Urban freight transport policies and planning in Europe: an overview and classification of policy measures

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Abstract

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. Local communities, on the one hand, have to facilitate the essential flows of goods in urban areas and on the other hand have to reduce the adverse impacts of urban goods on their communities being served.

In Europe, with its historic city centres and dense living areas, the nuisance of freight traffic has been addressed to as problem for a long time now on a local level but also on the national and even the European level (EU-action 321 Urban Goods Transport). In 2003, the OECD published a report on urban freight transport with the title Delivering the Goods, 21st Century Challenges to Urban Goods Transport (OECD, 2003).

In a period of more than 15 years, in European cities measures have been taken to reduce traffic by introducing vehicles restrictions or by promoting consolidation of goods flows. Also introduction of cleaner, smaller and more flexible freight vehicles are proposed.

This paper presents a general overview of different public policies and planning in the field of urban freight transport, based on my involvement in different European Commission projects, in the making of the OECD-report and as member of the Institute for City Logistics.

Different public measures and instruments are discussed and categorised, such as licensing and regulation, private and public initiatives to bundle good flows and different types of freight centres.

1 Introduction

Within urban areas, different types of goods transport take place, from transport of bulk goods and containers to and from ports or industrial areas to consumer goods to retail or people's homes.

In this paper, I will only focus on goods transport related to consumer goods in urban areas, in particular the final stage in distribution and with its destination within the urban area.

Although the following goods flows are considerable, goods transported through urban areas (through traffic), building and demolition traffic, and the provisioning of the wholesale trade, will not be the centre point of my attention in this paper.

Consumer goods come in different forms and shapes and can be categorised by their physical characteristics (function, value, weight, etc.), shipment characteristics (packaging, homogenous/heterogeneous) or by the characteristics of goods flows (distribution and transport characteristics). The majority of products shipped into urban areas are produced elsewhere. The shipments are composed of products from different places, around the world and shipped from strategic locations to customers in urban areas.

The complexity of operations and conflicting policy goals make urban goods transport a contentious area (OECD, 2003): "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 are easily felt."

According to the OECD-report the various problems both encountered and caused by urban goods transport, can be categorised, as follows:

- Accessibility and congestion problems. The main reasons for accessibility problems are: insufficient urban goods transport infrastructure, access restrictions and congestion.
- Environmental issues. At local level, freight transport contributes to local air pollution, traffic noise and other forms of nuisance such as smell, vibration and physical hindrance. Also in global environment and sustainability discussions, regarding emissions which influence

climate change, the depletion of natural resources and the dumping of waste materials, freight transport in general is an issue.

- Safety issues. In particular, the size and weight of the vehicles make freight transport a traffic safety issue. The transport of dangerous good is also an issue as well as nowadays security.
- Energy consumption.

Particularly in cities with high urban densities in combination with old city centres, urban freight transport is an issue on the local policy agenda (see further). This is quite understandable, these areas are not equipped for receiving large and heavy vehicles. Modern cities are designed for today's ways of transportation but even then it is not guaranteed that freight vehicles can move around freely without causing some sort of nuisance. Noise and air pollution (NO_x, SPM, SO_x) are typically freight vehicle related problems and that is why these vehicles are the main focus of local clean air acts.

Figure 1.1 Policy objective for urban goods transport

As we will see in this paper, countries have different experiences and different approaches regarding urban freight transport policies. The country-reports in the OECD-report are a start to categorise the different measures and policy instruments (section 2). This categorisation does not present the full picture of possible measures. Therefore based on a systems approach, it is possible to give a broader overview of measures (section 3).

2 Different countries, different experiences and approaches

For the OECD-report (OECD, 2003) information on urban freight transport policies in different OECD countries was collected (see annex). Let's discuss some results. In many countries, urban freight transport is mainly a local policy matter. It is an issue only at the local level and in specific situations, such as in historical areas, based on environmental concern of when pedestrian zones within shopping areas are developed. On the other hand in some countries national policies have been established. The experiences in the OECD-countries show a broad spectrum of measures. These measures are categorised as follows:

- Licensing, regulations and freight routes
- Freight centres and consolidated delivery
- Low-emission vehicles and alternative fuels

2.1 Licensing, regulations and freight routes

Time windows and weight restrictions are popular measures, implemented mainly in European cities and in Korea. New types of restrictions like eco-zoning are emerging. With eco-zoning, only low-emission vehicles can enter a specific zone.

Table 2.1 Examples of different truck limits for city access delivery regulations in some large European cities

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

Source: OECD, 2003

The restrictions in time, weight and emissions-level differ between countries. In particular, within countries differences in restrictions between urban areas make the logistic operations for truck operators more difficult and are in some countries, like the Netherlands an issue. For truck manufacturers the variety of vehicle restrictions on an international level are of concern.

2.2 Freight centres and consolidated delivery

Freight centres are essential for consolidation. In some countries local consolidated delivery, is practised, based on a private or local public initiative. In Germany experiences in many cities with consolidated delivery, named City-Logistik, a joint service by different transport companies for urban delivery, didn't lead to successful implementation. In Monaco and the city of Fukuoka (Japan) co-operative delivery systems are operational with support from the local government

2.3 Low-emission vehicles and alternative fuels for urban areas

New trucks in Europe need to meet Euro-4 and Euro-5 standards. The implementation have a considerable impact on emissions. The use of electric vehicles and trucks on alternative fuels, like CNG, LNG and LPG has been assessed in different countries. The experiments have led to implementation in urban areas on a small scale. These vehicles are adjusted to moving around in urban areas. They are smaller, highly flexible and make less noise. The down side is that at longer distances these vehicles are less efficient than large trucks. It's therefore important that these vehicles only have to operate in urban areas.

Although these measure show some results, there is no definite answer if the urban freight transport issues are going to be solved the next decade. Considering the higher emission standards in for instance Europe and the demand for cleaner trucks or otherwise to ban certain trucks out of urban areas, the problem is getting even more serious.

Considering the economic, social and environmental interests it is important the have a long term perspective in mind, when developing urban freight transport policy. The OECD-report provides a wider picture and presents eleven recommendations. These recommendations will not be discussed here, but a relevant recommendation is that to find effective measures all interests have to be considered. Creating win-win situations is very important.

Consolidation of cargo leads to more efficient transport in terms of economy, environmental and socially. A long term policy requires insight in best practices and a policy and analytic framework. Such an approach is known as City Logistics (see for more information: www.citylogistics.org). City logistics is an integrated approach for urban goods distribution based on systems approach. It promotes innovative schemes that reduce the total cost (including economic, social and environmental) of goods movement within cities. City logistics encourages collaboration between key stakeholders within a market based economy.

The OECD-report provides best practices and policy guidelines. In the next chapter, an analytic framework is provided to analyse the effectiveness of measures.

3 Systems approach to define more options

Here, I'll introduce the 'layer scheme' for the transport system, as applied to urban goods transport. This layer scheme enables a systematic analysis of the system and helps to define inefficiencies in the system. The scheme classifies the primary functions and services of the goods distribution system, identifies different roles and names the actors that can play these roles (see Van Binsbergen & Visser, 2001). In this paper, I focus on the use of the layer scheme to categorise policy measures and to show these measures improve the efficiency of the urban goods transport system.

3.1 Layer scheme

In order to describe the freight transport system in detail, the system is subdivided into layers in a layer scheme. Historically, due to specialisation, consumers and producers became spatially separated, which made transport essential. In due time, goods transport was no longer carried out solely by consumers or producers, but became the responsibility of specialised carriers. The next phase of the process was the separation between the provision of the transport service (*Transport*) and the actual movement of vehicles carrying the goods (*Traffic*). Specialised actors now act as service desks, while the carriers concentrate on performing the actual transport. Economic and technical developments have enabled this kind of specialisation.

With the introduction of each specialisation, new market situations have emerged. Each service layer represents such a market situation, in which a specific service is demanded and provided in order to act as one transport system. The market situations are referred to as *Phenomena*, while the associated service levels are referred to as 'primary services'. The primary services or service layers represent the main transport functions.

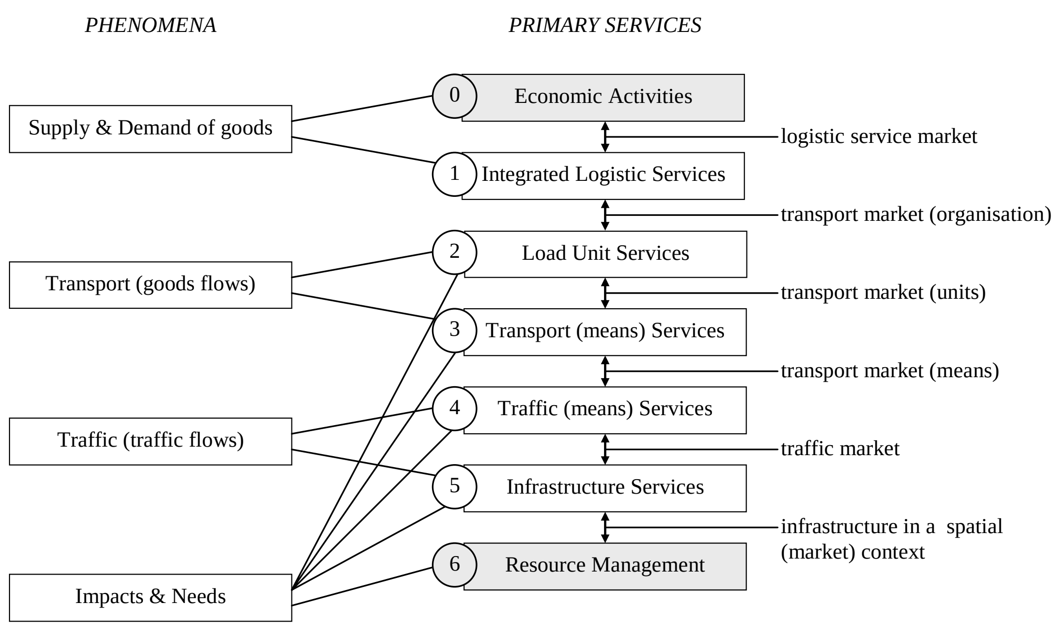

Figure 3.1 'Phenomena', service layers and markets in the goods transport system (Van Binsbergen & Visser, 2001)

3.2 Efficiency

Inefficiencies occur in the different levels of operations in the transport system. For instance, the volume of goods we consume (or at least buy) is always less than the volume that is transported. This is due to the simple reason that we need packaging material and/or load units to transport these goods. The routing of goods through the logistic chain can cause inefficiencies: there is an almost natural difference between the Euclidean distance and the actual transport distance between the origin and destination of a flow of goods. Other inefficiencies are introduced by means of insufficient consolidation, which leads to a relatively high number of vehicle kilometres compared to the actual transport performance. Finally, inefficiencies can also occur because of the way the vehicles are operated, for instance, the use of oversized vehicles and deadheading.

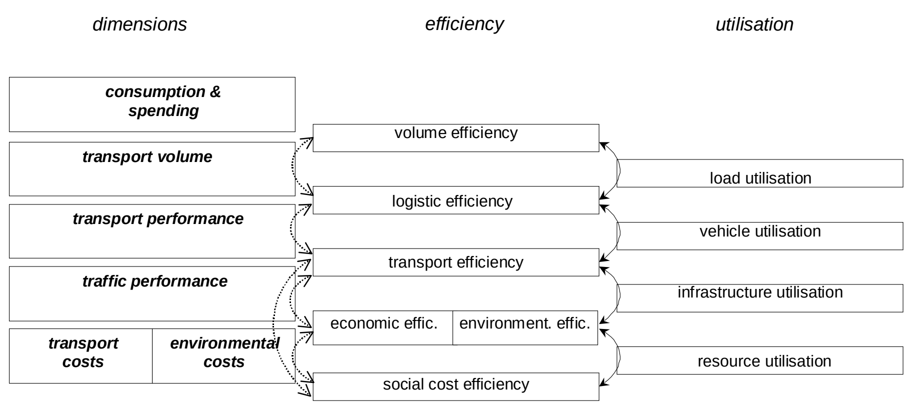

Figure 3.2 Defining efficiencies in the urban goods transport system (Van Binsbergen & Visser, 2001)

Strategies to solve these inefficiencies can be defined at several levels in urban freight transport, as was described before as a layer system. Between each layer, a market inefficiency can be introduced, as shown in Figure 3.2. Some considerations must be taken into account when assessing 'inefficiencies'.

First, trade-offs can occur between layers. An efficiency improvement at one level can lead to inefficiencies at another level, or vice-versa. In addition, trade-offs between economic and environmental efficiencies are possible, as are trade-offs between local and regional efficiencies. Second, efficiency improvements within a system can lead to inefficiencies outside that system, or vice versa. For instance, the reduction of the flow of waste packaging materials by using re-usable packaging materials can turn efficient, highly consolidated transport flows of waste materials into inefficient, hardly consolidated, return flows.

In this section, we will specify the different types of efficiency that can be derived from the layer scheme (figure 3.2).

Volume-efficiency

One indicator of volume-efficiency is the handling factor. The handling factor is the quotient of the produced mass or volume and the transported mass or volume. The volume-efficiency is actually the reciprocal of the handling-factor. An illustration can be drawn based on the UK food and drink sector in the period 1983-1991 (McKinnon and Woodburn, 1995). The handling factor increased by 13 percent in that period, meaning that 13 percent of the weight was transported twice. A growth of consumed tonnes of 7.8 percent coupled with an increase in the handling factor with 13 percent should mean an increase of the transported tonnes of 21.8 percent. McKinnon and Woodburn (1995) concluded, however, that the transported tonnes increased by only 10 percent during that same period.

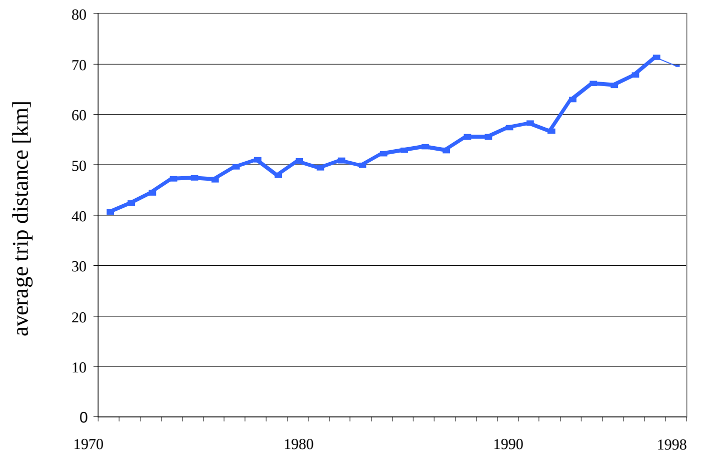

Figure 3.3 Average transport distance in domestic goods transport in the Netherlands between 1970 and 1997 for goods trucks (source: CBS, 1999)

Logistic efficiency

Logistic efficiency can be defined as the ratio between the transport volume (tonnes) and the transport performance (loaded tonne kilometres per year). It reproduces the reciprocal of the transported distance. The shorter this distance, the better the logistic efficiency. Figure 3.3 shows that in the Netherlands the average transport distance grew from 41 kilometres in 1970 to 70 kilometres in 1997.

Transport efficiency

Transport efficiency can be defined as the ratio of traffic performance (in terms of vehicle kilometres per year) to transport performance (in terms of loaded tonne kilometres per year). It reproduces the reciprocal of the load factor and the loading capacity of a vehicle. shows the maximum loading capacity of different types of vehicles. The transport efficiency in figure 3.4 gives some indication of the development of the load factor of trucks in the Netherlands.

Table3.1 Transport efficiency of different vehicles (source: Bouman et al., 1990)

Year 1995	*Cars*	*Vans [diesel]*	*Light trucks*	*Trucks*	*Articulated trucks*
Maximum loading capacity [tonnes/vehicles]	0.25	0.94-1.43	4.73	9.68-13.99	25.5-25.8
Transport efficiency [veh.km/tonnekm]	4	0.7-1.06	0.21	0.07-0.1	0.04

If we take a closer look at data on domestic freight transport in the Netherlands, it is clear that there is a decrease in the utilisation in terms of load factor of road transport. Figure 3.4 shows that there is a steady decrease in the ratio of the loaded tonne kilometres to the load capacity tonne kilometres. Two important factors are responsible for this: a decrease in load factor and an increase in empty vehicle kilometres. The situation in urban freight transport becomes worse when examining the national figures (the average load factor in 1997 was 41.8 percent). The reasons for this include: own transport has a relatively high share in urban freight transport, and the average load factor in own transport is relatively low compared to professional transport (35.9 percent and 43.8 percent, respectively, in 1997). In urban freight transport, the share of smaller trucks and vans is relatively high, while the average load factor of these vehicles is relatively low (25.3 percent for vans in 1997).

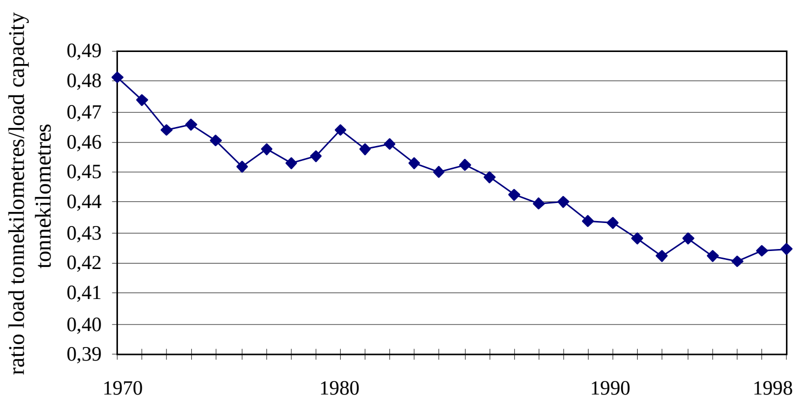

Figure 3.4 The average load factor between the years 1970 and 1998, expressed in the ratio loaded tonne kilometres/ load capacity tonne kilometres (source: CBS, 1999)

The ratio of loaded vehicle-kilometres to total vehicle-kilometres is another indicator of the efficient use of vehicles. If this ratio is high, it means that the total for vehicle-kilometres driven empty is rather low, and vice versa. Figure 3.5 shows that between 1970 and 1997, the percentage of loaded kilometres decreased from 73 to 72 percent. In 1990 it was at its lowest, at 70 percent. This means that vehicles, trucks in this case, are again increasing the number of kilometres driven while empty. Since 1992, the percentage has gone up to 72 percent.

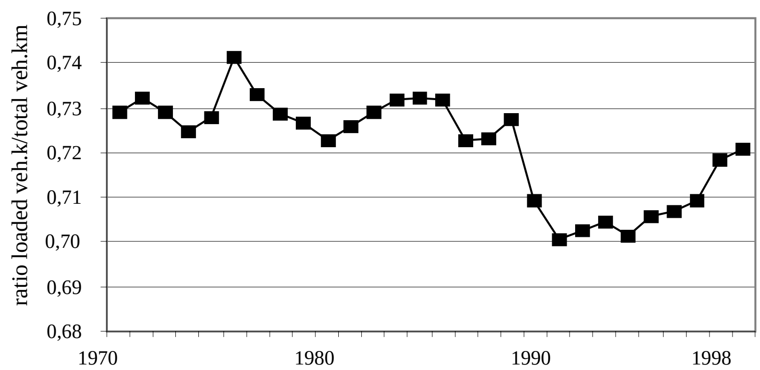

Figure3.5 *Ratio loaded goods vehicle kilometres versus total vehicle kilometres between the years 1970 and 1999 in the Netherlands (CBS, 1999)*

Environmental efficiency

Environmental efficiency has many measurements, including the quantity of emissions.

Table 3.2 shows the emission-efficiency of different vehicles. If we combine this with transport-efficiencies in table 3.1, then we are able to construct an integrated efficiency-coefficient. Thus, we can compare different vehicle types and even different logistic concepts.

The following indicators must be elaborated for this methodology:

- Transport cost efficiency. Transport costs are a simple indicator, but speed and reliability must also be included in some way;
- Social cost efficiency. This is normally done by monetarisation of, for instance, emissions and noise pollution.

Table 3.2: Freight traffic in urban areas and emission indicators (Source: CBS 1996; Poppe, 1997)

Year 1995	*Cars*	*Vans [diesel]*	*Trucks*	*Articulated trucks*	*Total*
Traffic volume [mln veh.km]	-	5353	483	597	6400
Primary Energy [MJ/km]	3.5	4.1	16.0	19.7	6.4
CO_2 [g/veh.km]	254	297	1174	1441	469
NO_x [g/veh.km]	0.84	1.13	13.53	20.54	-
SO_2 [g/veh.km]	0.069	0.248	1.139	1.401	0.422
VOC* [g/veh.km]	0.65	0.77	4.72	8.09	-
CO [g/veh.km]	2.9	3.5	6.7	10.2	-
Benzene [mg/veh.km	92	91	182	182	98
Aerosols [g/veh.km]	0.009	0.29	0.972	1.003	-
Traffic safety [lethal accidents/mln veh.km]	6	4	30	29	
[severe injuries/mln veh.km]	78	58	106	--	
* VOC: Volatile Organic Compounds					

3.3 How to improve the overall efficiency

Measures to improve urban freight transport can be categorised by using the earlier defined layer system. Each measure serves a certain efficiency, as defined earlier. This is elaborated in the next figure 3.6. The following categories are used:

- Transport prevention. This refers to solutions by the shipper to avoid or reduce the need for transportation
- Logistic optimisation. This refers to logistic chain optimisation and different ways of consolidation.
- Transport optimisation. A carrier can take measures to optimise his fleet use, like route-planning, use of standardised load units or adjust his vehicles.
- Traffic optimisation. The infrastructure provider can improve the infrastructure, introduce access restrictions, road pricing or traffic management.
- Protective strategies, like noise barriers.

By connecting measures to a layer and by determining how it improves the efficiency of the transport system, it is possible to determine qualitatively or quantitatively the effectiveness, in terms of transport and environmental and social costs. In particular transport prevention and logistic optimisation have potentially considerable impacts in terms of improving efficiency. In the Netherlands, the national government supported in the nineties on a large scale efficiency scans at different transport generating companies, efficiency improvements between 10-15 percent turned out to be directly feasible, without doing any large investments.

		Demand volume [tonnes/year]	• volume-efficiency [transported tonnes/tonnes]	Transport volume [tonnes/year]	• logistic efficiency [tonnekm per tonne]	Transport performance [tonnekm/year]	• transport efficiency [veh.km/tonnekm]	Traffic volume [veh.km/year]	• transport costs efficiency [costs/veh.km]	Transport costs [costs/year]	• economic efficiency [economic benefits/ transport costs]	Economic benefits [costs/year]	• emission efficiency [emission/veh.km]	Emissions volume [emissions/year]	• social cost efficiency [social costs/emission]	Social costs [social costs/year]
I	**Transport prevention or avoidance**															
	Transformation from goods to electronic information	X		→		→		→		→		→		→		→
	Reduction of weight or volume of goods	X		→		→		→		→		→		→		→
	Reduction of packaging material		X													
	Local production (stream downwards assemblage or stream upwards assemblage)			(x)	X	→		→		→		→		→		→
	Consolidation of production (brandless assemblage)			(x)	X	→		→		→		→		→		→
	Regional suppliers			(x)	X	→		→		→		→		→		→
II	**Logistic optimisation**															
	Chain optimisation and consolidation (Get rid of stock optimisation)						X	→		→		→		→		→
	Virtualisation of the logistic chain						X	→		→		→		→		→
	Consolidation of logistic chain or outsourcing (brandless distribution)						X	→		→		→		→		→
	Consolidation within transport means (intermodality) or modal shift						x	→		→		→		→		→
	Shift of distribution activities in time or space								x	→		→				
III	**Transport optimisation**															
	Dynamic route-information and routeplanning						x	→	x	→		→		→		→
	Standardisation of loadunits						(x)	→	x	→		→		→		→
	Vehicle optimisation						x	→		→		→	x	→	x	→
IV	**Traffic optimisation**															
	Infrastructure improvements						(x)	(→)	x	→	(x)	→	(x)	(→)	x	→
	Access restrictions									→		→			x	→
	Road pricing							(x)	x	→		→		(→)		(→)
	Traffic management								x	→		→				
V	**Protective strategies**															
	e.g. noise barriers														x	→
	X – level of intervention → - influencing															

Figure 3.6 Possible solutions and the way the influence transport costs and social costs

This approach is applied in a simplified form with determining the consequences or ICT and e-commerce for freight transport in urban areas (Visser & Nemoto, 2003)

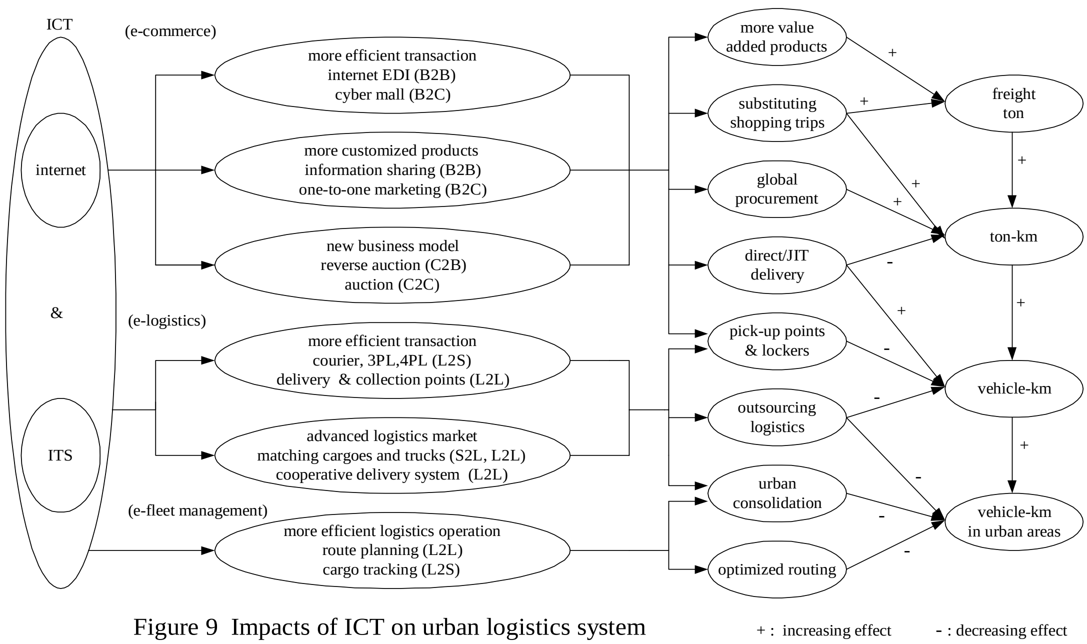

Figure 3.7: The consequences of ICT for freight transport in urban areas (Visser& Nemoto, 2003)

4 Conclusions

Urban freight transport is vitally important for residents and industries in urban areas. At the same time, there are problems, relating to environment and accessibility.

There are very different policy practices in different countries. There is no best solution, although consolidation in combination with cleaner vehicles is a promising but difficult solution.

In order to develop a better analytical framework. A layer systems approach is proposed in combination with defining different types of efficiencies.

Measure are categorised based on the layer approach. For each type of solution is determined how it influences the efficiency of the urban freight transport system

This way an analytic framework for an integrated approach, as recommended by the OECD-report is created. The layer scheme approach is used in several transport studies in the Netherlands by TRAIL Research School and TNO and turns out to be a successful approach to model transport systems in more detail. The next step is to use this approach to optimise freight transport policies.

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Annex: Differences in policies between the selected countries

	Australia	Belgium	Czech Republic	Denmark	France
Two main policy objectives	• Provision of good level of service for users • Enhance urban livability	• 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.	• Congestions • Environmental problems	• Congestions • 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, only some examples on companies' level	• Freight villages/freight centers 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 experiences	• The Copenhagen Scheme. • Voluntary cooperation 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 2 years.	• Experiments with electric trucks
Consultation	• Federal and State level consultation is extensive, local government level less so.	• Local consultation	• Local consultation programme	• National and local consultation "Forum for Citylogistics"	• National and regional consultation programs
Policy level	• Three tiered, federal, State and local	• Local and regional	• Local	• Local	• National

	Germany	Japan	Korea	The Netherlands
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 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)
Freight centres	• Implementation of (multi-modal) freight centres (GVZ)	• Implementation of different types of freight centres	• Implementation of freight centres	• Experiments with consolidation terminals
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 experiences	• Experiments with electric/ hybrid and LNG-trucks
Consultation	• Local consultation programs	• National and regional consultation programs	• National and local consultation programs	• National consultation program
Policy level	• Local	• National	• National and local	• National

	Spain	Sweden	United kingdom	U.S.
Two main policy objectives		• Safety • Sustainable transport	• Integrated transport • Sustainable transport	• Inclusion within Metropolitan Planning Process • Improve efficiency
Underlying problems		• Air quality • 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	• Time windows and access control by smart card in Barcelona	• Environmental zones • Use of stickers • Time windows • Other local regulation	• 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	• Public multimodal freight centres	• Private multimodal freight centres	• Private and public/private multi-modal freight centres	• None
Freight routes		• Weight restrictions on part of the 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	• Local	• National and local	• Local

Source: OECD Working Group and Van Binsbergen & Visser, 2001