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Best Urban Freight Solutions

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BESTUFS II

Best Urban Freight Solutions II

Co-ordination Action

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Urban freight in small and medium sized cities, Urban waste logistics

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PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1. Introduction BESTUFS

The EC established the Co-ordination action (CA) on BEST Urban Freight Solutions II (BESTUFS) as the follow up initiative to the Thematic Network (TN) BEST Urban Freight Solutions carried out from the year 2000 to 2003. BESTUFS started in 2004 with a duration of 4 years. BESTUFS aims to maintain and expand an open European network between urban freight experts, user groups/associations, ongoing projects, the relevant European Commission Directorates and representatives of national, regional and local transport administrations and transport operators in order to identify, describe and disseminate best practices, success criteria and bottlenecks of City Logistics solutions. The concept of a Co-ordination Action thereby seeks to obtain the co-operation of experts and projects with already existing or just emerging experiences and expertise, and the collection and raw analysis of existing project results from national and European projects - rather than starting new research activities.

To reach the above objective, the results of national, European and international projects and investigations about the urban transportation of goods are considered, and the expertise and knowledge of the different stakeholders in urban goods transportation is obtained. The main sources for this deliverable focus on the expertise and knowledge of CA participants by collecting and working up the views and contributions of the different individuals or groups in the BESTUFS workshops and from the material collections in work package 2 (Best Practice).

For the duration of the BESTUFS Co-ordination Action recommendations will be described each year as a public deliverable.

Thematic focus

The thematic workshops organised in BESTUFS in year 2 focused on the following themes

- "Freight logistics in small and medium sized cities: Approaches, solutions and success factors" (addressed in a workshop on 29/30 September 2005 in Kaposvar, Hungary).
- “Urban waste logistics” (addressed in a workshop on 9/10 March 2006 in Zurich, Switzerland including a site visit of waste installations of the ERZ – the Zurich waste management company).

2. Urban freight in small and medium sized cities

2.1 Introduction

A workshop entitled "Freight logistics in small and medium sized cities: approaches, solutions and success factors" took place in Kaposvar, Hungary on 29-30 September 2005. This subject had not been previously addressed in BESTUFS workshops or in the rest of the BESTUFS thematic network. Main reasons to organise such a workshop were that there has been little previous consideration of freight transport and logistics issues and potential solutions in small and medium sized cities in Europe.

Nine presentations about freight transport in small and medium sized cities were made at the workshop, together with a roundtable discussion on the issues and possible initiatives. The workshop was attended by 45 participants from across Europe.

2.2 Definition and Research

1. There is a lack of a clear definition of what is meant by the terms "small and medium sized cities" and "urban".
2. What is thought of as a small or medium sized city in one country may not be viewed in this way in another country.
3. In this report the term "small and medium sized cities" refers to all urban areas in European countries except large cities. This therefore extends from small urban settlements with a population of a few thousand people up to urban areas with tens of thousands or hundreds of thousands of inhabitants.

Definition – Urban Areas

Before considering small and medium sized cities, it is necessary to consider what is meant by "urban" as opposed to "rural". As noted in the ESPON programme "Small and Medium-sized Towns (SMESTO)" report (discussed below), a number of different approaches to defining "urban" currently –co-exist, often within each country. As this reports notes the various definitions of what is meant by "urban" depend on "the nature and history of its urban population, as well as its political and administrative structures for land-use control". The SMESTO report (2005) summarises that definitions of "urban" used in European countries can be grouped into three categories:

1. The "administrative approach" defines urban area based on the legal or administrative status of municipalities. This definition can be based on population size, governmental decisions, or historical developments. This approach corresponds to the city as instrument used by the state to structure, organise and control a country.
2. The "morphological approach", defines urban areas based on the extent and/or continuity of the built-up area, the number of inhabitants, proportion of the municipal area covered by urban settlements. This approach corresponds to the city or town as a physical or architectural object.
3. The "functional approach" defines urban area based on interactions between a core area, which may be defined according to morphological criteria, and the surrounding territories. Daily commuting flows are the central parameter in this respect, as they reflect the existence of a common labour market. This approach corresponds to the city as an economic and social entity.

These three approaches are complementary, describing the multiple facets of what can be meant by urban. Often one or more of the approaches to defining "urban areas" are applied in each European country.

Examples provided in the SMESTO report shows that definitions of "urban" based on population size can range from 2,000 inhabitants in the Czech Republic to 10,000 inhabitants in Switzerland, Italy and Spain.

Some countries that do not have a formal definition of urban areas, such as Germany or Poland, use density of population as an indicator when delimiting the extent of urban areas. For instance, in the German case, NUTS 3 regions with a population density of more than 150 inh/km2 are considered urban. In Poland, the density of population is used as a qualitative parameter, i.e. it is taken into consideration but without any formal quantitative threshold. In the Netherlands, the Statistical Office has defined 5 possible degrees of urbanisation (based on addresses per square kilometre):

- Extremely urbanised: 2,500 addresses or more
- Strongly urbanised: 1,500 to 2,500
- Moderately urbanised: 1,000 to 1,500
- Hardly urbanised: 500 to 1,000
- Not urbanised: fewer than 500

In terms of functional definitions of "urban", these also differ between European countries. For example the Table below shows some definitions of "urban core" used in different countries.

Country	**Name**	**Definition of the urban core**
France	Pôle urbain	Urban area with at least 5,000 jobs and not belonging to any other agglomeration
Belgium	Ville centrale	Statistical divisions of the territory with a density of population over 50 inh per hectare and three other parameters linked to the share of housing in the city centres.
Switzerland	Commune-noyau	Municipality (or group of municipalities) with at least 2,000 jobs, and the ratio of the number of persons working in the municipality to the number of active persons is higher than 0.85
Austria	X	Municipality with a minimum of 10,000 inhabitants, at least 5,000 local employees (not working in agriculture)
United Kingdom	Metropolitan Economic Labour Areas	At least one municipality with a minimum of 20,000 jobs + adjacent municipalities with a job density of 1235 jobs/km^2
The Netherlands	X	Not defined

Source: Österreichisches Institut für Raumplanung, 2005

The Table below (taken from the SMESTO report) shows the synthesis of the different notions that are used to define "urban" in some European Union countries, plus Switzerland and Norway. It reflects the multiple potential definitions of urban areas that currently exist both within and between countries.

Synthesis of morphological, functional and administrative approaches to the definition of "urban areas" in Europe

Countries	Morphological approach		Functional approach		Administrative approach	
E: Existing definition N: No definition found	Continuous built-up area	Density	Urban Regions	Labour Market Areas	Size of municipality as a basis for the town	Town by governmental decision
France	E	N	E	E	N	N
Sweden	E	N	N	E	N	N
Germany	N	E	N	N	E	E
Austria	E	N	E	N	E	E
Finland	E	N	N	E	N	N
Norway	E	N	N	E	N	N
Italy	N	N	E	E	E	E
Spain	E	N	E	N	E	N
Poland	E	E	E	N	E	E
Hungary	N	N	E	N	E	E
United Kingdom	E	N	E	N	N	N
Ireland	E	N	E	N	N	N
The Netherlands	N	E	E	N	N	N
Greece	E	N	N	N	N	N
Czech Republic	N	N	N	N	E	N
Belgium	E	N	E	N	N	N

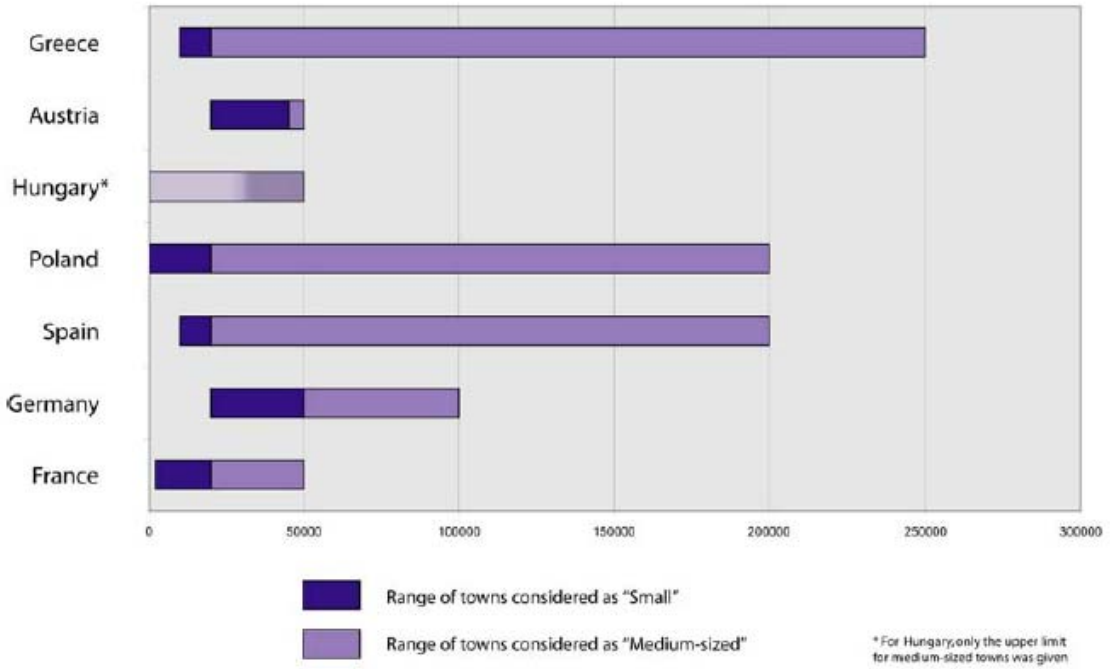
Source: Österreichisches Institut für Raumplanung, 2005

Definition - Small and Medium Sized Cities

In BESTUFS we have referred to urban areas other than large cities as "small and medium sized cities". Terminology used to refer to urban areas that are smaller in size than large cities differs between projects and networks. For instance, the work by Österreichisches Institut für Raumplanung for the ESPON programme refers to "small and medium-sized towns (SMESTO)", the Europolis refers to "medium-sized cities" (with populations of 50,000 to 350,000 inhabitants), while the Eurotowns Network (previously named the "Medium Sized Cities Network") refers to "towns and cities with populations between 50,000 and 250,000".

Small and medium sized towns and cities do not have formal, precise definitions in most European countries. In the countries in which such a definition does exist it is usually based on the number of inhabitants in the urban area. The Figure below shows quantitative definitions of small and medium sized towns in terms of population size in countries that have such definitions. Some of the ranges shown in the Figure are official while others are unofficial but commonly used. The Figure indicates the wide variation in quantitative definitions of small and medium sized towns in European countries. As noted in the SMESTO report, "quantitative understanding of the small and medium-sized towns is very dependent upon the national urban systems. It is therefore not possible to use the national criteria of size in order to compare SMESTO of Europe. Indeed, a large town in France (more than 50,000 inhabitants) is considered a medium-sized town in Spain or Poland".

Population size ranges for small and medium sized towns



Source: Österreichisches Institut für Raumplanung, 2005 (based on a survey of national experts in the project)

Small and Medium Sized Cities – Research and Networks

There are a few existing networks and research projects into small and medium sized cities in Europe. These are summarised below.

Europolis is a European Commission-funded project that focuses on the role of medium-sized cities in the wider European spatial development. The project includes 14 medium-sized cities from Belgium, Germany, England and France, as well as national and regional regulatory authorities. Partner cities have a population of between 50,000 and 300,0000 inhabitants. The project is based on urban actions carried out jointly by all the partners in the cities on local projects aimed at controlling urban growth. The objective is to work together on specific projects in order to devise, test, share and spread across Europe new sustainable urban development practices. Further details of the project are available at: http://www.europolis.equipement.gouv.fr/

The European Spatial Planning Observation Network (ESPON) was established to support policy development and to build a European scientific community in the field of spatial development. The main aim is to increase the general body of knowledge about spatial structures, trends and policy impacts in an enlarged European Union. A project into "Small and Medium-sized Towns (SMESTO)" has been led by Österreichisches Institut für Raumplanung (ÖIR – the Austrian Institute for Regional Studies and Spatial Planning) as part of the ESPON research programme. This study has the aim of improving knowledge about the role of small and medium sized towns (SMESTOs) in spatial development in European countries as well as analysing the strengths and weaknesses of small and medium sized towns. Further details of the project are available at:

http://www.espon.eu/mmp/online/website/content/projects/261/410/index_EN.html

Eurotowns was established in 1991 as the Medium Sized Cities Network. It is developing into a Europe-wide network for towns and cities with populations between 50,000 and 250,000 as towns and cities of this size play a significant part in the economic and social life of Europe. There are currently 21 towns and cities with membership of Eurotowns. The Eurotowns network aims to ensure that the needs of such towns are reflected in the development of European legislation. The aims and objectives of the Eurotowns Network are:

- To establish a distinctive policy agenda for Europeans medium sized cities
- To create a forum for partnership working and collaboration
- To organise a programme of lobbying, PR and opinion forming
- To assist members to access funds for projects and research
- To establish strong links with the European Commission, MEPs, the Committee of the Regions and other appropriate networks
- To organise a programme of research and development

The Eurotowns Network has created a policy goal of "Providing effective, efficient and sustainable mobility". The aim of the Eurotowns Mobility Task Team (EMTT) is to create a task team to help overcome barriers to sustainable urban transport issues, share visions and learn from other cities' experiences in the field of sustainable mobility, in accordance with the Eurotowns Network aims and objectives. It allows officers to learn about specific transport concepts and their policy and implementation implications. Further information is available at: http://www.eurotowns.org/

2.3 Developments in Small and Medium Sized Cities in Europe

Much focus of economic growth, development and research work has taken place in relation to large cities in recent decades. The trend towards globalisation has resulted in the importance of these urban areas becoming ever-greater.

Meanwhile, over recent decades, the economic importance of many small and medium sized cities has diminished, especially as the manufacturing and agricultural base and employment levels of many (especially western) European countries have declined as a result of international competition. This has resulted in some small and medium sized cities losing some of their economic roles and vitality over time, and the areas becoming subject to urban decline, and reductions in population.

However, as well as facing such economic difficulties, small and medium sized cities also offer opportunities and alternatives to larger cities. They can be viewed as offering a better quality of life and environment than larger cities. Therefore, while small and medium sized cities may seem relatively unimportant at a European or national level they are still of great importance in regional and local economics and society, and offer important opportunities for future sustainable development. They typically have relatively compact layouts and shorter journey distances than larger cities, and have a rich and diverse cultural and architectural heritage. This offers potential for future growth in commerce, leisure and tourism. Small and medium sized cities also have an important role to play as intermediate points between larger cities and rural areas.

It is important to note that the research focus on large cities has resulted in a lack of recent research into small and medium sized towns and cities which makes it difficult to summarise the current economic and social status of these urban areas, and their future prospects.

2.4 Freight Transport Issues for Small and Medium Sized Cities

There are several specific issues faced by small and medium sized towns and cities in relation to freight transport:

- Typically little freight transport research and policy consideration has taken place in small and medium sized cities in the past.
- In most cases, little or no resource is available in small and medium sized cities for freight specific actions. This often means that there is no contact point within these authorities for logistics operators and other stakeholders.
- There is often relatively little co-operation between small/medium cities, and between such cities and the larger regional or national institutions concerning freight transport. Also, there is typically little awareness of freight issues in small/medium towns and cities.
- These urban areas are still receiving less research and policy consideration than larger cities.
- Scoping and prioritisation of freight transport issues has not taken place in many small and medium sized cities.
- Relatively few logistics operators are usually based in small and medium sized cities (despite the fact that they carry out collection and delivery work there).
- There is usually relatively little logistics infrastructure in small and medium sized cities in terms of distribution centres, rail freight terminals, ports and airports.
- Many of the freight transport and logistics problems in small and medium sized cities are likely to be similar to those in larger cities (it is just the scale and severity of the problem that may differ) – this provides opportunities for the transfer of ideas and solutions from large cities to smaller ones.
- Traffic problems are often not as severe in small and medium sized cities as in large cities. However traffic problems do seem to be worsening over time.
- Some small cities may have only one or a small number of main roads. This can result in high traffic levels and congestion on these roads. This can make the incorporation of the loading and unloading needs of freight transport on these roads difficult.
- In small and medium sized cities there is usually limited space for on-street parking and loading. ESP type solutions could be considered to help co-ordinate and improve the efficiency of loading and unloading activities.

2.5 Conclusions

- There is a need for similarity between the policy measures implemented in different small and medium sized cities to prevent the proliferation of different regulations and requirements in various cities. This would be very difficult for operators to meet and would be likely to result in a reduction in freight transport operational performance and efficiency. This can be overcome by dialogue and joint working between policy makers from different towns and cities.
- Bypasses have been used to overcome problems associated with through traffic (including freight) in small and medium sized towns and cities. Nevertheless, a considerable number of towns and cities still do not have such bypasses, which tend to be expensive schemes.
- Some logistics difficulties in large cities can be addressed through the provision or improvement of logistics infrastructure such as distribution centres, consolidation centres, rail freight terminals, ports and airports. Such logistics infrastructure solutions require a given level of freight throughput in order to justify the investment required. It is unlikely if such infrastructure-led solutions will generally be relevant in small and medium sized cities. However such infrastructure approaches may be relevant if such logistics infrastructure already exists and is important in terms of freight flows in the urban area.

- A specific topic that planners in small and medium sized cities need to consider is the allocation of road space to different road users. Traditionally the needs of goods vehicles have not been considered in a detailed manner in terms of both moving vehicles and loading and unloading arrangements. This consideration should take account of how the road space is best allocated at different times of day.
- Consideration should be given to the need for appropriate advisory and in some cases compulsory routes for vehicles (and the associated signage) to ensure that transit traffic (both passenger and freight) does not travel through small towns and cities if these locations are already congested.
- Delivery maps and roads signs can be helpful in showing drivers how best to access different locations in towns and cities. This approach has been used by several small and medium sized cities in the UK in recent years. Such maps and signs are easier to produce for small and medium sized cities than for large cities due to the total geographical area involved.
- The fact that few logistics operators are usually based in small and medium sized cities can make it difficult for policy makers to identify the relevant operators to engage in dialogue about freight transport issues. However, the smaller number of companies involved in urban freight in small and medium sized cities can provide better opportunities to form meaningful partnerships than in larger cities with so many companies.

2.6 Recommendations

- Both small and medium cities and the freight transport problems related with them have received very little research attention in recent decades. BESTUFS recommends that further research is carried out into the following issues related to small and medium sized cities:
  - Developing a better understanding of what is meant by small and medium sized cities in European countries, and determining whether freight transport problems and potential solutions differs in kind and size compared to bigger cities. At present, it is assumed that the structure and size of the city, the transport system and the regulations for freight transport have a bigger influence than the size itself.
  - Investigation of freight issues and problems in small and medium sized cities to determine whether these issues are different to those faced in larger cities, or if the problems are broadly similar but differ in terms of magnitude and importance,
  - Comparison of the nature and scale of freight transport problems in different small and medium sized cities
  - Compilation of case studies of freight transport solutions implemented in different small and medium sized cities.
- BESTUFS recommends that policy makers in small and medium sized cities need to place freight transport considerations higher in their agenda. This will require that urban freight is given more priority and publicity. This also includes the integration of freight issues in the transport planning tasks of the responsible authorities in these small/medium urban areas. These responsible authorities should also have the necessary know how and experience to deal with urban freight topics.
- There is a need for policy makers to incorporate freight transport planning more fully into urban planning considerations alongside passenger transport planning in small and medium sized cities. This has been a weakness in many large cities as well, but some larger cities are making progress. BESTUFS recommends that there should be greater scope for small and medium sized cities to learn from the changes and developments taking places with respect to freight transport planning in larger cities.

- As resources tend to be particularly limited in small and medium sized cities, BESTUFS recommends that co-operation among such cities and with larger cities should be fostered in order to develop common strategies for dealing with similar problems and issues.
- Given the likely similarity of many freight transport issues and problems in small/medium cities and larger cities, BESTUFS recommends that policy makers in small/medium sized cities should consider most of the issues addressed by policy makers in large cities. The most important of these are described below.
- BESTUFS recommends that policy makers in small and medium sized cities should review existing vehicle access and loading regulations in their cities to determine their suitability to current situations.
- In addition, these policy makers in small and medium sized cities should review existing the on-street provision for loading and unloading in their cities to determine its adequacy. They should consider making changes where necessary.
- BESTUFS recommends that clear and accurate road signs should be used by urban authorities in small and medium sized cities to help explain vehicle routing and regulations to goods vehicle drivers.
- Advisory or statutory lorry routes should be considered by policy makers to prevent goods vehicle drivers using unsuitable or sensitive routes in small and medium sized cities.
- BESTUFS recommends that policy makers in small and medium sized cities should provide information to freight transport companies and drivers through the use of maps, local information boards, and traffic and roadwork information.
- BESTUFS recommends that policy makers in small and medium sized cities should seek to establish good working relationships with companies involved in freight transport and logistics in their areas. In the UK policy makers from all sizes of urban area are encouraged by national government to set up such partnerships, which are called “Freight Quality Partnerships” (FQPs). To limit and share the workload, a group of small and medium sized towns and cities in the same geographical region could work together to develop such a FQP with the private sector and other interest groups.
- FQPs are a means for urban authorities, businesses, freight operators, environmental groups, the local community and other interested stakeholders to work together to address specific freight transport problems. FQPs provide a forum to achieve best practices in environmentally sensitive, economic, safe and efficient freight transport, and allow partners to exchange information, experiences and initiate projects. The table shows the suggested action points for setting up an FQP in the UK.

Action points for urban planners before setting up a Freight Quality Partnership (FQP)
• Through consultation, develop a distribution strategy.
• Consider how an FQP could help you deliver your distribution strategy.
• Promote the benefits of the FQP - internally to secure the necessary commitment and • externally to attract partners.
Action points in setting up an FQP
1. Set initial objectives that are specific, measurable, achievable, realistic and timed
2. Appoint a Freight Champion who will take responsibly for the FQP within the Authority.
3. Identify and recruit partners that help achieve your objectives.
4. Establish the FQP's management structure including a chair and secretariat.
5. Decide when, where and how often you should meet.
6. Identify funding sources and seek the necessary endorsement.
7. Try to pre-empt potential problems.
Action Points in Developing an FQP Plan
1. Identify problems and collect the necessary information to clarify their precise nature.
2. Assess the various solutions and reach consensus on what should be done.
3. Draw up a timed action plan for delivering the solutions, identifying who is responsible for each task by when.
Action Points for Maintaining Momentum in an FQP
1. Consider how you can maintain interest and keep the momentum going.
2. Use publicity to promote the Partnership and its activities.
3. Constantly monitor progress of the process, outputs and outcomes.

Source: Department for Transport, UK, 2003.

3. Urban waste logistics

3.1 Introduction

A workshop entitled "Urban waste logistics" took place in Zurich on 9/10 March 2006. The subject of waste logistics had already been addressed in a previous BESTUFS best practice material collection documented in the first BESTUFS II Best Practice Handbook providing the following conclusions:

- EU directives on waste management are core of national and regional waste management activities
- There are large differences in the approaches of waste management and logistics in the EU member states due to different interpretations of EU directives
- There is a tendency to privatize waste collection processes for municipal waste, with partly (negative) impacts on the urban transport situation.
- Various demonstration projects on technical and operational innovations in waste logistics have taken place focusing mainly on efficiency and sustainability issues in the waste transport chain.

The theme "Urban Waste Logistics" was taken up again at the Zurich workshop in order to discuss:

- Technical Innovations in urban waste logistics
- Approaches to improve efficiency and sustainability of urban waste logistics
- Recent trends in urban waste strategies and developments

Overall 9 presentations were given by speakers from different countries. The workshop was attended by 40 participants from across Europe.

3.2 EU waste management policy

On EU level DG Environment developed a strategy on waste policy among others with focus on:

- Avoiding waste production
- Reducing the environmental impact from waste transport and
- Exchanging best practice on avoidance measures

Within this strategy however, no particular consideration is given to logistics and transport issues. This is critical to assess as the impact of waste transport, especially in the urban area, is important for the entire transport system as well as for the environment:

- Estimations suggest that about 3000 million tons (including construction waste) are generated in Europe.
- Municipal waste is estimated with 306 million tons per year
- Industrial waste sums up to 740 million tons per year

The movement of these volumes is taking place mostly in city areas and creates one of the largest commodity groups in urban freight transport.

3.3 Definition of waste logistics

Waste Logistics is a broad term referring to the logistics management and disposal of hazardous or non-hazardous waste from packaging and products. It includes reverse distribution which causes

goods and information to flow in the opposite direction of normal logistics activities. The following processes are part of the waste disposal logistics:

- Collection
- Transportation
- Transhipment
- Storage

While traditional logistics seeks to organize forward distribution, that is the transport, warehousing, packaging and inventory management from the producer to the consumer, environmental considerations opened up markets for recycling and disposal, and led to an entire new sub-sector – Reverse Logistics. Reverse Logistics is different from Waste Logistics as the latter mainly refers to collecting and processing waste efficiently and effectively. Reverse Logistics concentrates on those streams where there is some value to be recovered and the outcomes enter a (new) supply chain. Reverse Logistics starts with products going back in the supply chain or calling for recovery or value reclaim. In principle there is a returning party, who had the product, and a receiving party, who is trying to resell, redistribute or recover value from the product.

Focus of the BESTUFS Best Practice material collection has been on urban freight related logistics approaches, namely on:

- Municipal waste logistics
- Industrial waste logistics
- Special waste logistics

An overview on the relevant thematic fields defining urban waste logistics is given in the picture below:

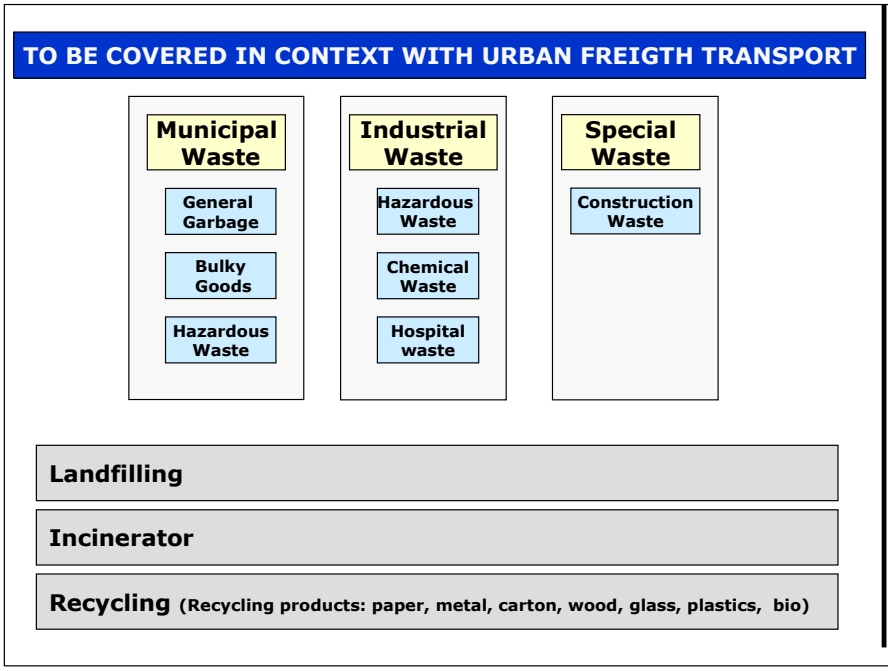


Figure 1: Theme of this material collection

Not of main focus in the material collection was reverse logistics and waste logistics for sludge, atomic waste, inherited waste and waste from electricity production.

3.4 Need for action and approaches to urban waste logistics

The main challenges in urban waste logistics can be summarized as follows:

- Adapting to new waste management strategies (e.g. separate collection, recycling)
- Adapting to new legal framework conditions (e. g. prohibition of landfill)
- Site planning for new incineration plants or landfill sites
- Reduction of negative impacts of urban waste logistics
- Improving efficiency of urban waste logistics (reducing costs, also because of financial burden of municipalities)
- Reducing littering and unlawful disposal.

The present situation is characterised by approaches to improve the efficiency and sustainability of waste transport. Within the following approaches to waste logistics will be discussed addressing:

- Technical innovations to improve the efficiency and reduce environmental burdens
- Efficiency of processes and improvement of the organisation and
- Institutional issues

Technical innovations

Technical innovations mainly address the following aspects:

- Noise of the waste collection vehicles, lifting devices and compactors
- Exhaust emissions of the vehicles
- Optimising waste transport chains using intermodal transport modes
- Identification technology for waste containers and bins

Noise and emission of waste collection vehicles

Currently, different cities are testing alternative waste collection vehicles. Madrid recently implemented a waste collection fleet of CNG propelled vehicles. In Gothenburg a fleet with hybrid propelled vehicles (electric and gas engine) is being tested.

In the CIVITAS city Gothenburg a new vehicle concept for waste collection was tested. The vehicles combined alternative propulsion with a silent and clean waste filling process. The vehicles are hybrid (gas and electric engine). The filling process replaces hydraulic lifting and compacting by electrical propelled processes. Due to this, significant reductions in noise as well as in the emission exhaust could be achieved. A problem is the investment costs, which are about 20% higher – including the compactor than conventional technologies. However, surveys carried out showed that customers would be willing to pay more if the service would be cleaner with less noise.

A more practical and immediately available solution seems to be CNG propelled vehicles. This technology is presently available and an procurement of adapted fleets is possible in the short term. In Spain CNG waste fleets are also used during night due to the lower noise emissions.

Optimisation of transport chains using intermodal transport modes

The BESTUFS Best Practice handbook stated clearly that approaches using intermodal transport modes can be very successful. Examples from the Netherlands, Belgium, Switzerland, as well as from Germany, suggest that transport of waste by inland shipping can be economically viable even at short distances (25km). A comparable project is given from the London canal which proved that inland barges can be very cost effective compared to road at a distance of 10-12 km. Cost calculations have shown that savings of up to 20% can be achieved compared to the traditional waste transport system. Cost figures depend highly on the congestion situation in an area. This field is so far researched only poorly.

The example of Cargo Tram Zurich from Switzerland shows that tramways could also be used for the collection of specific waste. This solution can reduce vehicle kilometres and improves the quality of life in urban areas.

Intelligent waste container

Presently most collection processes of waste containers are carried out by means of a "milk run" process – a regular scheduled collection tour not considering the filled capacity. Approaches to optimise the collection process only when the container is full have been tested, however are not common practice yet. A main barrier was so far the high requirements on location and communication technology that used to be expensive. However, the potentials in reducing transport km is high. Future technology developments, e.g. RFID or intelligent collection systems for housings could further foster the implementation of intelligent collection systems. Initial examples of RFID equipped containers with an underlying GPS-based positioning and weighing have indicated the benefits of such systems.

Process efficiency and improvement of organisation

Experiences of optimising waste collection processes show that, due to the introduction of new processes or simple measures, significant cost savings of up to 30% can be achieved. Such measures include:

- The introduction of new working hour models
- Reducing truck crew by technological innovations
- Changing the collection area and time
- Optimising trip planning

Main variables to introduce new working models are:

- Operation in a one shift model versus more shifts
- pick up system versus pick up on demand system
- Larger crew versus additional technical on-board devices
- Extending the collection intervals

Recent developments in vehicle technology allow for a more efficient employment of labour forces to carry out the waste collection. Therewith, the collection area is of high relevance:

- In areas with low traffic density and disturbances (e.g. due to vehicle parking) waste collection can be carried out in a pick-up system without employing additional loading personnel. Loading takes place by side or front loaders that are steered by a joystick (e.g. by the driver or co-pilot)
- In inner city areas with a high traffic density, productivity gain can be achieved when shifting the processes out of the traffic peak hours or consolidating waste at particular collection points. This increases the number of disposal services and limits the threat of congestions, e.g.

for emptying the waste container. Concealed containers, as e.g. in Zurich are a possibility to increase efficiency of the collection process. The disposal and collection takes place centrally that saves operation costs as well relieves the inner city area from a time consuming doorstep collection.

- Cost reductions can also be achieved by extending collection intervals. For example in Germany a collection interval of 2 weeks is common practice (also due to the separation of waste) while in Southern European cities (e.g. Barcelona) a collection takes place each day.
- Further variables to influence the efficiency of waste collection processes are to optimize the collection by using trip planning software. Result of such an optimization might be that:
    - Areas and collection intervals can be changed
    - A combined collection of different waste collections can take place
    - Reduction of transport distances (tour consolidation)
    - Increasing the use of capacity by employing the right vehicle in the right area.
- In addition to the traditional collection systems, collection on demand might be an option to increase efficiency and sustainability. An example of this is containers equipped with filling level sensors or weighs. (e.g. for glass containers or clothes a collection takes place when the container is full). By recording the weight and fill rate of containers with an on-board device, the position and number of containers and the collection intervals can be optimised.

Institutional conditions

Waste logistics organized by public and regional entities

Waste logistics is to a large extent determined by institutional regulation. In municipal waste collection processes, both public and private operators exist in the market. However, the tendency for privatization is clearly shown. In Germany the share of municipal operators is at about 37%, while in other countries this share is higher.

In the London area for example waste collection is mainly organised locally by the boroughs. This causes on one side a lot of competition, and on the other side there are uncoordinated actions. The Mayor's Office is currently looking into overall strategic options on waste transport with the following key points:

- To develop proximity principle strategies
- Proposal to develop single waste authority
- To manage 85% of wastes arising within the capital by 2020
- Recycling and biodegradable waste diversion targets
- To make greater use of alternative modes of transport – water and rail

Obviously, the strategies for urban waste management are different in European cities and member states. However, the liberalization of the waste market suggest for a centralized planning of the landfills and incineration plants. Given this strategic structure waste logistics should be adapted optimally, in terms of cost efficiency and sustainability. This includes the employment of intermodal transport modes as well as interregional planning. Given that interregional transport flows will become common practice in the future, municipalities have the option either to co-operate with private operators or to completely privatize the urban waste collection.

Urban waste transport data and off-peak waste collection

Information and Data are not readily available on a national or European level. An impact assessment, e.g. on the contribution to urban congestion is presently not possible. Obviously, it is to be expected that waste collections carried out during peak hours delays the transport flows, reduces waste collection efficiency and can contribute to a worsening of the overall traffic situation in peak hours. Still in some major cities, e.g. like Paris waste transport is carried out also during peak hours. While other cities, like Barcelona or Madrid shifted the collection to night times and off peak hours. A shift into off peak hours suggests benefits in terms of more productive transport processes (more disposal services and larger operation radius) as well as for the overall transport processes. On the other side shifting collection into off-peak hours also implies higher personnel costs and needs adapted working plans, e.g. with the landfill station or incineration plant. Recommendations on the "optimal" policy are difficult to develop due to a lack of data as well as due to a lack of transparency of political and geographical specifics.

3.5 Recommendations

Developments and experiences show that more integrated waste logistics approaches from the point of collection through to the disposal process are needed. Such concepts are based on:

- An optimisation of catchment and collections areas
- Consolidation (with division of collection and transport and / or intermediate depots)
- Night collection or specific time window collection.

Cities should increasingly develop medium and long-term strategies and concepts and evaluate their effects on the economy, society and environment. Such strategies should takes into account infrastructural measures (location of plants, transhipment points, local collection points etc.), operational/organisational measures (tour planning, definition of collection areas, etc.), technical measures (vehicle technology, collection equipment, telematics applications etc.), and also legal measures (night collection, emission levels of vehicles, etc.). In developing such strategies consideration should also be given to the use of other modes (inland waterway, rail, tramway) – these modes could be an option depending on the waste flows and framework conditions.

When developing an urban waste strategy and/or policy, consideration of the transport and logistics issues would be beneficial. Presently there is a lack of urban freight related data in general and none on the impact of urban waste transport in particular. In this regard, information and data on:

- The impact of waste logistics on urban congestion
- The impact of waste logistics as a cause of noise pollution

are of major interest. BESTUFS recommends to fill this gap by exemplary data collections and analysis for various European cities. A pan-European database would provide comparative data for urban transport plans.

A growing number of cities are also planning to introduce low emission zones. A major consideration should be to include all vehicles, especially the waste collection fleet. Here results from CIVITAS and experiences from other cities such as Madrid should be made available. BESTUFS recommends the development of practical guidelines for city planners to convert municipal waste collection fleets to the objectives and requirements of low emissions zones.

Different stakeholders and authorities are involved in the waste and reverse logistics supply chain. Our investigation suggests a need for better co-ordination of activities. The following interfaces are of particular relevance:

- Activities that determine the structures for the waste processing (landfill, incineration plants, transfer points etc.) and the structures of urban waste collection. The planning of when waste processing is carried out is highly pertinent to urban transport issues.
- The integration of waste and transport issues in urban land use planning.
- The design of a waste collection fleet in line with the city development strategies (e.g. low emission zone etc.).
- The development of innovative waste logistics and transport strategies and measures which makes the waste collection more efficient and reduce the environmental burdens. Such approaches should consider new vehicle and collection technologies, intermodal transport, ITS, pick up systems with specific containers, night collection etc.

BESTUFS encourages the setting-up of planning and operational roles dedicated to freight within city government. Cities should set up long-term policies and strategies to address urban freight aspects. Within this organisation reverse logistics and waste transport should be clearly addressed as a distinct issue with clear ownership by planners and politicians.

It seems that tailored, specific waste logistics applications exist that are adapted to national, regional issues and framework conditions. There are several solutions for the same problems. The question is how to share best practices. One approach is to highlight efficiency and sustainability aspects, however, especially in waste logistics, geographical and political aspects needs to be considered. BESTUFS recommends to place attention in following actions on waste logistics best practices. Measures concerning how best to extract and bring best practices to the users efficiently should be worked out and implemented in pilot actions.

The liberalisation of the waste market may lead to interregional and international transport of waste, whilst at the same time environmental policies are applying pressure to reduce the kilometres travelled by waste from the point of production. If, however, longer haul transport is required, the characteristics of waste are well-suited to the use of intermodal transport. Cost-benefit analysis shows significant cost saving potential in intermodal waste supply chains. There is a need to elaborate and consider concepts on inner city intermodal transhipment points for waste logistics in European cities. BESTUFS recommends the devising of a European master plan in which European cities intermodal transport modes in waste logistics can provide high benefits.