Delivering the Goods

21st CENTURY CHALLENGES TO URBAN GOODS TRANSPORT

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21st Century Challenges to Urban Goods Transport

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FOREWORD

The OECD brings together 30 member countries and helps governments meet the challenges of a globalised economy. The OECD's Programme of Research on Road Transport and Intermodal Linkages (RTR) takes a co-operative international approach to addressing transport issues among OECD member countries.

The mission of the RTR Programme is to promote economic development in OECD member countries by enhancing transport safety, efficiency and sustainability through a co-operative research programme on road and intermodal transport. The Programme recommends options for the development and implementation of effective transport policies for members and encourages outreach activities for non-member countries. All 30 member countries participate in and fully fund the RTR Programme.

The RTR Working Group on Urban Freight Logistics was formed to undertake studies on goods delivery in urban areas an area where little work has been undertaken despite its importance. This report is the outcome of the Working Group's efforts to identify "best practices" in dealing with challenges facing urban goods transport, and recommends measures to develop sustainable goods transport systems in OECD cities.

This report is published on the responsibility of the Secretary-General of the OECD.

ABSTRACT

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Although delivery of goods is vitally important for residents and industries in urban areas, the presence and operations of goods transport vehicles in urban areas are often regarded more as a nuisance than an essential service. Relatively little has been done by governments to facilitate the essential flows of goods in urban areas and to reduce the adverse impacts of urban goods transport on the communities being served. This has resulted in increasing problems associated with goods delivery including competition with passenger transport for access to road infrastructure and space for parking/ delivery facilities. How should OECD countries deal with the difficult challenges they face in this area?

This report analyses measures taken in many cities in the OECD area and provides recommendations for dealing with these challenges.

Fields: 72 traffic and transport planning; 73 traffic control; 10 economics and administration; 15 environment

Keywords: freight transport, urban area, lorry, delivery vehicle, competition, accessibility, OECD, parking, policy, logistics, storage, demand (econ), planning, partnership, sustainability.

*The OECD International Transport Research Documentation (ITRD) database contains more than 300 000 bibliographical references on transport research literature. About 10 000 references are added each year. Each record contains an informative abstract, from the world's published literature on transport. ITRD is a powerful tool to identify global research on transport, each record containing an informative abstract.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

Goods transport in urban areas has a major impact on the economic power, quality of life, accessibility and attractiveness of the local community, but it receives little attention in comparison to passenger movement. With the ongoing increase in urban goods transport, there is increased concern about goods movements and their consequences. There are many solutions that have been proposed and implemented in OECD member countries with both successes and failures.

The OECD Working Group on Urban Freight Logistics was set up to learn from such international experiences with the aim of identifying what could improve the efficiency of urban goods transport systems, while ensuring the environmental sustainability and liveability of urban areas. The members of the Working Group gathered information on urban freight policies from different OECD countries. This is the first OECD report that is fully devoted to the topic of the delivery of goods in urban areas. The limited and fragmented information available in this area meant that some aspects could not be addressed as comprehensively as others.

Overview

Definition of urban goods transport

For the purposes of this report, the Working Group focused on the delivery of consumer goods and defined urban goods transport as:

> *"The delivery of consumer goods (not only by retail, but also by other sectors such as manufacturing) in city and suburban areas, including the reverse flow of used goods in terms of clean waste."*

The Working Group recognised that delivery of consumer goods is only part of the whole logistics chain and should therefore be considered from a broader systems perspective. Consequently, this report provides a more encompassing view of urban freight logistics and its problems.

Developments in society and policy-making

Urban goods transport issues result from a wide pattern of developments in our society. These include movement toward a post-industrial society, ageing and individualisation, urbanisation, and sustainable development, which is becoming the guiding vision for many OECD countries. Policy-making in such a context requires well-designed consultation and participation processes due to the complexity of issues involved and diverse interests of various stakeholders. This is particularly the case for policy-making in urban goods transport, since it involves many different parties with diverging and often conflicting interests who have to share limited urban space. The complex operations of urban goods transport and the variety of problems they cause further complicate policy-making in this area.

Developments in freight transport

Freight transport is a fundamental component of urban life. Globalisation of economic activities, changes in consumer behaviour and developments in advanced technologies have led to many developments:

- Businesses have expanded the area of their sourcing and distribution operations, developing world-wide supply chains that link customers, suppliers and manufacturers. Urban goods transport has therefore become integrated with long-haul transport. Businesses seek to improve the flow of their supply chains by utilising information and communications technologies (ICT) and optimise such supply chains by reducing the number of warehouses, centralising inventory and consolidating deliveries.
- The retail sector seeks to minimise cost by saving storage space and reducing stock, resulting in strict demands being placed on the supply chain which include reduced delivery lead times and just-in-time deliveries.
- As customers become increasingly integrated in the supply chain, the need to respond more rapidly to varied and often-changing customer demand requires the flow of the supply chain to be increasingly time sensitive. The rapid development of e-commerce also requires fast and reliable delivery.

These developments have led to increases in freight transport and further increases are unavoidable if no additional measures are taken. However, the various negative impacts show that the impact of continued growth in freight transport is not sustainable in the long term. Therefore, efficient organisation of urban goods transport has become crucial not only for successful supply chain management and the development of e-commerce, but also for sustainable development.

The demand for just-in-time, tailor-made urban goods deliveries, which is difficult for non-road modes to meet, poses a challenge to the development of intermodal transport, although considerable efforts are being made in some countries to find intermodal solutions. Urban goods delivery by road transport raises another issue: the type of vehicles to be used. Smaller vehicles are often used for deliveries in urban areas, although they tend to generate more traffic and energy inefficiencies than heavier trucks.

Increases in the number of passenger vehicles have led to passenger and freight transport competing for limited urban space, with the former often receiving priority in policy-making. Passenger vehicles can be a final link in the logistic chain, since people make use of cars to bring goods to their homes. Urban goods transport policies need to take into consideration the interactions between passenger and goods traffic.

Problems of urban goods transport

Since urban goods transport often takes place in areas with a high density of population and mixed use of public space, problems have been encountered in many cities.

Accessibility problems are both encountered and caused by urban goods transport. Problems encountered by freight vehicles are mainly due to insufficient infrastructure, access restrictions or congestion. This results in freight vehicles causing disruption of traffic and further congestion.

Freight transport contributes considerably to *environmental problems* such as emissions, noise, vibration and physical hindrance. It also causes *safety problems* since freight vehicles, due to their size, manoeuvrability and on-road loading/unloading operations, are a significant cause of accidents. Urban goods transport is a major and rapidly growing sector of oil consumption, which gives rise to problems of *energy consumption* and related emissions concerns.

These problems have led to some increased concerns about the consequences of urban goods transport. Although it is clear that urban goods transport is crucial for maintaining the economic and social functioning of cities, there seems to be a serious lack of awareness of its benefits. Awareness of urban goods transport seems to be rather one-sided, focusing more on its problems than on its importance.

Lessons learned from approaches in member countries

Countries are in different phases concerning policy development on urban goods transport. However, from the experiences in member countries, the following lessons can be learned.

Different situations, common challenges…

While being increasingly concerned about negative impacts of urban goods transport, cities are aware that delivering goods to the city is essential for maintaining their economic and social functions. Therefore, cities are confronted with common and difficult challenges of maintaining their sustainability and liveability while ensuring a goods transport system that sufficiently serves their needs.

The extent of national government involvement in urban goods transport varies.

In many countries, problems of urban goods transport are dealt with at a local or regional level, resulting in a lack of consistency among local or regional measures. Only a few countries have developed an explicit encompassing national policy focused on urban goods transport.

Lack of awareness and knowledge is a serious obstacle.

There is a lack of awareness and knowledge of urban goods transport not only among the general public but also among governments and city planners. This has often led to transport-related policies and facilities being planned merely from the passenger transport perspective, without adequate consideration of the needs of freight transport.

There is also a lack of before-and-after evaluations and data.

Few countries have analytical tools and data for evaluating the effectiveness of their policy measures concerning urban goods transport, resulting in their measures causing unexpected side effects.

Policy measures tend to lack long-term and supply chain perspectives.

Policies currently in place tend to focus strongly on short-term problems and solutions. Few attempts seem to have been made to provide forecasts for future developments or to develop long-term policy options. Also, in spite of the fact that urban goods transport is integrated with long distance transport, current measures on urban goods transport often only take account of the urban area and pay little attention to the supply chain as a whole.

Regulations tend to be unharmonised, unstable and are often not enforced sufficiently.

Local regulations tend to differ among different municipalities and be changed as circumstances change. This can cause difficulty in enforcing such regulations on drivers who are often not aware of the different and changing restrictions. Such a lack of harmonisation and stability also causes problems for the vehicle manufacturing industry in developing vehicles that comply with such regulations.

Public-private platforms seem to be helpful.

Since urban goods transport issues are complex and involve many stakeholders, consultation platforms have proved to work well in some countries in bringing such stakeholders together to discuss issues and plan measures.

Distribution centres tend to fail if not market-based.

Publicly owned or publicly driven distribution centres often do not receive support from the private sector and tend to become commercially unsuccessful.

Consolidation seems to be an emerging trend.

Consolidation of deliveries is emerging as an important tool for solving problems, but little attention is being paid to accommodating or facilitating this through policy measures.

Innovative policies are being attempted.

Some countries are attempting to implement innovative policy measures, *e.g.* selective time-sharing and multiple use of infrastructure, introducing environmental zones and using pricing for diverting freight traffic from residential areas, with some promising results.

Policy recommendations

Urban goods transport is now facing many difficult challenges. However, the opportunities for dealing with such challenges have increased in recent years, as the civil society has become aware of the need for sustainable development and is realising that it is a common responsibility of both public and private actors. Experiences show that single-shot measures, planned and implemented by local governments alone, are generally *not* sufficient in developing a sustainable urban goods transport system. Therefore, consideration has been given to the policy framework necessary for developing such a system as well as recommendations on actual measures.

Policy framework

National/state government initiatives are crucial.

In order to apply consistent, stable and effective measures throughout the supply chain, national/state governments need to take the initiative and provide clear policy objectives and frameworks under which tailor-made local measures can be planned and implemented.

The main policy objective should be sustainable urban goods transport.

Continuing economic growth while protecting the environment and ensuring a better quality of life for future generations are foremost objectives in OECD member countries. Therefore, the main national objective should be *sustainable urban goods transport*, which requires the development of an urban goods transport system on a socially, economically and environmentally sound basis. Both short and long-term policies should be developed under this objective.

Urban goods transport policy needs consultative planning.

Urban goods transport involves a wide range of public and private actors, with different and often conflicting interests, who act interdependently. Agreement among all stakeholders, especially support from the private sector, is necessary in developing a feasible and practical policy vision.

Public-private partnerships are important.

Therefore, consultation can be considered to be a major part of establishing a sound policy framework for urban goods transport. Since urban goods transport has become a final leg in global supply chains, the actual consultation process needs a supply chain management perspective, with the involvement of stakeholders responsible for national or international supply chains. Public-private partnerships (PPPs) – where various levels of government, shippers, transport operators, vehicle manufacturers, retail and wholesale organisations, real estate developers, research bodies and inhabitants all co-operate closely in developing common objectives and solutions – are necessary for effective action.

Integration of policies and measures across sectors is important.

Since transport and logistics are interrelated with international trade and regional and local concerns, the policy framework should be seen in a much broader context. Integrating policies not only with passenger transport but also among different policy areas and different levels of government is necessary for establishing a more effective urban goods transport policy.

Policies should be formulated so as to enhance developments in the private sector.

The private sector has become increasingly aware of its roles and responsibilities and is active in developing sustainable urban goods transport systems. Many developments in increasing efficiency and reducing negative impacts of urban goods transport systems are initiated by the private sector.

Policy measures should be formulated so as to enhance and facilitate such developments. Regulations need to be sufficiently harmonised and stable so as to provide a clear framework to encourage the private sector to assess the effectiveness and viability of potential investments. Planning through a public-private partnership process can guarantee that the measures are practical and that the private sector is committed to such measures. Active and continuous campaigning, including promulgating best practice, is also important in order to stimulate and foster the awareness of the private sector.

Recommendations on measures: dealing with new challenges

Drawing on experiences in member countries, the following non-prioritised recommendations are proposed in implementing such measures within the proposed framework.

1. Active measures are needed to increase awareness of the importance of urban goods transport and to diffuse knowledge

Increasing awareness and knowledge in urban goods transport is a starting point for developing an efficient goods transport system. Governments should encourage public awareness of the importance of urban goods transport in their daily lives, the progress made so far, and the future challenges concerning urban goods transport which require participation of all stakeholders in order to be resolved. Communication and consultation processes including public-private partnerships can be useful to increase such awareness and diffuse knowledge among all stakeholders.

In order to diffuse and increase awareness and knowledge in local governments, one useful procedure may be for the national or state governments to require local governments to formulate local transport plans that include urban freight transport and have local government consult national/state governments on their plans. Local governments will be compelled to increase awareness of urban goods transport issues and their knowledge will improve accordingly. This will also contribute to achieving consistency among local measures. In the initial phase, it will be useful for the national/state governments to provide guidance and consultation to local governments.

2. Evaluation methods and data are prerequisites for effective policy measures

In order to plan and implement effective urban goods transport policies, both before and after (ex-ante and ex-post) evaluation methods need to be used from the planning phase through to their implementation. All stakeholders need to reach a consensus on clear policy objectives, indicators to measure the achievement of such objectives, and a standardised evaluation method for planning and monitoring the effectiveness of measures actually taken, using the agreed indicators. National/state governments should encourage local governments to implement both ex-ante and ex-post evaluations. In relation to planning vehicle access and freight traffic restrictions, it would be desirable for possible regulations to be evaluated, including for cost effectiveness, prior to their adoption and implementation. Ex-post evaluation is also necessary, both for monitoring and benchmarking measures, and for comparing the results with the ex-ante estimates, thereby improving the evaluation method.

Data necessary for evaluation methods should be collected in a consistent manner with sufficient standardisation so as to allow long-term monitoring and benchmarking. For this, agreement on the definition and collecting methods for all data needs to be reached, preferably on an international basis.

3. Consolidation is a key to achieving sustainable urban goods transport

With increasing demands for frequent and just-in-time delivery on one hand and the restrictions of limited spatial infrastructure and environmental demands on the other, future solutions for achieving sustainable urban goods transport should be sought through the consolidation of goods delivery. The purpose of consolidation is to improve the utilisation of the transport system to generate economies of scale, thereby reducing vehicle trips, increasing efficiency and decreasing financial and environmental costs of transport.

A useful measure for improving consolidation is the implementation of a commercial urban transhipment centre, where freight destined for the urban area would be sorted into consolidated loads for final delivery. Community collection and delivery points could also be used to improve goods consolidation. As consolidated loads generally would be delivered by small vehicles, the highest possible vehicle utilisation is necessary in order to compensate for the additional transhipment cost and to ensure reduction of vehicle kilometres. Using ICT to manage available capacity, making optimal vehicle utilisation and route planning could help achieve this.

Although consolidation has mainly been driven by the private sector in the form of voluntary co-operation, governments are able to promote such consolidation by way of encouraging and assisting pilot projects and by favourable regulations.

4. Regulations need to be harmonised, standardised, stable, easy to enforce and cost effective

Various regulations have been implemented that aim to maintain the living environment in certain urban areas and to facilitate smooth and safe traffic flows. Of these regulations, access restrictions based on time and/or vehicle size or weight have been widely implemented, especially in Europe. Such restrictions differ among municipalities and are often not sufficiently explained to drivers, causing serious difficulties for operators who organise world-wide supply chains.

In order to achieve transparency as well as stability in long term policies, it is important that better harmonisation be achieved on truck size and weight definitions. Existing regulations on truck size and weight should be reviewed for consistency, if possible, making them simpler and closer to the professional needs of carriers, shippers and retailers. Such reviews need to be promoted by both national government initiatives and by international co-operation, while ensuring private participation in the decision making process.

Regulations related to transport vehicles are crucial for vehicle manufacturing industry and fleet owners. The widest possible standardisation of clear regulations applied for a sufficiently long period is necessary to encourage vehicle manufacturers to develop low-noise and low-emission delivery vehicles. Ideally, a limited number of recommended “ideal size” truck dimension limits for city access should be determined internationally. Harmonisation and standardisation of regulations related to vehicles can also facilitate the consolidation of goods between shippers and transporters.

Enforcement is always an important issue. Regulations should be designed in such a way (as to be clear, simple, easy to understand, cost effective, and preferably performance-based when relevant) that it is easy to enforce them. Lack of control and enforcement has made policies less effective, resulting in regulations often being ignored, especially by passenger vehicles using infrastructure provided for freight vehicles. Strong control and enforcement is necessary and has been made possible, due to the development of new monitoring techniques and tools.

5. Infrastructure capacity should be used more imaginatively on a 24-hour basis

In order to make optimal use of the limited urban infrastructure while maintaining accessibility and liveability in cities, selective allocation of infrastructure capacity on a 24-hour basis needs to be considered. Such allocation schemes serve to separate infrastructure use in terms of time and space per type of vehicle based on their characteristics. Experiments in mixed use of streets have proved satisfactory and have shown that acceptance by all stakeholders and effective enforcement is crucial for success.

An important measure under discussion is the introduction of night deliveries. Although freight vehicles have been banned from many urban areas at night due to their noise problems, studies show that night deliveries could reduce the concentration of activities and road congestion during the day, resulting in removing traffic from peak hours and improving efficiency of deliveries, which in turn produce cost and environmental benefits.

In order to become acceptable, night deliveries need to be considered in conjunction with the development of quieter delivery operations – including quieter vehicles and loading/unloading facilities. Innovative vehicles and equipment need to be developed and experimented. Governments can promote such developments by favourable regulations or financial incentives. Consultation is necessary to achieve acceptance by the local community. Experiments and pilot projects are useful during the consultation process, since these enable residents to experience actual low-level noise operations before agreeing to a formal change of regulations being introduced.

6. Cleaner, low-noise and more energy-efficient vehicles need to be promoted

Innovation in vehicles including environmentally friendly and energy efficient engines, on-board routing systems, delivery-suited vehicle designs, and delivery handling equipment should be promoted by providing incentives, providing information and by establishing clear and stable international standards.

7. Adequate logistic facilities need to be provided.

In order to increase efficiency of urban goods transport and at the same time reduce negative impacts concerning road use, loading/unloading zones need to be provided. Locations and time periods for such zones should be carefully planned, clearly signed and strictly enforced in order to accommodate freight vehicle operations in the most efficient manner. Off-road loading/unloading facilities for new buildings should be included in zoning codes and building permit requirements.

Co-ordinated actions should be pursued with the private sector to develop transhipment facilities and facilities for home delivery which will contribute to the consolidation of goods, utilisation of intermodal transport, and efficient home deliveries.

8. Efforts need to be made to reduce safety risks of urban goods transport

The often severe consequences of accidents involving goods deliveries have greatly contributed to the negative image of freight vehicles. Governments should provide the necessary infrastructure, with private participation where appropriate, to reduce risks of accidents involving freight vehicles. Governments also need to strengthen their control regarding freight transport operations and promote efforts by the private sector to reduce the safety risks of their operations.

9. Reverse logistics need to be developed

The imminent need in many countries to reduce, reuse and recycle waste will only become feasible with a transport system which carries used and returned goods for reuse and recycling (reversed logistics) in a cost-effective manner. Governments can facilitate the development of efficient reverse logistic systems by providing necessary infrastructure and by diffusing and encouraging best practice.

10. Technological and conceptual innovation can support sustainable urban goods transport

Various measures for developing sustainable urban goods transport systems will be made possible due to innovative technology development. For governments, with the use of ICT, flexible implementation of access restrictions, loading/unloading zones, and transport demand management schemes will become feasible and easily enforceable. The evolution of city logistics also offers opportunities for this concept. Development of underground distribution systems offers possibilities for more sustainable urban goods transport systems, but would require an active government role.

Technology developments in the private sector also contribute to increasing efficiency and reducing cost and environmental impacts, and therefore should be promoted by facilitating experiments and diffusing best practices.

11. Next steps: the need for further study and international co-operation

It became clear during the studies by the Working Group that the development of sustainable urban goods transport is only in its initial phase. Further studies and data collection are clearly necessary. However, it is encouraging to find that countries have begun to be aware of the importance and problems of urban goods transport, and are trying out various measures to meet the challenges. Since such challenges are common among most countries, it proved to be extremely useful to exchange experiences amongst the countries. Further international co-operation is necessary not only in sharing best practices, but also in harmonising regulations, standards and data collection.

Chapter 1

INTRODUCTION

Goods transport in urban areas has a major impact on the economy and liveability of cities, but receives little attention in comparison to passenger movement. The Working Group on Urban Freight Logistics was set up to undertake studies on international experiences in this area. This report is the outcome of the Working Group's efforts to research the issues and identify "best practices" in dealing with challenges facing urban goods transport.

This chapter describes the background and aims of the report as well as its scope and structure.

Background and aim of the report

An efficient and environmentally friendly urban goods transport system is essential for the economy and liveability of cities. The delivery and collection of goods in urban and metropolitan areas, especially in the core areas of cities with old and established centres, have a major impact on the local community as concerns its economic strength, quality of life, and the accessibility and attractiveness of the city. While traffic and its impacts in urban areas have received attention in recent years, much of this attention has been directed at public passenger transport and private car traffic, and relatively little attention has been paid to urban goods transport. However, due to the increase in urban goods transport and the resulting problems, there is growing concern about urban goods transport and its environmental consequences.

The Working Group for Urban Freight Logistics was set up as part of the Programme of Research of Road Transport and Intermodal Linkages. The primary objective of the Working Group was to identify what could improve the efficiency of urban goods transport systems (including making optimal use of innovative measures), while ensuring the environmental sustainability and liveability of urban areas.

Urban freight logistics is a challenging topic in freight transport policy. It deals with the organisation of transport of goods, mostly within urban areas. Local, state and provincial issues as well as national issues play a role. Therefore, it is of concern for local as well as regional and national governments at both the European and international level. Many solutions to problems encountered in urban freight distribution have been proposed and implemented with some successes and many failures. For this reason, it is important to learn from international experiences and to establish “best practice” in urban freight policy.

Therefore, the objectives of the Working Group were:

- To determine appropriate urban policies for freight transport, focusing on innovation, connectivity, transport efficiency and minimisation of negative impacts.
- To identify the impacts of new technologies, private sector policies and urban planning on the organisation of city logistics.
- To establish best practices.

In order to meet these objectives, the Working Group focused on the following tasks:

- Identify developments influencing urban freight transport.
- Identify innovative solutions to minimise harmful effects of freight distribution.
- Evaluate the barriers and problems of such new solutions.
- Evaluate the impacts of these options on distribution efficiency.
- Identify the policy implications.

The report contains information on urban freight transport policies, collected by the members of the Working Group from different OECD countries.[1] The Working Group did not aim to assess "best practice" in the sense of practice having positive effects for all actors and purposes, since a solution may have positive effects for some actors but negative effects for others. Hence, the approach taken by the Working Group is similar to the approach taken by BESTUFS (Best Urban Freight Solutions).[2]

This is the first OECD report that is fully devoted to the topic of the delivery of goods in urban areas. The limited and fragmented information available in this area and the limited number of member countries participating in the Working Group meant that some aspects could not be addressed as comprehensively as others.

Structure and scope of the report (definition of urban goods transport)

Within urban areas, different types of goods transport take place. This report focuses on a particular type of goods transport, namely that related to consumer goods, as defined by the following concept.

Definition of urban goods transport*: "The delivery of consumer goods (not only by retail, but also by other sectors such as manufacturing) in city and suburban areas, including the reverse flow of used goods in terms of clean waste".*

It should be noted that there are considerable goods traffic flows in the urban environment – such as goods transported through urban areas (through traffic), building and demolition traffic, the provisioning of industry with raw materials and semi-manufactured articles, and the provisioning of the wholesale trade – that are excluded by the above definition. Similar terms which are often used in studies are urban freight transport, urban freight logistics or urban goods distribution. Some studies, however, do not include home delivery of goods or reverse logistics. Others include transport of raw

[1] Many other reference materials provide useful information. The reports from the three roundtable meetings on urban freight transport, organised by the European Conference of Ministers of Transport (ECMT, 1976; ECMT, 1984 and ECMT, 1999) present insightful overviews. In Europe, research was carried out for the European Commission from 1990-1998 in close co-operation with some member states, such as France and Germany (European Commission, 1998). THERMIE (1990-1994) and JOULE-THERMIE (1995) investigated and assessed various energy-efficiency measures and technologies concerning urban goods transport. Also, the following COST (European Co-operation in the Field of Scientific and Technical Research) actions concerning freight transport and logistics are relevant: COST 310/316: Freight Transport Logistics (1989-1992); COST 321: Urban Goods Transport (1994-1998); COST 339: Small Containers (1998-2001).

BESTUFS (Best Urban Freight Solutions) is an EC-funded thematic network in the 5th Framework Programme, which started in 2000. The task of this thematic network is to identify, describe and disseminate best practices with respect to urban freight transport. The BESTUFS Clustering Report (Deliverable D 4.3) provides extensive information on BESTUFS-related projects of the 4th and 5th EU Framework Programmes.

IMPACTS (Information Management Policies Assessment for City Transportation System), a network of cities in North America and Europe, held a conference in 2001 to exchange knowledge and experiences on freight management and goods deliveries.

[2] According to BESTUFS (2001), "best practice" is defined as planned or implemented private only, public only or public-private partnership strategies, measures or activities which have an essential contribution to urban goods transport and ideally lead to benefits for all actors involved. The following requirements are relevant:

- They have to fit to a defined theme or address a relevant problem with respect to the movement of goods in urban areas.
- They should be based on real experiences or analysis in studies.
- They should have considerable and measurable positive effects for all actors on relevant indicators of urban goods transport.

materials, maritime containers or other types of freight with an industrial destination within an urban area.[3]

It is important to bear in mind that delivery of consumer goods is only part of the whole logistics chain. Measures concerning delivery in city areas have interrelated effects in other areas of freight transport and should therefore be considered from a broader systems perspective.

Therefore, the report provides a wide encompassing view of freight logistics and its problems[4], followed by discussions on measures for dealing with problems associated with delivery of retail goods in city areas while including discussions on other areas of freight transport where necessary, such as dangerous goods.

The contents of the report are as follows:

- Chapter 2 describes the trends in urban goods transport. Attention is paid to exogenous trends, which definitely influence the demand and supply of urban goods transport. Current problems in urban goods transport are also described.
- Chapter 3 summarises practices in different countries. The analysis of different practices leads to some conclusions, which are described as lessons learned.
- Chapter 4 presents an assessment of necessary actions to improve the efficiency, safety and sustainability of urban goods transport systems. A policy framework for planning and implementing effective measures is suggested as well as recommendations on actual measures.
- The annexes provide detailed information on measures implemented and planned in member countries and a toolkit of possible measures for urban goods transport policy-making.

Some actual examples of urban goods transport activites and flows are shown in Box 1.1.

Box 1.1. **Examples of urban goods transport**

1. Urban goods transport activity in Bordeaux, France[5]

The Bordeaux conurbation is the sixth largest city in France, with a population of 660 000 people and an area of 552 km^2. In a 1994 survey, 72% of runs were direct trips and 28% were rounds. Fifteen stops per round were made on average. If trips not included in the survey (refuse collections, removals, construction sites, etc.) and empty trips by vehicles whose place of arrival is not the same as their place of departure are added, 380 000 trips are estimated to be made by goods vehicles during a week, representing some 70 000 movements per day over five working days.

2. Business-to-business parcels carrier depot in Norwich, United Kingdom[6]

A parcel carrier's depot in Norwich with a population of approximately 195 000 people in the built-up area was studied for a week in September 2001. The depot serves this city plus other towns and villages within a catchment area with a radius of 35 km. 49 vehicles are operated from the urban depot (includes local delivery vehicles and trunking vehicles operating between the urban depot and the central hub).

[3] For more insight on definitions and types of activities included, see Allen *et al.* (2000a, 2000b, 2000c) and van Binsbergen and Visser (2001).

[4] This report does not address the general issue of changes in goods locations and flows due to globalisation.

[5] Dufour and Patier (1999), p. 53.

[6] Allen *et al.* (2003).

Box 1.1. **Examples of urban goods transport** *(continued)*

Weekday activity of all vehicles of the carrier at the depot:

- 8 000 kilometres travelled per day by vehicle fleet (trunking and local delivery vehicles).
- 5 000 parcels delivered per day.
- 50 delivery rounds operated per day.

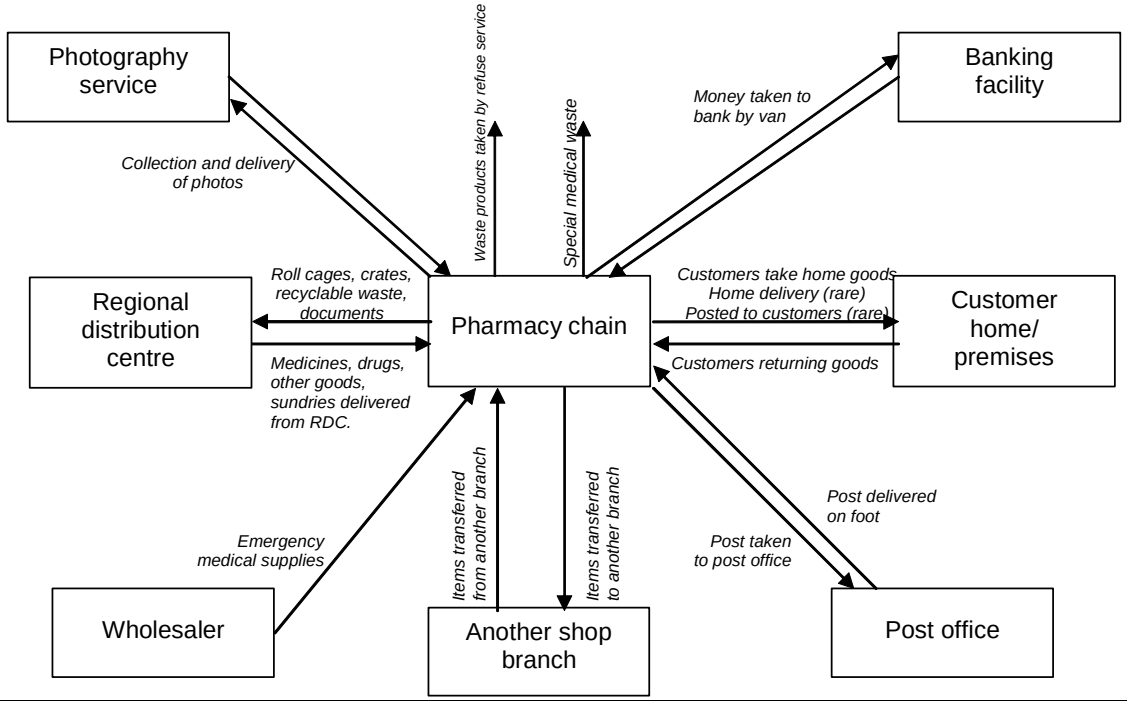
Of the delivery rounds of the carrier studied in detail in the city area:

- Average distance travelled on vehicle rounds was 32 kilometres.
- Average time taken per vehicle round was approximately four hours.
- Average of 45 addresses visited on a vehicle round.
- Average of 30 stops on a vehicle round.
- On average, 1.5 addresses were visited per vehicle stop.

3. Goods flows of a multiple chemist on a high street[7]

Urban goods transport involves around the clock activities of various service providers, shippers and customers. The University of Westminster studied the flow of goods of a specific multiple chemist situated on a main street in Norwich. The following figure illustrates the various activities relating to urban goods transport and reverse logistics in the daily business of the chemist.

Figure 1.1. **Goods flows: multiple high street chemist**



[7] Browne (2001).

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Chapter 2

DEVELOPMENTS IN URBAN FREIGHT LOGISTICS

Urban goods transport issues are a result of a wide pattern of developments in our society. Policy developments in such a context require well-designed consultation and participation processes. Various negative impacts show that the impact of continued growth in freight transport is not sustainable in the long term. Efficient organisation of urban goods transport has become crucial for sustainable development.

This chapter examines general developments in society and policy-making as well as in freight transport, and provides information on freight transport problems.

General developments

Urban goods transport issues are the result of a wide pattern of developments in our society. Some relevant trends relate to societal, technological and organisational developments. The latter include developments in policy approaches, focusing on more open and greater consultative processes among governments, industry and civil society.

The post-industrial society

In the late 20th century, the developed world began to move away from an industrial society into a post-industrial society. In simple words, the developed countries are moving away from machine technology toward an intellectual society, in which knowledge is the key factor. Important characteristics of the post-industrial society are:[8]

- Emphasis on available information.
- Growth of the service sector.
- Codification and application of theoretical knowledge, bringing us the technological revolutions we experience every day.
- Globalisation.

The post-industrial society depends very strongly on a smooth and gigantic flow of information. In all areas of our globalising economy, digital information transmission is of vital importance. Nonetheless, this type of economy also depends strongly on reliable and flexible transportation of goods. Therefore, the development of an efficient freight transport system in which information technology plays an important role is a key factor of the post-industrial society.

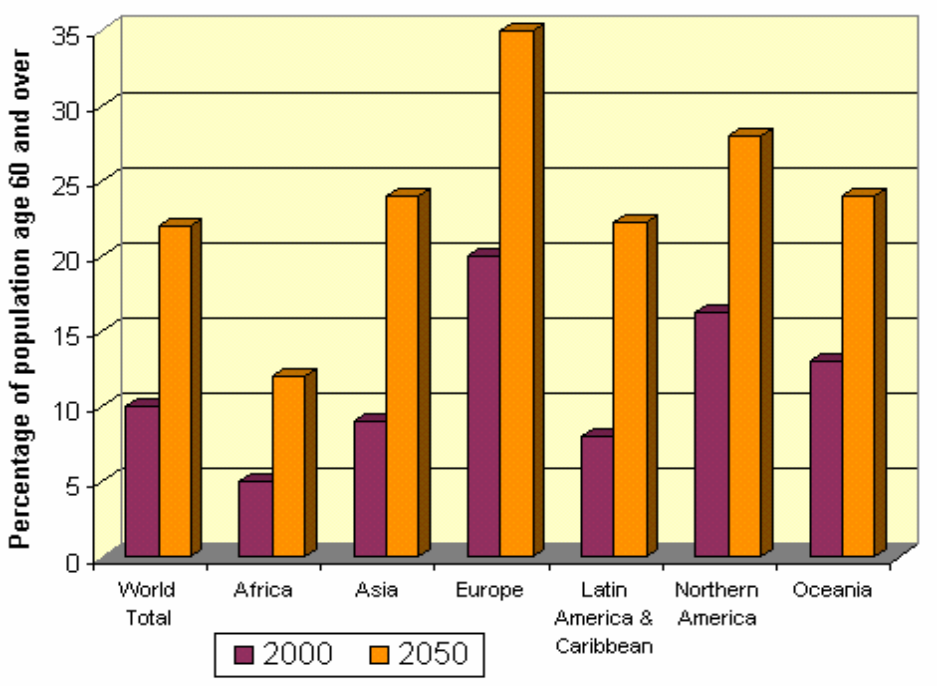
Demographic trends: growth, ageing and individualisation of society

At the beginning of the 21st century, the dominant factor in modern western societies is the rapid growth in the older population and the relative declining share of the younger generations. In most developed countries, the birth rate is now well below the replacement rate of 2.2 live births per woman of reproductive age. Growth in family formation has been the driving force of all domestic markets in the developed world, but the rate of family formation is certain to fall steadily unless bolstered by large-scale immigration of younger people. This means that immigration is an important issue in all developed countries, particularly in urban areas.

Changes in the composition of society and the individualisation of society lead to changes in overall consumer behaviour, resulting in fundamental changes in markets. Changes in consumer behaviour affect the types of goods demanded, the quantitative and qualitiative distribution of goods, and the organisation of deliveries. The homogeneous mass market that emerged in all developed countries after World War II no longer exists. Customers increasingly expect products focused on their demands and flexible delivery systems. This trend leads to further fragmentation of current markets, the consequence for distribution of goods being goods flows becoming more diffuse. Therefore, a high increase in numbers of consignments and deliveries is likely to be the result of increasing individualisation in society.

[8] Bell (1986).

Figure 2.1. **Percentage increase, age 60 and over by region, 2000-2050**



Source: World Population Prospects, the 1998 Revision, Volume II: Sex and Age.
Population Division, Department of Economic and Social Affairs, United Nations Secretariat.

The declining share of the younger population will also pose a challenge for the labour market in freight transport. The tighter labour market could prove to be a constraint for delivery systems which need to cope with more consignments and deliveries. Creating new employment patterns and improving working conditions are needed in order to secure an adequate workforce. On the other hand, the tighter labour market will necessitate and therefore could give an impetus for innovative delivery solutions.

Urbanisation

Cities have been the driving force in the economic and political dynamics of the industrialised world. They serve needs that cannot be served otherwise, and therefore tend to attract more inhabitants (including immigrants) and visitors each day. Revitalisation of old urban spaces ("city renaissance") has also attracted inhabitants and contributed to urbanisation in some cities. Urban areas will continue to grow by merging suburban areas. OECD countries' urban areas comprised 50% of their total population in 1950, 77% in 2000 and are projected to comprise 83% in 2020[9].

Urbanisation can lead to developments of either multipolar metropolitan areas or centralised metropolitan areas. In many cases, urbanisation is expected to lead to further development of megacities, as can be seen in New York, Los Angeles, Paris, Tokyo and the Randstad-Brussels-Ruhrgebiet axis. Such developments coupled with the growth in traffic movements lead to various transport problems. For example, in central London, vehicles spend half of their time waiting in traffic jams.

[9] OECD (2001a).

The increase in number of passenger vehicles and vans has created problems in terms of environment, congestion and safety. For example, in the Netherlands, the number of passenger cars has doubled in ten years (1991-2001) and levels have reached 6.5 million. The number of vans has also increased in many countries, due to the need for frequent and just-in-time deliveries and access restrictions for larger vehicles. For example, in the Netherlands, light vans have increased by more than 100 000 in three years (1999-2001) and reached 675 000, whereas larger freight vehicles have remained around 135 000. In the United Kingdom, light vans have increased by 255 000 in five years (1995-2000), whereas larger freight vehicles have only increased by 7 500 during the same period. Due to such increase in vehicles and other problems such as sewage and waste disposal, many countries have increasing concern for the liveability of urban areas.

Since the trends toward urbanisation do not appear likely to be reversed, countries are striving to find ways of increasing the benefit of cities while ensuring their environmental sustainability and liveability. This issue of sustainable urban development has become one of the top priority objectives in many governments, and is being tackled in partnerships with the private sector and the civil society.

Sustainable development

Sustainable development has become the guiding vision for many industrialised countries. Sustainable development means integrating the economic, social and environmental objectives of society, in order to maximise human well-being in the present without compromising the ability of future generations to meet their needs. This implies seeking mutually supportive approaches and making well balanced trade-offs wherever possible. The OECD actively stimulates good practice in developing and implementing strategies for sustainable development.

Demand for both passenger and freight transport is expected to increase substantially. However, the various negative impacts including environmental degradation, damage to human health, congestion and the human costs of accidents, show that the impact of continued growth in transport services is not sustainable in the long term. Achieving sustainability will require both short-term and longer-term measures to ensure that transport continues to deliver significant economic and social benefits while addressing its adverse environmental and social impacts.[10,11]

Increasing complexity in policy-making

Policy-making in the civil society

Well-designed consultation and participation processes are essential components of democratic governance. They are increasingly important for the implementation of policies achieving sustainable development objectives, because of the complexity of the issues involved. Co-ordination mechanisms are needed for confronting and reconciling diverging interests and points of view among different social groups and stakeholders. For the perspective of the civil society, such mechanisms require:

[10] OECD (2001b).

[11] The approach which stresses the importance and interdependence of economic, environmental and social performance is sometimes referred to as a “triple bottom line approach”, “corporate social responsibility”, and a “people, planet, profit” approach.

- Establishing co-ordinated policy frameworks that involve all levels of governments, both horizontally and vertically.
- Involving citizens and business in governance.
- Developing accountable partnerships, *e.g.* public-private partnerships.
- Establishing national and international transparency and consultation with interested groups in the development and implementation of policies.

In order to achieve cohesive development under these mechanisms, governments need to:

- Establish a clear vision of desirable future directions.
- Organise multi-stakeholder forums to translate the broad vision into specific short term and long term objectives at the national and local level and to examine available policy options.
- Apply mechanisms for cross-sectoral policy integration.
- Monitor current trends and identify necessary changes in the course of action.

Policy-making for urban goods transport

Policy-making for urban goods transport is particularly complex and difficult due to the following features:

- Conflicting and diverse requirements of a wide range of participants.
- Complex and diverse operations of urban goods transport and the various problems caused therefrom.

Conflicting and diverse requirements of a wide range of participants

Urban goods transport involves many different parties with separate interests. Each stakeholder has a different task within the process of urban goods transport, as is indicated in Table 2.1.

Table 2.1. **Division of tasks**

Parties/stakeholders	Function
Municipalities	Division of available space and time (road and kerbside) to different parties in a balanced way
Police	Law enforcement, traffic management
Retail, companies, institutions, construction areas, inhabitants	Demand and receive goods and services
Producers, trade, wholesale, shippers and transporters	Suppliers of goods and services

Space and infrastructure available for transport within the urban area is limited and has to be shared between many interest groups with diversified interests. The need for mobility and enhancement of the living environment is increasingly important in urban areas while transport demand is continuing to rise. The interaction of rising demand and limited space has led to declining mobility and increasing congestion.

Although all stakeholders share a common interest in the consumption of goods, their other individual interests often conflict, as shown in Table 2.2.

Table 2.2. **The interests of various stakeholders involved**

Stakeholders	Interests
Residents	Good living climate, minimal hindrance of vehicles and trucks, especially during night hours. Timely availability of goods.
Visitors	Attractiveness, good shopping climate, accessibility and parking space.
Estate managers and developers	Profitability.
Retail	Good shopping climate for visitors and customers, profitability.
Shippers, carriers and retail	Accessibility, attractive local working environment, adequate infrastructure for transport operations, cost efficiency.
Businesses	Accessibility, attractiveness.

For a sound and efficient urban goods transport policy, the interests of all the various actors must be taken into account.

Complex and diverse operations of urban goods transport and the various problems caused therefrom

The operations of urban goods transport are complex, and therefore difficult to take into account in public policy. There are many participants involved in a logistic chain. Requirements of users, structure and size of transport service operators, range of goods transported and locations served, are all diverse and widely ranged. Problems of urban goods transport, such as noise, congestion, and emissions, also vary. Adding to the complexity, in goods transport, the distinction needs to be made between goods movement and vehicle movements. For example, a given consignment may involve several vehicle trips as it moves within the transport chain, while another vehicle may run empty without carrying any goods.

Therefore, from a logistic point of view, public policy should include the various aspects of urban goods transport operations, which are indicated in Table 2.3.

Table 2.3. **Various aspects of urban goods transport**

1. Total number of vehicles/trips to premises in urban areas.
2. Number of goods vehicle trips at each premise.
3. Organisation of supply chain.
4. Time/day of goods and service vehicle operations.
5. Traffic disruption caused by goods and service vehicles.
6. Impact of urban freight operation.
7. Number of services and other commercial trips to/from premises.
8. Size of goods vehicles in urban areas and dwell time of vehicles while loading/unloading.
9. Distance travelled by each vehicle in urban area.

Source: Allen *et al.* (2000a).

Trends in freight transport

Freight transport is a fundamental component of urban life. Every day, citizens consume and use goods – food, clothes, furniture, books, cars, computers – produced by people throughout the world. Urban goods transport enables these citizens to have access to these products wherever and whenever they require.

Continuing globalisation of economic activities, changes in consumer behaviour and developments in advanced technologies have led to many developments in freight logistics.

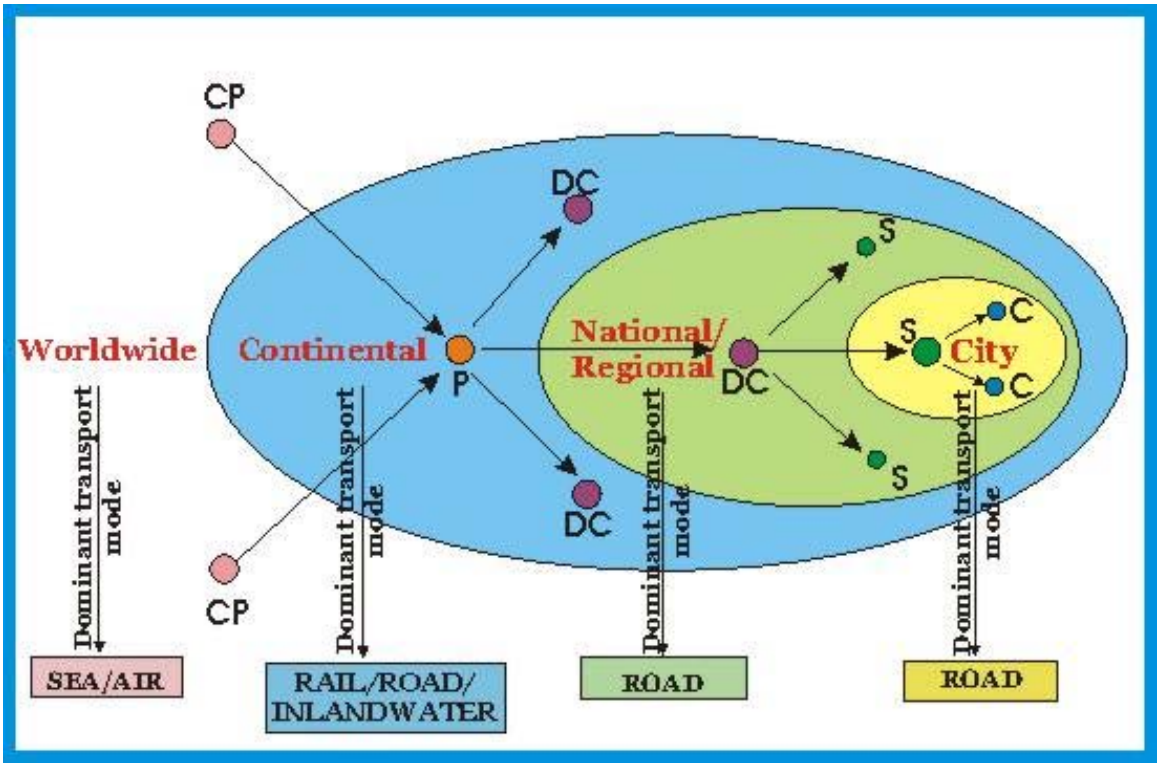
Supply chain trends and urban goods transport

Total freight transport is expected to rise. The EU White Paper "European Transport Policy for 2010: Time to Decide" forecasts a 38% increase in demand for goods transport by 2010, and that heavy goods traffic alone will increase by nearly 50% over its 1998 level unless new measures are taken. In the United States, forecasts of freight tonnage growth (2000-2020) by region range from 100-200% growth in the south to 79% growth in the northeast.

Over the past few years, companies have steadily concentrated their production capacity in fewer locations and have expanded the geographical scale of their sourcing and distribution operations. This has led to a wider logistic reach of companies – the length of their supply lines upstream and distribution channels downstream. This globalisation influences the pattern of goods transport in urban areas, the consequence being that urban goods transport has become more integrated with long haul transport.

In Figure 2.2 the scales of logistics and their dominant transport modes are illustrated. The majority of products shipped into urban areas are produced outside these areas. These products consist of many different components which are assembled from different areas around the world and shipped from strategic locations to customers in urban areas.

Figure 2.2. **Example of a modern distribution pattern integrating the long haul transport chain with urban goods transport chain**



CP: components producer. P: producer. DC: distribution centre. S: shops. C: consumers.
Source: OECD Working Group on Urban Goods Transport.

Therefore, in planning policies on the delivery of goods in urban areas, the following issues need to be taken into consideration:

- International freight flows and logistics.
- National and inter-regional freight flows and logistics (not only flows which have urban destinations but through traffic as well).
- The architecture of local delivery systems.
- Customer demands.

The transport sector has now changed from a "push" market-oriented approach to a "pull" market-oriented approach which fully integrates customers into the supply chain. Therefore, urban goods transport can also be considered the first link in the distribution chain – putting users and customers first – instead of the final link in the distribution chain starting from the production location and finishing at a retailer or customer.

Logistic chain management: centralisation of inventory

Companies have concentrated not only their production capacity but also their inventory capacity. In achieving cost reductions by fleet management and by reorganising transport networks, supply chain directors have rationalised supply chains by reducing the number of warehouses and by outsourcing specific transport activities. Co-operation between various transporters and shippers is

optimising the use of and thereby reducing the number of warehouses in most metropolitan areas in OECD countries. Warehouse operations are becoming a major activity of logistic chain integrators.

On the other hand, with the concentration of inventory, non-stockholding, break-bulk facilities are needed in order to maintain transport efficiency. Companies have been able to achieve inventory cost savings while minimising additional transport costs by geographically separating stockholding and break-bulk operations, with the former being centralised while the latter remains decentralised.

Direct delivery is also increasing, reflecting the growth of direct marketing, particularly through electronic media. It enables manufacturers to bypass conventional wholesale and retail channels.

Given the restrictions on urban goods transport, consolidation of goods deliveries between companies is increasingly necessary in order to increase efficiency. Multifirm consolidation systems such as city logistics which have one warehouse able to serve several adjoining regions and companies differ from classical delivery systems where companies distribute their goods via their warehouses in each region.

Hence, logistic chain management is changing classical delivery systems and has led to the development of different delivery systems, all aiming to increase efficiency and respond to strict consumer demands.

Urban goods transport in cities: the example of the retail sector

The retail sector is very complex and diversified. Trends in consumer behaviour strongly influence business strategies of retail organisations. There are two major transport considerations related to retail. The first deals with the front door of retail stores, namely the accessibility of shopping areas for the customer, which mostly concerns passenger transport. The second deals with the back door, namely the stricter demands on the delivery of goods. In both aspects, accessibility is a central issue. Given the growing importance of accessibility in urban areas particularly in shopping areas for marketing, a "P" (for parking) could be added to the five already existing marketing criteria (price, product, performance, presentation, and promotion). This P for parking is of significant importance to both real estate and retail sectors, since it concerns the geographical hindrances not only to freight transport, but also personal mobility. Living conditions, such as the pedestrianisation of inner cities, have become increasingly important in recent years, and any interference with mobility is less tolerated in urban areas. Customers and inhabitants of cities have become more demanding. The accessibility of urban areas has become a very important marketing asset which is worth a large price.

The second aspect in the retail sector is the drive to minimise costs that has led to techniques for maximising the return on space. Service premises have sought to use maximum space for direct service provision with the result that space can no longer be used for storage and other back-office functions. The manufacturing industry and retail sector follow the principle of floating inventory in order to produce and sell tailor made products while saving storage space as selling area or production facility, thereby receiving a maximum return on investment.

As a result, a recent study shows that the demands placed on the supply chain, especially by the retail sector, have never been greater.[12] All links in a logistic chain need to become "leaner" and costs need to be reduced. Most notable among these trends is the need for more frequent delivery with reduced delivery lead times. Expectations are rising for same-day, 24-hour and two to four-day delivery, while delivery lead times of a week or more are declining.

[12] Kearney (1999).

For example, in one area of Barcelona, 70% of retail outlets no longer have storage areas. This trend of zero-storage management and just-in-time logistics, driven by mass customisation and insufficient urban space, has added to the complexity of the urban delivery systems. Thus, a medium-sized supermarket may have between 28 and 36 deliveries per week[13] for an area only a fraction of a factory of a similar turnover[14].

Urban goods transport – the role of intermodal transport

Public policy in most OECD countries fosters intermodal transport, aiming at optimising the possible multimodal use of distribution centres in order to divert transport from road to (short) sea, rail and inland waterways. However, road transport is the common mode of transport for urban goods transport, and non-road modes offer little potential for substantial urban goods deliveries. The reason for this is that most urban goods require just-in-time, flexible and tailor-made deliveries, thereby creating transport demands which are difficult for non-road modes to meet. Retail and service establishments have complex delivery patterns. Diversified pharmacies, for example, may have tens of deliveries per week involving express deliveries of expensive/urgent medication, other medical products, photographic service collection and return and non-medical products (see Box 1.1). Similar analysis can be undertaken for leisure complexes, restaurants, and financial services. Therefore, it will be difficult to substantially increase the role of non-road modes.

However, possibilities for intermodal urban goods transport should be explored. When available, land use opportunities for railway constructions or inland waterways harbours should be explored for goods delivery. In many countries, the capacities of these locations are only used for construction site logistics and hardly developed for urban goods transport. Nevertheless, an increasing effort in some countries to search for opportunities to apply intermodal solutions can be seen.

Logistic chain integration is based on the principles of rationalisation, standardisation and interoperability. Rationalisation is a prerequisite for consolidation of goods in the limited urban space. Standardisation of loading units and roll containers throughout the logistic chain can lead to more interoperability of logistic services from producer to consumer.

Urban transport in cities: different vehicles for different purposes

The relationship between the volume of deliveries and the type of vehicle used is important in understanding urban goods transport. As Table 2.4 shows, different vehicle types are used for different purposes.

[13] Jackson and Timpson (2001).

[14] Hollingsworth and Monticelli (2001).

Table 2.4. **Different categories of vehicle and their use in urban goods transport (as applied in the Netherlands)**

Weight	Contents – length	Goods
Less than 3.5 tonnes	Maximum: 8m³ – 6 metres	Parcels Services B2B Independent retail
3.5 – 7.5 tonnes	Maximum: 23m³ – 7.5 metres	Lifestyle(clothes/shoes) Daily products(food) B2B Parcels
7.5 – 18 tonnes	Maximum: 40-44m³, 10 metres	Bars/restaurants Lifestyle (clothes/shoes) Daily products (food) B2B
18 – 40 tonnes	Maximum: 34-100m³, 19.3 metres	Department stores Daily products (food) Do-it-yourself
The production requirements for new vehicles are: less visual intrusion, increased safety, better working conditions, high capacity, light weight, and clean engine.		

Source: Netherlands Forum for Physical Distribution in Urban Areas *(Platform Stedelijke Distributie)*.

Degrees of efficiency in energy use and emissions vary as different vehicles are used for urban deliveries. In France, research by the French Environment Agency in 1997 found that round-trip deliveries using heavier and larger trucks in the urban environment can consume less energy than a bundle of direct deliveries. As more trips are required to deliver loads with smaller vehicles, this makes less efficient use of the urban infrastructure. The research found that 12 delivery vans of 500 kilogrammes each, making parallel deliveries to 12 shops ten kilometres away from a distribution centre, was more energy-consuming and produced more emissions and noise than one six-tonne truck making a round-trip delivery to these 12 shops from the same distribution centre.

In general, heavy trucks are needed for deliveries to big supermarkets and hypermarkets. Small and medium-sized retail often require smaller vehicles and vans for the delivery of goods, due to their central location in urban areas. Consolidating for these shops is often difficult. Because of the demand structure in retail, the size of vehicles will not change substantially in the coming years. Small trucks and vans will continue to play an important role in retail logistics, although they generate more traffic and energy inefficiencies than heavier trucks.

Waste and reverse logistics

The increase in waste has led to awareness of the need for new ways to deal with waste, resulting in increased attention to recycling, both by governments and by society as a whole. Recycling requires used products to be returned to their original producers and therefore makes transportation of products back along the supply chain a very important issue, particularly with regard to urban goods transport. Even where excellent waste collection systems exist, the need for recycling used goods requires specialised collection and transport of these goods, referred to as “reverse logistics” (see Box 2.1).

In order to realise a reverse logistics concept, the management of involved companies needs to re-organise internal processes so that used goods can be collected and transported in a cost efficient manner. Organisational restructuring involves all industry partners in the logistic framework as well as customers. Such goods transport also requires information technologies.

Role of supply chain management and ICT

As industrial activities continue to expand globally, businesses are restructuring their logistic systems. They are organising strategic, world-wide networks that deliver an efficient and high-quality response to demand from any segment of the world market. The efficient and integrated organisation of such networks, seeking to optimise the flow of the whole logistics chain, is often referred to as supply chain management (SCM). This concept of SCM extends integrated logistics management to include customers, suppliers and manufacturers. Urban goods transport constitutes the final leg of the supply chain, and therefore is an integral part of SCM.

ICT plays an important role in SCM. ICT connections not only allow businesses to integrate their operations and diversify their supplies, but also allow businesses and consumers to communicate with each other in producing and ordering products. Thus, ICT has enabled customers to be integrated into the supply chain, and industry to respond swiftly to their complex demands. With the development of ICT, the so-called customer order decoupling point (the point at which goods become designated for particular final customers) has moved upwards through the logistics chain. Figure 2.3 illustrates the increased integration of customer demands into SCM.

Box 2.1. **Reverse logistics**

Amounts of waste are increasing faster than the capacities of dumps and waste combustion facilities. There is also a tremendous increase in emissions caused by combustion of waste. The need to find new ways of dealing with waste has led to the trend to recycle and reuse raw materials.

This trend has been driven by public attention rather than by the industry itself. In the past decade, waste management and recycling have become important political keywords in many countries. EU policy stresses prevention of waste production and possibilities for recycling of waste. Measures for this include return-premium measures and deposit systems. As a consequence, many European countries have established waste management plans. In the Netherlands, for example, the objective for 2001 was to reuse 65% of the packaging waste[15]. All such waste management plans give priority to the reduction of waste and the reduction of its harmfulness.

The main reasons for return flows are as follows:

Type of product	Reason for return
End of life (EOL) products	Dismantling, recycling, reuse, disposal
Packaging waste	Recycling, disposal
Handling equipment	Cleaning, reuse
New consumer products	Customer rejection, damaged goods, order mismatch
Used consumer products	Repair, refurbishment, resale

Source: SULOGTRA (2000-2001).

An increasing proportion of end of life (EOL) products and packaging is returned for recycling and reuse. This generally involves them travelling longer distances through more complex reverse logistics channels. Limited research has so far been done on the evolving structure of these channels[16].

[15] NEI (1999).

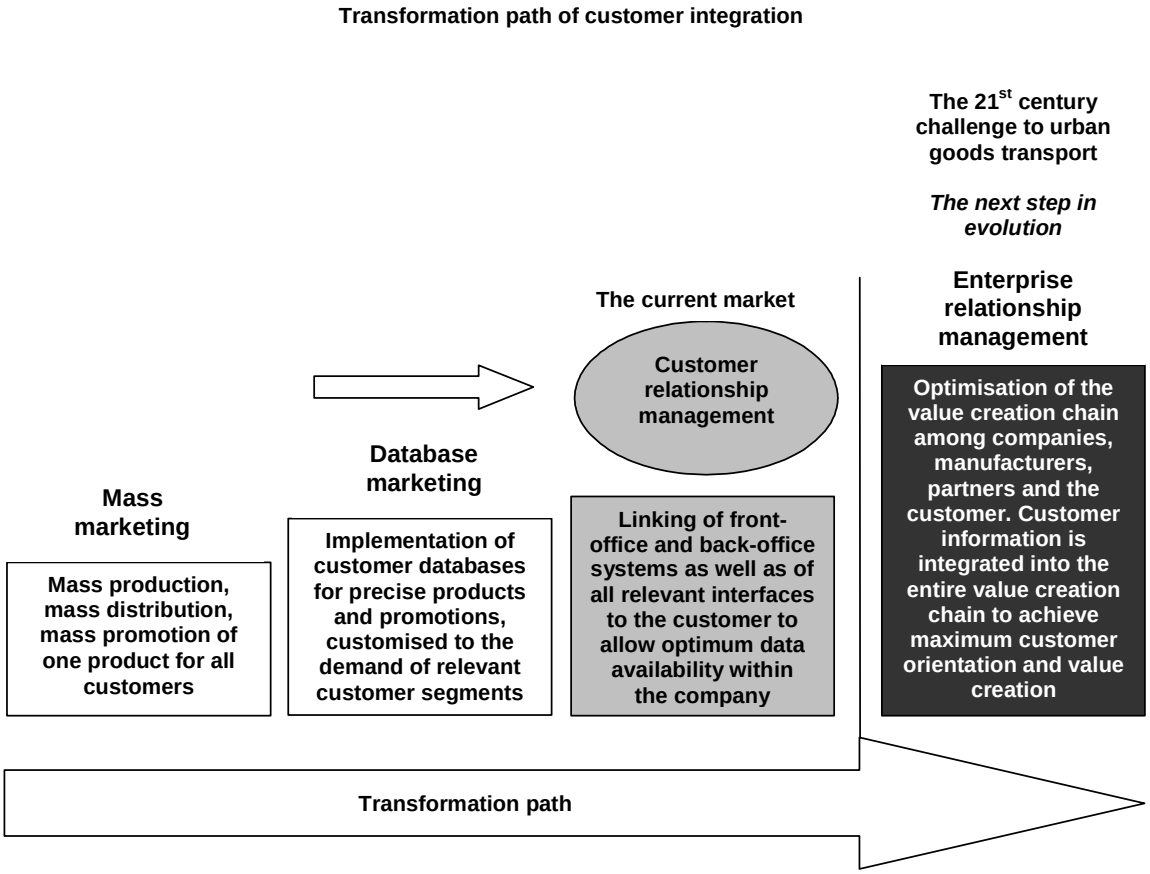
[16] For example, Philipp (1999).

Box 2.1. **Reverse logistics** *(continued)*

The configuration of these channels is influenced by several factors. The sorting strategy requires waste fractions to be separated prior to recycling or reprocessing. Such dismantling of products can take place either at separate disassembly plants or at the same factories in which products are manufactured. If the value density of the waste is low, reprocessing tends to take place close to the source of the waste. As most waste is of a relatively low value, transport costs represent a large proportion of the recycling cost and therefore the price of the reprocessed waste. Hence it is crucial to keep transport costs low so as to enable the recycling to be economically viable. As the volume of products undergoing reprocessing increases, economies of scale will depress the unit cost of this operation. Compaction of the products will allow them to be economically transported over longer distances. Also, transport of waste differs from other freight transport in that speed is usually not of importance. A further factor is the structure of the logistics channel. Legal obligations on producers and/or distributors to take back EOL products and packaging can encourage their return through existing distribution channels.

So far, this special collection, sorting and transport produces more financial costs than revenues, although there are some leading edge companies which have adapted recycling in their business processes. This is why laws and regulations are used to guarantee that private companies act in accordance with the public interest.

Figure 2.3. **The consumer integration in logistic supply chain**



Source: SULOGTRA (2000-2001).

This virtual infrastructure serves as an information network for SCM. It has been mainly developed by the private sector, and public policies have supported it by establishing protection for the privacy of customers or implementing regulations for the liberalisation of telecommunication markets.

As customers become increasingly integrated in the supply chain, product flow in world-wide supply chains becomes increasingly time sensitive, due to the need for responding more rapidly to varied and often-changing customer demand. Coupled by the increasing demand by customers for frequent and just-in-time deliveries, efficient organisation of urban goods transport has become crucial for a successful SCM.

ITS-based efficient and environmentally friendly logistics systems

Intelligent transport systems (ITS) allow shippers and freight carriers to establish more efficient and environmentally friendly distribution systems.[17] ITS has become an important element in rationalising existing logistics operations, and has been applied to improve urban distribution systems using the following systems:

- Logistical matching systems.
- Intelligent fleet management systems.
- Innovative survey methods.
- Booking systems for truck parking places.

Logistical matching systems for freight transport using the internet are a type of e-commerce (B2B) within the freight industry that attempt to match the demand from shippers who offer jobs for carrying goods and the supply from freight carriers who offer a vacant space on their trucks that can be used for transporting additional goods. In principle, all the activities of offering demand and supply, auction, negotiation and transaction are done via the Internet, although telephone and fax are also used for negotiation and questions/answers. ITS is used for identifying the vehicle location and its carrying loads in the logistics matching systems.

ITS-based intelligent fleet management systems have been introduced in the logistics industry to increase the efficiency of freight vehicle operations and trace packages or containers. These systems allow freight carriers to dynamically control freight vehicles to provide better service to customers.

The intelligent fleet management systems can provide innovative methods for surveying traffic conditions in terms of link travel times on the road network. If a large number of freight vehicles were equipped with devices recording their location using GPS and/or gyroscope, this could provide traffic data on link travel times. This type of system is called a probe vehicle system, because the vehicle itself is a probe, measuring the speed of traffic moving in the network. The data can be stored in the digital recording systems in the vehicle and input to the computer in the data centre after finishing travel.

Booking systems for on-street or off-street truck parking places are a good application of ITS in the logistics area. These systems allow freight vehicles to save unnecessary travel in finding a parking place near their customers in urban areas. These systems are comprised of monitoring devices for automatically identifying whether parking places are occupied or vacant, a control centre for all car parks in an area and communication systems between the vehicles, the control centre and the devices at the parking places.

[17] Taniguchi and Thompson (2002).

Box 2.2. **Use of ITS in fleet management**

In general, ITS for pickup/delivery truck operations have three significant functions:

- To allow drivers and the control centre to communicate with each other.
- To provide real time information on traffic conditions.
- To store detailed historical data of pickup/delivery trucks operations.

Vehicle location identification systems (VLIS) are now available using GPS (global positioning systems) and advanced mobile communication systems. Once the vehicle control centre recognises the current location of vehicles based on VLIS, it can optimise the vehicle routing and scheduling with real time information of variable travel times or variable demands from customers.

Historical data of travel times provided by the actual operation of vehicles can be a source of better operation of vehicles the next day. Many researchers working in the area of ITS applications overlook this feature. Vehicle routing and scheduling plans can be modified using the results of analysed data of past operations. A probabilistic approach can be a powerful tool for optimising vehicle routing and scheduling using the updated distribution profile of travel times for each link of the road network.[18]

In addition, stored historical data on travel times by each company could be shared by other shippers and freight carriers. A common information platform would be used for storing the updated travel times of vehicles operated by many companies. This platform could process the data to provide an appropriate form of data to shippers and freight carriers. The common information platform should be supported by the public sector, since it would promote more environmentally friendly logistics systems.

E-commerce

The explosive growth in the use of the Internet has led to a rapid development of e-commerce. This development has also been influenced by changes in consumer behaviour and proliferation of product types, which resulted in mass customisation and customer focussed integration.

E-commerce currently appears to be one of the fastest growing marketing channels for different kinds of products and services. Business-to-business (B2B) e-commerce accounts for by far the largest share of trade using advanced information technologies. The share of business-to consumer (B2C) transactions is still small, not only compared to B2B transactions but also compared to traditional retailing. However, B2B and B2C are interrelated within the supply chain, and co-ordination between them is a key factor for SCM.

Table 2.5 shows the differences between the delivery of goods at retail outlets and B2C e-commerce deliveries.

[18] Taniguchi, Yamada and Tamagawa (1999).

Table 2.5. **Differences between traditional deliveries and e-commerce deliveries**

Traditional		E-commerce
Delivery to retail stores	**Consumer shopping trips**	**Home delivery**
Large quantities	Small quantities	One piece delivery
Boxes, crates, roll cages, etc.	Plastic bags	Parcels
Homogeneous loads	Heterogeneous loads	Heterogeneous loads
Large trucks (vans)	Passenger cars	Small vans (trucks)
One stop	One stop	Many stops
Transport companies and own transport	Own transport	Mostly use couriers and parcel services
Vehicle movements to and within shopping areas	Vehicle movements between shopping and residential areas	Vehicle movements to and within residential areas
No delivery failures	No delivery failures	Possibility of many delivery failures

Source: Visser and Nemoto (2002).

E-commerce may seem similar to traditional mail order services. Instead of ordering by mail or phone, Internet services are used. In both cases, goods are delivered directly to homes. However, the operations of the deliveries tend to differ. Traditional mail order services use their own facilities for administration, storage, product selection and even delivery, although courier services are also often used. On the other hand, many major retailers are not fully equipped to deal with e-commerce businesses and often outsource most of their administrative and logistic activities to fully integrated express carriers.

Trends seem to indicate that e-commerce will lead to an increase in freight transport in terms of tonne-kilometre volume, and to greater fragmentation of consignments particularly at the level of urban distribution. Highly fragmented consignments would need to be delivered globally within a very tight timeframe and at low cost if e-commerce were to develop further.

On the other hand, e-commerce can contribute to advanced distribution systems by, for example, facilitating consolidation through online bidding of transportation. The advances in innovative logistic schemes (e-logistics and e-fleet management) can be used to consolidate transport flows both to and within urban areas. This could potentially lead to better services in terms of fast and reliable delivery. Outsourcing of logistics, co-operative delivery services, and optimised routing could also lead to consolidation and contribute to reducing traffic.

Therefore, e-commerce provides both challenges and opportunities for achieving efficient and sustainable urban goods transport systems.

Passenger traffic

77% of the population in OECD countries live in urban areas.[19] Higher incomes, more leisure time, ageing of the population, more access to cars by women and declining household size have all contributed to extending car usage for commuter trips as well as for social, leisure and shopping activities. Private vehicles offer considerable advantages over other modes of transport in terms of comfort, flexibility and availability, characteristics highly valued by users, even in urban areas with an

[19] For 2000. Source: OECD (2001a).

efficient system of public transport. Therefore, the number of passenger vehicles in use is increasing by around 3% a year, and trip lengths are becoming longer.

Given the limited space available in urban areas, this trend has led to severe competition between various means of passenger transport and goods transport. Integration between passenger and goods transport is often difficult, since urban goods transport operate within integrated supply chain management whereas passenger transport serve individual needs. Ruled by the "goods do not vote, passengers do" principle, passenger transport has received attention and priority in policy-making when competing for limited funds. The smaller government role in goods movement has also been a significant factor affecting this competition for funds, since goods transport tends to be regarded as being mainly the responsibility of the private sector[20].

Increases in urban population levels, vehicle ownership and distance travelled per vehicle are all leading to greater volumes of traffic and increasing road congestion. This constitutes a serious obstacle for efficient urban goods transport. On the other hand, since urban capacity is limited both physically and by regulatory restrictions, increasing numbers of freight vehicles have contributed to congestion and safety problems for both passenger and freight transport.

However, the increase in passenger vehicles could lead to pressures for the development of innovative systems, in the context of community interest in more sustainable passenger and freight transport systems in urban areas.

Systems which combine passenger and freight tranport have been considered in the Netherlands, but have not yet been sucessful. Goods transport using the Amsterdam Metro system or light rail transportation systems are being considered. In Dresden, a tram system *(S-Bahn)* has been developed for goods transport, but passengers are not considered in this system. In many countries, passengers and parcels are transported together in public transport systems in rural areas. However, a substantial integration of passenger and goods transport in urban areas remains a challenge, due to the intolerance of passengers in waiting during loading/unloading of goods.

In many countries, people make use of passenger vehicles to get goods to their homes. This final link in the logistic chain is essential, since home delivery is not very common. For example, in the Netherlands, an articulated truck delivering goods for C&A fashion stores containing 5 000 pieces of clothing is considered to carry the same amount of goods as normally carried by 2 000 passenger vehicle moves (customers). In countries with large shopping facilities, such as supermarkets, shopping malls and factory outlets on the outskirts of towns, passenger vehicles are often the only efficient means of transportation. A survey of urban freight transport in Bordeaux in 1995 indicated that 54%[21] of freight transport comprised goods transport by passenger vehicles for shopping, and 37% of goods transport by trucks (the remainder being transport to/from construction sites, transport of waste, etc.).

Therefore, urban goods transport policies need to take into consideration the interactions between passenger and goods traffic.

[20] Especially in the United States, with a long history of keeping government out of private sector business decisions (except for regulation), the private sector has been expected to provide the infrastructure and support services that they need for their operations, (except for the roads themselves). For example, railroads are privately owned in the United States whereas in Europe many are national.

[21] The data are in vehicle kilometres private car equivalent (each type of vehicle used is converted to private car equivalence according to its size).

Problems of freight transport in urban areas

Complexity of operations and conflicting goals make urban goods transport a contentious area. Urban goods transport plays an important role in the discussion of quality of life in urban areas, since a large share of the traffic moves take place in areas with a high density of population and mixed use of public space, where external costs of transport are easily felt.

The various problems both encountered and caused by urban goods transport, which have important policy implications on the local, national and international agenda are discussed below.

Accessiblity and congestion

Accessibility problems encountered by urban goods transport are often caused by the following reasons:

- Insufficient urban goods transport infrastructure.
- Access restrictions.
- Congestion.

Although delivering goods to city centres is essential for maintaining economic and social functions of cities, freight vehicles in many cities encounter the problem of not having the infrastructure necessary to function properly. There is a serious lack of parking places for freight vehicles, both on-road and off-road, which can be used for loading or unloading. Even where such places exist, they are often illegally occupied by other vehicles, since restrictions allowing only freight vehicles to use such places are rarely enforced. This results in freight vehicles being forced to double park on roads when they stop for delivery, causing disruption to traffic and safety problems.

Many local authorities, especially in Europe, impose access restrictions on freight vehicles. These restrictions aim to maintain the living environment and restrict movements of freight vehicles in city centres according to time, size or weight of vehicles. As a result, operators of goods transport are forced to adjust their logistic systems to deliver goods to city centres within the imposed time windows and/or to use smaller vehicles. Furthermore, such restrictions differ among different municipalities, and are often not sufficiently explained to drivers.

Congestion caused by the increase in passenger and freight vehicles and aggravated by the lack of available infrastructure and access restrictions is another major difficulty encountered in urban goods transport. In order to avoid the influx of passing traffic into urban areas, it is desirable to develop ring roads that detour around urban areas as well as other roads that provide direct access to airports and ports. These developments should coincide with the development of arterial motorway networks.

On the other hand, such congestion also causes accessibility problems for passenger transport. Since freight vehicles constitute a considerable portion of urban traffic (*e.g.* 18% in terms of private car equivalent units [road occupancy] in French urban areas), goods transport tends to be considered as a major hindrance for urban mobility and a major cause for congestion and aggrevated pollution.

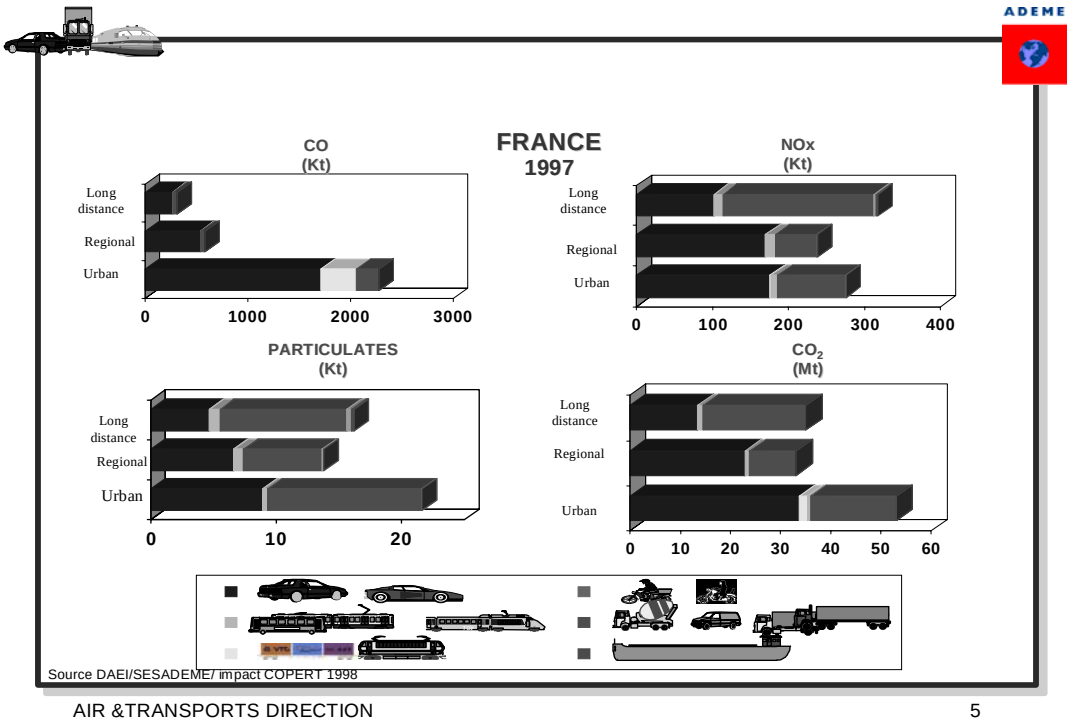
Although accessibility and congestion problems are well known, no estimates have been made of the economic costs of reduced accessibility. This is a weak point for those who argue in favor of improvements in accessibility.

Urban goods transport is situated at the crossroads of conflicting interests. Accessibility restrictions are justified by the need to maintain liveability, but on the other hand, reduced accessibility influences the development of economic centres. To address this problem, the varying needs and interests of all stakeholders must be taken into account.

Environmental issues

Freight transport contributes to global emissions as well as local air pollution and a reduction in the quality of the environment in urban areas in general. With improvements in passenger vehicles, such as the breakthrough of catalysts and environmentally friendly fuels, freight vehicles have become more prominent as an environmental problem. The fact that many trucks use older technology (diesel engines) also contributes to them becoming significant generators of local pollutants, including particulates. Figure 2.4 illustrates the significance of freight transport emissions in urban areas as a proportion of national emission levels in France.

Figure 2.4. **Urban transport share in environmental problems**



Source: Agence de l'Environnement et de la Maîtrise de l'Énergie, France.

At local level, the principal environmental and nuisance problems caused by road-based freight transport are:

- Local air pollution such as carbon monoxide (CO), nitrogen oxides (NO_x), sulphur oxides (SO_x) suspended particulate matter (SPM) and volatile organic compounds (VOCs).
- Traffic noise.
- Other forms of nuisance such as smell, vibration and physical hindrance.

Considerable progress has been made in reducing the levels of some local air pollutants in many OECD countries, but it is still difficult to meet legislated standards for some pollutants, and air pollution remains a major problem in many cities. Freight transport contributes considerably to some pollutant emissions. For example, the contribution of freight vehicles to total transport SOx emissions is 43% in London and 32% in Marseille. For SPM, the contribution of freight transport is 61% in London and 47% in Marseille. For NO_x, the contribution of freight transport is 28% in London, 42% in Marseilles, 50% in Prague and 77% in Tokyo. Therefore, improvements in freight vehicle emissions are an important issue.

Noise is another important concern in urban goods transport. The increasing delivery of goods puts a heavy burden on the tolerance of the local people and their ability to cope with urban goods transport. The main noise problems are caused by exhaust, engines, tires, doors and body rattle of freight vehicles and other freight equipment, *e.g.* fork lifts. Noise problems are caused by deliveries to shops and are aggravated at night. Also, overnighting of freight vehicles in front of their drivers' houses causes problems in residential areas by the re-starting of engines in early morning hours. Various municipalities have established decibel (dB) indicators for acceptable noise levels.

Smells, vibrations and physical hindrances are other nuisances that affect the quality of life in urban areas but are not often measured.

Urban goods transport also contributes to some of the critical global environmental and sustainability issues that governments are confronting on a global basis. These include:

- Emissions which influence climate change, such as carbon dioxide (CO_2) and greenhouse gasses (N_2O and methane [CH_4]) and acidification (nitrogen oxides [NO_x], sulphur dioxide [SO_2]) and hydrocarbons).
- The depletion of natural resources.
- Dumping of waste materials, such as tyres, oil and other materials.

In many countries, although CO_2 emissions from other human activities have fallen overall, emissions from transport activities have increased. With the expected growth in demand for freight transport, the use of cleaner and more fuel-efficient freight vehicles and new distribution systems, including waste collection and recycling, is essential for achieving more sustainable development.

Concerted action needs to be taken across all sectors of the economy to address these issues. Like other parts of the transport sector, governments are expecting urban goods transport to contribute to the actions required.

Safety

Roads in urban areas are often congested due to high traffic volume, limited space for infrastructure, signalised intersections on trunk roads, traffic entering and exiting from roads and buildings, on-road parking and pedestrian traffic. The densities of facilities, such as roadside buildings and elevated highways are also features in urban areas. In this situation, the following road safety problems arise.

Problems caused by on-road loading/unloading

Due to lack of adequate facilities in buildings, loading and unloading tends to be carried out on-road. In commercial districts where on-road parking is common, even when on-road loading/unloading facilities exist they tend to be used by other vehicles, resulting in loading and unloading often being carried out from vehicles that are double parked. This leads to congestion, and vehicles changing lanes to avoid double-parked vehicles increase the risk of accidents.

Problems caused by population and building density

Freight vehicles often transit residential streets to avoid congested trunk roads. As a result, accidents involving freight vehicles may increase and have serious impacts, including the involvement of pedestrians or destruction of roadside buildings. Also, when accidents involving large freight vehicles occur on elevated roads, they could have serious effects on the roads below caused by the collapse of noise barriers and the shedding of loads. Furthermore, accidents on crowded roads in urban areas aggravate traffic jams.

For example, in Japan, the accident rate (number of fatal or injury accidents per million vehicle kilometres) for freight vehicles is 0.96 per 1 million in urban areas and 0.47 per 1 million in non-urban areas. Accident rates are therefore two times higher in urban areas.

Problems caused by excessive demands in deliveries

There are cases when excessively strict delivery deadlines lead to dangerous driving, causing accidents. For example, when drivers' salaries are based on number of deliveries, drivers try to make as many deliveries as possible and may drive aggressively and unload carelessly from double-parked vehicles, thus increasing accident risks.

Problems caused by characteristics of vehicles and loads

Generally, accidents involving freight vehicles are greater in scale than those involving passenger cars, and often include shedding of loads. The social loss caused by such accidents is greater, since it takes more time to deal with the accidents, leading to long traffic jams.

Also, there are cases when vehicles and cargo that exceed height restrictions pass under elevated railways, roads or pedestrian crossing bridges and collide with such structures.

Another important aspect is that other road users tend to lack knowledge of the limitations and manoeuvrability of large freight vehicles, which differ from those of passenger vehicles. The lack of understanding that large freight vehicles are not able to stop or change directions quickly could result in collision with such vehicles. In Australia, for all fatalities resulting from a crash on Australian roads, one in five crashes involves a truck. Trucks are also involved in 10% of serious injury crashes. However, research has shown that for most of these fatalities and serious injuries, the truck driver is not at fault. Car drivers were primarily responsible for five out of six crashes involving an articulated truck and two out of three crashes involving a rigid truck.[22]

[22] Data is for 1995 from Australia Federal Office of Road Safety, Monograph 18, 1997.

Problems caused by dangerous goods

Dangerous goods include hazardous waste, gasoline, gas cylinders (propane, acetylene, etc.) and chemicals. Transport of dangerous goods in urban areas has serious safety implications, and has become an increasingly important item on the political agenda.

In most European inner cities, transport of dangerous goods has become a major concern, particularly in metropolitan areas where economic and industrial activities are integrated in urban life. In Europe, transport of dangerous goods is usually regulated by defining special routes and/or restricting access to certain areas by vehicles size. Dangerous goods vehicles are often restricted from using designated bridges and tunnels. In such cases, alternative routes bypass dense urban areas.

In the United States, transport of dangerous goods through urban areas is subject to regulations listing designated routes for each state but restricted to various substances, and preferred routes for transporting those substances. In local areas dangerous goods (or hazardous materials) are often handled by signage at the outskirts of cities directing trucks to use prescribed, signed truck routes, which keeps them from the most congested areas. Otherwise, the delivery of dangerous goods within urban areas is generally unrestricted so as not to violate the commercial rights of trade and industry. Land use in the United States tends to be homogeneous, *i.e.* similar land uses are far more likely to be concentrated than in Europe.

Energy consumption

In OECD countries, transport is the major and most rapidly growing sector for oil consumption (increasing at a rate of about 2% a year).[23] Overall transportation energy demand in OECD countries is projected to rise by around 40% over the period 1997-2020, with increases in most modes, particularly in truck and car consumption.

Goods transport greatly contributes to transport energy demand. The French National Research launched in 1993 found that goods transport contribute to around 40% of total urban transport energy consumption (Figure 2.5).

For fossil fuels as a whole, although the prospect of resource exhaustion over the short to medium term is not likely to be a limiting factor, over the longer term (more than 50 years), constraints on supplies of some fuels may necessitate alternative energy technologies to complement or replace present systems. Actions need to be taken at this stage if new technologies are to be developed and widely available by the time their use becomes necessary.

Awareness of urban goods transport

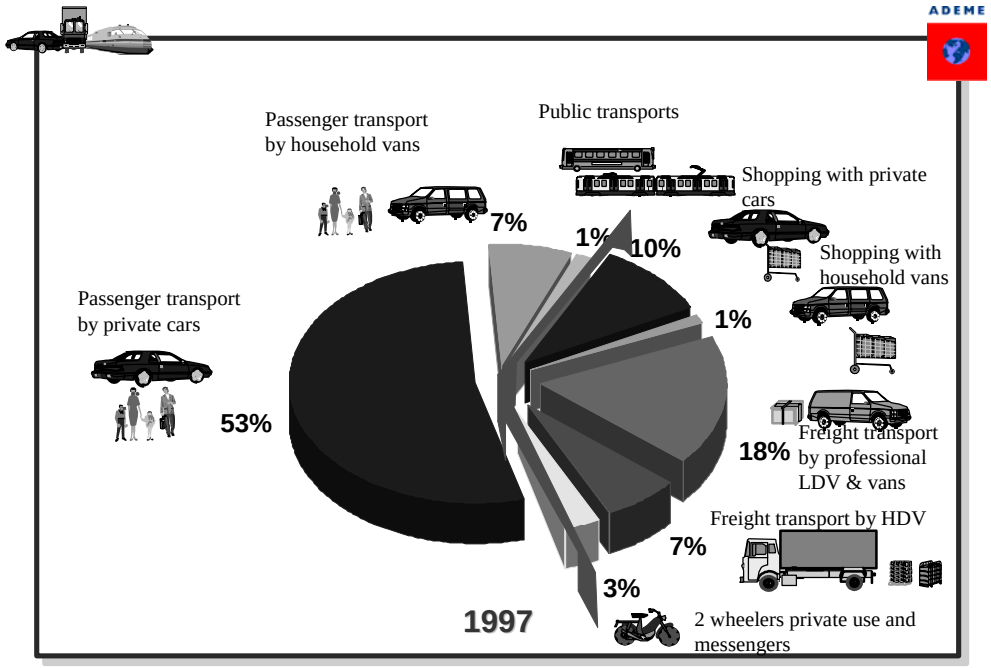
Communities seem generally very well aware of congestion, environmental and safety problems associated with goods transport in urban areas. The various problems have led to some increased concerns about the consequences of urban goods transport. Although the extent of such concern varies among countries, most countries are planning or implementing various measures to alleviate the problems.

On the other hand, although it is clear that urban goods transport is crucial for maintaining the economic and social functioning of cities, there seems to be a serious lack of awareness of benefits of urban goods transport. Awareness of urban goods transport still seems to be rather one-sided, focusing

[23] OECD (2001b).

more on its problems than on its importance – leading to some negative perceptions of the importance of urban goods transport.

Figure 2.5. **Breakdown of urban transport energy consumption according to the use of vehicle**



Source: Agence de l'Environnement et de la Maîtrise de l'Énergie, France.

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Chapter 3

APPROACHES TO EFFICIENT URBAN GOODS TRANSPORT

Countries are in different phases of policy development with respect to urban goods transport. This chapter analyses practices in member countries and presents the lessons learned.

Analysis of practices in member countries

Information on urban freight transport policies in different OECD countries was collected by the members of the Working Group. Full details are provided in Annex 2. These country reports show that there are significant differences among member countries in respect of their approaches towards urban freight transport issues. A key point that has emerged from member countries' experiences is the framework for policy development, *i.e.* the issue of how and at what level of government urban goods transport policies are discussed. Therefore, this section first examines the level of policy-making, followed by a comparison of policy objectives and underlying problems of urban goods transport in member countries. Policy measures applied in member countries are then discussed, focusing on licensing and regulations, developing freight centres and freight routes, consolidated delivery and promoting low-emission vehicles. The development of consultation platforms for discussing problems and measures among governments and the private sector is also examined.

Policy level

Urban freight transport is mainly a local policy matter in many countries. It is an issue only at the local level and under specific situations, such as in historical areas, based on environmental concerns, or when pedestrian zones within shopping areas are developed.

In Belgium, a wide and diversified range of possible interventions at a local level, in particular in the capital city of Brussels, can be observed.

In the Czech Republic, where the main policy measure is access restriction and fees for vehicles entering the city centre, the national legislation allows local authorities to establish conditions and fees for vehicles accessing city centres.

In Denmark, on the national level, freight transport is mainly influenced by tax rules, the Road Traffic Act, environmental laws and energy policies. In 2000, new legislation gave the Minister of Transport the authority to allow local municipalities to suspend general traffic rules in specific areas and for a limited time period with reference to environmental objectives (environmental zones).

In Germany, there is no national policy directly related to urban goods distribution. Policy is guided through the 16 federal states *(Bundesländer).* In 1996 the Federal Minister for Education, Science, Research and Technology published a new traffic research framework which aimed for sustainable mobility. Besides the federal government and the *Länder* (regional governments), local authorities also seek to influence truck traffic and to ameliorate its negative effects on urban development and urban environments. Many cities in Germany have studied and, in some cases, implemented a variety of measures.

In Italy, the current guidelines for urban traffic plans (PUTs), the planning instrument for urban transport, does not propose strategies for urban goods transport although the relevance of freight transport is recognised. Recently, the new national transport plan introduced urban mobility plans (PUMs) in addition to the PUTs as part of urban transport planning. PUMs need to focus on urban goods transport as well as passenger transport.

In Sweden, the national policy level has generally been reluctant to adopt dedicated policies in the area of urban goods transport, although this reluctance has appeared to decrease in recent years – for example, Sweden is investigating the possibility of implementing a modern kilometre taxation system for heavy vehicles. The reluctance was due to the fact that Swedish cities and municipalities traditionally and legally act independently from the national policy level in many areas, including

urban goods transport. Also, industry has generally opposed national policy interventions with the argument that long-run efficiency is best attained through undisturbed market processes. Therefore, national policies with relevance for urban goods transport seem to have concentrated on vehicle/fuel taxation and regulations, and national R&D programmes within the field of vehicles and alternative fuels.[24]

In the United States, despite the inclusion of the need for planning for urban goods movement since the inception of the requirement for metropolitan transportation planning in the 1962 Federal Aid Highway Act, and the reinforcement of that need in subsequent acts (ISTEA in 1991 and TEA 21 in 1998), planning for urban freight movement has received relatively little attention in urban areas. The United States takes the perspective that private firms should hold their destiny in their own hands; hence there is no national freight policy. However, after the passage of the North American Free Trade Agreement, the federal government undertook the Latin American Trade and Transportation Study (LATTS). This study generated a wealth of current and projected freight movements through US ports and resulted in the creation of the FHWA Freight Analysis Framework, a computer tool to allow states and cities to analyse freight movements at county level.

On the other hand, national policies have been established in some countries. Many of these countries have also attempted to find a creative and constructive way for local and national government to work together on urban goods transport issues,

In Australia, the federal government announced in May 2000 the development of a Freight Transport Logistics Industry Action Agenda. Proposed actions include improving data and information, developing a tool kit of best practice and benchmarking, developing quality assurance standards, stimulating innovation, research and development and promoting sustainable freight logistics. Actions in the area of planning, infrastructure and regulation are also proposed. In November 2002, the federal government released a major option paper on a strategic rethink of national transport strategy. Urban planning and expenditures form part of that vision, although to implement this new strategic structure, state governments need to agree to restructure their relations with the federal government. At the state level, strategic plans often exist, but many of these initiatives are reliant on federal and state funds.

France began with a national approach. In 1993, the Ministry of Transport (MELTT) and the environmental and energy agency ADEME launched a national experimental and research programme on urban goods transport in France. The research focused on freight transport surveys in urban areas, modelling (the software of the model has been distributed to local traffic planners), initiating pilot projects, and making policy recommendations. In December 1996, cities with over 100 000 inhabitants were given two years to draw up "urban movement plans" (*plans de déplacements urbains,* PDU in French), which need to include urban freight transport.

In July 2001, the Japanese Cabinet formally approved the New Comprehensive Programme of Logistic Policies, which elucidates a direction for new logistics policies in Japan. The objectives of these policies have been made clearer by setting quantitative targets as indicators of the achievement of these objectives. An example of such a target is to improve the loading rate of all trucks to 50% during the beginning of the 21st century.

In Korea, the national government introduced the Logistics Improvement Law in 1991. The Improvement Plan for the Logistics System (1994-2003), based on this law, is a long-term national government plan to improve the nation's logistics systems, and includes policies for urban goods

[24] European Commission, Directorate General Transport (1998).

transport. Recently, the Korean Ministry of Construction and Transport published the "Urban Goods Transport Planning Manual" for local urban goods transport planning processes. Based on this policy guideline, Seoul and six large cities need to establish their urban goods transport plans by 2003.

In the Netherlands, municipalities are strongly independent and implement their own measures, based on national traffic regulation. The Platform for Urban Distribution *(Platform Stedelijke Distributie)*, initiated by the national government, harmonises municipal legislation and promotes best practices on a national level, based on local experiences.

In the United Kingdom, the national government has affirmed its commitment to bringing about more sustainable urban distribution operations in the most recent Transport White Paper (DETR, 1998) and the daughter document entitled "Sustainable Distribution" (DETR, 1999). The approach that the government is taking involves making urban freight transport both more economically and environmentally sustainable. Much of this is expected to take place at a local level with urban authorities working closely with freight transport companies and their customers. Local authorities are now required to include a section on sustainable distribution in the new local transport plans (LTPs) that they have to submit to government for the allocation of resources for local transport capital expenditure. National support for local initiatives is also provided by means of guidance and advice about freight quality partnerships and innovative urban distribution strategies.

Underlying problems and main policy objectives

In most countries, urban goods transport does not seem to be a top priority item as yet, and countries are clearly in different phases of public policy development in this area. For example, in the United States, urban goods transport is not yet an important policy issue, but there is growing interest in this area in many states. In Japan, urban goods transport is considered an important issue, but has received less attention than other transport issues. Country practices show that the intensity of the policy initiatives is closely related to the perceived urgency of the problems of transport in urban areas.

Many countries are faced with common problems in urban goods transport. In many member countries, such as Belgium, the Czech Republic, Denmark, France, Japan, the Netherlands, Sweden and the United Kingdom, environmental problems and accessibility problems, including congestion, have attracted public attention. It is of interest that Germany reports transport inefficiency as a problem. It is a fact that in most countries, much of the freight traffic movements within urban areas are not economically efficient, due to low load factors. This means that efficiency from an environmental point of view is also relatively low. This has serious consequences since urban areas are particularly sensitive to emissions and noise problems.

The French and Korean reports mention the need for reinforcement of urban structure as an issue.

The main policy objectives in each country are not identical. Although reducing local traffic and emissions are of importance in most countries, there is a difference in emphasis. Belgium and the Czech Republic have quality of life as a policy objective. In addition to emissions, noise, smell, traffic safety, physical hindrance and transport of hazardous goods are all important issues for improving the quality of life in urban areas. Reducing freight traffic, as mentioned by France, is a more focussed, clear policy target.

Improving accessibility is often mentioned as a typical economic and social motivation. Germany, Japan, Korea and the United States have included increased efficiency as a policy objective.

Sustainable transport, mentioned by Belgium, the Netherlands, Sweden and the United Kingdom, combines economic, social and environmental objectives.

Licensing, regulations and freight routes

Time windows and weight restrictions seem to be popular measures, implemented mainly in European countries but also in Korea. New types of restrictions such as eco-zoning are also emerging. With eco-zoning, only low-emission vehicles can enter a specific zone. Eco-zoning is applied, for example, in Amsterdam (the Netherlands), Nuremburg (Germany) and Zermatt (Switzerland). The temporary measure of alternating entry based on odd and even number plates in French cities on very high pollution days can be regarded as an interim form of eco-zoning. Since this measure has been introduced, it has only been applied once (1 October 1997) in Paris and 22 surrounding towns.

Many cities have restricted routes for transport of hazardous goods. Some cities have special routes for freight traffic. Freight routes for deliveries within urban areas have been experimented, but the reason for such routes has mainly been to divert freight traffic from other routes rather than to improve the quality of the freight network. However, in some cities, special truck routes and route guidance systems are under discussion.

In Australia, each level of government (federal, state, regional and local) can to a large degree regulate the weights and dimensions of the truck configurations that can travel on the roads for which that level of government is responsible. Restrictive time window hours are rare in Australia, but are more often seen on local government roads, and very occasionally on state urban arterial roads.

In Belgium, a measure to ban heavy goods vehicles traffic from the city centre and certain other parts of the city is being studied in Brussels. The measure being considered is to ban vehicles of more than 19 tonnes from the historical centre and residential areas except for destination traffic with a permit. Under this measure, freight carried by vehicles of over 19 tonnes will pass through a city distribution centre where it will be transferred to small delivery vans. In some city centres, goods deliveries are authorised only for a few hours during the morning, before the usual shopping hours. Only two cities (Antwerp and Brussels) have banned trucks from some of their urban roads. Antwerp applies delivery time windows in the city centre. Also, trucks over 7.5 tonnes may not enter the historical centre.

In the Czech Republic, local authorities are allowed to establish conditions for vehicle access to the city centre, both by regulating access of freight vehicles and by establishing access fees. The main aim of these measures is to protect the city centre from heavy traffic and regulate the movement of freight vehicles in city centres during peak hours.

For example, in the capital, Prague, there are two zones with restricted access – inner centre and centre:

- Inner centre: access restriction for vehicles with total weight over 3.5 tonnes in effect Monday to Friday (08:00-18:00), except for vehicles with permits issued by the city council.
- Centre: access restriction for vehicles with total weight over 6 tonnes in effect daily, except for vehicles with permits issued by the city council.

Other cities (with populations between approximately 20 000 and 400 000) have also established permit schemes for access to the city centre. The permit is usually required for all types of vehicles, not only freight vehicles.

In Denmark, new legislation allows municipalities to suspend general traffic rules in specific areas and for a limited time period with reference to environmental objectives ("environmental zones"). For example, the municipality of Aarhus plans to implement a trial environmental zone scheme for pedestrian streets, banning delivery by vehicles that weigh over 6 tonnes. In addition, requirements for engine technology and capacity utilisation will be introduced. In Copenhagen, a compulsory certification scheme has been introduced in the medieval city centre with capacity utilisation and engine technology requirements. This will initially run for two years from 1 February 2002. In Aalborg, from 1 May 2002, a voluntary transportation co-ordination initiative has been in place in association with the municipality of Aalborg together with four of the largest transport companies, the City Commercial Council and the police. In the first phase, the trial includes a number of initiatives, which include transport coordination and modifications in physical transport conditions. Later, the possibility of establishing a distribution system will be formulated, whereby smaller transporters could deliver their parcels for collective distribution in the city.

In France, all local authorities may restrict access and all those with a population of over 30 000 have done so. Paris introduced an access regime in 1991. Vehicles occupying less than $16m^2$ are authorised to deliver goods at all times (except on red roads and bus lanes between 07:30-09:30 and 16:30-19:30). Larger vehicles (occupying between 16-$24m^2$) are authorised to deliver goods at all times except between 16:30-19:30 (and except on red roads and bus lanes between 07:30-09:30). Vehicles occupying more than $24m^2$ are authorised to deliver goods between 19:30-07:30. A proposal is being made to dedicate special lanes or lanes only shared with public transport to freight transport on certain routes in Paris.

In Germany, the increase of environmental legislation has made special legislation for city planning necessary (*e.g.* guarantee of a certain number of parking places). There have been trials in several cities (Lübeck, Aachen) to close the city centre to particular types of vehicles, but they were unsuccessful for legal reasons. Environmental legislation allows cities to ban or reduce traffic due to particular emissions (air pollution). One example of an overall approach to reducing emissions by use of a general framework is the *Luftreinhalteplan Stuttgart* (Stuttgart clean air plan). When emissions exceed a certain level, various measures are taken depending on the circumstances. Such measures include temporary traffic signs, reduced speed limits and rerouting of trucks. Further measures, such as closing particular routes to traffic and limiting city access for trucks between 10:00 and 16:00 are being considered but have not yet received political agreement. In the cities of Bremen, Cottbus, Düsseldorf and Dortmund, special routes for freight traffic have been introduced.

In Italy, in order to reduce traffic within certain areas, cities such as Rome have implemented limited traffic zones. In Rome, an access control system is in operation since October 2001. A proposal for further access control which includes road pricing for freight traffic is being developed.

In Japan, weight is generally restricted to 20 tonnes or less for any vehicle, while approximately 47 000 kilometres of highway network including motorways and non-motorways are designated by road administrators for vehicles of over 20 tonnes and under 25 tonnes GVW. The network will be extended in accordance with road improvements such as reinforcement of bridges. For the vehicles exceeding maximum weight and dimension limits, it is necessary to obtain permission to travel from the road administrator. A new system for permission applications on the Internet is in preparation. Vehicles will be approved through a computerized process.

In the Ward area of Tokyo, in order to protect the environment for the residents, large vehicles of over eight tonnes GVW are restricted between Saturday 22:00 and Sunday 07:00 in the areas within Ring Road 7, which is located approximately 10 kilometres away from the centre of Tokyo. On Ring Road 7 in Tokyo, large vehicles are obliged to travel on the lane closest to the centre lane in order to

reduce the noise level in the nearby areas. In addition, livelihood zone, community and school zone regulations are being implemented. These regulations restrict the access of large freight vehicles of over three tonnes loading weight that do not have travel destinations within the zone. In certain sections in central commercial districts in Tokyo, in order to prevent traffic congestion heavy trucks are prohibited from entering and driving in sections surrounded by arterial roads. Truck operators must obtain permission to make deliveries within these sectors.

Also, when purchasing a vehicle in Japan, buyers must provide proof that they have a parking space within two kilometres of their home.

In Korea, access to certain areas of Seoul is restricted to trucks of over 3.5 tonnes during peak hours (07:00-10:00, 17:00-21:00). Access for trucks carrying dangerous goods is restricted 24 hours a day in these areas.

In Spain, the city of Barcelona has implemented an access and parking control system. An access control zone has been created in the historic centre where only vehicles holding a special smart card have access. Delivery vehicles are banned during certain time windows. This system now has digital video enforcement. Public acceptance of such zones has been high, and plans to extend this zone control are being discussed.

The use of certain lanes is allocated to different users on a 24-hour basis – deliveries between 07:00 and 17:00, general traffic between 17:00 and 22:00, and residents' parking at night.

In Sweden, the cities of Stockholm, Gothenburg, Malmö and Lund have implemented environmental zones. The same rules are applied in all cities and are relevant only for freight vehicles. The main rule is that all vehicles weighing over 3.5 tonnes (total weight), registered for the first time over eight years ago are forbidden from entering the environmental zone. Municipal councils have the right to control the age of the vehicles entering the zone, and to this end vehicles must display approval stickers on their windscreen. In addition to environmental zones, each city has local access regulations restricting time of entry and size of vehicles that can access certain areas. The environmental zone in Stockholm has, according to the latest results, led to reductions of approximately 10% in NO_x and approximately 40% in particles of freight vehicle emissions.

In the Netherlands, access restriction times for trucks are implemented in many cities and are often accompanied by technical measures. Many different vehicle restrictions and time windows are used. In order to harmonise local regulations, the National Platform for Urban Distribution proposed a standardised vehicle access matrix, which has been approved by all parties in the logistic chain. Some experiments with permits have been conducted. Special lanes dedicated to trucks or shared only with public transport have been implemented in the city of Groningen and Amsterdam.

In the United Kingdom, freight traffic in urban areas is regulated in many different ways, including:

- Pedestrianisation schemes with access time restrictions.
- Loading time restrictions.
- Planning restrictions (conditions in planning permissions) or noise abatement orders restricting delivery times.
- Vehicle size and weight restrictions.

In London, the London Lorry Control Scheme came into force in 1985. This is a London-wide night and weekend ban on lorries over 18 tonnes GVW. The ban includes all roads in London except trunk roads and several other exempt roads. Any goods vehicle over 18 tonnes GVW that wishes to use a road that is part of the London Lorry Control Scheme during the controlled hours must be covered by an exemption permit. These permits are available to vehicles that can demonstrate a need to use restricted streets at controlled times.

A congestion charging scheme has been introduced in London from February 2003. Also, the feasibility of introducing low emission zones in London is being investigated.

In the United States, truck routes have been quite common in small and mid-size cities for many years. Their primary purpose is to provide bypasses to route through commercial traffic around downtown areas, and away from shopping and residential areas. The Georgia Department of Transport has just completed a seminal study of truck flows on the freeways of Atlanta in an effort to identify a wide range of strategies to lessen congestion caused by truck traffic and to improve freight flow through the region.

There is a growing awareness in US cities of the need to pay more attention to the impacts of freight traffic, whether local or through. For example, the Freight, Goods and Services Plan prepared by the Orlando (Florida) Metropolitan Planning Organization discusses a variety of issues that impact future planning, including vitality and quality of life aspects, and urban shape and growth management. A few other cities, notably Baltimore, Chicago and Portland (Oregon), have also begun to explore this issue.

Freight centres and consolidated delivery supported by local policy

The concept of freight centres differs among countries. Freight centres are essential for consolidation and some countries have experienced consolidated delivery from these freight centres. In the Netherlands, public or public-private owned consolidation terminals (urban distribution centres) with specific exemptions from city access restrictions have been promoted. Other countries have focused on area-type freight centres, such as freight villages.

In Australia, there is no regulation on any aspect of consolidation, only regulatory restrictions on loading with regards weights and cargo compatibility. However, transport depots and distribution centres are often zoned into industrial or retail areas. This zoning usually happens with the approval of local government or sometimes, but less frequently, state planning authorities.

In Belgium, a goods distribution centre (GDC) combined with a ban on heavy goods vehicles is being studied in Brussels.

Denmark mainly carried out theoretical analyses and research projects on freight centres and consolidated delivery during the 1990s. In 1995 a working group was established to apply a solution model to a specific project in Copenhagen, which turned out to be the first implemented city logistic arrangement in Denmark. In the late 1990s a number of projects were also carried out in other Danish cities.

Exploration of other concrete solutions and testing of alternative models in smaller city areas led three Danish municipalities – Aalborg, Aarhus and Copenhagen – to co-ordinate efforts for the development of effective and environmentally friendly goods transport in city areas through the Forum for City Logistics. The three cities have embarked on trial development projects to test various models and parameters of city logistics.

France has a long tradition of developing freight centres, such as Garonor and Rungis in the Paris region. These areas have been built up by private developers. In 1993, there were about 150 freight centres in France. However, few practical experiments on consolidated delivery have taken place in France, but a public terminal for urban freight transport is operational in Monaco. It consists of a dispatching platform for delivering goods, in order to prevent trucks larger than 8.5 tonnes from entering the inner city. Other experiments include projects in the Lille-Douai-Arras area and in Castelnau d'Estrétefonds (near Toulouse), and a feasibility study of a public terminal using electric vehicles in La Rochelle. The public terminal has been in operation since the beginning of 2001.

The French experiences in public terminals have shown that terminals used only for consolidated deliveries are not viable and therefore need permanent financial assistance from municipalities. On the other hand, politicians prefer to give financial assistance for two or three years in order to experiment or initiate a terminal, but are generally not keen on long-term financial assistance. The most viable solutions seem to be to mix consolidated deliveries with other activities – a fifty-fifty mix seems to work best. Other activities may include business to business transport within the urban centre, business to consumer transport (for downtown retailers), transport for temporary storage, transport for order preparation, transport to showrooms and transport of clean waste. The main difficulty, as confirmed by the public terminal experience in La Rochelle, is to find private companies which could mix consolidated deliveries with other activities. Several companies specialising in urban transport activities are interested in this new concept. It is hoped that new responses to calls for tender will be made by such companies in La Rochelle by the end of 2003.

In Germany, freight centres referred to as GVZs *(Güterverkehrszentrums)* aim mainly at promoting intermodal transport. The introduction of GVZs is an initiative by the national government, which mainly focuses on the optimal use of rail infrastructure for goods transport. GVZ master plans have been developed since the beginning of the 1990s, with an objective to create 30 GVZ locations in order to shift freight from roads to rail and sea. Besides the GVZ Bremen, GVZs have been implemented at Augsburg, Dörpen, Dortmund, Hannover, Leipzig, Munich, Nuremburg, Rostock and Trier.

Consolidated delivery (*City-Logistik* in German) refers to a joint service by different transport companies for delivering goods to urban areas. The Bremen City logistics Company set up such a service in June of 1994. Other *City-Logistik* projects have taken place in areas such as Hannover, Nuremburg and Stuttgart. Attempts to implement such a concept were initiated without success in many other cities. Although the presence of a GVZ is not a precondition for *City-Logistik*, both concepts benefit from this combination. Although these projects initially seemed promising, nearly all of the projects have now ended. In the period 1995-1999, transport companies withdrew their participation in *City-Logistik* projects, mainly for commercial reasons, but also because of lack of public policy support.

In Italy, freight centres are known as *Interporti*. They have intermodal facilities that can offer a range of combined services. Pilot projects on consolidated delivery within urban areas have been conducted, for example in Sienna.

In Japan, about 280 freight centres were developed in the 1960s and 1970s. About 230 of those were projects that grouped small and medium-sized wholesalers. Twenty-five freight centres called common truck terminals were built in order to increase the efficiency of truck transport. The freight centres that are expected to solve urban problems are called distribution business areas. There are 22 distribution business areas in Tokyo and 14 in other cities. In order to contribute to the maintenance and promotion of city functions, the development of urban distribution centres has been promoted based on the law concerning the improvement of urban distribution centres.

Co-operative delivery systems have been much promoted in Japan. An example is the city logistics system in Fukuoka City implemented in 1978. Through a partnership including national and local governments, transport operators, retailers and building owners, a pilot co-operative delivery system using low-emission vehicles was conducted in 2001 in the Marunouchi area of central Tokyo.

In Korea, the national policy is to construct freight distribution facilities in major cities to formulate a nationwide "hub and spoke" freight transportation network. About 40 such facilities are to be constructed by 2011. It is expected that the construction and operation of these facilities will effectively reduce the current high costs of logistics activities by making the movement of goods more systematic, alleviate traffic congestion by making more efficient the use of trucks in urban areas, and promote more efficient land use for logistics activities.

In 1998, Seoul Metropolitan City performed a large-scale research project to collect urban freight movement data and develop a comprehensive improvement plan for urban goods transport. Based on this research project, Seoul established a mid-term urban goods transport plan in 1999 which includes the construction of new freight distribution facilities, the improvement of truck operations, and the establishment of a data base for urban goods movements. Seoul plans to construct seven new freight distribution centres, and has also designated four districts with high truck vehicle traffic as "freight districts" and planned to implement intensive measures to improve truck operations. Examples of policy measures include the introduction of the "truck time plan" which allows dual usage of parking spaces by trucks and passenger cars during different time periods, and the provision of on-road and off-road loading facilities for trucks.

In the Netherlands, attempts were made between 1993-2000 to start up urban distribution centres (UDCs) in cities such as Maastricht, Leiden (which made use of special electric vehicles), Groningen, Amsterdam, Utrecht and Arnhem. These experiences proved that UDCs for cities with fewer than 200 000 inhabitants and run by a public-private partnership on a less than fully commercial basis are commercially unsuccessful and not very effective in solving problems. The UDCs often faced problems due to their locations and did not receive support from the commercial transport companies. UDC concepts that are likely to stay relate to commercially and privately owned DCs of nationwide operating transporters. These transporters can be qualified and earmarked as local urban distributors when they run dedicated services with full truckloads, possibly with environmental friendly equipment. As a reward municipalities can grant these transporters special entry admissions for inner city delivery.

In the United Kingdom, UDCs were proposed in the 1970s. However, it was considered that physical transhipment would be costly and smaller lorries would not necessarily be better if there were more of them on the roads. Consolidation takes place by private transport companies on an individual basis.

Low-emission vehicles and alternative fuels

Regulations such as the European vehicle emission standards are a strong driving force for innovation. The EU's "Euro-4" and "Euro-5" standards are driving innovation in emissions control for diesel engines. New trucks will need to meet the Euro-4 and Euro-5 standards in 2005 and 2008 respectively. The implementation of the Euro-4 standard for trucks in 2005 will have a considerable impact on emissions.

The use of electric vehicles has been assessed in the EU's ELCIDIS (Electric Vehicle City Distribution) project that is based on practical demonstrations in six European cities (Rotterdam, Stockholm, Erlangen, Stavanger, La Rochelle and the Lombardia region). The project succeeded in

verifying the principal merits of using (hybrid) electric vehicles in urban delivery concepts. The implementation of environmental zones, as can be seen in Denmark and Sweden could be an incentive to use low-emission vehicles.

France also participated in the ELCIDIS project. Experiments with electric trucks have been conducted in La Rochelle since the beginning of 2001.

In Germany, experiments with electric and CNG trucks are being carried out. In order to promote low-emission vehicles, traffic restrictions on certain road sections do not apply to environmentally friendly trucks.

In Japan, when individuals or companies purchase or rent low-emission vehicles, *e.g.* electric, fuelled by natural gas or methanol, hybrid vehicles and automobiles with conventional low-emission engines, they are eligible for various subsidies and tax breaks for automobile acquisition tax, etc. In June 2001, the NO_x and PM Law for motor vehicles was enacted. The objective of the law is to determine the areas heavily affected by air pollution including the Tokyo, Nagoya and Osaka metropolitan areas, and also to regulate the use of the vehicles which do not meet certain gas (NO_x, PM) emission standards in these areas. In addition to the NO_x and PM law, from October 2003, the Tokyo metropolitan government will prohibit diesel-powered vehicles that do not meet the particulate emission standard defined by the ordinance from travelling in the Tokyo metropolitan area. By the end of the 2005 fiscal year, the Tokyo municipal government will oblige business owners with over 200 vehicles to introduce 5% or more ultra low-emission vehicles in total. In response to this obligation, subsidiary measures aiming at lowering emission levels of vehicles have already been launched. Apart from the Tokyo municipal government, other prefectures in the Tokyo metropolitan area (Kanagawa, Saitama and Chiba) will adopt a similar approach. Furthermore, other metropolitan areas including Osaka and Nagoya are giving consideration to whether to introduce such measures to promote the use of low-emission vehicles.

In Sweden, the use of low-emission vehicles is also promoted by national R&D programmes encompassing such vehicles and alternative fuels as well as by the introduction of environmental zones.

In 1999 the Dutch government proposed an environmental target of between 30 and 60% of vehicles within inner cities to use liquid propane gas (LPG) or liquid natural gas (LNG) as fuel by the year 2010. Based on the results of some experiments with LPG trucks, the government decided to no longer promote LPG trucks in urban areas due to the high costs of engines, problems concerning the safety of LPG and the non-availability of standardised LPG trucks on the European market. An urban distribution centre in the city of Leiden used electric vehicles.

In the United Kingdom, experiments with low-emission vehicles are taking place. The use of low-emission vehicles is also promoted by tax incentives and special grants.

Consultation

Most countries have established programmes for discussing problems and measures concerning urban goods transport among governments and the private sector, albeit with some significant differences. The purpose of these consultation programmes is to develop more effective policies which receive support and co-operation from the private sector. Consultation programmes can be organised at a local or regional level or at the national/federal level.

In countries such as Belgium, the Czech Republic, Germany and the United States, consultation takes place at the local level. For example, Germany has no national consultation programme for urban goods distribution, but in several cities, such as Hannover and Düsseldorf, local consultation platforms *(Güterverkehrsrunde)* are active. In these platforms, problems of freight traffic are discussed between the local authority and the private sector, and measures for regulating road haulage traffic are developed.

In some countries, national governments have installed local and/or national consultation platforms to discuss urban freight issues.

In Australia, the Freight Transport Logistics Industry Action Agenda initiated by the national government attempts to realise a partnership between government and industry. This consultative framework was developed in order to achieve a common goal for efficient and sustainable growth, through the best strategic investment options for both national transport and logistic infrastructures. Following the release of this recent Industry Action Agenda initiative, the Australian Logistics Council was instigated by the federal (national) government. This council has representation from all transport industry modes, senior regulators, academic educators and ICT experts and important representative industry associations.

Transport consultation in Australia usually occurs at the federal and state government levels. Currently, the National Road Transport Commission (NRTC) has three legislated consultative forums. These involve consultation with the road freight industry participants: the Industry Advisory Group (IAG), the Bus Industry Advisory Group (BIAG) and the road transport authority chief executives (TACE). In each Australian state, the state transport ministers have a freight industry advisory body which interacts formally with the road freight industry. The National Transport Secretariat (NTS), which examines the somewhat strategic nature of Australian freight planning, has proven also to be a highly interactive and consultative coordinator for strategic input to state and federal transport ministers.

In Denmark, consultation mainly takes place at a local level, but a national "Forum for City Logistics" (see earlier section on freight centres and consolidated delivery supported by local policy) has also been established with the participation of three municipalities and the Ministry of Transport.

In France, GART *(Groupement des autoritiés responsables de transport)*, a network of 150 French cities and metropolitan authorities (not including Paris), operates as a national consultation programme for local public authorities in the area of urban goods distribution. GART promotes a national consultation programme where public and private representatives meet as well as local consultation programmes. Such programmes are necessary because of the absence of regulatory harmonisation. For example, regulations in municipalities in the Paris region use at least 30 different definitions of a truck.

In Japan, a national committee sponsored by the ministries and agencies relating to logistics, has been established as a consultation programme. On the regional level, promotion of logistics measures appropriate for each region has been based on regional conferences. Through such regional conferences, which are established in ten regional blocks across the country and consist of local branches of the national government, local governments and private sectors, views of the private sector are also taken into account in promoting measures.

In the Netherlands, the national Forum for Urban Distribution *(Platform Stedelijke Distributie)* has been in place since April 1995. This forum was initiated by the Ministry of Transport, Public Works and Water Management and functions as a public-private partnership. All interest groups, such

as shippers, wholesale companies, retail organisations, transport companies and local and provincial governments are represented. The role of the platform is to harmonise municipal legislation, to initiate, guide and stimulate new projects and policy objectives, and to publish the results. Various products have been developed by the forum, and are promoted and implemented in the major towns by four regional task forces.

In the United Kingdom, the Freight Transport Association (FTA) launched an initiative in 1996 working with distribution companies and local authorities in four urban areas: Aberdeen, Birmingham, Chester and Southampton. This initiative was an important stage in the development of what are now called freight quality partnerships (FQPs). In a FQP, local governments and representatives of local and environmental interest groups are brought together as a local consultation platform to discuss urban freight transport issues.

Conclusions

As can be learned from this overview and the member country reports in Annex 2, most countries are still focusing more on investigating urban freight transport than promoting and implementing national/state policies. Early experiences may have made them cautious. Most countries have no long-term public policy in place; rather, their policy can best be described as "learning by doing'. The United Kingdom and the Netherlands have emerging long-term policies, having national government initiatives for urban freight transport policies and strongly promoting public-private partnerships in order to achieve their objectives. Japan has also been in an implementation phase since the authorisation of the 'Comprehensive Programme of Logistics Policies' in 1997. Also, in most countries, the private sector has shown that it takes an interest in public policies via participation in platforms and pilot projects.

Table 3.1 summarises the main findings from the country reports on differences in policies relating to urban goods transport.

Table 3.1. **Differences in policies between selected countries**

	Australia	Belgium	Czech Republic	Denmark	France
Two main policy objectives	• Provision of good level of service for users • Enhance urban liveability	• Sustainable transport system • Improving the urban life quality	• Reducing of local emissions • Improving the life quality	• Improving local environment (air, aesthetics) • Accessibility and improving working conditions	• Reduction of freight traffic and shopping trips • Reduction of local emissions
Underlying problems	• Passenger and freight growth are high • Congestion is becoming a concern in the two biggest cities	• Congestion • Environmental problems	• Congestion • Accessibility problems	• Accessibility problems • Visual environment • Air pollution	• Need for urban structure reinforcement • Lack of enforcement of regulations • Congestion • Environmental problems
Licensing and regulations	• Street access is more often restricted by Vehicle GVM • Night curfews for trucks now exist on certain major roads in cities	• Time windows for deliveries, weight or access restrictions	• Access restrictions – permits • Implementation of weight restrictions	• Implementation of trial environmental zones	• Implementation of time windows, weight and volume restrictions • Experimenting with temporary closing when pollution limits are exceeded
Freight centres	• An open market applies in locating independently owned distribution centres. • Local government zoning of these locations may apply	• Freight villages, outside urban areas • Urban distribution centre being studied in Brussels	• Not applied, some examples at company level.	• Freight villages/freight centres outside urban areas	• Implementation of freight villages
Freight routes	• Local and state legislatures plan and regulate the length and maximum mass of vehicles to gazetted routes	• Being studied in Brussels	• No special routes.	• No special routes.	• No special routes
Consolidated delivery supported by local policy	• Minimalist experience only, although this is expected to grow slowly	• No experience	• No experience	• The Copenhagen Scheme. • Voluntary co-operation between the Municipality of Aalborg and four major distributors	• No city logistics experience
Low-emission vehicles	• Introduction for Euro-3 and Euro-4 standards are in place. Some assistance for gas conversion to LPG or CNG		• No promotion	• A large-scale in-use test of particulate traps is carried out in the city of Odense for a period of two years.	• Experiments with electric trucks
Consultation	• Federal and state-level consultation is extensive, but less so at the local government level	• Local consultation	• Local consultation programme	• National and local consultation “Forum for City Logistics” (three municipalities and Ministry of Transport)	• National and regional consultation programmes
Policy level	• Three-tiered: federal, state and local	• Local and regional	• Local	• Local	• National

Table 3.1. **Differences in policies between selected countries** *(continued)*

	Germany	Japan	Korea	Netherlands	Spain
Two main policy objectives	• Efficiency improvement • Reduction of hindrance	• Efficiency improvement • Decrease in environmental burden	• Improving efficiency of logistics	• Sustainable distribution • Accessibility improvement	
Underlying problems	• Transport inefficiency • Heavy duty trucks in urban areas	• Congestion • Environmental problems	• Congestion • Need for reinforcement of urban structure	• Environmental problems • Accessibility problems	
Licensing and regulations	• Implementation of time windows and weight restrictions • Experiments with low-emission zones	• Implementation of weight and size restrictions • Obligation to verify a parking space • Restriction of travelling in designated areas	• Implementation of time windows, weight and size restrictions	• Implementation of time windows, weight and size restrictions • Experiments with permits (green sticker)	• Time windows and access control by smart card in Barcelona
Freight centres	• Implementation of (multi-modal) freight centres (GVZ)	• Implementation of different types of freight centres	• Implementation of freight centres	• Experiments with consolidation terminals	• Public multi-modal freight centres
Freight routes	• Experiments with freight routes • Intercity freight trains	• Route designation for heavy vehicles	• No special routes	• Attempt to use bus routes • Experiments with freight routes near industrial areas	
Consolidated delivery supported by local policy	• Implementation of co-operation in city logistics, but ending	• A few cases of experiments • Governmental promotion	• Surveys and city logistics plans • A few cases of experiments	• Attempt, but failed • No experiments	
Low-emission vehicles	• Experiments with electric and CNG-trucks	• Subsidising of low-emission vehicles	• No experience	• Experiments with electric/ hybrid and LNG-trucks	
Consultation	• Local consultation programmes	• National and regional consultation programmes	• National and local consultation programmes	• National consultation programme	
Policy level	• Local	• National	• National and local	• National	• Local

Table 3.1. **Differences in policies between selected countries** *(continued)*

	Sweden	United Kingdom	United States
Two main policy objectives	• Safety • Sustainable transport	• Integrated transport • Sustainable transport	• Inclusion within metropolitan planning process • Improve efficiency
Underlying problems	• Air quality in urban areas • Road wear • Congestion in large cities	• Congestion • Air quality in urban areas	• Not perceived as a major problem • Freight community reluctant to participate
Licensing and regulations	• Environmental zones • Use of stickers • Time windows • Other local regulations	• Pedestrianisation schemes with access time restrictions • Loading time restrictions • Planning conditions and noise abatement orders restricting delivery times. • Vehicle size and weight restrictions • Low-emission zone feasibility studies • Congestion charging studies	• Some size and weight restrictions
Freight centres	• Private multimodal freight centres	• Private and public/private multi-modal freight centres	• None
Freight routes	• Weight restrictions on part of the road network •	• Freight routes in some urban areas • 7.5 tonne weight restrictions in some urban areas • London lorry ban	• Regulated “hazmat” restricted routes and preferred routes • Local truck routes
Consolidated delivery supported by local policy	• Beginning to be recognised	• Freight quality partnerships	• Beginning to be recognised
Low-emission vehicles	• Tax incentives and subsidies • Demo projects and research	• Experiments • Tax incentives • Grants	• No requirements yet
Consultation	• National	• Local and national consultation	• Local only
Policy level	• Local	• National and local	• Local

Source: OECD Working Group on Urban Freight Logistics; van Binsbergen and Visser (2001).

Lessons learned

From the experiences on urban freight logistic issues in various member countries, the following lessons can be learned:

1. Different situations, common challenges

Despite the fact that cities vary in size, population and in other ways, there are some common challenges. The significant contribution of freight transport to total traffic and moreover the contribution of freight transport to problems of accessibility, congestion, environment and safety is leading to growing awareness of the importance of urban goods transport policies. However, most cities are not adequately equipped as yet to analyse and prepare for these challenges.

With the expected growth in freight transport, most cities are increasingly concerned about deteriorating accessibility, environment and safety. On the other hand, cities are aware that despite the problems caused by urban goods tranport, delivering goods to the city (both to commercial premises and to private dwellings) is essential for maintaining their economic and social functions. Therefore, cities are confronted with the common and difficult challenges of maintaining their sustainability and liveability while ensuring a goods transport system that sufficiently serves their needs.

2. The extent of national government involvement in urban goods transport varies

In many countries, problems of urban goods transport are dealt with at a local or regional level. Only a few countries have developed an explicit encompassing national policy focused on urban goods transport. The private sector requires consistent and fair approaches in policy measures to be applied throughout their supply chain. Such approaches appear to be difficult where there are no national initiatives or guidelines to ensure consistency among local or regional measures.

3. Lack of awareness and knowledge is a serious obstacle

Urban goods transport tends to often be seen as a cause of problems in cities, and the awareness of its importance seems to be low, not only among the general public but also among governments and city planners.

There are very few freight transport specialists. For example, although the municipality of Paris has 200 specialists dealing with passenger transport and traffic planning, the first specialist in urban freight was appointed to the office in March 2002. In most cities, city planning and traffic surveys are based solely on passenger transport. This lack of awareness and knowledge has often led to transport policies being planned mainly from the passenger transport perspective, without adequate consideration of the needs of freight transport. There does not appear to be a systematic basis for assessing the relative value of alternative passenger and freight transport uses. Another consequence of the lack of awareness and knowledge is that facilities in many cities are being ill-designed for freight transport, *e.g.* poor access, sizes of parking places being too small for freight vehicles, insufficient number of freight elevators in buildings.

4. Lack of before-and-after evaluation and data

Few countries use analytical tools for evaluating the effectiveness of their policy measures concerning urban goods transport, both ex-ante and ex-post. Also most cities have little data on urban goods transport which could be used for such evaluations. Data are rarely collected, and tend to be

inconsistent when they are collected. Among the countries participating in the Working Group, very few countries had data on urban goods transport (see Annex 5).

As a result, measures for urban goods transport have caused unexpected side effects. For example, vehicle size restrictions have led to unintended increases in vehicles per vehicle kilometre and costs.

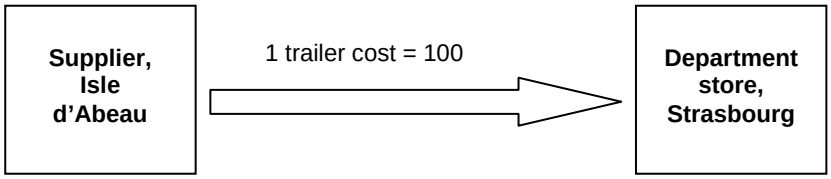
Box 3.1.

Access restrictions for heavy goods vehicles (two axles) over 19 tonnes in Strasbourg « Grande Ile » since 11 January 1999 resulted in a cost increase of 34% for a supplier.[25]

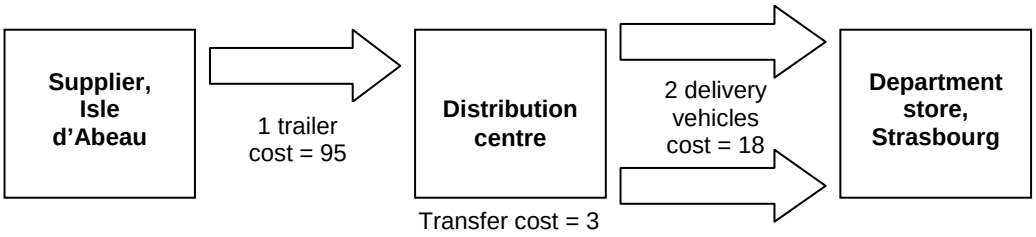
Before implementation of restrictions: cost of direct delivery of goods by a trailer from the supplier in Isle d'Abeau to a retail shop in Strasbourg = 100.

After implementation: the supplier re-organised its goods transport. Goods need to be transferred to delivery vehicles in a distribution centre. Two delivery vehicles are needed in order to deliver the goods during shop-opening hours. Therefore, the cost is now 95 (transport to delivery to distribution centre by trailer) + 3 (transfer cost) + 2 x 18 (delivery vehicle cost) = 134. Also, the transfer of goods infers additional time costs and risks of damage or theft.

Before implementation



After implementation



Access restrictions for heavy goods vehicles over 20m² during afternoons in Nice resulted in a cost increase of 60% and increased traffic and emissions.

Deliveries to a retail shop in Nice by one large HGV with the cost of 100 had to be reorganised into deliveries with two smaller vehicles, each with a cost of 80, resulting in the total cost being 160 and more vehicle kilometres and emissions.

[25] Source: Interface Transport, France.

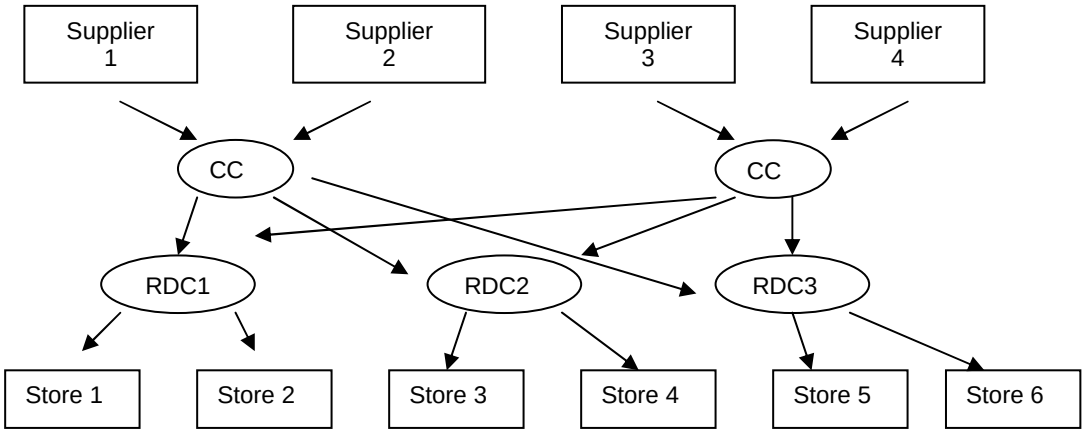
5. Policy measures tend to lack long-term and supply-chain perspectives

The policies currently in place focus quite strongly on short-term problems and solutions. Little or no attention seems to have been paid to long-term problems. Current policies seem to deal only with current conditions, and the expected effects of proposed measures on future situations are often missing. Few attempts seem to have been made to provide forecasts for future developments or to develop long-term policy options.

Also, with respect to urban goods transport, little attention is paid to the supply chain as a whole which extend beyond urban areas. In spite of the fact that in many cases, goods often come from other regions or countries and therefore urban goods transport is more and more integrated with long distance exchange of goods outside urban areas, current measures often only take account of the urban area itself.

Box 3.2. **Examples of urban goods transport being integrated with long distance supply chains: Effects of delivery curfews to the supply chains of Safeway, United Kingdom**[26]

Safeway, one of the top four grocery retailers in the United Kingdom, has organised a 24-hour supply chain which minimises stockholding and maximises the flow through of goods, especially in the chill sector. In this chain, local suppliers deliver their less than full vehicle loads destined for individual regional distribution centres (RDCs) into their nearest regional consolidation centre (CC), normally managed by third parties. Here, they are broken down and consolidated with other suppliers' products into full loads for each RDC. An average Safeway store receives 28-36 deliveries per week. The activities in the CCs, the primary transport routes, the RDCs and the store delivery routes are all highly synchronised on a 24-hour basis.



42% of Safeway's stores are subject to delivery curfews which severely curtail the 24-hour activity. The impact of daily curfews has severe effects both upstream and downstream from the delivery. Stores cannot receive goods in a pattern which enables them to get the goods out on to the shelves through the night. Upstream in the supply chain, the result is congestion in the RDCs and more vehicles being forced on road during morning and evening rush hours. This results in increased costs, congestion and emissions.

[26] Jackson and Timpson (2001).

6. Regulations tend to be unharmonised, unstable and often lack enforcement

Local regulations tend to differ among different municipalities and are seldom co-ordinated at the national level. For example, cities have different access regulations in regard to vehicle weight or size restrictions and time windows. As mentioned earlier, regulations in the Paris region use more than 30 different definitions of a truck.

This causes problems for shippers and transport companies which operate not only on a local level, but on a wider geographical area. Drivers are often not aware of the different restrictions or changes in restrictions, which adds to the difficulty of enforcing such regulations.

Lack of harmonisation and stability in access regulations also causes problems for the truck and van manufacturing industry which need time and opportunity to develop adequate vehicles that comply with such regulations.

7. Public-private platforms seem to be helpful

Urban freight sytems are complex in nature. They involve many stakeholders and organising such systems depends upon a multiplicity of factors, *e.g.* types of goods concerned, urban infrastructure, city use pattterns, and site locations and structures of retail and manufacturing sectors. Therefore, feasible and practical solutions in urban goods transport require an integration of different interests and points of view from different stakeholders.

Consultation platforms have proved to work well in the Netherlands and the United Kingdom in bringing together various stakeholders for discussing issues, planning practical and cost-effective measures and gaining support for policy measures.

8. Non-market-based urban distribution centres tend to fail

Publicly owned or publicly driven distribution centres tend to be unsuccessful**.** They often face location problems and are not successfully integrated into the private sector's supply chains. Therefore, they do not receive support from the private sector and become commercially unsuccessful. The size of a city may also be an important factor in determining the viability of urban distribution centres.

9. Consolidation seems to be an emerging trend

Consolidation of delivery, especially in city logistics, receives attention in most countries but its implementation is not easy. A few successful cases exist in Germany and Japan. While consolidation is emerging as an important tool for solving problems, it is mainly considered a matter for private actors, and little attention is being paid to accommodating or facilitating this through policy measures.

10. Innovative policies are being attempted

Some countries are attempting to implement innovative policies, such as selective time-sharing and multiple use of infrastructure, introducing environmental zones, and using pricing to divert freight traffic from residential areas.

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Chapter 4

ACTIONS NEEDED: THE WIDER PICTURE

Drawing on experiences in member countries, policy recommendations for dealing with challenges in urban goods transport are proposed in this chapter. Experiences show that single-shot measures, planned and implemented by local governments alone, are generally not sufficient in order to develop a sustainable urban goods transport system. There is a need for a policy framework at the national/state government level, with an overall objective of sustainable urban goods transport. Actual policy measures recommended in this chapter need to be integrated and planned within this policy framework.

An efficient urban transport system is essential for sustainable development in urban areas. The previous chapters show that urban goods transport is now facing many difficult challenges due to:

- Increasing urbanisation.
- Increasing demand for frequent and just-in-time deliveries in urban areas.
- Increasing competition for the use of limited urban infrastructure.
- Increasing complexity of the multidisciplinary problems both encountered and caused by urban goods transport.

On the other hand, the opportunities for dealing with the challenges have increased in recent years. Not only governments, but also the private sector and citizens have become aware of the need for sustainable development and are realising that it is a common responsibility of both public and private actors. Because of the complexity of issues involved in sustainable development objectives, engaging private sector and citizens in the decision-making process and thereby developing accountable partnerships among all stakeholders have become important in the policy-making process.

Chapter 3 showed that various measures for dealing with problems of urban goods transport have been proposed and implemented in many cities, with some successes and many failures. It seems clear that single-shot measures, planned and implemented by local governments alone, are generally not sufficient in developing a sustainable urban goods transport system. Therefore, in this chapter, the actions needed will be put in a wider picture, and consideration will be given to the policy framework necessary for developing such a system as well as recommendations on actual measures.

Policy framework

National/state government initiatives are crucial

Urban goods transport issues tend to be dealt with on a local or regional level in many countries. However, in the case of national government systems, there seems to be a clear need for national government initiatives that provide clear policy objectives and frameworks for dealing with urban goods transport issues for the following reasons. (In the case of federal systems, there would be value in the state/federal government being involved in similar initiatives.)

- Supply chains and logistic operations are now organised on a regional, national or international level. Freight vehicles are operated throughout the country and therefore the interests of shippers and transport operators are more national than local. Local regulations need to be co-ordinated on a national basis in order to be consistent and effective.
- Environmental standards are usually a national government responsibility, due to the need for equitable, wide-scale applications. Therefore, environmental problems caused by urban goods transport need to be dealt with under national government initiatives and guidelines.
- National/state policy objectives can be frustrated by local measures which focus on local optimisation. For example, local access regulations may prove to be counterproductive in reducing vehicle kilometres on a national level. National/state governments need to clearly enunciate their policy objectives and seek local measures that take adequate account of national/state optimum solutions as well as meeting local concerns.
- Of course, lack of national/state government awareness or initiatives could result in national regulations becoming an obstacle for local innovative measures. For example, local governments usually cannot provide exceptions for fuel tax to be used as incentives in their

municipalities, since fuel tax is regulated at a national level and does not allow exceptions. On the other hand, lack of national regulations can also constitute an obstacle for local innovative measures. For example, local innovative programmes using new vehicles are often not possible due to lack of national legislation on such vehicles.

- Best practice needs to be promoted and diffused as widely as possible. National/state governments are in a better position to fund experiments and innovative projects, exchange information with other countries, and diffuse the lessons learned among a wide range of stakeholders. Data necessary for understanding and monitoring developments in urban goods transport are best collected in a standardised manner in order to be comparable and consistent.

Therefore, in order to deal with challenges for urban goods transport in a consistent, stable and effective manner, national/state governments should provide policy objectives and frameworks under which tailor-made local measures can be planned and implemented – act local, think national/global.

The main policy objective should be sustainable urban goods transport

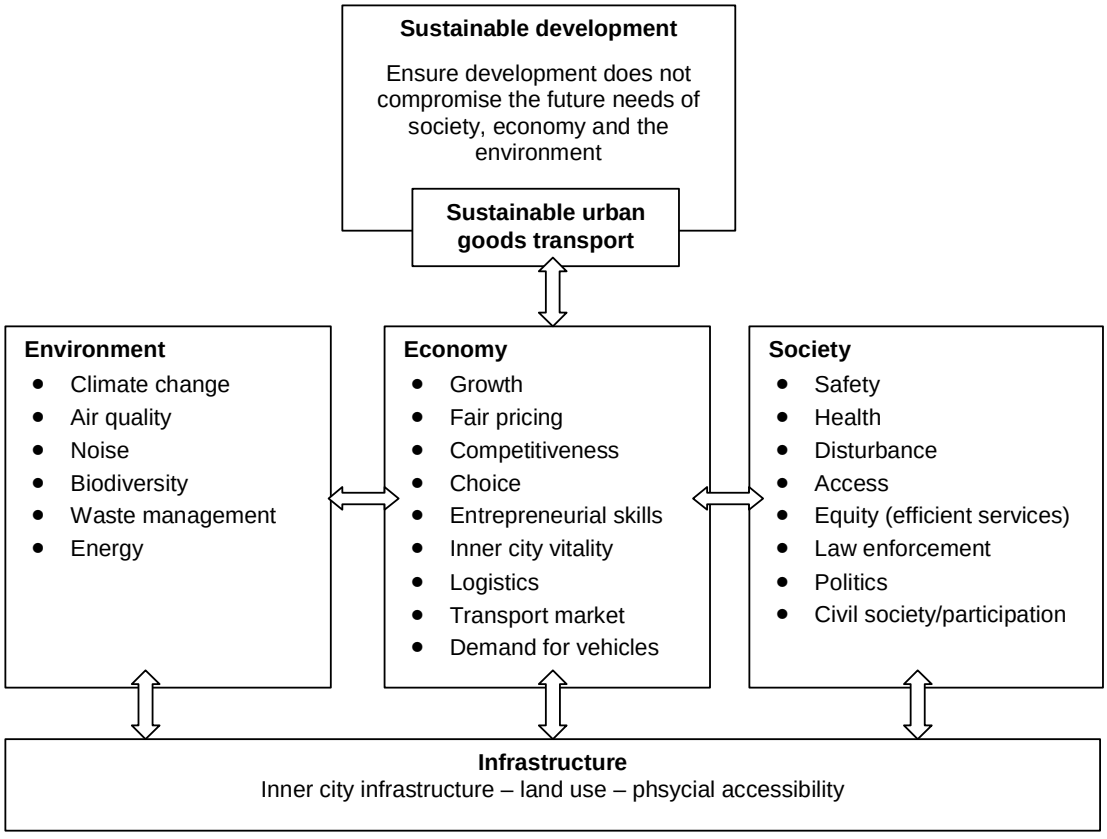
Continuing economic growth while protecting the environment and ensuring a better quality of life for future generations are foremost objectives in OECD member countries. Urban goods transport is an important contributor to these objectives. Although urban goods transport is crucial for supporting economic and social activities in urban areas, it should not be at the expense of the environment and liveability of urban areas experienced by present and future generations.

Therefore, the main national objective should be *sustainable urban goods transport*, which requires the development of an urban goods transport system on a socially, economically and environmentally sound basis. This system should be demand driven, aiming to serve the various needs of urban people, thereby establishing an innovative and effective system, while ensuring efficient use of infrastructure, if possible on a 24-hour basis. Both short and long-term policies should be developed under this objective.

The context for sustainable urban goods transport is shown in Figure 4.1. The concept of sustainability expressly recognises that all the outcomes are interdependent. Failure to address problems of pollution, noise or safety, for example, would eventually threaten economic growth. The United Kingdom has developed the concept of sustainable distribution, and has set out a comprehensive, integrated strategy for the sustainable distribution of goods and services in the United Kingdom.[27] This report aims to promote this concept of sustainable distribution for urban goods transport.

[27] United Kingdom Department of the Environment, Transport and the Regions (1999).

Figure 4.1. **Sustainable urban goods transport context**



Urban goods transport policy requires consultative planning: the importance of public-private partnerships

Urban goods transport involves a wide range of actors, both public and private, who interact interdependently, as well as a great variety of different and interrelated issues. These aspects make urban goods transport a very complex subject for formulating a clear vision and goal-oriented policy. All interests and issues should be considered during the policy process in order to develop a sound and effective policy framework. The planning processes are a key element in policy-making. Three different processes can be identified:

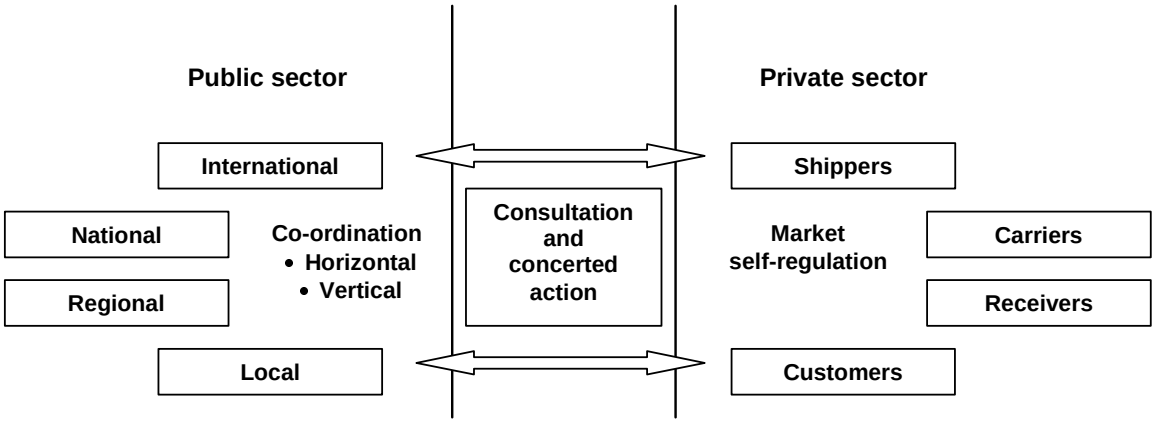
- Traditional planning, in which governments act as doctors: they try to diagnose and solve problems with top-down developed and prescribed measures.
- Progressive planning, in which governments act as educators: providing information to the relevant actors and letting each of the actors solve their own problems.
- Consultative planning, in which governments act as facilitators: they present a window of opportunities and encourage interaction, such as public private partnerships.

Establishing a policy framework for urban goods transport often includes regulation, which tends to lead governments to plan their policy in a traditional style. However, in freight transport, information necessary for policy planning is available mainly in the private sector. Also, with the wide range of stakeholders with different and often conflicting interests, feasible and practical solutions require the integration of different interests and points of view of all stakeholders. Policy solutions need to find the right balance between system efficiency (in terms of both costs and service levels) and sustainability. For example, environmental innovations for cleaner vehicles may be desirable, but operators may require an agreed minimum period of unchanged local and regional regulations such as 6-8 years for an economically viable depreciation period. Another example would be that if the environmental policy is to only allow access to less polluting vehicles such as with Euro-3 or Euro-4-based engines, it may be desirable from a cost perspective to allow a reasonable transition period. Agreement among all stakeholders, especially support from the private sector, is necessary in developing a successful policy vision.

Therefore, consultation can be considered to be a major part of establishing a sound policy framework for urban goods transport.

In the actual consultation process, it is important to involve stakeholders who are responsible for national or international supply chains. Considering the urban goods transport system merely within an urban scale is now insufficient, since urban goods transport has become a final leg of more encompassing supply chains. Decision makers in the private sector have come to operate on a national or global scale. Therefore, the consultation process needs a supply chain management perspective (Figure 4.2).

Figure 4.2. **The position of consultation related to governmental co-ordination and market self regulation**



Source: van Binsbergen & Visser, 2001.

Public-private partnerships – where various government levels, shippers, transport operators, vehicle manufacturers, retail and wholesale organisations, real estate developers, research bodies and inhabitants all co-operate closely in developing common objectives and solutions – are often necessary for effective action.

Box 4.1. **Public-private partnership (PPP): the platform approach**

Given the complexity of urban freight transport issues, objectives can only be set and solutions found when public authorities and industry co-operate closely. Public-private partnership approaches can help set the common objectives. One application of such an approach is the "platform" strategy, in which common components are developed and shared wherever possible between different municipalities and other stakeholders. There are many examples in Europe of successful platforms, operating on a local, regional and national level (Examples were presented at the 8th BESTUFS Workshop, "Successful Private-Public Partnership Enhancing Urban Goods Transport", 12-13 September 2002).

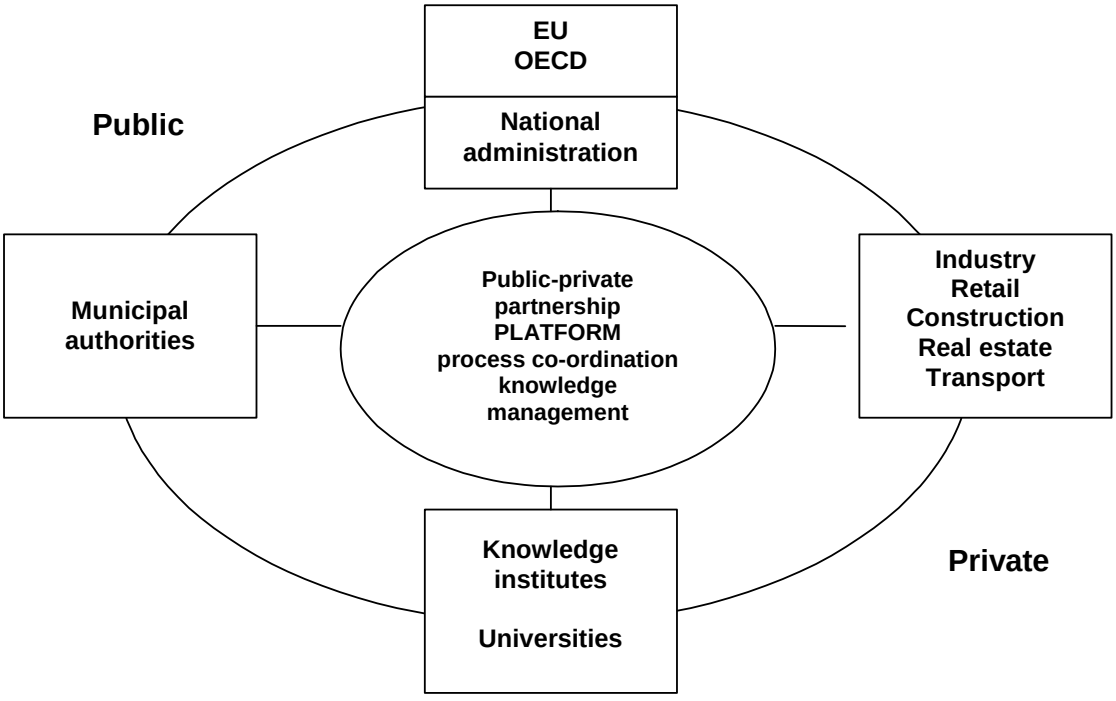
One of the important tasks for the platform is to concentrate on setting objectives and making uniform products, which municipalities can adapt. The objectives could be, for example:

- Identifying specific requirements by businesses and inhabitants in municipalities for the delivery of goods.
- Facilitating supply chains from a nation wide and regional perspective.
- Establishing administrative and political frameworks for government-to-business co-operation.
- Gathering and disseminating information to foster innovations.

On a local scale, a platform construction should result in clear and concrete solutions for improving the quality of urban goods transport in the area. The United Kingdom promotes this approach under their Freight Quality Partnerships scheme.

Depending on the size of a country, successful co-operation on a local scale could be bridged by regional or nation-wide public-private partnerships. These public-private partnerships could focus on establishing shared common knowledge in the field of sustainable urban goods distribution, thereby facilitating improvement among its participating members.

This concept of a PPP platform approach in the area of urban goods transport is illustrated below.



Integration of policies and measures across sectors is important

Urban goods transport policy will not be very effective if applied solely to local goods transport planning. Policy integration should cover not only all transport modes and passenger transport but also different sectoral policy areas, to establish a more effective urban goods transport policy. For example, local spatial planning, traffic planning and environmental planning should be in line with each other in order to be effective in meeting broad policy objectives. An important initiative to reinforce the importance of freight in urban planning would be to mandate consideration of freight issues in processes that underpin current planning processes.

Integrated policies, based on concerted actions or policy packages are generally more effective than solitary measures. Integrated policy perspectives are also necessary for involving different policy areas and achieving equilibrium between various interests. In order to promote integrated policies, policy-makers need to be well-informed of policy developments in other policy areas.

Certain such policy issues extend beyond the jurisdiction of national administrations charged solely with improving the performance of the transport sector. Since transport and logistics are interrelated with international trade, international finances, global, regional and local concerns, the policy framework should be seen in a much broader context. Policies should be co-ordinated across all sectors and levels of governments, both vertically and horizontally, and internationally where appropriate.

Policies should be formulated so as to enhance developments in the private sector

The private sector has become increasingly aware of its roles and responsibilities and is active in developing sustainable urban goods transport systems. Many developments in increasing efficiency and reducing negative impacts of urban goods transport systems are initiated by the private sector.

For example, the private sector actions to optimise supply chains and consolidate transportation, which were initially driven by needs for cost reduction and customer satisfaction, often result in reducing negative impacts of freight transport. The increasing awareness in the private sector of its responsibility toward sustainability has promoted the introduction of voluntary measures which include adopting low-emission vehicles and low noise devices, *e.g.* silent refrigeration units and air brake silencers. Such private sector measures also help improve their corporate image. Investment is also being made for new technologies in more energy-efficient, low-emission and low-noise vehicles and devices as well as in ICT to increase efficiency of goods transport systems.

Policy measures should be formulated so as to enhance and facilitate such developments. Such developments can be facilitated through assistance programmes which provide incentives, *e.g.* by allowing preferential use of infrastructure, allowing the safest and most environmentally friendly vehicles access to otherwise restricted areas or time windows, or through financial assistance to promote innovations. When regulations are used to attain such developments, governments need to ensure that such regulations are sufficiently stable and harmonised and provide a clear framework to encourage the private sector to assess the effectiveness and viability of potential investments. Experience indicates that such regulations should preferably regulate the outcome of the expected performance and not be technologically prescriptive, enabling the private sector to decide how to achieve such outcomes. Planning through a public-private partnership process can guarantee that the measures are practical and that the private sector is committed to them.

It is also important for governments to engage in active and continuous campaigning in order to stimulate and foster the awareness of the private sector. Best practices should be encouraged and widely disseminated.

Recommendations on measures: dealing with new challenges

The discussions in the policy framework section of this report show the need for policy frameworks at a national/state government level, with an overall objective of sustainable urban goods transport. Policy measures need to be integrated and planned within this framework (*e.g.* by way of public-private partnerships), thereby enhancing developments in the private sector. There is no single "magic bullet" for achieving sustainable urban goods transport – a combination of various public policy measures is necessary. This policy mix needs both facilitative and restrictive measures.

Drawing on experiences in member countries, the following recommendations are proposed in implementing such measures within the proposed integrated policy framework. Since these measures interrelate and cannot be prioritised, the recommendations on measures are not in order of priority.

1. Active measures are needed to increase awareness of the importance of urban goods transport and to diffuse knowledge

Urban goods movement is vitally important to residents, commerce and industry located in urban areas. Lack of awareness and knowledge in urban goods transport are common obstacles in all countries. Overcoming these obstacles is a starting point for developing an efficient goods transport system.

Citizens and even governments are not really aware of the importance of urban goods transport in maintaining their economic and social functions. For many people, freight transport is little more than a nuisance. The complexity of urban goods transport issues adds to this problem by making such issues difficult to comprehend. Also, innovations in vehicle technology are often hardly noticed by the public.

Therefore, governments should encourage public awareness of the importance of urban goods transport in their daily lives, the progress made so far, and the future challenges concerning urban goods transport which require participation of all stakeholders in order to be resolved.

Communication and consultation

Communication and consultation processes including public-private partnerships can be useful to increase such awareness and diffuse knowledge among all stakeholders. Awareness can only be achieved by including all stakeholders in identifying the problems involved, and, with the co-operation of all stakeholders, creating visions on what needs to be achieved as well as measures that need to be implemented.

Local transport plans

In order to diffuse and increase awareness and knowledge in local governments, one useful procedure may be for national or state governments to require local governments to formulate local transport plans which include urban goods transport and have local governments consult national/state governments on their plans. Local governments would be compelled to increase awareness of urban goods transport issues and their knowledge would improve accordingly. This would also contribute to achieving consistency among local measures.

Since it may be difficult in the initial phase for the local governments to formulate their plans, due to lack of experience and knowledge, it will be useful for the national/state government to provide guidance and consultation. One good example is the Local Transport Plan (LTP) process in the United Kingdom, in which the national government provides minimum requirements of the plan and also examples of good characteristics of a good LTP as guidance. The good characteristics include establishment of freight quality partnerships, thereby encouraging local governments to promote public-private partnerships.

2. Evaluation methods and data are prerequisites for effective policy measures

In order to plan and implement effective policy measures, an analytical base for evaluating and monitoring the effectiveness of such measures is necessary. At present, there is a serious lack of evaluation procedures and relevant information to enable such before and after (ex-ante and ex-post) analysis. Many countries have traditional transport models which are used ex ante to estimate future travel demands and impacts, but there are no agreed standardised evaluation methods or indicators to compare or monitor the effectiveness of measures undertaken.

Even with adequate methods, evaluations will only be undertaken if accorded the necessary priority. The fact is that, in many cases, governments do not have ex-ante evaluations in their policy planning, which means that policy-planning consultation with other stakeholders often takes place without any formal analysis of the outcome of the proposed measures. This has resulted in unexpected or undesirable effects of policy measures. Also, lack of ex-post evaluation implies that it is impossible to monitor and benchmark the effectiveness of measures undertaken.

In order to plan and implement effective urban goods transport policies, both ex-ante and ex-post evaluation methods need to be used, preferably in a standardised manner, from the planning phase through to their implementation. For this, all stakeholders need to reach a consensus view on clear policy objectives and indicators to measure the achievement of such objectives (Box 4.2). In addition to the Dutch example, other indicators/criteria may also be applied, such as reliability or those related to environmental management systems (EMS). An environmental operator performance rating scheme, which reflects the effort an operator puts into environmental initiatives, has recently been developed in Australia.

An evaluation method then needs to be agreed upon, which will be used both for planning and monitoring the effectiveness of measures by using the agreed indicators. National/state governments should encourage local governments to implement both ex-ante and ex-post evaluations. In relation to planning vehicle access and freight traffic restrictions, it would be desirable for possible regulations to be evaluated, including those for cost effectiveness, prior to their adoption and implementation. Ex-post evaluation is also necessary, both to monitor and benchmark measures as well as to compare results with the ex-ante estimates, thereby improving the evaluation method.

Box 4.2. **Checklist for city distribution evaluation: The Netherlands**

The Netherlands has developed a checklist which enables expected impacts of policies to be clearly identified under agreed indicators. This checklist is used for policy planning in urban goods transport in major Dutch cities.

Objective	Indicator	Expected impact
Accessibility		
Improve accessibility by reducing number per vehicle kilometres and improve accessibility in inner cities.	1. Vehicles / tonne-km. 2. Size of vehicle movements 3. Time to reach destination 4. Obstacles	
Environment		
Decrease of burden from deliveries in urban areas	1. Noise in dB(A) 2. Emissions (CO, etc.) 3. Vehicle movements 4. Citizen complaints 5. Consumer complaints 6. Safety/number of accidents	
Transport efficiency		
Increase loading factor of goods vehicles	1. Average loading factor/trip 2. Fuel usage	
Economic development		
Sustain and improve the economic welfare of inner cities	1. Size of office space 2. Number of shoppers 3. Number of retail establishments 4. Revenue 5. Costs 6. Profits	
Social support		
Advantages for all stakeholders	1. Citizens' opinion 2. Opinion of shopping public 3. Opinion of transport companies 4. Opinion of retailers 5. Local government opinion	

Some transport models have been developed mainly in the academic world, but they are seldom used in the policy planning process. There is not yet a common practice in urban goods transport modelling. A recent development of the French FRETURB model (for urban freight transport simulation), which estimates traffic volumes and traffic space occupancy and is used for urban goods transport policy planning in various French cities is encouraging. This model is made available to any French city, free of charge, on CD-ROM.

Box 4.3. **Urban goods transport modelling**

It is common practice in urban transport planning to justify results on the basis of transport modelling and traffic simulation software tools. Tailor-made geographical information systems (GIS) applications enable planners to use an updated model of transport infrastructure, to model the origin and destination flows of individuals, to adjust the model on the basis of real traffic counts and to simulate ex-ante any infrastructure changes or policy measures and assess their results. Commercial tools generally do not address urban freight issues and are often designed principally for passenger transport. This situation is mirrored by the fact that urban administrations and their experts generally focus on passenger transport.

Some new urban freight transport models and software prototypes have been developed, mainly in the academic world, but are seldom used in policy planning processes. A recent development is the French FRETURB model, which is used for urban goods transport policy planning in various French cities. Another attempt is the Dutch GoodTrip model for the modelling and evaluation of urban goods distribution, which was developed by the Delft University of Technology together with the Netherlands Research School for Transport. This model was used in a case study for the city of Groningen and focused on the evaluation of freight distribution concepts from both a societal and economical point of view. Finally, there is the WIVER model developed by the German company IVU which represents an integrative approach to address not only the freight distribution activities in a city but also the business traffic as a whole. This model was first used in Munich and afterwards in a few other German cities. However, internationally, and from both an academic and practical point of view, there is not yet a common practice in urban goods transport modelling.

Data necessary for evaluation methods need to be collected in a consistent manner with sufficient standardisation so as to allow long-term monitoring and benchmarking. In order to collect comparable, standardised data, agreement on the definition and collecting methods for all data needs to be reached, preferably on an international basis. New technologies will enable an efficient and low-cost collection of such data.

3. Consolidation is a key to achieving sustainable urban goods transport

With increasing demands for frequent and just-in-time delivery on one hand and the restrictions of limited spatial infrastructure and environmental demands on the other, future solutions for achieving sustainable urban goods transport should be sought through the consolidation of goods delivery. The purpose of consolidation is to improve the utilisation of the transport system to generate economies of scale, thereby reducing vehicle trips, increasing efficiency and decreasing financial and environmental costs of transport.

Various consolidation activities take place in urban areas, including those by multiple retailers, express and parcels companies, wholesalers, and freight transport operators consolidating goods of several customers. An emerging form of consolidation is the co-operative city logistics scheme, where freight transport companies that all work in the same urban area work together to share collection and delivery. With this scheme, goods destined for a single address or a certain geographical area are consolidated at one freight transport company's depot or a common depot and delivered in a single full-loaded vehicle.

Results from such schemes include improved consolidation, drop density, more efficient use of vehicle capacity, fewer vehicle trips and vehicle-kilometres in the urban area, and shorter vehicle dwell times. These operational changes could lead to reduced fuel use and a reduction in the environmental and social impacts of road freight transport. The use of cleaner vehicles in such schemes will further contribute to reducing environmental impacts.

A useful measure for improving consolidation is the implementation of an urban transshipment centre on a commercial basis. The urban transshipment centre would be located on the edge of the urban area it serves, and freight destined for the urban area would be off-loaded at the centre and sorted into consolidated loads for final delivery into the urban area. A particular advantage of

transhipment centres is the increased scope to consolidate goods flows destined for delivery to several customers in the urban area, and thereby reduce the total number of trips. Increased use of transhipments could encourage the use of lorries specifically designed to operate in urban areas (*i.e.* quieter vehicles with lower emission levels and designed to be more manoeuvrable).

Community collection and delivery points could also be used to improve goods consolidation. These points could be solely for the storage of goods purchased by customers from surrounding shops, used as home delivery points, or used also as transhipment centres.

As consolidated loads generally would be delivered by small vehicles, the highest possible vehicle utilisation is necessary in order to compensate for the additional transhipment cost and to ensure reduction of vehicle kilometres. Using ICT for managing available capacity, making optimal vehicle utilisation and route planning could help achieve this.

Although consolidation has been mainly driven by the private sector in the form of voluntary co-operation (and mergers and acquisitions), governments are able to promote such consolidation by way of encouraging and assisting pilot projects and by favourable regulations. Experiences show that public urban distribution centres tend to fail, but commercial urban distribution centres operating as transhipment centres for consolidated delivery should be promoted in the private sector. One way of promoting such centres is to facilitate operators of consolidated goods transport by allowing a greater degree of access into urban centres or into various municipalities within one urban region than the access allowed for non-consolidated operators.

Box 4.4. **Example of successful consolidation**

In the central business district of Fukuoka City, Japan, where traffic congestion is a major problem, 29 freight transport operators initiated a co-operative city logistics scheme in 1978. After a public-private partnership process involving national and regional governments, police authorities, local industries and freight transport operators, a city logistics company for co-operative collection and distribution in the area was set up in 1994 under the co-operation of 36 freight transport operators. Along with this scheme, the public sector dealt with traffic problems by installing parking meters to be used exclusively by freight vehicles and by increasing enforcement of parking regulations.

The scheme has resulted in reducing the number of freight vehicles by 65% and reducing freight vehicle kilometres in the area by 87%, thereby reducing environmental impacts accordingly.

4. Regulations need to be harmonised, standardised, stable, easy to enforce and cost effective

Various regulations have been implemented that aim to maintain the living environment in certain urban areas and facilitate smooth and safe traffic flows. Of these regulations, access restrictions based on time and/or vehicle size or weight have been widely implemented in various countries, especially in Europe. Although vehicle regulations which regulate vehicle size and mass are applied on a national/international level, the criteria for vehicles to be given restricted access to city centres are within the sphere of local governments. Such restrictions differ among municipalities (for example, regulations in the Paris region use more than 30 different definitions of a truck) and are often not sufficiently explained to drivers. These factors cause serious difficulties for operators having to organise worldwide supply chains while responding to increasingly stringent customer demand for frequent, reliable and just-in-time deliveries.

Box 4.5. **Examples of different truck limits for city access delivery regulations in some large European cities**

Paris	$16m^2$ and $24m^2$
Amsterdam	7.5 tonnes
London	18 tonnes
Barcelona	3.5 tonnes / 5 tonnes / 16 tonnes
Milan	3.5 tonnes / 15 tonnes

In order to achieve transparency as well as stability in long term policies, and to facilitate efficient urban goods transport systems, it is important that better harmonisation be achieved as concerns truck size and weight definitions. Existing access and freight traffic restrictions based on truck size and weight should be reviewed for consistency, if possible, making them simpler and closer to the professional needs of carriers, shippers and retailers. This review needs to be promoted both by national government initiatives and by international co-operation, while ensuring private participation in the decision-making process.

Regulations related to transport vehicles are crucial for vehicle manufacturing industry and fleet owners. Vehicles produced, purchased or leased need to comply with all relevant regulations in order to be used within urban areas. As wide as possible standardisation of clear regulations applied for a sufficiently long period is therefore necessary for private investments to pay off. Ideally, a limited number of recommended "ideal size" of truck dimension limits for city access should be determined internationally. Such standardisation and stability will encourage vehicle manufacturers to develop low-noise and low-emission delivery vehicles.

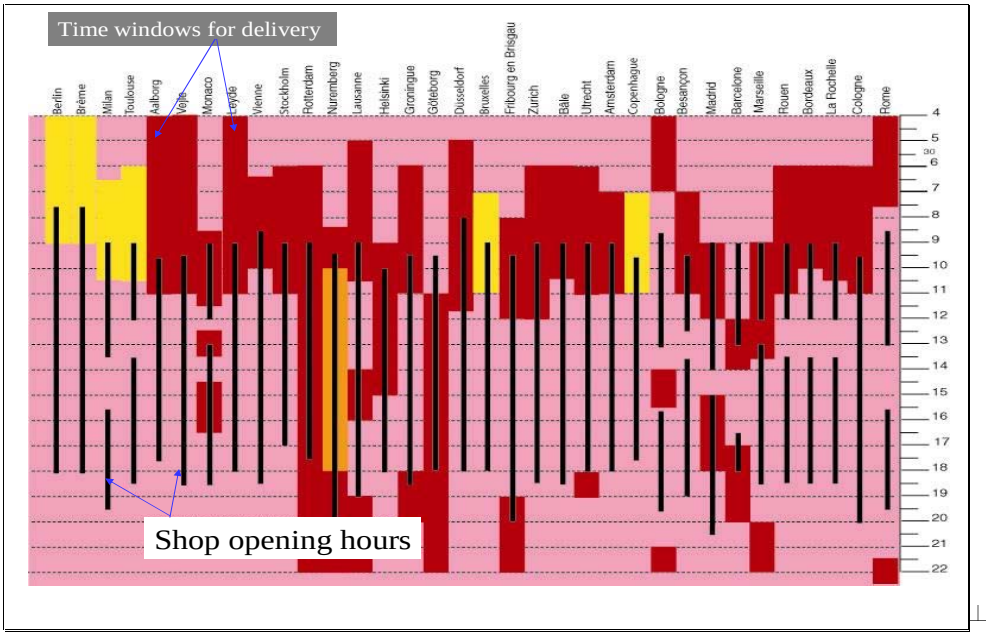
Harmonisation and standardisation of regulations related to vehicles can also facilitate the consolidation of goods between shippers and transporters. Harmonisation of municipal regulations will lead to co-operation and determination of "most efficient routing" of urban goods transport.

Harmonisation of regulations in other sectors can also be helpful, such as harmonising time windows to shop opening hours or vice versa (Figure 4.3). Regulation for labour or labour conditions is another aspect.

Enforcement is always an important issue. Regulations need to be designed in such a way (clear, simple, easy to understand, cost-effective, and where relevant, preferably performance-based) that it is easy to enforce them.

Experience shows that lack of control can make policies less effective. Quite often, regulations are ignored, and lack of control and enforcement result in regulations becoming weaker and ultimately useless. Good control strengthens regulations by making them impossible to ignore. Therefore, in Amsterdam, parking guards are made responsible for the enforcement of regulations. Special attention should be given to passenger transport, since special uses which are provided for goods transport vehicles, *e.g.* kerb-side facilities or dedicated lanes, can be frustrated by passenger vehicles using the infrastructure and thereby hindering urban goods transport. Politicians are sometimes reluctant to implement enforcement measures on passenger vehicle users.

Figure 4.3. **Examples of shop opening hours and delivery time windows in European cities**



Source: S. Guillou, France (2001).

Due to technology development, new monitoring techniques and tools are now available to support the enforcement of regulations, including the use of electronic identification, video surveillance, and non-permanent roadblocks (such as rising pyramids or rising steps). In Barcelona and Rome, cameras are linked to a system which automatically generates and sends tickets to the offender. Some Dutch cities, such as Delft, Den Bosch and Arnhem use automatic barriers such as rising pyramids or rising steps.

5. Infrastructure capacity should be used more imaginatively on a 24-hour basis

In order to ensure the liveability and viability of cities, a certain level of accessibility needs to be guaranteed. Poor accessibility will prevent commercial zones or shopping districts within urban areas from being economically viable. However, on the other hand, the living environment in cities needs to be maintained, and limited infrastructure needs to be shared between passenger and freight transport.

Therefore, in order to make optimal use of urban infrastructure, while maintaining accessibility and liveability, selective allocation of infrastructure capacity on a 24-hour basis, such as flexible time sharing of road space, needs to be considered at the busiest locations. Such allocation schemes serve to separate infrastructure use in terms of time and space per type of transport based on their characteristics. For example, certain roads can be used by general traffic or as bus lanes during peak hours, for delivery or short term parking at off-peak hours, and for residential parking at night. Such mixed use of streets is being experimented on Balmes Street in Barcelona and has proved satisfactory. The experiment shows that acceptance by all stakeholders and effective enforcement are crucial for such measures to be successful.

An important measure for a better utilisation of infrastructure discussed in several countries is the introduction of night deliveries. Freight vehicles have often been banned from urban areas at night due to their noise problems, but the expected future increase in direct deliveries to customers will necessitate reconsidering local regulations which ban night deliveries. Night deliveries could reduce the concentration of activities during the day, resulting in removing traffic from peak hours and improving efficiency of deliveries. For example, a case study in the United Kingdom[28] shows that allowing deliveries during night time and Sundays to the top four grocers in the United Kingdom will reduce 600 vehicles representing 687 000 trips per annum (which are now made during peak travel hours). This will result in a savings of 106 million kilometers, meaning considerable benefits in terms of reduced pollution. IVECO estimates that an 8-13% shift in European urban freight distribution to night time will produce savings of EUR 40 billion in passenger time, EUR 10 billion in commercial vehicle time, and that increasing the fluidity of daytime urban traffic flows will result in environmental benefits including a 6-7% reduction in total urban transport emissions and a 4-5% reduction in CO_2 emissions.

In order to be acceptable, night deliveries need to be considered in conjunction with the development of quieter delivery operations – including quieter vehicles and loading/unloading facilities. Innovative vehicles and equipment need to be developed and experimented. Such innovation can be promoted not only by favourable regulations (allowing night delivery) but also by financial incentives by governments. For example, the Netherlands has set up the Peak programme, which beginning in December 2004 will allow the transport sector unlimited access to the urban area during off-peak and night hours if they operate under 60/65 decibels. This programme has been established through consultation between the public sector and private businesses, allowing the transport and retail sector time to adjust to the new requirements. Investments in trucks and codes of conduct on how to deliver goods with low noise emissions will be required. The government supports experiments by the private sector for necessary technical developments.

Consultation is necessary to achieve acceptance for night delivery. Freight quality partnerships promoted by the United Kingdom provide a framework for developing agreements for allowing night deliveries in return for the use of cleaner and quieter vehicles and a nighttime code of practice. Experiments and pilot projects are especially useful for the introduction of night delivery, since residents need to experience the actual low-level noise operations before they agree to a formal change of regulations to be introduced. Other stakeholders, such as small shopkeepers and labour unions, also need to be consulted before formal introduction of night delivery.

New methods for vehicle noise measurement in urban areas may also be necessary. It is questioned by the trucking industry whether the ISO 362 standard testing procedure for trucks noise measurement (which measures an unladen chassis cab entering a noise measurement area at a speed of 50 km/h and then accelerating at its maximum rate) is adequate for delivery trucks whose operations in urban areas are usually below 50 km/h. It is argued that vehicles designed to meet the ISO 362 requirements are noisier than if their design had been optimised for low-speed conditions.

6. Cleaner, low noise and more energy-efficient vehicles need to be promoted

Various developments in the vehicle manufacturing industry are being made towards not only quieter vehicles but also cleaner and more energy-efficient vehicles. Electric engines, CNG and hybrid fuel systems seem to be especially well suited for urban environments, but cost and performance considerations have so far limited their use. Traditional vehicles applying the latest technologies are

[28] Jackson and Timpson (2001).

now considerably cleaner and in some cases (in particular diesel injection engines with the latest particulate filters) now guarantee extremely low emissions of local pollutants (a traditional cause of air quality problems in urban areas).

Innovation in vehicles including environmentally friendly and energy-efficient engines, on-board routing systems, delivery-suited truck and van design (lateral doors, low floor), and loading/unloading and handling equipment, should be further promoted. Governments should promote such innovations through financial assistance or provision of information (*e.g.* the Green Star Rating System in Australia where information on emission performance and fuel consumption rates of vehicles less than 3.5 GVM is provided by the government) as well as by incentives such as favourable city access regulations.

Establishing clear and stable international standards of such vehicles will also stimulate industry for further developments by giving them time and opportunity for their investments to be worthwhile.

7. Adequate logistic facilities need to be provided

In order to increase the efficiency of urban goods transport and at the same time reduce negative impacts of road use, various loading/unloading zones for freight vehicles need to be provided. A survey in Lille (France) showed that more than half of parked vehicles were parked illegally, and 40% were double-parked on roads. Lack of loading/unloading facilities lead to drivers searching for road space to park, resulting in losing time as well as increasing congestion and risk of accidents. Therefore, in inner-city areas, on-street loading/unloading zones should be considered as an intrinsic part of road design and traffic management.

In creating such zones, location, dimension and priority time periods should be carefully considered so as to accomodate freight vehicle operations, which differ from those of passenger vehicles, in a most efficient manner. The Lille survey shows that delivery vehicle stops are short and concentrated during certain time periods. Of 17 000 delivery vehicle stops per day in Lille, 2 600 stops/hour are made between 09:00 and 11:30, and 55% of vehicles park for no longer than ten minutes. Also, drivers try to stop close to their destinations to avoid having to carry deliveries the rest of the way. Such characteristics need to be taken into account in planning locations and possible time-sharing of such zones with other vehicles.

These zones should be clearly signed and their proper use should be strictly enforced. In many cities where loading/unloading zones are provided, they tend to be used for long-term parking by passenger vehicles, forcing freight vehicles to double park outside such zones. The experiment in Barcelona uses ICT, and delivery vehicles with stickers authorising access to the parking places reserved with disks are monitored by sensors which calculate the duration of parking. A red signal indicates the expiration of authorised parking time so that the police can intervene. This system is supplemented by cameras.

Off-road facilities are also needed not only for reducing on-road loading/unloading but also for long-time operations, waiting for shops to open and overnight parking. Some government-funded experiments in Japan provide dedicated off-road parking which can be reserved by using a mobile terminal or Internet on trucks. Terminals in the parking area enable drivers to reserve in another area when one area is full, and to reserve a parking space near their next destination.

Off-road loading/unloading facilities for new commercial and industrial buildings should not be forgotten in zoning codes and building permit requirements. In Paris, all commercial and industrial buildings larger than 250m^2 are required to provide such facilities. Establishing standards for such

facilities will be useful, since lack of expertise on size and manoeuvrebility of freight vehicles has led to inadequate facilities which are avoided by drivers.

There should be strong promotion of trans-shipment facilities which contribute to consolidation of goods, leading to increased utilisation of vehicle capacity and, moreover, making intermodal transport a feasible alternative for long-haul road transport.

The rise of e-commerce has led to the direct involvement of the customer into the supply chain; B2C has resulted in increased home deliveries, which has highlighted the problem of the addressee needing to be present at the time of delivery. In a very limited number of cases, solutions to this problem have been sought in the use of local pick-up points in urban areas, which allow more efficiency in organising deliveries. Governments need to co-ordinate actions with the private sector in developing necessary logistics facilities including local pick-up points and parking places in order to restrain the expected growth of transport in urban areas. Active involvement of the private sector in planning such logistics facilities is crucial for them to become commercially successful.

8. Efforts need to be made to reduce safety risks of urban goods transport

Freight vehicles are a significant cause of accidents although research suggests private motorists are often at fault in accidents involving freight vehicles. Especially in urban goods transport, characteristics of goods transport operations and vehicles operating in dense areas, give rise to specific safety problems, as discussed in Chapter 2. This has contributed to freight vehicles having a negative image of being “noisy and dangerous”.

Governments should provide the necessary infrastructure, with private participation where appropriate, to reduce risks of accidents involving freight vehicles. These infrastructure include ring roads for enabling through traffic to bypass city centres, dedicated roads and lanes for separating passenger and freight traffic during necessary time periods, loading/unloading zones for avoiding operations on traffic lanes, and transhipment areas outside urban areas enabling consolidation and avoiding large vehicles entering the city centre.

Governments also need to strengthen their control regarding freight transport operations. Maximum limits of freight carried by freight vehicles, transport of dangerous goods and routes designated according to vehicle weight or content of freight need to be strictly observed.

Since dangerous driving caused by strict delivery deadlines and the resulting work pressure on drivers seem to be the cause of some accidents, governments need to promote efforts by the transport operators to improve working conditions of drivers and to invest in safety devices (*e.g.* e-safety). Japan has obliged operators to equip large-sized freight vehicles with speed limit devices. Governments need to increase awareness of industry operators and citizens regarding urban goods transport safety issues, including the risks associated with pressing just-in-time delivery requirements and the limitations on the peculiar maneuverability of large freight vehicles.

9. Reverse logistics needs to be developed

Waste management is an important issue for creating sustainable urban areas. Many countries are faced with problems of limited capacity of combustion dumps and emissions caused by combustion, and are realising that a mass consumption and mass waste-producing economy is not sustainable. This has led to make efforts to reduce, reuse and recycle waste (“the three Rs”). This will only be possible under an efficient freight transport system, which collects waste quietly and without causing

congestion on roads, and will carry used and returned goods for re-use and recycling – reverse logistics – in a cost-effective manner.

Efforts are being made in many cities to collect waste with low-emission vehicles during off-peak early morning hours. However, noise problems still persist, especially in residential areas early in the morning. There is therefore room for further improvement.

Recycling waste is usually not profitable, and governments therefore need to promote recycling by imposing legal obligations on industries. However, since transport costs constitute a large part of recycling costs, in order to promote recycling, it is important to increase efficiency and reduce costs of reverse logistics.

The costs of reverse logistics can be reduced by carrying large quantities, therefore utilising economies of scale. Since waste is usually transported over relatively long distances and speed is often not of importance, it creates an opportunity for intermodal transport to become feasible.

Governments can facilitate the development of efficient reverse logistic systems by providing necessary infrastructure and diffusing and encouraging best practice. In Japan, where recycling of various goods including construction waste has been made compulsory, an Internet system which selects the best recycling plant to carry such waste has been developed and is being used for the transport of waste asphalt and concrete materials from road construction sites to recycling plants. This system selects the most appropriate plant, taking into account distance, time required, processing capacity of each plant (by category and volume of materials), and processing cost. Also, in order to promote water transport of waste, the Japanese government is developing port facilities which accommodate recycling facilities and inshore dump yards.

10. Technological and conceptual innovation can support sustainable urban goods transport

Various measures for the development of sustainable urban goods transport systems will be made possible due to innovative technology development. For governments, access restrictions, access slots or access fees to city centres as well as use of dedicated loading/unloading zones by certain freight vehicles during designated times will become feasible and easily enforceable through the use of ICT, including smart cards and e-tags. These technologies will also enable the creation of a database that identifies freight vehicles entering the city. This database can provide various data, including frequency of access and duration of trips, which are necessary in planning policy measures. Another application may be the development and use of traffic management systems for urban goods transport.

Transport demand management (TDM) will also become feasible by using ICT. In Japan, a TDM project under a public-private partnership is attempting to increase urban transport efficiency and reduce environmental impacts. This project, consisting of a package of various measures such as introducing low-emission and energy-efficient vehicles and promoting consolidated delivery includes installation of on-board computer technology for diverting traffic from congested areas. The project is expected to increase traffic speed and reduce both NO_x and PM emissions.

The development of underground distribution systems with the potential to increase efficiency and reduce negative environmental impacts offers potential opportunities for more sustainable urban goods transport systems. However, since such systems require large investments in infrastructure, initiatives and feasibility studies have mostly proved to be unsuccessful without an active government role and assistance.

Technological developments in the private sector also contribute to increasing the efficiency of urban goods transport. Goods and vehicle tracking has been developed, as well as real-time vehicle routing and scheduling systems, which identify current and future locations of tractors, trailors and goods, and plan operations which maximise utilisation of vehicle space and minimise vehicle trips. Such systems can also process and transit information on freight to collection points and distribution centres, so that optimum loading of expected freight can be planned in advance, allowing freight to be sorted and reloaded with maximum speed upon arrival. Vehicle cargo matching systems, which enable arrangements to be made between available truck capacities and consignors, contribute to increasing truckload efficiency and reducing cost and envrionmental impacts.

Governments should promote such developments in the private sector by facilitating experiments and diffusing best practices. In Japan, the government supported the development and experimental study for vehicle cargo matching software, with an aim to enable small and medium-sized operators to take part in vehicle cargo matching systems, thereby increasing vehicle utilisation and reducing the negative impacts of congestion and emissions.

The evolution of city logistics also offers oportunities for sustainable urban goods transport (see Box 4.6).

Box 4.6. **City logistics**

City logistics is an integrated approach for urban goods distribution based on the system approach. It promotes innovative schemes that reduce the total cost (including economic, social and environmental) of goods movement within cities.[29] City logistics is based upon the framework of sustainable development and fits within the framework of consultative planning. Both frameworks provide basis for policy evaluations of city logistics initiatives.

City logistics schemes typically involve establishing partnerships between the public and private sectors. There are numerous types of city logistics schemes, including:

- Advanced information systems.
- Co-operative freight transport systems.
- Public logistics terminals.
- Promoting shared use of freight vehicles.
- Underground freight transport systems.
- Area access control.

City logistics encourages collaboration between key stakeholders within a market based economy. It also promotes the development and application of models for predicting the effects of schemes. Transport network modelling approaches for estimating the demand, level of service and impacts of schemes are required. There have recently been a number of developments in modelling methods that allow the impacts of city logistics schemes to be estimated.[30]

11. Next steps: the need for further study and international co-operation

It became clear during the studies by the Working Group that the development of sustainable urban goods transport is only in its initial phase – countries need to start by raising awareness in this area. The gap between developments in passenger transport and developments in goods transport is astonishing. Urban freight transport is mainly perceived as a purely commercial and business activity, and is generally not considered as something which should be featuring high on the political agenda, at any level of government.

[29] Taniguchi and Thompson (2002).

[30] Taniguchi, Thompson, Yamada and van Duin (2001).

Therefore, there are many issues (including the important emerging issue of security of goods transport) and possible solutions which are not covered in this report. Further studies and data collection are clearly necessary.

However, it was encouraging to find that countries have begun to become aware of the importance and problems of urban goods transport and are trying out various measures to meet the challenges. Slowly but certainly, the “star” of urban freight transport policies is rising on the political firmament. Since most countries have common challenges, exchanging experiences among countries proved to be extremely useful. Further co-operation among countries and with other international organisations is necessary not only in researching the key issues and possible solutions and in sharing best practices, but also in harmonising regulations, standards and data collection.

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ANNEX 1

MEMBERS OF THE OECD WORKING GROUP ON URBAN FREIGHT LOGISTICS

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Takuya Seo	Japan
Satoru Mizushima	Japan
Yoshikazu Imanishi	Japan
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Fred Heuer	Netherlands
Roeland Van Bockel	Netherlands
Johan Visser	Netherlands
Charles Aangenendt	Netherlands
Judith Ritchie	United Kingdom
Michael Browne	United Kingdom
Robert Radics	United States
Anthony Ockwell	OECD Secretariat
John White	OECD Secretariat
Yuri Furusawa	OECD Secretariat

ANNEX 2

HIGHLIGHTS OF PRACTICES IN MEMBER COUNTRIES

Australia

Overview

Australia is a federation of six states and two territories. There are three levels of government in total, of which only two levels (federal and state/territory levels) are formally recognised in the federal constitution. This has some impacts for road funding.

Australia is a land mass equivalent in size to the United States (excluding Alaska) with a population of only 19 million. Some 70% of the population reside in 14 urban centres situated around, or close to, the coastline.

The urban planning process is spread across local and state governments. Federal governments traditionally take a limited role in intra-urban issues, but achieve buy-in to this process via funding of inter-urban links through the national highway system and major state projects. The federal government also provides funding to local governments through untied grants that are distributed to local governments via state/territory-level authorities.

Each state and in some cases local governments regulate the mass and dimension of vehicles on their own roads. Even time of day restrictions on road use can be regulated on local roads by local government and on state arterial roads by state government. This power is not extensively used at present, as while there are some time-of-day restrictions on use of various truck types in some specific locations, vehicle use restrictions more commonly limit the routes that specific vehicles can use, rather than the time of day. For example, B-Doubles (a prime mover towing two semi-trailers linked by two "B" or fifth-wheel couplings) are limited to particular routes, and there are mass restrictions for vehicles that operate on particular road segments and particularly on nominated bridges.

In 1991 the federal and state government heads (COAG, Council of Australian Governments) established the National Road Transport Commission (NRTC). This national body is tasked with harmonising the road transport law across the jurisdictions. This has included setting national road use charges for trucks and buses, comprising an agreed component of the federal excise on diesel fuel and annual registration charges.

Another strategic road transport agency called the National Transport Secretariat is currently examining, on behalf of the Council of Federal, State and Territory Transport Ministers, a range of issues relating to strategic infrastructure use and investment arrangements. These issues range from the impact of e-commerce-related activities in urban areas to the strategic development of national freight corridors and the development of national intermodal performance measures.

In July 2000, Australia implemented a consumption tax system based on goods and services, the GST (Goods and Services Tax). In parallel to the new taxation system a new arrangement for diesel excise was introduced. This was called the diesel and alternative fuels grant scheme. It allowed a partial excise rebate, down to the level of the road use charge, to be reclaimed by the user against a set of rules. One of these rules was that the rebate was available to all diesel vehicles above 20 tonnes gross vehicle mass (GVM), regardless of where they operate. However, for diesel-powered vehicles between 4.5 tonnes and 20 tonnes GVM, this rebate was not available for operations within major urban centres, on environmental grounds, irrespective of the emissions rating being Euro-1, Euro-2 or even Euro-3. So a 1958 Bedford truck with a GVM of 38 tonnes can claim a rebate for fuel used within a major urban centre, but a 15-tonne GVM Euro-3 DAF, Man or Volvo cannot. All trucks greater than 4.5 tonnes continue to pay a charge to recover the costs of providing and maintaining roads associated with different classes of vehicles and this is set by the NRTC.

A focus on the urban environment

Australia's states and territories rely on road funding to increase the capacity of freeways, toll way and new ring roads. Funds are generally obtained from consolidated government funds, but in a small number of cases are provided out of hypothecated revenues or toll facilities. This increasing supply of road capacity may not be so forthcoming into the future and other user pricing mechanisms have been discussed at various levels of government. However, nothing has been implemented other than the NRTC's road construction and maintenance charge. In most cases the revenue obtained from these charges flows to consolidated funds. An indirect tax exists on diesel vehicles of 4.5 tonnes to 20 tonnes GVM in major urban centres, as these vehicles are excluded from particular taxation rebates available to vehicles outside urban areas. It should also be noted that, irrespective of their mass, alternatively fuelled trucks and buses in Australia, *e.g.* CNG, LNG or LPG-fuelled trucks do not pay fuel excise. This includes the component of this excise that is designated a road use charge to help recover the costs of constructing and maintaining roads for heavy vehicles. They only pay the annual registration charge component of the national road use charges set by the NRTC.

New environmental emission standards have been legislated over the next five years and it will be the role of federal regulators to enact these reforms for new vehicles and state and territory regulators to ensure they remain in force for vehicles once they are in use.

Underlying problems and main policy objectives

In the larger Australian cities with populations of over 1 million people, congestion is emerging as a significant issue. However, freight and freight access policy is more often determined by the respective governmental authority (federal, state or local) responsible for the road types in its own jurisdiction.

The more commonly applied transport and freight restrictive access regimes are at the local government level, with some access restrictions for state arterial roads. At the current time, in urban areas most restrictions are designed to prevent transport access intrusion and noise for specific vehicle configurations at specific times of the day. Protection of infrastructure (pavements and bridges) against damage is also a highly important consideration.

Urban pollution from freight vehicles is regulated at the national level through the adoption of international emission standards for new vehicles only, but enforcement of in service emission standards are usually enforced at the second tier, or state government level. In service emission standards for trucks greater than 4.5 tonnes GVM were legislated by federal legislation in 2001 and this in service legislation is being adopted by state governments on a state-by-state government basis.

Licensing, regulation and freight routes

In Australia, trucks and light commercial vehicles operate to the same dimensional lengths, mass limits and driving hours as non-urban vehicles. However, the main distinction in Australia comes from having three levels of government. Each level funds specific roads, for example, federal highways, state urban arterial roads and local roads respectively. As such, but not always, each level of government can to a large degree regulate the weights and dimensions of the truck configurations that can travel on the roads for which that level of government is responsible.

Restrictive time window hours of operations are rare, but are more often seen on local government roads, and very occasionally on state urban arterial roads. Some arterial roads may restrict heavier combination vehicles at certain times and even on certain days, for example weekends. It is more common to see vehicle mass limit restrictions on state and local government roads and bridges. Variations to the operational truck weights and dimensions for a particular truck type can be made usually to the local government council or state government road authority.

Consolidated delivery supported by local policy

In Australia there is no regulation on any aspect of consolidation, only regulatory restrictions on loading with regards weights and cargo compatibility. However, transport depots and distribution centres are often zoned into industrial or retail areas. This zoning usually happens with the approval of local government or sometimes, but less frequently, state planning authorities.

Low-emission vehicles

In Australia low emissions are targeted by legislation for new makes and models of passenger sedans, light trucks and heavy trucks and buses. There is no retrospective legislation for vehicle emissions, except for acceptability of in service running standards. Australia has experimented with low-emission vehicles. General Motors Holden in Port Melbourne produced a functional sedan electric vehicle in 2001. This vehicle however, was a concept vehicle and will not be produced commercially.

Australia also hosts the international World Solar Challenge (“Sunrace”) which is a rally for solar-powered vehicles. This race in conducted every two years between Darwin and Adelaide, a distance of 3 000 kilometres, attracts 100 teams, many being international.

Some Australian state and local governments have purchased small numbers of hybrid fuel vehicles but this is an ad-hoc purchasing policy for both evaluation and proactive image purposes.

Consultation

One area in Australia where there is a large amount of interaction is in the area of consultation with the road freight industry. This usually occurs at the state and federal government levels. Currently the National Road Transport Commission (NRTC) has three legislated consultative forums. These involve consultation with the road freight industry participants, the Industry Advisory Group (IAG), the Bus Industry Advisory Group (BIAG) and the road transport authority chief executives (TACE). In each state of Australia, the state transport ministers have a freight industry advisory body which interacts formally with the road freight industry. In late 2002, at a broader level, the Australian government established the Australia Logistics Council. This council, however, has a much wider focus than the urban freight task.

The National Transport Secretariat (NTS), which examines the somewhat strategic nature of Australian freight planning, has proven also to be a highly interactive and consultative co-ordinator for strategic input to state and federal transport ministers.

Informal industry representation also occurs at the state level though industry road transport associations which form an umbrella representative body called the Australian Trucking Association. Formally this body was called the Road Transport Forum and was founded in 1989.

Policy level

In November 2002 the Australian government released a major option paper on a strategic rethink of national transport strategy. Urban planning and expenditures form part of that vision. However, to implement this new strategic structure, the state government jurisdictions must agree to many of the proposed restructures of historical relations between the state and federal government.

At the state government level, five, ten or 20-year strategic plans often exist and involve sets of both urban and regional strategic policy initiatives. Many of these initiatives are reliant of federal funds and state funds.

At the Australian local government level, the capacity for urban transport strategic and policy development is often very reflective of the size of the particular local government authority. These may range in size from several thousand residents to over 1 million within the jurisdiction of a local government. Policy initiatives at the local government level are often through zoning land use, zoning the weights and dimensions of the maximum size vehicle for a freight route, and very often planning public transport requirements. Inventive changes to the use of new freight vehicles will more usually be activated by state government jurisdictions and possibly be adopted nationally through the interactive policy loop involving the National Road Transport Commission as well as the federal and all state and territory governments.

Within the last few years the regulatory focus of transport regulators is moving slowly to an urban policy focus instead of the longer distance articulated trucking focus that has been uppermost on the horizon of regulators for the last decade.

Belgium

A specific federal policy plan for a nationwide approach to urban goods transport has not been developed in Belgium, but a wide and diversified range of possible interventions can be observed. The most striking features are mentioned here.

Urban distribution centres

Brussels Capital is now studying a measure to ban heavy goods vehicle traffic from the city centre and certain other parts of the city. This measure will be combined with a goods distribution centre (GDC). Vehicles over 19 tonnes will be banned from the historical centre and residential areas except for destination traffic with a permit. Freight carried by vehicles of more than 19 tonnes will then pass through a city distribution centre where it will be transferred to small delivery vans. It is a very controversial measure, because depending on the location of the GDC, it could lead to an increase of distance travelled by heavy goods vehicles (HGVs) and the number of trips made by city distribution vans (because the use of small vehicles leads to more vehicle kilometres), and thus to an increase in pollutant emissions. Such a measure requires the use of electric small vans in order to be

environmentally friendly.[31] Another controversial issue is the extra cost generated by transfer operations.

The restriction criteria chosen are weight-based as the aim is to limit the physical damage that freight vehicles inflict on the infrastructure and its surroundings.

Pricing

Brussels Capital is now studying how to develop a traffic toll system on road axes surrounding the region. The system would apply to both passenger and freight road users. However, different prices may be applied, for instance, according to time windows or types of vehicles.

Night safe-deposit boxes

Because distribution of goods to shops in city centres has become more difficult, night safe-deposit boxes could be a solution to accept deliveries when the shopkeeper is not present. Moreover, at night, there are no traffic difficulties on the roads. Some urban shops in Belgium are already equipped with this kind of space, such as in Louvain-La-Neuve. Overall, the main problems encountered are noise and lack of contact between shopkeepers and suppliers.

Ownership of off-street delivery bays

At the end of 2002, the Brussels government approved a circular concerning the parking of freight vehicles in buildings. This document states that large industrial buildings should be equipped with off-street delivery areas accessible to vans (up to a height of 2.6 metres) and lorries (up to a height of 2.3 metres), and that "office buildings should be equipped with a delivery area for vans if the floor area is between 1 000m^2 and 10 000m^2. If the floor area exceeds 10 000m^2, the building should be equipped with at least one delivery area accessible to lorries. Buildings for crafts and industrial activities, trade, wholesale business, big specialist shops or storage, should be equipped with at least one delivery area for vans, if the floor area lies between 500m^2 and 1 000m^2. If the floor area exceeds 1 000m^2, they should possess at least one delivery area accessible to lorries with more than two axles." It should be noted that this document is a circular and not a by-law. It therefore indicates to the local authorities the limits that can be applied without being opposed by third parties.

Traffic permits

In some areas of Brussels Capital (historical centre and residential areas), lorries of over 19 tonnes will be banned except for those with a delivery permit and local destinations. In Flanders, the city of Antwerp applies delivery time windows in the city centre.

Reserved on-street truck delivery spaces

Almost all Belgian cities have now reserved special sites on street for delivery operations, yet the measure is not very efficient because lack of enforcement has led to a very high private car occupation rate in these areas. Better enforcement will lead to a reduction in the time freight vehicles spend in the urban area and the subsequent negative impacts (contribution to congestion, pollution, and noise).

[31] But even then they will still contribute to traffic congestion, which leads to lower average speeds of all vehicles and higher emissions.

Developments of alternatives to road transport

Development of regional rail and waterway networks in combination with urban distribution offers some promise. Major Belgian cities are developing logistic areas integrating all transport modes: railway, waterway and road. Some of them try to combine urban distribution with other activities in these logistic centres. For instance, in Brussels Capital, waterways are used for transport of construction and demolition waste.

Spatial measures

Land use planning is an instrument to control the supply of space quantitatively and qualitatively. This is especially important in urban areas where space is rare, which makes recommendations and strict control of the location of economic and industrial activities necessary. Brussels Capital uses the ABC-location planning which determines location of commercial and industrial activities comparing their profile of mobility (which transport means are required) with their profile of accessibility (which transport facilities are settled in the place).

The combination of the Flemish land use plan and its mobility plan determines major directions of the Flemish sustainable policy: economic centres and transport infrastructures reinforce each other in improving mobility. Economic activities will be consolidated in a few major economic/industrial centres (*e.g.* Antwerp, Ghent, Zeebrugge) which will be equipped with appropriate transport infrastructure for all transport modes in order to guarantee accessibility.

Truck route-restrictions

At this time, only two cities (Antwerp and Brussels) have banned trucks from some of their urban roads.

Time-related measures

Some city centres authorise goods deliveries for only a few hours in the morning, prior to shopping hours in order to avoid conflicts with customers. Carriers have some difficulty managing the diversification of these time windows.

Guidance and information systems for traffic management

More and more carriers equip their fleets with new information technologies and guidance systems. This private initiative will cause a reduction of vehicle kilometres and time spent by freight vehicles on the urban road network and, as a consequence, a corresponding reduction of the emission of pollutants into the atmosphere. However, due to the high cost of such systems, they are mainly used by large companies.

Pick-up points

Today, there are many ways to shop: goods can be ordered by telephone, fax or Internet, and are delivered to homes or to pick-up points (local facilities such as gas stations or retailers).

Czech Republic

The main urban freight transport policy measures are restricted access for freight vehicles and city centre access fees. There are no general conditions governing access restrictions, but Law 556/1990 Coll. on local fees regulates the implementation of access fees to the city centre.

Local authorities are allowed to establish conditions for vehicle access to the city centre, both by regulating access of freight vehicles and implementing access fees for entering vehicles. The main aim of these measures is to protect the city centre from heavy traffic and regulate the movement of freight vehicles during peak hours.

Restricted access for freight vehicles

The larger cities generally provide access restrictions to freight vehicles. For example, in Prague (population 1.2 million), there are two zones with restricted access – the inner centre and centre.

- Inner centre: restricted access for vehicles totalling over 3.5 tonnes, applied Monday to Friday (08:00–18:00), except for vehicles with permits issued by the city council.
- Centre: restricted access for vehicles totalling over six tonnes, applied daily, except for vehicles with permits issued by the city council.

City centre access fees

Other cities (with populations between approximately 20 000 and 400 000) have implemented permit schemes for city centre access. Permits are usually required for all types of vehicles, not only for freight vehicles. Two examples follow.

Brno (population 390 000)

Permits are issued by the city council and are necessary for all types of vehicles. Permit fees vary according to duration:

- 1 day: 20 CZK (EUR 0.63).
- 2-5 days: CZK 40-100 (EUR 1.25 – EUR 3.13).
- 5-14 days: CZK 200 (EUR 6.30).
- 1 month: CZK 300 (EUR 9.40).
- 3 months: CZK 500 (EUR 16).
- 6 months: CZK 800 (EUR 25).
- 9 months: CZK 1 100 (EUR 34).
- 1 year: CZK 1 500 (EUR 47).

Permits are free of charge for residents and companies in the restricted area, as well as for handicapped persons.

Pardubice (population 95 000)

The city council issues permits for access to the city centre. Permit fees vary according to duration and vehicle weight:

- Vehicles up to 3.5 tonnes.
    - 1 day: CZK 20 (EUR 0.63).
    - 1 month: CZK 300 (EUR 9.40).
    - 1 year: CZK 3 000 (EUR 94).
- Vehicles over 3.5 tonnes.
    - 1 day: CZK 20 (EUR 0.63).
    - 1 month: CZK 550 (EUR 17.20).
    - 1 year: CZK 6 000 (EUR 188).

These two examples illustrate the different approach to permits in different cities. Some cities (*e.g.* Brno) apply a single fee for all vehicles; others (*e.g.* Pardubice) apply different fees for different vehicle types.

Permits are issued by the city council upon request. Fees are not required for municipal, emergency and urban transport vehicles. Permits are also free for handicapped persons. In general it is not difficult to obtain permits; local authorities usually issue them to nearly all applicants who have business or make deliveries within the restricted area. The main aim of the permits is to protect the city centre most notably from non-resident traffic; therefore, permits are usually granted to all types of vehicles. The efficiency of these measures depends heavily on city council policy, how vast the framework is and how many vehicles are permitted to enter the city centre.

The fees for the permits are not high (similar fees are applied in other cities in the Czech Republic) and are paid in advance for the selected duration at City Council offices. Electronic payment for permits has not been implemented in the Czech Republic. Therefore, entry fees for single entries to the city centre can only be applied in small cities where manual fee collection at limited points can be organised. The price of a single entry fee is similar to that of a one-day permit.

Denmark

On a national level, freight transport is mainly influenced by tax rules, the Road Traffic Act, environmental laws and energy policies. In 2000, new legislation was passed which gave the Minister of Transport the authority to allow local municipalities to suspend general traffic rules in specific areas and for a limited time period with reference to environmental objectives (“environmental zones”). See description of the Copenhagen project below.

Initial measures

During the 1990s when Germany, the Netherlands and Switzerland among other countries carried out a number of pilot projects on alternative models for distribution in city centres – known as city

logistics – Denmark mainly carried out theoretical analyses and research projects. One exception was the co-operation initiated in 1993 by the initiative of the Danish Minister for Transport between Danske Fragtmænd and DSB Gods, the two largest collective distributors in Denmark. Based on their experience in daily distribution in city areas, they aimed to create feasible solution models which would benefit the local environment and at the same time accommodate the interests of local authorities, carriers and traders. The work resulted in the following three papers:

- Portrait of an environmentally friendly transport solution for city areas (in Danish only).
- Principles of future regulation (certification) of goods transport in cities (available in English).
- Catalogue of ideas for goods transport in city areas (in Danish only).

The proposals attracted keen interest from the municipality of Copenhagen, and in 1995 a working group was established to apply a model solution to a specific project, which turned out to be the first implemented city logistic arrangement in Denmark (see section on Copenhagen). In the late 1990s a number of projects were carried out in other Danish cities as well.

Odense

An analysis carried out in the city of Odense (185 000 inhabitants) in 1995 concluded that a city logistic terminal would be feasible. The main positive effects of the terminal would be a reduction in energy consumption by vans and lorries in the city centre by 31%, which would amount to a reduction of total traffic – including private cars – related energy consumption by 7%. Furthermore, the number of lorries over six tonnes in the city centre would be reduced by about 450 per day. However, total traffic levels would not be reduced due to an estimated increase in the use of smaller vehicles for distribution of goods in the city centre. NO_x emissions and particles were expected to fall significantly as a result of a city logistic terminal, whereas emissions of HC and CO were expected to increase. No further action has been taken since the study.

Aalborg

In 1996, the municipality of Aalborg (162 000 inhabitants) carried out a thorough survey of goods transport and the potential for its rationalisation. This was followed in 1999 by a joint project between the municipality and the Road Directorate of the Ministry of Transport, where the basis for establishing a city logistics company was explored. No such company has been established yet, but a transport coordination project has been initiated whereby two major collective distributors Danske Fragtmænd and Post Denmark, jointly undertake the distribution of goods to selected areas in the city in co-operation with the recipients of the goods. Initially, the focus is on voluntary measures to ensure more efficient goods transport. This means that the recipients will receive the goods on time, carriers will benefit from increased efficiency and the number of vehicles in the city will be reduced.

Aarhus

As a result of a joint project involving local city authorities, local businesses and the Danish Environmental Protection Agency, the municipality of Aarhus (285 000 inhabitants) published in 2000 an analysis of three possible concrete solutions for reducing the number of trucks in the city centre and for utilising vehicle capacity to a higher degree: *i*) establishing an environmental zone in the inner city centre; *ii*) co-ordination of freight distribution on a voluntary basis; and *iii*) tenders for freight distribution in the city centre. Based on this result, the municipality of Aarhus plans to implement a trial environmental zone scheme for the grid of pedestrian streets. The primary purpose of the scheme

is to limit the size and weight of vehicles in order to solve the problem of vehicles spoiling the visual environment, making noise, emitting exhaust fumes and damaging pavement. The aim is to introduce a maximum total weight limit of six tonnes. In addition, requirements for engine technology and capacity utilisation will be introduced.

Copenhagen

In Copenhagen (with about 1.2 million inhabitants in the greater metropolitan area), a pilot project on city logistics was carried out during 1998-2000. This project has led to a compulsory certification scheme in the old medieval city centre with requirements of capacity utilisation and engine technology, which will initially run for two years from 1 February 2002. The aim of the trial is to reduce the environmental impact of freight traffic in the city centre and make the narrow medieval streets more accessible. The medieval centre has an area of 1 km^2 and 6 000 vans and lorries drive into the area each day. Only 15% of these vehicles have a loading rate of more than 60%, and more than half of such vehicles have a loading rate of less than 20%. Under this scheme, all trucks over 2.5 tonnes need a certificate in order to make a stop inside the inner city centre. A green certificate gives access to 20 attractively located dedicated loading zones at a price of EUR 44 for the two-year period. A truck receiving the green certificate is required to have *i*) an average loading rate of at least 60% and *ii*) an engine which is not older than eight years at the time of application. Until 31 July 2002, trucks that meet these requirements could receive a yellow certificate at a price of EUR 44. A one day red certificate that can be obtained by any truck at a price of EUR 7 enables a truck to stop within the inner city centre, but does not give access to dedicated loading zones. All haulage needs to be documented by operators, and the local authorities control the reports. Parking fines will be imposed on trucks which stop in the inner city without a certificate. English information can be found at www.citygods.dk.

Høje Taastrup

In a joint project between the Municipality of Høje Taastrup – a suburban commune just outside Copenhagen – and the Road Directorate of the Ministry of Transport, a preliminary analysis published in 2002 recommends a holistic approach to city logistics through the joint implementation of efforts in four interdependent areas: *i)* possible advantages of using the Høje Taastrup transport centre, *ii)* measures to achieve a more effective delivery of goods to shops, *iii)* requirements from goods recipients and *iv)* the planning of public authorities. No further action has been taken so far.

Tri-city co-operation

Exploration of other solutions and testing of alternative models in smaller city areas led three Danish municipalities — Aalborg, Aarhus and Copenhagen — to co-ordinate efforts for the development of goods transport in city areas. The primary objective is to create transport solutions to the benefit of the city environment in terms of road safety, air and noise pollution, accessibility, energy consumption, safety and the visual environment. Other objectives are to ensure the exchange and communication of experience and to maintain consistency in the various pilot projects to be launched. This prevents the implementation of different schemes within Denmark, which would make unreasonable demands on transport companies operating nation-wide. The three cities have also embarked on trial development projects to test various models and parameters of city logistics. As a consequence, the three cities and the Ministry of Transport have established a joint forum - the Forum for City Logistics — with its own secretariat. See www.forum-citylogistik.dk. (English summary of initiatives in Denmark is included).

France

France started, almost from the beginning, with a national approach. Both the freight transport sector and city authorities were particularly concerned with the lack of data, methods and references necessary to construct a policy framework. Therefore, in 1993, the Transport Ministry (MELTT) and the environmental and energy agency ADEME launched a national experimental and research programme on urban goods transport in France. The research focused on freight transport surveys in urban areas, modelling, initiating pilot projects, and making policy recommendations. The programme aimed to provide useful information to several groups of stakeholders, such as planners, infrastructure managers, governmental organisations and the transport sector.

Data collection

In the first phase of the programme (1993-1996), relevant quantitative information was collected on urban goods flows. Three in-depth surveys in Bordeaux, Dijon and Marseilles were carried out. Information on different stakeholders' views on urban freight transport – their main concerns and strategies – was collected. Other activities in this phase of the programme include a critical review of the legislative, regulatory, and institutional framework, an analysis of the cost structure of urban sections of logistic chains and a review of experiences in neighbouring countries. In the second phase of the programme, experiments were conducted.

Urban movement plans

In December 1996[32], cities of over 100 000 inhabitants were given two years to draw up "urban movement plans" (*plan de déplacements urbains*, or PDU in French). These plans needed to include urban freight transport. One of the intentions during this phase was to provide cities with information about traffic flows and an urban freight transport model. Pilot experiments for urban freight management were also planned, one of the ideas being to create a permanent urban freight transport monitoring system.

Local experiments

Generally speaking, few practical experiments are yet in place in France, except in Monaco, where a public terminal for urban freight transport is operational. It consists of a dispatching platform for delivering goods, in order to prevent trucks of over 8.5 tonnes from entering the inner city.

Other experiments include:

- A project has been launched in the Lille-Douai-Arras area.
- A new programme in Castelnau d'Estrétefonds (near Toulouse), which is promoted by the region.
- A city distribution centre using electric vehicles has been operating in La Rochelle since February 2001. Trucks of 3.5 tonnes and over are not allowed to enter the city centre after 07:30. Goods are transferred to electric delivery vehicles.
- Traffic flow management was studied by providing real time information in the "sustainable urban and regional freight flow" (SURFF) project in Rouen and Le Havre. The aim of this project was to create an intelligent freight programme which process and exchange

[32] This occurred as the result of the 1996 Clean Air Act in France.

information concerning the logistic chain. This is an ongoing project with participation of local stakeholders.

- Experiments in Strasbourg of urban goods deliveries using a “park and ride” concept, during the 1998 Christmas period.
- A study by the SNCF of use of rail for deliveries examined measures for changing purchase behaviour and the use of rail stations as pick-up points.
- Providing parking bays for trucks has been studied, but proved to be unsuccessful due to lack of enforcement.
- Paris is starting an experiment on deliveries using electric delivery tricycles. A feasibility study on city distribution centres is starting. Paris is also launching a study on the use of ships for the transport of goods (in addition to waste and building materials already transported by ships).

Much research has been carried out without extensive practice. This is probably due to the fact that private companies manage their own freight problems, and do not rely on public intervention.

Freight centres

It must be mentioned that France has a long tradition of developing freight centres, such as Garonor and Rungis in the Paris region. These areas have been built up by private developers. In 1993, there were about 150 freight centres in France. The three largest private developers are Garonor, Sogaris and Pan Euro Log.

GART (Groupement des autoritiés responsables de transport)

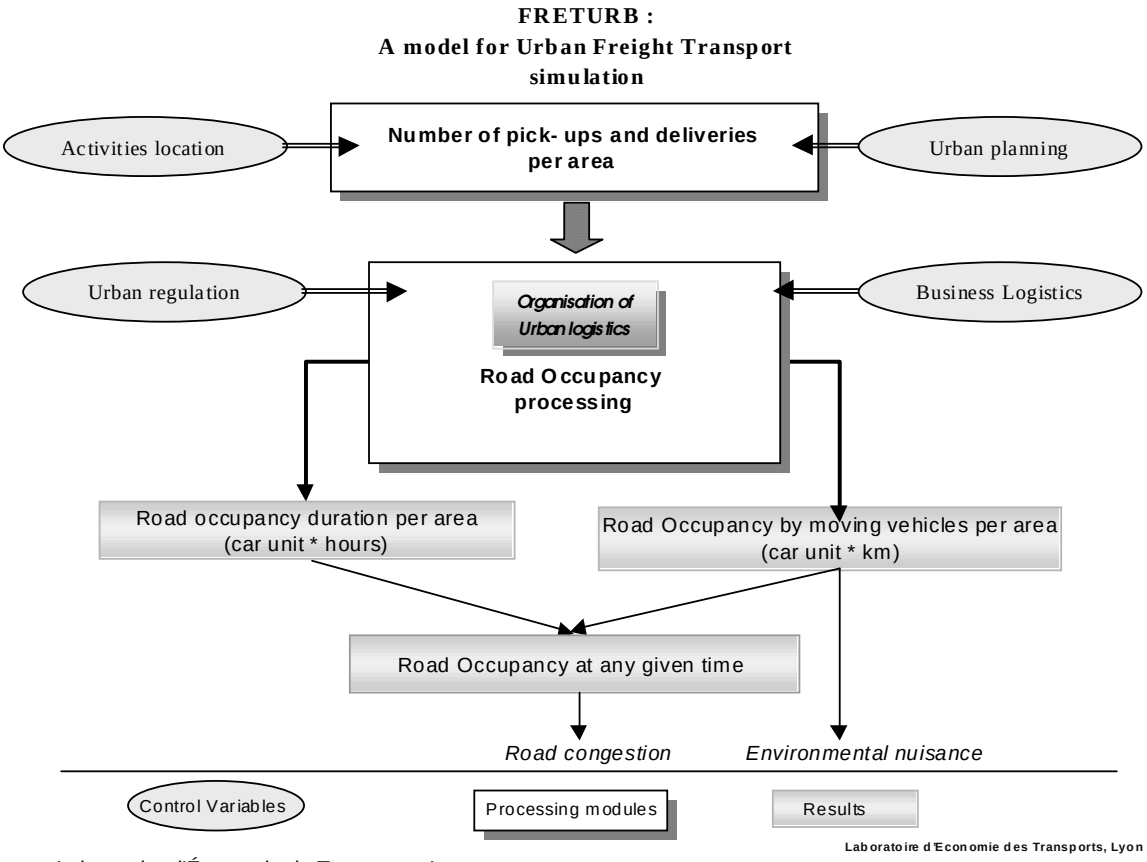
In France, GART, a network of 150 French cities and metropolitan authorities (not including Paris), operates as a national consultation programme for local public authorities in the area of urban goods distribution. GART promotes the concept of a national consultation programme, where public and private representatives meet. They also promote the installation of local consultation programmes. Such programmes are necessary because of the absence of regulatory harmonisation. For example, regulations in municipalities in the Paris region use at least 30 different definitions of a truck.

FRETURB (urban freight)

In the framework of the *Marchandises en Villes* programme (DRAST-ADEME), a model was developed to estimate the impact of urban freight transport on traffic within urban areas. The model estimates traffic volumes and traffic space occupancy (moving vehicles and vehicles loading and unloading).

The diagram of FRETURB model can be represented as follows (Figure A):

Figure A. **FRETURB**



Source: Laboratoire d'Économie de Transports, Lyons.

The software was distributed to local traffic planners. At the moment, about 20% of French towns with a PDU use the programme.

The main reason for this low performance is the lack of awareness of urban freight issues in city planning due to the reasons below:

- Public transport has been organised by municipalities for a long time and there are many specialists in public transport planning and improving efficiency of the road use by cars. Several models have been developed for this purpose and new engineers are being trained using such tools.
- On the other hand, urban freight transport has only been included in PDU since 1997 and harmonisation of freight regulations in urban areas has only been discussed since 2000. Therefore, new knowledge and practices have not been sufficiently disseminated to city authorities. Cities have had great difficulty in recruiting urban freight transport managers due to lack of specialists in this area, and few cities have succeeded in doing so.

Germany

In Germany, there is no national policy specifically dedicated to urban goods distribution. Policy is guided through the 16 federal states *(Bundesländer)*. The Federal Ministry for Education, Science, Research and Technology published a new traffic research framework in 1996 which aimed at sustainable mobility. Research projects in the field of urban goods transport aim for:

- Planning, design and implementation of freight centres (*Güterverkehrszentrums* or GVZs).
- Information technology in the goods transport sector (tools for loading space/loading zone exchanges, logistical optimisation of goods transport chains).
- City logistics (new models for co-operative goods distribution in urban areas).

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 urban environments. Many cities in Germany studied and, in some cases, have implemented a variety of measures:

- Development of logistical concepts – in co-operation with the businesses located in urban areas – with the aim of achieving organisational improvements and reducing unnecessary travel volume.
- Establishing freight transport centres and freight distribution centres with the aim of concentrating regional freight traffic flows, encouraging use of rail or inland waterways and encouraging deliveries from such transport centres to urban centres by more efficiently loaded trucks, in order to reduce the volume of truck traffic in inner city areas.
- 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 developed 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 parks and companies.
- Introducing traffic restrictions (with exemptions for environmentally friendly trucks) on certain road sections to protect the inhabitants in the neighbouring area from harmful effects of freight traffic.
- Establishing freight transport groups for local authorities and the private sector to discuss freight traffic problems together and develop worthwhile measures for regulating road haulage traffic.

The development of GVZs and the introduction of *City–Logistik* has, in recent years, been an important element in the modernisation of the German transport system. Whereas GVZs aim for the creation of inter-regional networks between conurbations, *City-Logistik* aims to organise the delivery of goods within urban areas.

Güterverkehrszentrum (freight centres)

The introduction of GVZs is a national government initiative which mainly focuses on the optimal use of rail infrastructure for goods transport. GVZ master plans have been developed since the early 1990s. Their objective is the creation of 30 GVZ locations to shift traffic from roads to rail and

ships. In addition to Bremen, GVZs have been implemented at Augsburg, Dörpen, Dortmund, Hannover, Leipzig, Munich, Nuremburg, Rostock and Trier.

City-Logistik

Briefly described, *City-Logistik* refers to a joint service for delivering goods to urban areas by different transport companies. The Bremen City Logistics Company set up such a service in June 1994. The associates of this company consist of the GVZ development company and nine forwarding agents. This company uses 13 "ecological" trucks. In 1996, 1 500 tonnes were distributed monthly (this is equivalent to 5 000 consignments or 4 000 delivery stops); this led to a traffic reduction of about 100 stops a day. In other German cities, *City-Logistik* projects have also been started (for an overview, see COWI/NTU, 1996).

Other *City-Logistik* projects have been carried out in the Hannover and Stuttgart areas. On a smaller scale, a *City Logistik* initiative has been initiated in the Aachen area. Although the presence of a GVZ is not a precondition for *City-Logistik*, both concepts benefit from this combination. Although at the start the projects looked promising, a significant number have now ended. In the period 1995-1999, transport companies withdrew their participation in *City-Logistik* projects, mainly for commercial reasons, but also because of lack of support by public policy.

EU Cost 321

Within the framework of the EU Cost 321 programme, the German federal government investigated 20 different policy measures for urban goods distribution with data from nine cities: Augsburg, Munich, Nuremburg, Cottbus, Bremen, Hannover, Bielefeld, Dortmund and Düsseldorf. The results can be found in the Cost 321 final report (European Commission Directorate General Transport, 1998). The results are not used in any national policy document in Germany.

Güterverkehrsrunde (Consultation programme)

Germany has no national consultation programme for urban goods distribution. However, in some cities, *e.g.* Hannover and Düsseldorf, local consultation programmes called *Güterverkehrsrunde* are active. These programmes are set up to develop and introduce local initiatives to solve the problems related to freight traffic in these cities (see Sustrate, 1999).

Italy

In Italy, urban goods transport consumes more than 3 billion TOE (tonne oil equivalent) per year, *i.e.* more than 7% of total energy consumption by the transport sector. Light duty vehicles (LDV), which are usually used for urban goods transport, produce 40 billion vehicle kilometres (the total of all freight transportation is 100 billion vehicle kilometres per year). LDVs are utilised for less than 30% of their capacity. On Italian urban motorways, the share of freight vehicles flow is between 12% and 15% of all vehicles, while road space occupied by goods vehicles in urban areas is higher than 20%.

Most local Italian administrators have not addressed the problem of urban goods transport. The current Guidelines for Urban Traffic Plans (PUT), the planning instrument for urban transport in Italy which was introduced in 1986, does not propose strategies for urban goods transport, although the relevance of freight transport is recognised.

The PUT is mandatory for any municipality with more than 30 000 inhabitants. Recently, the new National Transport Plan introduced mobility urban plans (PUMs) alongside the urban traffic plans in

urban transport planning. PUMs have to focus also on urban goods transport. Because of the lack of experience in Italy, pilot projects are needed. One of the pilot projects is conducted in Sienna and concerns the feasibility of a logistic base (urban distribution centre or freight centre).

In Rome, where the city centre accounts for only 1.1% of the whole city area but absorbs 33% of freight, new plans including toll systems, night deliveries, and incentives for promoting low-emission vehicles are being discussed.

Several projects concerning the use of ICT in urban freight transport are in progress. In 2002, the Ministry of Infrastructure and Transport promoted a feasibility study for a large pilot project dealing with telematics applications in urban freight transport. This project involves Rome, Siena, Terni, Parma and Vicenza. The municipality of Rome is promoting a project that aims to implement a telematic system for monitoring urban freight demand in the limited traffic zone (ZTL) through the automatic access control system which is now active in the city. The city of Parma is also developing a project for experimenting urban freight fleet management.

Japan

Comprehensive Logistics Policies Programme

In 1997 the Cabinet formally approved the Comprehensive Programme of Logistics Policies, with the following three proposed objectives:

- To provide the most convenient and attractive physical distribution services in the Asia-Pacific region.
- To establish logistics costs which will not harm competitiveness in any enterprise's establishment of its industrial or business locations.
- To address energy issues, environmental problems and traffic safety issues of physical distribution services.

The programme was a general framework of policies with the goal of realising, by 2001, logistics services which are internationally competitive, including cost aspects. In this programme, specific measures were incorporated relating to infrastructure development, deregulation, and the computerisation and standardisation of logistics systems concerning not only urban distribution systems, but also regional and international distribution. Annual follow-up reviews of the programme have been carried out and a report on the success of policies has been issued.

New comprehensive programme of logistic policies

Approaching the year 2001, the target year of the Comprehensive Programme, evaluations of logistics policies based on the programme showed that issues such as enhancing functions of logistic-related infrastructure development and smooth urban traffic flows were still challenges, although certain results were achieved on related policies. In addition, societal challenges such as the increasing gravity of environmental issues and rising demands for safety mean that logistics policies need to respond appropriately to these concerns.

Realising the need to advance policy measures efficiently and effectively through partnerships among relevant ministries and agencies, the national government has revised the Comprehensive Programme of Logistic Policies of 1997. In July 2001, the Cabinet formally approved the New Comprehensive Programme of Logistic Policies, which sets forth directions for new logistics policies.

The new programme aims to develop a new distribution system, based on the following two objectives:

- To establish an internationally competitive market including cost competitiveness by promoting comprehensive measures on logistics.
- To achieve a logistics network that will reduce negative impacts on the environment and contribute to a recycling-oriented society.

In order to achieve these two objectives, the following three policy directions have been proposed:

- To establish an advanced and wholly effective distribution system for a competitive society.
- To establish a logistics system that responds to social issues.
- To establish a logistics system that securely serves the public.

Policies in the new programme will be implemented bearing in mind the following perspectives:

- The appropriate role-sharing between stakeholders (government and private sector, and between national and regional governments).
- The establishment of a fair and competitive logistics market.
- The effective development and utilisation of logistics-related infrastructure.

In addition, the objectives of these logistics policies have been made clearer by setting quantitative targets as an indicator for the achievement of these objectives. An example of such a target is to improve the loading efficiency of all trucks to 50% during the beginning of the 21st century.

The following measures in the new programme relating to urban goods transport have been implemented.

In Japan it has been calculated that automobile emissions account for 41% of NO_x in the major cities. Automobile emissions account for 19% of Japan's CO_2 emissions. Traffic congestion costs Japan JPY 12 trillion annually. Therefore, transportation demand management (TDM) measures are being promoted by way of public-private partnerships. TDM aims to improve quality of public transportation service, to support the planned introduction of environmentally friendly (low-emission, energy-efficient) vehicles, and to improve the efficiency of urban goods transport.

One of the major features of TDM is the consolidation of freight through freight-handling facilities in urban areas. Increased traffic speed and reduced NO_x and PM emissions are expected. In the 2001 fiscal year, through a partnership including relevant ministries and agencies, local governments, transport operators, retailers and building owners, a pilot experiment for collaborative delivery services using low-emission vehicles was conducted in the Marunouchi area in central Tokyo. In this experiment, several distributors concentrated freight in one distribution centre, from which one distributor transported the freight by low-emission vehicles to the buildings where the final destinations were situated. Each high-story building was equipped with floor delivery staff that carried the transported freight to the floor of the final destination. Consultation among the stakeholders was intensive, and a platform comprising the stakeholders planned and monitored the project. The outcome of the experiment showed that the number of all vehicles in the area was reduced by 7%, NO_x and PM

emissions were reduced by 47% and 51% respectively, illegal on-road parking was reduced by 46% and the overall loading rate of trucks increased to 50%.

At the same time, measures are being implemented to expand road capacity, such as building ring roads and bypasses to divert through traffic, and improving bottleneck crossroads and intersections in order to relieve serious traffic congestion and to improve punctuality and speed of deliveries.

Parallel to developing inner-city logistics centres, establishing collaborative off-road loading/ unloading spaces and on-street loading/unloading space have been promoted, particularly in commercial districts. For example, a "pocket loading system" was created and experimentally implemented in the Roppongi area of Tokyo. This system is an off-street parking facility which aims to secure off-street loading space by utilising existing parking facilities such as monthly parking areas. The experiment was implemented by a council consisting of local residents, local shopping district organisations, the Tokyo metropolitan government and the Tokyo Truck Association. The facility was installed for freight vehicles under two tonnes (maximum loading weight) in order to improve loading efficiency. The facility was free of charge for use up to 30 minutes. A telephone reservation system was also implemented allowing users to reserve at nearby facilities. Users were able to make reservations after checking an electronic billboard showing space availability. The outcome of the experiment had positive effects of reducing traffic congestion by eliminating on-street loading and reducing idling and unnecessary driving around to find loading space. On the other hand, the experiment showed that there are still issues to be resolved, such as the need to upgrade the reservation system and create a flexible toll system, and the need to improve the road environment, such as widening sidewalks to increase safety.

Local governments have promoted the establishment of parking facilities for goods delivery by enacting parking ordinances. Currently 22 city governments have done so.

In order to contribute to the maintenance and promotion of city functions, the development of urban distribution centres has been promoted based on the law on the improvement of urban distribution centres.

With respect to environmental issues such as urban air pollution, which in recent years has become an urgent problem, measures targeting urban distribution operators also are being implemented.

Regarding air pollution, environmental impacts caused by truck transportation are being mitigated by strengthening regulations on vehicle emissions and adopting preferential tax treatment for the introduction of low-emission vehicles. In 2001, the air pollution act for NO_x and PM was amended and stricter standards were adopted. Additionally, stronger authority was given to local governments to supervise truck operators.

In addition, an environmental road pricing system imposing different tolls on toll roads (one through residential areas and the other through coastal areas) has been implemented on an experimental basis. This system aims to divert traffic from residential areas to coastal areas by imposing a lower toll on the road in coastal areas.

Furthermore, in order to contribute to the reduction of the total volume of trucks that flow into urban areas, intensive development of distribution facilities and distribution points on the outskirts of urban areas in the vicinity of ring roads and coastal areas has been promoted.

In order to reduce traffic noise caused mainly by large trucks, various measures have been promoted, such as low-noise pavement and noise barriers.

In addition, in order to make urban distribution more efficient, reduce environmental impact and reduce demand (including through-traffic demand) for trucks in urban areas, the possibility of promoting the use of ship or rail transportation has been examined, while taking into account the characteristics of each mode.

As a response to the problem of the need of safer distribution, including accident prevention, several measures have been introduced in order to prevent accidents by large trucks passing through at excessive speeds. For example, traffic safety facilities have been revised by setting vehicle stopping areas and improving traffic lights. Moreover, the act that obliges truck fleet operators to equip their large-sized trucks with speed limiters will be enforced beginning in September 2003.

Other implemented or planned measures for an efficient and environmentally friendly distribution system include: promoting information-oriented logistics, *e.g.* introducing ITS to ameliorate road traffic problems such as congestion, safety and environmental deterioration; regulatory reform and simplifying administrative procedures.

Framework for promoting logistics policies

At the national level, a committee has been established that is sponsored by the ministries and agencies dealing with logistics, such as the Ministry of Land, Infrastructure and Transport and the Ministry of Economy, Trade and Industry. The objective of the committee is to promote comprehensive and integrated logistics measures based on the new programme. On the regional level, promotion of logistics measures appropriate for each region has been based on regional conferences for promoting comprehensive logistics policies. Through such regional conferences, which are established in ten regional blocks across the country and consist of local branches of the national government, local governments and private sectors, views of the private sector are also taken into account in promoting measures.

Korea

Government policy for urban goods transport

For decades, goods transport in urban transport planning processes had only been given a minimal amount of attention in Korea because of the complex characteristics of urban goods movements and the lack of knowledge and experiences in this area. In recent years, however, a number of efforts have been initiated for the improvement of urban goods transport in major Korean cities.

The Korean government introduced the “Logistics Improvement Law” in 1991 to improve the efficiency of the nation’s logistics systems. Based on this law, the government established the long-term “Improvement Plan for Logistics Systems (1994-2003)”, which includes policies for urban goods transport.

One important policy is the construction of freight distribution facilities in the major cities to formulate a “hub and spoke” freight transport network. Based on this plan, about 40 freight distribution facilities will be constructed nationwide by 2011. It is expected that the construction and operation of these facilities will effectively reduce the current high costs of logistics activities by

making the movement of goods more systematic, alleviate traffic congestion by making more efficient the use of trucks in urban areas, and promote more efficient land use for logistics activities.

Another important policy is the establishment of urban goods transport plan for major cities. The Ministry of Construction and Transport has recently published the "Urban Goods Transport Planning Manual" which provides the guidelines for urban goods transport planning processes. Based on this policy guideline, Seoul and six large metropolitan areas need to establish their urban goods transport plans by 2003. The guideline suggests that plans include the following contents:

- Analysis of current urban goods movements and environments.
- Forecasting urban goods movements for next 10 years.
- Future demand for infrastructure for urban goods transport.
- Other policy measures for improving urban goods transport.
- Implementation plan and financial issues.

Seoul Metropolitan City

In Seoul, total freight volume reached 652 000 tonnes a day in 1996. Truck vehicle traffic at the major expressway and arterial roads from/to Seoul accounts for 20% of total road vehicle traffic (in terms of number of vehicles). Truck vehicle traffic at major arterials inside Seoul accounts for 11.7%.

Seoul had mostly relied on some regulatory policies for truck movements in urban area. They have restricted the access of trucks to certain zones. Inner centre, Yeongdungpo centre and Olympic expressway restrict the access of truck larger than 3.5 tonnes during peak hours (07:00-10:00, 17:00-21:00). Also, in these zones, the access of trucks carrying dangerous materials is restricted 24 hours.

In 1998, Seoul Metropolitan City performed a large-scale research project to collect the urban freight movement data and to develop a comprehensive improvement plan for the urban goods transport. Based on this research project, Seoul Metropolitan City established a mid-term urban goods transport plan in 1999, including the construction of new freight distribution facilities, the improvement of truck operations and the establishment of a data base on urban goods movements. Seoul Metropolitan City plans to construct seven new freight distribution centres. It also designated four districts with high truck vehicle traffic as "freight districts" and planned to implement intensive measures to improve truck operations. Examples of policy measures include the introduction of the "truck time plan" which allows dual usage of parking spaces by trucks and passenger cars during different time periods, and the provision of on-road and off-road loading facilities for trucks.

In recent years, other major cities such as Busan and Incheon have also initiated similar research projects to improve urban goods transport.

Spain

In Barcelona, the number of small delivery vehicles is now 41 000, and is growing rapidly compared to the number of private cars and heavy lorries. The city has 6 200 loading/unloading places, but a survey conducted by the municipality found that vehicles parked in such areas often did not make deliveries. Therefore, the city is implementing the following new policy measures.

Surveillance with labels

Loading/unloading areas are signposted and monitored. Delivery vehicles receive stickers which show that they are authorised to use these places, therefore enabling the use of such areas to be monitored. Sensors calculate the duration of the parking time of vehicles. A red signal announces the expiration of authorised parking time so that the police can tow away the vehicle. Cameras supplement this system.

Special lanes for multiple uses

Special lanes are used for deliveries between 07:00 and 17:00, by general traffic between 17:00 and 22:00, and for residential parking at night.

Access control zone

An access control zone has been created in the historic centre. Only vehicles holding a special smart card have access. Delivery vehicles are banned during certain time windows. This system now has digital video enforcement. Public acceptance of such zones has been high, and plans to extend this zone control are being discussed. These plans will offer more flexible time slots to clean goods vehicles.

The city is also planning to create an Internet site which will provide general information on traffic and loading/unloading areas.

Sweden

At national policy level, there has generally been reluctance to adopt dedicated policies in the area of urban goods transport, although reluctance seems to have been decreasing in recent years – for example, Sweden is investigating the possibility of implementing a modern kilometre taxation system for heavy vehicles. The reluctance was due to the fact that Swedish cities and municipalities traditionally and legally act independently from the national policy level in many areas, including urban goods transport. Also, industry has generally opposed national policy interventions with the argument that long-run efficiency is best attained by undisturbed market processes.

Therefore, national policies with relevance for urban goods transport seem to have concentrated on vehicle/fuel taxation and regulations, and national R&D programmes within the field of vehicles and alternative fuels.

Environmental zones

In Sweden, the cities of Stockholm, Gothenburg, Malmö and Lund have implemented environmental zones. The same rules are applied in all cities and are relevant only for heavy vehicles.

The main rule is that all vehicles weighing over 3.5 tonnes (total weight), registered for the first time more than eight years ago are forbidden to enter the environmental zone at any time. Municipal councils have the right to control the age of the vehicles entering the zone, and this is made possible by the vehicles needing to have approved stickers on their windscreen. There are, however, some exceptions to the main rule:

- Vehicles which can be certified according to Euro-4 (or better) can, after approval, enter the zone even if they can not live up to the "eight year rule".
- Vehicles with additional catalytic converters following stipulated requirements can also apply for permits to enter the zone.
- It is also possible to enter the zone after engine replacement, if the engine meets stipulated (EU) requirements for the best environmental class when the engine is installed.

There are also exceptions for vehicles with special equipment, but they must in all circumstances use additional exhaust cleaning devices.

The environmental zones are clearly defined by "borders" in all cities, with the exception of Stockholm where some main through roads in the zone are excluded from the regulations.

The environmental zone in Stockholm has, according to the latest results, led to a reduction of approximately 10% in NO_x and approximately 40% in particles. Some reduction in noise emissions has also been achieved. Earlier estimations pointed at a reduction of 20% with hydrocarbons. All these figures concern emissions from heavy vehicles. The actual total environmental improvements are obviously of a smaller extent due to the traffic by lighter vehicles, *e.g*. passenger vehicles.

Netherlands

The introduction of urban distribution centres on the national transport policy agenda (to solve the accessibility and environmental problems of freight transport in cities) occurred in the Netherlands between 1990 and 1995. This was one of the measures mentioned in SVV II (Second Dutch National Transport Plan of the Ministry of Transport, Public Works and Water Management, 1990). The Ministry considered the introduction of an urban distribution centre (UDC) in the city of Maastricht as a pilot project to verify this policy. The results are discussed below.

In 2002, the SVV II is to be replaced by the the Ministry of Transport, Public Works and Water Management's *Nationaal Verkeer en Vervoer Plan* (NVVP) following parliamentary approval. The NVVP requires concerted actions of municipalities located within 19 different regions in the Netherlands, in order to establish a sustainable transport policy, including urban freight transport. Some elements of these plans are to be approved by the central government. The policy document also announces additional research of other initiatives in the field of urban goods transport. An important policy initiative is the promotion of 24-hour delivery for urban areas within specific noise limits, which is 60-65 decibels in residential areas between 19:00 and 07:00.

Urban distribution centres

Between 1993 and 2000, a few attempts were made to start up urban distribution centres in cities such as Maastricht, Leiden (which made use of special electric vehicles), Groningen, Amsterdam, Utrecht and Arnhem. These experiences proved that UDCs for cities with fewer than 200 000 inhabitants and non-commercially run by a public-private partnership are commercially unsuccessful and not very effective in solving problems. The UDCs often faced problems with their locations and did not receive support from the commercial transport companies. UDC concepts that are likely to stay relate to commercially and privately owned DC's of nationwide operating transporters. These transporters can be qualified and earmarked as local urban distributors when they run dedicated services with full truckloads, possibly with environmental friendly equipment. As a reward municipalities can grant these transporters special entry admissions for inner-city delivery. The

Groningen and Amsterdam projects look quite promising, and many cities in Netherlands are likely to copy the Amsterdam model.

National forum

In April 1995, the Forum for Physical Distribution in Urban Areas *(Platform Stedelijke Distributie)* was set up. This forum was initiated by the Ministry of Transport, Public Works and Water Management and functions as a public-private partnership. The forum supports initiatives from local authorities or private enterprises that will lead to more efficient urban freight transport. All interest groups, such as shippers, wholesale companies, retail organisations, transport companies and local and provincial governments are represented in the programme. The role of the forum is to harmonise municipal legislation, to initiate, guide and stimulate new projects and policy objectives, and to publish the results. Various products have been developed by the forum and are promoted and implemented in the most important towns in the Netherlands by four regional task forces. The regional task forces are staffed by representatives from various public institutions and businesses. The most important products of the forum are the Vehicle Access Matrix and a list of experimental innovative measures applicable for problem solving in cities, *i.e.* truck routes, off-time and night deliveries, kerbside facilities, and dedicated lorry lanes, including lanes shared with public transport within urban areas. A benchmarking model has been developed in order to confront the municipalities with the consequences of local regulation to urban goods transport. This model relates to the criteria of sustainable urban goods transport, *i.e.* environment, economy, society and infrastructure.

Harmonisation and standardisation

In 1999, a vehicle access matrix was proposed by the transport interest groups and accepted by the forum to promote standardisation of the vehicle restriction regimes in the Netherlands. The application of this matrix was adopted in the national transport policy document (NVVP, 2000). The Vehicle Access Matrix serves as a guideline for vehicle restrictions in urban areas. It describes, for four types of trucks with a weight of more than 3.5 tonnes, to what extent they could have access to certain types of areas, and under what conditions (loading factor, emission standards). Four types of area are distinguished: main routes, the inner city, 7.5 tonnes (total truck weight) restricted areas, and pedestrian zones.

Table A. **Vehicle access matrix**

Category 1 vehicles		*Access regime*		
Type: Truck *Weight:* 3.5-7.5 tonnes *Wheel base:* < 4.5 m *Length:* max. 7.5 m *Width*: max. 2.3 m *Height*: max. 3.2 m	*Load factor* Not applicable *Emission standard* Euro-2, hybrid, LPG or other clean technology	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 06:00 - 12:00	*Permit required* No No No No, else custom-made
Category 2 vehicles		*Access regime*		
Type: Truck *Weight*: 7.5-18 tonnes *Wheel base*: < 5.5 m *Length*: max. 10 m *Width*: max 2.55/2.6 m *Height*: max. 3.6 m	*Load factor* 80% or more *Emission standard* Euro-2, hybrid, LPG or other clean technology	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 06:00 - 12:00	*Permit required* No No Yes, custom-made No, else custom-made
Category 3 vehicles		*Access regime*		
Type: Solo-truck *Weight*: > 18 tonnes *Wheel base*: > 5.5 m *Length*: max. 12 m *Width*: max 2.55/2.6 m *Height*: max. 4 m	*Load factor* 80% or more *Emission standard* Euro-2, hybrid, LPG or other clean technology	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 06:00 - 12:00	*Permit required* No Yes, custom-made Yes, custom-made Yes, custom-made
Type: Tractor-trailer *Weight*: < 40 tonnes *Wheel base*: too divers *Length*: max 16.5 m *Width*: max 2.55/2.6 m *Height*: max. 4 m	*Load factor* 80% or more *Emission standard* Euro-2, hybrid, LPG or other clean technology	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 06:00 - 12:00	*Permit required* No Yes, custom-made Yes, custom-made Yes, custom-made
Type: Articulated truck *Weight*: < 40 tonnes *Wheel base*: too divers *Length*: max. 18.75 m *Width*: max 2.55/2.6 m *Height*: max. 4 m	*Load factor* 80% or more *Emission standard* Euro-2, hybrid, LPG or other clean technology	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 06:00 - 12:00	*Permit required* No Yes, custom-made Yes, custom-made Yes, custom-made
Category 4 vehicles		*Access regime*		
Type: Special transport *Weight*: > 40 tonnes *Wheel base*: - *Length*: - *Width*: - *Height*: -	*Load factor* Not applicable *Emission standard* Euro-2	*Zones* 1 = Main routes 2 = Inner city 3 = 7.5 tonnes 4 = Pedestrian	*Time of delivery* 24 hours 24 hours 24 hours 24 hours	*Permit required* No Yes, custom-made Yes, custom-made Yes, custom-made

Source: Netherlands Forum for Physical Distribution in Urban Areas *(Platform Stedelijke Distributie)* (1999).

Law enforcement

One of the difficult issues confronted in local policies is how to control freight vehicle movements, and how to enforce regulations about time and size restrictions in different parts of cities. Although there are strict regulations concerning which trucks may or may not enter the city and when, it is quite difficult to enforce these regulations and to maintain control. For the moment, in most cities, parking guards are in charge of this function. In some cities, an electronic system has been proposed, which would control access to some areas.

Underground transport systems

A long-term project is the development of underground transport systems for freight. The feasibility and desirability of an underground freight transport system in cities is being studied in different projects initiated by the national government. (Hacco *et al.*, 1996; Brouwer *et al.*, 1997a, 1997b). Feasibility studies have been taken place for Leiden, Schiphol and Tilburg. The concepts look promising but very cost intensive, and the government is not willing to pay the investment costs without significant private participation. Therefore, the medium term prospective is not promising so far.

Environmentally friendly vehicles

In 1999, the national government proposed, as an environmental target, that in the year 2010 between 30-60% of the vehicles within inner cities must use liquid propane gas (LPG) or liquid natural gas (LNG) as fuel. Based on the results of some experiments with LPG trucks, the Dutch government decided to no longer promote LPG trucks in urban areas because of the high costs of these engines, the safety aspects of LPG and the non-availability of standardised LPG trucks on the European market.

United Kingdom

Between the mid-1970s and the late 1990s there was a lack of research and policy interest in urban freight transport in the United Kingdom. However, this situation has now changed. The UK government has now affirmed its commitment to bringing about more sustainable urban distribution operations in the most recent Transport White Paper (DETR, 1998) and the daughter document entitled "Sustainable Distribution" (DETR, 1999). The approach that the Government is taking involves making urban freight transport both more economically and environmentally sustainable. Much of this is expected to take place at a local level with urban authorities working closely with freight transport companies and their customers to encourage these organisations to distribute goods in a more efficient manner that will reduce distribution costs for the companies concerned and bring about environmental benefits for those living and working in the urban area.

With the government's recently acknowledged need for integrated thinking when considering transport (DETR, 1998), the Department of Environment, Transport and the Regions (DETR)[33] has begun to recognise and promote the need for a supply chain approach, especially when relating freight transport to the notion of sustainability. Within the government report "Sustainable Distribution" (DETR, 1999), the following sustainable distribution objectives are identified:

[33] Following reorganisation in 2001, the DETR has now become DTLR (Department for Transport, Local Government and the Regions).

- To increase the efficiency of distribution and thereby improve competitiveness, choice and economic growth.
- To minimise the social and environmental impacts of distribution and thereby increase people's quality of life.

Passenger transport issues have generally taken priority over freight transport matters in local government in the United Kingdom. However, at local government level this is changing and there is growing recognition of the importance of freight transport considerations. This is due to the following factors:

- The recognition of the environmental problems caused by freight transport.
- A realisation that there is a need to make freight transport more efficient for commercial reasons.
- Pressure from central government to generate policies and plans for freight transport (local authorities need to place increased emphasis on urban freight transport policy in order to successfully develop their new local transport plans[34]).

As a result of this new thinking in central government, local authorities are now required to include a section on "sustainable distribution" in the new local transport plans (LTPs) that they have to submit to government for the allocation of resources for local transport capital expenditure. Local authorities in England had to prepare and submit to national government their first five-year LTPs in July 2000. These plans were assessed at a national level and the central government issues their decisions about local transport capital settlement for 2001/2002 in December 2000.

As part of the LTP process, the national government provided guidance that defined minimum requirements of a sustainable distribution plan, together with characteristics of a good sustainable distribution plan. These are shown in Table B.

Table B. **Government guidance criteria for sustainable distribution**

Minimum requirements
• Description of policy for the development of an integrated, sustainable requirements distribution system which takes into account the dominant role of road freight and the potential for modal transfer to rail or inland waterways.
• Evidence that the strategic role of freight distribution in the growth or regeneration of the local and regional economy has been assessed.
• Evidence that efforts have been made to bring freight transport operators, businesses and the local community into the strategic thinking and planning processes.
• Clear evidence of effective partnership with navigation authorities, rail infrastructure providers and freight operating companies to promote greater use of alternative modes for freight distribution.
• Evidence that opportunities for the greater use of rail and water freight are being taken into account in land use planning decisions.

[34] Local transport plans are the system by which the United Kingdom central government allocates resources for local transport capital expenditure. These plans, which are produced by local highway authorities, cover all forms of transport, and are designed to co-ordinate and improve local transport strategy and provision.

Table B. **Government guidance criteria for sustainable distribution** *(continued)*

Characteristics of a good local transport plan
• Evidence of progress in establishing freight quality partnerships, identifying key organisations and companies involved.
• Clear strategies to help industry develop and implement best practice.
• Comprehensive assessments of existing operational and non-operational freight facilities within the area, evidence of consideration of potential for freight grants.
• Clear strategies and identification of flows that could be transferred to alternative modes, including an assessment of the lorry journeys to be saved.
• Strategy to balance the requirement for efficient goods distribution with the social and environmental effects, particularly in an urban environment.
• Clear evidence of lorry routing strategies.

Source: Adapted from DETR (2000).

As can be seen from Table B, the government selected "progress in establishing freight quality partnerships" as characteristic of a good LTP. Freight quality partnerships (FQPs) are an initiative launched by the Freight Transport Association (FTA) in 1996. The FTA initiative brought together industry, local government and representatives of local and environmental interest groups to pursue the following agenda:

- To identify problems perceived by each interest group relating to the movement and delivery of goods in their city.
- To identify measures within the group's competence to resolve or alleviate such problems.
- To identify best practice measures and principles for action by local government and industry to promote environmentally sensitive, economic and efficient delivery of goods in towns and cities.

The FQP initiative was tested in four United Kingdom urban areas in 1996: Aberdeen, Birmingham, Chester and Southampton.

The United Kingdom government has been promoting FQPs since 1999 (DETR, 1999). FQPs can facilitate improved dialogue about urban freight transport issues between local authorities, freight transport companies, retailers, manufacturers and other businesses, local residents and other interested parties. This can lead on to more efficient, less harmful operations. In their guidance document the government stated that, "Freight Quality Partnerships provide local authorities with a means to formalise the consultation and development work undertaken in their sustainable distribution strategy. Authorities have an integral role to play in helping industry, through developing partnerships to progress and develop best practice in sustainable distribution systems, and to find solutions to the issues of greatest concern. For example, freight quality partnerships provide a good means of delivering air quality and noise benefits while removing peak hour traffic and improving the efficiency of deliveries at the same time. Companies can be given improved access to premises and extended delivery hours, including night time deliveries, in return for agreeing to use cleaner, quieter vehicles and agreeing a night time code of practice," (DETR, 2000).

Approximately 50 local authorities referred to the development of FQPs or similar schemes under a different name in their Local Transport Plans. However, study of the LTPs that mention FQPs shows that there are significant differences in how these local authorities are choosing to define FQPs, and some are still in the process of working towards the introduction of FQPs rather than setting them up now. The LTPs indicate that approximately 15-20 local authorities have already put in place formal

agreements and arrangements for a FQP. These authorities include: Hampshire, Southampton City, Surrey (FQP established in Guildford), Kent (FQP in Canterbury), Ripon, Northamptonshire, the West Midlands, Leicestershire, and Nottinghamshire. An example of what may be involved in a FQP is shown in Box A.

FQPs should help ensure that freight and service transport receives the level of attention they deserve, providing recognition of the fundamental role played by freight and service vehicles in the functioning of towns and cities. FQPs should play an important role in finding a suitable balance between economic and environmental pressures in UK urban areas. However, there are several unresolved issues surrounding FQPs. These include:

- How to include freight and service companies not based in urban area.
- How to involve a significant proportion of all relevant companies.
- The level of public funding available for policy measures, initiatives and enforcement.
- How to ensure compatibility between policymaking at the local, regional and national levels.

Box A. **Example of the Guildford Freight Quality Partnership**

Guildford is a county town plus regional shopping centre located in Surrey, which is southwest of London. Guildford has a population of 126 000. Surrey has the highest level of car ownership in United Kingdom (83% of households).

Aim: to conserve historical character, be pedestrian-friendly, encourage trade and reduce traffic congestion through public transport.

Guildford freight traffic – typical weekday (07:00–18:00).

Light goods vehicles (up to 3.5 tonnes gross vehicle weight): 7% of vehicle trips.

Heavy goods vehicles (over 3.5 tonnes gross vehicle weight): 3% of vehicle trips.

A survey of businesses has been carried out to determine problems in receiving goods. Main findings are:

- Lack of parking enforcement, causing unloading problems.
- 11:00-16:00 pedestrianisation restricts delivery flexibility.

Lack of desire for out-of-hours deliveries due to costs, staffing, security.

A survey of operators has been carried out to determine problems delivering goods. Main findings are:

- Staff not always ready to receive goods.
- Some streets narrow and difficult to manoeuvre in.
- Lack of kerbside loading facilities.
- Poor signing on the town centre gyratory system leads to some drivers becoming lost.

Solutions considered by members.

- More out of hours deliveries.
- Transhipment centre – to transfer goods from large to small vehicles (but more trips).
- Need to reduce private car traffic.

Preliminary measures identified in the Guildford FQP:

- Map for delivery drivers showing suitable routes.
- Improved signing to help drivers.
- Investigation of park-and-ride possibilities.
- Improved enforcement of parking restrictions to protect kerbside for deliveries.

Guildford FQP membership list: Guildford Borough Council, Surrey County Council, Guildford Environmental Forum, Guildford Society, Surrey Police, J Sainsbury plc, Cavington Distribution, Courage Limited, Cranleigh Freight Services Ltd, Boots the Chemist, Freight Transport Association.

Major urban freight policy developments in London

Four policy measures concerning urban freight transport in London are discussed in this section:

1. The London Sustainable Distribution Partnership.
2. The London Lorry Control Scheme.
3. The Congestion Charging scheme.
4. The London Low-Emission Zone.

Of these, the London Sustainable Distribution Partnership and London Lorry Control Scheme already exist, the Congestion Charging scheme was implemented in February 2003, and the London Low-Emission Zone is currently only a feasibility study. Each of these is described in more detail below.

The London Sustainable Distribution Partnership

The London Sustainable Distribution Partnership (LSDP) was established in 2002 by Transport for London (T*f*L) as part of the Mayor's Transport Strategy to bring together the boroughs, business and the freight industry to develop an effective strategy for distribution of goods and servicing in London.

The objectives of the LSDP are encapsulated in the Mayor's Transport Strategy. Policy 4K.1 states:

> *"The Mayor and Transport for London will work with the London boroughs, business and the freight, distribution and servicing industries, and other relevant organisations to ensure the needs of business and Londoners for the movement of goods (including waste) and services are met, whilst minimising congestion and environmental impacts in accordance with the objectives of the Mayor's transport, air quality, waste and noise strategies."*

LSDP will identify and deal with the key issues affecting sustainable distribution in London, encouraging the introduction of trial schemes, and championing innovative solutions. It is intended that these objectives be achieved through the joint working of the partners under the umbrella of LSDP.

LSDP will initially focus on road-based distribution and delivery issues, rail freight development, and the use of London's waterways. This will include developments and implementation of the following:

- Review of the London Lorry Control Scheme.
- Improve the conditions for service vehicles in London.
- Explore the potential for out-of-hours deliveries to ease congestion.
- Seek to minimise the environmental impact of freight transport and servicing in London.
- Promote opportunities to foster a progressive shift of freight from road to more sustainable modes such as rail and water.

- Identify and develop suitable rail freight routes, multi-modal depot sites, use of mainline termini and innovation in freight handling.
- Review and identify options for maintaining and increasing freight use of the Thames and other waterways.

Members of the LSDP are drawn from a diverse group but all with an interest in freight and its commercial and environmental impacts. The value of such a diverse group is to bring expertise, knowledge and examples of good practice to deliveries, distribution and servicing in London.

The London Lorry Control Scheme

The former Greater London Council (GLC) decided that it should introduce restrictions to stop unnecessary heavy lorry movements disturbing Londoners at night. As a result, the London Lorry Control Scheme came into force in 1985. This is a London-wide night time and weekend ban on lorries over 18 tonnes gross vehicle weight. The ban includes all roads in London except trunk roads and several other exempt roads.

The controlled periods for lorry movements are as follows:

- Between 21:00 and 07:00 on Mondays to Fridays inclusive.
- Between 00:00 and 07:00 and between 13:00 and 23:59 on Saturdays.
- At any time on Sundays.

Any goods vehicle over 18 tonnes gross vehicle weight that wishes to use a road that is part of the London Lorry Control Scheme during the controlled hours must be covered by an exemption permit. These permits are available to vehicles that can demonstrate a need to use restricted streets at controlled times.

Congestion charging scheme

The Mayor of London introduced a congestion charging scheme in central London in February 2003. In this scheme vehicles pay GBP 5 per day to enter central London between 07:00 and 18:30.

Goods and service vehicles working in central London are subject to this charge. The Mayor anticipates that the congestion charge will reduce traffic levels in London, and that freight and service companies will benefit in terms of shorter and more reliable journey times.

It was originally proposed that goods vehicles should pay GBP 15 per day. The freight industry was critical of this charge. The proposed charge was subsequently reduced to GBP 5 per day for all vehicles.

Transport for London anticipated that congestion charging would result in substantial decreases in traffic:

- Inside the zone:
  - Traffic would be reduced by 10-15%.
  - Queues would be reduced by 20-30%.
  - Traffic speeds would be increased by 10-15%.

- Outside the zone:
  - Traffic may increase on orbital routes by up to 5%.
  - Traffic would be reduced on radial routes by 5-10%.
  - Overall reduction in traffic by 1-2%.

Clearly, the reductions in traffic actually achieved could lead to greater reliability for the trip times of goods and service vehicles. Increased reliability could offset some or all of the additional costs but full impacts have not been assessed. In addition, while it was expected that traffic would fall in the congestion charging area it was also expected that congestion would be worse around the edge of the zone. This in turn would reduce the level of benefits to be expected from more reliable delivery and service trips in the central area.

Feasibility of a London low-emission zone

The Mayor of London, the Association of London Government and two government departments have jointly commissioned a study examining ways of improving the quality of air in London. This is in response to recent United Kingdom and European legislation which has introduced target levels for air quality in forthcoming years. Air quality monitoring has shown that London's air quality is the worst in the United Kingdom and is also amongst the worst in Europe, and it is unlikely to achieve the targets set out in the legislation unless action is taken.

It is likely that London will exceed the target levels in large parts of the central and inner area, along the M4 corridor including Heathrow, and across the city's major road network. Studies show that the main source of the poor air quality is road traffic. Under the legislation, "air quality management areas" have to be declared and action plans drawn up detailing possible measures to improve their air quality. The Mayor of London also has to produce a London Air Quality Strategy. An important measure that could help improve London's air quality is the implementation of a low-emission zone (LEZ).

As part of this study, the feasibility of introducing low-emission zones in London is being investigated. Similar zones are already in use in Sweden. The aim of a LEZ is to improve air quality by excluding older, high-polluting vehicles from certain areas and encouraging the faster take up of more modern, cleaner vehicles.

The London feasibility study is examining the potential of LEZs applying to HGVs, buses, coaches and taxis, which are the dominant source of the road transport pollutant emissions of concern. It is also considering the possibility of extending the zone to include Light Goods and Commercial Vehicles (*i.e.* commercial vehicles below 3.5 tonnes gross vehicle weight)

At this stage three main areas are being considered for the LEZ: *i*) the entire area inside the M25, *ii*) the entire area inside the North/South Circular, and *iii*) the entire area inside "inner" London (consistent with the area proposed in the Congestion Charging Scheme). Potential schemes in the Heathrow/West London area and outer London town centres are also being considered.

If the London authorities decided to go ahead with an LEZ for London the earliest possible date it is likely to be implemented is 2005.

United Kingdom freight initiatives taken by companies

Companies (freight transport and service companies and/or their customers) tend to implement initiatives that will reduce the impact of their freight operations, because they will derive some internal benefit from this change in behaviour. This could occur because the company can achieve internal economic advantages from operating in a more environmentally or socially efficient manner, either through improved economic efficiency or through being able to enhance market share as a result of their environmental stance. Instances of company-led initiatives include increasing the vehicle load factor through the consolidation of urban freight, making deliveries before or after normal working hours, the use of routing and scheduling software, improvements in the fuel efficiency of vehicles, in-cab communications systems, and improvements in collection and delivery systems (including materials handling technology, unitisation of loads and co-ordination between shipper, carrier and customer). As this list illustrates, some of these initiatives are technology-related, some are concerned with freight transport companies reorganising their operations and some involve change in supply chain organisation.

These company initiatives vary in terms of: *i*) responsibility for action — *i.e.* which party or parties in the supply chain need to change their operations to realise the initiative, and *ii*) support for the initiative – *i.e*. which other party or parties in the supply chain need to support the initiative in order for it to be successful. Some company initiatives, which could result in environmental and economic benefits, only require the action of one party in the supply chain and are therefore the easiest to achieve in managerial and implementation terms. Other company initiatives require the action of one party in the supply chain and the support of other parties, or require more than one party in the supply chain to jointly implement changes to their operations for the new approach to be feasible. These initiatives are more difficult to achieve as they can require dialogue, agreement and joint working between supply chain parties.

Some company initiatives that require the involvement of more than one party in the supply chain will not necessarily appeal to them all. This is because the operational or financial benefits that would be derived from the initiative would all accrue to one party. In the case of some of the initiatives which yield net financial and/or operational supply chain benefits (for example, out-of-hours deliveries, and staff at receiving premises helping to unload delivery vehicles/distribute goods within the premises), one supply chain party would experience increased costs as a result of the initiative, while another party would reap the benefits. This represents a barrier to the implementation of initiatives that would, in macro terms, have environmental and economic benefits. In order to ensure that such initiatives are implemented it is necessary to establish ways in which the benefits could be shared between the supply chain parties.

The company initiatives also vary in terms of the time it would take to bring about the desired effect. For instance, the benefits of driver training programmes are immediate, whereas modal shift from road to rail and its associated benefits would take far longer to achieve.

Many company initiatives that could be introduced require agreement and operational changes at the point of goods delivery. However, if the delivery to the premises is made by a third party freight transport company on behalf of a supplier or wholesaler, then it is usually the case that the transport company's customer is in fact the sender rather than the receiver of the goods. In this situation, formal communication and planning between the transport company and the receiving premises tends to be limited or non-existent. The lack of a contractual arrangement between the transporter and receiver can make it difficult for parties to discuss and reach agreement about the implementation of company-driven solutions such as, for example, the times at which deliveries are made, and the need for checking and signing for deliveries.

The implementation of initiatives that need the active participation of several supply chain parties tends to require the existence of good existing communications and meetings between suitably senior staff from each party. Often such meetings between supply chain parties to discuss distribution initiatives do not currently take place, especially in the case of smaller companies, and also larger retailers and manufacturers that use many different freight transport and logistics companies.

United States

Despite the inclusion of the need for planning for urban goods movement since the inception of the requirement for metropolitan transportation planning in the 1962 Federal Aid Highway Act, and the reinforcement of that need in subsequent acts (ISTEA in 1991 and TEA 21 in 1998), planning for urban freight movement has received relatively little attention in US urban areas. The United States takes the perspective that private firms should hold their destiny in their own hands; hence there is no national freight policy. However, after the passage of the North American Free Trade Agreement, the federal government undertook the Latin American Trade and Transportation Study (LATTS). This study generated a wealth of current and projected freight movements through US ports and resulted in the creation of the FHWA Freight Analysis Framework, a computer tool to allow states and cities to analyse freight movements at a county level.

The following are a few examples of freight problems and solutions identified by major urban area planners.

New York City

Major barriers to freight mobility are widespread congestion, theft/vandalism, inadequate docking space, and insufficient kerbside parking for commercial vehicles. Recommendations to increase productivity in the central building district include off-peak and extended delivery hours, additional truck parking zones, and incentives to upgrade docking areas. Initiatives that have the potential to increase efficiency of urban goods movement include improved law enforcement to deter theft/vandalism, information-based improvements such as accurate signage, the use of ITS technology and management systems to actively manage kerbside commercial parking zones, and improved road maintenance.

Los Angeles area

Major components of the goods movement strategies include proposals for developing dedicated truck lanes on freeways, grade separation of major freight corridors at key arterial streets, and development of strategic freight corridors such as the Alameda Corridor that provides a direct and efficient link between our ports and the central business district. It is becoming more evident that physical capacity enhancement to handle freight movements and distributions must be coupled with improvement in operations in co-ordination with all the stakeholders involved. Some of the specific actions that would help improve overall regional mobility include extension of port operation hours, restriction of trucks on the freeways during peak hours, and flexible delivery schedule of goods.

There are many other cities – Seattle, San Francisco, Phoenix, Chicago, Philadelphia, New Orleans, Atlanta, etc. – that are beginning to awake to the fact that provisions need to be made to accommodate urban freight though not yet at the same level as passenger planning.

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ANNEX 3

TOOL KIT OF POSSIBLE MEASURES

Various measures are implemented or planned in order to achieve efficient urban goods transport systems. The main possible measures are discussed below.

Regulation and licensing

Various types of access regulations have been implemented in member countries, especially in Europe. The following types of regulations can be applied to freight traffic:

- Time windows.
- Axle load and/or vehicle weight.
- Dimensions and/or surface areas of vehicles.
- Emissions.
- Noise.
- Target group.
- Loading rate.
- Type of freight (dangerous goods).
- Any combination of the above.

When necessary, certain sections of a city can be made difficult to access for all vehicles. These areas are known as eco-zones, car-sheltered areas or pedestrian areas.

Time windows

Time windows primarily aim to keep designated streets or areas free of freight traffic during specific periods. As a result, freight traffic is concentrated during the window times. Many European cities have regulations on delivery time windows in city centres. In many cases, time windows open up in the morning (starting at 07:00, closing at 12:00 or 13:00) and are partly extended in the afternoon for pick-up activities and home deliveries. Delivery time windows very much depend on the opening times of shops.

For example, time windows in the Netherlands usually start between 06:00 and 08:00, and close between 10:00 and 12:00; the majority are from 07:00 to 12:00. A time window of four hours is usually sufficient; but in some cases, it is of two hours. In certain cases, there may also be time windows during evenings.

Night deliveries are often regulated and are controversial. For example, French cities are (nearly equally) divided – some cities consider this as a good strategy to decrease the number of trucks in the city during daytime, and other cities argue that truck and delivery noise impacts of night delivery are too high and therefore should be banned. Local habits and cultural differences influence the acceptability of night deliveries.

In many municipalities, introducing time windows is on the agenda.

Weight restrictions

Restrictions based on axle load and/or vehicle weight aim to limit the physical damage that freight vehicles inflict on the infrastructure. The infrastructure at risk of being damaged may be located either under or beside the road surface. Weight restrictions are the most common regulation in Europe.

Dimensions and/or surface area restrictions

Restrictions based on dimensions and/or surface areas of vehicles (such as those applied in Paris) are primarily intended to limit the physical hindrance of freight traffic. Smaller vehicles are easier to operate in the urban environment, and the driver's control of the vehicle is usually better. In many municipalities, the maximum length used is 10 metres.

Emission and noise restrictions

Emission and noise restrictions aim at preserving the quality of life in urban areas, which is already under assault due to the concentration of activities. Traffic is often the main source of emission and noise, and freight traffic plays a significant role.

The system of "eco-zones" used in Germany utilises "emission" criteria: traffic in a particular area is admitted only as long as it does not lead to higher levels of polluting substances than is permitted. In practice, standards are applied to emissions and traffic volume, whereby the total level of emissions is controlled. For freight traffic, it essentially means that only vehicles that conform to strict environmental standards may enter the areas concerned. Four cities in Sweden have introduced environmental zones. Within these zones, trucks are only admitted if they satisfy certain criteria.

Restrictions based on target groups

Access restrictions based on target groups are another form of restrictive policies that may be used. For example, restrictions can be waived for freight transport operators making consolidated deliveries. The city of Amsterdam aims for a higher loading rate by providing only a limited number of concessions.

Licenses

Licensing is a measure to control access by allowing access to a street, an area, or a parking zone only for operators with licenses or to licensed vehicles.

Criteria for giving licenses may be linked to the characteristics of vehicles or of freight traffic. Everyone who satisfies the criteria receives a license. The criteria are free to be defined as long as general commercial rules are not in conflict.

In Copenhagen, a pilot project was carried out where licensed vehicles obtained access to several preferred loading and unloading zones only if their loading rate was above 60%. Within 18 months, 80 companies had over 300 licensed vehicles (mainly big lorries). Almost all participants in the voluntary scheme were able to achieve the required 60% loading rate and the transport companies were generally satisfied. 20% of all participating transport companies changed their daily transport planning behaviour during the experiment. The project has led to the introduction of a compulsory certification scheme.

It is also possible to apply a point system, such as the "eco-point" system for international freight traffic in Switzerland. Whoever has used too many points will no longer be allowed into the city.

A new development in regulation is the certification of transport companies in combination with the introduction of permits (*i.e.* green sticker). Certification means that transport companies, organisations, or vehicles, meeting a set of criteria, such as size, weight, emissions, and/or average loading rate, receive a permit. With this permit, the company can make use of certain routes, may enter certain areas or may use certain public loading/unloading facilities. The loading rate is useful as a criterion because it is an indicator for an efficient use of vehicles.

Access slots

Access slots are still only in use on the private side in order to regulate and optimise gate access for a warehouse or a large retailer. Nevertheless, it will become possible on the basis of conventional technologies to control the access of individual vehicles at certain entry points or within predefined areas. Measures allowing only a limited number of accesses per district or per time unit can then be realised, and approaching vehicles can register in advance for their access. This is still in the future for public domains, but allows tailor-made solutions in implementing regulated access.

Preferred truck routes

Preferred truck routes are useful in preventing transit freight traffic from penetrating city centres. Preferred truck networks can be planned by assessing environmental and time effects of various routes within a model.

The city of Bremen has investigated such a truck guidance network for the following two reasons:

- The increase of traffic has led to a shift of transit traffic from main routes to smaller roads in residential areas.
- Experience has shown that restrictions and/or bans lead to detours causing greater problems in certain (other) residential areas.

The aim of the new truck guidance network was to minimise travel times and trip lengths for all trucks on the Bremen road network and prevent residents being affected by freight traffic. The city printed and distributed maps for drivers with recommendations on routes, and the final evaluation showed a positive acceptance.

Preferred truck routes are quite common in US cities.

Parking and unloading

Loading and unloading zones

The provision and access regulation of loading and unloading zones is also an important aspect in many dense urban areas. In areas without such zones, delivery vehicles often stop on a regular lane as a second parking row, with immense negative effects to the road capacity. Many cities provide dedicated zones for freight handling and some regulate their access (*e.g.* in Copenhagen the access is dependant on a licence).

In addition to public zones, it is also possible to regulate the provision of private loading/unloading zones in large commercial and industrial buildings. Within the city of Paris, all commercial and industrial buildings larger than 250m² need to provide an off-street loading/unloading area.

Long-term parking zones

Some cities provide special facilities for trucks to park during the night, wait for shop-opening hours, enable drivers to rest, load goods to a smaller truck or park trailers before entering an area inaccessible for trailers.

Economic instruments

Traditionally, economic instruments are classified into two groups: supportive instruments such as subsidies, and punitive instruments for adding external costs through taxes and pricing.

Financial support

Financial support can vary in the level of subsidisation, including:

- Subsidies.
- Credit loans.
- Acting as a guarantor for financing.

Financial support may be used for the development of or market introduction of services or technologies as well as for supplying necessary infrastructure.

Some countries provide financial support for innovative projects, R&D and for introducing environmentally friendly vehicles.

Taxes and pricing

Taxes and pricing are widely used policy instruments. There are a large variety of taxes and pricing instruments, such as:

- Taxes.
- Access pricing.
- Road pricing.
- Parking pricing.

Taxes are common in all countries. Taxes are used to collect money for the costs of road construction and maintenance, or to promote certain measures such as energy efficient vehicles.

Road and access pricing are more controversial instruments. Their objectives can be financing of infrastructure, demand management, or internalising external costs. There are different pricing schemes[35], with different charging strategies (area-wide, cordon, electronic road pricing by time/distance and special lanes) and charging mechanisms (paper, electronic tag, video automatic number plate recognition [ANPR] and GPS/GNSS (global navigation satellite system).

Some cities, such as Stockholm, have already introduced pricing systems. London introduced a congestion charging scheme in February 2003. Congestion charging schemes are also under discussion in Brussels and Tokyo.

Private sector initiatives

The private sector believes that reducing logistics costs is essential to maintaining and increasing competitiveness in the global market, and is working to reduce logistics costs. Efforts are being made to analyse the details of the cost structure and reduce all possible costs through various measures described below.

Integration of distribution centres

The locations of distribution centres are being reorganised in order to increase transport efficiency and to optimise inventory management. For example, companies are integrating distribution centres previously located in each region. These initiatives aim to achieve the following outcomes.

- Concentrating inventory in one distribution centre allows freight to be consolidated, enabling transport by bigger and fewer trucks.
- Concentrating inventory in one distribution centre instead of having inventory in each regional centre can reduce the overall volume of inventory.
- Reducing replenishment of inventory shortages at one centre with stock from another centre can reduce overall transport volumes.
- Concentrating inventory facilitates response to fluctuations in demand.

Co-operation/collaboration

The main purpose of voluntary co-operation is to achieve efficiency improvement in terms of cost reduction or quality improvement through consolidation. The following trends can be identified:

- Outsourcing: Companies are moving away from conventional in-house delivery and increasingly outsourcing their deliveries to transport companies, thereby increasing efficiency of transport.
- Transport agents: Transport of goods to regions where a company has low transport volumes is subcontracted to a local haulage company thereby increasing overall efficiency.

[35] Baker, J., "Implications of Urban Road Users Charging for the Distribution of Goods", presentation at the 6th BESTUFS Workshop, 8-9 November 2001, Genoa, Italy.

- Incorporating associated work: Companies are incorporating activities related to transport of products into transport work which then can be outsourced. Such activities include bill-collecting, packaging, attaching price labels and installing delivered equipment.

Box B. **Consolidation**

The consolidation of goods bound for urban areas can play an important role in reducing the number of vehicle trips that need to take place in the urban area to deliver goods to their ultimate destination. Consolidation of goods being sent to urban areas can take place in several different ways.

A widely publicised type of goods consolidation for urban areas is the approach used by multiple retailers (or other larger businesses) that have their own distribution network (which is either operated by the retailer or by a dedicated contract logistics provider). Goods destined for each of the shops are consolidated at the companies' own regional distribution centres and are despatched to their shops on fully loaded vehicles. This type of consolidation tends to involve the use of large goods vehicles and reduces the vehicle trips and thereby vehicle kilometres performed in urban areas.

There are several other types of consolidation that are commonly operated in addition to the multiple retailer approach described above. These include:

- Express and parcels company operations. Express and parcels companies operate regional and local depots that help to consolidate goods flow. Regional depots (hubs) are typically used to consolidate the flow of goods destined for the same urban area – thereby reducing the vehicle trips between regions. Once the goods are delivered to the local depot they are then sorted onto local delivery rounds, with each round based on a certain part of the urban area, thereby consolidating deliveries by geographical catchments. In addition, some of these express and parcels carriers have large-scale operations with very high throughputs of parcels. They may well therefore deliver parcels from more than one sender to each delivery address in the urban area (another form of consolidation). Large goods vehicles tend to be used to move goods between the regional depots. The size of goods vehicles used for local delivery in urban areas depends on the density of deliveries, but typically involves smaller goods vehicles than the multiple retailer approach described above.

- Shared user distribution operations. In this type of consolidation, an individual freight transport company combines its work for several different customers using common vehicles and warehousing systems for all the companies' goods. This approach differs from dedicated distribution systems in which the vehicles and distribution centre facilities are only used for one customer's goods. By sharing their freight transport resources between more customers, a freight transport company can potentially achieve better utilisation of these resources.

- Wholesaler operations. Wholesalers sell goods produced by many different suppliers. Wholesalers are capable of providing several or, in some cases, all of goods required by urban businesses. This helps to reduce the number of vehicle deliveries that need to be performed to an urban business as all the products ordered from a wholesaler can be delivered on the same vehicle.

- Freight transport companies with geographically focused operations. Some freight transport companies specialise in making deliveries in a particular geographical area. This can be a single urban area, or a certain geographical region. These freight transport companies are able to make deliveries to businesses in the urban area on behalf of the supplier of the goods or other transport companies. In this type of consolidation the goods would be delivered to the freight transport company's depot which is close to, or on the edge of, the urban area. They will then load these goods onto their own vehicles and make the final delivery into the urban area. By offering this service, the freight transport company is able to win business from several customers and can consolidate their goods onto vehicles for final delivery.

Systems of consolidated delivery within a building have been promoted in Tokyo (Japan), in areas where large buildings with a large number of corporate tenants are concentrated. In this system, deliveries to the tenants of the building will be contracted to a single transportation company, which will make use of loading/unloading space situated in the underground parking area. This will save time and cost of individual freight transport companies' deliveries within the building, and will also reduce the number of freight vehicles parking (often) on-road while the delivery is being made.

Several other types of consolidation are also possible but are less common at present. Some of these may require support or intervention by local government, and some have been tested in pilot schemes.

Box B. **Consolidation** *(continued)*

Co-operative city logistics schemes

Freight transport companies that all work in the same urban area can work together to share collection and delivery work in the urban area and thereby improve their vehicle load factors, utilisation and productivity through consolidation. For instance, if several companies have goods to deliver to a single delivery address, rather than each sending a vehicle/driver to the address, they can consolidate the goods at one of the freight companies' depots and then all the goods could be delivered to the address on a single vehicle. There are many different types of co-operative city logistics schemes that could be devised. Examples include:

- Goods destined for a single delivery address are consolidated at one freight transport company's depot or a common depot and delivered in a single vehicle.
- All goods destined for a specific road, set of adjacent streets or geographical area are consolidated at one freight transport company's depot or a common depot and delivered in fully loaded vehicles.

Changes that could result from city logistics schemes include improved consolidation, drop density, more efficient use of vehicle capacity, fewer vehicle trips and mileage in the urban area, shorter vehicle dwell times, and the use of cleaner vehicles. These operational changes could lead to reduced fuel use and a reduction in the environmental and social impacts of road freight transport.

Urban transshipment centres

A recurring theme in the discussion of ways to improve consolidation and thereby reduce goods vehicle trips or the number of heavy goods vehicles operating in urban areas has been the implementation of an urban trans-shipment centre. The urban trans-shipment centre would be located on the edge of the urban area it serves, and freight destined for the urban area would be off-loaded at the centre and sorted into consolidated loads for final delivery into the urban area. A particular advantage of trans-shipment centres is the increased scope to consolidate goods flows destined for delivery to several customers in the urban area, and thereby reduce the total number of trips. Increased use of trans-shipment could encourage the use of lorries specifically designed to operate in urban areas (*i.e*. quieter vehicles with lower emission levels and designed to be more manoeuvrable).

Community collection and delivery points

Community collection and delivery points could also be used to improve goods consolidation. These points could take several forms:

- They could be solely for the storage of goods purchased by customers from surrounding shops. Customers then either collect the goods from the location themselves or have them delivered to their home.
- In addition to the above, community collection and delivery points could also be used for receiving and delivering goods destined for shops and other businesses that are sent by suppliers from outside the urban area (*i.e.* operate as an urban trans-shipment centre).
- They could also be used as home delivery points, with goods ordered remotely by customers delivered to the community delivery points and then delivered onto the customers' home using specialist vehicles.

Collection and delivery points that are used for making deliveries to private customers' homes could help to consolidate goods flows between shops and residential properties (with a single well-loaded goods vehicle replacing several car trips). As described above these points could also be used as trans-shipment centres, at which goods sent from outside the urban which are destined for delivery in the urban area (at commercial or residential properties) are consolidated onto well-loaded vehicles.

Integration and use of relevant information

Transport is only part of logistics activities. Therefore, it is necessary to integrate all relevant information in order to achieve overall efficiency. For example, customs information has been integrated with transport information in Japan. Previously, information on customs procedures for imported freight was not communicated to transport operators. Therefore, trucks arriving in the custody area to take freight had to wait until customs procedures had finished. Also, in the reverse case, freight had to stay in the custody area for a long time before being carried off by trucks. Communicating information to truck operation controllers on the status of customs procedure has enabled trucks to arrive in the custody area to take freight immediately after customs procedures are finished, thereby eliminating waiting time and cost.

Proactive participation in activities to reduce social burden

The private sector is becoming increasingly aware of the importance of and their responsibilities in protecting the environment. In particular, since the use of freight vehicles has significant impact on global warming and atmospheric pollution (NO_x, SPM), transportation companies and corporate transport divisions have promoted voluntary measures in order to reduce negative impacts on the environment and thereby improve their corporate images. The following are part of such strategies.

- Installing vehicle devices that automatically cut engines off when stopped at red lights.
- In urban areas where relatively small trucks are used, companies are increasingly using low-emission vehicles such as natural gas or electric vehicles.

Businesses are increasingly using low-mission vehicles for transport within large-scale facilities such as amusement parks.

Information and communications technologies (ICT)

The use of ICT is essential for increasing efficiency of urban goods transport. ICT enables urban goods transport to respond to customer demands of just-in-time delivery by managing information and freight operations in an efficient manner. Several examples are discussed below.

Use of mobile phones and Internet

Just-in-time inventory management requires increasingly advanced transport, and supermarkets and convenience stores require delivery within a very short lead-time, for example, only 15 minutes after their request. In response to this demand, transport operators communicate their time of arrival and departure at each delivery point to a control centre by mobile phones, thereby enabling management of delivery time information. This allows loading arrangements to be completed before truck arrival, thereby shortening lead-time. Customers can also be informed of the expected delivery time.

The recipient of deliveries is often absent, resulting in wasted trips. Therefore, transport operators have required customers to specify a delivery time when the recipient will be present. In addition, transport operators are setting up automatic response systems via phone or Internet to receive instructions from the absent recipient on the next delivery time.

Vehicle cargo matching systems by use of Internet enable transport arrangements to be made between consignors and available truck space. Such systems increase truckload efficiency and contribute to environmentally friendly transport by reducing less than truckload consignments.

Sophisticated vehicle and load management

Optimum vehicle utilisation is made possible by managing information on current and future locations of tractors and trailers, and computerising their most efficient operations. This management can be extended to manage not only information on vehicles but also the space inside the trucks, thereby adding freight into trucks with less than truckload.

Efficient loading of trucks is made possible by computerising the characteristics of loads and processing the information to develop optimum loading plans. For example, transmitting information on the content and destination of loads to collection points and distribution centres enables optimum loading plans and load set up to be developed in advance and reduces time for sorting and loading.

Global Positioning System (GPS)

GPS technology is one of the most widely used road traffic-related ICT technologies. The number of passenger vehicles and trucks, fitted with GPS (mainly navigation systems) has increased.

Examples of existing or planned utilisation of GPS in urban goods transport are as follows.

- By entering delivery destinations in the GPS system, drivers are advised real-time of the most efficient routes while being tracked by the navigation system. This enables drivers with less training to make efficient deliveries.
- When collection or delivery is requested, the control centre locates the nearest vehicle, thereby shortening lead-time.
- Constant tracking of vehicle locations by the control centre enables recipients to be informed of the expected time of delivery. This enables recipients to prepare for unloading upon arrival of delivered goods.
- A navigation system with IC memory can trace and record the location and time of vehicles. This recording forms an electronic travel record which improves the management of routing and working hours.

Management of loading/unloading zones

ICT can be used for searching and reserving dedicated loading/unloading zones. Trucks can search loading/unloading zones closest to their destination and reserve their place prior to their arrival, thereby saving time searching for available places and reducing on-road parking.

Underground distribution systems

Distribution of goods in urban areas using vehicles driving through underground tunnels is a possible alternative for traditional surface distribution with potential for reducing negative external impacts and improving quality of traditional systems.

The system uses dedicated underground infrastructures. The internal tunnel diameters define the size of the largest vehicle using the tunnel, and therefore the size of the largest applicable load-unit. There are different ways of moving goods through the tunnels, ranging from individual self-propelled vehicles to train-like systems.

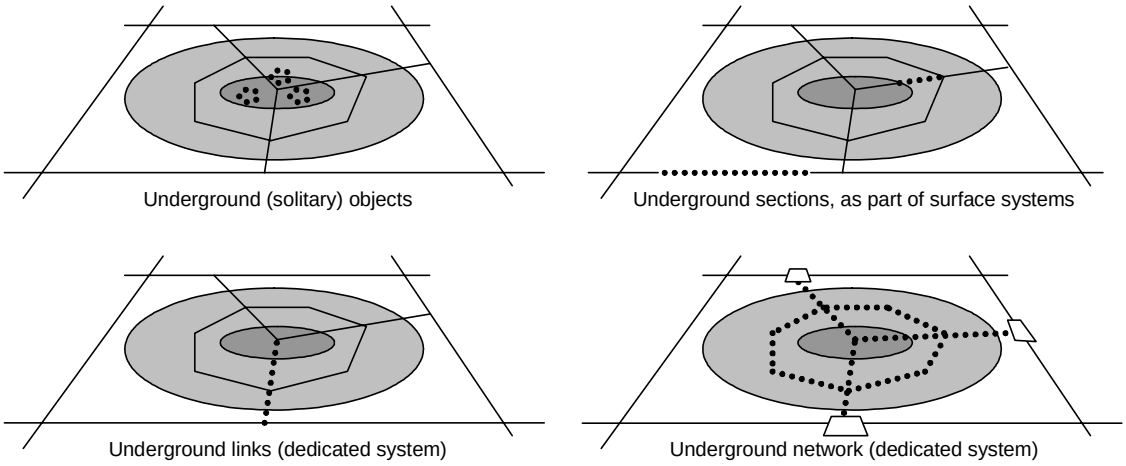
In general, advantages of underground systems include:

- Autonomous infrastructure, allowing undisturbed traffic flows and transport automation.
- Weather-independent.
- Occupying less surface space.
- Less environmental impacts such as noise, air pollution, physical inconvenience, and separation.

Therefore, underground systems offer environmental and logistical advantages of higher (operational) speeds, higher reliability and fewer emissions and energy use. On the other hand, there are disadvantages including high investment costs and grave consequences in case of accident or failure.

For goods distribution in urban areas, four underground concepts are illustrated in the figure below.

Figure B. **Underground network concepts**



Underground solitary objects are distribution points that serve local addressees. They are typically local facilities that make no part of an underground (distribution) system.

Underground sections are traditional infrastructures (road or rail) which partially run underground to overcome (surface) spatial or nuisance problems.

Underground links are dedicated underground transport systems (in contrast to underground sections). Such systems underpass congested areas and directly connects important activity centres without being interfered by other (transport) activities. Interactions with traditional transport facilities arise only through trans-shipments. Examples include the proposal to use the Mail-Rail system in London (UK) for goods transport. Since links can provide direct connections, specialised transport systems can be used. Use of vehicles such as dual mode trucks which can be used both on surface (on traditional infrastructure) and underground are also possible.

Full underground networks interconnect multiple urban activity centres. A full underground network provides an independent (autonomous) service not hindered by other traffic. The OLS (Underground Logistic System) project plan in the Netherlands is an example. This autonomous

system allows the use of dedicated vehicles as well as multi-purpose vehicles. In urban areas, access points to the underground system will act as transfer centres since it will seldom be feasible to connect all existing buildings to the underground goods transport system, unless by systems of very small tube diameters. Many plans for this system exist, but are difficult to realise.

Underground freight transport systems offer opportunities that were not feasible with surface transport. The OLS concept in the Netherlands is significantly different from merely being an underground form of urban goods transport, in that automated direct delivery of shipments of the OLS concept occurs in a closed and completely managed environment. Therefore, the system can avoid loss of time and cost caused by trans-shipment and roundtrips with many stops which usually accompany urban distribution. This provides opportunities for various just-in-time services. The introduction of nationally functioning OLS systems may lead to profound changes in the logistic chains.

New vehicle technologies

New technologies are constantly being developed. With increasing environmental problems, the shift to low emission vehicles has become a priority in many countries and vehicles with fuel cells, electric engines, gas, LPG, and hybrid cars have been rigorously developed. Regulations such as the European vehicle emission standards are a strong driving force for innovation.

The EU standards of Euro-4 and Euro-5 are driving the innovations for diesel engines. From October 2000, Euro-3 standards apply to new trucks. In 2005 and 2008, new trucks need to meet the Euro-4 and Euro-5 standards (see Table C). The implementation of the Euro-4 standard for trucks in 2005 will have a considerable impact on emissions, but more will be required.

Electric engines and hybrid systems are especially well suited for applications in an urban environment, within tunnels or on dedicated infrastructures. On trunk lines fuel cell systems may become an alternative to traditional fuel[36].

Table C. **European standards for emissions by trucks (g/kWh)**

	NO_x	HC	CO	Particulate matter (PM)
ECE 49 (<1988)	18.0	3.5	14.0	
Euro-0 (1988)	14.4	2.4	11.4	
Euro-1 (1992)	8.0	1.1	4.5	0.36
Euro-2 (1996)	7.0	1.1	4.0	0.15
Euro-3 (2000)	5.0	0.66	2.1	0.10
Euro-4 (2005)	3.5	0.46	1.5	0.02
Euro-5 (2008)	2.0	0.46	1.5	0.02

[36] Fuel cell systems tend to be large and will probably function best with larger vehicles, in which case the relative size may be limited.

Other vehicle technologies which are being or will be developed include:

- On-board computer technology in combination with telematics (routing and navigation technology).
- Smart card technology for security and access control.
- Noise reduction technology, *e.g.* engine isolation, low noise tyres.
- Steering and manoeuvring technologies.
- Light weight vehicles.
- Low loading floor constructions.
- Safety technologies, *e.g*. collision warning systems.
- Ro-Ro technology.

ANNEX 4

EXAMPLES OF MEASURES IMPLEMENTED OR PLANNED IN MEMBER COUNTRIES

Measures implemented/planned at the national government level

Access restrictions

France

Freight vehicles of more than 7.5 tonnes are banned (1974-) on Saturdays/days before public holidays: 22:00–00:00 and Sundays/public holidays: 00:00–22:00.

- *Objective:* Road safety.
- *Enforcement:* Well-enforced and accepted by the public.
- *Outcomes:* Fewer accidents.

Parking restrictions

Belgium

Trucks cannot park continuously for more than eight hours in urban areas except in authorised places that are specifically marked.

- *Objective:* To avoid on-street parking, especially in residential areas.
- *Enforcement:* Difficult, as trucks move 1-2 metres to reinitiate the eight-hour period.

Harmonising/relaxing restrictions

Netherlands

Standardisation of city access restriction regimes of municipalities through the Forum for Physical Distribution in Urban Areas (1995-).

- *Objective:* Logistic chain integration.
- *Outcome:* Better standardisation, awareness of importance of freight transport, improved co-operation between stakeholders.

United Kingdom

(planned)

Planning to allow 44-tonne, six-axle lorries

- *Objective:* Fewer vehicles
- *Expected outcome:* Savings of 100 million vehicle kilometres per year (1 000 fewer lorries) and 80 000-100 000 tonnes of CO_2 emissions per year.

Provision of loading/unloading zones

Japan

Encourages cities to establish local parking regulations which provide parking for deliveries. The national government encourages cities to do this by drawing up model regulations.

- *Outcome:* 22 cities established parking regulations dealing with deliveries.

Distribution centres

Netherlands

Established municipal distribution centres around cities (1990-94).

- *Outcome:* Unsuccessful. Government interference with the liberalised supply chain market had damaging effects on sustainable solutions for the management of the urban supply chain.

Japan

Development of distribution industry districts.

- This aimed to promote smoother traffic flow in cities and to improve the city's physical distribution functions by concentrating distribution facilities/ districts on the outskirts of the city, based on the "Law relating to the Creation of Distribution Industry Districts."
- *Outcome:* Paved the way for improved distribution functions and traffic flow by promoting concentration of distribution industry facilities.

Integration of distribution centres spreading in urban areas in suburban areas and enhancing their functions.

- This allows freight to be concentrated at one point and to be transported by large trucks.
- *Outcome:* Reduction in number of overall trucks.

Roads to detour through traffic

Japan

Ring roads are being constructed.

- *Expected outcome:* Reduction of pollution and congestion in urban areas.

United Kingdom (planned)

Government Ten-Year Plan includes investments for 100 new bypasses and 130 local road improvements.

- *Expected outcome:* Reduction of pollution and congestion.

United States

Many cities have ring roads (also known as beltways or perimeters) to detour through traffic.

- *Expected outcome:* Reduction of pollution and congestion.

In addition, numerous cities post "truck routes" to direct through truck traffic onto certain facilities.

Noise reduction measures

Japan

1. Implemented vehicle regulations

- *Consultation:* With automobile manufacturers on available technology
- *Outcomes:* Estimated to reduce noise by 0.9-1.3 dB.

2. Installing low-noise pavements/noise barrier fences

- *Consultation:* Intensive with local residents.
- *Outcome:* Reduced noise, low-noise pavements –3 dB, barrier fences –10 dB.

Netherlands

Noise reduction measures are being promoted. Night deliveries to retailers in populated areas will be permitted under noise restrictions of maximum limit 60dB(A): 23:00-07:00 and 65dB(A): 19:00-23:00 (2004-). The freely occurring noise (peak load) is measured by a "fast" meter reading 7.5m from the source at the reference height of 1.2m above road surface.

- *Consultation:* Incentive: government subsidises private parties' R&D investment for technical improvements to reduce delivery noise. Also, possibility of subsidising initial expenses is being investigated.

United Kingdom

Government Ten-Year Plan includes investments for quieter road surfaces on 60% of road network.

Pricing/taxes

Belgium (planned)

Brussels Capital is studying the application of traffic toll system on the main roads surrounding the region.

Japan

Road pricing aiming to divert traffic from residential areas to coastal routes by setting higher tolls for routes through residential areas.

Subsidies/tax incentives

Japan

Subsidies:

- To local governments purchasing low-emission garbage collection vehicles and busses (50% of cost for shifting to low-emission vehicles).
- For LPG gas stations (50% of cost for providing and operating stations).
- To bus/truck operators purchasing low-emission vehicles in three main urban areas (25% of cost for purchasing low-emission vehicles).
- To providers of electric mini-vans sharing system among multiple transport operators (33% of initial cost for establishing the provider business).

Tax incentives for purchasing low-emission vehicles.

United Kingdom

Subsidies (GBP 30 million) for retrofitting of older lorries with technologies to reduce emissions

Support for R&D

Belgium Federal research authorities are financing a research programme on urban freight transport. The purpose of this research project is to make the link between city logistics and household behaviour concerning freight transport.

Netherlands Support for private companies experimenting technical feasibility of low noise night delivery requirements. Such technologies include rubber pavements, low noise containers, rule of conduct for drivers and new engines.

United Kingdom Support for benchmarking projects in various sectors.

- *Outcome:* The chilled food sector has developed software which measure efficiencies of road transport operations against key performance indicators (vehicle fill, empty running, time utilisation, deviations from schedule and energy efficiency).

Government plans to commission research to assess the longer-term implications of home shopping for planning and transport services.

Support for pilot projects

Japan Support for joint delivery projects (some combined with use of low-emission vehicles) (1996-).

- *Consultation:* Intensive between local governments and operators.
- *Outcome:* Some have led to permanent joint delivery systems.

United Kingdom (planned) Commission for Integrated Transport and FTA joint initiative is exploring scope for flexibility in night delivery curfews in exchange for adoption of best practice by the industry (2002-).

- *Expected outcome:* Code of Practice agreed by industry and local authorities, by which delivery curfews can be relaxed without increasing disturbance to residents. (Leading to industry investing in mitigation measures). Also relaxing night delivery curfews could avoid retailers being forced to schedule deliveries during daytime).

Dissemination of best practices and other information

Belgium The Walloon authorities in charge of regional transport policy are going to publish a handbook dealing with freight aspects which need to be considered within local mobility plans.

Japan Action plan for development and diffusion of low-emission vehicles includes dissemination of information.

- *Outcome:* Increased sentiment in favour of the mass introduction of LEVs.

Netherlands Through the Forum (2000-), information is disseminated on projects, recent developments in cities, innovative ideas and municipal regulations.

United Kingdom Best pratices are disseminated through the Energy-Efficient Best Practice Programme.

Government will collaborate with industry to publish a new Journal of Sustainable Logistics, which will have a wide circulation.

Measures implemented/planned at the regional/local government level

Access restrictions

Belgium *City of Brussels* (planned)

Banning trucks of over 19 tonnes in certain areas (excluding local delivery) is under consideration. Combining this with a city distribution centre for transferring freight to small vehicles is being considered.

- *Problems encountered:* How to indicate the area and notify all drivers of the restriction, extra cost of transferring freight, possible increase of vehicle kilometres (and emissions).
- *Consultation:* A committee (with the Belgian Road Haulage Association, Port of Brussels, Chamber of Commerce, Union of Companies, Environment Administration) will pilot the study.

Antwerp

Through traffic of trucks over 7.5 tonnes may not enter the historical centre and must take the ring road (1990-).

- *Problems:* Enforcement difficulties.
- *Outcomes:* More traffic on the ring road.

Some city centres authorise goods deliveries only for a few hours in the morning, out of shop-opening hours.

- *Problems: Drivers have difficulties managing different time windows.*

Czech Republic Local authorities may restrict access and implement access fees.

Large cites generally provide access restrictions.

Prague (2000-)

Inner centre: access for vehicles over 3.5 tonnes is restricted weekdays from 08:00 to 18:00 (except with special permission).

Centre: access for vehicles over six tonnes is restricted (except with special permission).

- *Problems:* Enforcement problems.
- *Consultation:* Only brief consultation with transport operators.

- *Outcomes:* Reduced environmental impacts; city centre more attractive for residents.

Smaller cities (populations between 20 000-400 000) charge fees for access to the city centre.

Brno (population 390 000) (1998-)

All vehicles (except residents, people working in the area and handicapped persons) pay fees, which vary from one day (EUR 0.63) to one year (EUR 47).

Pardubice (population 95 000) (2001-)

Vehicles (excluding residents, delivery, emergency and handicapped people) pay entry fees to acquire licences.

Vehicles up to 3.5 tonnes: One day (EUR 0.63) to one year (EUR 94).

Vehicles over 3.5 tonnes: One day (EUR 0.63) to one year (EUR 188).

- *Problems:* Since electronic fee collection has not been introduced, fees need to be paid in advance at city council offices or collected manually (in small cities); enforcement is difficult (although the police can collect fines ranging from EUR 6 to EUR 20 from vehicles without licences).
- *Consultation:* Only brief consultation with transport operators.
- *Outcomes:* Vary among cities. Some cities have issued too many permits, and therefore the restriction has not led to the expected outcomes.

Denmark *Copenhagen*

A compulsory regime for the medieval centre of Copenhagen has been running from 1 February 2002 for two years. Under this scheme, all trucks of more than 2.5 tonnes must have a certificate in order to make a stop inside the inner city centre. A green certificate gives access to 20 attractively located dedicated loading zones at a price of EUR 44 for a two-year period. A truck receiving the green certificate is required to have *i)* an average loading rate of at least 60% and *ii)* an engine which is not over eight years old at the time of application. Until 31 July 2002, trucks meeting these requirements could receive a yellow certificate for a price of EUR 44. A one-day red certificate, which can be obtained by any truck for EUR 7, enables the truck to stop within the inner city centre but does not give access to dedicated loading zones. All haulage needs to be documented by operators, and the local authorities control the reports. Parking fines will be imposed on trucks which stop in the inner city without a certificate.

France Local authorities with a population of more than 30 000 may restrict access.

Time restrictions have been in effect in Paris since 1999. The previous measure started in 1991.

- Vehicles occupying less than $16m^2$: authorised to deliver goods at all times (except on red roads and bus lanes between 07:30-09:30 and 16:30-19:30).
- Vehicles occupying between $16m^2$ and $24m^2$: authorised to deliver goods at all times except 16:30-19:30 (and except on red roads and bus lanes between 07:30-09:30).

- Vehicles occupying more than $24m^2$: authorised to deliver goods between 19:30-07:30.

Exceptions exist for specific vehicles (mail, frozen foods, public works, car carriers, etc.)

- *Problems:* Enforcement difficulties, disregard for economic consequences, different restrictions among local authorities.
- *Consultation:* Since 1998, local authorities and private sector have begun consultation in working out master plans on urban mobility.
- *Outcome:* Fewer trucks, more vans and more air pollution in city centre.

Netherlands

Access restriction times for trucks are implemented in many cities, along with:

- Technical measures (such as poles, Den Bosch).
- Accessible lanes for all delivery vans and trucks, including bigger trucks (Amsterdam).
- Logistic routing and back-door delivery (Tilburg).

Consultation: Brief public consultation.

Problems: Enforcement, depending on availability of technical measures.

Outcome: Reduction of traffic, better fleet management, more efficient packing in trucks in some municipalities.

Planned measures:

Access restriction times for trucks are being planned in combination with:

- Dedicated lorry lanes.
- Use of public transport infrastructure.
- Exemption for fully loaded trucks.

The exempted trucks will be operated by distributors recognised by the municipality for dedicated and consolidated transport within the city (Groningen).

- *Consultation:* Intensive public and private consultation before and after agreement within the municipality.

United Kingdom

HGV delivery restrictions are imposed by local authorities either through planning conditions (restricting HGV movements at the grant of planning permission) or through noise abatement notices (which sometimes require complete cessation of the activities creating the noise).

- *Outcome:* by restrictions on HGV movements during the night, retailers are forced into scheduling deliveries during daytime, adding to congestion particularly at peak travel times.

A public-private joint initiative aims to develop a code of practice by which delivery curfews can be relaxed while avoiding increases in disturbance to residents.

The London Lorry Control Scheme (1985-) prevents lorries of over 18 tonnes from entering London (excluding trunk roads and roads in industrial estates) at the following times:

- Monday to Saturday 19:00 to 07:00.
- Saturday 13:00 to Monday 07:00.

Exemption permits are issued annually (30 000 per year) or on a single journey basis (5 000), for essential business.

- *Outcome:* Successful in removing freight trips through London and minimising use of unsuitable roads, thus safeguarding the environment for residents without unduly affecting the economy.

Planned:

Low-emission zones, with criteria including: the boundary of the zone and the road network it contains, the times when the zone is in effect, the air quality objectives of the zone, the vehicle emission characteristics appropriate for the zone, transport management measures used in and around the zone.

Parking restrictions

Czech Republic Large cities have an overnight parking ban for freight vehicles.

Japan *Tokyo*

A comprehensive measure to reduce the number of illegally parked vehicles is in force for principal arterial roads and commercial districts of high traffic areas, where congestion is severe due to illegal parking. The following measures for freight vehicles are being implemented or discussed.

- In case of unavailability of off-street loading space, some on-street parking meters were converted into parking spaces exclusively for loading/unloading purposes.
- In order to eliminate on-street loading on principal arterial roads, provision of loading spaces outside these roads is being discussed.

Taking the effects into account, the measures will further be developed and implemented.

United Kingdom *London*

Overnight on-street parking ban on HGVs.

- *Problems:* Insufficient off-street parking places.

On-street parking and loading restrictions.

- *Problems:* Regulations are often seen as neither meeting the needs of business nor reflecting local circumstances, and are frequently not understood by business.

The variation of regulations within a borough and between boroughs can be confusing and the quality of enforcement can vary considerably.

Provision of loading/unloading zones

	Provision by government	*Regulate (obligate) provision by private sector*
Belgium	Almost all cities have reserved special on-street zones. • *Problems:* Lack of enforcement, leading to occupancy by passenger vehicles.	*Brussels (planned)* Requirement for important commercial and industrial activities to have their own off-street delivery bays (to be included as a condition in obtaining building permits).
France	Provision was experimented in several hundred towns (including all towns of over 10 000 inhabitants) • *Outcome:* Unsuccessful, due to a lack of enforcement.	*Paris (1990-)* All new commercial and industrial buildings larger than 250m^2 need to provide an off-street loading/unloading area. • *Consultation:* City planning authorities consulted inhabitants and all stakeholders.

Japan	*Kanazawa* Provided off-road loading/unloading area and removed parking restriction on certain back roads for delivery, at the same time equipping them with parking meters. Co-operation of building owners to provide additional spaces for loading/unloading is requested • *Consultation*: With local retail organisations. • *Outcome:* Reduction in illegal parking.	*Tokyo* By the amended parking regulation which will be effective, buildings with total floor area over 2 000m^2 will need to provide off-street loading/unloading areas. The minimum size of the area is also regulated. The national government has recommended that local governments provide for such regulations. • *Consultation:* A committee consisting of national and local governments (including police), organisations of transport operators, parking lot operators and building owners discussed the regulation.
United States	Many cities provide off-road loading/ unloading areas and/or restrict time parking for loading/unloading. • *Consultation:* With local retailers, zoning boards. • *Outcomes:* Reduced illegal parking, quicker turn-around in offloading.	

Support for pilot projects

France	*La Rochelle* Trucks above 3.5 tonnes were banned after 07:00. Goods were transferred to electric vehicles for making deliveries in the city centre. • *Outcome:* The lack of electric vehicles made the project difficult. Only small electric vans are available at present. Providing parking bays for trucks (all over France). • *Outcome:* Unsuccessful, due to lack of enforcement.
Japan	*Tokyo (Marunouchi)* Consolidation Several distributors concentrate freight in one distribution centre, from which one distributor transports the freight by low-emission vehicles to the final destinations. Each high-storey building has floor delivery staff that carries the transported freight to the floor of the final destination.

- *Consultation:* Intensive, by platform including national and local governments, transport operators, retailers, building owners, etc, which planned and monitored the project.
- *Outcomes:* Reduction in number of vehicles, emissions and illegal on-road parking. Increased loading rates.

Tokyo (Nihonbashi)

Loading zone

Set different on-road free parking hours for passenger and freight vehicles. Also, designated routes for delivery where loading/unloading was inevitable and encouraged trucks to use parking meters on such routes.

- *Consultation:* With local residents and transport operators.
- *Outcome:* Possible to park nearer to final destinations, thereby increased turnover rate of on-road parking spaces and increased distribution efficiency.

Netherlands *Haarlem*

Out-of-hours delivery (06:00-07:00 and 19:00-21:00) to supermarkets (six months).

- *Consultation:* Intensive among municipality, transport operators and retailers.
- *Problems:* Logistic operations of supermarkets span beyond a single city.
- *Outcomes:* Found that involving all stakeholders is essential. Out-of-hours delivery leads to transport efficiency, but implementation in a wider area is necessary.

Dedicated/priority truck lanes

United Kingdom *London*

First bus/lorry priority lane established 1998.

- *Consultation:* Intensive, between local authorities and industry.

United States *Southern California (planned)*

Dedicated truck lanes on freeways are being planned. Cost (two lanes each direction for 37 miles) is estimated at USD 4.2 billion, but would be more cost-effective than adding the same number of mixed flow lanes.

- *Consultation:* Since it is evident that this must be coupled with improvement in operations in co-ordination with all stakeholders involved, dialogue to consider such measures has begun.

Preferred truck routes

United Kingdom	There is an established network of "primary routes", which includes major local authority roads as well as all trunk roads and motorways. The Scottish Office and Convention of Scottish Local Authorities have published guidance on "rural roads hierarchy and lorry routing", showing the economic benefits of managing the network and controlling lorry routes
United States	Quite common in US cities.

Utilising intermodal transport

Belgium	Major cities are developing logistic centres which integrate road, rail and water transport. Example: *Brussels* Waterway transport for construction and demolition waste.
Czech Republic	Prague is planning to improve intermodal freight transport systems.

Integrating transport into land-use planning

Belgium	*Brussels* Uses ABC — location planning which determines location of commercial and industrial activities by comparing required means of transport and transport facilities available in the area. In Flemish land-use plans, economic activities will be consolidated in a few major economic/industrial centres (Antwerp, Ghent, Zeebrugge), which will have appropriate transport infrastructure for all transport modes in order to guarantee accessibility.

C. Measures implemented by road transport operators

Consolidation

Denmark	*Aalborg* A transport co-ordination project has been initiated whereby *Danske Fragtmænd* and Post Denmark, two major collective distributors, jointly undertake the distribution of goods to selected areas in the city in co-operation with the recipients.
France	Merging of transport operators has begun to become profitable again in the competitive transport market. Operators subcontract delivery in city areas to local haulers, as the last kilometre is the most expensive (about 50% total transport cost). Many small subcontractors have been established, leading to problems involving working conditions and safety.

Japan Joint distribution is increasing.

- *Consultation:* Intensive between government and operators. Strong initiative of the government is often required to have many (if not all) operators to participate.
- *Problems:* Participation by all operators is difficult to achieve. Certain goods (express delivery, frozen goods, etc.) are often excluded.
- *Outcome:* Mixed, in terms of profitability and reducing traffic.

Netherlands M&A between regional/nationwide /international operators can be seen.

- *Problems:* Fleet routing (old and new vehicles mixed), while meeting diverse demands of cities for truck specifications.

Joint distribution combined with exemption from access restrictions is being discussed.

Use of ITS

Belgium Operators are equipping trucks with ITS, especially on-board computer and GIS.

- *Problems:* High costs restrict the use of ITS by large operators, lack of ITS standardisation, lack of updated and real-time data in GIS.

United Kingdom Operators use ICT to:

- Optimise vehicle routing and scheduling, and link driver, base and customer in order to ensure optimum arrival time for deliveries.
- Minimise queuing, disruption and intrusion and delivery points by pre-notifying arrival time or variations there from.
- Ensure drivers avoid rat-runs by giving clear instructions, with maps where appropriate.

United States Major delivery services (Federal Express and UPS) use ITS and GPS to track parcels.

Measures implemented by manufacturers

France Outsourcing transport activities to operators who can provide just-in-time services.

SCM and cargo tracking have also begun.

Japan Standardising freight handling equipment and pallets, in order to facilitate use of intermodal transport, and developing large-size vehicles that enable automated pallet loading.

- *Problems:* Since each operator has its own established freight handling equipment/pallets, standardisation requires long adjustment periods.

Netherlands Outsourcing in areas such as dairy and food products and office equipment in order to achieve just-in-time delivery.

United Kingdom Where possible, utilises otherwise empty return journeys for packaging and waste material collection, customer/supplier collections and shared use of resources.

E. Measures implemented by retailers

Home delivery

Belgium Goods are delivered to customers' home or pick-up points (gas stations, retailers).

- *Problems:* Not profitable (many experiments have failed).

In the case of home delivery, absence of the customer leads to an increase in vehicle kilometres.

Netherlands Local pick-up points for out of opening time deliveries (Leiden), joint operation of home delivery vans (Tilburg) are being implemented.

- *Problems:* Managing profitable operations, liability problems.

Night delivery to retailers

Belgium Delivered to night delivery boxes in shops when shopkeepers are absent.

- *Problems:* Noise, lack of communication between shopkeepers and suppliers.

France Delivery at night or in early morning has begun (due to the fact that just-in-time deliveries between 21:00-00:00 are becoming increasingly difficult).

- *Consultation:* Extensive with local authorities to allow night deliveries.

Netherlands Night delivery to supermarkets.

- *Consultation:* Intensive, among all stakeholders.

Using new vehicles

Japan Using CNG vehicles and silent refrigeration units

- *Problem:* Cost.

United Kingdom Adopting low-emission vehicles, alternative fuels, silent refrigeration units, air brake silencers, air suspension helping to reduce body rattle, steering/lifting axles helping to reduce road wear.

F. Measures implemented by the vehicle industry

France The vehicle industry has been manufacturing various types of urban freight vehicles in order to comply with various requirements, leading to high cost of such vehicles and difficulty to produce low-emission engines. Now working on standardisation of engines and vehicles.

- *Consultation:* Intensive with national government and environmental agencies to clearly define the requirements as well as to seek finance for research on low-emission engines.

Netherlands Vehicle industry is developing LPG engines for trucks.

- *Problems:* LPG has lower emission than diesel engines, but is not financially feasible. The government subsidy necessary to introduce such engines is more than what the national budget offer.

G. Logistical platform for discussing urban freight issues among multiple stakeholders

	Area	Members	Membership	Issues discussed	Outcome
Belgium	None				
Czech Republic (in planning)		Local governments, authorities, transport operators			
Denmark	National and local	Ministry of Transport and three local governments	Voluntary	All city logistics issues.	A small secretariat which seeks to ensure the exchange and communication of experiences and maintain consistency in the various pilot projects is to be established.
France	National and local	National and local governments, transport operators, trade unions	Voluntary	All freight transport issues.	Convention between GART (group of authorities responsible for public transport) and FNTR (national federation of carriers).
Hungary	None				
Japan	National and local	National and local governments, transport operators, shippers	Voluntary	All freight transport issues.	Joint delivery systems. TDM pilot projects.
Netherlands	National and local	National and local governments, transport operators, shippers, retailers.	Voluntary	All freight transport issues.	Tuning of various municipal regulations. Checklist for efficient urban distribution, database.
United Kingdom	National and local (in 22 regions)	Local governments, transport operators, shippers, retailers	Voluntary	All freight transport issues including: agreement of a strategic network within the region for distribution purposes, town centre freight access plans, production of HGV driver maps, driver questionnaires, identification of congestion hot spots, route signing and information strategies, exploring opportunities for greater use of environmentally friendly modes other than road, pursuing traffic management techniques to provide for efficient delivery, promotion of industry best practice initiatives.	The government is to encourage further take-up of FQPs and is about to embark on an assessment of current FQPs with a view to establishing best practice in existing FQPs and producing a guidance framework to help local authorities and industry when considering the establishment of FQPs.

ANNEX 5

DATA AVAILABLE IN MEMBER COUNTRIES

Country	National estimates	Data on urban areas		
	Number of vehicles	Traffic (vehicle kilometres)	Freight traffic (vehicle tonne-kilometres)	Average loading rate (%)
Australia	Available (data for freight vehicles by articulated/ rigid trucks and light vehicles)	Data for capital city, provincial urban, rest of state and interstate available by articulated/ rigid trucks and light vehicles	No data	No data
Belgium	Available (data for total of freight vehicles)	Available for few cities (by freight traffic modelling)	Available for few cities (by freight traffic modelling)	No data
Czech Republic	Available (data for freight vehicles by load capacity category)	No data	No data	No data
Denmark	Available (data for freight vehicles by GVM (gross vehicle mass) category)	No immediate data	Data available for Copenhagen.	Estimates available
France	Available (data for freight vehicles by GVM category)	No data	No data	No data
Hungary	Available (data for freight vehicles by load capacity category)	No data	No data	No data
Japan	Available (data for freight vehicles by GVW (gross vehicle weight) category)	Data for total of freight vehicles (excluding special purpose vehicles) are available (total of six urban prefectures)	Data for total of freight vehicles (excluding special purpose vehicles) are available (total of six urban prefectures)	Available (by vehicle size)
Netherlands	Available (data for freight vehicles by lorries plus delivery vans/tractors)	No data	No data	Available (by GVM category)
United Kingdom	Available (data of freight vehicles by GVM category)	Data for urban-urban, urban-outside urban, outside urban-outside-urban traffic available by GVM category. Forecasts available.	Data for urban-urban, urban-outside urban, outside urban-outside-urban traffic available by GVM category.	Data for urban-urban, urban-outside urban, outside urban-outside-urban traffic available by GVM category.
United States	Available (data of freight vehicles by single-unit trucks/tractors)	Data for interstate urban and other urban areas available by single-unit trucks/tractors	May be available in certain cities.	No data

	Data on urban areas			
	Average daily frequency of trip chain	**Average daily trip chain distance (km/vehicle)**	**Average daily delivery points per trip chain**	**Types of freight transported**
Australia	No data	No data	No data	Available for capital city
Belgium	No data	No data	No data	No data
Czech Republic	No data	No data	No data	No data
Denmark	No data	No data	Available for some cities	No data
France	No data	Available for some cities	Available for some cities	No data
Hungary	No data	No data	No data	No data
Japan	Available*	Available*	Available*	Available*
Netherlands	No data	No data	Estimate available	No data
United Kingdom	No data	No data	No data	Available
United States	No data	No data	No data	No data

* Values are obtained by tabulating data in the road traffic census. The census itself does not present these values.
Source: OECD Working Group.

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