Urban space and logistics:
on the road to sustainability?

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Considers the transportation of urban goods

Urban space and logistics – a framework for sustainability

Arguing with the necessity for more sustainability in the urban and regional environment, there is actually no need for further explanations. Basically, there are five fundamental goals in sustainable development as recently formulated by environmental planners in the UK (see Blowers, 1993):

(1) *resource conservation* to ensure the supply of natural resources for present and future generations;

(2) *built development* to ensure that the development and use of the built environment respects and is in harmony with the natural environment;

(3) *environmental quality* to prevent or reduce processes which degrade or pollute the environment, to protect the regenerative capacity of ecosystems, and to prevent developments which are detrimental to human health or that diminish the quality of life;

(4) *social equality* to prevent any development which increases the gap between rich and poor and to encourage development that reduces social inequality;

(5) *political participation* to change values, attitudes and behaviour by encouraging increased participation in political decision making and in initiating environmental improvements at all levels from the local community upwards.

The transportation sector – and in particular freight transport – is an important field for local sustainability strategies, since it causes severe environmental, social and economic problems in towns and regions, such as air pollution, noise emissions, infrastructure and land use demand – much more than its average share of motorized trips in urban transport may indicate. There is a rising conflict between functional requirements of freight movement and commercial traffic and the significance of the city as a residential and recreational habitat.

In this context, the basic objectives for strategies of "greening" logistics are: improving freight traffic efficiency (from the economic perspective); improving freight traffic acceptability (from the social perspective); and improving freight traffic sustainability (from the environmental perspective).

Planning approaches for freight traffic policy

Compared to passenger traffic, freight transport planning is nevertheless much more difficult to steer. Since it would not be successful to set up comprehensive but inadequate planning rules and strategies, investigating realistic strategies means considering the following:

- From the urban planning point of view, many subsystems of logistics are undergoing a process of "fragmentation", corresponding to the structural change: the number of delivery activities and frequencies, the number of involved companies and the specific logics of each urban distribution channel limit a comprehensive planning strategy.
- An important problem is also derived from the functional and physical "distance" between the location of the enterprises and the location of the environmental damage, caused by their logistical structures. When the stock in shops is reduced and the orders function in short terms, or when more large trucks are operating because of their cost advantages, those decisions are made far away from the frequented area. The question is whether and how the logistical chains can be influenced "backwards" from that location.
- Accessibility provided by transport and logistic facilities is becoming a major factor in evaluating potential production locations and thus is a central parameter in regional business development. Economic as environmental problems of business-related-traffic are locally handled in a very sensitive matter. The reason is that every

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authority is interested in maximizing the economic vitality and the enterprise's conditions, so there may be a certain willingness to accept external effects of transport.

- The planning knowledge in freight traffic is not very advanced; the existing data sources are more or less directed only towards long-distance transport. In most European cities there is a poor knowledge of local freight transport, as there is much less experience in managing it.

As difficult as this "operating arena" of freight and commercial transport may appear, it is obviously necessary to develop planning and communication strategies to integrate freight transport into the local and regional planning process – step by step. This is an ambitious task and requires a clear understanding of the real structures and the desired future. First of all, the relevant structures, volumes and problems of commercial transport should be elaborated, related to the conditions of space and time, the diverse participants and their problems. This is an important prerequisite for any practical measure.

Changing structures of commercial transport – a case study

The following results are valid for the tri-city region Remscheid-Solingen-Wuppertal (North Rhine Westphalia, Germany), but they may be representative of other German or European cities of that size. The population consists of more than 670,000 inhabitants, and the urban area is characterized by high density and specific topographic bottlenecks for transportation. Economically, the region has an old industrialized structure, dominated by export-oriented industries (textiles, machine tools, paper, electronics, divers automobile-components etc.); there is also a long tradition in servicing small firms by professional forwarders and transporters.

The research is based on transportation analyses, statistical surveys and nearly 700 inquiries into retail, industry and transport economy. From that perspective, freight transport in urban areas is characterized as follows (Hesse, 1994):

- The average share of commercial traffic is estimated at nearly 30 per cent of all daily motorized trips in town. Twenty per cent of these account for the service functions, most of them done by passenger cars, 10 per cent account for trucks and delivery lorries, dependent on the different land-use patterns.
- Nearly 60 per cent of the lorries belong to the 7.5 tons maximum weight category, the others are above; only a small percentage consists of heavy-vehicle traffic (28 tons, 44 tons total), which occurs not only in industrial areas, but is also related to the food-store delivery into residential areas.
- A significant part of the city delivery is related to retailers (textiles, food, pharmacies, book-stores, flowers etc.; especially warehouses and supermarkets) and to the industry (each nearly 30 per cent), further trips stem from construction, waste management and others.
- The average daily delivery volume is very differentiated: while small retailers are going to be served only twice to five times a day (e.g. small textile stores), food stores tend to be delivered 15 to 25 times a day, dependent on the size and the diversity of the goods supply. Supermarkets and warehouses are the most frequented retail locations with more than 40-50 lorry trips a day.
- The real transport function is served by forwarders and transporters (nearly 30 per cent), shippers (more than 30 per cent), retailers themselves and specialized logistic firms. Most of the relevant logistical dispositions stem from either the shippers or the receivers, not from the forwarders and transporters.
- The time-scale of the delivery function tends to be spread out over the whole day, with peak periods in the later morning and early afternoon. More and more goods are going to be distributed in the early morning (fresh food, newspapers) or during the night (car components); national and international long-distance transport is operated in many cases during the night time.
- Most of the participating firms expect an increase in delivery frequency over the next few years (52 per cent of those questioned), because of more short-term-demand-oriented goods supply by shippers and distribution chains.

Conclusions

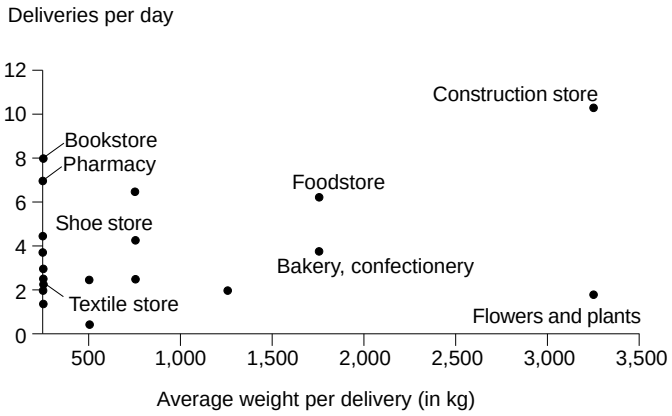
According to the structural change within a rationalized supply and demand of logistic services, the future estimations for freight traffic are characterized by a growing diversity of products and distribution channels, increasing distances and vehicle miles travelled, and a growth in the volume of transported goods in total (see Figures 1-5).

Freight transport and the urban environment

There are several problems for the environment, urban construction and social interests, derived from commercial transport, and in particular freight traffic. The underlying impact processes can be explained as follows:

(1) The increase in the intensity of daily or weekly delivery, following the interest of firms in reducing

Figure 1. *Transport frequency and volume*



Source: IÖW 1993

Figure 2. *Commercial transport in central city areas*

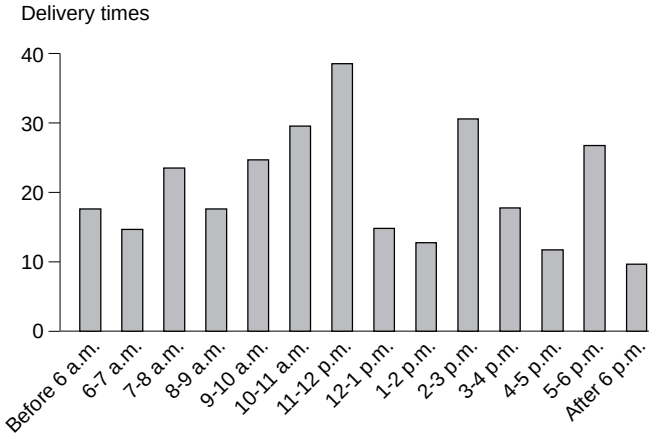


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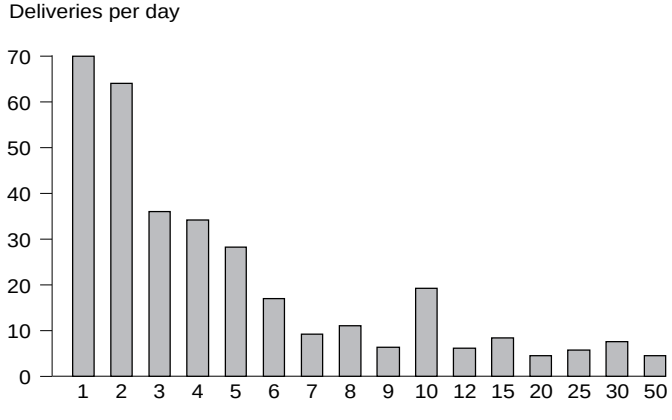
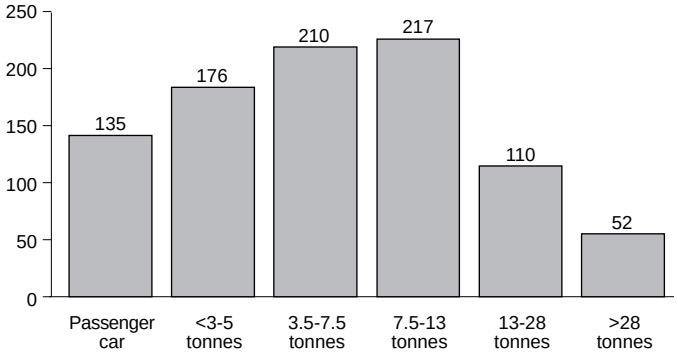
Figure 3. *Commercial transport in central city areas*



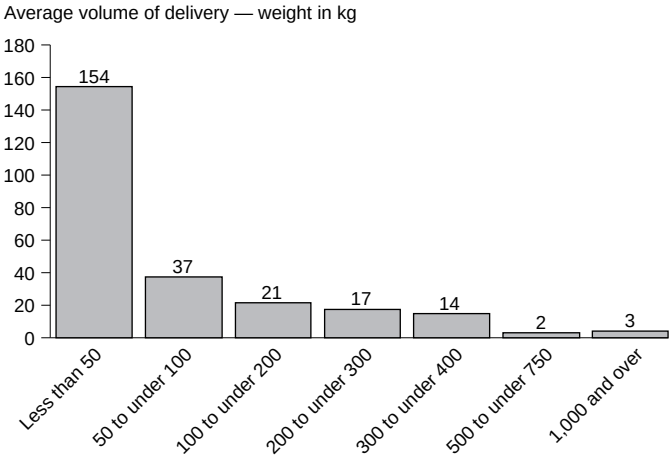
Source: IÖW 1993

Figure 4. *Type of vehicle, delivery traffic (1993)*



Source: IÖW 1993

Figure 5. *Average delivery volume (1993)*



Source: IÖW 1993

stock in shop and establishing a short- term-oriented demand for goods; this occurs in the industry, e.g. by increasing the share of "just-in-time" production, and in the retail business also (see Bromley and Thomas, 1993).

(2) An increasing volume of larger and heavier lorries, because of the cost advantages of high-volume-traffic. The bigger and heavier the lorries are, the more intensive will be the damage on the road infrastructure.

(3) There is an increasing demand for space because of the reduction of stock in shop and the functional setting up of logistical services (forwarders, integrators). New functions along the logistical chains require in many cases new locations for certain enterprises such as subcontractors, integrators etc. (Hesse, 1993).

Following the growth of the vehicle miles travelled, the growing average share of road transport on the total freight; and the growth of heavy-vehicle traffic, energy

consumption, noise disturbances and exhaust emissions are increasing. For example, freight transport accounts for 40-50 per cent of all total urban transport's emission of nitrogen oxide. Also of importance – and largely underestimated – are the material and financial implications for public infrastructure maintenance, derived from heavy-vehicle transport.

Politicians, enterprises and local administrations were not aware of those problems for a long time. But public concern about freight transport problems has increased with the process of deregulation and liberalization of the transport economy in the European Single Market, which has been a primary driving force in transport growth over the last few years. Also, companies themselves are interested in new solutions since congestion arises and leads to time and money losses. The basic question is: could there be a common interest of the economy and the environment to make freight transport more efficient and less expensive?

Business and planning – a communication problem

Integration of urban planning, urban design, business operations and transportation activity must give due consideration to the complex structures which make up the city, the need to supply the city with goods and the overall traffic volume. Seen as a central task in this regard is the provision of an arena for communication and co-operation among the various operatives in this field. Relations between city planning authorities and the business community are, however, strained within the region being studied:

- New demands on urban design are in conflict with traditional and modern demands in terms of (transportation) infrastructures as seen from the commercial user's point of view.
- There is dissonance between urban planning and commercial traffic in the context of the specific development dynamics of the transportation sector and, in particular, the growth dynamics of freight movements. The transportation sector is becoming a central driving force in urban development.
- The complex problem of urban planning and business traffic is also characterized by underdeveloped capabilities on the part of operatives to reach agreement and to act out conflicts. There is virtually no exchange of ideas and information between these two action levels; each side presumably knows relatively little about the motives, problems and constraints of the other side.
- Finally, the political decision-making situation is contributing to ever greater dissonance. Both groups of operatives, private and public, move within a society in which a political decision-making process – characterized by political bodies regulating public order and arbitrating conflicts – is being replaced to an increasing extent by the articulation of special interests (especially by representatives or lobbyists appointed for this purpose).

The research project has executed a "Freight Traffic Round Table" to promote discussion and to provide a venue in which the appropriate conflict management techniques could be implemented. The intention was to spark willingness to exchange opinions, to lend transparency to each participant's interests, and to explore the leeway available for formulating solutions which promise to find consensus. Over two-and-a-half years, 30-40 representatives of companies, city authorities and research came together twice a year to have an exchange of problems, instruments and experiences related to their daily business, moderated by the research project and accompanied by the chamber of commerce.

This very concrete and detailed exchange led not only to a better understanding of each other's position, but made a more flexible, efficient impact and concept assessment possible. Although no final solution was reached by the participants (and a city-logistics experiment failed because of lack of interest and participation of retailer firms), the round table helped to set up a joint goal system for the region's future freight transport policy. Some of the strategies explained in the next section will be executed in a joint action by private and public participants over the coming years.

Policy strategies and opportunities

A successful strategy for freight transport policy depends first on the ability to find a local and regional consensus between the relevant operators along the logistical chains at the federal, state, regional and local level. The purpose of participants should be to search for a "principle of territory", through closing the gap between the causes and damages of logistic usages and through increasing certain qualifications and implementing ability of city and regional authorities to deal with logistics in urban space.

There are several measures and instruments available to participants in terms of transportation planning and management, legal ordinances (regulation policy), technology and fiscal strategies. The following points offer an overview (source, Institut für ökologische Wirtschaftsforschung, 1993):

(1) *Measures of road and rail management and transport planning:*
- integration of goods movement into transport planning policies;
- specified truck management within the road network (telematics);
- delivery infrastructure in public space (roads, parking lots, delivery lots, pedestrian zones);
- delivery ordinances for industry and retail sites;
- improvement of the rail transport system.

(2) *Measures of time management*:
- enforcement and management of time windows for delivery;
- enforcement of speed limits for trucks;
- organization of heavy-vehicle traffic outside peak hours and periods;

(3) *Terminals and infrastructure*:
- site planning for freight terminals;
- site planning for logistic subcentres;
- telematic infrastructure for terminal networks;
- integrated supply of rail infrastructure.

(4) *Land use planning*:
- location planning for industrial and commercial sites;
- location planning for logistic firm sites;
- mixed use site planning.

(5) *Local/regional fiscal strategies*:
- road pricing;
- local "feebates".

(6) *Construction management*:
- organization of construction management outside peak hours and periods;
- local material supply stocks for construction companies and building projects;
- infrastructure supply and improvements for big construction projects.

(7) *Vehicle technology and fleet improvements*: submission of advantages for low-noise- and low-emission vehicles in public space.

(8) *Dangerous goods movement*:
- definition of road networks allowed for the transport of dangerous goods;
- definition of restrictions for the transport of dangerous goods.

(9) *Community and company co-operation*:
- development of a local and regional "Freight Transport Information Network";
- enforcing co-operation by round table talks.

(10) *Deregulation of logistic enterprises*: support of freight transport co-operatives.

(11) *Public-passenger transit*:
- development of goods movement supply in public transit systems;
- use of underground infrastructure for freight traffic.

(12) *Local energy supply policy*:
- support of natural gas and District Heating infrastructure;
- reduction of coal and gasoline delivery.

Road and rail improvements

Road and rail infrastructure management could provide some better conditions for freight transport. Designing specific time and space options and regulations (e.g. loading zones) helps rationalize the truck operations and minimizes the duration of stops, which can be economically and environmentally positive. Here the entire impact of certain measures should be taken into consideration: from the environmental perspective, it is not desirable to widen the infrastructure or to support day and night delivery in towns.

Designing a specific routing ordinance for maximum-loaded trucks or dangerous goods offers chances to reduce the damage caused by heavy vehicle traffic. Another opportunity is to integrate the railway systems into the long-distance network of big industries or retailers, e.g. hub-and-spoke-logistics; several warehouse companies are using railway infrastructure for their distribution concepts.

Land use planning

Land use and location planning decisions are very important for freight transport management especially in consideration of the restricted opportunities for managing existing usages. If new business projects are being planned, such as shopping centres, retail stores etc., urban planning should develop delivery ordinances and step-by-step co-operation concepts alongside transporters and customers or developers, to minimize the increasing amount of delivery activities in sensitive areas. Both require interactive communication between public and private participants.

Practical measures are given to support low-emission vehicles and lorries with capsuled engines (low noise emissions). Because of the higher expense of rail transportation (in many cases rail transport is also less capable and convenient) compared to environmentally friendly lorries, rail transportation solutions are not very popular from the firm's point of view. As a result of this, it is necessary for public authorities to offer incentives to those firms which voluntarily operate with more

sustainable systems (adequate time windows, open access to central business district (CBD), co-operations etc.).

Communication and co-operation, "City-Logistics"

Further strategies are directly based on organizational innovations between several firms to improve distribution efficiency and to establish highly organized logistical chains within the city. Shippers, transporters and customers should come together, not only to develop efficient paths of organization within each distribution channel, but also to make synergies between different participants possible. This kind of public and private interaction requires detailed knowledge of the specific operating conditions of each participant, and it also needs self-confident individuals, not only within the firms but also in the public arena.

A current example of successful co-operation strategies is the so-called "City Logistics" system. This means the shift in the delivery from a product-related distribution to a space- or customer-related distribution. Seen as a close co-operation between several forwarders, these models are already operating in practice. They are primarily directed towards problem spaces (CBD) and special "problem customers". Space-oriented models are currently practised in Freiburg, Germany (four co-operations with 12 forwarders), Kassel, Germany (one transporter with CBD-freight-flows of ten forwarders) and Ulm, Germany (joint disposition for two companies). "Problem customers" such as hypermarkets, or logistical locations of the big retailers are operating in Bremen, Germany (nine forwarders), Cologne, Germany (four forwarders), also in Stuttgart, Berlin and Frankfurt (all Germany). From Switzerland we recently know of three pilots of City Logistics: Zürich-Oerlike, Biel and Basel. A current state of the art report on City Logistics estimates the number of City Logistic discussions in Germany at around 60, and projects in operation at around 20 (Syntonics AG, 1995).

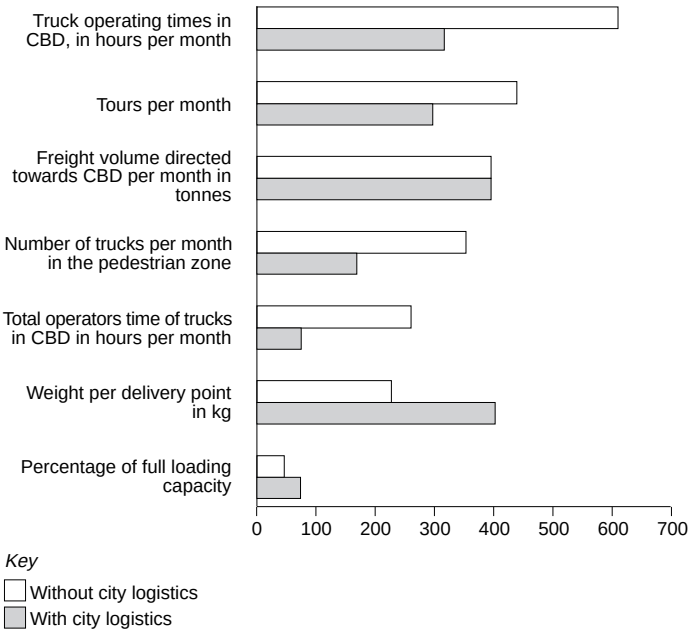
The potential of City Logistics is to achieve more efficiency in the delivery process, especially by reduced operating time for the trucks in the CBD; reduced vehicle miles travelled (VMT); and less heavy vehicle traffic in sensitive areas. That makes a hopeful combination of economic and ecological incenctives come true. The most recent German pilots of City Logistics are located in Freiburg and Kassel. In Freiburg it was possible to reduce the monthly number of truck operations from 440 to 295 (by 33 per cent), the number of the trucks within the pedestrian zone was reduced from 352 to 171 (by 51 per cent). The operating time of the trucks was reduced on average by 48 per cent from 612 hours to 317 hours (Thoma, 1994). The Kassel pilot showed a reduction of VMT related to the CBD by nearly 40 per cent and a reduced VMT by nearly 70 per cent; the number of the delivering trucks decreased by 11 per cent (Strauss, 1995). Since this is very impressive, it is necessary to consider that, at the moment, City Logistics are valid only for a certain part of the central city's commercial traffic and these are also only responsible for a certain part of the CBD-related delivery. The amount of that part of the delivery is estimated at approximately 31-36 per cent of all delivery operations and nearly 30 per cent of the weight of the goods. Nevertheless, the first results of the pilots in Germany and Switzerland offer some hopeful strategies for making urban goods movement more acceptable, if these initial steps can be transformed to other elements of the entire delivery process to integrate them into a comprehensive urban logistic system (see Figure 6).

Telematics

Looking at the current ranking of potential instruments and measures, telecommunication seems to be very popular as a hopeful strategy for managing transport and material flows. But it is still unknown whether telematics could help us to improve the efficiency of road transport by increasing the load average: in free market competition there exists no "transparent" lorry.

However, much know-how and resources are directed towards the road system, we would still need to consider the participation of modern railway systems in the enforcement of telematic innovations: to improve rail efficiency, to increase its capacity and to gain a higher market share in the distribution economy. This will be necessary without any doubt.

Figure 6. *City Logistics: the Freiburg case*



Source: Staudte (1994)

Future requirements

There are several opportunities to make urban goods distribution more acceptable but the future task in freight transport policy will not be to make growing transport demand as efficient as possible. In terms of sustainability (see Daly and Cobb, 1989), the real task consists of:

- Minimizing the general and specific transport demand of the producing-consuming-waste-management chain; here we need new instruments to estimate the transport demand of new production concepts or locations, by a life-cycle assessment of logistics.
- Avoiding additional transport and limiting transport growth, e.g. by supporting "compact city" strategies and new industrial districts, which could lead to more "proximity" in production and consumption and less division of labour in space.
- Finally, every regional and local strategy requires a framework of nationally and internationally negotiated and thus accepted pricing policy. The basic aim is: "getting the prices right", for supporting a less material-intensive structural change, with more services and less energy and material consumption in the economy.

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