Inner urban freight transport and city logistics

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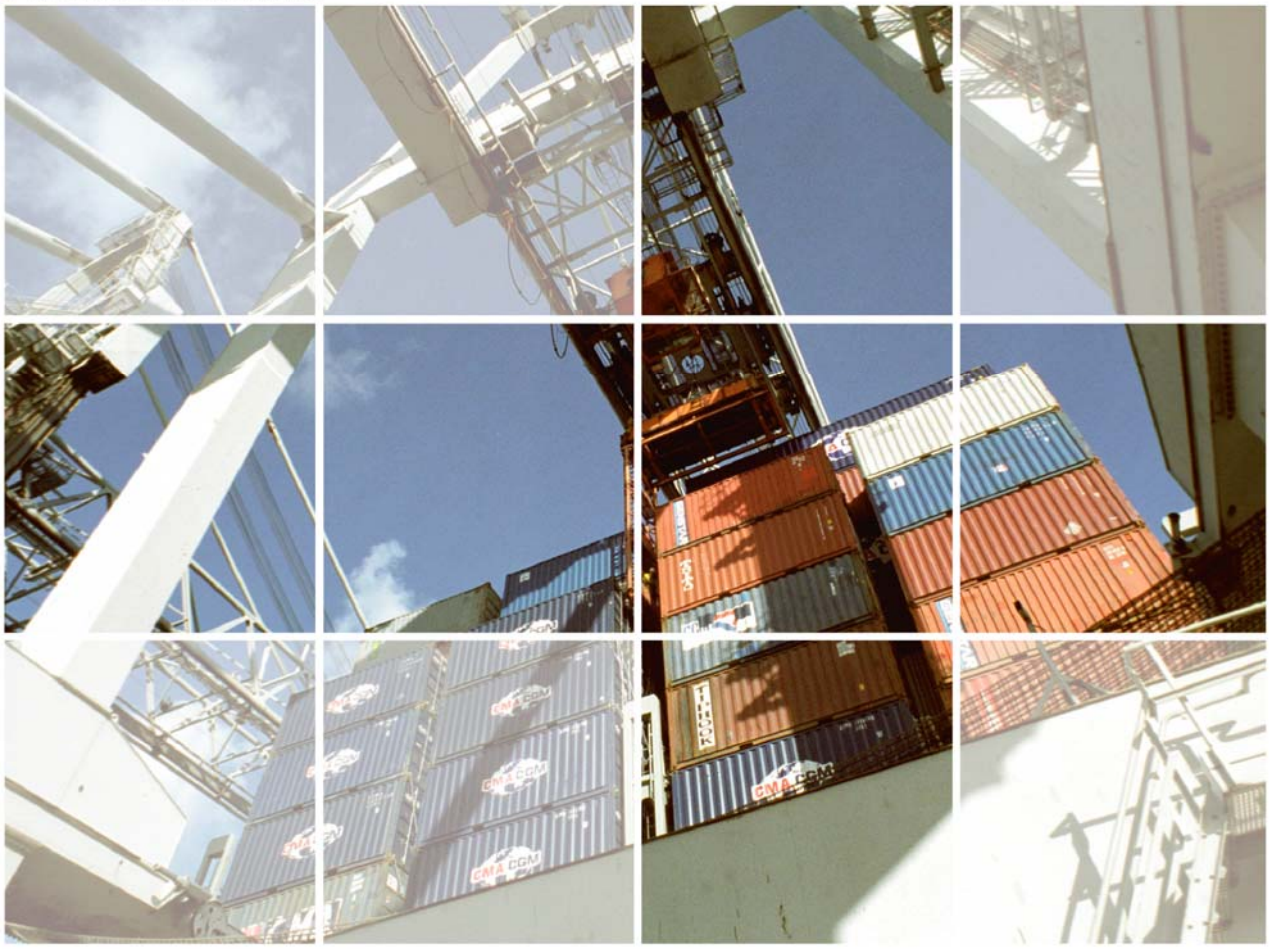

RESEARCH FOR SUSTAINABLE MOBILITY

EU-funded Urban Transport Research Project Results

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The following set of material should rather act as a PORTAL and facilitate the access of single projects and detailed results by the lecturers.

Therefore the material in hand doesn't lay claim to completeness.

Since the expectations of the lecturers regarding these materials are quite diverse - the expectations run the gamut from 'providing a survey of the result of the EU-research to a specific topic' to 'providing special results of a single research-project in detail' -, the attempt has been made to make a compromise and (more or less) come up to the expectations of all user groups.

The following compendium contains results of EU research-projects and complementary results of national research-projects. PORTAL thanks the partners and collaborators of the following projects. A complete list of the projects, consortia, and cited literature is given at the end of the material.

This material of project results for the topic **"Inner Urban Freight Transport and city logistics"** was compiled by Ulrich Schäffeler and Jost Wichser (both IVT-ETH, Institute for Transport Planning and Systems, Swiss Federal Institute of Technology) in 2001 and adapted after a workshop with lecturers in 2002.

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1. Introduction

1.1 Introduction

In the following Chapters, the special characteristics of freight transport in urban areas or in municipal metropolitan areas are explained. As transport chains typically constitute both technically and also organisationally a unity, and the transport chains cross the geographical borders of metropolitan areas, an exclusive examination of urban freight transport is not possible. Therefore, the following Chapter covers the complete transport chain.

Freight transport in urban areas is often brought together with the concept of "city logistics". City logistics, in the sense of supplying city centres with goods (in the form of freight), is a part of the theme dealt with here. However, freight transport in urban areas includes much more than only the maintenance and disposal from city centres.

1.2 The Definition of Freight Transport in Urban Areas

The conditions under which freight transport in urban areas must be transacted differ greatly from those in rural areas. One reason for the characteristic of freight transport in urban areas is the significant environmental sensitivity of densely settled areas. As a result of this, extensive research in this field has been undertaken in recent years. However, these new developments in the freight transport sphere have not come to the forefront, although they are essential for future development. Improvements are only possible when all participants are well versed in the new knowledge and begin to put it into practice.

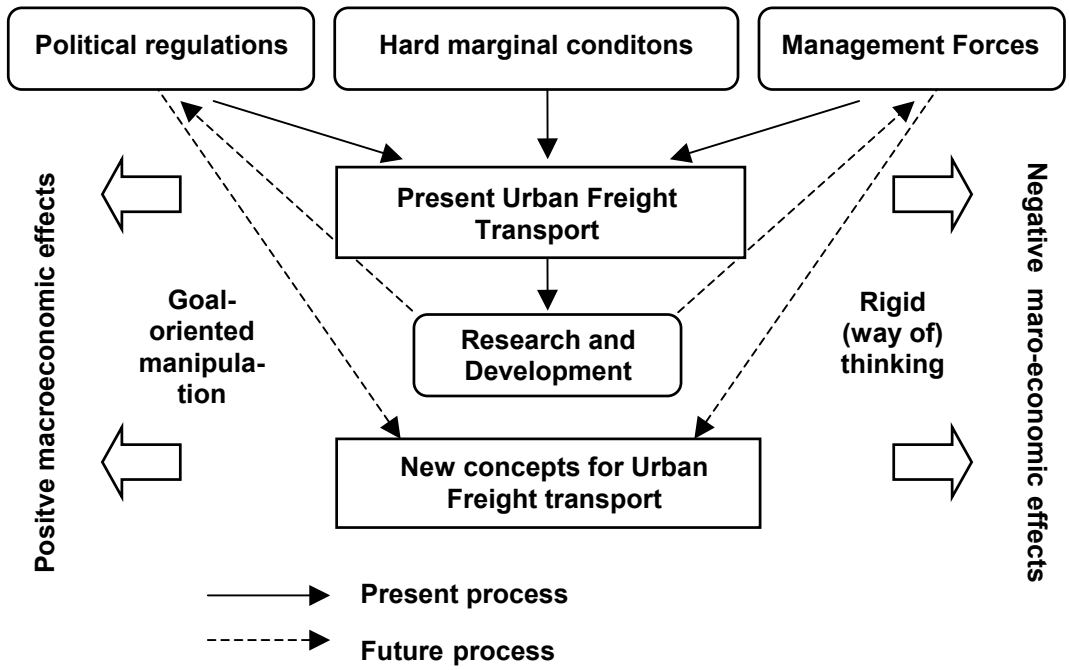

Exhibit 1: Importance of research within urban freight transport

1.3 Significance of urban freight transport

In Europe over 75 % of the population is living in urban areas [3] and by that, industrial production is also concentrated on urban areas. This leads to a high potential for freight transport.

From the total traffic within urban areas, freight transport (lorries > 3,5 to) has a share of about 10 %. If vans and cars, which have become more and more important in recent years, are included this share would be much more higher [13]

The importance of urban freight transport can also be shown by the cost distribution within the freight transport chain. The share of pick-up and delivery operations, which often take place in urban areas, on the total door-to-door cost is in combined transport about 40 % [7]. The weight of these costs is further increased by the reduction of stocks, the smaller size of consignments and the increase in their number.

Problems due to urban freight transport

Due to the high density of settlement within urban areas and the limited resources (infrastructure, environmental resources, …), urban freight transport has to cope with many difficulties.

Besides high population density and consumption there is of course also the high density of buildings. Hence the traffic infrastructure is very limited and the possibilities for enlarging it are bounded by the lack of unutilised areas. On the other hand underground construction is very expensive and can be afforded only in a few cases.

Beyond the constraints due to the traffic infrastructure, environmental aspects have a major importance in urban areas. These high requirements are related to the dense settlement. In the urban area of Bremen, Germany (~ 500'000 inhabitants) more than 500 tons of fuel are consumed daily for traffic (freight and passengers). This leads to above listed emissions of air pollutants:

Carbon monoxides	34 to/day
Particles	0.16 to/day
NOx	18 to/day
CH	8 to day

The share of freight transport on energy consumption and pollution is higher than the corresponding percentage in vehicle kilometres [13].

A further environmental aspect is traffic noise in urban areas. In the city of Zurich, Switzerland, one third of the population lives in areas with noise emissions above the limits fixed in the federal noise protection law [12].

Need for urban freight transport

Despite the problems described in the previous chapter, the profit for the whole society of restriction for freight transport in urban areas is conflicting.

For the economic competitiveness of an urban area it is very important to guarantee a free and cheap exchange of goods. City centres can suffer compared with peripheral shopping centres if delivery traffic is too expensive. In this context it has to be taken into account, that one lorry delivering to a shop in a residential area causes fewer problems than 100 private cars, fetching the same amount of products from an outlying shopping centre.

1.4 Link with EU Policies

One of the central aims of the European Union is to harmonise and integrate economic activity throughout the union. This aim is of course closely related to the transport system for goods being efficient. And although the longer part of freight transport is occurring between regions, almost all loads finally end up in urban areas, since that is where the consumer market is. Also for other reasons – mostly environmental concern – has the Union been involved in policymaking related to transport issues. Further, many of the problems that have been approached in such policymaking (air pollution, congestion) are most pronounced in urban areas.

Thus, there would be reason to believe that urban freight transport would have been a rather central issue in European policy making. However, in the documents that the commission has published to support the making of a common European transport policy, issues on city logistics have in fact been only rarely mentioned. The complexity of the issue, especially the links to commercial competition, and the limited room for public initiatives that follows from that, may have been reasons behind the relative silence in official documents.

A first acknowledgement of the complexity of these issues is presented in the green paper *The impact of Transport on the Environment, COM(92)46,* published in 1992. Here it is stated that *"Transport of goods has to be seen as an integral part of the production and distribution process"*. Examples are given of structural changes that have induced a general increase in demand for goods transport. Such examples are Just-in-time management and customer-oriented production. The choice of mode for freight is discussed, and the conclusion is that qualitative aspects such as reliability and flexibility may be gaining in importance. Urban distribution, local terminals et cetera are however not discussed specifically.

In the second half of the 1990's, a lot of the transport policy discussion was focused on issues concerning pricing. As a result, a white paper was published in 1998: *"Fair payment for infrastructure use"*. This paper suggested steps towards practical implementation of a common pricing system for transport throughout the union. The basic idea was to bring real costs closer to transport users, thereby giving them a better basis for efficient decision making concerning issues such as mode and route choice etc.

In *"Fair payment for infrastructure use"* it is concluded that if pricing was based on marginal social costs, reflecting also transport externalities*," that would lead to new, more efficient, systems for logistics and distribution"*. Here, it is clearly assumed that the current design of those systems is not optimal from a societal point of view. The market is however assumed to be able to solve the technical and organisational issues needed for an improved design, if the correct price mechanisms are put in place.

Recently, a comprehensive document, formulating European transport policy has been published: *European transport policy for 2010: time to decide, COM(2001) 370.* Here, the trust in marginal cost pricing seems to be somewhat reduced. Although the price mechanism is still one of the recommended tools, a much wider range of measures is now suggested to reduce different current deficiencies in the transport system. It is, however, acknowledged that for reasons of subsidiarity, national or regional agencies will for many measures be more appropriate decision makers than the agencies at the European level. Interregional freight, which most often is international, is however regarded to be central to commercial competition and economic integration, and is therefore subject to explicit recommendations for measures to be taken. Among those suggestions are introduction of a new profession – freight integrators – and financial support to the development of intermodal technologies.

For reasons given above, in *European transport policy for 2010* there are no suggestions on the same detailed level concerning measures for the improvement of urban freight transport. However, it is clearly stated in the report that the same kind of needs for increased integration, and new technical solutions, apply also for the final distribution of goods. Hereby the commission expresses its support for wide spread, but local, policy initiatives within the area of city logistics.

1.5 Summary

As urban freight transport is a part of the hole transport chain, it has to be seen in a wide context.

Urban transport as a part of the freight transport chain, has it own requirements:

- The access of city centres in Europe is limited because of
  - Narrow roads
  - The overcharged road networks
  - Restrictions on road traffic due to the high density of residents and their requirements on the environmental impacts
- As urban freight transport is mainly the distribution of goods at the end of the transport chain, the loads are mostly small, which leads to many trips.

While urban freight transport has to be integrated in the transport chain, a compromise between the requirements of urban freight transport and other parts of the transport chain has to be found. Unfortunately, this compromise often leads to an overweight of long distance transport, without taking into account the requirements of urban freight transport.

As optimisation of traffic flows within city centres is often not accordable with the interest of the involved partners. They tend to optimise their traffic flows in accordance to their specific needs, which aren't conforming to the objectives of an overall optimisation.

Due to this, approaches of freight distribution centres where in most cases without any success.

The set-up of freight traffic centres has achieved improvements. The aim of these centres is the concentration of freight traffic intensive enterprises on well-linked industrial areas. For such freight traffic centres the equipment for intermodal transport (terminals...) can be provided.

2. An Introduction to Logistics

2.1 The Concept of Logistics

The concept "Logistics" is used in varying spheres such as mathematics (Greek: logisticse: the art of calculation), military, and economics.

The concept of logistics was originally used in the military sphere and meant the personnel and material support for the fighting troops (food, munitions, materials, repair services, medical services and transport). Later the concept also found a place in economics. The original definition can be seen in the origin of the word; the expression comes from the French; logistique, Logis: accommodation.

In the present examination, only the economic definition of logistics is needed and applied:

Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information form the point of origin to the point of consumption in order to meet customers' requirements [2].

With this, transport is a part of logistics, with respect to logistical processes of acquisition and distribution of goods.

2.2 The Logistical Process

Structure

The logistical process describes the interaction of production, movement and warehouse processes. With this, such a process can be represented as a network. Through the network, objects (goods) are moved. Two different elements of a network represent the main functions of logistical processes:

Nodes	→	Storage
Links	→	Movement

Nodes can have different functions:

- Production; i.e., the qualitative change of a good
- Deconsolidation; i.e., shipments are united or dispersed
- Storage: i.e., goods are stored until they are called for by consumers
- Consumption; i.e., goods are consumed or further changed qualitatively
- Disposal; i.e. consumed goods as waste are depolluted

Links are the transport routes. A classic view of transport, as was earlier the rule (and in passenger transit is still today), concerned itself only with overcoming the distance between two nodes. Today transport is understood as part of the logistic process.

Economic Principles in Logistics

The logistical process itself is steered through production factors. These are:

- Costs
- Time
- Quality

The geographical positioning of different nodes therefore depends on:

- Production costs, particularly availability and the costs of personnel, energy and production areas
- Costs of warehousing and physical possibility of building warehouses
- Costs and time requirements for deconsolidation
- Quality factors in production, deconsolidation and transport
- Possibilities to carry out transport between nodes as well as the costs and time requirements

The final variable chosen in the logistical process for manufacture and distribution of a good is the total optimum concerning the market uses. The specific location, means of transport, and transport routes are chosen in order to bring the product to the customer at a good price, at the right time, in the correct quantity, and in the right condition.

Examples

Thus production locations are always chosen on the basis of lower production costs. Today, these places are increasingly in countries where salaries are low and, for example, there is little concern for the environment. They are still farther removed from the place of consumption, but transport is still cheaper than high-wage labour.

Picture 1: High Tech products are produced in high cost countries

Warehouses are avoided whenever possible, because generally during the warehousing little value is added, save a few exceptions. Likewise, it should be noted that during warehousing capital remains unproductive.

The Deconsolidation serves to optimise the transport costs, in which greater transport unity can be put into practice and less packing material needs to be transported. Additionally, the information flow necessary to each logistical process is simplified.

The long transport routes between production and market has led to, for economic reasons, the time becoming an ever more important element in the logistical process. On the one hand, transport and capital tie together to result in transport costs. On the other hand, the storage minimisation leads to high demands on the reliability. This leads to "just in time" operations, meaning both short transportation time and high reliability; reliability is the more important demand, with the exception of high value and perishable goods.

The choices of means of transportation and transport routes are, on the one hand, optimised within themselves. On the other hand, these are held in place by other elements; the optimisation possibilities are already limited. Personnel costs for mass production often lead to distant production locations, as these comprise a larger portion of the final costs than transport. Whether the value share of the work is high thus plays a dominant role in the transport time. This in turn leads to overly expensive air transport.

The present world economy is formed in part by large production cost distinctions and in part through cost-saving and varied transport possibilities.

Thus, the significantly growing transport volumes are primarily determined by the different production costs rather than the transport costs.

Passenger Transport- Freight Transport

In contrast to passenger transit, there are no goods that can literally move by itself. Goods are always moved and its transportation organised by people. A central difference is that goods cannot enter and leave the transport container without external force. From that also, a change of transport containers or means of transportation is always dependent on expenses and, likewise, costs.

Passengers	Goods
Travel (active)	Transported (passive)
Board, get off and transfer without assistance	Must be loaded, unloaded and transferred
Process information and act on it without assistance	The information must be processed through logistics managers
Meet choices between means of transport without assistance but often irrationally	Logistics managers meet choices between means of transport rationally

Exhibit 2: Differences between Passenger Transport and Freight transport

Whereas in passenger transport, passive information (i.e., signals, signs, announcements, etc.) guides travellers, an information flow (corresponding to transport volumes) guides freight transport in accordance with goods flow.

Picture 2: Expensive infrastructure is necessary for the "transfer" of goods

The main criteria for the choice of transport mode are:

- Transport costs
- Transport time
- Transport reliability, in terms of time
- Safety of transported goods

For reasons of complexity concerning the information flow, unimodal transport (i.e., train from factory to factory, road transport) is today, as earlier, often preferred even if the remaining criteria favour a multimodal or different unimodal transport transaction.

2.3 Goods Flow and Freight Transport

Goods Flow Concepts

Logistical processes are fundamentally divided into two types.

Single-Step System

The goods flow between supply point (origin) and reception point (destination) is *direct.* This system has the advantage that the goods flow between supply and reception points is unbroken. With this, no additional storage or movement process is necessary.

Exhibit 3: Single-Step System, with Direct Goods Flow [4]

Multi-Step Systems

Here, the goods flow between supply point and reception point is *indirect.* The goods flow is interrupted in at least one place. At this interruption point, distribution or aggregation processes take place.

Distribution: shrinking of transport units (because of the limited consumer demand)

Consolidation: many small goods flows are united into a larger bundling (aggregation).

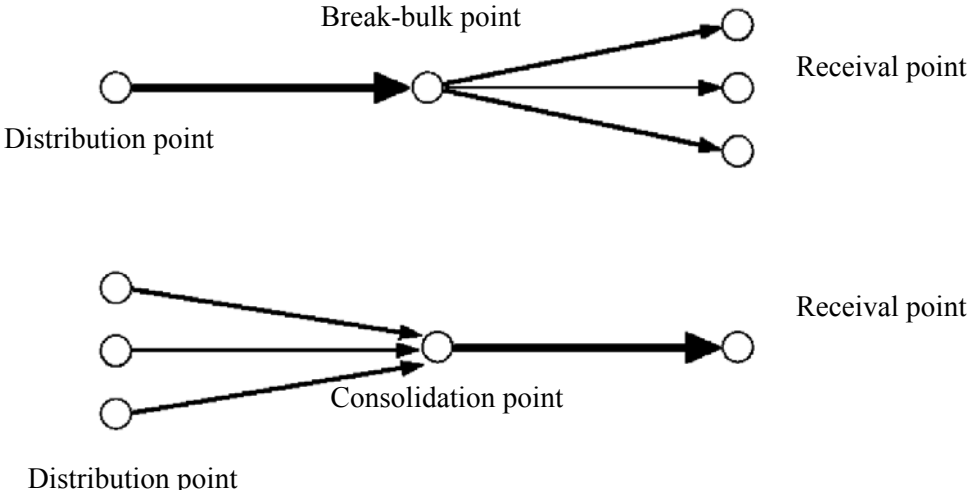

Exhibit 4: Multi-Step System, with Indirect Goods Flow [4]

Combined System

In a combined system, simultaneous direct and indirect goods flows are possible.

With great distances, the goods flow can be, for example, too slow to cover the resulting needs at the reception point on time. The distribution points have the character of a regional warehouse. Multi-step systems are also recommended by the fact that the economics of a goods flow generally depends directly on the volume.

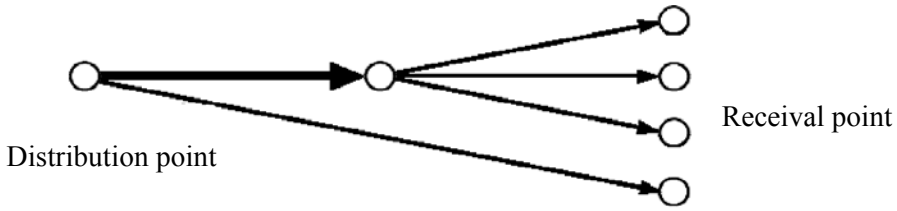

Exhibit 5: Combined System, with Direct and Indirect Goods Flows [11]

Transport Process

The solution of this transport problem consists of the development of a *transport chain.* In freight transport, these are defined as:

Sequence of technical and organisational interconnected events, by which goods are moved from an origin (supplier) to a destination (receiver).

The transport chain is a part of the goods flow and refers only to the logistical function of transport.

Organisationally, transport chains can be built up in the following way:

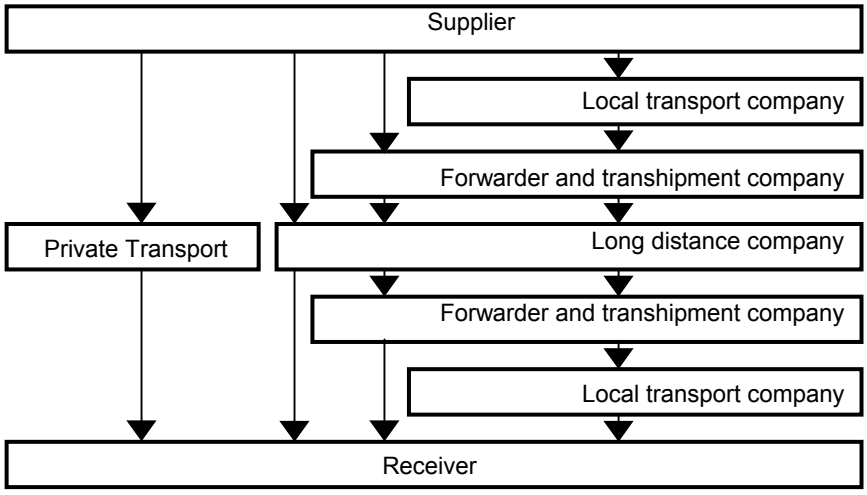

Exhibit 6: Organisation of Transport Chains [11]

The following two fundamental processes exist in freight transport:

- direct "*door-to-door transport"*, with unique loading and unloading facilities, and
- "*node-to-node transport*", with aggregation and distribution of small shipments (also known as general cargo) at nodes, and in between transport larger cargo units (also known as wagon load consignment). Such nodes are then rationally used for further logistical tasks, such as warehousing and deconsolidation.

Transport chains can be built up as single-step and multi-step processes and are understood in this sense as multidimensional functions.

In a *single-step transport chain,* only *a means of transport* is needed between the supplier and the receiver. Therefore, it is only a question between so-called *uninterrupted* or *direct* transport.

In a *multi-step transport chain, a change of transport means* takes place between supply and reception points. So-called *interrupted* or *combined (intermodal)* transports are thus spoken of in the broadest sense.

Combined (intermodal) transport in the narrower sense means *no change of transport containers* takes place. Here, the transport vessel can be a container, a vehicle or a part of a semi-trailer.

Picture 3: Intermodal transhipment at a harbour

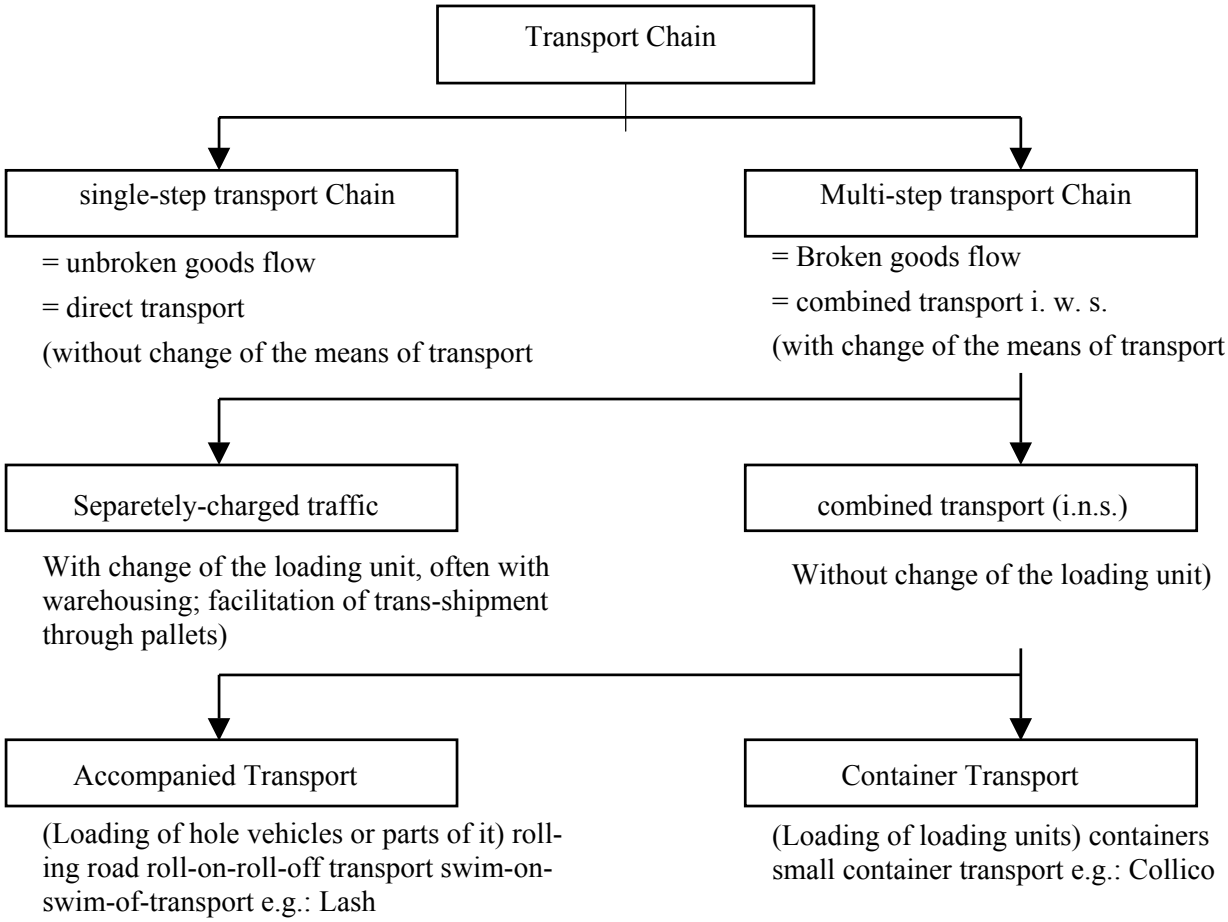

Exhibit 7: Structure of a transport chain [4]

3. Features of Freight Transport in Urban Areas

3.1 External Marginal Conditions

The conditions under which freight transport in urban areas must be dealt with differ greatly from those in rural areas. From this fact alone, a separate examination of freight transport in urban areas justifies itself.

Spatial Restrictions

In city centres, special logistical configurations are primarily important because of limited spatial relationships.

The usual transportation means (40 tonne truck, wagon) often cannot be used. A delivery to city centres is frequently possible only with small delivery vans up to 3.5 tonnes in weight. These travel on the basis of limited load capacity, which leads to more trips and a further burden the road network.

Picture 4: Space in city centres is very limited, even for 3.5 to trucks it can be too narrow

Because of the demands on the townscape, it is not otherwise possible to park vessels and containers for a longer time. The loading and unloading must take place concurrently during the delivery.

Traffic Infrastructure

A large demand on transport capacity (in goods transport as well as passenger transport) stands in opposition to a very limited offering on the side of infrastructure in the centre of metropolitan areas. This leads to road congestion, which has the repercussion of considerable delays in the transport process. Further infrastructure development is hardly possible because of intensive land use and is additionally associated with great financial expenditures.

Picture 5: Traffic infrastructure in urban areas is very costly

Environmental Concerns and Sensitivities

In the centres of metropolitan areas, transport should have been dealt with as environmentally friendly as possible, because of the higher settlement densities. Corresponding to this is emissions controls, as well as noise barriers and land consumption.

3.2 Connections within the transport chain

In order to be able to understand the complexities of freight transport in urban areas, it is necessary to conduct an examination of various logistical arrangements.

There are essentially four different groups of actors taking part in the logistical process and transport arrangements:

- Manufacturers
- Distribution companies: freight forwarders, parcel services,
- Consumers/Receivers: retail shops, food supplier
- Authorities: Because of the different perspectives of the distinct actors, the arrangements can come out very differently, depending on task divisions.

Receivers without specific delivery logistics

Approximately one-fourth of receivers in European cities have no organised logistical arrangement. They receive their goods either directly from the manufacturer or by way of a distribution company. This results in a greater number of suppliers providing goods to an individual receiver and, consequently, causing many trips with vehicles that are not fully loaded.

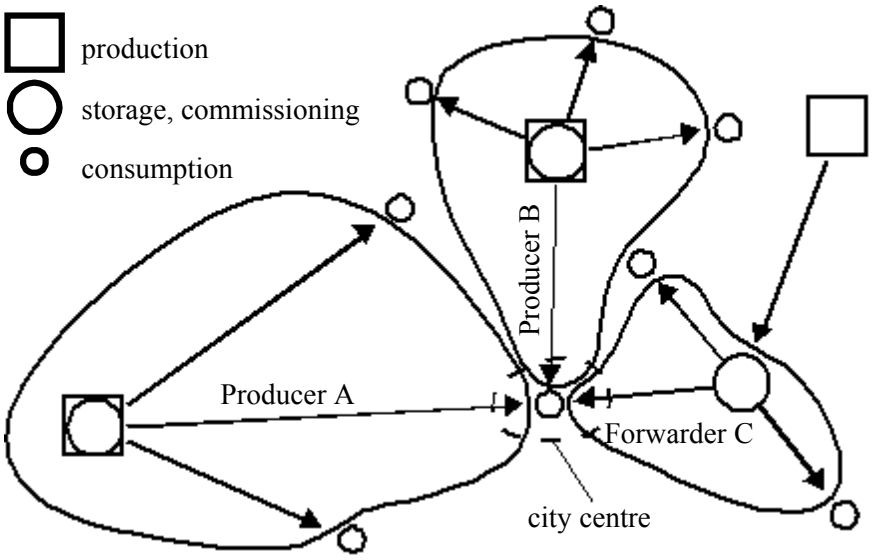

Exhibit 8: Transport Arrangements of a Receiver without Co-ordinated Logistics

Picture 6: Restaurants are often delivered by various suppliers

Receivers with distribution company coordinated delivery logistic

The traffic flow generated by receivers without specific delivery logistics are mostly more bundled as described in the chapter above. The distribution companies often have more than one client in a city centre. Normally they supply many various receivers with different sorts of goods (in general small unites like parcels). Therefore, they optimise their delivery route through a city centre, which leads to the required bundling of distribution traffic and a decrease of trips.

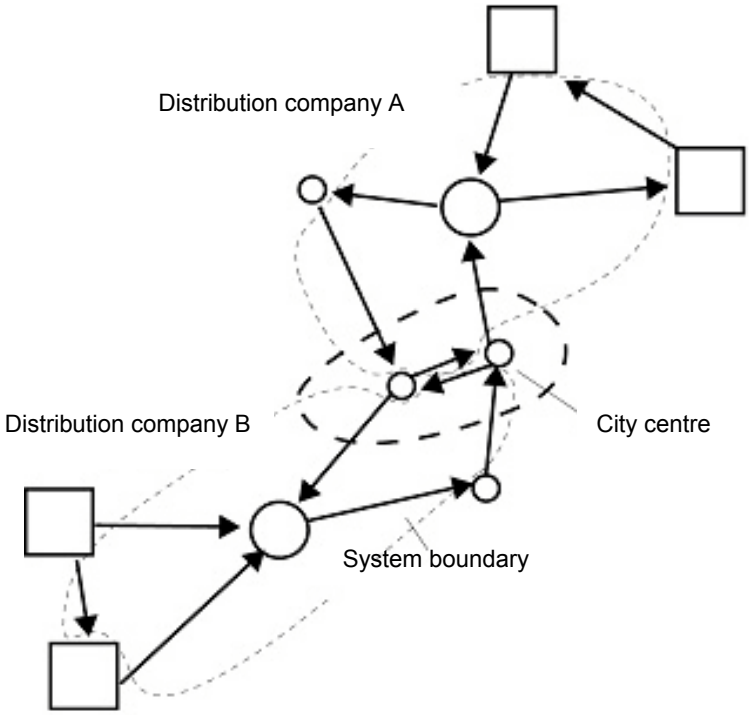

Exhibit 9: Receivers with Co-ordinated Logistics

Receivers with self coordinated delivery logistics

Enterprises who have organised their own logistical arrangements comprise approximately three-quarters of receivers in European cities today. These are generally retail chain stores, such as grocers and department stores. As these companies customarily have more delivery points at their disposal, they have their goods delivered to a central warehouse. Therefore, they can order their goods in larger quantities and negotiate with the supplier for conditions that are more favourable. In these distribution centres, the goods are commissioned, stored and organised into shipments for the specific delivery points. Through direct contact between the receiver and the distribution centre, the necessary goods can be dispatched precisely. Hence, further storage facilities at the delivery point become unnecessary. The transport from the distribution centre to the receiver can either be carried out by the company itself or given over to a distribution company. With this, the receiver is supplied only by its own deliveries.

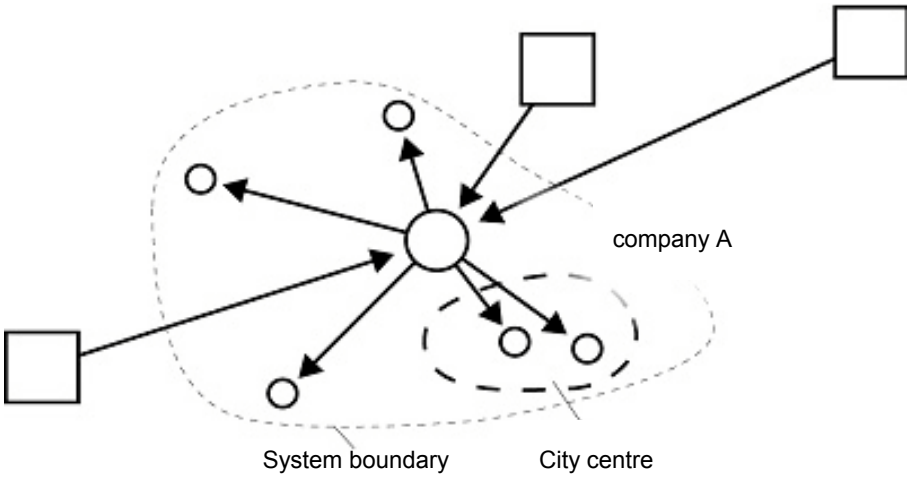

Exhibit 10: Receivers with Co-ordinated Logistics

Picture 7: Chain stores have their own delivery logistic

3.3 Resulting Problems

The problem points for freight transport in urban areas, analysed in the following, are global economic (macroeconomic) properties; i.e., all significant deviations from the total optimum of arrangements and processes.

Lack of Oversight for the Entire System

Decisions in freight transport are normally based on rational considerations (i.e., the choice between modes of transport). The result of such an optimisation is dependent consequently on the shape and the size of the corresponding systems. As the system boundaries are endlessly shifting, so are macroeconomic objectives reached through economic optimisation in business.

Although reasonable results are normally pursued based on rational decision processes in freight transport, many transport processes are not optimal from a macroeconomic perspective. This comes from the small size of the systems, which is optimised under the constraints of business.

Delivery Problems

Receivers who do not co-ordinate their own logistical arrangements – who do not consider processes as a part of their internal functions – frequently cause suboptimal transport arrangements (see Exhibit 8). Many suppliers provide the receiver with goods directly or through a distribution company. This leads to a great number of trips and small transport quantities.

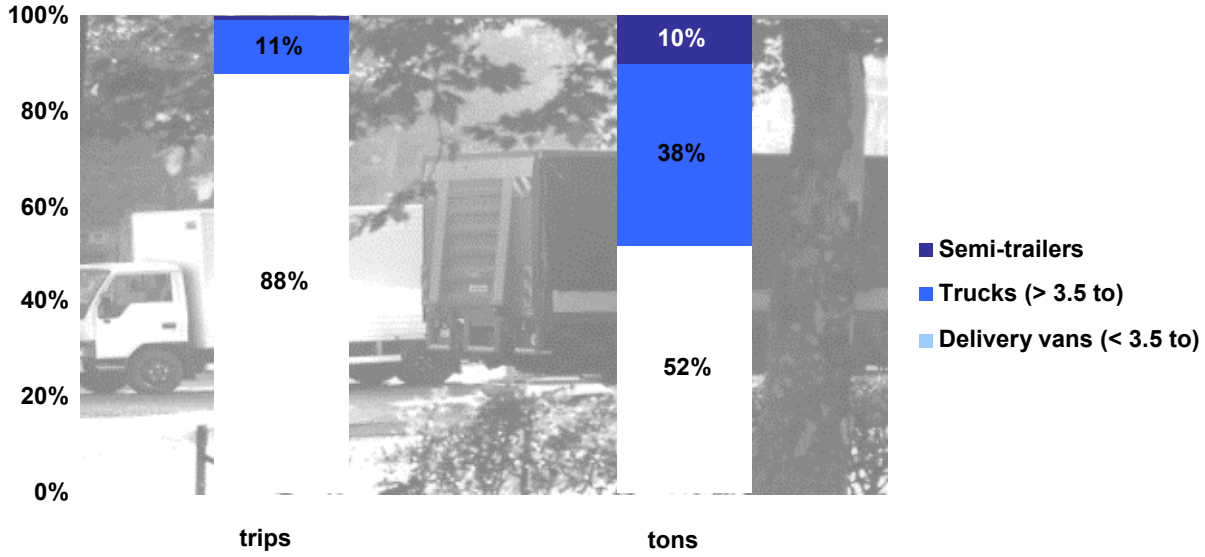

Exhibit 11: Relationship between Trips and Tonnage by Vehicle Category in Lausanne. [13]

This is even more problematic, in terms of environmental pollution and the exhausting of road capacities, when the rural network (in reference to the receiver) is more intensive (city centres).

By far, the situation is more favourable when the receiver co-ordinates his own logistics; in other words, the logistical arrangements are a part of the internal processes. With this, the receiver is called upon to optimise these arrangements, in accordance with business economics. Since every trip incurs costs, he is required to minimise the number of trips. These are achieved by a best possible bundling of transport. The receiver can bring multi-step distribution systems into this (see Chapter 2.3), whereby the savings effect resulting from the bundling must be greater than the additional expenditure resulting from the additional distribution points.

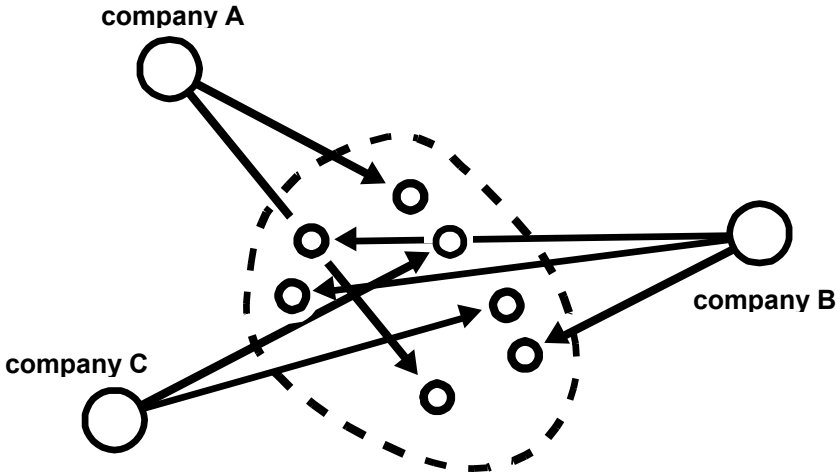

Exhibit 12: Delivery in City Centres by Various Large Chain Stores

Whereas logistics co-ordinated on the receiver-side are considerably more rational than uncoordinated logistics, these are not at all optimal from a comprehensive perspective. Though every enterprise may have optimised the benefits to its branches, the possible synergies among individual receivers from various enterprises are not exploited.

As seen in, a further bundling of freight transport streams is theoretically conceivable and meaningful. Admittedly, this is hardly possible in practice; single enterprises (receivers or representative distribution companies} stand in competition with one another and thus are not interested in necessary co-operation. Because companies are only interested in optimising their internal process and therefore no direct advantages can be expected, there is also no economic motivation. Only the public strives for optimisation of such a complete system.

The public interferes in the transport process through the delineation of political issues (environmental protection, infrastructure), as described in Chapter 3.1. These political conditions can cause problems from the view of the distribution companies, (e.g., limitation of delivery times in city centres), but they serve to move the system closer to the economic optimum. In this sense, these concerns do not need to be discussed in this context. Still, the question of whether macroeconomic objectives can be reached with these regulative measures exists.

Suboptimal Transport Chains from a macroeconomic perspective

As noted in Chapter 3.1, because of limited spatial conditions, European city centres frequently can only be served by small transport units. The frequent lack of economical efficiency at distribution points in transport chains leads to the use of these short-haul vehicles also for mid-length and long stretches, in the form of direct goods flows. In addition, there are very strict laws regarding driving licences and rest periods for drivers; on the contrary, these restrictions do not exist for smaller delivery vans. Therefore, the unfavourable conditions between trips and tonnage influence trips outside downtown areas.

The lack of economic efficiency of transhipments (distribution points) also limits the opportunities for combined transport. Loading from a railway car to road vehicle is expensive, and, in transhipment, not only a change of vehicles (technical system boundaries) but also a change from one transport enterprise to another (organisational system boundaries) takes place.

4. Possibilities for optimisation

4.1 New forms of Organisations

Goods Distribution Centres

On the basis of structures described in Chapter 3.2, the question was brought up, whether the delivery vehicles with a destination in the city centre could not be collected at goods distribution centres (city terminal) and thus be able to achieve an effective distribution. The goods distribution centres would thus become a concentration point in the transport chain,

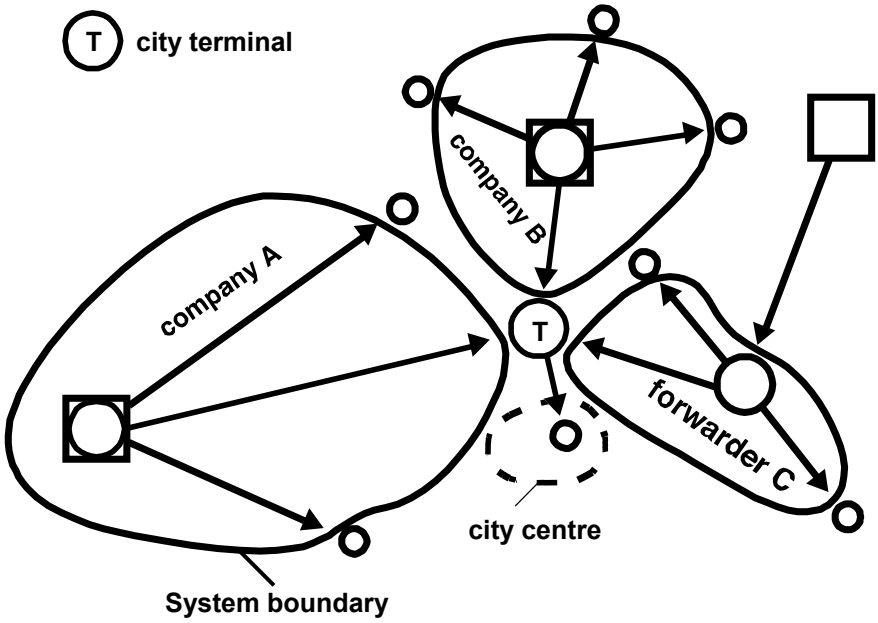

Exhibit 13: Functioning of a Goods Distribution Centre

Connected with goods distribution centres is the hope that freight transport inside urban areas could be substantially reduced. Particularly the problem of the receiver, who has no co-ordinated logistics and causes many trips, could be diffused.

In practice, it has turned out that this system hardly allows itself to be implemented, outside of a few exceptions such as automobile-free tourism locations (Braunwald, Wengen).

Picture 8 und 9: Goods distribution centres are necessary, where ordinary deliveries are not possible

The reasons for the lack of practical suitability of such goods distribution centres are varied.

4.2 Lack of Interest on the Part of Business Management

Goods distribution centres represent an interruption in the transport chain that is associated with costs for the distribution company (shipments partitioning and new consolidation share 1/3 of total transport costs [7]). In the view of the distribution company, there is no reason for these interruptions, since the deconsolidation and warehousing had been optimally integrated in another part of the logistical chain. From the perspective of the distribution company, these additional interruptions in the transport chain result only in additional costs that are not compensated by the rationalising effect that results from additional bundling. [10]

Furthermore, goods distribution centres have to be located close to city centres, where land prices are mostly high. These additional land cost leads to unattractiveness of goods distribution centres for companies. Establishing city terminals will therefore only be possible when public areas are provided or subsidies are being paid.

4.3 Lack of Readiness for Co-operation

The aim of a goods distribution centre is to bundle the traffic of all distribution companies in an area through a co-ordinated global logistic. This requires, however, co-operation between separate enterprises. Because of the severely competitive relationship between such firms, no interest whatsoever exists for this sort of co-operation. In light of the lack of will, the necessary transparency of the internal process of the enterprise cannot be realised [9].

4.4 Lack of Identification

Receivers repeatedly wait to have their goods supplied directly from the manufacturer. This makes it possible for them to get into direct contact with a representative (driver) in the case of a complaint. A delivery from a third party, such as co-ordination of delivery through a goods distribution centre, is often rejected because of the lack of direct contact with the manufacturer. Furthermore, the distribution company is interested to ride with their own lorries within the city centre due to the purpose of publicity. It follows that distribution companies as well as receivers have no interest in the construction of a goods distribution centre.

4.5 Decrease in need

In recent years, an enormous concentration process in retail stores has led to the formation of large chain stores. The rational profit of these enterprises is, among other things, the optimised logistical processes

Picture 10: The distribution of goods is organised by the supplier

The use of goods distribution centres, with reference to these large chain stores, is quite modest, currently comprising approximately three-fourths of receivers in European cities. The distribution centres of these enterprises, whose assignment is the concentration, as well as the deconsolidation and warehousing of shipments, correspond to the function of goods distribution centres. In this respect, the large chain stores do away with the basic problem of freight transport in downtown areas by integrating these logistical processes into their own system.

Freight villages (Freight Transport Centres)

The issue of freight transport in downtown areas cannot be reduced to the distribution problem in city centres by itself. Goods distribution centres fail directly because they only offer the start of a solution to this problem. Other difficulties, such as deconsolidation, warehousing, mid-length and long-distance transport, or transhipment, are not addressed. For this reason, a comprehensive solution for freight transport problems is sought by providing freight transport centres.

Freight villages (freight transport centres) are industry zones with the best connections to the transport network, where freight transport intensive enterprises, such as distribution companies and logistics service providers, are established. Ideally, they have the equipment for the transhipment between different transport modes [9].

Picture 11: Freight village in Bologna (I)

The idea of freight transport centres is based on the use of synergies between established transport services. Through this, the infrastructure organisation can be optimally exploited and different general services can be offered cost-effectively.

The potential for savings presents itself consequently through cost-saving transhipment at small terminals and through the direct delivery of goods within freight transport centres, whereby the expensive road sections of the route are no longer necessary.

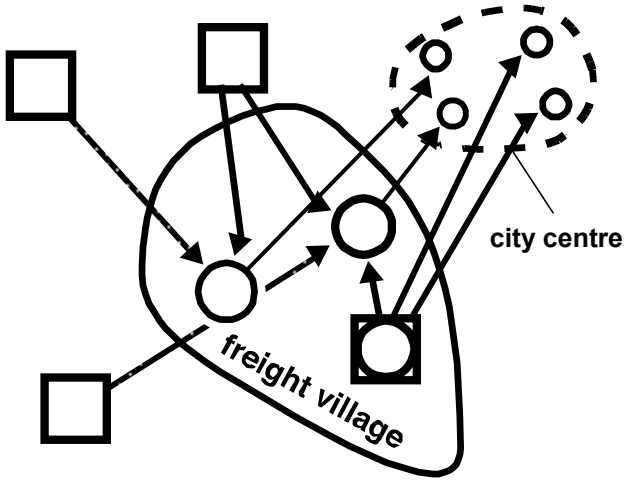

Exhibit 14: Functionality of a freight village with Transhipment Service

Exhibit 14 shows the structure of a freight village, which accommodates traffic intensive businesses like forwarders and distribution companies (circles). The supply of goods form the producers (squares) to the freight villages is partly done by rail.

Picture 12: Rail access for intermodal transport

4.6 Infrastructure Services

Freight transport centres should be able to deal with as many logistical processes as possible [5]:

- Long-distance transport
- Distribution transport
- Warehousing
- Deconsolidation

Picture 13: Warehousing and deconsolidation service

- Before this is possible, the necessary infrastructure services must exist. The components are:
- Connections to the transport network (high capacity roads, railway network, waterways, etc.)
- Transhipment services for intermodal transport
- Branch lines
- Environmental protection services

These infrastructure services contribute significantly to the attractiveness of a freight transport centre. Through this, a location will be interesting economically interesting for an enterprise.

Services

Apart from infrastructure services, the attractiveness of a freight transport centre can be further enhanced by the establishment of service operations for the transport branches [5]:

- Distribution service, in the sense of a city terminal
- Garage for vehicles, containers and transhipment equipment
- Offices for customs, road traffic
- Safety services
- Information services, communications services (i.e., conference rooms), consultancy services.

4.7 Positive Macroeconomic Effects

Because of their multifunctionality, freight transport centres have positive macroeconomic effects.

Because of transhipment services, resident enterprises there transport an exceptional amount of goods by intermodal transport. Through this, the proportion of rail freight traffic is raised.

Through the creation of a Europe-wide network of freight transport centres, this proportion can grow still wider (freight transport centres in all important metropolitan areas and industrial centres). To this, the development of cost saving transhipment equipment is decidedly important (see Chapter 4.9).

		Type						With City Logistics
Country	Mono-modal	Bimodal		Multimodal			Total	
		Rail-Road	Road-water	Rail-Road-Air	Rail-Road-Water	Road-Rail-, Air-Water		
Austria		2			1		3	
Belgium		2					2	1
Denmark	1	2					3	
France	2	6			1		9	2
Germany		16			1		17	1
Great Britain		3					3	
Italy	7	18					25	3
Netherlands	1	3	2	1			7	
Portugal		1					1	
Spain		5				1	6	1
Sweden		1					1	
Switzerland		1					1	
Total	11	60	2	1	3	1	78	8

Table 1: Freight Transport Centres in Europe [10]

The local concentration of transport-intensive operations causes a channelling of freight transport. Through this, it is possible to meet specific environmental protection measures along the concerned traffic links.

Additionally, there is the possibility of uniting shipments (in the sense of a goods distribution centre) throughout the local area of the different freight transport providers. However, the difficulties described in Chapter remain.

Freight transport centres can contribute to the economic strength of a region and increase the attractiveness of an economic location.

4.8 Possible Negative Effects

The possibility of bundling different flows of freight traffic leads to a more uneven distribution of the negative effects (congestion, pollution). On the one hand, this can be an advantage for the efficient shielding of the infrastructure like sound isolating walls. But it can also be seen as unfair concentration of emissions which is controversial in the sense of town planning. For this reason it can be supposed, that construction of a freight village creates hostility among the affected population.

Concentration of traffic intensive businesses can also lead to overloading of the road network and therefore to additional congestion. For greater urban areas like London, Milan or Paris, several freight villages are needed, which results in major traffic in between them.

4.9 New Technical Developments

A further broadening of multimodal freight transport centres requires both a greater terminal density and cost-saving transhipment techniques. This requires the offering of new concepts in rail transport along with economical access of smaller terminals, as well as transhipment technologies that make transhipment at low prices possible with the rising use of small containers.

New transhipment technologies

As described in chapter 4.7, a main necessity for the comprehensive success of freight villages is the existence of cheap infrastructure for transhipments. This infrastructure has not only to be cheap with regard to the investments cost, it also has to be economical in operation.

Today, transhipment terminals are normally designed for the loading and unloading of complete trains. Investments are high, and specially trained personnel are necessary. In order to keep the costs per transhipment (of the entire transport) from becoming excessively expensive, a larger volume of containers (at least two complete trains) must be able to be loaded and unloaded each day, (around two hundred transhipments per day).

Because the complete trains only supply connections between two terminals, terminals can only be economically introduced in regions with very large transportation flows, which show a large catchment area with appropriate long road sections of the route. That means, for most freight villages, the transportation flows would be fairly low.

In Europe, also smaller terminals exist, mostly equipped with old universal cranes or reach stackers. However, these are only active and practical in transport to, and from, seaports (ISO Container). For internal transport in Europe, such small terminals are not economically competitive, due to the lack of fast train availability.

To facilitate the separation of long distance transport from supply and delivery transport within urban areas, it is necessary to find solutions also for transhipment terminals with a lower amount of freight. Otherwise, distribution companies will use their long distance vehicles for city delivery in order to economise on further transhipment costs from road to road.

Today intermodal transport is efficient for transport distances over 500 km. Presently, the demand for goods over a distance of 300-500 kilometres is much larger than that over 500 or more kilometres [10]. With regard to the traffic problems in greater urban areas (Paris, London), the transport of good from one freight village to another within an urban area could also be an area of application of these technologies.

For small transport flows, there are meanwhile special made-to-order solutions with reference to simplified transhipment technologies. Examples of this are the quite widely used ACTS system and, more recently, the system Palfinger/Bermüller. However, these systems are not compatible with normal containers and thus not suitable for general purposes like what is desired at freight villages.

4.10 Operational Requirements

A higher level of automation makes the minimisation of personnel expenditures possible. The machines must be able to be served by truck drivers and train personnel; with this, personnel who exclusively transfer containers can be reduced Equipment that occupies little space reduces spatial requirements. Additionally, small terminals must not be calculated for the loading and unloading of 700 metre long trains.

Picture 14: New and smaller transhipment technologies

Liner trains especially – trains with longer stops at several freight villages of intermediate cities – require machinery that can be loaded and unloaded under the catenary. Thus, switch time can be saved, which also provides time and expense savings in other forms of operations. Transhipment equipment for liner trains must have a high efficiency during a short time.

Admittedly, additional costs result from the more expensive connection to small terminals (greater development density).

Smaller Containers in the Logistical Sphere [14]

As already described in previous chapters, a main problem in freight transport are the high costs of transhipment and deconsolidation. In the previous chapter possibilities for cheaper transhipment have been presented. In this chapter the focus will be on the possibilities of the reduction of deconsolidation costs.

Urban freight transport mainly signifies delivery transport, which means that load units are normally much smaller than for long distance trips. These larger load units and their corresponding containers are not particularly suitable for collective transport from customer to customer. From that, partial load transport is today a domain for road freight transport, and transport between goods distribution centres is avoided. This means, as deconsolidation is very cost intensive, delivering city centres with long distance vehicles is often the most advantageous practice for distribution companies.

Smaller containers, which correspond to the usual loads of delivery traffic, are seen as a possibility to decrease the costs of deconsolidation, resp. to make deconsolidation unnecessary. In comparison to today's containers, small containers can be suitable for short distance trips with small loading units as well as for long distance trips with high loading units. Thus the requirements of urban freight transport (narrow roads, environmental aspects) are taken into consideration without increasing transport costs too much.

4.11 What are small containers in the technical sense

Small containers are understood as containers that correspond to, at most, half of a 7.45 metre long standard swap body and are used in intermodal transport. The minimal size corresponds to the envelope of an ISO pallet.

Picture 15: Today's standard containers are too big for having access to city centres with them

The currently standardised intermodal containers – ISO containers and swap body – show a load capacity of approximately forty to ninety cubic metres, or fifteen to thirty tonnes. From this, these containers are suitable for direct shipments (from a supplier to a receiver) of a size from approximately twenty cubic metres or ten tonnes. Smaller shipments require an aggregation of shipments in order to fill containers and, in the case of the receiver, a distribution. This can happen with a trip from supplier to receiver or over goods distribution centres. These events are costly and require time.

Proposals for small container standards

Proposed are two small containers: one-half and one-quarter, respectively, of a 7.45 metre long swap body, in accordance with standard CEN EN 284, with a load capacity of eight to nine or four ISO pallets (1200 x 800 mm), respectively.

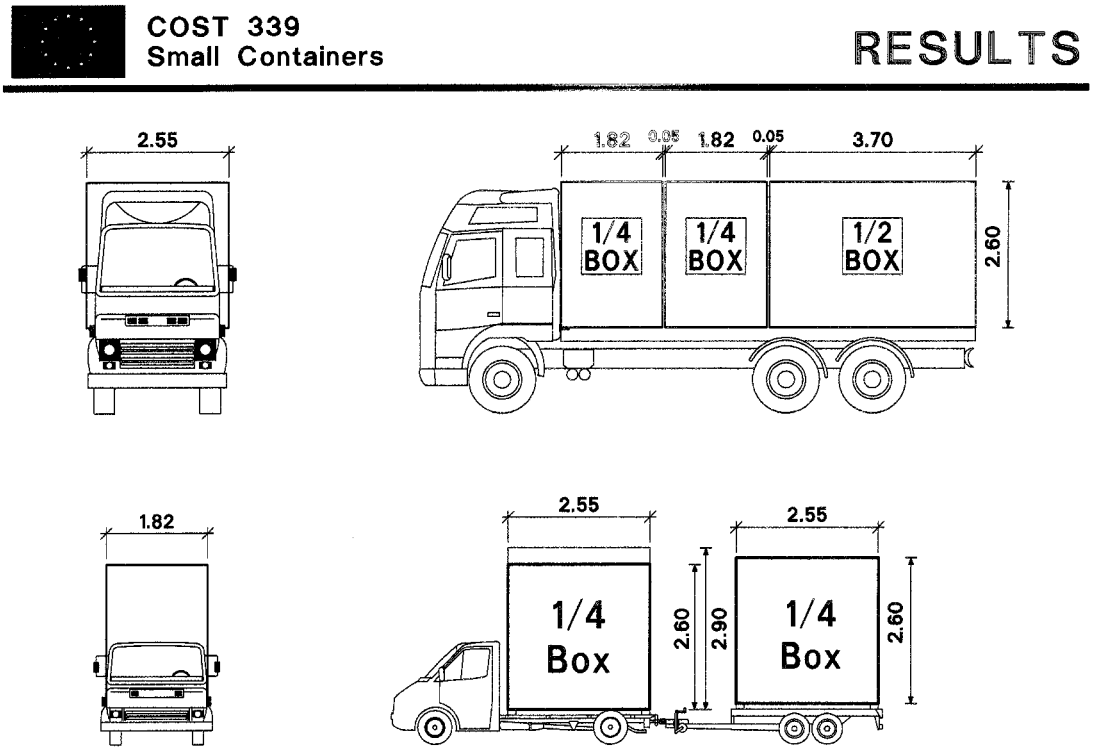

Exhibit 15: Proposed Measurements of Small Containers [14]

Design Proposal:	Standardised class C swap body 7.45m (EN 283/284). Standardisation under way	
Container Group:	1/4 Swap Body	1/2 Swap Body
Measurements outside		
Length	1.82	3.70
Width (isolated)	2.55 (2.60)	2.55 (2.60)
Height	2.60 (2.90)	2.60 (2.90)
Load Capacity:		
800x1200 pallets	4	8-9
1000x1200 pallets.	2	6
Rating:		
Heavy box (tanks optional)	8.500 kg	17.000 kg
Normal box	4.000 kg	8.000 kg
Light box	1.800 kg	3.600 kg
Vehicle		
Van (city delivery)	Yes (light)	Yes(light on 7tons)
Truck	Yes	Yes
Rail wagon	Only with frame	Yes
High speed rail (closed wagons)	Yes (max 2.6mheight)	No
Vessels (sea)	No	Only with frame
Vessels (inland water-ways)LKW	(Only with frame)	Only with frame
Transhipment		
Corner fitting	Yes	yes
Fork lift pockets	Yes	yes
Rollability	Yes	yes
Warehousing (Stackability)		
Empty	6	6
Fully-loaded	3	4

Table 2: Technical Data for Small Containers

4.12 Experiences with small containers

Non- standardised small containers, similar to the 1/4 containers described above, were put into use in Zurich, Switzerland. With this, grocery goods were brought from a logistics centre fifty kilometres outside Zurich to smaller receivers in the city for a mid-sized grocery distributor. For these small containers, transhipment equipment was developed, with which the containers could be transferred by a intermediate frame onto a small delivery truck. The transhipment equipment was equipped for a high degree of automation. The vehicle, with a weight of 3.5 tonnes (lighter containers), was of special design, with which the containers could be put on the floor without further assistance. The intermediate frame could be transported with a truck as well as a standard carrying wagon for swap bodies and transferred with conventional transhipment equipment.

It was however obvious that the specially developed transhipment equipment should be given up. Rollable containers with fork lift pockets, proves to be advantageous, because simpler transhipment techniques that are already in use can be applied (semi heavy fork lifter).

4.13 Further Development

Moving forward, as the design has been produced and possibilities for handling have been demonstrated, only the elements must be technically developed and tested. Towards this, their suitability in practice must be proven with a larger demonstration and future users must be made aware of the new system.

4.14 Administrative Control Mechanisms [1]

As has been shown in previous chapters, urban freight transport is a field, where economic necessities meet the objectives of the whole of society. The aims of the whole of society could be also seen as the optimisation of the comprehensive system. The systems of the partners involved (producers, distribution companies, receivers) are much smaller and therefore their objectives are not congruent with those of the whole society. The objectives of the whole society should be represented by the local authorities.

They could be summarised as follows:

- optimal use of the limited infrastructure capacities
- minimisation of the emissions
- economical welfare and competitiveness of the urban area
- Though many of these criteria are not achieved in a satisfactory way, the problems related to urban freight transport have not been realised by many authorities yet. About 20 % of the cities have no employees at all addressing urban freight transport issues and only a quarter of the cities have one or more full-time staff dealing with those questions.

Possible spheres for control mechanisms

- The possibilities for involvement in urban freight transport and traffic in general are quiet various. Adequate instruments can only be found, if the whole process of urban freight transport is understood and all actors (public authorities/police, retailers and business sector associations, shippers, forwarders, distribution companies, etc.) are involved. Therefore it is necessary to create co-operation among all local actors to set up a framework of possible agreements. It is necessary to provide those actors with information about existing and new regulations.

- To get the right image of the present situation, it is necessary for the local authorities to collect and analyse statistical data on freight transport. Therefore it is also important to co-ordinate urban freight policy with neighbour cities, especially when they are located in the same metropolitan area.

- Urban freight transport policy has to be an integrated part of transport policy of a metropolitan area. Consequently it is important to combine it with comprehensive transport, town and land-use/infrastructure planning.

- Possibilities at the disposal to the public sector to influence transport can be divided into three groups:

- Creation of regulations

- Taxation

- Subsidies and infrastructure development

Creation of regulations

The term restriction was used in the past for expressing the reduction of certain modes. Today, restriction was replaced by regulations, which indicates a more directing exercise of influence by authorities.

- Weight: Weight restrictions are quiet common in European Cities. They mostly limit the access of heavy lorries over 3.5 to. It has to be taken into consideration, that weight restrictions lead to a use of small vehicles. Of course the use of small vehicles lead to more trips, which is not necessarily favourable (see also Exhibt 11).

- Emission: Emissions of vehicles are restricted by European Commission. However, several cities, especially with outstanding tourist attraction (e.g. Amsterdam, Zermatt) allow the access to the city centre only for emission free vehicles.

- Delivery time: Time restrictions allow the access to city centres only during certain hours. It is controversial how time restrictions can be efficiently implemented. A main problem persists in the possible disability of making delivery due to access time restrictions, which can lead to a accumulation of trips.

Picture 16: Access restrictions in city centres

- Access roads: Restriction of special roads has results in a concentration of the traffic elsewhere in the road network. Also congestion on several roads can lead to this effect.
- Loading zones: Loading and unloading in city centres is often constrained by parked cars. Therefore it is necessary, to provide a suitable area by public authorities. In some cities like Paris, a retail shop with a certain size has to provide loading areas themselves.

Taxation

Taxation in urban traffic is mostly implemented for the reduction of private car traffic. It is most unusual in freight transport. However, taxation in freight transport is becoming a measure for the internalisation of external cost, like tools for heavy traffic or supplementary taxes for high pollutant vehicles. But these are general measures with no special importance for urban areas.

Subsidies and infrastructure development

Subsidies and regulations are very close to each other. Instead of limiting modes of dealing with a negative effect, more favourable methods can be subsidised, for example, vehicles with low

emissions or lorries with a high loading rate. Subsidies in this context does not only mean a direct payment for special efforts, it can also mean, for example, better access to the infrastructure like high occupancy lanes.

The risk of subsidies persist in the promotion of undesired side effects. Subsidising lorries with high loading rates could lead to unnecessary movements and flows.

Subsidies in urban freight transport can also mean the promotion of desired logistic structures like intermodal transport, freight villages or goods distributions centres (see also chapter 4.1). Therefore it is useful to provide the necessary infrastructure, like transhipment terminals for intermodal transport or branch lines.

However, with the implementation of measures, care should be taken that, through these, no unwanted side effects arise. It is difficult to determine the best measures to achieve the right aims.

Examples:

- Rigid conditions placed upon delivery in the city centre can lead, for example, to retail enterprises undesirably moving out of urban areas and into more suburban ones. One lorry delivering a shop in a residential area causes surely less problems than 100 private cars, fetching the same amount of products from in a outlying shopping centre. In this context, care should be taken that the attractiveness of city centres endures for the business owners.

- Strict regulations and tools for larger trucks have led to more and more goods being transported with small delivery trucks, which are not affected by these conditions. With this, the desired bundling of trips is contradicted (see also Chapter 3.1 and Chapter 3.2).

4.15 National differences/local adaptations

Freight transport in Europe is characterised by many differences in law and regulations.

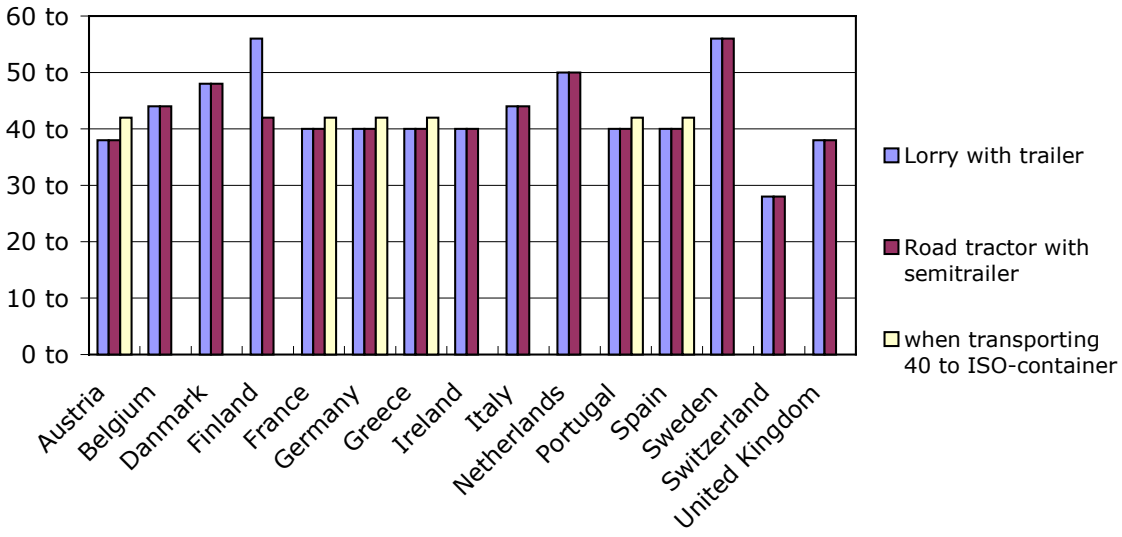

Exhibit 16: Permissible weights of lorries in Europe . [13]

Main differences are in

- Tax imposes on trucks
- Fuel prices
- Permissible dimensions and weights of motor vehicles
- Regulations governing hours of work and the number of hours a driver can be behind the wheel
- Safety regulations
- Parking space and loading areas regulations

Even when ratifying common regulations (like in the field of emissions of pollutants), the interpretations of the different member countries can lead to a non-homogeneous application.

A main objective of European politics is to make regulations on the transport sector homogenous. Only under this condition, optimisation of load units for entire transport chains is achievable. Especially intermodal transport suffers form non-homogenised regulations in Europe, as it is dependent on road and rail standardisation.

However, the responsibilities for many regulations tools (regulations in time and space) for urban freight transport have to be under the control of local authorities. Thus, a common way in Europe has to be found in standardisation and not in homogenised ways of implementation.

5. Recommendations for further reading

For further reading the following literature is warmly recommended:

From COST 321:

Urban Goods Transport: Final Report of the action [13]

From REFORM:

Final Report [10], especially chapters 5 and 6 (The Handbook)

For Best practise examples on urban freight transport a collection, comparison and summary of available experiences and results on projects and initiatives is available

from BESTUFS:

Deliverable D1.1 [1], chapter 2

6. Exercises

For a better understanding of the correlations within urban freight transport, the following exercises can be helpful.

The exercises are discussions in small groups of students. The students shall get the better understanding by discussing with their fellow students. The teacher should only have the function of a moderator. He only intervenes with critical questions to the statements of the students.

Finally the students have to write a summary on the discussion and its results.

6.1 Unnecessary Freight transport

"Peeling German potatoes in Italy for making afterwards French fries in Belgium out of them" is one of the popular arguments for stressing out the apparent ineffectiveness of freight transport.

The question of the laws of freight transport shall be discussed and students should understand, why such "ineffective" freight transport is generated.

Objectives

The students should understand, how freight transport is generated. Therefore they have to get a major understanding of economical effects and the system of the international division of labour.

Through this example, students should understand that freight transport is economically highly rationalised. Consequently, the "potato transport" is of course very efficient.

Discussion items

- Why are goods transported from one place to another?
- Why are they not produced at the place where they are consumed?
- Why are the negative effects on the environment not taken into account?
- Students shall understand the problems of thinking in small systems
- Which measures could lead to less negative macroeconomic effects

6.2 Effectiveness of Small Containers

A main reason for the absence of success of a city terminal is the necessity of the separation of loads. This makes further transhipments economically uninteresting for distribution companies.

The students shall discuss, whether small containers could contribute to a more efficient transhipment at city terminals.

Objectives

A general understanding of the problems of city terminals should result out of the discussion. The discussion should know, how European cities are delivered today. Therefore they should be sensitised for the limited possibilities of city terminals.

The students should get an idea of the difficulties in freight transport to invent new technologies (standardisation,…).

Discussion items

- What has to be delivered in City Centres?
- Who delivers to stores in City Centres?
- Why are City Terminals not successful?
- Can small containers really improve the competitiveness of City Terminals?
- What are the opportunities of small containers
- What are the difficulties of inventing them?

6.3 Finding Political compromises

Freight transport in urban areas is often a question of finding the right compromise between the different aims of the partners involved.

Several small groups of students shall discuss new solutions in urban freight transport. Each group should be put in the situation of one of the different actors (distribution companies, receivers in city centres, political authorities and inhabitants). During the discussion the groups have to represent the aims of the corresponding actors.

Objectives

The main aim is to get an understanding of the partly conflicting objectives and the difficulty of reconciling these ideas to a accepted solution. Students shall also understand why the involved partners react as they react. They have to comprehend their need to have an economical solution which is therefore limited to their internal process.

Discussion items

- What are my (as representative of a involved partner) interests?
- How can I promote these interests
- What do I expect from the other actors involved?
- How do I have to change my organisation for adopting a more flexible position?

6.4 Freight villages

Freight villages are promoted in many European countries. The idea is to have a more sustainable solution for freight transport in urban areas. However, the positive effects of freight villages on urban transport are contradictory.

Objectives

The students shall understand that no solution can be a perfect one. Every approach has also disadvantages, which should be as good as possible.

Discussion items

- What is the main idea of a freight village
- For which problems should they be a better solution
- Can those problems be solved with the idea of freight villages
- Which new problems occur with regard to freight villages?
- Therefore, how do the freight villages have to look like

7. Glossary

List of the most important terms in relation to urban freight transport.

Combined Transport *(dt.: kombinierter Verkehr, fr.: trafic combiné)*: Intermodal transport where the major part of the journey is by rail, inland waterways or sea by any initial and/or final leg carried out by road are as short as possible [6]

Consolidation *(dt. Konsolidierung, fr.: consolidation)*: many small goods flows are united into a larger bundling (aggregation).

Distribution company (dt.: Spedition, fr.: commissionaire de transport): Distribution *(dt.: Verteilung, fr.: distribution)*: shrinking of transport units (because of the limited consumer demand)

Freight village *(dt.: Güterverkehrszentrum, fr.: plateforme terminaux)*: is a industry zones with the best connections to the transport network, where freight transport intensive enterprises, such as distribution companies and logistics service providers, are established. Ideally, is has the equipment for the transhipment between different transport modes.

Goods distribution centres *(dt.: Güterverteilzentrum, fr. Plaque tournante)*: all goods flows with destination city centre are consolidated there and compiled to new loads. The aim of a city terminal is the minimisation of delivery traffic in city centres.

Intermodal Transport *(dt.: intermodaler Verkehr, fr.: transport intermodal)*: the movement of goods in one and the same loading unit of vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes [6].

ISO containers: Freight container complying with all relevant ISO container standards in existence at the time of its manufacture

Logistics: is the doctrine of the flows of materials, energy, and goods within an economic entity or between this entity and its environment

Small containers *(dt.: Kleinbehälter, fr.: miconteneur)*: are understood as containers that correspond to, at most, half of a 7.45 metre long standard swap body and are used in intermodal transport. The minimal size corresponds to the envelope of an ISO pallet.

Transport chain *(dt.: Transportkette, fr.: chaîne du transport)*: Sequence of technical and organisational interconnected events, by which goods are moved from an origin (supplier) to a destination (receiver).

8. Literature

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9. Inner Urban Freight Transport and city logistics – The consortia of the projects

LEAN - Integration of LEAN LOGISTICS in urban multimodal transport management to reduce space demand and optimise use of transport mode

Consortium:	
ALCATEL AUSTRIA AG	AT
University of Sheffield	UK
Wickham Rail Developments Limited	UK
Asociacion De Investigacion Y Cooperacion Industrial De Andalucia	ES
A. Steigenberger Unternehmensberatung Gmbh	DE
PROINCA S. COOP. AND.	ES
Business And Logistic Systems - Gesellschaft Fur Unternehmensberatung Und Systementwicklung M.B.H.	DE
Econsult, Betriebsberatungsges.M.B.H.	AT

BESTUFS – Thematic Network "Harmonisation of strategies and highlighting best practice to determine optimum URBAN FREIGHT SOLUTIONS"

Consortium:	
PTV Planung Transport Verkehr Ag	DE
NEA Transport research and training	NL
RAPP AG Ingenieure + Planer	CH
University Of Sheffield	UK

IDIOMA – Innovative distribution with intermodal freight operation in metropolitan areas

Consortium:	
PTV Planungsbüro Transport Und Verkehr Gmbh	DE
Friedrich-Alexander-Universität Erlangen Nürnberg	DE
Statens Järnvägar	SE
TFK - Institutet För Transportforskning	SE
OHB Teledata Telekommunikation Systeme+Service Gmbh	DE
Rapp Ag Ingenieure & Planer	CH
United Rouch SA	FR
Goederen Vervoer Randstad	NL
Malmö Stad	SE
Rotterdam Trans Port Team B.V.	NL
Fraunhofer Anwendungszentrum Verkehrslogistik Und Kommunikationstechnik	DE
City Of Nuremberg - DPT For Economic Affairs	DE
Integriertes Güterverkehrs-MGT Nordbayern MBH & CO. KG	DE
Gvz Hafen Nurnberg Gmbh	DE
Dachser Gmbh & Co	DE
TRADEMCO - Tpt, Dvpt, Engineering And Mgment Consultants LTD	GR
Ica Menyföretagen AB	SE
Frigoscandia Distribution AB	SE
NEA Transport Research And Training	NL
Transport Auto Brunier S.A.	FR
Symbol Technologies Gmbh	DE
Ass. Pour Le Dvpt De La Formation Prof. Dans Les TPT	FR
Buck Consultants International BV	NL
NOVATRANS S.A.	FR

COST 321 – Urban goods transport

Consortium:	
Fachhochschule Flensburg	DE
N.T.U. Nodisk Tranport Udvikling	DK
COWI Consulting Engineers and Planners AS	DK
DRAST	FR
CERTU	FR
ADEME	FR
Plancenter Ltd. Consulting Architects and Engineers	FI
TÜV Rheinland TSU GmbH	DE
Umweltbundesamt	DE
Landeshauptstadt Düsseldorf	DE
Ingenieurgruppe IVV	DE
University of Piraeus	GR
I.S.I.S.	IT
ENEA, Dipartimento Energia	IT
Minister voor Verkeer en Waterstaat	NL
Technische Universiteit Delft	NL
Prometni Institut	SLO
Environment, Transport & Planning	ES
TFK, Transport Research Institute	SE
Swedish Institute for Transport and Comminications Analysis	SE
Tiefbauamt der Stadt Zürich	CH
Cranfield University	UK
ETSU	UK

SOFTICE – Survey on Freight Transport including a cost-comparison for Europe

Consortium:	
Dipartimento Idraulica Trasporti E Strade	IT
University of Leeds	UK
Chalmers University Of Technology AB	SE
Ecole Polytechnique Federale De Lausanne	CH
Universität Karlsruhe	DE
Institut National De Recherche Sur Les Transports Et Leur Securite	FR
Instituto Superior Tecnico, Universidade Technica De Lisboa	PT

FV-2000 – quality of freight villages structure and operations

Consortium:	
Eeig Europlatforms	IT
Sogesca Srl	IT
Interporto Bologna SpA	IT
Danmarks Transport Center	DK
Centro Studi sui Sistemi di Trasporto SpA	IT
FDT - Foreningen Af Danske Transportcentre	DK
Centro Intermodal De Logistica	ES
Sogaris	FR
Segar Ingenierie	FR
Garonor Services	FR
TFK - Institutet Ftr Transportforskning	SE
Nordic Transport Development APS	DK

FREYA – Towards the networking of European freight villages

Consortium:	
PLS Ram-Boll Management	DK
Helsinki University Of Technology	FI
Impetus Consultants LTD	GR
Netherlands Economic Institute	NL

INFREDAT – Methodology for collecting intermodal freight transport data

Consortium:	
PTV Consult Gmbh	DE
ISIS -Istituto Di Studi Per L'integrazione Dei Sistemi	IT
Institut Für Seeverkehrswirtschaft Und Logistik	DE
System Planning And Management Consultants S.A.	GR
Kessel & Partner Transport Consultants	DE
NEA Transport Research And Training	NL
MDS Transmodal	UK
Sofres S.A.	FR

REFORM – Research on freight platforms and freight organisation

Consortium:	
Gesellschaft Für Informatik, Verkehrs- Und Umweltplanung MBH	DE
STRATEC S.A.	BE
Istituto Di Studi Per L'informatica Ed I Sistemi	IT
NORDIC TRANSPORT DEVELOPMENT LTD	DK
Environment, Transport and Planning S.L.	ES
Azienda Tramvie E Autobus Del Comune Di Roma	IT

COST 339 – Small Containers

Consortium:	
Eidgenössische Hochschule Zürich	CH
Technische Universität Graz	AT
University of Piraeus	GR
Van Roost, Bureau de Recherche	BE
BIKIT	BE
ICARUS E-Com	IRL
Costaferroviaria s.p.a	IT
ECOS Office Centre	DE
Studiengesellschaft für den kombinierten Verkehr	DE
Universita degli Studi di Padova	IT
Airline Management AS	NOR
Norway Post	NOR
Fundacion ICIL	ES
Associacao dos Transitarios de Portugal (APAT)	PT
Ingenieurbureau GUHA AG	CH
Romanian Research Institute for Transport	RO
Prometni Insitute	SLO

DIRECT – Data Integration Requirements of European Cities for Transport

Consortium:	
STRATEC S.A.	BE
Simulog Sa	FR
University Of Southampton	UK
Barcelona Technologia S.A.	ES
Netherlands Organisation for Applied Scientific Research	NL
Centre D'etudes Techniques De L'equipement De Lyon	FR
Azienda Torinese Mobilita	IT
Centre D'etudes Techniques De L'equipement Nord Picardie	FR
Societat Municipal D'aparcaments I Serveis, S.A.	ES
Centre D'etudes Sur Les R_Seaux, Les Transports, L'urbanisme Et Les Construction S Publiques	FR
LILLE METROPOLE - Communaute Urbaine	FR