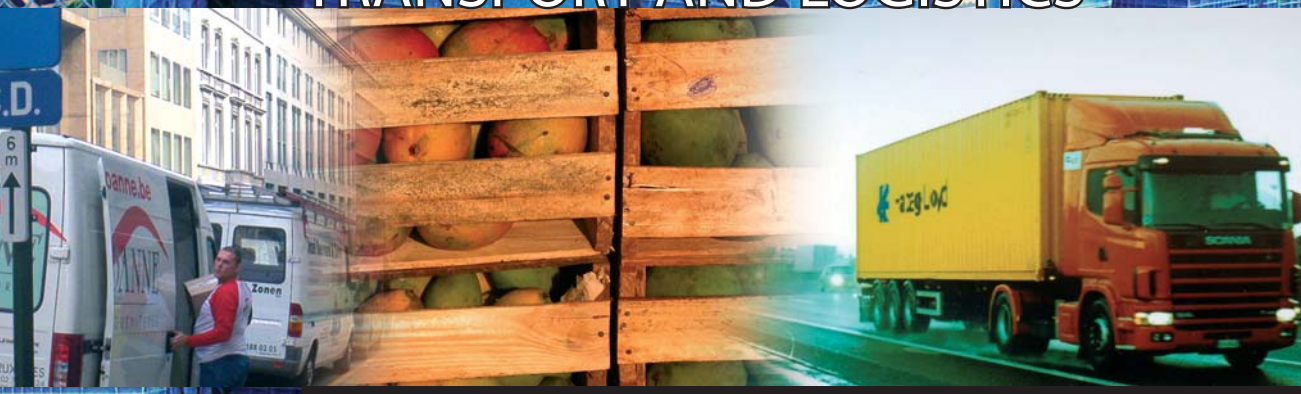
URBAN FREIGHT TRANSPORT AND LOGISTICS



An overview of the European research and policy

Directorate-General for Energy and Transport

EUROPEAN COMMISSION

CONTENTS

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Additional information on transport research programmes and related projects is available on the Transport Research Knowledge Centre website on the European Commission's Europa server:
http://ec.europa.eu./transport/extra

In addition, a public e-mail enquiry service is available at:
helpdesk@transport-research.info
Information on the wider transport activities of the European Union is available on the internet. It can be accessed through the Europa server:
http://ec.europa.eu./dgs/energy_transport/index_en.html

Manuscript completed by Damian Stantchev and Tony Whiteing, ITS (University of Leeds), in July 2006.

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FOREWORD

This document provides an overview of research results from the EC's Fourth and Fifth Framework programmes and a series of national research projects in the area of urban freight transport and logistics. It also discusses policy implications and requirements for future research.

The adoption of best practice methods offers the most promising opportunities for urban logistics operations to become both more efficient and more environmentally sustainable. Such best practice methods include:

- the use of more environmentally-friendly alternatives to current urban freight transport practices through improved fuel efficiency and the use of alternative fuel vehicles;
- the use of information and communication technologies (such as RFID and vehicle routing software);
- the possibility to improve deliveries to urban areas through the use of urban distribution networks and consolidation depots.

Full benefits are unlikely to be achieved, however, when such proposals are put into practice in isolation, and it may well be more sensible to consider them as a wider package of measures. This topic has therefore been explored in the light of the need for integrated solutions, which pull the above-mentioned policy measures together and help eliminate the obstacles to achieving more effective and sustainable urban freight transport and logistics practices. Roles and responsibilities of the various actors and stakeholders have also been considered as an additional element of analysis.

1 DEFINITION OF THE SUBJECT

Urban freight transport and logistics operations are concerned with the activities of delivering and collecting goods in town and city centres. These activities are often referred to as 'city logistics' as they entail the processes of transportation, handling and storage of goods, the management of inventory, waste and returns as well as home delivery services.

Often many of these processes, or parts of them, are undertaken outside urban areas but they still have impacts on urban operations. Therefore, freight transport and logistics operations in urban areas cannot be viewed and studied in isolation but rather in the context of the entirety of supply chains that typically cross the geographical boundaries of urban areas.

The growing significance of urban freight transport and logistics is related to increased population and sustained economic growth in urban areas. Goods transport in cities represents from 10 to 18% of road traffic (COST321, 1998). As the majority of the population in Europe lives in urban areas and the bulk of industrial production is despatched to these areas, the result is an increased demand for freight transport. Furthermore, as urban freight transport deals primarily with the distribution of goods at the end of the supply chain, many deliveries tend to be made in small loads and in frequent trips, thus resulting in many vehicle kilometres.

The urban environment is characterised by high settlement and population densities and high consumption of goods and services. In such environments traffic infrastructure and the possibilities for its extension are both limited and unsustainable. This dichotomy between demand and limitations of the urban environment has resulted in significant problems associated with urban freight transport. The most commonly mentioned are congestion, pollution, safety, noise and carbon creation. In fact, the transportation of goods accounts for 40% of air pollution and noise emissions (COST321, 1998). The combined effects of these problems are both economic and societal, in that they not only reduce the efficiency and effectiveness of urban freight transport and logistics operations but also impact on the well-being of a nation by decreasing the quality of life of citizens and through detrimental effects on health.

One would expect that, because of its importance, this topic would have been given a more central role in European policy making. However, despite its significance and the problems associated with it, relatively little attention has been paid by researchers and policy makers until recently. Indeed, especially in the first half of the 1990s, "in the documents that the Commission has published to support the making of a common European transport policy, issues of city logistics have in fact been only rarely mentioned" (PORTAL, 2003, p.7). European policy documents concentrating specifically on urban freight transport and logistics remain relatively rare.

2 RESEARCH NEEDS

Improvements to the urban environment through the more environmentally friendly use of freight transport vehicles

There is a need to identify the most suitable types of vehicles for urban freight and logistics operations. Key areas for consideration relate to the most appropriate size of vehicles to be used and the type of fuel they require. Many issues such as pollution, carbon creation, noise and safety must all be considered. There is a problematic trade-off between the size and capacity of the vehicles and the numbers of vehicles that will be required to fulfil logistical needs. The type of fuel is important not only for fuel consumption and hence emissions of pollutants and greenhouse gases but also, from the point of view of noise although, of course, urban noise levels are affected by the handling systems used as well as by the operation of the engine. There is a need for research into how the use of environmentally friendly vehicle technologies can be encouraged or enforced.

What restrictions should be applied to urban vehicle movements according to vehicle type and size? Should financial penalties or incentives be used to influence the choices made by vehicle operators? Should night-time deliveries be encouraged to reduce congestion impacts and, if so, how can potential noise problems be ameliorated?

Improved deliveries to urban areas through the use of urban distribution networks and consolidation depots

Perhaps the greatest potential for environmental improvement in urban logistics relates to the improved consolidation of the many small loads prior to delivery into the urban centre. What, then, constitute the best opportunities for the rationalisation of urban logistics operations through the use of consolidation depots, and what are the limitations on their use? Why has this seemingly attractive idea seen so little success in practice to date? Who should operate such facilities, and should their use be mandatory or voluntary? What areas should they serve? Is there potential to link the operation of such schemes to transport modes other than the lorry, for instance by locating urban

consolidation depots at, or close to, rail and intermodal terminals or, as has been suggested in some cities, by using urban tram and light rail networks for freight operations?

The use of information and communication technologies (such as RFID, vehicle routing software or load sharing systems)

The logistics industry has already embraced a wide range of information and communication technologies and reaped major efficiency gains as a result. This is almost certainly the area with the greatest 'win-win' potential, i.e. where efficiency gains go hand in hand with environmental benefit through reduced travel distances, fewer vehicle movements, better matching of vehicles to work and improved levels of load consolidation.

In the future, Intelligent Transport Systems will introduce many opportunities for better management and control of urban logistics operations, for instance through the use of dynamic scheduling systems linked to real-time traffic and road works information. As the pace of development of such technologies continues to increase, there is a need for research to identify how they can be used to best advantage to improve the environmental performance of urban logistics operations.

The need to consider these proposals as a wider package of measures

There are many other issues which could be taken into consideration to improve the performance of urban logistics operations, such as driver behaviour and training, the role of the receiver/customer in improving the sustainability of urban freight, and the scope for improved policy measures and enforcement (both in terms of road freight and other road users for moving and parked traffic). In this brochure, however, attention is focused on the three areas outlined above.

These may produce significant environmental benefits when introduced in isolation, although all towns and cities are different and the potential benefits will vary from place to place. However, the potential benefits may be considerably magnified if all the possibilities can be combined to produce the most effective overall package of measures for the area in question. This important aspect of the problem is discussed further in Section 5.

3 RESEARCH PROGRAMMES

The European Commission

The following EU programmes and sub-programmes have funded research projects in the area of urban freight transport and logistics:

- FP4 - Strategies for changing modal split (including transport means, organisation and operation) – projects such as **UTOPIA**
- FP4 - Transition in multi-modal transport – projects such as **REFORM**
- FP4 – Quality of the terminals – projects such as **FV-2000**
- FP4 – "Transport RTD Programme" – projects such as **IDIOMA**
- FP5 – **Growth, KA 2** "Sustainable Mobility and Intermodality" – projects such as **BESTUFS** and **D2D**; Demonstration projects within the **CIVITAS I** Initiative such as **VIVALDI, TELLUS** and **MIRACLES**
- FP5 – **EESD, KA 4** "The City of Tomorrow and Cultural Heritage" – projects such as **CITY FREIGHT**
- FP5 – **IST, KA 1** "Systems and Services for the Citizen" (KA 1, Cluster 1 "Mobility and Intelligent Infrastructure for Transport") – projects such as **GIFTS, MOSCA** and **eDRUL**
- FP5 – **EESD, KA 6** "Economic and Efficient Energy for a Competitive Europe" – **TRENDSETTER** (a **CIVITAS** project)
- FP6 – "Sustainable Development, Global Change and Ecosystems" thematic area - projects within the **CIVITAS II** Initiative such as **CARAVEL, MOBILIS, SMILE** and **SUCCESS**

The BESTUFS network is a notable example of research in this area. Its aim was to "*establish and maintain an open European network between urban freight transport experts, user groups/associations, ongoing projects, interested cities, the relevant European Commission Directorates and representatives of national, regional and local transport administrations in order to identify, describe and disseminate best practices, success criteria and bottlenecks with respect to the movement of goods in urban areas.*" (Huschebeck, 2004, p.3). Following its success, the **BESTUFS II** project was launched in 2004 under the EU FP6 programme.

National programmes

The following are examples of national research programmes across Europe. Many of these programmes, however, deal primarily with public transport rather than freight and only individual projects within these programmes focus directly on the area of urban freight transport and logistics:

- Logistics Austria Plus (Austria, 1999-2003)
- Mobility and Transport (Germany, ongoing): Optimised Transport Logistics for Recycling and Waste Management sub-programme
- Flexible Transport Chain (Germany, 1997-2001)
- Centre for Logistics and Freight Transport (Denmark, 2001-2005)

- Ministry of Transport and Communication's R&D Projects Supporting Transport Policy (Finland, ongoing): projects within the 'Goods Transport and Logistics', 'Transport of Dangerous Goods' and 'Environment and Vehicle Engineering' themes.

- **VALO** Real-time Logistics in Networks (Finland, 2001-2004)

- **VINNOVA SP8** Innovative Logistics and Freight Transport Systems (Sweden)

- Department for Transport (UK, ongoing), Freight Best Practice and Freight and Logistics Programmes. Examples of projects include '**Alternative Delivery Solutions** – **Nottingham Trial'** and **'Urban Consolidation Centres'** (Sustainable Distribution Research sub-programme);

- **National Programme on Urban Goods Transport** (France, ongoing); French Ministry of Transport, **ADEME**

- **PIEK** multi-annual programme into delivery noise (The Netherlands)

4 RESEARCH RESULTS

Improvements to the urban environment through the more environmentally friendly use of freight transport vehicles

The 'Best Urban Freight Solutions' **(BESTUFS)** European project has provided the following recommendations on how best to improve the urban environment through the more environmentally friendly use of freight transport vehicles. The recommendations address the following areas:

Size of vehicles

The **BESTUFS** project identified the need to use higher cubic capacity vans and more specialist equipment (e.g. for the transportation of fragile and temperature sensitive goods).

The use of more environmentally friendly vehicle technologies

The **BESTUFS** project has highlighted the environmental and noise reduction benefits of Compressed Natural Gas (CNG) and electric propelled vehicles. The lack of a comprehensive CNG supply infrastructure in Europe, however, has been identified as an obstacle to the more widespread adoption of CNG vehicles. The project has also recommended an increase in the share of alternative fuels and active support for the development of environmentally friendly vehicles for urban transport within the subsequent Framework programmes. Other areas for improvement outlined by the project are largely concerned with enhancing the current understanding of alternative engines and fuels, which the project has recommended to be undertaken by considering the US and international experience.

The need for research into how the use of environmentally friendly vehicle technologies can be encouraged or enforced

The **BESTUFS** project has provided an insight into the instruments that are required to promote the use of environmentally friendly vehicle technologies. The project suggested a set of encouragement measures to support the use of innovative vehicle technologies, such as an exemption from access restrictions to the inner city for low emission vehicles. Other promotional measures included the demonstration of new vehicle technologies, especially in authority-owned and -operated fleets.

The summaries of projects on the next page (p.8) are examples of research projects, which complement and expand the above-listed **BESTUFS** recommendations.

The **CITY FREIGHT** project targeted the problems of road freight transport in urban areas by providing guidance to a range of interested stakeholders on the best practices for analysing their city freight problems as well as for designing and implementing integrated strategies to solve them. Such best practice recommendations include:

- reducing the noise emissions of off-peak deliveries;
- consolidation of consignments;
- combining freight traffic with passenger traffic within the cities to reduce the demand for transport (e.g. through the use of Cargo Tram, electric and hybrid electric vehicles, bicycle couriers and distribution by walking);
- integrating land use and transport planning.

Source: http://ec.europa.eu/transport/extra

The **UTOPIA** project aimed to provide project managers and policy-makers with the necessary information base, tools and guidelines to support the introduction of promising urban transport solutions based on cleaner vehicles. **UTOPIA** developed four major outputs:

- an assessment of the most promising applications for cleaner vehicles and supporting measures, from a city perspective;
- recommendations on policy actions at the European and national levels to promote or facilitate market introduction and demonstration;
- a good practice guide to setting up and running pilot and demonstration projects, aimed at potential project champions;
- a software framework ('NAVIGATE UTOPIA'), which provides information and assessment methodologies covering clean transport solutions.

Source: http://ec.europa.eu/transport/extra

The **COST 321** project studied the design and implementation of innovative measures to improve the environmental performance of freight transport in urban areas. It has analysed how "air pollution, noise and energy consumption are reduced by optimising the use of trucks in city traffic through the application of modern logistical devices and appropriate administrative measures." (PORTAL, 2003a, p.8) The project suggested that the optimisation of urban freight transport should take into account the following parameters:

- transhipment technology
- land use management
- conditional access for delivery service providers
- transport fleet composition
- infrastructure capacity
- locally convened development forms and programmes
- political drive and availability of money.

Source: http://www.eu-portal.net

Safety of urban freight transport and logistics practices is another area which needs to be considered. An Irish study entitled **'Contributions to the Safety and Efficiency of the Multi-drop or Local/Short Haul Operations'** identified a number of constraints and incompatible requirements that were impacting on the safety and efficiency of the Urban Multi-Drop Delivery (UMDD) operations. Traffic levels, transport policy measures, ineffective regulation, customer demands, internal management and work processes were identified as constraints affecting the ability of the UMDD service to function safely and efficiently (See: *http://ec.europa.eu/transport/extra/web/index.cfm*).

The use of information and communication technologies (such as RFID, vehicle routing software or load sharing systems)

Research into the use of information and communication technologies has called for actions towards standardisation (Huschebeck, 2004). The **BESTUFS** project has recommended:

- To continue the standardisation activities related to traffic information data technology. Currently, traffic information data comes from different sources for which different content, formats and protocols are in use. Therefore, a common standard for all data was found to be of potential benefit;
- To promote various ways of data communication (such as GPRS, UMTS, radio frequencies, etc) and not to favour one communication standard as this will allow finding cheaper solutions in the future;
- Most of the conclusions of previous research projects, such as **COMETA, FLEETMAP, SURFF** or **INTACT,** regarding standardisation issues in freight transport management systems were deemed valid. The development of web based technologies was pointed out as a source of future solutions. The need for flexible low cost technologies for urban freight transport standard data formats for transport planning systems was also outlined.

The summaries of projects below and on the next page (p.10) are examples of research projects that complement and expand the above-listed **BESTUFS** recommendations.

The **GIFTS** project explored the use of telematics for the management of deliveries and the intensive use of automated and computerised methods for handling of freight. The outcome of the project was an open access Internet portal/e-marketplace providing services to the logistics and freight transport industry in the European Union. The project has implemented a web platform of services that is fully interoperable and integrated with any ICT system. **GIFTS** provides applications for the operational (e.g. tracking, tracing and monitoring of the door-to-door journey; aid in trip management; tracking and tracing of goods; fleet management, etc.), as well as all the e-commerce functions and insurance of a door-to-door freight transport chain (i.e. including order matching, e-document transfer, e-payment, etc.).

Source: http://ec.europa.eu/transport/extra

The **MOSCA** project has developed a set of tools for improving the efficiency of door-to-door transport of goods in urban areas. This set of tools offers services for shortest path finding, on-line vehicle routing planning and urban shop delivery planning. The **MOSCA** project has also addressed the issues of integration and interoperability at European level. To achieve integration and interoperability at European level, the project has called for the development of innovative tools and methods for the management of freight deliveries in city centres at a European rather than national or company level.

Source: http://ec.europa.eu/transport/extra

The **D2D** project, whilst not particularly focused on urban freight and logistics, has demonstrated how to achieve efficiency within the transport chain with the assistance of advanced information and communication technology. The main results of the project comprise: a transport chain management system available as a web based application on the Internet, a monitoring system, the efficient implementation of a system integration tool (communication platform), simulation and service profiling technology and tracking and tracing technology. The **D2D** system reduces the complexity of organising the physical and information flows within the supply chain and contributes to improved quality of life, health and safety of citizens by reducing pollution and noise and relieving congestion.

Source: http://ec.europa.eu/transport/extra

The **eDRUL** project investigated and tested an innovative e-logistics platform and services to manage freight distribution in urban areas. The project was specifically designed with historic centres in mind. The online platform was tested as a working pilot in two cities, Siena and Lisbon. A major success of the Siena pilot was the 'Park & Buy' service, which enabled individuals who had walked into the pedestrianised city centre to buy a heavy item and have it delivered to a collection point in their car park. The booking and delivery to the car park was organised by the shop selling the item. The shops involved (some 20 in all) were all enthusiastic supporters of Park & Buy, as it enabled them to offer an additional service to customers.

Source: http://www.edrul.org

The use of urban distribution networks and consolidation depots

The following recommendations regarding the use of urban distribution networks and consolidation depots have emerged from the **BESTUFS** project (Huschebeck and Allen, 2005):

- Publicly-organised Urban Consolidation Centres (UCCs) do not have a good track record in terms of implementation and operation. For UCCs to be attractive to companies and to be successfully set-up **BESTUFS** recommends that they should be led and operated by one or several key commercial players that have identified the potential benefits of being involved. Similarly, public funding needs to be made available to pay for the research work and pilot studies for any form of UCC that is not related to a major new property or commercial development. Without this funding such UCC research and trials are unlikely to proceed.

- There is clearly a need for raising awareness (including success and failure factors) amongst local authorities, retailers and transport operators to enable them to add the UCC concept to their set of possible policy measures for consideration. **BESTUFS** recommends the active support of this awareness building process. This should be done by developing appropriate instruments (e.g. UCC planning guidelines or tools) as well as training measures for urban freight planners.

- **BESTUFS** recommends that governments should issue guidance to local authorities as to where consideration should be given to the establishment of UCCs when major development proposals are being considered and when town centres are being restructured.

- The standard objection to UCCs is that they will lead to increased costs in the delivery operation. It is therefore important to discuss the wider implications of such schemes with the road transport industry and retailers and to demonstrate that, by using such centres, costs in other parts of their operation could be reduced. Such reductions could be achieved through less time being spent on (expensive) town deliveries, shorter journey times and increased vehicle utilisation, and the possibility of night-time deliveries (UCCs could be open when their customers are closed).

- One of the key financial considerations is how to allocate the costs and benefits resulting from a UCC scheme as a whole and not solely the cost impact in one part of the supply chain or a single player. This is not a simple matter and the allocation of costs and benefits needs to be the subject of a more comprehensive and detailed study and ideally one based on a fully measured pilot project. **BESTUFS** recommends setting up a study that would encompass both the financial costs / benefits along the whole supply chain and the wider issue of how to handle the environmental costs and benefits.

- When a UCC scheme is being considered there is a need for the detailed measurement of the flow of traffic and goods in the prospective location(s). This should be followed by a period of consultation about the precise nature of the UCC scheme to be tested, and then an extended pilot that is managed and scrutinised by representatives of all the potential players – the local authority, logistics companies, retailers and other users (at both a local and national level), potential UCC operators, and environmental lobby groups.

The summaries of projects appearing on the next page (p.12) are examples of research projects, which complement and expand the above-listed **BESTUFS** recommendations.

The **FV-2000** project has investigated the operations and internal organisation of freight villages (FVs), particularly with respect to dangerous goods, and has measured the impact of such structures on the environment. Three management tools, to improve working conditions and security for freight village operators whilst increasing their awareness with regard to risk factors, safety and the environment, have emerged:

- a Good Practice Code, in the form of a user-friendly handbook, addressing transport and storage operations in FV areas,
- a Decision Support System (DSS) designed to help assess the risks associated with handling dangerous and flammable goods;
- a Training Software Tool comprising technical guidelines for operators and providing recommendations on communication, organisational matters, professional skills and related training of staff, ultimately promoting the implementation of an environmental management system in FVs.

Source: http://ec.europa.eu/transport/extra and http://www.eu-portal.net

The **REFORM** project has addressed the problems of congestion and pollution in urban areas and has suggested that freight platforms (transhipment areas where many transport companies (such as forwarders and logistic service providers) are located, and ideally, where at least two transport modes are connected) can offer a solution to these problems. The project has developed a handbook, with guidelines targeted at local authorities and transport sector companies. The guidelines were successfully tested by computer simulation at different European sites in Berlin, Brussels, Rome and Madrid. The project has demonstrated that freight platforms can contribute to a reduction in urban traffic as a result of 1) an increased co-operation between companies onsite which results in higher load factors and a reduction of truck trips and 2) the provision of onsite services, which increases operational efficiency. Freight platforms have also an overall positive economic effect as they increase the competitiveness of the region concerned.

Source: http://ec.europa.eu/transport/extra and http://www.eu-portal.net

A UK study entitled **'Urban Consolidation Centres'** was conducted "to identify the potential for the development of consolidation centres that have as their principal objective the alleviation of local environmental and traffic concerns in urban areas". It has provided advice to logistics providers and local authorities as to the viability of such initiatives, an area the project has identified as being under-researched. The evidence gathered within the project has identified the scenarios in which urban consolidation centres are most likely to be successful:

- specific and clearly defined geographical areas where there are delivery-related problems;
- town centres that are undergoing a retailing regeneration
- historic town centres and districts that are suffering from delivery traffic congestion;
- new and large retail or commercial developments (both in and out of town);
- major construction sites.

Source: http://www.rmd.dft.gov.uk/project.asp?intProjectID=12079

The European project **IDIOMA** investigated the possibilities to improve the distribution of goods within urban areas and between intermodal transport terminal/freight centres and urban areas. This project demonstrated a variety of new technological applications and distribution concepts, integrating as fully as possible intermodal transport, to achieve a more environmentally friendly transportation of goods in urban areas in different European countries.

Source: http://ec.europa.eu/transport/extra

5 EUROPEAN **POLICY IMPLICATIONS**

Over recent decades road freight, along with other forms of motorised road transport, has seen substantial growth in European urban areas. All these motorised forms of road transport, while competing for limited space on the urban road network, have contributed to increased congestion, noise, pollution and accidents, which all decrease the quality of life in these areas. In the past, the actions taken to tackle these problems were largely limited to controlling and restricting road traffic or building new roads. More current approaches recognise spatial planning and land management as important factors of urban freight traffic (**CITY FREIGHT**, 2004). Particular emphasis has been placed on the use of best practice methods to make urban logistics operations safer, more efficient and more environmentally sustainable (Huschebeck, 2004).

European policy documents focussing specifically on urban freight transport and logistics remain relatively rare. National research programmes primarily deal with public transport rather than freight and only individual projects within these programmes directly exploit the area of urban freight transport and logistics.

A number of issues relevant to European policy makers have emerged from the review of the research projects and address the following areas.

Improvements to the urban environment through the more environmentally friendly use of freight transport vehicles

The research projects in this area have highlighted several issues:

- The trend in the use of bigger vehicles and specialist equipment for the transportation of goods in urban areas;
- The need to increase the share of alternative fuels;
- The requirement to combine freight traffic with passenger traffic to reduce the demand for transport. Actions should also be taken to integrate collection and delivery work or waste management and product distribution to increase the level of vehicle fill and reduce the number of vehicle trips. Integrated planning of freight and passenger transport is also required;
- The need to integrate land use and transport planning;
- A direction towards integration and interoperability of urban freight transport operations across Europe.

The use of information and communication technologies (such as RFID, vehicle routing software or load sharing systems)

The research projects in this area have emphasised the need for standardisation in freight transport management systems and have demonstrated a range of decision-support tools to improve the efficiency and reduce the negative environmental impacts of freight transport operations in urban areas.

The importance of information and communication technologies, such as RFID and web platforms, was also demonstrated.

The use of urban distribution networks and consolidation depots

The importance of the initial investigation stage was considered. To guarantee efficient and successful operations, urban consolidation

centres should be led and operated by commercial players. Public funding, however, should be made available to pay for the research work and pilot studies in the setup stages. Roles and responsibilities of the various actors and stakeholders are important factors for the success or failure of the urban consolidation schemes. The UK example has shown that consolidation centres for airports or shopping malls have been instigated by companies but public sector authorities have been supportive.

Other issues resulting from the research projects include:

- The need to raise awareness of the UCC concept, especially of the benefits from cost reductions through the optimisation of other supply chain activities as a result of UCC usage;
- Increased co-operation and dialogue between local authorities, logistics companies, retailers, potential UCC operators and environmental lobby groups;
- The availability of decision-support tools for local authorities and transport sector companies such as examples of good practice and training software;
- In order to maximise the benefits from multimodal transport, in line with the EU policy of shifting the balance between transport modes and freight integration, the choice of sites in close proximity to railways and waterways should be encouraged. Furthermore, freight platforms, utilising the benefits of multimodal transport, are acknowledged to have wider positive economic effects in addition to solving urban logistics problems.

The need to consider these proposals as a wider package of measures

The adoption of the best practice methods listed in this section offers the most promising opportunities for urban logistics operations to become both more efficient and more environmentally sustainable. Full benefits are unlikely, however, when any such proposals are put into practice in isolation, and it may well be more sensible to consider them as a wider package of measures. Hence, the need for integrated solutions which pull the above-mentioned policy measures together and help eliminate the obstacles to achieving more effective and sustainable urban freight transport and logistics practices.

An integrated approach to urban freight transport operations, for example, should take into account a range of measures including the use of most suitably sized and environmentally friendly vehicles with quieter engines, powered by gas, electricity or a non-fossil alternative fuel.

The same approach can also be adopted for the promotion of the urban consolidation concept. Although the concept of urban distribution networks and the use of consolidation depots is seemingly attractive, potential applications have received a somewhat mixed response from operators to date. Amongst the reasons quoted is the fact that "many operators seek exemption from such schemes, usually on the grounds that the goods they carry are highly perishable, may contaminate other goods, or require high levels of security" (Whiteing, Browne and Allen, 2003, p.311). Operators also fear losing control over the whereabouts of their goods in the supply chain due to the lack of information. RFID, which can provide such information and therefore improves the visibility and integration of operations in the supply chain, may offer a solution to these problems.

6 FUTURE RESEARCH DEVELOPMENTS

This brochure has reviewed research results from the EC's Fourth and Fifth Framework programmes and a series of national research projects in the area of urban freight transport and logistics. It has not been possible, however, to consider results from research projects in subsequent Framework Programmes as many of these studies have not been completed yet. Expected results from **CIVITAS II FP6** research projects such as **CARAVEL, MOBILIS, SMILE** and **SUCCESS** are contributing to the following areas:

- the use of clean vehicles for freight, including research into alternative and cleaner fuels **(CARAVEL, SUCCESS, MOBILIS)**;
- new concepts and policies for the local distribution of goods, involving new urban logistics organisation and management **(SUCCESS)**;
- helping accession countries to implement environmentally friendly technologies **(SUCCESS)**;
- efficient, clean and safe city distribution of goods **(SMILE)**.

Other current EU-funded projects into urban freight focus on:

- Collection and dissemination of logistics best practice knowledge across Europe **(BESTLOG)**;
- Innovative concepts for making urban transport more efficient, competitive and sustainable **(NICHES)**;
- Logistics management methods that focus on optimising vehicle load capacity, improving transhipment operations and integrating delivery operations with city traffic management and control **(FIDEUS)**.

To improve air quality and protect human health, the London Low Emission Zone initiative has been proposed in the UK to accelerate the introduction of cleaner vehicles and reduce the numbers of older, more polluting vehicles in the Greater London area.

The use of technologies to improve urban freight and logistics operations is an area of great potential for research. **BESTUFS** has acknowledged the importance of Intelligent Transport Systems (ITS) and has identified this area as high amongst the priorities for future research work in urban areas. "Furthermore, **BESTUFS** recommends the development of ITS to support or enable urban freight transport policies and measures, e.g. the management of urban delivery space, co-operation among SME and interfaces between long haul and urban distribution." (Huschebeck, 2004, p.25)

At the same time, the **BESTUFS** project has identified the following areas as under-researched:

- The lack of results and experience from demonstration projects evaluating the possibilities and potentials of Intelligent Transport Systems **(ITS)** in urban areas on a European scale;
- The benefits of ITS in urban areas brought about by integrating traffic management systems with urban freight transport systems.

As far as consolidation centres are concerned, research into the financial and environmental costs and benefits along the whole supply chain has been suggested. The apparent success of the scheme for the Broadmead

shopping centre in Bristol in the United Kingdom may form the basis for such a study of the overall benefits of an Urban Consolidation Centre.

Although there is ongoing research into the use of cleaner vehicles and fuels, more research into the optimum size of vehicles and the onboard facilities is needed. The wide-ranging **Green Logistics** project, recently launched in the UK and funded by the Engineering and Physical Sciences Research Council **(EPSRC)** for the period 2006-2010, includes work modules on urban logistics which will focus on the more effective and sustainable use of smaller commercial vehicles in urban areas and also on improved systems of reverse logistics and waste management.

The **BESTUFS** project has recommended active support for the development of environmentally friendly vehicles for urban transport within the subsequent Framework programmes and to enhance the current information base on alternative engines and fuels with knowledge drawn from the US and international experience.

The **BESTUFS** project has also made a call for more demonstration projects to promote the use of environmentally friendly vehicle technologies, especially in publicly owned and operated fleets.

Glossary

CNG	Compressed Natural Gas
EU	The European Union
FP4	The European Union's Fourth Framework Programme for Research, Technological Development and Demonstration activities (1994-1998)
FP5	The European Union's Fifth Framework Programme for Research, Technological Development and Demonstration activities (1998-2002)
FP6	The European Union's Sixth Framework Programme for Research, Technological Development and Demonstration activities (2002-2006)
FV	Freight Village
GPRS	General Packet Radio Service
ITS	Intelligent Transport System
RFID	Radio Frequency Identification
SME	Small and Medium-sized Enterprise
UCC	Urban Consolidation Centre
UMTS	Universal Mobile Telecommunications System
UMDD	Urban Multi-drop Delivery

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Urban freight transport and logistics operations are concerned with the activities of delivering and collecting goods in town and city centres. The EC's Fourth and Fifth Framework Programmes included projects undertaking research on this issue. The topic has been explored in the light of the need for integrated solutions that pull the best practice measures together and help eliminate the obstacles to achieving more effective and sustainable urban freight transport and logistics practices.

This brochure provides an overview of research results from the Fourth and Fifth Framework Programmes as well as a series of national research projects in the area of urban freight transport and logistics. It also discusses policy implications and requirements for future research.