic), because given the great amount of goods dealt in by the supermarkets, supply is carried out by vehicles with greater capacity than the ones used by the retail S.P.;
on the other hand, an increase in private traffic as a consequence of the fact that purchases are more substantial and bulkier and that the distance between houses and S.P. is more remarkable.

Currently there are no objective elements that allow us to understand if, as far as urban traffic is concerned, retailers have more advantages or disadvantages in comparison with the great sales areas and vice-versa.

This situation is in fact inevitably designed to increase the problems caused by the inefficiency of the delivery transport system: several vehicles scarcely used that greatly contribute to cause pollution and traffic jams, obstacles to urban traffic due to a higher number of deliveries per local unit, more and more uncivilised and unregulated ways of parking.

The sector of urban transport of goods accounts for nearly 50 % of standing expenses of the whole haulage sector in Italy. Transports covering less than 50 km distance are 45,6% of the total amount of tons of goods transported (National Calculation of Transports, 1994). In terms of traffic units, several studies have confirmed that the amount of trade vehicles used for collection and delivery in the cities accounts for nearly 25 % of global traffic.

Despite its great importance, clearly emphasised by these data, this phenomenon has drawn little attention that only concerned both the methods of research and the quantitative estimate of these phenomena, and proposals and ways of carrying out public intervention.

In fact. the analysis of the past and current policy in the sector of urban freight transport shows that it is very seldom that official proposals (intended as the result of public policy formulation and enforcement) play a leading, or even a significant role in determining the evolution of the situation. In fact, the leading role is clearly played by the operators, not only in the implementation but more importantly in the practical design and in the subsequent proposal of interventions.

What follows is a brief overview of the main policies related to the subject matter, as they are observed in Italy. For the sake of clarity, the distinction has been made between: i) general policies and ii) specific policies.

2.2. General policies.

The main reference policy instrument addressing the global issue of the regulation of urban traffic is the so-called PUT (Piano Urbano del Traffico), originally introduced in 1986, and then included in the new road transport code at the national level under the name of PUTV (Piano Urbano del Traffico Veicolare).

The PUT is mandatory for any municipality with more than 30 000 inhabitants. However, no specific indications concerning the planning of goods transport are made explicit in the official texts.
As a result, other - non public - institutions have tried to fill this gap with spontaneous proposal. Among these, the operators associations, the manufacturers associations (e.g. Assolombarda, the association of manufacturers of the Lombardia Region), FIAT and other can be quoted.

These proposals usually share a common approach to the problem, which may be outlined as follows.

The planning of urban goods traffic must be based on two fundamental axes. i.e.:

- the land use policies (settlement policies, functional decentralisation, accessibility)
- identification of the strategic guidelines for intervention
- It is in this context that the traffic policies must be assessed, through:
- the planning and re-appropriation of the roadway system
- the design of the public transport system
- the control of parking.

This means, among other, the need to hierarchise the road network, as well as interventions on the network and the fluidification of traffic, the regulation of stops and the minimisation of the possibilities of violation.

Altogether, the following lines of action emerge as meaningful:
interventions in urban planning, i.e. changes in the location pattern of warehouses and other urban management functions, or through the specialisation of roads/streets, or a time limitation of activities, or a spatial limitation of specific urban zones
interventions aiming at regulating road use through economic mechanisms, aiming at increasing the perception of the need to pay for the use of public road space
interventions in the area of the goods distribution logistics (company management, rationalisation of the existing systems)

2.3. Sectoral policies in the specific area of freight transport management

Specific proposals are often formulated by sectoral operators, and therefore reflect a varied range of interests, owing to the diversities in size and organisation. They may be directed to the optimal location of city (or borough) warehouses and deposits, to the size of carriers, or else to the possibilities of using roadways and parking spaces independently of norms and regulations on passengers transport.

CONFETRA, the Italian Confederation of Traffic and Transport, proposes technological actions, such as the adoption of electric vehicles, or actions on parking tariffs (as opposed to the ban on inner city traffic), as well as measures facilitating the search of a parking spot for loading/unloading operations.

More specifically, CONFETRA's most significant proposals concern:

- priority to the transport of goods, with no limitations whatsoever imposed upon the corresponding traffic
- reduction of delivery times, through the limitation of unloading operations to the entrance door
- public or/and private areas dedicated to the unloading operations
- access to limited traffic zones within specific time periods
- preferential time zone (1:30 to 3.30 p.m.)

In addition, CONFETRA issues recommendations in the areas of Intermodal Platforms and of the distribution logistics, with particular regard to the location of refrigerated goods warehouses and of wholesale markets and general warehouses.

Other proposals (all issued from non public institutions), mention a number of possible interventions such as:

- establishment of systematic time zones (Transtec 1990)
- establishment of specific spatial limitations according to weight (threshold of 3.5 tons), time period, alternate registration plate numbers, etc. (Bologna)
- ad hoc mixes specifically designed for goods distribution, as the one proposed for the City of Rome, including e.g. night time goods distribution to the city core (historical center), a dedicated time zone (2 to 4 p.m.) for the inner belt (*intra muros*), the fixed periodicity of supplies, the downsizing of distribution vehicles, compulsory time zones for the delivery of perishable goods, etc

3. Two significant city cases.

3.1. Milano.

The city of Milano is particularly interesting not only in that it is clearly a large metropolitan area with all the typical problems of congested, high density areas but also because it has repeatedly been the object, over the past 10 years an more, of surveys and studies specifically targeted on the issue of goods traffic, including original counts and data collection as well as extensive use of simulation models for impact analysis of possible interventions.

3.1.1. The scale of the issue.

The structure of the economic and commercial activity in the city is illustrated by the ratio between the number of retail shops and population, which is as high as 64 shops per thousand inhabitants in the city center, over 30 in the intermediate ring and 15 in the outer agglomeration. A very high percentage of the retail sales points have less than 50 m^2 (90% for food, 65% for clothes, etc.), therefore resulting in an extremely fragmented picture, which in turn bears heavily on the volume and pattern of the traffic generated by distribution.

This is confirmed by the following summary statistics (observations):

area	daily number of vehicles entered	daily number of vehicles per km of road network
city centre	13923	160
intermediate ring	25428	104
outer areas	28763	43

with the following distribution of vehicle types:

area	% cars	% city vans	% vans	% trucks
city centre	15	20	48	17
intermediate ring	13	16	45	26
outer areas	13	14	46	27

A second important issue concerns the parking and stop patterns:

Duration of stop (minutes)	1 to 10	10 to 20	20 to 30	30 to 60	more than 60
% distribution	74	16	6	3	1

and the following land use:

modality of stop	reserved spot	authorised parking	pavement	double parking	other unauthorised
% distribution	4	30	20	25	21

therefore resulting in almost two thirds of unauthorised land use for stopping, a percentage which further increases when considering short stops only (less than 10 minutes).

3.1.2. The simulation of policies

Extensive simulation exercises have been carried out in years on the commercial traffic in Milano. What follows is a brief summary of the work conducted by MEGLIOMILANO, a local non profit organisation. This work is based on the use of HAPPYTRAILS, a suite of programmes dealing with traffic management, designed and developed by Politecnico di Milano (Curti and Marescotti), who provided technical support to the studies and simulations. HAPPYTRAILS integrate most of the typical functions of transport and traffic management, including the search of minimum length paths and of minimum cost paths.

The use of the simulation tools was directed to provide answers to the following ambitious questions:

- what is the expected impact of interventions on:
  - the level of service of road transport
  - the increased fluidity on specific links
  - pollution levels
- what is the cost of interventions:
  - production of global quality indicators
  - number of vehicles on the road
  - distribution of links according to classes of level of service
- how to establish alternative intervention scenarios.

A wide variety of simulation runs were conducted, the most significant of those being:

- Modification of the distribution modalities, i.e. decrease of the overall number of distribution trips through the use of vehicles with increased loading capacity, and without changing the global volume of delivered goods.
- Modification of the time zones for goods delivery, through a limitation of goods distribution in peak hours, or/and an increase in off peak hours.
- Modification of the demand of passengers transport, to analyse the effect on traffic density of measures aiming at decreasing (only at peak hours) the use of roadways for passengers, therefore increasing its availability for goods distribution.
- Modification of the supply of transport infrastructures, mainly in terms of different use of land and roadways reserved for parking (these measures being more feasible than large viability projects requiring huge investments and time length).
- Combinations of the above.

3.1.3. Conclusions and recommendations

Also owing to the approach followed in the simulation, the conclusions and recommendations formulated by MEGLIOMILANO do not focus on interventions requiring large infrastructural investments, but rather on regulatory measures as well as on actions stimulating behavioural changes of the involved communities. The most significant recommendations are summarised hereafter:

- introduce/strengthen parking tariffs with modular progression in the city centre, trying to avoid the emergence of unfair competition in parking supply
- develop and enforce more stringent anti-violation policies and instruments
- create *red routes* (re: London experiences), where parking is totally forbidden
- encourage the shift from private to collective for passengers transport, through a variety of measures
- introduce limitations to private traffic (time and space)
- stimulate through incentives the voluntary modification of habits in the selection of the time period for distributing goods
- promote co-ordination among transport operators
- promote targeted actions for the co-ordination of goods transport in specific problem areas
- promote the role of local Street Associations (among retailers), with particular regard to warehousing optimisation

3.2. Parma.

3.2.1. The scale of the issue

The Region Emilia-Romagna, on the spur of the regulations of the New Highway Code concerning the development of the Urban Plans of Vehicle Traffic (art. 36), decided to promote an initiative aimed at developing a general policy for the analysis and regulation of this sector.

The specific targets of this study have been the following:

- To draw out the guidelines for the analysis of the phenomena and to plan intervention in the sector of urban transports of goods in an average city in the Region Emilia-Romagna;
- To value and validate these guidelines by means of a pilot study on the city of Parma, carrying out research, applying simulating methods and elaborating intervention proposals.

Thanks to all the data, model methods and results of simulations, it has been possible to fully understand the phenomena concerning the transport of goods in the urban area of Parma, to single out the critical areas, and to start with the co-operation of the categories and business a debate on the main interventions whose realisation can give the opportunity of dramatically improving the delivery system.

The studies made on the city of Parma have highlighted four main problems that can be generalised to other similar urban areas:

i. dimensional fragmentation of the commercial offer within the urban area and the resulting fragmentation of the supply system;
ii. strong spatial and temporal concentration of the urban haulage activities;
iii. low saturation level of the load capacity of the vehicles used to transport goods within the urban area;
iv. widespread parking against regulations of commercial vehicles that collect and deliver goods in the historical centre.

Singling out and quantifying all these problems and observing the objective presence of phenomena such as traffic congestion and pollution has been useful to point out a targeted series of interventions and to quantify, if only roughly, the impacts on the urban traffic system as a whole. Such interventions will obviously have to be evaluated and integrated according to the targets of the development policy of the city and of its hinterland as regards the use of land and of regional and inter-regional integration. Some basic figures help setting the quantitative framework.

The density of inhabitants per retail sales point index, that estimates the concentration/fragmentation rate of the commercial supply in the province of Parma (54), is consistent with the national mean (56). The value is about three times lower than for Great Britain (165) and Germany (148).

Taking into account all the commercial units located in the City, 67% employ 1 or 2 sales staff, and 86% less than 6. In the retail trade sector the percentage of the sales points with less than 6 sales staff accounts for 91%. Roughly 75% of them, moreover, don't even have an area where to load/unload goods.

To the dimensional fragmentation of the sales points is related a strong territorial concentration (43,7% of the local units of the retail trade are located in the historical centre of the town, with a density of 17 inhabitants per local unit). More than a fourth of the local units resident in the City are located in only 24 of the 1.200 town streets.

In the historical city centre roughly 8.400 daily deliveries are made, with an amount of 2.700 deliveries per km, seven times higher than the amount of deliveries reported in the middle and suburban area of the town.

The time distribution of deliveries is concentrated from 8.00 to 12.00 (55% of total deliveries). Only in the trade sector this percentage increases up to 60%. In the afternoon a peak is reached at about 16.00 which is more than two times lower than the one in the morning.

80% of deliveries to sales points are carried out with vehicles owned by third parties (haulage and delivery firms, or producers), while only 20% of deliveries are self-supplied.

With regard to the supply of transport services, the most remarkable fact that is partly influenced by the dimensional fragmentation of the demand above reported, concerns the poor use of the load capacity of medium-light vehicles. While in the transports carried out by heavy vehicles, the load unit capacity is satisfactorily overstocked, as regards medium-light vehicles (motor vans, vans, light trucks) the load factor accounts for about 20% of tonnage. Even though the percentage is to be corrected depending on the weight of the transported goods in the delivery phase, this fact shows that there is a serious inefficient situation, but at the same time it shows that there are some chances to improve it.

The study on the commercial vehicles parking, made on eleven downtown streets and on the city first middle strip of the town (about 4.000 parking being studied), showed the high percentage of illegal parking (85%). However, it should be noticed that only a bare 15% of illegal parking reported causes real problems to traffic. Parking on the pavements has a remarkable percentage (36,6%), while double-parking (6,3%) or parking on bus lanes (2%) is occasional.

3.2.2. Intervention proposals and simulation of the effects.

The reduction of running vehicles

It can be pursued in two different interdependent but complementary ways:

concentrating the demands of supply made by local units of the historical centre by aggregating the transport demands on a local basis (street or district consortium) in order to create critical amount of demands able to create the highest vehicle saturation;

increasing the efficiency of the running trade vehicles (higher number of deliveries per time unit, more goods to be loaded), by means of bonus policies of organised transport and by means of the development of innovative managing methods of the fleets of vehicles in the city (AVM, mobile communication, route planning, traffic information, etc...).

To achieve the above, it is in turn necessary:

- to separate the responsibility of the goods supply from the responsibility of the transport supply, promoting and fostering;

- to make the most of the potentials of the infrastructures specialised in the joining and integration of different transport sections (logistic platforms/goods centres/interports);
- to base the management and the organisation of the enterprises on new data processing and telematic technologies to manage the demand (database of orders, EDI, etc).

In such a scenario some homogeneous groups of local units of the historical centre make co-ordinated supply demands by means of a telecommunication system that connects them to the main suppliers; the requested goods are therefore located in a logistic platform equipped for a modal transhipment between the main transport vehicles and the medium light distribution vehicles. From the equipped logistic platform they are treated and sent to their final destinations.

The application sectors whose development can strongly help to improve the system efficiency are:

- systems of vehicles locating and monitoring that allow those who plan deliveries to have in real time all the information regarding the location of vehicles during collecting and deliveries in the cities;
- mobile communication systems that allow to communicate the instruction regarding deliveries and collection of goods depending on the dynamic changes of supply and demand;
- systems of traffic information that help to choose extremely well the vehicle routes.

The simulating models developed ad hoc for the Parma study allowed to estimate the results of all the co-ordinated interventions showing a reduction of roughly 15% in the commercial km -vehicles (from 17.200 to 14.600) and of 21% of the trade time -vehicles (from 690 to 540) during rush hours of the whole traffic (from 7,30 to 8,30), with an increase in the average commercial speed of 7,5% (from 25,1 to 27 km/h without taking into account stops). The whole impact of these measures on the *urban traffic would account for a reduction of about 5% in rush hours of the whole* traffic and an average reduction of 8% over the whole day.
These simulations were also useful to gauge alternative scenarios as concerns locating of logistic platforms to be used for the above mentioned purposes. The result of the simulations shows that the most cost-effective solution for the local transport , is to create a co-ordinated network of logistic platforms on the most important entry streets of the city (via Emilia East and West, SS 343); such a solution would cause, conditions being equal, a decrease of 10% of the whole cost of the

urban haulage system in comparison with the current situation (having a saving of about 8 billion liras a year).

The control of goods transports within the town

Roughly 60% of deliveries in the historical centre of Parma, as above said, are concentrated in the time period from 8.00 to 12.00 a.m., and nearly 40% in the two hours from 9.00 to 11.00. Bearing in mind the results of the studies, the criteria to determine the interventions on this ground can be summed up as follows:

- a remarkable number of local units (nearly a tenth) assert their willingness to accept deliveries out of business hours; the preferred time period that also corresponds to the off peak hours reported in the studies of the Mobility Plan, is from 13.00 to 15.00, while the possibility of promoting and developing night deliveries is to be excluded;
- an even higher number of local units maintain that they are willing to accept unprotected deliveries "out of business hours", also in this case considering in particular the technology of marketing goods and delivery schedules, some initiative aimed at reducing the concentration of deliveries in rush hours could be started.

The intervention of the public authorities can therefore be aimed at promoting building trade changes that enable to easily carry out unprotected deliveries (use of basements provided with automatic goods delivery systems, locating delivery areas, also to be shared among sales points, to be used for unprotected deliveries made by suppliers who have the permit to enter these areas).

As regards the conditions to deliver and load the goods (made within an average of 12 minutes) it is advisable to consider, at least in rush hours, the possibility of imposing the condition to deliver "on the doorstep".

These measures are likely to have a double effect:

- to discourage deliveries in busier rush hours;
- to reduce parking hours of the vehicles within the same hours.

Such measures will have to be carefully estimated even as regards the methods aimed at controlling their implementation.

A plan aimed at regulating these elements could be the following:

- goods must be delivered "on the doorstep" in the historical centre (or only in the more traffic-congested streets) from 8,00 to 12,00 and from 15,00 to 17,00;
- vehicles are allowed to park on the pavements (in the areas that are wide enough not to cause problems to pedestrian traffic) within the time strictly necessary for delivery under the condition of the "doorstep" (estimated in an average of less than 5 minutes);

- an "expensive" alternative is to be conceived (not in terms of charging the parking) to those people, in decided hours, who don't want to accept the conditions of delivery "on the doorstep", creating reserved areas and parking areas to load/unload goods;
- hard penalties and a strict control must be imposed on those people who don't comply with the measures and alternatives above mentioned.

The use of the delivery system on the doorstep should bring about a further decrease in the time-vehicles of 15% (from 540 to nearly 470 in rush hours of the whole traffic).

It should also be noted that for some of the streets that have been studied with regard to parking there is the need of a detailed revision of the current regulations on the parking of commercial vehicles.

3.2.3. Conclusions and recommendations.

The priorities

All the intervention proposals included in the previous sections are to be listed according to the following priority scale:

i. The most urgent priority is to change the current system of parking regulations, at least as concerns those streets that have been studied; within this framework there is the need to change the current regulations, almost totally ignored, bearing in mind the current regulations and the alternatives that can really be accomplished;
ii. The second priority is the whole of the initiatives to regulate working hours, parking, ways of delivery (included the building changes aimed at making "unprotected" deliveries easier) and those vehicles that are allowed to enter the historical centre for deliveries;
iii. The third priority which is not less important but it is very difficult and very expensive to achieve, is the intervention aimed at improving the efficiency of the urban transports of goods system and most of all the intervention aimed at achieving, also thanks to the use of communication and data processing technologies, the concentration of supply and demand of transports in order to maximise the kind of use of the vehicles.

However, all the interventions will have to be characterised by the following factors:

I. The area considered is basically limited to the historical centre and in particular to some traffic-congested areas or streets;
II. Their planning will have to be realised according to regulations and actions aimed at urban development, envisaged by the PRG and by the Mobility Plan;

III. The proposals will have to made to/ talked over with the business with different ways of involvement.

The makers of the change

According to the results of the studies the standard of satisfaction showed by the local units of the city of Parma, most of all by the retailers, regarding the current services of the distribution system is very high. Under these circumstances it is likely that any regulatory intervention (or rather any proposal to change) can meet objections (or rather be boycotted) by the business involved. It is therefore necessary in such a circumstance to reach a common agreement on the advantages of the intervention and on the social costs caused by the not regulated evolution of this sector. For the above mentioned initiatives to be successful, there is the need of a qualitative change of the approach and of the commitment of the business and of citizens as concerns the quality of urban mobility. Every further action will have to be based on the common belief of the importance and of the need of the problems to be faced and on the chance to contribute to solve them.

The authors of this change, as already said, will have to be first the trade and transport companies. In particular, the organisations/authorities that can easily be involved in planning and testing the interventions are likely to be:

- Association of retailers willing to test and introduce new ways of work;
- Transport and organised delivery companies;
- The existing logistic structures (inland port, markets), because they are the potential co-ordinators of the system of logistic platforms and of the different kinds of traffic flows;
- Public transport companies or any other authorities, as potential bodies providing information services on the traffic and other information services requiring urban technological infrastructures.

Pilot experiments, involving specific targeted subsectors, are now being promoted to test the above policy guidelines on real scale.

COST 321

National Report

THE NETHERLANDS

June 1997

Elly Y. de Gooijer
Ministry or Transport

Table of Contents

1.	Introduction	201
1.1.	The Netherlands' efforts within Cost 321	201
2.	Environment	202
2.1.	National policy	202
2.2.	Local policy	205
2.3.	Number and types of cities in the Netherlands	206
3.	Measures	206
3.1.	Projects	206
3.2.	Models used	211
3.3.	Simulations	212
4.	Effects	212
4.1.	Results of the projects	212
4.2.	Conclusions	213
Appendixes:		214
1.	Overview of city measures with direct influence on goods transport	214
2.	Overview of city measures with indirect influence on goods transport	215
3.	Grid: graphic presentation of the potential of solution areas	217
4.	Diagram with influences	218
5.	UDP projects at a glance	219
6.	Urban Distribution Effect Model	220
7.	Check list to describe the simulation method and the modelling toolkit	222
8.	check list to characterise and describe the model cities	224
9.	check list to describe the effects of the different measures	227

1. Introduction

Economic growth and improving the quality of life must go hand in hand. This is why both central and local authorities have the constant task of promoting a better flow of goods transport. Provinces and cities are responsible for keeping (inner) cities accessible for the transport needed to distribute goods. Measures concerning urban distribution fall almost always within municipal jurisdiction. City governments can choose among a large number of measures in order to implement national traffic and transport policy within their boundaries. Municipalities therefore, are capable of solving bottlenecks and achieving their political goals.

Yet proposed solutions can multiply in all directions if they are not coordinated. For goods distribution transport, this can result in an inconsistent and disturbing jumble of measures in a region or between (neighbouring) cities. A cohesive and efficient plan for mobility and distribution can only be achieved through cooperation. Business and government must work together on a national, provincial and municipal level in order to achieve accessibility. Through the implementation of municipal measures, a balance can be found between the quality of so-called public space and the demands and requirements for urban accessibility. In brief: a clear connection between room for economic growth and improvement in the quality of life.

In the first place, government will see that the business world honours its responsibility to cooperate as much as possible. This also means they will do their best to consolidate those goods with a destination in the same city or in the same section of the city. This will result in a higher load factor for trucks (more freight per truck), thereby reducing time spent in the city (shorter staying time) and decreasing vehicle kilometres. It is furthermore the municipal governments' responsibility to implement supportive measures enabling businesses to work toward an urban goods distribution which is as efficient as possible while harmonising with other civic activities.

1.1. The Netherlands' efforts within Cost 321 comprised:

participation in the management committee
brochures and other information
presentations
chairmanship study group A until mid-1996
"TNO report" number INRO-LOG 1995-10 "State of the Art, Description of Measures and First Assessment of Selected Measures"
participation in study group starting mid-1996

2. Environment

2.1. National policy

The State determines the frameworks for provinces and cities from its national vision. With respect to the policy area of goods distribution within cities, the State's task is to direct, stimulate and facilitate the lower authorities. Both cities and provinces have a responsibility to translate national traffic and transport policy within their borders. This is why they are expected to keep (inner) cities and economic centres accessible for necessary distribution transport and thus the supply of goods within cities.

Urban supply policy is coordinated on a national level within the Urban Distribution Platform (UDP), which was formed on April 25, 1995.
Logistics specialists from the business world (loaders, wholesalers and retailers and transporters) are represented in the platform, along with local, provincial and national governments. The Urban Distribution Platform wants to assist cities and help solve bottlenecks in urban goods transport.

Urban distribution refers to the necessary transport of goods to and for the inner cities. This involves the transport vehicles delivering supplies efficiently while placing as little burden on quality of life and surroundings as possible.

Distribution, particularly urban distribution, concerns a complex policy area with many players and various situations, both physical and political. The politics help determine which functions a city wants to fulfil, which also has an effect on the necessary supply.

Despite this complexity, the UDP has managed to determine the most important policy directions for solutions, the so-called priority areas. These include upstream consolidation, cooperation among transporters, receiving after opening hours, ideally set periods and central and local legislative means.

The UDP believes that by working tangibly on these priorities the greatest chance of improving accessibility on the road, the quality of life, of increasing transport efficiency (in environmental terms) and maintaining and, if possible, improving the economic situation in (inner) cities is created.

The priorities are in various phases of development. At this time no favourable technological innovations are forthcoming which could lead to the solution of the problems of urban distribution in the near future. That will have to be something for the long term. However, the UDP has defined projects that were started recently or soon will be which can serve as a model project for a priority. These project managers and the UDP are entering into a cooperative agreement to determine the projects' effects. The UDP wants to be involved in two projects per priority.

For the projects which have been agreed upon, the UDP wants to assess in advance and determine afterward what the effects were. This is why the UDP has developed a model to determine the effects of urban distribution projects. These include indicators for each objective of the UDP. It is the intention of the UDP to determine two projects per priority area in the period through to the end of 1999. The effects of these projects will be measured and quantified.

Urban districts must remain accessible for short-distance goods transport; i.e. with a travelling distance of up to 50 kilometres, including distribution in the city. In all certainty, this segment will keep growing and become more intricate with smaller units. For short-distance goods transport on the road, a modal shift is not realistic. This is why the State wants to create more space for goods transport on the road in the urban areas. Without an alternative, the State wants to facilitate short-distance road transport and long-distance road transport particularly for the flow around the urban districts.

This occurs through specific (traffic control) measures, such as rush-hour lanes, shared bus lanes, industrial parks with their own on- and off-ramps and target group lanes (sometimes time-related).

Urban distribution must be geared toward consolidating goods at the edge of the city, consolidating goods as much upstream as possible with a destination in the same city in or in the same city section, and toward the maximal use of the vehicle's available load capacity. It involves logistical concepts which are applied for picking up and delivering goods in (inner) cities where means exist, particularly within the UDP, whereby the established measures will be maintained.

The activities concerning short-distance domestic transport are devoted both to more efficient vehicle use, especially by increasing the load factors and decreasing vehicle kilometres as well as promoting cleaner, quieter vehicles and innovations in that direction in order to decrease environmental burdens such as emissions. The State believes that other modalities within short-distance transport are not yet in the picture. The State realises that road transport will retain a major role in domestic goods logistics.

The UDP wants to closely follow and support developments concerning an environmentally friendly light-weight urban distribution vehicle (UDV).
This is why a model project has been started within the framework of the programme "Quieter, Cleaner and More Efficient traffic and transport in urban areas".
The UDP has promised to make positive contributions, such as reporting transporters who are interested in using the vehicle, putting tógether a panel that wants to be involved in the development of the prototype, and function as a sounding board for the project.

The stimulation of uniformity and standardisation of legislative means and harmonised solutions is a separate primary task of the UDP. A proliferation of proposed solutions must be prevented. Through analysis of the results of the model projects, the UDP will make policy recommendations. By communicating proven successes and widely publicising the effects of projects, the UDP expects a certain degree of standardisation because the their experiences will be used in similar situations.

Uniformity and standardisation apply on the one hand to the authorities and on the other to businesses.
Businesses will have to make efforts toward taking over and applying suitable successful concepts and innovations that contribute toward remedying urban problems.
The possibility of transferring loads efficiently between the various carriers, but also from large to small trucks, is promoted by using standardised load units. Just as with the large containers, standardisation of packaging and load units can also increase efficiency in urban distribution.

The policy is aimed at distributing supplies over the largest possible part of the day and promoting night-time delivery as well, within acceptable limits for both quality of life - the noise factor - as well as for the employees involved. This also correlates well with the current Shop Hours Act.

In these endeavours, the legislative means necessary for the quality of life must be as free from exemption as possible, so that unnecessary discrepancies in regulations among cities can be prevented.

2.2. Local policy

This is about keeping unnecessary traffic, or so-called avoidable auto traffic, out of the city. To realise this situation, however, there is no standard package of measures that can be implemented in any random city. Cities can choose from a great many direct and indirect measures (appendices 1 and 2) to solve bottlenecks and to reach their political goals. This often results in a proliferation of solutions and a lack of coordination within a region or between neighbouring cities.

Cities have a plethora of direct and indirect measures available to them which can be implemented autonomously to solve bottlenecks within their borders and to achieve set policy goals.
Nationally or regionally operating goods transport can be hindered by civic measures which are not regionally attuned to the provincial traffic and transport plans, or when business is not sufficiently involved, such as in urban traffic circulation plans.

Solutions can multiply in all directions. For business, this phenomenon is becoming increasingly difficult to deal with. It can also lead toward using more vehicles for the same load when goods must be delivered at various addresses within certain set periods.
But it is local government's responsibility to establish city regulations to create as efficient an urban distribution as possible without neglecting other city activities.

The Urban Distribution Platform (UDP) wants to offer clear, unambiguous solutions to cities in order to remove bottlenecks in urban goods transport. Cities can then choose the most fitting solutions, if possible in consultation with neighbouring cities or the region. This leads first of all to simplification and more cohesion. But also to a system of measures, techniques and agreements that are customised per region and/or city. Only through cooperation can a region arrive at one or more systems for mobility and distribution. The goal of the measures to be adopted is to bring the quality of public space into balance with the wishes and requirements of urban accessibility.

Harmonisation is an important factor for success in order to reduce problems threatening quality of life and accessibility in the long term. In finding and adopting solutions (particularly through cooperation and consolidating loads) to problems in the (inner) city, all concerned parties must be taken into consideration. Good harmony means that there is consultation among all the interested parties.

Through good coordination, solutions can be sought collectively. It can also help toward gaining insight more quickly into the undesired effects that measures can bring about. In practice it turns out that in many cases, cities consult with shopkeepers' associations and citizens. It is an exception, on the other hand, if a city consults beforehand with transporters or with (neighbouring) cities in the region. In most cases, however, the transporter is indeed annoyed by the measures, and will take actions which are sometimes in conflict with the public interest.

Within the framework of urban measures for goods transport, harmony and consultation among the following partners are important:

- transshipper and transporter representatives EVO, KNV and TLN
- preferably representatives with an economic interest in supplying the relevant (inner) city or regional representatives of these organisations
- businessmen and shopkeepers
- as important representatives of the economic interest
- (neighbouring) cities in the region
- the effect of measures can be negatively affected by measures in (neighbouring) cities in the region
- police
- in connection with upholding the city regulations

2.3. Number and types of cities in the country

The Netherlands has about 600 municipalities. The largest city has 750,000 inhabitants
and there are 6 cities with special attention for goods.

3. Measures

3.1. Projects

Urban Distribution is a form of goods transport which is both very important and very complicated. Important because the logistical chain without that last link, transport to the store, is incomplete and actually pointless. Complicated because many parties are responsible for carrying out urban distribution efficiently in an environmentally responsible manner.

The problems of urban distribution lie primarily in three areas: accessibility, environmental burden (noise and emissions) caused by truck traffic, and economic waste due to inefficient logistics.

On April 25, 1995, the Urban Distribution Platform (UDP) was set up by Minister Jorritsma of Transport and Public Works.
The goal of the UDP is to work toward solutions in the form of concrete products relating to urban distribution problems, so that accessibility on the road improves in urban areas, the quality of life improves, transport efficiency increases (in environmental terms) and the economic situation in the (inner) cities is preserved and if possible, improved.
Secretary: Ms Elly Y. de Gooijer, Ministry of Transport, Public Works and Water Management, Plesmanweg 1-6, P.O.box 20901, 2500 EX THE HAQUE, telephone + 31 70 351 6236, telefax + 31 70 351 7356

In this endeavour, urban distribution plays the following four roles, with the accompanying functions:

- as consultative body:
  - to guide/support projects which can, as models, make an important contribution to the UDP's objective
  - to promote standardisation and coordination (e.g. in measures, maintained access systems, logistic concepts, packaging, etc.)
- as process manager: to initiate and stimulate new projects within the selected priority areas
- as communicator: to make the results of the projects known
- as knowledge broker for businesses and governments

Actors that play a role in urban distribution: the (local) government, the shipper (incl. wholesale), the receiver (shopkeeper) and the transporter.

Factors that influence the combined action of the actors are: legislative means, consolidation of goods (flows), window periods, distribution concepts, information technology, infrastructure capacity, load factor, cooperation.

With the aid of an influence grid and an influence diagram (see appendices 3 and 4), it was examined how the different actors and factors are interconnected. This analysis and the activities of the previously mentioned study groups have led, among other things, to a survey of possible projects and actions.

The UDP has determined five priority areas (pa) based on influence grid and influence diagram.
Phase of policy development for the five priority areas

Explanation phases:

1. Becoming aware
2. Formulation of problem
3. Formulation of solution
4. Carrying it out

target groups / priority areas	transshippers	transporters	shopkeepers	government
upstream consolidation	1			
cooperation transporters		2,3,4		
receiving after business hours			1	
ideal set periods				1
central and local legislative means	2	2,3	1	4

The priority areas being:
Phase 1. Upstream consolidation
Consolidation of goods/shipments which are intended for the same (inner) city by transshippers/wholesalers. Primary goal: higher load factor and lower costs of physical distribution.
target group: transshippers
There are only a few transshippers (incl. wholesalers) who see the consolidation of flows of goods, in cooperation with other shippers and transporters, as a solution to their problems.
Transshippers without their own transport are not or hardly confronted with problems concerning urban distribution.
Transshippers with their own transport are indeed aware of the problems; there are hardly any initiatives to help them cope with these problems.
These are particularly transporters who personally experience the problems within historic cities.

Project: 9 "Development project for the fashion industry"
a project aimed at the consolidated delivery of clothing to shops
to make a positive contribution to the quality of life as a result of fewer vehicles in the centres of cities
to make a positive contribution to the environment by reducing the number of kilometres driven and reducing vehicle movement
to improve the transport efficiency to fashion shopkeepers by making fewer trips (and therefore reducing transport costs)
to arrive at a better load factor per vehicle through cooperation among fashion shopkeepers.

Phase 2. Cooperation transporters
Primary goal: to increase transport efficiency by reducing the number of vehicle kilometres and the number of vehicle movements.
target group: transporters
The projects in the priority area are developed a bit further. The transporters experience the problems within the cities firsthand. A number of transporters are involved in initiatives whereby solutions are presented concerning city distribution centres to urban and regional distribution.

Phase 3. Receiving outside of opening hours
Primary goal: to decrease the number of vehicle kilometres by making receiving possible outside of actual shop hours.
target group: shopkeepers
Examples of projects in this area: creating receiving stations and collective storage possibilities for retailers. The shopkeepers do not as yet consider the accessibility of their stores for supplying to be a high priority.
Project: "Shopping street distribution 2000"
a project aimed at supplying shopping streets through consolidation
Core of the Shopping Street Distribution concept is a distribution system whereby:
the goods are transported at night from the principals' distribution centres to the transporter's transhipment centre;
the goods are sorted in these transhipment centres at night in order of destination or delivery to the shopping street;
the goods are then delivered between 6:00 and 11:00 am
as a supplement to this distribution system, a packaging pool can be used, in which the reusable packaging remains behind at the transporter's regional centre

The expected results of the project:
a considerable reduction in travelling kilometres (a first estimate is a 30% reduction) because the goods are consolidated before the transport between the transporter's transhipment centres takes place, and as a result of the return flows
an improvement in transport efficiency resulting from a better load factor per vehicle
a positive contribution to the environment, due to a reduction in kilometres
a positive contribution to the social quality of life as a result of fewer vehicles in the centres of cities.

Phase 4. Ideal set periods
This priority area is aimed at harmonising set periods - the hours in which goods transport has access to the inner cities - within an economic region, so that the transporters are enabled to do their work more efficiently.
target group: local authorities
Activities in this domain are still in their infancy. A few cities are now adopting systems which do offer possibilities, but there is as yet no mutual harmonisation on a regional scale (for both the legislative means and the systems to be maintained).
Project: "Selective access 's-Hertogenbosch"
a project that regulates access to the centre of a medium-sized city
One of these initiatives is the urban distribution project in the city of 's-Hertogenbosch.
The city expects to implement the selective access system in the spring of 1997.
Selective access is guaranteed by so-called raisable pyramids (± 60 cm high), which close off access to the relevant streets outside of set periods. These pyramids can be lowered with a pass or through central control.
It is hoped that by spreading news of the experiences in 's-Hertogenbosch, a national standardisation of the pass system will follow. Transporters can then make use of one pass for different cities.
The goal of the project is:
to improve the accessibility of the inner city of 's-Hertogenbosch for goods transport
to improve the quality of life in 's-Hertogenbosch's city centre
to strengthen the 's-Hertogenbosch city centre's economic position
Project-leader of 's-Hertogenbosch: ing. M.C.J.M. van Rosmalen, P.O.box 12345, 5200 GZ 's-Hertogenbosch, telephone + 31 73 6155 688, telefax + 31 73 6155 321.