

**DG MOVE**  
**European Commission:**  
**Study on**  
**Urban Freight Transport**

FINAL REPORT

By  
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in association with

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# CONTENTS

<b>Abbreviations</b>	<b>1</b>
<b>Executive Summary</b>	<b>2</b>
<b>1 Introduction</b>	<b>22</b>
<b>2 Stakeholder analysis and the role of the public sector</b>	<b>27</b>
<b>3 The urban freight transport market</b>	<b>34</b>
<b>4 Review of existing measures and practices</b>	<b>48</b>
<b>5 European policy on urban freight transport</b>	<b>125</b>

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## ABBREVIATIONS

ARS	Access Restriction Schemes
AVL	Automatic Vehicle Location
AVM	Automatic Vehicle Monitoring
B2C	Business to Consumer
C2C	Consumer to Consumer
CCC	Construction Consolidation Centre
CNG	Compressed Natural Gas
DSP	Delivery Service Plan
ELTIS	European Local Transport Information System
FQP	Freight Quality Partnership
GHG	Green House Gas
HGV	Heavy Goods Vehicle
HoReCa	Hotel Restaurant Catering
ICT	Information and Communication Technology
ITS	Intelligent Transport System
JIT	Just-in-Time
KPI	Key Performance Indicator
LEV	Low Emission Vehicle
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
PM	Particulate Matter
PRT	Personal Rapid Transit
RTD	Research and Technical Development
SUMPS	Sustainable Urban Mobility Plan
TEN-T	Transport Trans-European Network
TfL	Transport for London
UCC	Urban Consolidation Centre
UFT	Urban Freight Transport
ULEV	Ultra-Low Emission Vehicle
ULP	Urban Logistics Plan

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## EXECUTIVE SUMMARY

### Chapter 1 Introduction

The **aim of the study** is to review existing and planned practices and measures relating to the urban section of the freight transport chain across the Member States of the EU with a view to determine whether, to what extent and in which form, action at the European level can be envisaged to promote successful solutions and improve the performance of freight transport.

The overall **objective of EU policy** in this area has been defined by the consultancy team as being the promotion of “sustainable urban distribution.” This concept combines maximising the economic efficiency of distribution in urban areas, while minimising the environmental and social impacts, taking into account the complete door-to-door transport chain.

There are various definitions of **urban freight transport (UFT)**, but for the purposes of this study we have defined it as: *The movement of freight vehicles whose primary purpose is to carry goods into, out of and within urban areas.*

To facilitate the analysis of UFT issues and to provide more practical conclusions from our review of measures and practices at a local level we have developed the following categorisation of urban areas:

- **“Metropolises”** - the very largest urban areas in Europe with over 3 million inhabitants that are likely to experience very significant road congestion and air quality issues.
- **“Other Large Urban Zones”** - urban areas with more than 500,000 inhabitants (excluding the “metropolises”) that are also likely to experience road congestion and air quality issues.
- **“Smaller Heritage Urban Areas”** - smaller urban areas that are “sensitive” environments because of the importance of the town or city in cultural or heritage terms.
- **“Other Smaller Urban Areas”** - all other urban areas, probably with less significant road congestion and air quality issues.

The study considers the role of all surface transport modes, but there is a particular focus on **road freight transport** given the dominance of this mode for “last mile” deliveries in urban areas.

As the demand for and supply of UFT is very largely determined by private sector organisations operating in a competitive market environment, the study considers the major **market sectors** of UFT. The structure of, and future trends in each of the following sectors will largely determine the nature of the challenges posed by UFT in the future:

- Retail (including e-commerce);
- Express, courier and post;
- Hotel, restaurant and catering (HoReCa);
- Construction;
- Waste.

This categorisation provides a reasonable basis for further analysis, although the distinction between different market sectors is becoming blurred. In particular, the courier and postal operators play a

key role in delivering goods purchased on the Internet, which is an increasingly important part of the retail industry.

## Chapter 2 Stakeholder analysis & the role of the public sector

UFT involves many different stakeholders, both those within the urban area that are not directly involved in the freight transport movements (city authorities, residents, tourists/visitors) and the actors in the supply chain. The latter can be categorised according to the demand for goods (receivers), the supply of goods (shippers or producers) and finally the transport of goods (transport operators). The interaction between these different stakeholders increases the complexity of the search for solutions to achieve sustainable urban distribution. This is particularly the case because logistics decisions are usually taken on the basis of commercial and operational factors rather than considering wider sustainability issues that are of concern to city authorities acting on behalf of residents and tourists/visitors.

UFT is essential to the functioning of urban economies as it is required, for example, to replenish stocks of food and other retail goods in shops, to deliver documents, parcels and other supplies to offices and to remove household waste from urban areas. Although UFT has these important roles in the economic welfare of cities and therefore supports urban economies, it has a number of negative effects:

- Road congestion: freight vehicle movements in urban areas contribute to congestion even though in total passenger vehicles usually have a more significant impact on congestion levels. Freight vehicles typically represent 8-15% of total traffic flow in urban areas but, when they park to make collections or deliveries outside designated parking spaces, they can reduce road capacity and contribute to congestion.
- Air quality: almost all freight vehicles are diesel-powered and these engines result in emissions of particulates that can damage human health; due to the direct impact on human health and the threat of fines from the European Commission when EU air quality limits are exceeded, city authorities often regard improving air quality as a high priority.
- Greenhouse gas (GHG) emissions: UFT is a significant generator of greenhouse gas emissions, although this may be less of a direct concern for city authorities because climate change is an issue that has to be addressed worldwide and its effects are perceived to be long term.
- Noise pollution: noise generated by freight vehicles in urban areas during the night is often regarded as a nuisance by residents because it disturbs their sleep.
- Intimidation and safety: city authorities sometimes regard road freight vehicles, particularly HGVs, as being intimidating for pedestrians and cyclists due to their sheer size. There is also concern about the number of serious accidents involving freight vehicles and cyclists.

In economic terms, these negative impacts are due to the lack of internalisation by the users and operators of UFT services of the total external costs associated with urban freight transport; in other words not all of the social costs are reflected in the price of freight transport charged by the UFT operators to their customers. Therefore, despite the economic benefits generated by UFT, there is a justification for intervention by the public sector in the market to redress the balance between social cost and social benefit derived from UFT.

Inefficiency in distribution in urban areas can be exhibited in the following ways:

- Low load factors and empty running;
- A high number of deliveries made to individual premises within a given time period;
- Long dwell times at loading and unloading points.

Inefficiency in distribution leads to additional costs for transport operators, which would normally be passed on to receivers/shippers (in the case of third party operators) or absorbed as costs for own account operators. These costs are ultimately borne by the wider economy. However, shippers, receivers and their transport operators do not always have a significant incentive to increase the efficiency of the deliveries to reduce costs. This is because the transport cost is often only a small proportion of the value of the goods that are being transported and the overall costs of the shippers/receivers. The freight transport operators are paid for the service they provide and are responding to market demand.

While intervention by the public sector is justified in order to reduce the negative impacts of UFT, the most effective measures at all levels of policy-making are most likely to be those that also incentivise UFT operators and/or their customers to increase distribution efficiency. Such measures will have the effect of both reducing costs and/or adding value for the private sector while also reducing negative externalities.

### Chapter 3 The urban freight transport market

The freight transport industry, particularly the road freight transport sector which is most relevant for UFT, is highly competitive. This means that freight transport operators are highly cost conscious and respond to market signals. It also means that any additional costs that are imposed by the public sector through increased regulation or other measures will, at least in the medium to long term, be passed onto customers and, ultimately, consumers as they cannot be absorbed by the operators. Therefore, while deliveries to and collections from urban areas are essential to the functioning of urban economies, inappropriate policy measures at a local level will have an impact on the efficiency and cost of UFT, which, in turn, will have a detrimental impact on the local economy and/or environment.

The highly competitive nature of the freight transport market also means that UFT policy measures should not, as a general rule, discriminate between different types of operator on the basis of the market in which they operate, as this will create market distortions.

The **retail sector** demonstrates how fragmentation of demand for UFT (e.g. numerous independent retail outlets located in a city centre) combined with the fragmentation of supply of UFT (e.g. numerous wholesalers and other suppliers using their own vehicles to make just-in-time deliveries) results in a greater number of UFT movements with only part-loads than would be possible if both demand and supply were more concentrated. The larger retail chains have greater volumes of traffic and are more likely, by working with their logistics providers, to be able to optimise their deliveries in terms of overall efficiency. While diversity in the retail sector provided by small and medium-sized independent retail outlets offers greater choice for consumers and can be seen as providing

wider benefits to society, economies of scale in the provision of freight transport services in all sectors tend to lead to greater logistics efficiency, lower costs and more sustainable distribution. The impact of the retail sector on UFT efficiency depends therefore on the structure and dynamics of the retail market. If left to market forces efficiency may actually decline in the future, with a larger number of deliveries at lower load factors, given the expected trends for city-centre redevelopment and the renewed interest in smaller store formats.

**Parcel, courier and express** transport services are one of the fastest growing transport businesses in cities. This sector uses large vans or small to medium sized trucks and is based on consolidated delivery and collection tours departing from cross dock terminals located in close proximity to suburban areas. An express courier delivery tour can involve 70-90 deliveries, while a traditional parcel delivery tour serves about twenty receivers. This is because the express couriers' network and planning processes enable them to increase the efficiency of their delivery tours.

From the express couriers' viewpoint, their efficiency is threatened by the ever-increasing tendency to regulate access to city centres. In particular, each municipality tends to set access restrictions based on its own needs, so that express couriers have to operate in a fragmented regulatory context. The two main operational features of these operators are time pressure and standardization of procedures, so ideally they need to be able to collect and deliver to all the cities they serve in the same time window and move freely to and within the relevant urban areas.

The **HoReCa** sector is generally described as an homogenous market sector, but its commercial activities present very different logistics and organisational constraints according to the specific service offered to the final consumers. In general terms, HoReCa distribution channels are characterised by unpredictability, which can mean that businesses maintain significant stocks but also means that just-in-time (JIT) supplies are often required in small quantities, leading to frequent (and inefficient) deliveries. Nevertheless, the larger, more "organized" HoReCa businesses, such as the large hotel and restaurant chains, are more likely to achieve economies of scale through centralised procurement and more consolidated and less frequent deliveries.

In the context of urban freight transport, **construction** activity involves the delivery of a wide range of materials to construction sites, which can be located in already congested areas and sensitive locations such as heritage city centres with pedestrianised zones; it also involves the removal of waste materials for disposal. Industry organisations have accepted that historically construction logistics, including the transport of materials to and from the site, are not always optimised, mainly due to the fragmented nature of the industry and the project-based nature of construction activity. This can lead to a relatively high proportion of lorries running either empty or with only part-loads, lorries having to wait to gain access to construction sites in urban areas or to be unloaded and significant amounts of waste material that has to be removed by lorries from construction sites. Some observers have suggested that improved construction logistics could save between 10 and 30% of project costs. The larger construction enterprises that are most likely to be responsible for large-scale projects in urban areas have been focusing on improved project design and planning incorporating consolidation of inbound loads, reduction of waste and reverse logistics in order to reduce costs and reduce the freight transport externalities involved.

City authorities or other public bodies generally have the legal responsibility for collecting **household waste** and they either operate their own companies or they put the service out to tender to private

companies. The increasingly liberalised market in Europe encourages mergers of companies, since larger companies can secure economies of scale. Waste collection and transport are specific tasks of municipal waste management. Their optimisation can make a significant contribution to the sustainability of cities by, for example, improving traffic flows through optimised fleet management and routing, by minimising environmental impacts (e.g. noise and pollutant emissions) and by improving access to waste disposal facilities (e.g. collection points). The trend towards privatisation and consolidation in the sector should lead to operational economies of scale that can lead to greater efficiency.

In **conclusion**, the freight industry is generally most efficient in terms of load factors, routing and number of deliveries to individual locations when economies of scale are available to larger operators. For this reason, as a general rule, large-scale retail distribution and express/courier services tend to be more efficient than very fragmented distribution services to small retailers and in the HoReCa sector, where just in time deliveries are more prevalent. Measures that contribute to the consolidation of freight transport activity (requiring co-operation between UFT operators) and collaboration between shippers/receivers in procuring UFT services (while respecting competition rules) should lead therefore to more sustainable UFT.

## Chapter 4 Review of existing measures & practices

### *Introduction*

This chapter provides a review of measures and practices that are employed, mainly at a local level, to redress the balance between social cost and social benefit from UFT. We have also sought to provide some views on what we would regard as “best practice” measures to secure more sustainable urban distribution, while accepting that the individual mix of measures in any particular urban area needs to be designed at a local level to take account of the specific economic, social and political context.

We have produced a classification of measures and practices in order to provide some clarity and aid analysis, while recognising that individual measures are not implemented at a local level in isolation but as part of a mix of measures. These categories are as follows:

- Regulatory measures;
- Market-based measures;
- Land use planning measures;
- Infrastructure measures;
- New technologies;
- Management and other measures.

The list of individual measures that have been considered is not comprehensive, but the aim has been to provide a review of the most significant (and often controversial) measures that impact on UFT and that are employed, mainly by city authorities, at a local level in Europe.



## Regulatory measures

Regulatory (or “command and control”) measures are essentially rules and prohibitions, supported by a control/enforcement system, that are designed, at least in theory, to control private activity for the wider benefit of society. They are usually easier to implement for city authorities and also have a higher degree of acceptability among all stakeholders compared with, for example, market-based measures. This is due to their more traditional nature and apparent equity. They require, however, an accurate enforcement system to prevent possible infractions.

**Time windows** for freight deliveries are most likely to be established in the centres of Smaller Heritage Urban Areas and pedestrianised zones in Metropolises and Other Large Urban Zones in order to avoid conflicts between sensitive urban environments and pedestrians on the one hand and freight vehicles on the other. However, where the time windows coincide with peak commuting hours, they can lead to traffic congestion and are likely to lead to the poor utilisation of vehicles. Where they are absolutely necessary, delivery time windows should therefore be made as wide as possible to facilitate economically efficient logistics and to avoid adding to road congestion in peak hours. In addition, the geographic area covered by delivery time windows should not be so extensive that it is not possible for deliveries to be made outside time windows when using suitable cargo handling equipment to facilitate safe deliveries in close proximity to pedestrians. This means, in turn, that designated loading/unloading areas should be provided close to the areas affected by the time windows.

**Vehicle weight and size restrictions** are essential to avoid the circulation of freight vehicles over a certain size or weight where they will cause damage to road infrastructure, damage the fabric of (perhaps historic) buildings or where freight vehicles will struggle to manoeuvre effectively and therefore cause road congestion. However, in the context of seeking to promote sustainable urban distribution, blanket weight and vehicle size restrictions over wide areas, rather than for specific streets or small areas of a city, are often counter-productive. This is because blanket restrictions over extensive areas tend to lead to a restructuring of the urban distribution fleet in favour of large numbers of smaller vehicles. These contribute to greater congestion and environmental emissions and the fragmentation of the supply of UFT.

**Low Emissions Zones (LEZs)** are where access to urban areas is limited to freight (and sometimes passenger) vehicles that meet certain emissions standards. They are usually introduced in Metropolises or Other Large Urban Areas where air quality is a particular concern. LEZs are becoming increasingly common in major European cities as a means for city authorities to seek to meet European air quality standards. Poor air quality is a major and urgent issue for some Metropolises and Other Large Urban Zones in Europe because of its impact on human health. In this context regulatory measures that reduce emissions of particulates are urgently required in the absence of, for example, a radical move away from diesel engines to the use of low and zero emission vehicles. There appears to be a lack of evidence on the effectiveness of LEZs, but they are likely to have some positive impact by reducing emissions from freight vehicles as freight operators are encouraged to renew their fleets and reduce their emissions without affecting logistical efficiency. LEZs should not, however, only be applied to freight vehicles, as passenger cars are usually responsible for the greatest proportion of emissions in urban areas.

LEZs and, as far as possible, other regulatory measures should also be harmonised at a regional level in the larger Member States and at a national level in the smaller Member States to allow operators to use their fleets as flexibly as possible and to reduce compliance costs.

A **summary** of the regulatory measures that could contribute to more sustainable UFT at a local level are provided in tabular form below. They generally suggest amendments to existing regulations, rather than additional regulatory measures. The summary tends to suggest that most of the measures would have a positive impact on the economic efficiency of UFT by reducing costs and reducing environmental impacts. While the introduction of LEZs should, on average, reduce UFT operational costs (through the deployment of more energy efficient vehicles), there are significant compliance costs for industry as operators will have to invest in more modern vehicles. Therefore the introduction of LEZs needs to be justified very carefully by the public sector in terms of improved air quality and human health when compared with the costs to industry of implementation and enforcement. Harmonisation of all regulations, including those that relate to LEZs, at a regional or national level should help to mitigate some of the increased compliance costs.

### Summary of regulatory measures at a local level

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFERABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Extending time windows	Lower	Lower	Better	Lower	Neutral	Higher	Good	High	1, 2 & 3
Removal of vehicle size & weight restrictions over extensive areas	Lower	Lower	Better	Lower	Neutral	Neutral	Good	High	1, 2 & 3
Introduction of LEZ for all vehicles	Lower (but increased capital costs)	Neutral	Better	Lower	Neutral	Higher	Moderate/poor	High	1
Harmonisation of regulations at regional or national level	Lower	Neutral	None	None	Neutral	Neutral	Good	High	1,2,3 & 4

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area

### Market-based measures

Fiscal measures such as taxes and tolls are usually defined as “**market-based**” measures because their aim is to “modify” the market prices of the goods whose production generates negative effects. Changes in prices usually have a direct impact on the behaviour of the freight industry, as individual operators have to respond to changes in their costs to remain competitive.

The **internalisation of external costs** (road pricing in the context of urban areas) is probably the most effective market-based measure in the long-term to develop sustainable urban distribution. However, it will require implementation by the EU and Member States through a comprehensive infrastructure charging scheme that includes the strategic networks as well as the urban road network and so has not been included in the table below.

A summary of the **market-based measures** that could contribute to more sustainable UFT at a local level are provided in tabular form below.

### Summary of market-based measures

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSE-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Congestion charging	Higher	Lower	Better	Lower	Neutral	Neutral	Moderate	Low/medium (most likely to be suitable for largest cities)	1 & 2
Mobility credits	Neutral	Lower	Better	Lower	Neutral	Neutral	Moderate/poor	High	1, 2 & 3
Indirect subsidies to “virtuous” UFT operators via differentiation	Lower (for some operators)	Lower	Better	Lower	Neutral	Neutral	Good	High	1, 2 & 3

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area

**Congestion charging** can provide appropriate incentives for UFT operators to adopt sustainable urban distribution practices, but is most likely to be suitable for the largest and most congested cities due to the high costs of implementation for a city authority. As with LEZs, there could be significant additional costs for the freight industry and so the wider social benefits would need to significantly outweigh the costs. In the long-run, congestion charges would not be required if a system of comprehensive road pricing was introduced in urban areas.

**Mobility credits schemes** are of considerable interest because they focus on changing the behaviour of the receivers of goods (the demand-side) rather than that of UFT operators, but appear to be difficult to design in a way that is seen as being equitable to all stakeholders.

In the short- and medium-term, the most suitable market-based measures are likely to be the use of **differentiation** to provide exemptions from regulatory provisions to UFT operators that adopt sustainable urban distribution practices, such as using Low Emission Vehicles (LEV)s. The provision of these **indirect subsidies** encourages sustainable UFT, but should also be cost-effective for city authorities as it does not involve direct subsidies for infrastructure or services.

### Land use planning

City authorities should adopt a holistic approach to land use planning that takes into account the demand for UFT that is generated by new developments as well as the needs of the freight industry. Such an approach can be highly effective in the long term because it can have a sustained beneficial impact on the sustainability of UFT operations.

Land use planning policies can make a major contribution to the development of adequate **parking spaces** for freight vehicles in urban areas. In particular, the developers of any new office or retail development in urban areas should be required to plan for freight activity, with the development of off-street loading/unloading bays for new developments over a certain size. Inner city logistics spaces could also be designed into mixed use developments, so that freight can be consolidated for last mile deliveries. Cities should also make adequate provision for on-street loading/unloading bays in streets where off-street facilities are not available.

In Metropolises and Other Large Urban Zones it is likely to be appropriate to **safeguard** sites close to city centres that have access to rail and waterborne freight networks. **Logistics zones** should be developed on the outskirts of these larger urban areas to combine warehousing and lorry parking facilities in specific locations to generate economies of scale and reduce “logistics sprawl”. In the case of the largest cities, intermodal rail freight terminals and/or inland ports should also be included in the logistics zones to facilitate the use of rail and waterborne freight services for medium to long-distance freight flows.

A summary of the land use planning measures that could contribute to more sustainable UFT at a local level are provided in tabular form below.

### Summary of land use planning measures

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFERABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Zoning of retail & logistics activities to secure critical mass	Lower	Lower	Better	Lower	Lower	Neutral	Good	Moderate +	1, 2,3 & 4
New developments with off-street loading/unloading facilities	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1, 2,3 & 4
Safeguarding of rail-connected & water-connected sites for future use	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1 & 2
Requiring large-scale distribution sites to be rail & water-connected	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1 & 2
* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area + (depends on local and national planning rules)									

The summary suggests that land use planning measures can be very powerful in the medium – to long-term in fostering sustainable urban distribution. They are also cost-effective for city authorities because, as a general rule, private sector developers would pay for the measures in return for development permissions. However, in order to be effective, these measures require the development of consistent planning policies over a long period of time and within specific national and local contexts. These land use planning measures need to be fully integrated into Urban Logistics Plans, which are transport plans developed specifically for the freight sector.

### *Infrastructure measures*

Rail, trams, inland waterways and underground systems are likely to have some role for the transport of freight for (near-) last mile delivery in some cities, but are likely to be successful only in niche markets. As a general rule road freight transport will remain the most important mode for last mile deliveries and collections in urban areas due to its inherent flexibility. For this reason there needs to be an increasing emphasis on providing cost-effective low and zero carbon technologies for road freight transport in urban areas rather than investing public funds in ambitious sustainable distribution schemes where there is no strong commercial and/or economic case.

Nevertheless, heavy rail can be very effective to transport freight over medium and long distances to **rail-connected distribution parks/logistics zones** on the outskirts of Metropolises and Other Large Urban Zones for subsequent “last mile” delivery by road. Inland waterways can play a similar role, particularly for construction materials and for high value freight where an urban area is linked directly by an inland waterway to international gateways such as sea ports.

Otherwise, the key infrastructure measure at a local level is likely to be the development of a network of designated **on-street loading and unloading bays**.

A summary of the infrastructure measures that could contribute to more sustainable UFT at a local level are provided in tabular form below.

### **Summary of infrastructure measures**

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSER-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Network of on-street designated loading & unloading bays	Lower	Lower	Better	Lower	Lower	Better	Moderate +	High	1, 2 & 3
Development of rail- and/or waterborne connected logistics zones	Lower	Lower	Better	Lower	Neutral	Neutral	Moderate ++	Good	1 & 2

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area  
+ (Good, if a charge is levied) ++ (if funded by public sector, not by developers)

The summary suggests that the development of a network of on-street loading and unloading bays for freight (perhaps on a shared basis with other users) should provide significant economic benefits in terms of lower UFT operator costs and reduced congestion costs. If charges are levied on UFT operators for using the spaces then the infrastructure can provide good value for money in the long term for city authorities. The development of facilities for non-road modes should generally be focused on the development of large-scale rail and waterborne freight distribution parks on the outskirts of Metropolises and Other Large Urban Zones, rather than on non-road schemes for “last mile” distribution while the latter appear to offer a reduction in externalities from UFT, they are unlikely to be economically or commercially viable and usually offer very poor value for money.

### *Technology*

The most promising alternative technologies to reduce emissions of CO<sub>2</sub> and improve air quality in urban areas for “last mile” deliveries appear to be electric and hybrid technology, although it is too early to make final and definite judgments about the most appropriate technology, given the amount of research and development work that is being carried out in the area.

Information and Communications Technology (ICT) and Intelligent Transport Systems (ITS) applications are already employed to increase the effectiveness of UFT operations by private sector road freight operators. Given the clear cost benefits from the application of these technologies by large-scale freight transport operators in an urban setting it is very likely that the private sector will adopt appropriate new ICT/ITS applications when they become available. Where the public sector at all levels can contribute to the effective **implementation of ITS** in urban areas is through the widespread implementation of systems that provide real-time data on the status of the road network in an interoperable way; this would allow road freight vehicles to operate in different cities without having to use different hardware and software. In this context the EU has a clear role in ensuring that such systems are implemented in urban areas around Europe as quickly as possible and in an interoperable way.

### *Management & other measures*

This category of measures includes not only management measures that are implemented directly by private sector actors to secure sustainable urban distribution, but also all measures, whether implemented by private or public actors, that are not included in the other categories. These are usually “bottom-up” measures that are “softer” in nature. They often require some kind of collaboration between actors in order to achieve more sustainable distribution while reducing costs or adding value for freight transport operators and/or their customers. They include the key concepts of the **consolidation of supply** of UFT (through, for example, Urban Consolidation Centres) and the **consolidation of demand** for UFT (through collaborative orders), which increases average load factors and reduces the number of deliveries.

The importance of integrating UFT measures into wider land use planning policies has been discussed above and the development of the UFT measures themselves are more likely to be effective if they are developed within formal transport plans. These plans, which could be called **Urban**

**Logistics Plans (ULPs)**, should become part of Sustainable Urban Mobility Plans (SUMPS) that provide integrated plans for the development of both freight and passenger mobility.

A **summary** of the main management measures that could contribute to more sustainable UFT at a local level are provided in tabular form below.

#### Summary of management and other measures

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFER-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Developing Urban Logistics Plans (ULPs)	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1, 2 & 3
Developing Freight Quality Partnerships, involving effective consultation	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1, 2 & 3
On-line one-stop shops for freight	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1 & 2
Indirect subsidies to support UCCs	Lower	Lower	Better	Lower	Lower	Neutral	Good	High	1, 2 & 3
Planning permission requirements for CCCs for major construction sites	Lower	Lower	Better	Better	Lower	Higher	Good	Moderate +	1, 2, & 3
Planning permission requirements for DSPs	Lower	Lower	Better	Lower	Lower	Neutral	Good	Moderate +	1, 2, & 3
Encouraging DSPs for existing businesses	Lower	Lower	Better	Lower	Lower	Neutral	Good	High	1,2 & 3
Developing network of e-commerce pick-up points	Lower	Lower	Better	Lower	Lower	Neutral	Good (if provided by private sector)	Moderate ++	1, 2 & 3
Lorry routing & signage strategies	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1 & 2
Facilitating night-time deliveries	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate ++	1, 2 & 3

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area  
+ (depends on planning rules in different Member States) ++(may be cultural differences)

The summary highlights the number of relatively low-cost management measures that can be implemented by city authorities in partnership and consultation with UFT operators, their customers and other stakeholders to promote more sustainable UFT. The key horizontal measure is the adoption of a process to develop an Urban Logistics Plan (ULP), in consultation with the freight

industry and other stakeholders, that sets out an integrated strategy to secure sustainable urban distribution over the long term. Other key measures are those that facilitate collaboration between receivers of freight in urban areas to procure consolidated deliveries, such as Delivery Service Plans (DSPs), and indirect measures to assist UFT operators to offer consolidated services for “last mile” deliveries. Most of these measures focus on a partnership between the city authorities and the freight industry and their customers to develop improvements for the long-term and do not provide “quick-wins.” This, in turn, emphasises the importance of the Urban Logistics Plans which can provide a long-term vision for local communities to develop measures and practices that secure more sustainable urban distribution. However, in areas such as the introduction of LEVs, ITS and infrastructure charging, measures at a European level in partnership with Member States are likely to be required to achieve the vision for UFT that was set out by the European Commission in its 2011 Transport White Paper.

### Conclusion

Public authorities are increasingly recognizing the importance of involving private actors in the policy-making process in order to reach their objectives, as well as taking into account their interests during the definition of policy measures. In particular, the current trend is to use consultative planning where public and private actors work together to identify the necessary measures to achieve specific objectives. This planning process aims to combine the advantages of the top-down and bottom-up approaches in the promotion and implementation of measures and allows policy-makers to become better informed about how the logistics industry works. Overall, city authorities should, in our opinion move away from stricter regulation of UFT and focus on planning-led policies (combining effective transport planning and land use planning for freight) and a greater focus in the short-term on ways to encourage the private sector (if necessary through indirect subsidies) to consolidate orders and deliveries.

## Chapter 5 European policy on urban freight transport

The **vision** for UFT that was set out in the European Commission’s 2011 Transport White Paper describes a scenario in which freight deliveries and collections in Europe’s urban areas are efficient both economically and environmentally in order to reduce emissions and to minimise generalised costs for UFT operators and their customers. The vision includes:

- Minimising the number of freight movements and the distances required to carry them out;
- Using low emission urban trucks to carry out deliveries;
- Making maximum use of ITS to increase the efficiency of deliveries;
- Reducing noise pollution from freight movements, so that road infrastructure could be used more efficiently by making night deliveries and avoiding morning and afternoon peak periods.

The Commission introduced the quantified **policy goal** for UFT of “essentially CO<sub>2</sub>-free city logistics in major urban centres by 2030.”

Our policy recommendations at a European level have been designed to support the achievement of the Commission’s vision for UFT in 2030, while also supporting a switch of a proportion of freight



flows over 300km (i.e. flows to and from urban areas) to non-road modes. The recommended policy measures have been categorized as follows:

1. **Efficient deliveries:** Encouraging the procurement and provision of efficient deliveries and collections in urban areas in terms of both internal and external costs.
2. **Low emission vehicles:** Encouraging the development and take-up of low emission vehicles for “last mile” deliveries.
3. **Intelligent Transport Systems:** Promoting the deployment of ITS to increase the efficiency of UFT.
4. **Night deliveries:** Allowing the most efficient use of scarce road infrastructure by facilitating the development of night-time deliveries.
5. **Intermodal transfer facilities and other infrastructure:** Encouraging the development of facilities in urban areas for the transfer of freight between sustainable modes of transport for medium to long distance flows and road transport for “last mile” deliveries, as well as other infrastructure to support sustainable UFT.
6. **Developing and disseminating good practice** in UFT throughout Europe.

### *Efficient deliveries*

One of the main reasons for inefficient UFT, characterised by low load factors, a low number of deliveries on delivery tours and long dwell times, is that UFT operators and their customers are not sufficiently incentivised to increase efficiency through transport pricing mechanisms. For this reason a vicious circle is created where city authorities, observing the apparent inefficiency of UFT operations in their city, impose regulations on the freight industry in an attempt to “control” UFT activities, sometimes with results that only exacerbate the problem. Given that most of the freight industry and its customers are in the private sector, the most effective way to incentivise the development of more sustainable UFT measures and practices (and reduce the amount of regulation) is to use the pricing mechanism i.e. through the internalisation of external costs into the price of freight transport in urban areas and beyond.

For road pricing to be effective in securing more sustainable UFT, the prices charged to transport operators would need to reflect the different social and economic costs imposed by different types of vehicle at different times of the day and week and take into account the distance travelled. This means that ICT/ITS needs to be deployed to allow electronic monitoring of the movements of vehicles by the charging authority and to make payment of the charges cost-effective. Road pricing would incentivise UFT operators through the pricing mechanism to optimise their activities in urban areas.

**EU POLICY RECOMMENDATION 1: INTERNALISATION OF EXTERNAL COSTS IN URBAN AREAS**

The EU should continue to develop its policy of road pricing based on the internalisation of net external costs and it should be applied to all kinds of road vehicles that operate in urban areas as well as to strategic freight and passenger transport movements. The system should replace existing forms of taxation on the ownership and use of road vehicles, including duty on fuel, rather than being an additional charge. Any net revenues from the road pricing scheme should be used to improve urban mobility.

Timescale: Long-term (after 2020)

***Low emission vehicles (LEVs)***

Conventional propulsion technologies that are used by UFT operators (principally diesel engines) lead to emissions of greenhouse gases (GHGs) and other air pollutants and also generate noise pollution. Therefore greater use of LEVs would have a significant impact on air quality and noise levels in urban areas (thereby facilitating greater use of night deliveries) and would make a contribution to reducing the levels of GHGs in the atmosphere.

There is a risk that the market take-up of LEV technology is slow because of high capital costs, uncertainty about the maturity of the technology and the poor availability of refuelling infrastructure. This is mainly due to the lack of manufacturing economies of scale that could reduce unit costs and improve the investment case for refuelling infrastructure. As well as the technological issues relating to LEVs and the knock-on impact on fleet investment strategies, a number of legal, regulatory and safety issues relating to LEVs emerged from discussions with stakeholders during the course of the study.

Our policy recommendation is that there should continue to be funding of European industry to develop alternative fuel, vehicle and infrastructure technology for low emission but cost-effective technologies for UFT vehicles. This research, provided through the RTD Framework Programmes, should be provided on a technology neutral basis, as the most appropriate technology to be deployed in the long-term remains uncertain. The R&D work should include not only technological issues, but also consider how best to ensure widespread market take-up of the technology (including the impact on business models and operations), and safety issues.

**EU POLICY RECOMMENDATION 2: R&D INTO ZERO & LOW & EMISSION VEHICLES**

The EU should continue to fund integrated R&D on a technology-neutral basis into low emission vehicles, fuels and infrastructure for UFT, taking into account safety and legal considerations and also considering how to overcome barriers to their market take-up and use by industry and the public sector.

Timescale: Short- and medium-term (2012-20)

## *Intelligent Transport Systems (ITS)*

The technology for ITS to improve the efficiency and sustainability of UFT has been available for some time, but there has been relatively little deployment of the technology in urban areas. The EU is in the process of implementing its ITS Action Plan, in partnership with Member States, city authorities and the private sector (through, for example, the work of the Expert Group on ITS), but one of the key issues that may slow its implementation is the availability of the most appropriate organisational, institutional and business models to facilitate the delivery of ITS at a local level.

### **EU POLICY RECOMMENDATION 3: RESEARCH INTO ORGANISATIONAL, INSTITUTIONAL & BUSINESS MODELS FOR THE DEPLOYMENT OF ITS FOR UFT IN URBAN AREAS**

The EU should fund research into the most appropriate organisational, institutional and business models for the deployment of ITS to move towards the rapid implementation of ITS on an interoperable basis by the relevant local, regional and national authorities in partnership with private sector providers. The research should include consideration of including charges for ITS within road user charging schemes.

Timescale: Short-term (2012-15)

## *Night deliveries*

Night-time deliveries, perhaps using electric vehicles, could help to relieve peak day-time road congestion and therefore make better use of road infrastructure capacity. However, low noise operations require all equipment (not just propulsion systems) to meet low noise standards. At the moment standard equipment used for handling goods does not meet the low noise levels that would be required for night-time operations. This means that UFT operators and their customers sometimes have to make additional investments in specialised low noise equipment in order to be able to operate at night.

Research into the benefits and costs of introducing standards for all road freight vehicles that automatically provide low noise operations (driving, loading and unloading operations) should be carried out, so that potential noise impacts from operation of the equipment (particularly at night, but also during the day) is minimised during the manufacture of the vehicles and equipment. The research would need to consider the extent to which night-time deliveries are likely to be required in the future, given the impact on residents and transport and retail workers, as well as the potential to reduce costs for businesses and to reduce day-time road congestion. If significant net benefits can be achieved, the EU would then need to consider how to facilitate the development and adoption of the required standards by the freight vehicle and equipment manufacturers.

#### EU POLICY RECOMMENDATION 4: INVESTIGATION OF STANDARDS FOR LOW NOISE EQUIPMENT FOR FREIGHT VEHICLES

The EU should carry out a cost-benefit analysis for the inclusion of low noise equipment in manufacturing standards for freight vehicles and associated loading and unloading equipment, so that future generations of vehicles and other equipment are more likely to be suitable for night-time deliveries without additional capital investment.

Timescale: short-term (2012-15)

#### *Intermodal transfer facilities and other infrastructure (TEN-T)*

The introduction of road pricing for both medium and long distance flows and “last mile” deliveries in urban areas, should encourage the transfer of freight between long-distance transport and road vehicles for final deliveries to city centres. This means that more intermodal freight interchanges need to be developed on the outskirts of major urban areas. There is also a need to support other key infrastructure priorities, such as the deployment of ITS (see Recommendation 3 above), to support the development of infrastructure for the refueling of LEVs (see Recommendation 2 above) and to relieve bottlenecks on inter-urban networks.

TEN-T funding should be made available to high quality “projects of common interest” that support the development of sustainable UFT in the 83 urban nodes defined in the Proposal for the TEN-T Guidelines (published in October 2011). In urban areas these projects would relate to the development of intermodal freight interchanges within or close to urban nodes, often with associated warehousing, so that freight can be transported over medium and long distances by rail/waterborne transport and then transferred efficiently to road transport for last mile distribution. However, the “projects of common interest” would also relate to the development of other infrastructure to support the development of sustainable UFT, such re-fuelling infrastructure for LEVs and the implementation of ITS in urban areas. The removal of bottlenecks on TEN-T links between urban nodes to improve the efficiency of the whole transport chain is also important, as “last mile” deliveries are only the final leg in a door-to-door transport chain.

#### EU POLICY RECOMMENDATION 5: TEN-T FUNDING FOR UFT

The EU should fund projects of common interest in urban nodes on the TEN-T that:

- (1) develop intermodal freight terminals in logistics zones for the transfer of freight between rail/waterborne transport for medium to long distance flows and road for “last mile” deliveries;
- (2) develop refuelling infrastructure for LEV freight vehicles;
- (3) deploy ITS that specifically improves the efficiency of UFT operations;
- (4) removes bottlenecks on inter-urban TEN-T links.

Timescale: Short, medium and long-term (2012-30)

## *Developing and disseminating “best practice”*

### Introduction

Under this heading there are four linked recommendations, starting with the need to encourage the development of good practice in planning for UFT, then assisting the development of innovative measures and practices in cities through the CIVITAS Programme and defining and disseminating good practice that can help stakeholders in UFT throughout Europe to implement sustainable urban distribution practices and measures.

### Urban Logistics Plans (ULPs)

The EU should develop guidelines for city authorities on how to develop Urban Logistics Plans (ULPs) within Sustainable Urban Mobility Plans (SUMPS), taking into account the local context. This would assist city authorities to develop freight expertise and would require them to carry out research on existing freight movements and develop an in-depth understanding of the freight market, complete ex ante and ex post evaluation of the impact of any measures, carry out consultation on potential measures with all relevant stakeholders and ensure greater integration of planning for UFT with passenger transport, land use planning and other policies. The completion of a ULP should become a requirement for further EU funding of UFT measures.

#### **EU POLICY RECOMMENDATION 6: URBAN LOGISTICS PLANS (ULPs)**

The EU should develop guidance on the development of Urban Logistics Plans (ULPs) as an integral part of Sustainable Urban Mobility Plans. The completion of a high quality ULP should be a prerequisite for the receipt of EU funding for UFT measures from CIVITAS, TEN-T and Cohesion Funds.

Timescale: Short-term (2012-15)

### Supporting innovation in sustainable UFT: CIVITAS

The EU should continue to fund the CIVITAS Programme, but with greater focus on some key UFT priorities where innovative demonstration projects and knowledge transfer is most appropriate.

## EU POLICY RECOMMENDATION 7: CIVITAS PROGRAMME

The EU should focus on the following key priority areas within the CIVITAS Programme:

- (1) development of Urban Logistics Plans, including data collection and evaluation methodologies;
- (2) development of demand-side rather than supply-side UFT measures;
- (3) implementation of demonstrations of ITS projects in urban areas with specific UFT applications;
- (4) implementation of innovative UFT measures at a European level.

Effective dissemination of results, following a high quality ex-post evaluation of results, is essential for the future success of the Programme.

Timescale: Short and medium-term (2012-20)

### Defining & disseminating “best practice”

The European Commission should develop and disseminate “best practice” guidance on sustainable UFT measures and practices for city authorities, private sector UFT operators and their customers. As “best practice” evolves over time, it should be defined by a "committee of experts" in sustainable UFT, which would meet on an occasional basis. The guidelines should then be disseminated through a one stop shop website, building on an existing website that is already visited by relevant stakeholders seeking information on sustainable UFT and sustainable mobility in urban areas (e.g. ELTIS).

## EU POLICY RECOMMENDATION 8: DEFINITION & DISSEMINATION OF GOOD PRACTICE

The EU should develop “best practice” guidelines for sustainable UFT and then disseminate these guidelines by means of a single already established website that "showcases" examples of innovation in sustainable UFT measures and practices at a local level.

Timescale: Short medium and long-term (2012-30)

### Promoting sustainable urban distribution in Europe

The European Commission should develop an annual award scheme for innovative sustainable UFT measures. The award, which would be a new award funded by the European Commission within an existing European logistics award scheme, would be for sustainable UFT measures and practices that have been implemented by the public and private sectors working in partnership in particular urban areas.

The European Commission should also promote sustainable UFT by making transport chains that involve urban deliveries and collections a “political priority” within the Marco Polo Programme. This would mean that a proportion of the total funding would be “reserved” for sustainable freight transport services that specifically include sustainable UFT practices (such as using electric vehicles for “last mile” deliveries) within long distance door-to-door transport chains.

**EU POLICY RECOMMENDATION 9: PROMOTING SUSTAINABLE UFT IN EUROPE**

The European Commission should promote the development of sustainable UFT through:

- An annual award scheme for sustainable UFT that "showcases" examples of innovation in sustainable UFT measures and practices at a local level.
- Making sustainable UFT a "political priority" within the Marco Polo Programme so that a proportion of the total funding is reserved for services that involve sustainable UFT practices within long distance door-to-door transport chains.

Timescale: Short and medium-term (2012-20)

### *Conclusion*

When considering the most relevant policy recommendations to add value at a European level, there is a tension between the principle of subsidiarity, which reflects local impacts of UFT on urban areas and local democracy, and the specific characteristics of the freight industry where last mile deliveries in urban areas are only the final leg in national, international and even intercontinental transport chains. Given the nature of these long-distance door-to-door transport chains and the (at least) pan-European markets for freight transport services and the trans-national nature of the challenge posed by climate change, the European Union has a clear role in promoting sustainable urban distribution while respecting the principle of subsidiarity.

The recommendations focus therefore on influencing the business environment in which UFT operates including, in particular, facilitating the take-up of private sector-led measures that increase logistical efficiency and, at the same time, reduce the impacts of UFT. In our opinion, the EU should also focus on introducing legislation that provides the private sector with appropriate price signals that encourage it to collaborate in the demand for and supply of UFT and promotes the widespread take-up of low emission vehicle technology.

## 1 INTRODUCTION

### 1.1 Aim and objectives of the study

The **aim of the study** is to review existing and planned practices and measures relating to the urban section of the freight transport chain across the Member States of the EU with a view to determine whether, to what extent and in which form, action at the European level can be envisaged to promote successful solutions and improve the performance of freight transport.

The **implicit objectives** of the study are to:

- Review existing and planned practices and measures relating to urban freight distribution at all levels, but particularly at a local level where practical implementation is undertaken;
- Provide conclusions and practical recommendations on the potential role of the European Union in the area of urban freight distribution.

The overall **objective of EU policy** in this area has been defined by the consultancy team as being the promotion of “sustainable urban distribution,” which combines maximising the economic efficiency, while minimising the environmental and social impacts, of the distribution of goods in urban areas, taking into account the complete door-to-door transport chain including making urban areas a more attractive environment in which to live and work.

### 1.2 Definition of urban freight transport

In the literature there is no common definition of Urban Freight Transport (UFT). Indeed the literature uses various different terms, such as “city logistics”, “urban distribution” and “urban goods movement” to refer to the same concept of the transportation of goods within urban areas. For instance “city logistics” is often used to indicate the whole range of policies and private sector initiatives that can be implemented to reduce the negative impacts of UFT. Indeed providing a clear-cut definition is not an easy task due to the whole range of activities and situations that UFT may include or describe. For these reasons, we address, as a first step in our analysis of UFT, the identification of the relevant trips.

UFT can be classified according to:

- **Type of vehicle:** UFT can be considered to be a freight trip, not on the basis of its actual purpose, but on the basis of the type of vehicle. As an example, the Italian Codice della Strada (Highway Code) classifies four-wheeled (or more than four-wheeled) motor vehicles into freight vehicles (category N) and passenger vehicles (category M).
- **Purpose of trip:** It is also possible to use a criterion that classifies freight trips as those whose main purpose is to move goods. According to this criterion, on the one hand, shopping trips made by individuals in passenger vehicles in urban areas would have to be considered to be freight trips; on the other hand, trips whose main purpose is to provide services other than transport (e.g. rescue vehicles, breakdown vehicles, etc.) would not be considered as freight trips, even though they are made using freight vehicles.



Assuming that trips have been defined using the first criterion, it is then possible to further group trips according to their purpose and therefore combine the two criteria. The results of a survey in Rome in 2008, for example, suggest that trips by freight vehicles between producers/wholesalers and retail outlets (i.e. deliveries to shops) are likely to be the most important in terms of tonnes of goods transported in Rome. However, in cities with high concentrations of administrative activity and clusters of professional service firms, deliveries of supplies and parcels/documents can also be a significant proportion of the total.

For the purposes of this study we have defined UFT as:

*The movement of freight vehicles whose primary purpose is to carry goods into, out of and within urban areas.*

This definition therefore excludes shopping trips in passenger vehicles and movements of “white vans” for servicing and maintenance (as well as personal) purposes.

**Freight vehicles** includes both Heavy Goods Vehicles (HGVs, over 3.5 tonnes gross laden weight) and Light Goods Vehicles (LGVs, under 3.5 tonnes gross laden weight).

### 1.3 Categories of urban areas

The definition of urban area that we have chosen to use is recommended by the United Nations and used by a number of European Union member states:

*Areas that have urban (i.e. built-up) land of 20 or more hectares that are less than 200 metres apart and linked to form a continuous built-up area.*

This provides a reasonable definition for the purposes of this study, but it includes a very wide range of towns and cities with different freight transport issues at varying levels of intensity.

Based on an analysis of the cities and towns that we have examined within this study, we have developed the following categorisation of urban area to facilitate the analysis of UFT issues and measures/practices in Europe:

- **“Metropolises”**, which are the very largest urban areas in Europe with over 3 million inhabitants<sup>1</sup>, with a central core city and a larger area around the core from which residents commute to the centre and therefore tend to have underground, suburban railway and bus networks to facilitate commuting. Metropolises are very large urban areas in terms of geographic extent and population, are often administrative and financial centres for EU Member States and usually suffer from poor air quality and high levels of road traffic congestion. Based on a 3 million population threshold there are ten metropolises in Europe and, ranked in terms of population, these cities are London, Paris, Madrid, the Ruhr Area, Berlin, Barcelona, Athens, Rome, Hamburg and Milan. Three of these cities - London, Paris

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<sup>1</sup> The definition of “metropolis” for the purposes of this study has been based on a judgmental view by the consultancy team that cities with a population of more than 3 million have UFT and mobility issues of a greater intensity than cities with a smaller population.

and Barcelona - have been visited during the study to analyse UFT issues and the mix of policy measures that have been introduced to address them.

- **“Other Large Urban Zones”** are, based on the Eurostat definition, urban areas with more than 500,000 inhabitants excluding the “metropolises” as defined above. These urban areas are likely, due to the concentrations of traffic found there, to suffer from poor air quality and road congestion and are also often major retail and tourism centres. Five of these cities have been visited during this study: Bremen, Gothenburg, Krakow, Tallinn and Utrecht.
- **“Smaller Heritage Urban Areas”**, which experience lower levels of absolute road traffic and are less likely to have significant air quality issues but are “sensitive” environments because of the importance of the town or city in cultural or heritage terms. Two cities of this kind have been visited during the study: Ljubljana and Parma.
- **“Other Smaller Urban Areas”**, which are smaller in terms of geographic area and population and less likely to have significant air quality problems. They may experience road traffic congestion in peak hours due to local commuting. As these urban areas are less likely to experience significant issues due specifically to UFT, they are less relevant for this study.

## 1.4 Scope of study

The **geographic scope** of the study covers all 27 Member States of the EU. The consortium has included examples of practices and measures in cities in most Member States and detailed case studies have been produced on ten European cities, including three from the “new” Member States, following visits by the consultancy team.

In terms of **modes of transport**, the scope is assumed to include all surface modes and, given that the policy objective of the study is the promotion of “sustainable urban distribution” the study has a strong focus on road freight transport while also considering the role of other surface modes.

The study takes into account the various **market sectors** of UFT, which we have defined as:

- Retail (including e-commerce);
- Express, courier and post;
- Hotel, restaurant and catering (HoReCa);
- Construction;
- Waste.

This categorisation provides a reasonable basis for further analysis, although the distinction between different market sectors is becoming blurred. In particular, the courier and postal operators play a key role in delivering goods purchased on the Internet, which is an increasingly important part of the retail industry.

## 1.5 Approach and methodology

As the freight transport industry is almost entirely operated by and for private sector businesses, the study has sought to examine the key economic drivers behind developments in UFT in Europe. The study has also involved desk research and consultation not only in relation to public sector measures, but has sought to review private sector initiatives that can secure sustainable urban distribution.

The analysis included in this Final Report is based upon:

- **Secondary research** on, and analysis of, practices and measures in Europe, particularly at a local level, that aim to secure sustainable urban distribution. The consultancy team carried out desk research into practices and measures that have been used in specific cities and completed fiches for 24 cities and four national level initiatives that are shown in Appendix 3 to this report. The fiches have generally been produced at the city level, rather than considering individual measures, to show how a mix of measures and practices are employed. The information contained in the fiches has been used to support the analysis contained in the main body of this Final Report, supplemented by a review of academic articles and the existing knowledge and experience of the consultancy team.
- **Visits**, carried out by the consultancy team to the following ten European cities: Barcelona, Bremen, Gothenburg, London, Krakow, Ljubljana, Paris, Parma, Tallinn and Utrecht. During the visits to the cities the consultancy team was able to observe the mix of measures that are being employed by each city and discuss both these existing measures and planned additional measures with city authorities and other key stakeholders. The key findings from each visit have been described in a case study for each city, with the exception of London which has been cited as an example throughout the report.
- **Consultation:** As well as the interviews that were completed during the city visits, further evidence was obtained from meetings with industry representative organisations at a European level and at an International Stakeholder Workshop in Rome in June 2011. The draft conclusions and recommendations from the study were discussed with stakeholder organisations at a workshop in Brussels in October 2011. The full list of organisations met or consulted during the study is shown in Appendix 1 to this report.
- **Computer simulation modelling:** A computer simulation model of urban freight transport in a specific city (Rome) has been used to provide some quantified analysis of the forecast impact of some measures at a local level. The model was developed by Tor Vergata University of Rome and uses data that was collected during surveys carried out by the University of Rome Sapienza.

## 1.6 Structure of the report

This report provides in Chapter 2 an analysis of the main stakeholders that are relevant to UFT and the key public policy issues that it generates.

Chapter 3 considers the UFT market itself, describing the different market segments and their logistics requirements.

Chapter 4 provides a review of existing measures and practices that are employed, particularly at a local level, to promote sustainable urban distribution. This review draws on the examples of measures and practices in European cities that are shown in Appendix 3 and information from the visits to the ten European cities. It contains our views on “best practice” in UFT at a local level and contains the case studies from the ten cities that were visited.

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Chapter 5 provides a description of the vision for the future of UFT that was presented by the European Commission in its 2011 Transport White Paper and our recommendations for practical policy measures at a European level. A qualitative evaluation of each recommendation at a European level has been carried out and the results are provided in Appendix 2.

## 2 STAKEHOLDER ANALYSIS & THE ROLE OF THE PUBLIC SECTOR

### 2.1 Introduction

This chapter provides the foundation for further analysis in the study by describing the different stakeholders that are affected by and have an interest in, the development of sustainable distribution in an urban context. The chapter then describes the public policy issues that UFT generates and concludes with a rationale for public sector intervention in the market.

### 2.2 Stakeholders and interests in UFT

UFT involves many different stakeholders, both those within the urban area that are not directly involved in the freight transport movements (public authorities, residents, tourists/visitors) and the actors in the supply chain. The latter can be categorised according to the demand for goods (receivers), the supply of goods (shippers or producers) and finally the transport of goods (transport operators). The interaction between these different stakeholders, each with their own interests and own perceptions of the issues related to UFT (see Table 1), increases the complexity in the search for solutions to achieve sustainable urban distribution. Logistics decisions are typically taken on the basis of commercial and operational factors, without any specific consideration for the local environment, so there is a need to reconcile the conflict between the commercial efficiency objective pursued by the stakeholders in the supply chain and the wider sustainability objectives pursued by city authorities on behalf of residents and tourists/visitors.

**Table 1. Stakeholders and interests in UFT**

Category of stakeholders	Stakeholders	Main interest in context of UFT
<i>Supply chain stakeholders</i>	Shippers	Delivery and collection of goods at the lowest cost while meeting the needs of their customers.
	Transport operators (own account, third party providers)	Low cost but high quality transport operations and satisfaction of the interests of the shippers and receivers.
	Receivers (major retailers, shop owners, etc.)	On time delivery of products, with a short lead-time.
	Consumers	Availability of a variety of goods in shops in the city centre.
<i>Resource supply stakeholders</i>	Infrastructure providers	Cost recovery and infrastructure performance.
	Infrastructure operators (managers)	Accessibility and use of infrastructure
	Landowners	Profitability of local areas
<i>Public authorities</i>	Local government	Attractive city for inhabitants and visitors, with minimum inconvenience from freight transport, while also having an effective and efficient transport operation.
	National government	Minimum externalities from freight transport, while maximising economic efficiency and effectiveness.

<i>Other stakeholders</i>	Other economic actors located in the urban area (manufacturers, service providers, etc.)	Site accessibility and on-time deliveries.
	Residents	Minimum inconvenience caused by UFT.
	Visitors/tourists	Minimum inconvenience from UFT and a wide variety of products in the shops.

Source: elaboration from Maggi (2007).

The categorisation of the different stakeholders in the field of UFT shown in Table 1 has been used throughout the current study.

Conflicts between the different interests of stakeholders inevitably arise, particularly between residents and transport operators in urban areas, and public authorities frequently intervene to try to balance the interests of both sets of stakeholders. Examples include where public authorities:

- Introduce measures to restrict access to city centres for HGVs that do not meet particular emissions standards in order to improve air quality and protect the health of residents. This means that transport operators generally have to modernise their fleets in order to continue to operate in the restricted urban areas.
- Ban night time deliveries by transport operators in city centres because of the noise that can be generated, which can disturb residents' sleep. This forces the transport operators to make deliveries during the day when there is more road traffic congestion.

There is also an inherent conflict between residents and tourists/visitors as consumers, which want goods to be available in shops, and the same stakeholders who regard road freight movements in urban areas (particularly HGVs) as a "nuisance" because they create traffic congestion, noise and environmental pollution and are also regarded as intimidating.

The fact that users of personal passenger transport are also residents with a vote in local elections, while freight transport operators do not usually have such direct political influence, means that freight traffic is more likely to be regulated by city authorities than passenger traffic; an example is provided by the Low Emission Zone in London, which is only applied to HGVs, LGVs and buses but not private cars. However, city authorities also increasingly recognise that efficient UFT is important to a city's economy.

Given the potential conflict between stakeholder groups in relation to UFT, the public sector's role can be considered to be to promote sustainable urban distribution, which seeks to find a balance between minimising both the economic costs and the impacts of UFT on behalf of all stakeholder groups.

### 2.3 Public policy issues generated by UFT

This section considers the issues relating to UFT from the point of view of both policy-makers, particularly at a local level, and the perspective of the freight transport industry. UFT is essential to the functioning of urban economies as it is required, for example, to replenish stocks of food and other retail goods in shops, to deliver documents, parcels and other supplies to offices and to remove household waste from urban areas. Although UFT has these important positive effects on the

economic welfare of a city and supports the urban economy, it has a number of negative effects, which are considered below.

### *Road congestion*

The first key issue is that freight vehicles contribute to **congestion**, which is caused by:

- The volume of traffic (passenger and freight) being greater than the capacity of the road network.
- Space being taken on the public highway network by freight vehicles waiting to make deliveries or loading and unloading.

When considering the volume of traffic that causes congestion, peaks of freight traffic often coincide with those of passenger traffic, as shown in surveys in Italian cities, which indicate freight traffic peaks during the periods 8am-11am and 3pm-5pm. This issue is of particular concern wherever local conditions oblige freight vehicles to stop for loading and unloading outside legal loading and unloading spaces, leading to a reduction in road capacity.

Most Metropolises, Other Large Urban Zones and Smaller Heritage Cities in Europe have ring roads that provide the most suitable routes for long distance freight traffic, but smaller urban areas are more likely to experience congestion from through freight traffic. An example in the UK is provided by the city of Bath, which despite being a heritage city, experiences road congestion in part due to long distance freight traffic on the A4. The city of Tallinn experiences some increased road congestion due to strategic ferry traffic en route between the city's ferry port and the strategic road network.

Reversing the perspective, there is a problem of meeting the needs of freight vehicles that are delayed by other traffic and are unable to carry out loading and unloading because of insufficient parking spaces. The time required for a vehicle to complete a delivery as part of a retail transport chain can be split into three parts: the time required to drive to the urban area, that required to drive through the urban area to the delivery point and the time spent for loading/unloading the cargo (dwell time). The last two components tend to occupy the majority of the vehicle time and therefore make up most of the freight operator's costs, particularly as they have to allow additional time in scheduling for delays due to congestion. The time spent within the cities (which also varies according to the size of the city) is an indicator of the reciprocal hindrance (congestion) that private users and transport operators cause to each other.

The conflict between freight and other vehicles is more acute when transport operators do not load/unload the cargo in private off-street loading/unloading bays and any designated on-street bays, but park vehicles on the street in illegal locations. In the centre of Bologna, the share of illegal parking of all freight vehicles was 57% according to a study carried out in 2005, but in most cases this is due either to the fact that there is no private or public loading/unloading bay available or those provided are occupied by unauthorized vehicles; in Bologna 23% of the transport providers interviewed in 2005 stated there was no loading bay available, and even when it was provided, most of the time it was occupied by other passenger or freight vehicles.

### *Conflict between UFT and pedestrians*

As inner city areas often see a concentration of retail activity and these areas are increasingly pedestrianised to create an attractive environment for shopping, there is a need to avoid the interference between loading and unloading operations and pedestrians when shops are open. Similar problems occur in historic city centres where there is a high concentration of tourists. The city of Chester in the UK, which is both a major retail centre for the county of Cheshire and North Wales and a heritage city, requires deliveries in the central pedestrianised area of the city to be made between 08.30 and 10.00 and 16.30 and 18.00.



Photos: MDS Transmodal

**Pedestrianised zone in Chester: loading/unloading times & freight deliveries in a heritage city**

### *Environmental pollution: particulate matter (PM)*

The circulation of freight vehicles in urban areas can produce significant air pollution. Although their share in the total traffic flows is not usually very high (a survey in Rome in 2001 indicated 12% of total flows between 07.00 and 18.00), as they are mostly diesel-powered the more significant impact is due to the release of particulate matter (PM), which is a source of health problems for residents. PM10 is linked with the worsening of conditions such as asthma, heart disease and respiratory diseases and in London it is estimated to result in 4,300 premature deaths per annum.

European surveys show that the share of emissions of freight vehicles is between 20% and 30% of total urban traffic emissions depending on the local situation. As an example, in Bordeaux the share of freight traffic compared to total urban traffic represents 19% of energy use, 21% of CO<sub>2</sub> emissions and only 14% of vehicle-kilometres. Furthermore, urban freight traffic is more polluting than long-distance freight traffic as fuel consumption increases sharply if vehicles make frequent stops. A critical issue in this respect is the delay of vehicle fleets in complying with the latest Euro standards on emissions. A survey in Rome has shown that in 2008 77% of all diesel freight vehicles were Euro 3 and lower, while only 23% were Euro 4. For exactly this reason, the authorities in London have introduced a Low Emission Zone (LEZ) that imposes a punitive charge of £200/day on any HGV that is Euro 2 or under and enters the city; from 3 January 2012 the charge will apply to any vehicle that is Euro 3 or under.



Air quality is likely to be a greater concern to city authorities than GHG emissions because it is localised and has direct impacts on the health of residents. In addition, there can be significant financial consequences for cities that fail to meet air quality standards set out in EU Directives; the UK, for example, has been threatened by the European Commission in 2011 with a fine of £300 million due to London failing to meet European air quality standards.

### *Environmental pollution: greenhouse gases (GHG)*

UFT is a significant generator of greenhouse gas emissions. In London in 2006 of the 9.6 million tonnes of carbon dioxide emitted by all forms of transport, some 23% was from freight vehicles (London Freight Plan, Transport for London).

As explained above, while city authorities are taking measures to reduce GHG emissions from UFT, they may be less of a direct concern than pollutants such as PM10 because global warming is an issue that has to be addressed worldwide and its effects are perceived to be long term.

### *Noise pollution*

Noise pollution generated by freight vehicles while they make deliveries in urban areas during the night is regarded as a nuisance by residents because it disturbs their sleep. For this reason, many city authorities ban night-time deliveries.

### *Intimidation and safety*

City authorities sometimes regard road freight vehicles, particularly HGVs when operating in an urban environment, as being intimidating for pedestrians and cyclists due to their sheer size. There is also concern about the number of serious accidents involving freight vehicles and cyclists; according to Transport for London, the city's mobility agency, half of all cyclist fatalities in London are due to accidents involving freight vehicles.

### *Economic efficiency in urban distribution*

Inefficient distribution in urban areas can be exhibited in the following ways:

- Low load factors and empty running;
- A high number of deliveries made to individual premises within a specific period of time;
- Long dwell times at individual loading and unloading points.

Dwell time if combined with frequency of delivery is a measure of the performance of the distribution process. Surveys in Rome show that the delivery frequency to retailers is, on average, higher than once a day, which is indicative of poor distribution efficiency.

The problem of empty running in one leg of the delivery trip (return leg) and of the collection trip (outward leg) is more likely to occur in own account operations and is indicative of poor efficiency, leading to more trips than absolutely necessary; in the city of Bologna third-party transport providers

account for 61% of total daily deliveries and carry out, on average, 15 deliveries on each trip, while own account freight transport, representing the remaining 39%, complete, on average, just 9 deliveries on each trip.

Inefficient distribution leads to additional costs for transport operators, which would normally be passed on to receivers/shippers (in the case of third party operators) or absorbed as costs for own account operators. However, shippers, receivers and their transport operators may not have a significant incentive to increase the efficiency of the deliveries to reduce costs because the transport cost may be only a small proportion of the retail value of the goods and of their overall costs. The freight transport operators are paid for the service they provide and are responding to market demand. The costs of distribution inefficiency are passed onto consumers through the goods and services they consume and borne as a cost to the overall economy.

Nevertheless, analysis of individual UFT market sectors tends to demonstrate that defining “sub-optimal distribution efficiency” is, in practice, difficult. The definition of “sub-optimal” will be very different for each of the following very common examples of UFT, due to the different type of goods transported (high volume versus high value versus high weight etc.) and the very different frequency of deliveries and dwell times required:

- A courier service provided by an LGV carrying very high value but low weight documents and small parcels and making a large number of deliveries with short dwell times at each delivery point;
- A delivery of ambient retail goods on behalf of a major supermarket to a single large retail outlet in a suburb of a major city, carried out by a 16.5 metre articulated HGV and requiring a dwell time of one hour to unload and then re-load with packaging etc.;
- A delivery of heavy beer kegs to a number of different catering establishments in a city centre in a 17.5 tonne rigid HGV.

The different characteristics of UFT in different market sectors makes it complex for city authorities to develop measures that incentivise greater efficiency, while being seen to be behaving fairly.

### *Differences between types of urban area*

In general terms, most of these public policy issues are more of a concern in Metropolises and Other Large Urban Zones because there are significant concentrations of receivers of freight in a relatively limited geographic areas and there are high concentrations of movements by freight vehicles and private cars during peak hours. The combination of these factors means that these larger urban areas are more likely to suffer from road traffic congestion and poor air quality.

In addition, the need to protect the culturally and physically sensitive centres of Smaller Heritage Urban Areas from traffic congestion, physical damage from larger freight vehicles and air pollution means that issues relating to freight movements are regarded as being a significant policy issue.

## 2.4 Conclusion

Although UFT has important positive effects on the economic welfare of a city and supports the urban economy, it also has negative effects as described above. These negative effects are due to the lack of internalisation by the users of UFT services of the total costs (congestion, environmental pollution and noise disturbance) associated with it. Therefore, despite the economic benefits generated by UFT, there is a justification for intervention by the public sector in the market to redress the balance between social cost and social benefit derived from UFT.

While intervention by the public sector is justified to reduce the negative impacts of UFT, the most effective measures at all levels of policy-making are most likely to be those that also incentivise UFT operators (supply-side) and/or their customers (demand-side) to increase distribution efficiency which will both reduce costs and/or add value for the private sector while also reducing externalities.

## 3 THE URBAN FREIGHT TRANSPORT MARKET

### 3.1 Introduction

This chapter focuses on the sources of demand for UFT and its supply in terms of the main distribution practices that can be observed in urban areas. For each sector we have sought to provide some indications of the likely efficiency of the different sectors and provided a view, based on secondary sources, of possible future market trends in UFT.

The following UFT market sectors are covered:

- Retail (including e-commerce);
- Courier and post;
- HoReCa;
- Construction;
- Waste.

Any study that seeks to develop policy recommendations related to UFT needs to take account of the nature of the freight transport industry. The freight transport industry, particularly the road freight transport sector which is most relevant for UFT, is highly competitive with relative ease of market entry. This means that freight transport operators are highly cost conscious and respond to market signals; it also means that any additional costs that are imposed by the public sector will, at least in the medium to long term, be passed onto customers and, ultimately, consumers as they cannot be absorbed by the operators. Therefore, while deliveries to and collections from urban areas are essential to the functioning of urban economies, inappropriate policy measures at a local level will have an impact on the efficiency and cost of UFT, which will in turn have a detrimental impact on the local economy and/or environment.

The highly competitive nature of the freight transport market also means that UFT policy measures should not, as a general rule, discriminate between different types of operator on the basis of the market in which they operate as this will create market distortions. For example, deliveries of fresh produce to grocery shops and supermarkets or pharmaceuticals to pharmacies should not be treated differently from deliveries of parcels to homes or deliveries of stationery to offices.

### 3.2 Retail market sector

#### *The European retail market*

The retail industry is composed of individuals and companies engaged in the sale of finished products to end-user consumers. Retailing is therefore the final step in the distribution of merchandise – the last point in the supply chain – connecting the bulk producers of commodities to the final consumers.

Traditionally, the retail business was dominated by smaller family-run or regionally targeted stores, but this market is increasingly being taken over by retail groups. Retail services encompass a wide

variety of forms, formats (from small shops to hypermarkets), products, legal structures (independent stores, franchises, integrated groups, etc.), and locations (urban/rural, city centre/suburbs, etc.).

In 2009, the European Commission started a retail market monitoring exercise, in line with the new market monitoring policy approach presented in the 2007 Communication on “A single market for 21st century Europe” (COM(2007) 724). The retail sector was included because of its economic significance for the European Union (4.2% of the EU’s GDP, 17.4 million employees and 20% of European SMEs), and, in particular, its close links with a multitude of upstream and downstream markets, making it a key player in the European economy.

In fact, as pointed out by the Commission report on retail market monitoring (“Towards more efficient and fairer retail services in the internal market for 2020”, COM(2010)355), any developments in the retail sector have knock-on effects on other economic sectors and on their respective actors. In the upstream markets, retailers often interact with a wide range of players, in particular wholesalers and suppliers, employees, commercial property services, transport companies, providers of payment systems, advertising and marketing agencies, security companies, energy suppliers, and waste collection and recycling services. In addition, the retail sector has a direct impact on the quality of life of citizens, determining consumers’ access to a wide choice of consumer goods, including basic household goods and groceries. Consequently, retailers can become a driving force in the adoption of sustainable growth paths due to their interaction with consumers.

The search for and benefits of economies of scale have transformed the business models of retailers. The small independent stores in the 1970s have been partially replaced by retail chain stores and supermarkets, offering one-stop-shopping for a wide variety of products. The purchasing power of retail groups has allowed them to negotiate low prices from their suppliers. Greater competition, also because of the growth of the discount retail channel, has contributed to making retail chains more efficient in order to curb the erosion of their margins. This trend has had an impact on small independent shops and on agricultural producers and small and medium sized manufacturers.

In northern Europe retailers have tended to develop large-format stores but in different ways. For example, Germany has a strong discount culture. This is reflected in the large number of hypermarkets and hard discounters, but the German consumer also shops at local markets. In France, the home of the hypermarket, large-scale formats co-exist with “superettes” and local markets whereas in the UK and the Netherlands fewer formats coexist with superstore and supermarkets. In southern and eastern European markets on the other hand the growth of large-scale formats has been slower; independent stores have continued to have a relative predominance.

Out-of-town shopping centres proliferated in Europe in the 1980s and 1990s, popular among consumers because they were generally easy to access by car and provided plenty of parking. During the last decade, out-of-town shopping centres and large-format stores continued to be developed throughout Europe. This was accompanied by a decline of traditional small shops, informal retail channels and high street businesses. In some cases, out-of-town shopping centres have attracted shoppers away from traditional high streets.

However, interest in smaller store formats is believed to be increasing once more. From the consumers’ point of view, experience in large formats is becoming less attractive because it requires too much time and does not allow for personalised service. Proximity is becoming a key issue and Europeans are returning to a more urban lifestyle, with the rebirth of high-street retailing and a

propensity towards in-town redevelopment is growing rapidly in Western Europe. In Eastern Europe the retail sector is likely to follow Western Europe back into the cities in the future.

This trend will be strengthened by demographic issues: the next decade will witness zero population growth, the number of consumers in Europe will be static, there will be many fewer young adults than at any time over the last 50 years and older adults will prefer to move back from the suburbs to city centres with ample, accessible shops and other services. By 2025 over three-quarters of Europe's population are forecast to live in urban areas and by 2050 the proportion is expected to increase to 84%.

From the retailers' point of view, smaller store formats are becoming a necessary part of their retailing footprint for a variety of very practical reasons. In smaller formats they are, for example, better able to tailor the mix of goods and their display. This control allows them to know their customers better, detect shopping behaviour and expectations, and consequently to change the product offerings, the display of goods, the layout of the store and offer new services. In addition, in some European countries, smaller-format stores are necessary because of regulatory constraints.

Demographic changes, the rebirth of high-street retailing and the interest in smaller store formats can be expected to have a considerable impact on UFT in the future.

### *Retail logistics and UFT*

#### Major retail chains

Transport, logistics and supply chain performance are increasingly considered to be key success factors for most major retailers. The supply chains of large retail groups have evolved over the last decades and in Europe, British retailers have played the role of pioneers in this transformation.

Until the 1970s, the logistics channel related to physical distribution remained under the control of suppliers and wholesalers. Direct store deliveries were made on an infrequent basis; the stores were usually able to hold stock in backrooms. During the 1980s, responsibility for shop deliveries shifted from manufacturers and wholesalers to the large retailers themselves. Retail groups invested heavily in distribution networks to take control of deliveries and increase overall supply chain efficiency, consolidating supplies upstream of the stores at centralised distribution centres. Stocks were partly shifted back in the chain from the store backrooms to these distribution centres. Most firms reduced the number of warehouses from which they serve the stores with the aim of exploiting economies of scale in warehousing and reducing inventory levels. These processes created a market for third-party services (distribution centre management, transportation, etc.). Large retailers in the 1990s progressively requested more frequent deliveries from their suppliers, in smaller order quantities, and so have moved to a just-in-time system. During the 2000s the collaboration among supply chain partners increased and the focus became more on the overall supply chain efficiency.

Since the major retail groups are important players for distributing goods to their stores in urban areas, the evolution of their supply chain has influenced UFT. The increased proportion of shop supplies delivered in consolidated loads from retailer-controlled distribution centres and a corresponding decline in the multiple drop deliveries of manufacturers and wholesalers promoted the consolidation of loads in larger vehicles. From the large retail chains' point of view, this has meant an increase in efficiency, making better use of each vehicle's carrying capacity and increasing the fill-

rate; it has also been relatively environmentally friendly behaviour, because it involves carrying out fewer deliveries per day.

This trend has led to issues for the retailers when vehicle weight restrictions are imposed in urban areas because they have been unable to optimise the fill-rates for their vehicles, but, at the same time, the decentralisation of shops to the periphery of urban areas has reduced the need for lorries to penetrate urban centres. However, while the decentralisation of retail activity has decreased freight traffic in urban areas, it has increased the number of shopping trips (and the number of commuting trips by retail workers) made by private car, increasing urban and suburban road congestion and contributing to air poor air quality.

### Independent retail

Independent retailers differ significantly from the major retail chains in terms of transport organisation and relationships with other stakeholders. They often do not control deliveries, with wholesalers or suppliers being responsible for goods transport (using their own account or third party carriers); the retailers usually do not pay for the transport directly and have no contact with the carrier except for the receipt of the delivery.

Independent stores and local convenience stores together can represent 30-40% of all daily deliveries in an urban area. Freight movements to these local stores contribute significantly to urban road congestion as they are supplied between three and ten times a week, they have diverse suppliers, with a predominant use of own account vehicles and low vehicle fill rates.

### *E-commerce and UFT*

The growth in the use of the Internet has led to the rapid development of e-commerce, which currently appears to be one of the fastest growing marketing channels for different kinds of products and services. Business-to-business (B2B) e-commerce accounts for by far the largest share of trade, whereas the share of business-to consumer (B2C) transactions is still small, not only compared to B2B transactions but also compared to traditional retailing. In the European Union, online shopping (B2C) represents only about 2% of the total retail sales: in 2007, only four Member States recorded a share of internet sales higher than 2% and the UK was the only Member State where this was approaching a 5% share.

The 5th Edition of the Consumer Conditions Scoreboard, published by the European Commission in March 2011<sup>2</sup>, shows that:

- 40% of EU consumers bought goods and services over the Internet in 2010, compared to 37% in 2009 and 26% in 2006;
- The use of other distance selling channels continues to decrease in comparison with e-commerce. 21% of consumers bought via the post (22% in 2009 and 27% in 2008) and 12% via telephone (14% in 2009 and 15% in 2008).

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<sup>2</sup> The Consumer Scoreboard is published twice per year. The spring Consumer Conditions Scoreboard monitors consumer conditions in EU Member States and tracks the integration of the retail single market.

- The gap between the take-up of domestic and cross-border e-commerce continued to widen in 2010: 51% of Internet users purchased goods or services online domestically but only 12% cross-border and the proportion of European retailers selling cross-border decreased to 22% in 2010 from 25% in 2009.

Convincing consumers already accustomed to shopping online domestically to shop across borders remains the key challenge for the European Commission to integrate e-commerce in the EU and to create a European single market. In fact, from the EU point of view, cross-border online shopping has the potential to bring significant benefits to consumers: it can provide greater choice of goods and promote competition among retailers. In addition, consumers living in remote areas can benefit from being able to access goods cheaply.

According to the *Flash Eurobarometer – Retailers' attitudes towards cross-border trade and consumer protection No300*<sup>3</sup>, in 2010:

- Almost three-quarters of retailers in the EU use at least one “distance” sales channel such as via the Internet, phone or post (72%; compared to 70% in 2009).
- The Internet was the most common distance sales channel: a small majority of retailers said they sold goods or services via the Internet (53%; up from 51% in 2009). The use of the telephone as a sales channel was mentioned by 43% of retailers and mail order (e.g. selling by “post”) was offered by 29% of retailers; these results were unchanged compared to 2009.
- In Ireland, Denmark and the UK, the norm was to offer customers the possibility to purchase goods or services without visiting the company’s physical store or production site: between 88% and 93% of retailers in these three countries used “distance” sales channels.
- 22% of EU retailers were selling their products or services in other EU countries. This proportion was lower than in 2006 (29%) or 2009 (25%), but slightly higher than the proportion observed in 2008 (20%).

Although B2C e-commerce still accounts for a small market share compared to conventional retail activity, it is growing very fast. In this high value potential market efficient and reliable logistics is a key factor of success, even more than with a traditional retail business.

In B2C e-commerce two physical distribution models are observed:

- The products flow along existing physical distribution channels. For example, books purchased over the internet are handled by existing physical distribution channels of express companies and postal networks; ‘white goods’ such as refrigerators are usually delivered to consumers’ homes even if they are purchased conventionally in a store.
- A new physical distribution channel to supply goods to consumers is established by retailers. In this case, logistics operations can be located at existing facilities/stores or in order fulfillment centres, which are specially dedicated to e-commerce orders.

Each on-line order comprises a small number of items (often just one) and the order picking is centralised at a national or regional level. There is a large flow of returned product; this requires major reverse logistics operations.

<sup>3</sup> Flash Eurobarometers are ad hoc thematic telephone interviews conducted at the request of any service of the European Commission. The objective of Flash Eurobarometer – Retailers’ attitudes towards cross-border trade and consumer protection (No300) – was to assess business attitudes towards cross-border trade and consumer protection in the EU internal market.



Most of the on-line orders are channeled through the “hub and spoke” networks of large parcel carriers or mail order companies. This is because many retailers outsource most of their administrative and logistic activities to these companies. Consequently, e-commerce is becoming a major driving force for growth in the parcel and express market.

In the case of on-line purchased goods provided by existing store-based grocery retailers (e-grocery), in which there are no existing physical distribution channels for the home delivery operation, these companies have to decide where to locate storage, order processing, picking and delivery activities.

Usually, major grocery retailers with a strong network of traditional supermarkets try to expand their brick-and-mortar business through the internet by using existing facilities because it involves them in lower investment costs than establishing dedicated order fulfillment centres. However, these store-based operations (shelf-picking) tend to prove less operationally efficient, and can negatively affect the shopping experience of those customers who continue to visit the stores. In addition, over the past 30 years the trend has been for retailers to reduce the amount of back storage space in shops and this now limits the capacity of existing retail stores to support the online order fulfillment operation. So, as the online business grows they tend to switch to the dedicated picking model which offers potential for efficiency gains but needs a high sales volume to cover the higher investment costs.

In contrast to the average general merchandise order, which comprises from one to three separate items, the online grocery orders can contain dozens of items, many of which are perishable and need rapid picking and delivery.

One of the biggest challenges in B2C e-commerce is the last mile delivery to the consumer. Particularly in the e-grocery business it is difficult to combine profitability, customer convenience and security. For acceptable delivery costs and prices for customers, the volume and the number of deliveries have to attain a certain threshold.

The goods can be delivered:

- 1. Without appointment with the consumer i.e. a non-timed delivery;
- 2. By appointment with the consumer;
- 3. During a time window selected by the consumer;
- 4. Using a so-called “unattended reception”.

In the case of non-timed deliveries, the customer may be not present at delivery. This can create legal and logistics problems, because there is nobody to sign the delivery note and facilities for storing the goods are needed. Furthermore, in the case of e-grocery business, different storage temperatures might be necessary. In addition, unsuccessful delivery can damage the company image. Although non-timed delivery produces various problems, it would allow delivery companies to optimise transport routes and schedules, thereby reducing overall traffic and achieving better vehicle and driver productivity for each unit delivered.

Delivering during a time window selected by the customer avoids the consumer-not-at-home problem, but it is difficult to organise efficient delivery tours. In the worst case there is a single delivery trip for each order, thus private shopping trips are just replaced by commercial delivery trips. In addition, few customers are willing to pay the high cost of time-definite delivery.

Time window delivery is an approach used to balance the trade-off between customer satisfaction and efficient delivery tours.

Another alternative is to use a form of “unattended reception”:

- Leaving the consignment outside the house, preferably in a concealed location (called “doorstepping” in the UK);
- Giving the delivery driver internal access to the home or an outbuilding;
- Placing the order at a home-based reception (or ‘drop’ box);
- Leaving the order at a local collection point (using existing infrastructure such as park & ride sites, petrol stations, schools, etc. or creating a dedicated “pick-up point”);
- Delivering the order to a local agency which stores it and delivers it when the customer is at home.

Using storage boxes or some kind of collection point allows e-retailers to optimize transport routes and schedules and thereby achieve better vehicle and driver productivity as well as reducing the total transport requirement for each unit delivered. On the other hand, these solutions require special infrastructures for storing goods, especially in the case of e-grocery business.

In addition, the local collection points would potentially generate significant numbers of vehicle trips both by companies delivering to the collection point and by consumers collecting from them. They could only contribute to traffic reduction if different orders at different retailers are assembled at the pick-up point, for example if the consumer’s single trip to the pick-up point would replace several shopping trips to different stores.

Trends seem to indicate that B2C e-commerce increases the total number of UFT movements and leads to greater fragmentation of consignments at the city logistics level. It tends to increase the amount and the frequency of deliveries and decreases the size of a single delivery.

On the other hand, B2C e-commerce can:

- Eliminate some journeys by allowing certain products to be downloaded electronically (book, music, home entertainment);
- Lead, potentially, to the rationalisation of home delivery services as express couriers undertake multiple drops in the same area on behalf of many different customers;
- Allow several individual shopping trips to be replaced by a single delivery trip by a commercial vehicle (but there is no reason to expect that consumers will travel less; their travel demand for non-shopping purposes may even increase).

Overall, the net effect of e-commerce on UFT is not clear, although it probably leads to fragmentation of retail purchases and may lead to a larger number of deliveries to residential areas of cities or offices.

### *Conclusion on retail market sector*

The impact of the retail sector on UFT efficiency depends on the structure and dynamics of the market and efficiency will probably decline in the future with a larger number of deliveries at lower load factors, given the expected trends for city-centre redevelopment and the renewed interest in smaller store formats. The retail sector demonstrates how fragmentation of demand for UFT (e.g. numerous independent retail outlets) combined with the fragmentation of supply of UFT (e.g. numerous wholesalers and other suppliers using their own account vehicles to make just-in-time deliveries) results in a greater number of UFT movements with part-loads than would be possible if both demand and supply were more concentrated. The impact of the trend towards e-commerce is still

unclear, but it seems likely that it leads to the fragmentation of retail purchases and leads, in turn, to a larger number of deliveries to residential areas of cities and to offices.

### **3.3 Express, courier & postal sector**

#### *Introduction*

According to a study for DG Internal Market and Services of the European Commission undertaken in 2009, the overall EU postal sector, comprising letters, parcel and express services, earned total revenues of about €94 billion in 2007 (approximately 0.7% of EU-27 GDP).

#### *The European letter post market*

The letter post market (which comprises correspondence, direct mail and publications) represents the largest segment with 56% of revenues, while the parcel and express market combined represents 44%.

The average EU citizen receives approximately 200 letter post items per year. The national postal operators are still the key players in the European cross-border and domestic letter post markets, delivering approximately 95% of items. In those Member States that have opened substantial parts of the market to competition, other postal operators have entered the market and gained importance.

Over the last few years, national postal operators have sought to optimise their logistics by limiting the number of sorting centres and delivery offices. Delivery routes have been restructured and enlarged. In this way, the number of transport routes to be served daily has been reduced.

In principle, all transport networks of postal operators can be regarded as hub-and-spoke networks, with the sorting offices acting as hubs and the delivery offices as spokes. Differences between operators occur in the extent to which sorting centres are directly linked or whether use is made of further hubs through which sorting offices are linked in an indirect way.

The recent economic crisis and the ongoing structural changes in communication behaviour are challenging the future role of letter post services. Direct mail and unaddressed advertising are directly impacted by cuts in the marketing budgets of many companies and organisations. Business customers are reducing postal expenses, preferring electronic delivery solutions.

According to the above-mentioned study for the European Commission, the role of multi-channel delivery of postal items will increase. The economic crisis and the structural change in communication behaviour will particularly affect the letter post volume of the mature letter post markets of the Western European Member States.

#### *The European courier, parcels and express market*

The European parcels and express market has seen rapid development over the last decade and over the period from 1997 to 2008, this market has continuously outperformed EU economic growth due to the implementation of free trade in goods (within the EU-27 and internationally), the globalization of production and the intensifying trend towards just-in-time-manufacturing. These trends have led to the requirement for faster, more reliable services than were provided by traditional postal services.

In 2008, the European parcel and express market was estimated at €42.4 billion and accounted for 0.34% of the EU-27 gross domestic product.

Parcels accounted for about two-thirds of the market revenue, while express shipments represented the remaining one-third of the market value. In the past, in comparison to the slower and cheaper services from the parcel operators, express companies offered high-quality products with a much faster service. Their focus was on documents and lighter parcels, with additional value-added services. In contrast to this, parcel operators focused on heavier parcels up to about 30 kg and offered a cheaper alternative with almost no value-added service options.

Increasingly, however, the former distinction between parcel and express services in terms of products is becoming less clear. Express operators, parcels companies and national postal operators compete against each other in order to offer clients a full service portfolio.

The largest segment of the EU-27 market, in terms of customer focus, is represented by Business to Business (B2B) shipments accounting for about 80% of the parcel and express market revenues. Parcels from the distance selling business (mail order and internet sales) are the main shipments within the Business to Consumer (B2C) market, which accounts for around 15% of the total market value. Traditional postal parcels are mostly part of the Consumer to Consumer (C2C) market segment, which represents only 5% of the market in terms of revenues.

The leading players in the EU parcel and express market today are the international express operators (also referred to as “integrators”), DHL, TNT, UPS and FedEx alongside the European parcel networks GLS (Royal Mail) and DPD (French La Poste/ GeoPost). In most of the national domestic markets the local postal operator and a small number of private local companies also play an important role. Competition between these players is intense and this highly competitive environment is expected to continue for the foreseeable future. Regarding the B2C segment, competition remains largely nationally-based due to the essentially domestic nature of the home delivery business.

Indeed, as highlighted by a Communication from the European Commission on Cross-Border Business to Consumer e-Commerce (COM(2009) 557), while e-commerce is taking off at a national level, it is still relatively unusual for consumers to use the internet to purchase goods (or indeed services) from another Member State. From 2006 to 2008, the share of all EU consumers that bought at least one item over the internet in the past year increased from 27% to 33% while cross-border e-commerce remained roughly stable (6% in 2006 to 7% in 2008). The Consumer Conditions Scoreboard published in March 2011 by the European Commission confirms this trend: in 2010, 51% of EU Internet users purchased goods or services online domestically but only 12% did so cross-border.

Despite the economic crisis, it is expected that the European parcel and express market will continue to grow in the medium and long term. The B2C market segment, which has grown more strongly than the B2B segment over the last few years, is expected to continue this growth primarily due to e-commerce related transactions.

Regarding UFT, parcel and express transport services are one of the fastest growing transport businesses in cities. This industry uses large vans or small to medium sized trucks, and is based on consolidated delivery tours departing from cross dock terminals located in close proximity to suburban areas. Express transport can make 70-90 deliveries in one delivery tour, while a traditional parcel delivery tour serves about twenty receivers. This is because the express courier network and planning enable these operators to optimise times and transport costs.

From express couriers' viewpoint, they work very efficiently in city centres, but their efficiency is threatened by the ever-increasing tendency of regulating access to city centres. In addition, as a general rule, every municipality sets access restrictions based on its own needs, so that express couriers have to operate in a fragmented regulatory context. The two main operational features of these operators are time pressure and standardization of procedures, so ideally they need to be able to collect and deliver in all the cities they serve in the same time window and move freely to and from and within urban areas.

### 3.4 HoReCa

#### *The European HoReCa Sector*

The term HoReCa refers to the food service industry and is an acronym formed by linking the words HOtel, REstaurant and CAtering. The HoReCa sector in urban areas mainly consists of the servicing of hotels and other short-stay accommodation (with and without restaurants), bars and restaurants, canteens and catering.

It is an important sector of the European economy and has grown strongly in recent years. About 7.8 million people were employed in this sector in 2004, which accounts for 4% of total employment in the EU Member States. The majority of manufacturers distinguish between the "organized" HoReCa distribution channel and the "non-organized" one. The first is made up of, for example, some major hotel and restaurant chains (such as Burger King and McDonalds) and the catering industry that supplies, for example, the hospital market, schools, work canteens and airline catering. The second type, the "non-organized" HoReCa channel, is the one that supplies small bars and restaurants and smaller hotels. Despite the success of the large hotel, fast food and takeaway chains and franchises, the sector is still dominated by the small, independent, family-owned "non-organized" HoReCa channel.

The three major issues for the sector as a whole are:

- Human resources: Long and antisocial hours, low pay, instability and low status makes work in hotels and catering sector unattractive as a career choice, and as a result the sector continues to suffer from high staff turnover and difficulties in recruiting suitable staff.
- Regulation: The HoReCa sector has been facing an ever-increasing volume of European Union legislation related to smoking, alcohol consumption, food safety and labelling.
- Technology: Both information technology (IT) and production technology, has profoundly impacted on the HoReCa industry and is expected to continue to have a major influence. While it creates opportunities, technology is also a major threat to small enterprises in the sector. Because of their small size, it is much harder for them to generate economies of scale and recover the cost of investment in new technologies. However, the changes brought by technology are forcing all the HoReCa companies to re-examine their business models and deal with the challenges raised, such as how to maximise technology's potential without devaluing staff or alienating the consumer. However, the initial boom in the use of information technologies appears to be slowing and, while its use will continue to increase, it is likely to be at a more gradual pace.

- **Enlargement:** The enlargement of the EU has positively impacted on the hotels and catering sector because the new Member States provide a new source of demand from competition and new sources of staff from migration.

Future trends in Europe are likely to be zero population growth leading to slower growth in demand, growing interest from consumers in the production and health aspects of food and consumers' demand for more value and more personal service. All these factors should lead to more social dialogue on human resource issues and an improvement in working conditions, the production of better-quality food, and an increase in niche markets. Improvements in working conditions, consumer protection and product information will probably increase costs for businesses. Small businesses will probably be the most affected because these changes encourage consolidation.

In recent years, there have been several unexpected events that have affected the hotel and catering industry, such as global climatic change, the 9/11 terrorist attacks, the invasion of Iraq in 2003, the outbreak of SARS, the foot and mouth epidemic in the UK and the bombings in Madrid and London. For example, in the wake of the 9/11 attacks, turnover growth in the hotel and catering sector slowed from between 4% and 4.5% per year before the attacks to about 1.5% per year afterwards. Turnover growth started to pick up in 2004 as consumer confidence was restored and US visitor numbers to Europe started to recover. Employment growth also slowed following the 9/11 attacks and, despite picking up in 2003, it continued its downward trend in 2004. The sector, as a whole, is likely to have suffered from the economic recession in Europe in 2009-10, as it often depends on discretionary expenditure by consumers.

In conclusion, the HoReCa industry remains dominated by small, family-owned and run restaurants, bars and hotels, despite the presence of some large multi-national chains. The business environment has increasingly favoured larger businesses that can generate economies of scale in relation to issues such as human resources, regulatory compliance, the application of technology, as well as procurement. After rapid growth up to the turn of the century the travel and catering industry has experienced slower growth in the 21<sup>st</sup> Century due to significant one-off events - perceived by consumers to be becoming more frequent - and more recently the impact of economic recession. All these factors tend to point towards greater consolidation in this sector.

### *The HoReCa distribution channel*

The HoReCa sector is generally described as an homogenous market sector, but its commercial activities present very different logistics and organisational constraints according to the specific service offered to the final consumers. In general terms, HoReCa distribution channels are characterised by unpredictability, which can mean that businesses maintain significant stocks but also means that just-in-time supplies are often required. Orders are generally very small and deliveries are often required on a JIT basis, which leads to frequent (and inefficient) deliveries; in Spain, for example, manufacturers for this sector have indicated that the small order size and the high frequency of deliveries to the HoReCa sector leads to costs that are four times the cost of deliveries to the retail sector. Nevertheless, the larger "organized" HoReCa businesses, such as the large hotel and restaurant chains, are more likely to be able to enjoy economies of scale that result in more centralised procurement and more consolidated and less frequent deliveries.

### 3.5 Construction

The construction industry builds or assembles buildings and infrastructure and, within urban areas, construction activity is mainly related to the construction of residential and commercial properties such as offices and shopping centres. The activity is project-based, with resources being applied in specific locations for finite periods of time to secure very specific objectives. The vast majority of construction projects in urban areas are relatively small-scale, involving for example the renovation of individual residential properties, but they can also be very large-scale and complex projects involving the construction of office blocks and shopping centres or even the redevelopment of whole sections of an urban area.

According to the European Construction Industry Federation, construction activity represents about 10% of Europe's GDP and directly employs 15 million people. It is a highly fragmented industry with 3 million enterprises in Europe, 95% of which are small and medium-sized enterprises employing fewer than 20 people.

In the context of UFT, construction activity involves the delivery of a wide range of materials to construction sites which can be located in already congested areas and in sensitive locations such as heritage city centres and pedestrianised zones and then the removal of waste materials for disposal. Industry organisations have accepted that historically construction logistics including the transport of materials to and from sites, are not always optimised, mainly due to the fragmented nature of the industry structure and the project-based nature of construction activity. This can lead to a relatively high proportion of lorries either empty or with part-loads, lorries having to wait to gain access to construction sites in urban areas or to be unloaded and significant amounts of waste materials that have to be removed by lorries from construction sites.

Some observers have suggested that improved construction logistics can save 10-30% of project costs. The larger construction enterprises that are most likely to be responsible for large-scale projects in urban areas have been focusing on improved project design and planning, consolidation of inbound loads, reduction of waste and reverse logistics in order to reduce costs and reduce the freight transport externalities involved in construction activity.

### 3.6 Waste

#### *Introduction*

An important market segment of UFT is municipal waste collection, which is increasingly carried out by private companies under contract to municipalities as part of wider waste management contracts. The waste management sector as a whole (solid waste management and recycling activities) is a major employer with an estimated 1.45 million people employed in the sector in Europe in 2000.

Municipal waste, defined as household waste and similar commercial, industrial and institutional wastes, includes three main groups according to the relevant European legislation:

- separately collected fractions: paper and cardboard, glass, plastics, metals, wood, organic kitchen waste, edible oil and fat, clothes, batteries, etc.;
- garden and park wastes: compostable waste, soil and stones, other non-compostable waste;
- other municipal wastes: mixed municipal waste, waste from markets, street cleaning residues, septic tank sludge.

The municipal waste produced in the EU in 2008 amounted to 259 million tons (520 kg per head), about 10% of the total waste produced<sup>4</sup>. In the two-year period between 2006 and 2008 there was a decrease of 4.3% in the number of tonnes of waste of all kinds produced, but an increase of 0.5% in the number of tonnes of municipal waste. The different consumption behaviours in the Member States vary significantly from 305 kg per head in the Czech Republic to 830kg in Denmark. In general, most of the Eastern European countries produced less than 400 kg of waste per capita, while most of the Western European countries produced between 500 kg and 700 kg of waste per head.

### *Key trends*

The main issues in the waste management sector relate to the disposal of municipal waste in a sustainable manner at a time when waste production per head is increasing. Compared to this overriding issue, the transport issues related to the removal of municipal waste from urban areas is much less significant.

The main drivers for change in this sector are therefore related to policy and EU legislation and the EU is increasingly requiring the development of waste policies based on waste reduction, maximisation of recovery and safe disposal to reduce the environmental impacts of municipal waste. Directive 2008/98/EC sets out measures to prevent or at least reduce the negative impacts on environment and human health relating to waste production and management, as well as to reduce and make more efficient resource use. It establishes the waste management hierarchy to be applied in waste prevention and management legislation and policy (prevention; preparing for re-use; recycling; other recovery; disposal). It also obliges Member States to draw up waste management plans and sets a number of targets to be achieved in the future.

The legislation places the emphasis on the need to efficiently treat waste. In 2009 20% of municipal waste was incinerated and used to generate energy, 24% was recycled into products and materials, 18% was recycled in other ways such as composting and 38% was taken to landfill. In general, the amount of recycled waste in the EU27 countries has increased, even if the proportion of recycled waste varies significantly from country to country from more than 60% (Austria, Germany, the Netherlands and Belgium) to less than 10% (Slovakia, Latvia, Czech Republic, Lithuania, Malta) with an average of 30%. In some countries, such as Romania and Bulgaria, the recycling rate is practically zero.

Likely future trends in municipal solid waste developments have been identified in a study entitled “Projections of Municipal Waste Management and Greenhouse Gases” published in August 2011 by

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<sup>4</sup> The source of the data on waste generation, municipal waste, and waste packaging is the Eurostat online database (<http://epp.eurostat.ec.europa.eu/portal/page/portal/environment/data/database>). The online codes are env\_wasgen, env\_wasmun, and env\_waspac.



the European Topic Centre on Sustainable Consumption and Production. Based on a “business as usual” scenario, the amount of waste generated in Europe (EU excluding Cyprus, plus Switzerland and Norway) by 2020 will be 558 kg, but the landfill rate will decline from 40% in 2007 to 28% in 2020 as a greater proportion of waste is recovered. However, full implementation of the EU Landfill Directive would further reduce the amount of waste put to landfill.

### *The household waste distribution channel*

City authorities or other public bodies generally have the legal responsibility for collecting household waste and they either operate their own companies (municipal firms) or they put the service out to tender to private companies. The collection of recyclable waste is mostly performed by private companies. The size of the private companies in the waste business varies from the small companies of local importance to large companies active throughout Europe. The free market encourages merging of companies, since larger companies have in general competitive advantages.

Like other public service sectors, liberalisation has been introduced in the European waste industry sector by, for example, privatising municipal disposal firms and opening up the markets in Central and Eastern Europe. In some countries like Great Britain and the Netherlands private companies are gaining an increasing share of the waste disposal market.

Waste collection and transport are specific tasks of municipal waste management and their optimisation can make a significant contribution to the sustainability of cities by, for example, improving traffic flows through optimised fleet management and routing, by minimising environmental impacts (e.g. noise and pollutant emissions) and by improving access to waste disposal facilities (e.g. collecting points).

## **3.7 Conclusion**

The freight industry is generally most efficient in terms of load factors and routing and number of deliveries to individual receivers of freight when economies of scale are available to larger operators. For this reason, as a general rule, large-scale retail distribution and courier/express services tend to be more efficient than very fragmented distribution services to small retailers and in the HoReCa sector where just-in-time deliveries are more prevalent. B2C e-commerce is probably leading to the fragmentation of purchases and an increasing number of UFT movements to deliver parcels to residential areas and offices. Measures that contribute to the consolidation of freight transport activity and/or greater cooperation (while respecting competition rules) between transport operators and their customers in urban areas should lead therefore to more sustainable UFT.

## 4 REVIEW OF EXISTING MEASURES & PRACTICES

### 4.1 Introduction

This chapter provides a review of measures and practices that are employed mainly at a local level to redress the balance between social cost and social benefit from UFT. In theoretical terms the common objective of these measures is essentially the internalisation of the external cost of private activities (balancing the marginal private benefit to the marginal social cost) or at least the maximisation of the positive effects of UFT while minimising its negative externalities.

We have also sought to provide in this chapter some views on what we would regard as “best practice” measures to secure more sustainable urban distribution, while accepting that the individual mix of measures in any particular urban area needs to be designed at a local level within the specific economic, social and political context to meet specific local needs and issues.

The list of individual measures that have been implemented or piloted in Europe is quite extensive. In this chapter of the report we offer a classification of these measures and practices according to the following categories:

- Regulatory measures;
- Market-based measures;
- Land use planning measures;
- Infrastructure measures;
- New technologies;
- Management and other measures.

Despite this categorisation, which is in our opinion a useful aid to further analysis, many practices and measures fall into one or more of the above categories and, where necessary, we have included them in the category which we believe is most appropriate because of its inherent characteristics. For example, the development of an Urban Consolidation Centre (UCC) could be considered to be an infrastructure measure where it involves the development of a new distribution centre and it could also be seen as a land use planning measure if land required for a UCC is safeguarded from other uses; it could also be characterised as a technology measure where low or zero emission vehicles are operated from the UCC. Fiscal and regulatory measures can stimulate the use of UCCs, where, for example, a congestion charge increases the cost for each delivery in an urban area or only zero/low emission vehicles operating from a UCC are allowed to access a city centre at certain times of the day. However, we have chosen to include UCCs in “management and other measures” because their success or failure is ultimately based on the ability of logistics companies to market and operate a freight transport service that meets the needs of its customers at a competitive price.

In Table 2, some examples of the different measures that are implemented are shown for each category, whether they are direct (they deal directly with the underlying external cost) or indirect (they deal with the causes of the external impacts). An example of a direct measure is one that reduces vehicle emissions linked to UFT, while an example of an indirect measure is where the use of old or pre-Euro standard vehicles is banned from an urban area. These measures are then further sub-

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divided according to the direct objective towards which they are directed: the vehicle, the fuel or the traffic situation.

Generally speaking, it can be said that while the first four categories of measures outlined above are implemented by public authorities (indeed they represent the so-called “direct intervention approach” of public authorities), the final two categories are generally implemented directly by the private sector or are the result of incentives from public authorities to change the behaviour of private stakeholders in UFT. In particular, the literature refers to a top-down or a bottom up approach to the promotion and implementation of UFT measures specifically to underline the fact that some of them are promoted (or, at least, imposed) and implemented by public actors while others are implemented directly by private actors.

**Table 2. Classification of UFT measures & practices**

Category	Type	Vehicle	Fuel	Traffic
<i>Market-based</i>	Direct	Emissions tax		
	Indirect	Tradeable permits Differential vehicle taxation Tax allowances for new vehicles	Differential fuel taxation High fuels taxes	Subsidies for less-polluting vehicles or modes Congestion charges Parking charges Charges for truck access
<i>Regulation/ "Command and control"</i>	Direct	Emissions standards	Fuel composition Phasing out of high polluting fuels	Physical restraint of traffic (such as designated routes or pedestrian zones)
	Indirect	Compulsory inspection and maintenance of emissions control systems Mandatory use of low polluting vehicles Compulsory scrappage of old vehicles Volume or weight restraints on vehicle use	Fuel economy standards Speed limits	Time window Night-time delivery Bus lanes and other priorities
<i>Land use</i>	Indirect	Provide available loading/unloading zones (especially within or near premises) Create reserved parking areas Use of reserved zones (bus lanes, taxi zones) and private car parks		Zoning Relocation of freight generators (logistics or industrial activities, hypermarkets) according to urban renewal Infrastructure access to freight transport generators Parking management system
<i>Infrastructure</i>	Indirect			New transport infrastructure (e.g. increasing the road network, rail and waterway connections, underground and tram systems) Transshipment or intermodal centre Urban consolidation centres Collection points Nearby delivery zones

Category	Type	Vehicle	Fuel	Traffic
<i>New technologies</i>	Direct	Develop new vehicles (such as electrical vehicles)  Install equipment on the vehicles that allow the monitoring of emission parameters	Alternative fuels (bio-fuel, CNG, LPG, etc.)	
	Indirect	Identification system for access control  Adopt IT technologies to improve the VRS of vehicles		Real time traffic information  Identification systems for access control  On line load /unload zone reservations
<i>Management and other policies</i>	Indirect	Incentives to increase the load factor  Promotion of driver training courses  Regulate driver working time limits		Foster consolidation strategies and freight carrier cooperation  Outsourcing of logistics activities  Create city logistics forum  Combining goods traffic with passenger ones  Foster intermodality and use of alternative modes of transport (e.g. tramway, underground)

Source: elaboration from Button (1993), Whiteing et al. (2003); Munuzuri et al. (2005); Ogden (1992).

The following sections describe in more detail each of the categories of measure and practice.

## 4.2 Regulatory measures

### *Introduction*

Regulatory (or “command and control”) measures are essentially a package of rules and prohibitions, supported by a control/enforcement system, that are designed to control private activity for the wider benefit of society. They are easier to implement and also have a higher degree of acceptability among all stakeholders compared with, for example, market-based measures due to their more traditional nature and apparent equity, but they require an accurate enforcement system to prevent possible infractions.

In general these measures are not compulsory for freight traffic only but they apply to all traffic within a city (such as speed limits, parking restrictions, one-way streets, etc.). However, there are specific measures that directly relate to freight traffic, such as:

- Time-based restrictions on access for freight vehicles;
- Volume or weight restrictions on access for freight vehicles;
- Emissions-based restrictions on access for freight vehicles;

- Mandatory use of low or zero emission freight vehicles;
- Encouraging use of third party UFT services rather than using own account vehicles;
- Regulations for loading and unloading freight vehicles.

These regulatory or command and control measures, which are the most common and “traditional” form of measure introduced by city authorities to regulate freight transport activity in urban areas, are considered in turn below.

Most regulatory measures are implemented by introducing some degree of differentiation between the vehicles affected and this differentiation is increasingly implemented by city authorities in the context of UFT, particularly in an attempt to promote sustainable distribution. The literature has provided a conceptual framework for differentiation, which is introduced for two reasons: firstly, to create incentives for “virtuous” behavior and, secondly, to take into account the special needs of specific categories of vehicles. Differentiation comes in various forms, but there can, for example, be exemptions from prohibition measures. Finally, prioritisation measures can apply to specific categories of vehicles only.

Differentiation to create incentives to change the composition of the vehicle fleet in operation in urban areas includes the following:

- Differentiation based on vehicle size aims at creating incentives to switch to smaller vehicles that occupy less space and are less intimidating. Regulation on vehicle size can be based on vehicle weight (usually measured by the permissible maximum laden weight), vehicle length, vehicle width, vehicle area (length times width) and number of axles. Although this form of differentiation is widely used, it might lead to more trips being performed by smaller vehicles and hence total higher fuel consumption and emissions of pollutants, as well as lower overall logistics efficiency in terms of cost/tonne or tonne-km.
- Differentiation based on type of operation aims at creating incentives to switch from own account to third party freight transport services. The presumption here is that third party service providers are more efficient and reduce the occupation of parking spaces in areas where there is a shortage of parking (because own account operators are more likely to park their vehicles on-street in urban areas close to their business premises).
- Differentiation based on the environmental performance of the vehicles aims at creating incentives to use less polluting vehicles or even to renew the vehicle fleet. Regulation can be based on type of propulsion, on emission class and on vehicle age. The propulsion type distinguishes between petrol, diesel, electric, CNG, liquefied petroleum gas (LPG) and hybrid (electric and fossil fuel propulsion). Electric and CNG propulsion have the additional virtue that there is no generation of heavy vehicles traffic (tanker lorries) to supply filling stations. The emission class can be derived from the Euro class based on existing Euro standards, which set limits for exhaust emissions from diesel vehicles.
- Differentiation based on the requirement of a minimum load factor. Here the aim is to create incentives to increase the load factor, which is beneficial in terms of efficiency. However the implementation of the differentiation on load factor faces a number of challenges as demonstrated by the experiences in, for example, Gothenburg (see Case Study 5 on Gothenburg).

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- Differentiation relating to vehicles carrying out distribution services from UCCs. The aim is to encourage the use by private operators of the UCC and to obtain efficiency gains in terms of higher load factors. These vehicles may, for example, be given exemptions from time-window access restrictions.
  - Differentiation that takes into account the special needs of specific categories of vehicles is based on the type of good. In this case the aim is to avoid imposing constraints on the delivery of goods such as pharmaceuticals, perishable food and valuables. In addition, vehicles that are used for construction and maintenance activities might be left free from constraints, perhaps based on the issue of permits.

## CASE STUDY 1

### Ljubljana – a focus on regulation

#### *Introduction*

Ljubljana is the capital of Slovenia, with a population of around 270,000. The city consists of an attractive historic centre surrounded by more modern residential, retail and industrial areas. The economy of Ljubljana is mainly based on the service sector as it is a major administrative centre, with significant retail and HoReCa activity in the centre of the city, as well as a university. There is some light industrial activity on the outskirts of the city, particularly to the North East of the city centre, but many former industrial areas are gradually being redeveloped for office accommodation. A pedestrianised zone has been implemented in the historic centre to provide an attractive environment for tourists, visitors and residents and this has gradually expanded in size.

Given the main economic activities conducted in the centre of Ljubljana in the pedestrianised areas, the main cargo commodities delivered into the centre are likely to be ambient retail goods to the shops and food and beverage supplies to the cafés and restaurants (ambient, chilled and frozen).

Most deliveries into the historic centre are likely to be carried out using vehicles operated directly by wholesalers and suppliers to catering/retail outlets (i.e. in-house operation) or by their contracted haulage carriers.

#### *Existing UFT issues and measures*

The main issues relating to UFT in Ljubljana are the need to ensure that deliveries are carried out at times that do not conflict with movements of tourists and shoppers within the pedestrian zone and air quality, with the city exceeding legal limits about 35 days a year. Transport generates about 30% of the relevant emissions and freight vehicles are estimated to generate some 42% of the PM emissions and 28% of the NO<sub>x</sub> emissions from transport.



*Photo: MDS Transmodal*

#### **Controlled access to the pedestrianised historic centre of Ljubljana during the time window**

Measures that have been implemented in relation to UFT in the city are as follows:

**Weight limits:** Vehicles exceeding 7.5 tonnes are not allowed within the inner ring road at peak times (06.30 to 09.00 and 14.00 to 17.00) and vehicles exceeding 3.5 tonnes cannot access the pedestrian zone in the centre of the city at any time.



**Time window:** Access for deliveries into the pedestrianised zones of the city is only between 06.00 and 09.30 to avoid conflicts with tourists, shoppers and residents.

**Loading and unloading bays:** 15 bays are available for freight vehicles in the city centre outside the pedestrian zone. Within the pedestrianised areas vehicles are able to park close to the receiving locations outside the time window because there is little or no conflict with other vehicles or pedestrians at that time of the day.

**Access charging:** Each LGV that wishes to access the pedestrian zone has to purchase an annual permit.



Photo: MDS Transmodal

### **Freight delivery outside the pedestrianised zone but within the inner ring road**

#### *On-going issues*

The major on-going issue in the city in relation to UFT is that the Municipality is aware that deliveries into the city centre could be more efficient as the freight vehicles are often only part-loaded. The city has therefore been considering whether it would be appropriate to implement a consolidation centre on the outskirts of the city with last mile deliveries by electric vehicles. The use of the consolidation centre could be incentivised by measures such as reducing the time window for existing unconsolidated deliveries. The city has, so far, carried out preparatory surveys and intends to develop a simulation model to provide an ex-ante evaluation of the impact of a consolidation centre on last mile deliveries in Ljubljana. Stakeholders will continue to be involved through a Freight Quality Partnership.

#### *Conclusion*

The city of Ljubljana has implemented traditional regulatory measures to protect its historic city centre and to provide an attractive environment for tourists, visitors and residents through the implementation of time windows and weight restrictions. The city is aware that existing last mile deliveries are often not optimized and is exploring the most appropriate means to increase efficiency.

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### *Time-based access restrictions*

There are two main types of time-based access restrictions for access to urban areas:

- Time windows for access to urban areas by road freight vehicles during the day;
- Restrictions on access to urban areas by road freight vehicles during the night.

#### Time windows during the day

Time windows are where access to specified urban areas is limited for freight vehicles to certain times of the day, such as between 07.00 and 09.00 in the morning and 18.00 and 20.00 in the evening. Time windows are therefore a measure that effectively bans freight vehicles from specific, usually quite limited, areas for a specified part of the day.

They are usually implemented to avoid conflict between pedestrians (whether residents or tourists/visitors) and freight vehicles that need to load and unload goods, but also to reduce road congestion and improve air quality if only in quite restricted areas. Time windows are particularly common in pedestrianised zones of urban areas of all kinds that have retail and heritage centres, where city authorities wish to maintain an attractive environment for shoppers and tourists. For this reason, access for passenger vehicles is also often restricted during the working day, often with exemptions for buses and taxis.

Time windows are quite common in the centres of European cities; examples include the Broadmead Shopping Centre in Bristol (UK), where, as a general rule, freight vehicles are only allowed access between 05.00 and 08.00 in the morning and between 18.00 and 20.00 in the evening to avoid conflicts with shoppers, but an exemption is provided for the vehicles operating from the shopping centre's urban consolidation centre (UCC). Freight vehicles can only enter the centre of Ferrara in Italy between 06.00 and 11.00 in the morning and 15.30 and 17.30 in the afternoon, but low emission vehicles can enter the city throughout the working day. In La Rochelle in France, freight vehicles can only access the city centre between 06.00 and 07.30 in the morning, with an exemption for vehicles operating to and from the city's UCC.

Time windows are effective in significantly reducing the circulation of freight vehicles in the restricted areas of city centres, assuming that enforcement is effective. Access is usually controlled by some form of physical barrier and/or number plate recognition cameras and can also be enforced by the police. Exemptions from time windows, as can be seen from the examples in Bristol, Ferrara and La Rochelle described above, are often used by city authorities to discriminate in favour of low/zero emission vehicles operating from UCCs.

Time windows are likely to increase the costs of distribution overall because of the need to deliver and collect all freight in the restricted area in a shorter space of time than would be possible if access was available at all times of day; the BESTUFS project quoted an example of a parcels delivery company that needed eight vehicles to make its deliveries in an urban area with a 4.5 hour time window per day, compared to only three vehicles if there was unrestricted access.

## Night time delivery regulations

Night time delivery restrictions are where deliveries by freight vehicles during the night in urban areas are either banned completely or closely regulated. These restrictions are usually implemented over quite extensive urban areas to avoid loading and unloading activities that might disturb the sleep of residents. Night time delivery restrictions are very common in urban areas throughout Europe, although the way in which they are applied can vary significantly depending on local contexts.

In England and Wales, for example, night time delivery restrictions are usually applied either:

- Under planning legislation when providing planning permission for a new development, such as a supermarket or shopping centre; the restrictions could be agreed on a voluntary basis between the city council (the planning authority) and the developer prior to permissions being provided, perhaps in order to remove objections from residents who live close to the site, or imposed as a condition of consent by the planning authority.
- Under environmental legislation through the city authority placing a noise abatement notice on a site; this can be put in place at any time under existing legal powers following complaints about noise at night.

As well as these regulations that are applied at the origins and destinations of freight journeys all over the country, there is also a regulatory scheme in London called the London Lorry Control Scheme that covers the city's road network.

### **The London Lorry Control Scheme: night time regulation of the road network**

The London Lorry Control Scheme requires all freight vehicles over 12 tonnes to use only certain exempted roads between 21.00 and 07.00 Monday to Friday and from 13.00 on Saturday to 07.00 on Monday morning. Any haulier that needs to use other roads can ask for a permit from the city authorities (in this case the London Councils), but the permit may require the trucks to use much less direct routes to avoid passing close to houses. This can lead to an increase in HGV kilometres and environmental emissions.

Whilst night time delivery regulations are likely to be effective in reducing the impact on residents from freight activity, there is increasing recognition from city authorities that night-time deliveries can reduce demand for scarce road network capacity during the day and operators can secure operational and cost efficiencies. Night-time deliveries are considered further in section 4.7 below.

## Conclusion on time-based access restrictions

Time windows for freight deliveries are likely to be required for Smaller Heritage Urban Areas and pedestrianised zones in Metropolises and Other Large Urban Zones in order to avoid conflicts between sensitive urban environments and tourists/residents on foot on the one hand and freight

vehicles on the other. However, they can lead to traffic congestion in peak hours and are likely to lead to poor utilisation of vehicles.

Where they are absolutely necessary, delivery time windows should therefore be made as wide as possible to facilitate economically efficient logistics and to avoid adding to road congestion in peak hours. In addition, the geographic area covered by delivery time windows should not be so large that it is not possible for deliveries to be made outside time windows using suitable cargo handling equipment to carry out safe deliveries in close proximity to pedestrians; this means, in turn, that loading/unloading areas should be provided close to the areas affected by the time windows to allow for deliveries outside time windows.

#### BEST PRACTICE RECOMMENDATION: TIME WINDOWS

Delivery time windows should be applied only in limited areas of city centres (e.g. pedestrianised zones) and made as wide as possible to facilitate economically efficient logistics and reduce congestion in peak hours, while not causing major conflicts with pedestrians. An adequate quantity of dedicated on-street loading/unloading bays for freight vehicles should be provided in reasonable proximity to the restricted areas to enable deliveries and collections to be made on foot at other times of the day.

#### *Volume- or weight-based access restrictions*

Volume or weight restrictions are where access to specified urban areas is restricted to freight vehicles under a certain weight or size. These are usually total bans that are introduced to protect road infrastructure that is not suitable for heavy or large vehicles due to physical constraints (e.g. a bridge which cannot support the weight of heavier vehicles or street that is too narrow to accommodate larger HGVs) or to protect a sensitive environment from physical damage (e.g. a medieval city centre). Due to their greater size and weight, the restrictions are inevitably mainly targeted at HGVs.

#### **Weight restrictions for HGVs in Prague**

Prague has two zones with weight restrictions for HGVs. The outer zone, which covers some 17km<sup>2</sup> only allows the circulation of vehicles under 6 tonnes, while the central part of the city (an area of 5km<sup>2</sup>) has a weight limit of 3.5 tonnes. Permits can be provided for HGVs to enter the regulated zones, related to construction activity for example, but the city authorities have seen an 85% reduction in HGV traffic in the central areas of the city since 1999 when the scheme was introduced, with a switch of traffic to the city's ring road.

Volume or weight restrictions are effective in significantly reducing the circulation of larger freight vehicles in the restricted areas of city centres, assuming that enforcement is effective. However, the restrictions have an economic cost to society in that transport operators are forced to adapt their

supply chains to use smaller vehicles, which is likely to be less efficient in economic terms if the load factors of the HGVs were reasonably high. Prague's experience was that operators started to use white vans to make deliveries in the restricted central areas of the city, which probably led to the splitting of loads.

#### Conclusion on volume- or weight-based access restrictions

Weight and vehicle size restrictions are essential to avoid the circulation of freight vehicles over a certain size or weight where they will cause damage to road infrastructure, damage the fabric of (perhaps historic) buildings or where freight vehicles will struggle to manoeuvre effectively and therefore cause road congestion. They also have the advantage of being relatively easy to understand for freight transport operators and easy to enforce. However, in the context of seeking to promote sustainable urban distribution blanket weight and vehicle size restrictions over wide areas, rather than for specific streets or small areas of a city, are often counter-productive as they tend to lead to a restructuring of the urban distribution fleet in favour of large numbers of smaller vehicles that contribute to greater congestion and environmental emissions; they can also contribute to the fragmentation of the supply of UFT, leading to sub-optimal logistics efficiency.

#### BEST PRACTICE RECOMMENDATION: VEHICLE WEIGHT & SIZE RESTRICTIONS

As a general rule, size and weight restrictions for road freight vehicles should only be applied in urban areas where larger vehicles would be unsafe or inappropriate (e.g. in narrow streets in heritage cities) to avoid the restructuring of the road freight transport fleet that serves a particular city in favour of larger numbers of smaller vehicles that contribute to greater road traffic congestion and environmental emissions and leading to the risk of sub-optimal efficiency in "last mile" distribution.

#### *Emissions-based access restrictions: Low Emission Zones*

Low Emissions Zones (LEZs) are where access to urban areas is limited to freight vehicles that meet certain emissions standards, such as Euro III or above, and are usually introduced in Metropolises or Other Larger Urban Areas where air quality is a particular concern. Access may be allowed for more polluting vehicles if the owner is prepared to pay a punitively high daily charge. LEZs are becoming increasingly common in major European cities as a practical means for city authorities to meet European air quality standards.

They are usually implemented to improve air quality in major metropolitan urban areas, with a focus on reducing Particulate Matter (PM) and Nitrogen Oxides (NO<sub>x</sub>) which are known to have a significant impact on the health of residents. A PwC/ISIS study in 2010 for the European Commission on Access Restrictions Schemes (ARS) reported that 91% of LEZs were introduced for environmental reasons, while 36% were also introduced to reduce road congestion and 18% for "other" reasons. In some cities LEZs specifically target freight vehicles because they are generally powered by diesel engines (i.e. they do not apply to older cars, vans and buses, even though these

may be more of an issue in air quality terms); 62% of the access restriction schemes examined in the PwC/ISIS study, covered both private vehicles and freight vehicles and 30% of schemes only targeted freight vehicles (compared to 8% that only targeted private vehicles).

LEZs are generally regarded as being effective in significantly improving air quality, which is the main reason for their introduction; where the LEZ is only applied to HGVs this beneficial impact may be more limited. The PwC/ISIS study concluded that: although information on outcomes from formal evaluations is quite limited, there are, "...consistently beneficial effects of...implementation in terms of traffic reduction, improving of air quality and overall performance of the urban transport systems."

#### **LEZ in Gothenburg**

An LEZ was originally introduced to improve air quality in Gothenburg in 1997 and was then extended to cover a larger area in 2007. All HGVs (over 3.5 tonnes gross laden weight) are required to meet Euro 4 emissions standards. The year after the extension of the LEZ some 96% of HGVs operating in the city centre met Euro 4 emissions standards and the city authority expects to reduce the amount of PM<sub>10</sub> by 1 tonne and of NO<sub>x</sub> by 40 tonnes each year between 2007 and 2013.

Adverse impacts of LEZs are that costs are likely to be increased for transport operators either because they replace their vehicles before the end of their economic lives or because they avoid the LEZ restriction by splitting loads and transporting them in smaller vehicles; these costs will be passed onto shippers and receivers and ultimately onto consumers. As with many regulatory measures, LEZs are also likely to distort the market by favouring larger transport operators that have greater financial resources; this should, however, provide wider economic benefits in the medium to long term as larger operators enjoy greater economies of scale, which will be passed onto their customers through market mechanisms.

A major issue which is highlighted in the PwC/ISIS study is the lack of harmonisation in LEZ schemes even within the same European region or country, which increases compliance and operational costs for UFT operators.

The ex ante demand simulation model for the city of Rome was used during the study to test the impact of introducing an LEZ in Rome which would ban all vehicles in 2012 which were not Euro 3 or higher from entering the city centre. In 2008 about 6% of vehicles were pre-Euro standard, 11% were Euro 1 or 2, 59% were Euro 3 and 24% were Euro 4. The modelling assumed that all vehicles of less than Euro 3 standard would be replaced by Euro 5 vehicles in 2012. The impact of such a measure would have the impacts set out in Table 3.

**Table 3. The modelled impact of implementing an LEZ for freight in Rome**

Air pollutants & GHG	Change 2012/08 (tonnes)	Change 2012/08
CO	-35.7	-47%
NO <sub>x</sub>	-5.1	-13%
PM <sub>2.5</sub>	-1.2	-23%
PM <sub>10</sub>	-1.2	-20%
CO <sub>2</sub>	-312.9	-2%

Source: University of Rome Tor Vergata/CTL

The results imply that the introduction of an LEZ in Rome, which would require the replacement of 17% of the fleet by modern vehicles, would lead to quite significant reductions in some air pollutants such as PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>x</sub> and carbon monoxide, but a relatively small impact in percentage terms on the amount of CO<sub>2</sub> (the main greenhouse gas).

### Conclusion on LEZs

Poor air quality is a major and urgent issue for many Metropolises and Other Large Urban Zones in Europe because of its impact on human health. In this context regulatory measures that reduce emissions of particulates are urgently required in the absence of, for example, a radical move away from diesel engines to the use of low and zero emission vehicles in urban areas.

Low Emission Zones (LEZs) are a means to reduce emissions from freight vehicles, based on the Euro engine standards, so that freight operators are encouraged to renew their fleets that operate in urban areas and reduce their emissions without affecting logistical efficiency. LEZs should not, however, only be applied to freight vehicles, as passenger cars are usually responsible for the greatest proportion of total emissions related to transport in urban areas. LEZs should also be harmonised as much as possible at a regional level in the larger Member States or at a national level in the smaller Member States to allow operators to use their fleets as flexibly as possible and to reduce compliance costs.

### BEST PRACTICE RECOMMENDATION: LOW EMISSION ZONES

Low Emission Zones are a way to reduce emissions from road vehicles circulating in urban areas and incentivize freight transport operators to modernize their fleets and adopt cleaner engine technologies. However, LEZs should be applied to both freight and passenger vehicles to maximise their effectiveness and the LEZs in regions or countries should as far as possible be harmonised so that road freight transport operators are able to deploy their fleets in a flexible way.

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### *Regulations for loading and unloading freight vehicles*

These are regulations that restrict the parking of freight vehicles on the public highway to certain locations and are closely linked to infrastructure measures that provide on-street parking spaces for freight vehicles (discussed in more detail below).

In all European cities vehicles are prohibited from parking on the public highway in some locations in order to allow a free flow of traffic or to maintain a vehicle-free environment. Loading and unloading may be permitted in certain locations at specified times of the day and some cities provide dedicated loading and unloading spaces for freight vehicles, reflecting the specific needs of freight vehicles. The measures are only likely to be effective if they are properly enforced.

The use of scarce on-street loading and unloading spaces has been used as a way of incentivising freight operators to achieve higher load factors and therefore secure more sustainable distribution in urban areas. Gothenburg has implemented a trial where certain spaces were developed and made available to operators that were supposed to achieve a load factor of at least 65%. There are, however, significant practical difficulties in monitoring the load factors of freight vehicles.

With the exception of such as schemes as those trialed in Gothenburg, parking regulations are relatively easy and cost-effective to plan and implement, but may require significant resources to enforce them. Enforcement has traditionally been carried out by municipal police and traffic wardens who patrol the streets and have powers to fine and/or have vehicles removed if they are illegally parked.

In many cities the parking regulations are complex, which can lead to illegal parking on the public highway by freight vehicles and the issue of fines. Significant issues are also created when parking rules are not adequately enforced, so that loading/unloading spaces that should be reserved for freight vehicles are occupied by private cars; this can force freight vehicles to double park, leading to additional road congestion and the issue of fines.

### *Harmonisation of regulations*

Regulations for freight vehicles should increasingly be harmonised across appropriate geographic zones, which could be at a national level for smaller countries or at a regional level for larger countries. This would allow freight transport operators and their customers to make long-term investments in vehicles and equipment that can be used flexibly at a regional or national level and therefore assist in the development of economies of scale for individual operators, which in turn will lead to greater logistical efficiency. Initiatives to move towards harmonisation of regulations affecting UFT have been pursued in the Netherlands at a national level and in the Emilia Romagna region of Italy, while in both cases respecting the right of individual municipalities to determine the most appropriate policies taking into account the local context. Where the relevant regulations affect the use of low and zero emission vehicles, the wider geographic scope of the regulatory framework should give the operators greater confidence to invest in fleets of electric or other low emission vehicles.



### BEST PRACTICE RECOMMENDATION: HARMONISATION OF REGULATIONS AT A REGIONAL OR NATIONAL LEVEL

Groups of city authorities should seek, wherever possible, to harmonise regulations of all kinds that affect UFT at a regional level (for the larger Member States) or national level (smaller Member States), in order to assist road freight transport operators to maximise the use of their vehicles and to adopt appropriate fleet procurement strategies for the future.

#### Conclusion on regulatory measures

A summary of the regulatory measures that could be regarded as “best practice” in terms of moving towards more sustainable UFT at a local level are provided in tabular form below, showing in general terms the impacts of the introduction of the regulatory measures, an indication of the likely value for money for the public sector, an indication of the extent to which the measure is transferable across the EU and the types of urban area for which the measures are most likely to be suitable.

The summary tends to suggest that most of the measures would have a positive impact on the economic efficiency of UFT in terms of both reduced costs and reduced environmental impacts. However, the introduction of LEZs tends on average to increase UFT operational costs and so needs to be justified more carefully by the public sector in terms of improved air quality and human health; harmonisation of regulations for LEZs at a regional or national level should help to mitigate some of the increased operational costs.

#### Summary of regulatory measures at a local level

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFERABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Extending time windows	Lower	Lower	Better	Lower	Neutral	Higher	Good	High	1, 2 & 3
Removal of vehicle size & weight restrictions over extensive areas	Lower	Lower	Better	Lower	Neutral	Neutral	Good	High	1, 2 & 3
Introduction of LEZ for all vehicles	Lower (but increased capital costs)	Neutral	Better	Lower	Neutral	Higher	Moderate/poor	High	1
Harmonisation of regulations at regional or national level	Lower	Neutral	None	None	Neutral	Neutral	Good	High	1,2,3 & 4

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area

### 4.3 Market-based or fiscal measures

#### *Introduction*

Fiscal measures such as taxes and tolls are usually defined as “market-based” measures because their aim is to “modify” the market prices of the goods or services whose production generates negative effects (or external costs). Changes in prices usually have a direct impact on the behaviour of the freight industry because it is highly competitive and so the individual freight operators have to respond to changes in their costs in order to remain competitive.

Market-based measures can be sub-divided into:

- Direct measures that are applied directly to the external cost produced, such as emissions taxed by an emissions charge;
- Indirect measures that relate to the causes of the external costs, such as charging for access to urban areas.

The European Commission has stressed the advantages of market based measures compared with regulatory measures due to their relative effectiveness and flexibility in implementation and their potential use by public authorities to raise funds. One of the key advantages of these measures is that, if they are carefully designed and effectively implemented, they provide effective price signals to private sector freight operators to adapt their behaviour and can be implemented independently of other measures. In this respect, a system of road pricing where external costs are internalized within the price of freight transport in urban areas (and beyond) on the basis of distance travelled, taking into account the type of road and the time of day is, in theory, the “perfect” measure to incentivize sustainable distribution in an urban context.

A disadvantage of this category of measure is that the schemes need to be correctly specified and they tend to encounter strong opposition from citizens and private operators that are affected; for example, the Freight Transport Association in the UK, supported by major retailers, lobbied Transport for London very strongly (if without success) to have freight movements exempted from the London Congestion Charge before it was introduced in 2003 on the grounds that freight movements were demand inelastic and therefore the charge would have no impact on the behaviour of the transport operators. However, the main disadvantage with these schemes is that they require considerable courage on the part of politicians when the electorate is being required to pay an additional charge to use the road network. For these reasons, economic theories originally put forward by Adam Smith to assist policy-makers on taxation policy suggest that any charges levied by city authorities or other public authorities in the context of UFT need to be:

- **Justified** by clear public policy objectives, evidenced by quantified externalities generated by freight activities that are directly related to the objectives, in order to change behaviour.
- **Equitable** between freight vehicles and other users of urban transport infrastructure.
- **Economic to collect** so that, even where the objective of the charge is not to raise public funds, the charges at least cover all the costs of collection.
- **Convenient** to pay for the freight operators, so they do not incur significant additional costs in administering and paying charges.

- **Certain** in terms of the amount and frequency of the charge so that transport operators can adopt appropriate strategies to minimize the charges they would have to pay.

Improvements in technology to collect charges, administer schemes and enforce payment, while not requiring toll booths that impede traffic flows, have helped to make the implementation of these schemes more efficient and cost effective.

### *Road pricing*

Road pricing is where a user of the road network is charged for the net external costs imposed on society by its use – the social cost of environmental emissions, road congestion, road construction and maintenance, accidents and noise that is not included in the market price of freight transport - while taking into account existing levels of relevant taxation. Road pricing therefore involves the internalisation of external costs, which has been and remains a core policy objective of the European Union. There are no examples of its application in a comprehensive way in any European city<sup>5</sup>, although a system of road pricing for freight has been introduced for the motorway network in Germany and Austria and will be introduced for freight vehicles on the motorway and trunk road network in France in 2013.

As freight transport operators have a less direct political voice than motorists in elections, and Member States also argue that road pricing is fair if it is applied to foreign HGVs as well as domestic operators, its application only for freight transport is more palatable politically. The best example of road pricing in Europe is the MAUT in Germany, which charges all freight vehicles according to the distance they travel and the emissions of the vehicle on the core road network; the scheme makes use of ICT to measure distances travelled and to charge the operators of the vehicles. France is introducing charges for HGVs in 2013 and the charging system will be applied to both the motorway network and other national roads. While these schemes are not being applied in urban areas, the technology is now available to extend it to the whole road network.

Road pricing could be introduced in urban areas, but any such policy initiative would need to be developed at a European level to ensure that it did not introduce additional barriers to the smooth functioning of the Single Market through an uncoordinated approach that lacked interoperability for freight operators between urban areas and between Member States of the EU. For this reason it is considered in more detail in Chapter 5, which focuses on recommendations for action at a European level.

### *Congestion charges*

Congestion charges are, as the name suggests, a market-based measure to charge road users for access to urban areas to encourage them to avoid “unnecessary” journeys and therefore reduce road congestion. However, the schemes usually also have secondary objectives such as improving air quality and reducing GHG emissions, which justifies the granting of exemptions or discounted charges to low and zero emission vehicles.

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<sup>5</sup> Although a system of road pricing has been implemented in Singapore since 1998, in a particular socio-economic and political context.

Only a few schemes of this kind have been implemented in Europe, including in Trondheim, Oslo, Milan and London.

### The London Congestion Charge

The scheme was introduced in 2003 and then extended to parts of West London in 2007 (before the western extension was removed in 2010 following the election of a new Mayor). Most HGVs are likely to pay £9 per day for access to the city centre between 07.00 and 18.00 on weekdays, which is the same charge as that levied on private cars.

The charge has to be paid every day that a freight vehicle passes into the Congestion Charge Area, which is clearly marked with street signs and road markings. The scheme is enforced using static cameras, so that number plates can be checked against a database of vehicles that have paid the charge. The charge can be paid in a number of ways either in advance or after the vehicle has entered the zone.

The scheme, which was introduced under the Mayor of London's existing legal powers, was designed to reduce levels of congestion in Central London, but Transport for London (the city's mobility agency) has reported that congestion has returned to pre-Charge levels because of a reduction in road space in Central London due to pedestrianisation schemes and road works. A secondary objective of the scheme is to raise funds for improvements to public transport; funds from the scheme are hypothecated for this purpose.



Photo: MDS Transmodal

#### Sign warning of entry into the London Congestion Charge zone

The charges are usually made when a vehicle passes a cordon and enters a particular area of the city centre. Charges can be levied every time the vehicle passes a cordon (as in Oslo) or on a daily basis (as in London). The basis for the level of the charge is not always clear, but is likely to be based mainly on the presumed elasticity of demand of road users. The level of charge for freight vehicles

can be greater than for private cars (justified by the greater amount of road space that a freight vehicle requires) or the same as a private car (as in London). The schemes are enforced either by toll barriers that require payment before access is possible (Oslo) or by the use of automatic number plate recognition cameras linked to an official database of vehicle registrations and a system of fines if the charge has not been paid (London).

### Conclusion on congestion charging

Congestion charging schemes are complex and expensive to implement for city authorities, can be very controversial politically and their impact on congestion levels and air quality does not appear to be clear. For these reasons the largest and most congested cities are most likely to introduce congestion charging schemes. However, depending on the level of charge, these schemes are likely to be effective in encouraging more efficient UFT as they can encourage increased load factors and the more efficient use of vehicles. This in itself is unlikely to make the adoption of a congestion charging scheme a preferred policy measure for most city authorities. In the long-run congestion charging would not be required if a system of road pricing was introduced.

### *Tradeable permits and mobility credits*

The mobility credits concept establishes the total amount of “acceptable” emissions within a specified zone of a city and then allocates them to economic operators such as retailers and occupiers of offices to “purchase” freight transport services that are not subject to additional access charges or restrictions. Where the credits have been used up, more credits can be purchased from the city authority or, if a market has been established, can be purchased from economic operators who have surplus credits. It therefore provides a financial incentive for the receivers of freight in city centres to analyse and carefully plan their deliveries to avoid exceeding their mobility credit budget. These schemes could be effective in changing the behaviour of the receivers of freight in city centres, but are likely to be difficult for city authorities to design and implement in a way that is seen as being equitable because of the practical difficulty of valuing and allocating mobility credits to different kinds of operator.

Such a scheme has been implemented in Genova (although the scheme has now been suspended) and has been considered for implementation in the centre of the city of Krakow.

## CASE STUDY 2

### Krakow: regulatory measures and trials of a mobility credits scheme

#### Introduction

Krakow is the second largest city in Poland, with a population of 750,000 and is located in the south of the country on the Vistula River. The historic centre of Krakow, located within an inner ring road, is the Old Town which includes the Market Square, one of the largest market squares in Europe, together with a network of narrow picturesque streets radiating from and surrounding the square. The Market Square itself includes several tourist attractions and a large number of pavement cafés/restaurants. The narrow streets surrounding the Market Square also accommodate cafés/restaurants together with hotels and boutique-style shops. The Old Town was recognised as a World Heritage Site by UNESCO in 1978 and the Market Square is a pedestrianised zone.

Since the fall of communism and Poland's entry into the EU, tourism has become an important contributor to the economy of Krakow and the city has become a major short break destination served by a number of low cost airlines. The main tourist attraction in the city itself is the Old Town in general and the Market Square in particular. The Old Town and Market Square provide an attractive and historic environment which is enjoyed by both tourists and city residents alike.



Photo: MDS Transmodal

#### The Market Square, Krakow Old Town, with sign indicating the time window for freight deliveries

Other major industries include the Tadeusz Sendzimir Steelworks, which is located close to the Nowa Huta district of Krakow. Krakow is also a major centre of education, with more than 10 University or similar level institutions offering courses in the city, with 170,000 students. There are a number of high-tech industries that have established their Polish HQs in Krakow and several major European retailers have established out of town retail establishments in the city (e.g. Carrefour, Ikea).

*Existing UFT issues and measures*

The main issues relating to Urban Freight Transport in Krakow are generally recognised as relating to deliveries into and collections from the Old Town and Market Square. The Municipality of Krakow has already introduced a number of restrictions on the deliveries of freight to the city centre (within the outer ring road) and the Old Town and Market Square (within the inner ring road) in order to protect the UNESCO World Heritage site and create an attractive environment for tourists and residents. The deliveries of goods are currently restricted to the following: time windows - 19.00 to 10.00 within the inner ring road (Old Town) and 23.00 to 10.00 in the Market Square; weight restrictions - the use of vehicles with a maximum weight of 7 tonnes within the outer ring road and 2.5 tonnes within the inner ring road.

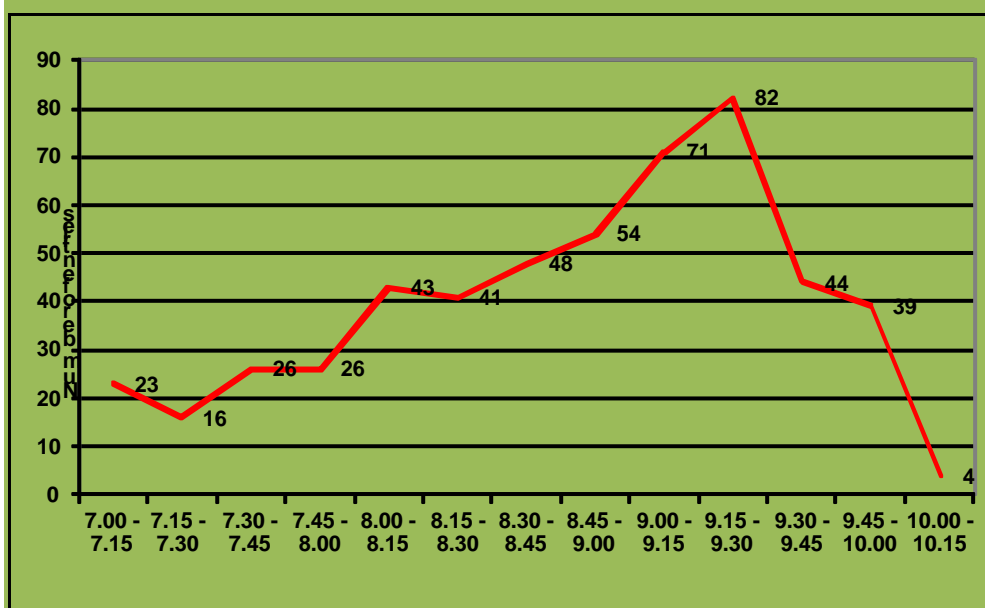
The main cargo commodities delivered into the Old Town are ambient retail goods for shops and food and beverage supplies to the cafés, restaurants and hotels (ambient, chilled and frozen). In addition, waste, empty packaging and goods that are returning to their suppliers (e.g. faulty goods) have to be collected from the Old Town (reverse logistics). Most deliveries into the Old Town are undertaken using vehicles operated directly by wholesalers and suppliers to catering/retail outlets (i.e. in-house operation) or by their 3rd party transport operators.

Dedicated loading and unloading bays for freight vehicles are provided at various locations on the Old Town's narrow streets. Some of these bays are located adjacent to some of the main delivery points and are dedicated to those particular establishments (such as major hotels), while general-use bays also provide locations for goods vehicles to park and unload, with the final delivery carried out on foot.

*On-going issues*

The main on-going problems and issues related to the delivery and collection of goods are generally agreed to be a combination of the following.

**1. Vehicle congestion** – in the Market Square and the narrow streets that surround it. The congestion results primarily from a significant peak in the number of goods vehicles entering the Old Town and Market Square during the delivery time window. A vehicle survey undertaken by the Municipality of Krakow in 2007 indicates that the peak for freight traffic in the Market Square occurs between the hours of 08.30 to 09.45, which also coincides with the main peak hours for commuters in cars.



**Goods vehicle entries into the Old Town** (source: Municipality of Krakow)

The volume of traffic entering the Old Town and the identified peak within the time window is greatly affected by the commercial arrangements which exist between the cafés/restaurants based in the Old Town and their wholesale suppliers. The competitive market which has developed means that a large number of wholesale suppliers are often delivering the same types of commodities to neighbouring cafés/restaurants. A single establishment may also receive deliveries from a number of different wholesale suppliers e.g. catering from one supplier, beverages from another wholesaler. Where neighbouring cafés do share common wholesale suppliers, they will often order deliveries for different days to keep their orders confidential. In brief, competition between neighbouring cafés/restaurants and between suppliers, combined with commercial confidentiality issues, has resulted in a lack of co-ordination between wholesale suppliers and deliveries, with higher numbers of part-loaded vehicles than would otherwise be the case were a more co-ordinated approach taken.

In addition, the café and restaurant establishments are open until the early hours of the morning. While they can, in theory, accept deliveries after 23.00 in the Market Square, this has generally been considered impractical because the cafés/restaurants do not want to receive deliveries when they are busy serving customers, staff will generally finish work as soon as the cafés/restaurants close and, in any event, the wholesale suppliers do not undertake night time deliveries. Consequently, many of the establishments do not have staff on-site and available to accept deliveries until around 08.30-09.00. A similar picture can be drawn for the retail outlets located in the Old Town, due to staff not being available to accept deliveries until 08.30-09.00. At the same time, the wholesalers need to make their deliveries before 10.00 due to the time window rules.



Photo: MDS Transmodal

### **Multiple deliveries being made to cafes and restaurants on the Market Square in the morning**

There is also **competition for parking spaces** with private cars within the Old Town during the morning peak. After accounting for the freight unloading bays, all the remaining suitable road space is occupied by private car parking and during the main peak period for goods deliveries, the freight unloading bays become fully occupied. As a result, goods vehicles can park illegally or in inappropriate locations, causing the narrow streets to become blocked.

**2. Visual/environmental impact of goods vehicles** delivering to the Old Town and Market Square, given that they are the main tourist destinations in the city, and for this reason the latter is a pedestrianised zone. As most of the goods vehicles make deliveries into the centre within a short timeframe the visual/environmental impact increases, yet protecting the historical heritage of Krakow and enhancing the environment for tourists are key priorities for the Municipality of Krakow given the economic importance of the tourism industry. However, as the



main visitor times to the Old Town and Market Square, for both tourists and city residents, is from mid-morning onwards (until around midnight-01.00), the impact of goods deliveries on the tourism industry may in practice be minimal.

**Noise and air quality issues** are also important, however they are considered less significant than the impact on congestion and the visual and environmental impact of freight deliveries. It is against this background that the Municipality of Krakow decided to investigate new UFT measures in the city.

#### *Policy response*

Given the above issues, the policy objectives of the Municipality in relation to UFT were to:

1. Reduce the total numbers of goods vehicles entering the Market Square - a target of reducing traffic entering the Market Square by 50% was identified by the Municipality;
2. Incentivise deliveries outside the 08.30-09.45 peak traffic times, thereby 'smoothing' the identified peak and reducing congestion; and
3. Encourage the use of more environmentally friendly vehicles, thereby reducing noise and improving air quality.

However, the range of policy responses that was possible in the Old Town was restricted by Polish road transport law which prohibits, in general, the direct charging for access to public highway infrastructure apart from certain sections of the Polish motorway network; as the Market Square is not officially classified as public highway infrastructure, some form of congestion charge would be possible for access to the square, but not for access to the Old Town as a whole.

A proposal for an out-of-town consolidation centre for hotel and catering supplies, originally suggested by the Municipality, was universally unpopular amongst relevant stakeholders. This would have seen all deliveries for the Old Town (regardless of supplier or customer) initially consolidated at a suitable location outside the city centre, with final transport into the centre undertaken by common haulage carriers. Another issue was that a suitable site for a consolidation centre close to the city centre could be not identified.

The proposed measure that was selected was based on the concept of '**mobility credits**'. Every trip into the Market Square would cost a certain number of 'credits', in effect a direct road user charge but using a 'virtual currency'. All vehicle operators would be entitled to a certain number of free credits for a fixed period of time. Once the credits had been spent for that period, additional credits would have to be purchased from the Municipality if further trips were required. Alternatively, by adopting more sustainable distribution systems, which would cost fewer or no 'credits', the additional costs would be avoided.

The basic principle of the measure is that environmentally friendly vehicles would be allowed to enter the Market Square outside the peak traffic period more often than conventional goods vehicles during the peak. Each month, a vehicle operator would be entitled to a certain number of free 'credits', the value of which would enable the equivalent of one trip per week into the Market Square during the identified peak traffic period using a petrol or diesel powered goods vehicle. Additional vehicle trips into the Market Square could take place by purchasing additional 'credits' from the Municipality or using more environmentally friendly vehicles outside the peak times.

A vehicle operator would be entitled to the equivalent of 30 free 'credits' per week, which would allow for one trip into the Market Square during a calendar week between 07.00 to 09.30 using a petrol or diesel powered vehicle. Assuming the operator undertakes such a trip, he would be left with zero 'credits' for that week and to undertake additional trips credits would need to be purchased from the Municipality. The operator could decide to undertake deliveries outside the peak traffic period, in which case he would be able to make two trips into the Market Square each week (i.e. 2 x 15 credits = 30 credits). Alternatively, the operator may decide to purchase LPG/CNG vehicles, thereby allowing up to 3 trips into the Market Square at peak times (i.e. 3 x 10 credits = 30 credits) or six trips between 23.00 and 07.00 (i.e. 6 x 5 credits = 30 credits). The use of electric vehicles outside the peak would not cost the operator any credits.

Essentially the measure attempts to change operator and receiver behaviour through a 'market' solution which imposes additional supply chain costs on existing delivery practices, thereby, in theory, incentivising the consolidation of loads or the purchase of more environmentally friendly vehicles by transport operators in order to remain competitive.

Underlining the proposed measure is the assumption that any additional costs incurred by the transport operators due to the requirement to purchase additional credits, would be passed on to receivers in the Market Square, the owners of the cafés and restaurants, through higher product prices. Consequently, the receivers would also want to avoid these extra costs, but at the same time maintain the flexibility of being able to have multiple deliveries each week. This would assist in meeting the identified aims of the measure by encouraging the receivers to contract wholesalers/suppliers that undertook deliveries outside the peak traffic period using environmentally friendly vehicles, to better co-ordinate deliveries and load sharing between operators and receivers and improved stockholding and procurement so that goods would be ordered only when absolutely required.

For the system to operate, some form of electronic monitoring of vehicle trips into the Market Square linked to an up-to-date database of vehicle registrations and operators would be required. Ideally, some form of ANPR (Automatic Number Plate Recognition) cameras would be used, which would identify the type of vehicle and operator when it entered the Square together with the time of entry. The necessary 'credits' would then be deducted from the operator's account or charges for additional 'credits' purchased automatically.

A 'simulation' of the measure was undertaken during two fortnight-long periods in late 2008 and Spring 2009. Due to the high costs of installing an ANPR system for these simulation periods, a manual recording method using hand-held monitoring/record devices was adopted. From this data collected over the fortnight-long periods, it was possible to calculate the credit values noted above and the costs to operators should the system be implemented (based on operating costs and fuel efficiency data obtained from a selection of operators).

Since the two-week simulation period in April 2009, the proposed measure has not progressed to full implementation and the proposed measure is on hold pending a political decision by the Municipality following lobbying from stakeholders who oppose the scheme.

### *Conclusion*

Krakow provides an example of the impact of time windows on UFT, which can result in concentrations of freight vehicles making deliveries at peak periods. It also provides an interesting example of an attempt to implement measures to incentivise greater load-sharing to reduce the number of part-loads and the use of environmentally sustainable vehicles through the development of a mobility credits scheme.

A mobility credit scheme is therefore a mixed measure, in that although it is mainly market-based as it seeks to provide financial incentives to change behaviour, it also involves the imposition of a maximum amount of emissions and a budget of credits to each economic operator by the city authority through regulation and is a management measure in that it seeks to change the behaviour of economic operators. Mobility credits schemes should, in theory, lead to more sustainable urban distribution and are potentially powerful in that they can focus on influencing demand behaviour (by influencing the behavior of the receivers of goods) rather than on the supply-side. In practice, however, they appear to be complex to design, are often not seen as being equitable by stakeholders and may be quite expensive to administer.

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## Subsidies

The opposite of taxation and tolls is the use of subsidies to encourage the development of sustainable urban distribution. The direct provision of subsidies by local authorities to operators is not widely used in the context of UFT because it is likely to be anti-competitive, may lead to state aid issues and is likely to be very expensive for city authorities. For these reasons indirect incentives, which provide cost advantages for the relevant private sector operators, are used to provide exemptions from regulatory provisions for behaviour that leads to sustainable urban distribution; examples include exemption from congestion charges for low and zero emission vehicles in London, allowing vehicles operating from UCCs to use priority lanes in Norwich and to enjoy wider time windows in Bristol and La Rochelle. In Utrecht, low and zero emission vehicles are exempt from time windows and are allowed to use priority lanes.

Subsidies have also been provided by the EU through the CIVITAS Programme, which has allowed city authorities to plan, implement and monitor innovative measures to promote sustainable urban distribution across Europe.

In the absence of full-scale implementation of road pricing in Europe, the use of indirect subsidies by city authorities is likely to be the most cost-effective way of incentivising transport operators and their customers to adopt sustainable distribution practices. Such policies as allowing low or zero emission vehicles, or vehicles operating from UCCs, to be exempt from time window restrictions or congestion charges (a policy of differentiation) is likely to be a more effective policy for city authorities than becoming involved in investing in UFT operations or infrastructure.

Indirect subsidies through differentiation can be used, for example, to provide incentives that encourage retailers and other economic operators located in city centres to employ third party UFT operators to provide freight transport services rather than to employ their own vehicles. This is usually for one or both of two reasons:

- Third party operators are specialist logistics operators and are therefore more focused on maximising the efficiency of their delivery runs by increasing average load factors, increasing the number of deliveries in a particular period of time and minimising the dwell times required, while own account operators tend to be less operationally efficient.
- Third party operators are more likely to have their depots outside city centres, whereas own account operators are more likely to park their vehicles on the street and take up scarce parking space.

In Rome, for example, the city council introduced measures in 2001 with the aim of increasing the use of third party UFT providers for deliveries in the city centre; exemptions from time window restrictions were provided to third party operators, allowing round the clock deliveries. Own account vehicles were only allowed access and parking in the city centre between 20.00 and 10.00 and between 14.00 and 16.00. Surveys of retailers in Rome indicate that in 1999 32% of them used own account vehicles to receive stock deliveries, while this figure had fallen to 20% in 2008.

### BEST PRACTICE RECOMMENDATION: USE OF INDIRECT SUBSIDIES TO ENCOURAGE SUSTAINABLE UFT

City authorities should seek to encourage the development of sustainable UFT through a policy of differentiation (i.e. indirect subsidies) for zero and low-emission vehicles or vehicles operating from UCCs or for the greater use of third party logistics providers, rather than through direct subsidies that are more likely to distort competition in the freight market to a significant extent. This can be achieved through exemptions from charges or regulations.

#### Conclusion on market-based measures

A summary of the market-based measures that could, at least in theory, contribute to more sustainable UFT at a local level are provided in tabular form below, showing in general terms the impacts of the introduction of the market-based measures, an indication of the likely value for money for the public sector and the extent to which the measure is transferable across the EU and the types of urban area for which the measures are most likely to be suitable.

#### Summary of market-based measures

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFERABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Congestion charging	Higher	Lower	Better	Lower	Neutral	Neutral	Moderate	Low/medium	1 & 2
Mobility credits	Neutral	Lower	Better	Lower	Neutral	Neutral	Moderate/poor	High	1, 2 & 3
Indirect subsidies to "virtuous" UFT operators via differentiation	Lower (for some operators)	Lower	Better	Lower	Neutral	Neutral	Good	High	1, 2 & 3

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area

Congestion charging can provide appropriate incentives to UFT operators to adopt sustainable urban distribution practices, but is most likely to be suitable for the largest and most congested cities due to the high costs of implementation for a city authority. Mobility credits schemes are of considerable interest because they focus on changing the behaviour of the receivers of goods (the demand-side) rather than on UFT operators, but appear to be difficult to design in a way that is seen as being equitable to all stakeholders; there are at present no on-going mobility credits schemes in place in Europe as Genova's scheme is suspended and the scheme in Krakow has only been trialed.

In the short- and medium-terms, the most suitable market-based measures are likely to be the use of differentiation to provide exemptions from regulatory provisions to UFT operators that adopt

sustainable urban distribution practices, such as using LEVs. The provision of these indirect subsidies encourages sustainable UFT, but should also be cost-effective for city authorities.

#### 4.4 Land use planning measures

##### *Introduction*

There is a two-way relationship between freight transport/logistics measures and land use planning measures where the latter relates to all interventions that change the use of space (at the local, regional or national level). In our opinion, the two types of measures should be integrated in order to maximise the overall benefits to society, although this can only be achieved with a consistent policy over a long period due to the time it takes to change existing land use patterns - which involves the change of use of land and buildings in private ownership.

##### *Zoning of activities*

The land use planning measures that have the most significant impact on UFT are those concerning the **zoning of economic and non-economic activities** as well as the relocation of freight traffic generators (such as logistics or industrial activities, hypermarkets, etc.) to non-urban locations. The concentration of, for example, commercial/retail activities might allow the rationalization of deliveries with positive benefits for the private sector operators as well as the whole community. For this reason, UCCs are often most likely to be commercially viable where they are associated with concentrations of retail activities in shopping centres; in the UK, almost all UCCs have been developed to serve concentrations of retail activity, such as the Broadmead Shopping Centre in Bristol, Regents Street in London, Heathrow Airport and the Meadowhall Shopping Centre in Sheffield, because the number of retail outlets is more likely to provide the necessary critical mass of traffic to justify the consolidation of loads. However, freight transport is only one of many issues that need to be taken into account in zoning economic activity; for example, while “out of town” shopping centres should lead to greater logistical efficiency they also lead to greater use of private cars on already congested road networks.

Zoning, when applied to urban logistics activities, can provide significant benefits because it concentrates activities in suitable locations on the outskirts of cities where there is sufficient land with good access to strategic routes and can help to reduce “logistics sprawl” that can be found on the peripheries of some European cities. The UFT operators can also benefit from the economies of scale that are available from shared facilities such as warehousing, HGV parking and (probably only for Metropolises and some Other Large Urban Zones) intermodal rail and waterborne freight facilities.

##### *Land use planning for modal integration*

One practical land use measure that is often not applied is the application of planning policies to encourage (or even require) the development of large-scale distribution parks on the edges of urban areas to be **connected to the rail and/or waterborne freight networks**. In the UK land use planning policies have effectively required developers of such sites to ensure that they are rail or water-linked

if the site is located in the “green belt” around an urban area. By requiring such modern distribution sites to be rail and/or waterborne connected the economics of long distance rail and waterborne freight are significantly improved because the fixed cost of transporting freight by road from a railhead or port/wharf is removed.

Another land use planning measure that is effective in supporting the development of sustainable urban distribution is the **safeguarding of sites** in urban areas for handling rail and waterborne freight against competing and more remunerative uses such as residential and office development.

#### **Safeguarding wharves on the River Thames in London**

The Greater London Authority (the planning authority in London) carried out a study of wharves along the River Thames to establish which should be safeguarded through the land use planning system from housing and office development because they have existing or potential use for the handling of freight. The recommendations from the report, which were based on an analysis of existing and potential freight markets, have given a high degree of protection through the planning system for many of the wharves so that they remain available for the handling of, for example, construction materials required for developments in the city.

#### *Conclusion on land-use planning measures*

City authorities should adopt an holistic approach to land use planning that takes into account the demand for UFT in terms of freight movements that are generated through planning decisions and the needs of the freight industry. Such an approach can be highly effective in the long term because it can have a sustained beneficial impact on the sustainability of UFT operations.

In particular, the developers of any new office or retail development in urban areas should be required to plan for freight activity, with the development of off-street loading/unloading bays for developments over a certain size. Cities should also make adequate provision for on-street loading/unloading bays in streets where off-street facilities are not available.

In Metropolises and Other Large Urban Zones it is likely to be appropriate to safeguard sites close to city centres that have access to rail and waterborne freight networks and to develop logistics zones on the outskirts of cities that combine warehousing, truck parking facilities and, in the case of the largest cities, intermodal rail freight terminals; zoning of these activities will lead to economies of scale and reduce “logistics sprawl”.

A summary of the land use planning measures that could be regarded as “best practice” in terms of moving towards more sustainable UFT at a local level are provided in tabular form below, showing in general terms the impacts of the introduction of the measures, an indication of the likely value for money for the public sector, an indication of the extent to which the measure is transferable across the EU and the types of urban area for which the measures are most likely to be suitable.

**Summary of land use planning measures**

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFER-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Zoning of retail & logistics activities to secure critical mass	Lower	Lower	Better	Lower	Lower	Neutral	Good	Moderate +	1, 2,3 & 4
New developments with off-street loading/unloading facilities	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1, 2,3 & 4
Safeguarding of rail-connected & water-connected sites for future use	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1 & 2
Requiring large-scale distribution sites to be rail & water-connected	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate +	1 & 2
* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area + (depends on local and national planning rules)									

The summary suggests that land use planning measures can be very powerful in the medium- to long-term in helping to develop sustainable urban distribution and are cost-effective for city authorities because, as a general rule, private sector developers would pay for the measures in return for development permissions. However, these measures require the development of consistent planning policies over long periods of time, within specific national and local contexts, to be effective. Planning measures to safeguard sites for, and then promote the development of, large-scale distribution sites with rail and/or waterborne connections are most likely to be appropriate for Metropolises and Larger Urban Zones because of the critical mass of traffic that is required to justify such facilities. These land use planning measures need to be fully integrated into Urban Logistics Plans, which are transport plans developed specifically for the freight sector (see section 4.7).

**BEST PRACTICE RECOMMENDATION: LAND USE PLANNING**

City authorities should adopt planning policies and rules that:

- Require the zoning of some commercial activities that generate UFT activity, including logistics activity, so that greater economies of scale can be achieved for UFT operators (while considering the impact also on passenger transport).
- Require new developments to make adequate provision for off-street loading/unloading facilities for freight vehicles.
- Safeguard sites in urban areas that can be used on a commercial basis for rail and waterborne freight transfer.
- Only allow large-scale distribution sites on the outskirts of Metropolises and Other Large Urban Areas if they are (or can easily be) connected to the rail and/or waterborne freight networks.
- Are fully integrated with Urban Logistics Plans.

## 4.5 Infrastructure measures

### *Introduction*

Infrastructure measures related to UFT, which are often integrated into land use planning measures, are the final category of measures usually implemented by public authorities. Due to the high cost of planning, implementing and maintaining transport infrastructure in urban areas and their perceived “public good” nature, the city authorities are often the only actors willing and able to fund their implementation. While infrastructure measures have a strong impact on UFT, they are more expensive to implement than market-based or command and control measures. Moreover they require time to reach a certain break-even point (particularly to achieve a critical mass of freight volume handled) in order to achieve the required results.

In relation to UFT infrastructure usually consists of:

- On-street loading and unloading spaces for freight vehicles;
- Facilities to secure modal shift from road to other modes (rail, underground, inland waterways).

Urban Consolidation Centres (UCCs) could also be considered to be infrastructure but, as they are usually based in private sector distribution buildings and their success or failure is generally based on commercial and management issues, they have been considered in more detail under Management and Other Measures (see section 4.7 below). In addition, Intelligent Transport Systems (ITS) will become an increasingly important element of the infrastructure of urban areas, particularly to help UFT operators to manage their operations more efficiently, but as ITS has a more technological focus it is considered in section 4.6 below.

### *On-street loading and unloading spaces*



Where private off-street loading and unloading spaces are not available, transport operators are forced to use on-street parking spaces. Where specified loading and unloading spaces are not available reasonably close to the final origin or destination the transport operators are forced to compete with other road users for on-street parking spaces, which can lead to illegal parking and increased road congestion.

In many European cities on-street loading and unloading is allowed in designated loading and unloading bays during delivery time windows, so that while freight vehicles may have to compete with each other for the use of the bays, they should not, in theory, have to compete with other road users if enforcement is effective.

Some cities, such as Bremen have introduced loading and unloading zones located close to final delivery destinations in city centres, which are exclusively available for low/zero emission vehicles. In Bremen, for example, the city has established an Environmental Loading Point (ELP) which is close to the pedestrianised central zone of the city; access to this loading area is only available to Euro 5 diesel vehicles or electric vehicles up to 8.5 metres in length and up to 7.5 tonnes gross vehicle weight. As well as the proximity of the ELP to the city centre, deliveries are allowed outside the usual delivery time window.



Photo: MDS Transmodal

#### **Designated loading bays in the centre of Chester**

The loading bays can be allocated to other road users outside delivery time windows, as in Chester where they can be used by disabled drivers/passengers between 10.30 and 16.30, while in other cities the loading bays are exclusively for the use of freight vehicles. Schemes such as those in Chester are low cost in that they only require road markings and signage.

In Barcelona there is a lack of off-street loading and unloading bays and the city authorities implemented a more ambitious scheme where road space is shared between bus lanes, loading/unloading activity and residents' parking according to the time of day. The infrastructure requirements involved road markings and variable message signs and cost €0.5 million per boulevard. The system of multi-purpose lanes was implemented on five wide boulevards in the city, where the lanes were used by buses in peak hours (08.00-10.00 and 17.00-21.00), but were exclusively available for the loading and unloading of freight between 10.00 and 17.00. Between 21.00 and 08.00 the five lanes are available for residents' parking.

In Paris the freight policy included in the city's Mobility Master Plan dedicates 15% of parking space to freight vehicles and the city has produced guidelines for its engineers on the design of its 10,000 on-street delivery spaces taking into account the size of the vehicles that will need to use them; between 2005 and 2009 the city's engineers had re-designed and implemented 50% of the city's on-street delivery spaces. In Paris, therefore, freight is seen as having specific loading and unloading needs which the city seeks to accommodate to maximise the efficiency of deliveries and minimise road congestion due to illegal parking of freight vehicles while making deliveries.

Where dedicated loading bays have been provided for freight vehicles, a charge could be levied on freight operators for their use, although this means that their availability would need to be enforced by the city authorities to ensure that private cars do not occupy them illegally. The charges would be justified because public space is being provided to a specific industry sector and the development of dedicated bays is also likely to involve some capital investment by city authorities.

#### **BEST PRACTICE RECOMMENDATION: ADEQUATE ON-STREET LOADING & UNLOADING BAYS**

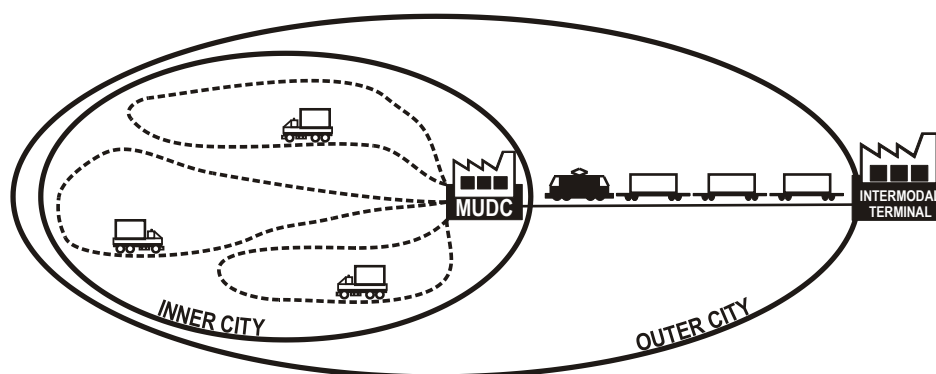
City authorities should ensure that freight vehicles are able to park legally on the street in order to make deliveries and collections and in reasonable proximity to origins and destinations of traffic. The requirements in each urban area will vary significantly, but in some cities where there is a shortage of on-street parking, a network of designated bays should be established and their dedicated use for freight vehicles should be enforced; city authorities could levy a charge on UFT operators for parking in these bays. Freight loading and unloading bays should be provided reasonably close to zones with time windows so that freight deliveries and collections can be made on foot inside the zones even when direct access for the vehicles is not possible.

## Rail freight

### Heavy rail

The use of goods yards located in city centres made rail a significant element of UFT in the past. However, the role of rail in UFT has been declining. Competition from road transport, in the light of its greater flexibility and ability to offer a door-to-door service, has been the main reason for the overall decline of rail market share. Recent years have seen a trend for discontinuation of single wagon load services as rail service operators, especially the market incumbents in each Member State, have given preference to the supply of block trains. The decline in the number single wagon load services, which are perceived as inefficient by providers in comparison with block-trains, should be seen alongside the closure of rail terminals in urban areas as there is stiff competition for land from other uses. Competition with passenger services for line capacity into and out of urban areas is an additional barrier to greater use of rail for UFT.

A few experiences in European cities have demonstrated that rail can still play a role in freight distribution and innovative schemes have centred around the use of rail for the urban penetration leg. Goods are consolidated in a centre located outside the urban area, are transported from this on shuttle trains to a distribution centre located inside the central area of the city (multi-modal urban distribution centres - MUDC), and are finally transferred from rail to low-emission road vehicles to reach their final destination. By reducing the number of vehicle-kilometres travelled on the urban road network, such schemes have the potential to provide benefits mainly in terms of reduced road congestion and lower environmental impacts.



The experience of the Monoprix chain of stores in Paris is most notable. Wagons are loaded in the evening and are then moved by shuttle train to the Bercy terminal near the Gare de Lyon. The following morning the loads are transported to the final destination using LNG (liquid natural gas) powered vehicles. The freight is handled on pallets and consists of textiles, beauty products and soft drinks. It has been demonstrated that the scheme, introduced in 2007 and currently operating on a permanent basis, provides environmental benefits. Other evaluations carried out for a proposed scheme in the city of Rome show the achievement of environmental and energy benefits due to the combined use of rail with LEVs for final deliveries.

However, the Monoprix scheme is not commercially viable from the operators' point of view in current market conditions even if managers at SAMADA, the Monoprix logistics subsidiary, state that the scheme may give them competitive advantage in the future, as it is expected that the implementation of the French road pricing policy for trucks will significantly increase the cost of the road mode (see Case Study 3 below).

### Light rail & underground systems

Another alternative to road-based distribution is the use of tramways. It was common at the beginning of the 20<sup>th</sup> century to use tramways to transport goods within city centres such as Vienna, but today its use is insignificant despite the fact that the freight services can be based on the use of the existing light rail network infrastructure.

Tramways are, however, used for freight transport in Zurich and Dresden. In Zurich since 2003 the Cargotram has provided waste disposal service for bulky refuse around the city. In 2006, following the success of Cargotram, an E-tram has been introduced to provide a waste disposal service for electrical and electronic goods. In Dresden, cargo trams have since 2001 connected a logistics centre and a car plant (to transport components) to avoid intense lorry traffic within the city.

A few cities are thinking of re-activating services that use tramways to distribute goods in city centres. Vienna, for example, has carried out feasibility studies and operational tests. Investigations have included looking at the potential use of tramways to link a detergent manufacturer's production and logistics facilities to provide a link between storage and customers for a beverage producer and a large bakery and to supply inner city supermarkets. In Paris, APUR (the planning agency) and RATP (the mobility agency) are currently investigating the technical and commercial feasibility of a freight service which would be operational by 2013.

## CASE STUDY 3

### Paris: Planning for the use of non-road modes

#### *Introduction*

The City of Paris has adopted several policies to promote sustainable UFT through, for example, the development of a network of on-street loading and unloading spaces that have been designed following guidance that was developed specifically for the needs of the freight industry. The city has also introduced regulations to limit access for articulated freight vehicles into central Paris between 07.00 and 22.00 (with the exception of car transporters). The city is also considering whether it should introduce a Low Emission Zone for freight vehicles, based on meeting European emissions standards, but no final decisions have been reached.



Photo: MDS Transmodal

### Delivery from dedicated on-street unloading space

#### Measures relating to non-road modes

The city authorities have safeguarded sites that have access to the rail network and the River Seine for use as logistics sites in the future and a number of non-road schemes have been developed by the public and private sector bodies in partnership. The city has established “urban logistics spaces” in the centre of Paris by renting space in underground car parks to logistics operators, but is also beginning to look at the concept of locating urban logistics centres below new residential or retail centres in mixed use developments.

**Monoprix & Bercy:** Probably the most high-profile project has been the use of Paris Bercy station to receive trains at an inner city location for onward distribution by truck to the chain’s 90 Parisian stores. The service involves the use of a short-distance (30km one way) rail freight service using conventional wagons between a distribution centre at Combs la Ville and Paris Bercy where the cargo is transferred to a fleet of LNG delivery vehicles for “last mile” delivery. The scheme started in 2007 and the rail-based transport chain is 20-25% more expensive than the direct road transport chain, but Monoprix has persevered because the road haulage costs into central Paris are increasing year-on-year and the company is keen to support sustainable distribution wherever possible. One of the issues with the scheme has been the amount of noise that is generated by loading and unloading freight and marshalling the wagons because Bercy is close to residential areas. SNCF is studying how to reduce the noise levels through screening.

**Distripolis:** This is a GEODIS/SNCF initiative to build on the existing Monoprix service and develop the use of SNCF stations for the receipt of freight with “last mile” delivery of low weight parcels by tricycle or light electric vehicles, and larger shipments by Euro 5/Euro 6 or hybrid vehicles. The rail freight terminals are, apart from Paris Bercy, planned to be at Montparnasse, the Gare St Lazaire and the Gare de l’Est,

**Tramfret:** The city is also considering the use of its expanding tram network for freight and is working with Carrefour and Casino to look at the potential for dedicated freight trams that would transport freight from a distribution centre to inner city stores located close to the tram route, with direct connections into the supermarkets. In 2012 there are expected to be some trials using empty trams.

**Cars on the River Seine:** The transport of new cars into central Paris and used cars out on articulated car transporters has an exemption from the general access regulations, but the city is working with Compagnie Fluviale de Transport (CFT) to transport cars along the Seine to Quai Bercy and a demonstration was carried out in September 2011.



Photo: MDS Transmodal

#### **Transport of containers on the Seine**

**Use of Metro:** Initial studies are being carried out into the feasibility of using the underground system for transporting freight, probably during the night, to make maximum use of the existing infrastructure capacity.

Tramways offer advantages over road distribution by offering greater capacity (for example, in Vienna trams are up to 60 metres long), being zero emission and allowing better utilisation of inner city road infrastructure. Barriers to the greater use of trams for freight are practical issues relating to the loading and unloading of freight, but there are promising low-floor vehicle-based solutions; another is the cost of the vehicles and use of the tramway network. In addition, the tram networks are normally designed to link passenger origins and destinations rather than linking, for example, a distribution site with a city centre retail area.

Underground freight distribution is considered a potentially sustainable solution because it can reduce environmental, congestion and space problems. However, initiatives for studying this solution have never reached the demonstration phase. In Amsterdam, a study for incorporating freight transport in the existing metro system used for transporting passengers was carried out by the municipality and the local public transport company in the late 1990s but concerns about operational and maintenance issues stopped the initiative. A feasibility study was carried out in 2002 by the Royal Mail into the use of a narrow gauge underground freight railway under Central London for the transport of general freight, but the concept was found to be very unattractive commercially (with or without subsidy) because of the low volume of freight that could be transported over very short

distances at a very significant cost compared to road transport on the surface. RATP in Paris is considering a scheme to use the Metro underground network for the transport of freight.

### *Waterborne freight facilities*

Infrastructure for the loading and unloading of waterborne freight is often available in cities that have rivers or canals passing through them, although it is unusual for waterborne transport to be used for last mile deliveries because final origins and destinations are not generally located adjacent to waterborne freight facilities. Exceptions to this rule are found in cities such as Utrecht, where there are hotels and restaurants that are immediately adjacent to the city's canal system, so that an electrically powered "beer boat" can deliver beverages and catering products (ambient, chilled and frozen) from a distribution centre to the city centre.

As a general rule waterborne freight facilities are operated on a commercial basis and therefore the land on which they are located is in competition with more remunerative uses such as residential development. This means they often need to be safeguarded through the planning system (see the example of London in the Land Use Planning section above).

The major commodities that are likely to be handled on a commercial basis close to city centres are construction materials for development projects. However, there is potential for their use for higher value commodities if distribution parks are located adjacent to the wharves or terminals (probably located outside city centres to provide sufficient land) and there is an inland waterway link to a deep sea container port. In Belgium the port of Antwerp and the inland port of Brussels are collaborating to increase the amount of distribution space available adjacent to the port of Brussels, which would provide access to a hinterland of three million people. In Manchester the company that owns the Port of Liverpool is developing a distribution park close to Manchester called Port Salford; as in Belgium, the seaport will be linked to the inland port with its distribution facilities by barge services. There are also plans to increase the volumes of containerised freight transported on the Seine between the deep sea container port of Le Havre and Paris.

The following case study on Utrecht shows how a barge service can be operated effectively for last mile deliveries given very specific circumstances and how a private sector logistics operator with an existing critical mass of traffic for the city centre is able to use an electric vehicle for last mile deliveries on a commercial basis (assisted by indirect subsidies).

## CASE STUDY 4

### Utrecht: Innovation in last mile delivery

#### *Introduction*

Utrecht is the fourth largest city in the Netherlands, with a population of around 310,000 and is located 40km south of Amsterdam. The city of Utrecht consists of a historic centre surrounded by more modern residential, retail and industrial areas. Much of the historic centre of Utrecht is formed by a network of narrow picturesque streets, largely retaining the layout (and many buildings) from the Middle Ages. The narrow streets accommodate cafés/restaurants together with chain store retail outlets and boutique style shops. The suburban districts of the wider Utrecht municipality are served by more modern highway infrastructure capable of accommodating the large goods vehicles in an efficient manner.

The economy of Utrecht is predominantly based on the service sector, with a number of head offices of major institutions located in the city, a large convention centre and a number of higher educational establishments all providing employment and generating economic activity. The historic centre of Utrecht is also an important contributor to the city economy as a tourist destination and the retail activity and numerous cafés/restaurants in the centre attract tourists and city residents alike. There is a concentration of cafés and restaurants along Oudegracht (Old Canal), which passes through the historic centre of Utrecht. Oudegracht has a wharf/cellar complex below the main street level which lines the canal, while the buildings on the upper street level are mostly occupied by retail outlets. A pedestrianised zone has been implemented in the historic centre to provide an attractive environment for tourists, visitors and residents.



Photo: MDS Transmodal

#### **The wharf/cellar complex along the Oudegracht in Utrecht**

Given the main economic activities in the historic centre of Utrecht, the main cargo commodities delivered into the centre are ambient retail goods to the shops and food and beverage supplies to the cafés and restaurants.

The beverage supplies are packaged in bottles and beer kegs and so are relatively heavy and 'bulky' compared to other types of deliveries. Food and beverages are also generally delivered in roll cages. In addition, waste, empty packaging (e.g. empty beer kegs, bottle crates, roll-cages etc.) and goods being returned to their suppliers (e.g. faulty goods) have to be collected from the city centre. Most deliveries into the historic centre are



undertaken using vehicles operated directly by wholesalers and suppliers to catering/retail outlets (i.e. in-house operation) or by their contracted haulage carriers.

#### *Existing UFT issues and measures*

The main issues relating to UFT in Utrecht are generally related to deliveries into and collections from the historic centre, including establishments which line the Oudegracht, as the main suburban industrial and retail areas are generally well served by modern highway infrastructure that is more suited to handling large goods vehicles.

A package of measures as part of a wider action plan relating to the movement of freight in the city, has already been implemented by the Municipality of Utrecht. The action plan includes both infrastructure improvements and regulatory measures. In terms of deliveries into the historic centre, the action plan is designed to address three key issues identified by the Municipality: conservation of the historic city and enhancement of its environment, promoting accessibility to the centre and improving air quality.

Relevant measures from the action plan relating to Urban Freight Transport in the centre are as follows:

1. **Time, vehicle length and axle weight restrictions:** access for HGVs is only allowed between the hours of 06.00 to 11.30 and 18.00 to 19.00 and the maximum vehicle length is 9.0m to prohibit goods vehicle traffic during the main times when tourists and city residents are visiting the historic centre and to protect the historic features of the city from damage by large goods vehicles. Additionally, goods vehicles accessing buildings located on the streets which line the Oudegracht are further restricted to a maximum axle weight of 2.0 tonnes to protect the cellar/warehouse complex at canal level.
2. **Dedicated unloading bays for goods vehicles:** These are provided at various locations on the historic centre's narrow streets to allow goods vehicles to park while allowing other road traffic to pass freely (promoting accessibility). Deliveries to adjacent establishments are then undertaken on foot.
3. **Low Emission Zone:** To improve the air quality in the historic centre, a low emission zone was introduced in Utrecht in the city centre in July 2007. As a result of the scheme, within the centre of Utrecht only the following types of goods vehicles over 3.5 tonnes gross weight are permitted entry: those fitted with Euro 3 engines with diesel particulate filters and less than 8 years old or fitted with Euro 4 engines and above. From July 2013, only goods vehicles fitted with Euro 4 engines and above will be permitted entry to the zone. The restrictions are enforced using Automatic Number Plate Recognition (ANPR) cameras and violations result in a fine of €160.



Photo: MDS Transmodal

#### **Dedicated on-street loading bay in Utrecht city centre**

### On-going issues

Despite these measures there remain significant issues related to UFT in the centre of Utrecht. The main on-going issue in the centre of Utrecht relates to **vehicle congestion and goods vehicles blocking the narrow streets** of the historic centre, where it can take one to one and half hours to make a delivery. This is caused by the following factors:

1. There is a significant peak of goods vehicles entering the centre between 09.30 and 11.30 due to small- and medium-sized catering and retail outlets not having staff available to take deliveries before 09.30.
2. There are a large number of part-loaded vehicles entering the centre because many different suppliers are often delivering the same types of commodities to neighbouring establishments or their customers are using several different suppliers, each making deliveries in part-loaded vehicles.
3. As the roads in the city centre were not designed to be accessible by modern large goods vehicles, vehicles can sometimes block the narrow streets while undertaking deliveries. While this problem has been eliminated at some locations by the installation of loading bays, there are many other locations where such a solution has not been possible due to a lack of space or a requirement to protect historic features.

Another issue is the **visual/environmental impact of goods vehicles** making deliveries in the narrow streets of the historic centre, exacerbated by the short timeframe within which they are often carried out. This is important from the point of view of the Municipality in that protecting the historical heritage of Utrecht and enhancing the environment for tourists are key priorities for the city.



Photo: MDS Transmodal

### Delivery in central Utrecht, with vehicle blocking the street

**Deliveries to the Oudegracht are relatively inefficient** because of the weight limit that has to be applied and because of difficulty in accessing the canal-side establishments from the road level. The axle weight limit on the Oudegracht means that relatively heavy cargo, such as beer kegs, wine bottles and roll cages of food, have to be delivered to the street using multiple trips of large vans and therefore adds to the vehicle numbers entering the centre. Furthermore, access to the wharves and cellars along the Oudegracht from the main street level is via a

series of steep steps, which means that heavy goods have to be manually handled down the steps by delivery staff, leaving delivery vehicles parked on the roads lining the Oudegracht for longer periods of time than would otherwise be the case when delivering to an establishment at street level.

A further issue, not affecting the historic centre but residential areas (and the urban routes serving them), relates to the **deliveries of goods ordered on the internet**. Competition in the parcel courier sector between multiple operators means higher numbers of part-loaded vehicles (generally medium-sized goods vehicles up to 7.5 tonnes) are entering residential areas than would otherwise be the case were a more co-ordinated approach taken. Also, in many cases such goods cannot simply be posted into letter boxes due to their size. If residents are out at work, deliveries cannot be completed and the goods have to be returned to the depot of the parcel courier and re-delivery arranged. The need to undertake re-deliveries further compounds this problem.

#### *Public & private sector response*

The public and private sectors have sought to address the above issues by planning and implementing two new measures in recent years.

1. The **Beer-boat** is a specially adapted barge that operates on the Oudegracht and delivers beverages and catering supplies to the numerous cafés and restaurants which line the canal, thereby reducing the number of LGVs making deliveries at road level on the Oudegracht and allowing deliveries to be made direct from the barge at the level of the canal. The beer boat is electrically-powered but with a diesel auxiliary engine and is owned by the city of Utrecht. Its customers are major beverage suppliers and a catering wholesaler, which each rent the barge for half-day periods to make their deliveries (i.e. shared loads are not consolidated). The cost of the service for its customers is lower than using LGVs making multiple trips.



Photo: MDS Transmodal

#### **The Beer-boat making a delivery on the Oudegracht**

2. The **Cargohopper** is an electrically powered goods vehicle which since April 2009 has delivered light-weight ambient retail goods and parcels into the historic centre of Utrecht from a transfer site close to the city centre. It carries goods controlled by a single logistics operator, Hoek Transport, for that are delivered to a suburban warehouse located some 11km from the city centre; the goods are then delivered to a transfer site (a flat area of land off-street where goods can be transferred between vehicles) located some 300m from the start of the time window/length limit zone. The Cargohopper consists of an electrically powered 'tractor unit' hauling three trailers which are similar to those used at airports for transporting passenger luggage to/from aircraft. The total length of

the Cargohopper is 16.0m and it is 1.2m wide, with a maximum weight (including cargo) of 3.0 tonnes; it is powered by an electric motor. Apart from a grant towards solar panels that can top up the battery charge during the Summer, the Cargohopper has received no direct public subsidy but does receive some indirect support from not being subject to the time window and length restrictions and being able to use Bus Lanes. Between April 2009 and October 2010, Hoek Transport estimates that Cargohopper has made more than 12,000 deliveries of around 66,000 parcels/boxes. On that basis, it is estimated that Cargohopper undertook the work of approximately 16,500 conventional goods vehicle trips into central Utrecht. This equates to a reduction of 122,000 vehicle-km and 34 tonnes of carbon dioxide. The success of the concept is such that Hoek Transport is introducing a new Cargohopper with a higher speed and greater range, which will allow deliveries to be made to suburban locations as well as the city centre.



Photo: MDS Transmodal

### The Cargohopper in Utrecht

The City of Utrecht is considering implementing measures to reduce the number of vans and other goods vehicle movements in the city through two further measures:

1. **Merchandise Pick-up Points:** The combination of the increase in the amount of goods being purchased on the Internet, the number of failed deliveries to residential addresses and strong competition between parcel operators has led to much larger numbers of deliveries by only part-loaded LGVs and small HGVs in residential areas. The Municipality of Utrecht is therefore examining the potential that goods purchased on the Internet could instead be delivered to a number of collection points located at a variety of convenient locations, such as railway stations or Park and Ride car-parks. The Municipality is keen to launch a pilot scheme in the near future for Merchandise Pick-up Points targeted at both Internet purchases and city centre retailing.
2. **Consolidation:** The Municipality is also considering developing a consolidation centre to consolidate the loads of small to medium scale suppliers of fresh produce to city centre catering establishments (cafés and restaurants) i.e. those operators currently entering the city with mostly part-loaded vehicles. The measure is at an early stage of design, and it would be for the private sector to implement/operate, although facilitated by the Municipality.

### Conclusion

The city of Utrecht has implemented traditional regulatory measures to protect its historic city centre and to provide an attractive environment for tourists, visitors and residents through the implementation of time windows and length and weight restrictions. The city has, however, also implemented an innovative waterborne freight

solution to address a very specific UFT issue on the Oudegracht. The Cargohopper service has been developed with some indirect assistance from the public sector, but is otherwise an almost entirely private sector initiative that could be transferable to other cities.

### *Conclusion on infrastructure measures*

Rail, trams, inland waterways and underground systems are likely to have some role for the transport of freight for “last mile” delivery in some cities, but are likely to be successful only in niche markets. As a general rule road freight transport will remain the most important mode for these deliveries and collections in urban areas due to its inherent flexibility. For this reason there needs to be an increasing emphasis on providing cost-effective low and zero carbon technologies for road freight transport for city logistics rather than investing public funds in ambitious sustainable distribution schemes in cities unless there is a strong commercial and/or economic case.

Nevertheless, heavy rail can be very effective to transport freight over medium to long distances to urban logistics zones on the outskirts of Metropolises and Other Large Urban Zones, for subsequent “last mile” delivery by road. Inland waterways can play a similar role, particularly for construction materials and for high value freight where an urban area is linked directly by an inland waterway to international gateways such as sea ports.

#### **BEST PRACTICE RECOMMENDATION: USE OF NON-ROAD MODES FOR UFT**

City authorities should consider public investment schemes in UFT that involve non-road modes of transport on a case-by-case basis, but should generally focus on improving the efficiency and sustainability of road freight transport as non-road schemes for “last mile” deliveries are usually only commercially and/or economically viable in very specific circumstances.

A summary of the infrastructure measures that could be regarded as “best practice” in terms of moving towards more sustainable UFT at a local level are provided in tabular form below, showing in general terms the impacts of the introduction of the measures, an indication of the likely value for money for the public sector, an indication of the extent to which the measure is transferable across the EU and the types of urban area for which the measures are most likely to be suitable.

**Summary of infrastructure measures**

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSER-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Network of on-street designated loading & unloading bays	Lower	Lower	Better	Lower	Lower	Better	Moderate +	High	1, 2 & 3
Development of rail- and/or waterborne connected logistics zones	Lower	Lower	Better	Lower	Neutral	Neutral	Moderate ++	Good	1 & 2

\* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area  
 + (Good, if a charge is levied) ++ (if funded by public sector, not by developers)

The summary suggests that the development of a network of on-street loading and unloading spaces for freight (perhaps on a shared basis with other users) should provide significant economic benefits in terms of lower UFT operator costs and reduced congestion costs. If charges are levied on UFT operators for using the spaces then the infrastructure can provide good value for money in the long term for the city authorities. On the other hand, the development of facilities for non-road road modes should generally be focused on the development of large-scale rail and waterborne freight distribution parks on the outskirts of Metropolises and Other Large Urban Zones, rather than on non-road schemes for “last mile” distribution; the latter appear to offer a reduction in externalities from UFT, but are (except in very specific circumstances) unlikely to be economically viable and usually provide poor value for money.

**4.6 New technology**

*Vehicle technologies for UFT*

Introduction

While there are several technologies that have the potential to be used to make urban mobility (for both passengers and freight) ultra low or zero emission, four are being very actively investigated by automotive manufacturers:

- Electric;
- Hybrid electric-plug in;
- Hydrogen;
- Natural Gas.

Each of these technologies has advantages and disadvantages and has been in and out of fashion for several decades. **Electric powered vehicles** are the obvious choice and most car manufacturers are either producing or developing various types of electric powered vehicles (e.g. Nissan Leaf,

Vauxhall/Opel Ampera). Besides being zero emission (at point of use), electric vehicles are able to use the existing electrical supply infrastructure even if special re-charging points are required to provide immediate access. As well as their environmental benefits, electric vehicles have lower running costs than diesel vehicles, due both to lower fuel costs and, as there are fewer moving parts, lower maintenance costs. In the UK some electric freight vehicles can be charged in 4 hours and the charging technology is gradually improving.

Electric vehicles do, however, involve greater capital investment than diesel vehicles because significant manufacturing economies of scale have not yet been achieved as the market is limited in size. The range of the vehicles on a single battery charge is strongly influenced by the weather conditions (both cold and hot climates considerably reduce the vehicles' range) and the driving style and the range offered by existing technologies (nearly 200km) is theoretically sufficient for freight delivery in urban areas if vehicles are not required to collect or deliver freight outside the city limits. However this range is purely theoretical because an incorrect driving style (combined with heat or cold) can reduce the range to 80km and there is a psychological factor as driver anxiety occurs whenever the residual autonomy available is under 50% of capacity. The vehicles are also less likely to be able to operate effectively in areas where there are significant gradients.

Discussions with industry stakeholders have also raised the issue of the weight of batteries which can mean that small electric vans have to be classified as HGVs. This, in turn, means that drivers that are qualified to drive HGVs have to be employed; while this also affects the operators' business plans as HGV drivers usually secure higher salaries, HGV drivers are also usually only interested in driving larger vehicles. The driving experience of an electric vehicle is quite different from that of a diesel vehicle, particularly because it has slower acceleration. Another safety issue is created by the fact that vehicles are much quieter than conventional engines, so that other road users and pedestrians are less aware of their presence.

**Hybrid electric** plug-in technology has the advantage over pure electric vehicles of extending the range, but has the disadvantage of not offering zero emissions. However, the more the vehicle is used in pure electric mode (which is decided by the vehicle energy manager and not by the driver), the more the engine pollutes when it is switched on because the warm-up phase of the internal combustion engine results in peak emissions.



Photo: courtesy DHL

#### Hybrid vehicle at DHL's Heathrow Consolidation Centre

There was significant interest in powering vehicles with hydrogen until 5-10 years ago, when its popularity declined as the range of electric vehicles was extended due to the availability of lithium ion batteries. Its popularity is growing again as the new Audi Q5 with fuel cells and the hybrid BMW (with a small fuel cell of 8 kW for urban use) are proving. Michelin demonstrated at the Bibendum challenge in 2011 that it can fit the fuel cell and hydrogen storage in the same space occupied by lithium ion batteries in an electric vehicle. The main problem related to hydrogen is, and will remain, the distribution infrastructure; however freight deliveries are usually carried out from depots, where building a hydrogen refueling (and eventually production) station is possible.

Finally **natural gas** is the only solution that is widely in use to date. It allows more flexibility in terms of vehicle range and size and can considerably lower CO<sub>2</sub> emissions using bio-methane (natural gas produced from bio-mass) and the newest E-Gas in which hydrogen (produced by electrolysis) and CO<sub>2</sub> are used to produce methane which when burnt re-introduces into the atmosphere exactly the same quantity of CO<sub>2</sub> that was extracted in the first place.

#### Batteries and charging technologies

State of the art batteries for electric vehicles are lithium ion. There is on-going research to move from a liquid electrolyte to a polymeric one, which will allow for better temperature control of the battery, reduces its cost and increase its life. Currently batteries are said to last four years but practical experience suggests that a more likely life is just two years. Other battery technologies, such as lithium sulphur, are being studied but are unlikely to be available on the market for 15-20 years. Charging infrastructure for electric vehicles can easily be installed using the existing electric grid.



### Achieving economies of scale for electric vehicles

Electric vehicles are unlikely to be able to provide a substitute for all conventional vehicles. To assist in the wider diffusion of electric vehicles new mobility concepts need to be adopted in cities; it is only through their wider use that electric vehicle technology will become mass market and manufacturing economies of scale can be achieved to reduce the cost for all users. For passengers car-sharing is an option for electric vehicles and even car manufacturers are showing a growing interest in the concept of selling mobility rather than vehicles; BMW, for example, has created the BMW-I brand to provide services for mobility including car-sharing services with electric vehicles.

For freight delivery in cities only strong policy interventions are likely to push the operators to deliver with ultra low environmental impact vehicles (ULEV) and therefore create the necessary market for such vehicles to secure economies of scale. The vision of having ULEV for both freight and passenger transport in urban areas is technically possible but not yet in sight and unless it is stimulated by policy measures it will be difficult to achieve.

### Conclusion on vehicle technologies

The most promising alternative technologies to significantly reduce emissions of CO<sub>2</sub> and improve air quality in urban areas for “last mile” deliveries appear to be electric and hybrid technology, although it is too early to make final and definite judgments about the most appropriate technology given the amount of research and technical development that is being carried out in the area.

The European Union is already part-funding research into technologies for ULEV and the issue of the most appropriate EU action in this area is considered in Chapter 5.

### *Description of different types of innovative technology for low/zero emission UFT*

Four innovative technologies for UFT are discussed below. For each technology, after a brief description, the benefits for UFT and the scenarios in which they can be applied are also described.

**Cybercars** are small automated vehicles for individual or collective transportation of people or goods. Cybercars offer a fully automated on demand transport system, meaning that under normal operating conditions no human interaction is needed. They can either be fully autonomous, or make use of information from a traffic control centre, from the infrastructure or from other road users.

The main benefits for freight transport in urban areas are due to the automatic driving capability, which removes the requirement for drivers, and the flexibility of a cybercar system, which contributes to optimising the loading factor. By using only the strictly necessary number of vehicles, congestion and pollution can be reduced.

The freight scenarios where the cybercars perform best are those related to “last-mile” deliveries to houses and/or small offices in city centres or suburbs, the simultaneous handling of passengers and goods in restricted areas such as hospitals, and the handling and transport of “problem goods” such as

urban waste and cash to banks and post offices. It does, however, require a completely new technology to be deployed and, as individual vehicles are small in size, they offer a low loading capacity.

**Personal Rapid Transport (PRT)** is a transport system featuring small fully automatic vehicles on dedicated tracks for the transport of people. The PRT is fully automated and the vehicles are small with capacity usually limited to between four and six passengers per vehicle. As for the cybercars, the main benefits for freight transport are due to the reduction of driver costs and the system flexibility. Furthermore conflict with passenger flows is reduced because the vehicles work on dedicated tracks, thus reducing traffic congestion. The transfer between logistic nodes contiguous to urban areas, such as inland and port terminals, airports and urban distribution centres, represents the freight scenario in which PRT performs best. However, PRT requires completely new infrastructure to be developed and again, as the vehicles are small, they offer a low loading capacity.

High Tech Buses are buses on rubber wheels, running for part of their route on guideways and operating more like trams than traditional buses; the technology is therefore very similar to traditional trolley buses. They can use various types of automated systems, either for guidance or for driver assistance or for other purposes, and always have a driver, who can take over control of the vehicle at any time, allowing the vehicles to use the public road. For freight transport they are renamed **High-Tech Lorries** (the body is different from the high-tech buses, while the structure and technology of the vehicles are the same). The benefits for freight transport are due to the automatic capability of docking, the automatic driving capability and the larger size than the cybercar and PRT, thus requiring fewer vehicles to transport the same amount of goods. Such benefits consequently mean less pollution and less congestion (due to the smaller number of vehicles circulating) and greater road safety. As for the PRT, the high-tech lorries' best scenario is for the transfer of goods between logistic nodes contiguous to urban areas and central urban areas.

**Dual-mode vehicles** are advanced city vehicles with a cybercar capability. The vehicles can be driven either manually (with driving assistance) or in full automatic mode in specific areas or conditions. The vehicles can move fully autonomously on a dedicated lane or can be moved in a platoon with a single driver. The benefits for freight transport are due to automated driving functionalities, which allow greater driving precision during difficult manoeuvres and parking, consequently increasing transport productivity and safety. The scenarios in which this technology performs best are just-in-time deliveries to shops in limited access zones, such as historic city centres or airports, and "last-mile" deliveries to houses and/or small offices in city centres or suburbs.

The four innovative technologies discussed above were tested by simulations in the passenger transport application in the CityMobil project through four case studies in Gateshead, Madrid, Trondheim and Vienna; scenarios were tested for 2010 and 2035. The results from the CityMobil project suggest that PRT is the most convenient solution for trips inside the city centre of small/medium cities (such as Gateshead and Trondheim), for between inner suburbs and city centres, and for the trips between different inner suburbs of small mono-centric cities like Trondheim. All these technologies would provide benefits in terms of better accessibility for users and reductions in environmental emissions and could reduce traffic congestion. However, they require very significant investments in new infrastructure (which would have to be paid for by users) and, with

the possible exception of High-Tech Lorries, provide lower maximum load factors than traditional vehicles.

### *Information and Communication Technologies (ICT) & Intelligent Transport Systems (ITS)*

#### Key applications & technologies

The main area of current use in UFT of ICT (Information and Communication Technologies) and ITS (Intelligent Transport Systems) is in the operation of commercial vehicle fleets. The aim is to expedite deliveries, improve operational efficiency, decrease operational costs and improve incident response.

Automatic Vehicle Location (AVL) and Automatic Vehicle Monitoring (AVM) systems are commonly used by transport companies for the real-time management of their fleets. AVL aims to monitor and trace the geographic location of vehicles. It allows operators to detect, in real-time, the location of vehicles and possible deviations or delays with respect to the schedule, to inform vehicles of incidents and traffic jams in the area, to reschedule and reroute based on incidents and delays, to inform clients about delays, to identify the vehicles closest to a given area, to locate broken or stolen vehicles and to carry out statistical analyses of vehicle trips. AVM allows operators to monitor the operational status of the vehicle. This includes mechanical parameters (e.g. fuel and oil level, oil temperature), on-board physical parameters (e.g. temperature of refrigerated cells, locking of doors), dynamic vehicle status (e.g. speed), detection of anomalies in the parameters and communication to the driver. By offering the possibility to carry out statistical analysis of Key Performance Indicators (KPI), AVL and AVM give the operator the necessary information base for improvement of operational efficiency.

AVL and AVM use a common architecture which includes a control centre, an on-board system and a communication network. The technology used for communication between vehicles and control centre depends on the operational needs and the geographic coverage. The GSM/GPRS mobile networks guarantee a high level of coverage, while the UMTS/HSPA networks have a coverage which is increasing; the Wi-Fi and Wi-Max networks are used for restricted areas and proprietary radio networks have a variable coverage with high costs. The most frequently found technology for commercial applications is the GPRS network because it offers wide geographic coverage and limited costs. AVL systems integrate satellite location technologies with Geographical Information Systems (GIS). GPS is the common solution for location. While GPS has an error margin of around 15 metres, the European Galileo system is expected to be more accurate. The main current limitation of GPS is its operation in the presence of obstacles, although a remedy for this will be available from new chipsets which are under development.

Other ICT/ITS applications that relate to the logistics process for a single operator are load planning, routing and scheduling software, the automation of administrative tasks (integrated management of order-delivery-invoice processes) and tracking and tracing. The barcode is the traditional solution for tracking and tracing, but Radio Frequency Identification (RFID) technology offers a new alternative solution. These often allow real-time recording of deliveries and subsequent updating of inventory. Also, Satellite Navigation systems (perhaps linked to scheduling software) are now used by many operators to direct drivers to city centre delivery locations. However there are sometimes issues with

accuracy (e.g. where two or more streets share the same postcode vehicles can be directed to the wrong address, and the directing of goods vehicles into unsuitable roads).

#### ICT for collaboration in supply of UFT through UCCs

Solutions where different operators co-operate in order to gain efficiency in UFT by consolidating loads for final deliveries through urban consolidation centres (UCCs), require the support of ICT systems to manage the “last-mile” distribution service, with interfaces enabling the communication between the operator, the vehicles and the shippers and the optimisation routines of vehicle loads and tours. These solutions, however, have often not passed the experimentation stage and have usually received public subsidy. The success of cooperative solutions lies in the possibility to gain benefits in terms of cost reduction for the individual operators joining the scheme. The cost of an additional transfer, concerns about the confidentiality of commercial data and liability issues represent currently the main barriers to implementation of consolidation services, rather than issues relating to ICT.

#### Use of ITS by city authorities

Efficiency of the overall urban freight distribution process can be improved by integrating the ICT/ITS solutions adopted by the individual operators with ITS solutions adopted by the municipality for traffic management. Traffic management solutions which integrate passenger and freight movements appear to provide promising avenues. The use of ITS for automatic booking and enforcement of parking spaces for loading and unloading, for access control, for the provision of information on traffic and incidents, with the concurrent sharing of information on travel times and length of delivery operations, will benefit both freight operators, who will gain from improved planning of their operations, and urban road users as a whole. Another application of integrated traffic management relates to the tracking and tracing of the flows of dangerous goods which enable improved incident response management.

The ITS Directive of the European Union (Directive 2010/40/EU on the framework for the deployment of ITS in the field of road transport and for interfaces with other modes of transport) and the subsequent action plan (Action Plan for the Deployment of ITS in Europe, COM(2008)886) point in this direction. They have identified one action area related to the continuity of traffic and freight management ITS services across modes, operators, and urban and interurban interfaces. The aim of the Action Plan is to benchmark and standardise the information flows between the relevant traffic centres and different stakeholders. One of the key services concerned is incident management.

#### Conclusion on ICT and ITS

ICT and ITS applications are already employed to increase the effectiveness of UFT operations by private sector road freight operators, although AVM and AVL and route planning applications (as opposed to using GPS for simple way-finding), which can provide particular benefits to operators and increase the sustainability of UFT, are most likely to be used by third party logistics companies with a large fleet of vehicles rather than smaller-scale operators.

Given the clear cost benefits from the application of ICT and ITS by large-scale freight transport operators in an urban setting it is very likely that the private sector will adopt appropriate new ICT/ITS applications when they become available. Where the public sector at all levels can contribute to the effective implementation of ITS in urban areas is through the widespread implementation of systems that provide real-time data on the status of the road network in urban areas in an interoperable way; this would allow road freight vehicles to operate in different cities without having to use different hardware and software in each city. In this context the EU has a clear role in ensuring that such systems are implemented as quickly as possible and in an interoperable way in urban areas around Europe and this issue is considered in more detail in Chapter 5.

## 4.7 Management and other measures

### *Introduction*

This final category of measures includes not only management measures directly implemented by private sector actors to secure sustainable urban distribution but also all measures, whether implemented by private or public actors, that do not involve regulation, fiscal measures, new infrastructure or technology or land use planning measures. These are usually “bottom-up” measures that are “softer” in nature, often requiring some kind of collaboration between actors in order to achieve more sustainable distribution in urban areas while reducing costs or adding value for freight transport operators and/or their customers. They include the key concepts of the consolidation of the supply of UFT (through Urban Consolidation Centres) and the consolidation of demand for UFT (through collaborative orders), which increases average load factors and reduces the number of deliveries.

### *Transport planning for UFT*

#### Urban Logistics Plans

The importance of integrating UFT measures into wider land use planning policies has been discussed above and the development of the UFT measures themselves are more likely to be effective if they are developed as part of formal transport plans. These plans, which could be called Urban Logistics Plans (ULPs), should become part of Sustainable Urban Mobility Plans (SUMPS) that provide integrated plans for the development of both freight and passenger mobility in urban areas.

Indeed much of the best practice that has been described above can be best encapsulated and communicated at a local level through the development of ULPS, that should form an integral part of SUMPS for Metropolises, Other Large Urban Zones and Smaller Heritage Cities. The plans would be valuable as a means to communicate policy objectives, strategy and individual policy measures that will be implemented by city authorities in the area of UFT to all relevant stakeholders. However, the process of developing the plans would be as important as the documents themselves and should involve:

- Carrying out analysis of existing freight movements;
- Completing ex ante evaluation of the likely impact of new measures;

- Adopting an integrated approach to UFT measures, taking into account both wider urban mobility and land use planning;
- Undertaking consultation with all relevant stakeholders, including the freight industry and its customers;
- Carrying out ex post evaluation of impacts in preparation for the next Plan.

The development of these plans is most effectively implemented by city authorities with staff that are able to specialise in, even if not exclusively, freight issues.

#### Freight data & evaluation to facilitate effective policy-making

City authorities do not always base their UFT plans and measures on up-to-date data on freight movements, carry out ex ante evaluations (to model expected impacts) or ex post evaluations (to examine what happened compared to what was expected to happen). While full-scale freight demand simulation models (for ex ante analysis) may not be necessary or appropriate for smaller urban areas, some data collection, ex ante and ex post evaluation should be carried out by all city authorities to ensure that they understand the baseline position and the likely impact on all stakeholders (including the freight industry and its customers) and can assess whether measures have had an impact.

#### BEST PRACTICE RECOMMENDATION: URBAN LOGISTICS PLANS

City authorities should develop Urban Logistics Plans to ensure that packages of UFT measures have been developed following analysis of the likely impacts and after extensive consultation. These Plans should include the collection of some freight data and some ex ante and ex post evaluation of impacts. These plans can most effectively be delivered by staff that are able to specialise in freight issues.

#### *Freight Quality Partnerships and other consultation forums*

The measures that are most often used to promote cooperation between private operators and public authorities are **local, regional or national forums** where private and public actors discuss possible UFT measures. In most countries, consultation forums are implemented at a local level through the realization of a consultation programme. In Germany, for example, the so-called Güterverkehrsrunde (local consultation programmes) were active in cities such as Hanover and Dusseldorf. In other cases consultation between public and private actors is promoted at the national or federal level, as in Australia (with the implementation of Advisory Groups and various Councils) and in the Netherlands (“Platform Stedelijke Distributie”). A combination of national and regional-based promotion has been implemented in Japan. Finally, in some European countries the consultation forums are essentially networks of national cities, such as the “Forum for city logistics” in Denmark which links the municipalities of Aalborg, Aarhus and Copenhagen and the Ministry of Transport or the GART (Groupement des autorités responsables de transport) network that brings together 150

French cities and operates as a national consultation forum. These forums are usually administered by the public sector, with the active involvement of private sector stakeholders. A specific approach implemented for the promotion of partnership between public and private actors that has achieved some success in the UK, leading to its export to other national contexts, is that of **Freight Quality Partnerships (FQP)**. FQPs are basically local forums where local government and supply chain representatives, as well as representatives of local and environmental interest groups, discuss UFT issues. FQPs are most effective when they lead rapidly to the implementation of practical measures that provide benefits to both society and the freight operators and their customers.

In conclusion, consultation and partnership working between city authorities and the freight transport industry and its customers is essential to the development and implementation of UFT policies and plans at a local level that have the objective of sustainable UFT. City authorities need to understand the impact of any proposed measures on freight activities before appropriate measures can be implemented and the freight industry and their customers need to understand and contribute to the development of appropriate public sector measures.

#### BEST PRACTICE RECOMMENDATION: FREIGHT QUALITY PARTNERSHIPS

City authorities (Metropolises and Other Large Urban Zones and Smaller Heritage Urban Areas) should develop ways to consult with all relevant stakeholders before measures affecting UFT are implemented. This could be achieved through a network of freight transport operators and their customers and other stakeholders that meet on a periodic basis to discuss practical issues related to UFT, prior to effective implementation to secure concrete results.

#### *Single windows for UFT*

A potential outcome of the development of Urban Logistics Plans and the work of Freight Quality Partnerships could be the development of an on-line single window for freight that, in particular, provides a single point of reference for information that the freight industry is likely to need to operate in a particular urban area or region. Such on-line single windows are most likely to be useful in Metropolises and in some Other Large Urban Zones where the freight industry is often operating in a complex regulatory environment. Such a website has been developed in London, for example.

These single windows can help freight operators and their customers to reduce compliance costs and increase the sustainability of their operations. The single windows could:

- Provide information on existing regulations;
- Provide information on policies relevant to UFT and publish the Urban Logistics Plan;
- Allow for on-line payment of any charges and on-line registration of vehicles;
- Offer on-line maps and the preferred routes for freight and loading/unloading bays and areas;
- Provide an on-line forum.

**BEST PRACTICE RECOMMENDATION: ON-LINE SINGLE WINDOWS FOR FREIGHT**

City authorities (particularly Metropolises and perhaps some Other Large Urban Zones) should develop on-line single windows specifically for freight to provide a single source of regulatory and compliance information for the freight industry.

*Consolidation of UFT demand: collaborative transport orders*

The consolidation of orders for goods is probably the most powerful potential means to reduce the number of deliveries and increase load factors in urban areas, but it requires a significant change in behaviour on the part of shippers, receivers (including households) and transport operators who are used to being able to order goods whenever they want and receive rapid deliveries of their orders within narrow time windows and with little appreciation of the implications for road congestion and the environment. There are also implications with respect to competition and choice in service provision which could lead to uncompetitive activities emerging, such as price fixing. It should also be noted that EU directives to develop more competition in the parcel sector and the growth of internet trading have tended to work against a more collaborative approach.

Organisations are increasingly used to being able to order small volumes of goods such as stationery and receive them on a just-in-time basis. A key issue therefore is how best to encourage greater consolidation of orders by individual large organisations and encourage collaboration between SMEs in procurement of transport services.

Transport for London has been promoting the use by the public and private sectors of Delivery Service Plans (DSPs), which are effectively the freight equivalent of green travel plans. Among other things they encourage organisations to collect data on their deliveries of stationery, catering supplies and other goods and then examine where and how the number of deliveries can be reduced, leading to cost benefits for the organisation. This usually requires centralisation of procurement and TfL argues that by reducing the number of deliveries they receive organisations can reduce costs because delivery costs are in themselves lower and less staff time is required to make orders, receive deliveries and process invoices. TfL has developed a DSP for one of its offices in London and secured the following benefits:

- TfL centralised its procurement and storage of stationery and negotiated with its supplier to reduce deliveries from twice a day to just three times a week;
- Catering supplies deliveries were reduced by 40%;
- The frequency of deliveries from off-site document storage was reduced from daily to three times a week.

If a large number of organisations followed this approach, the impact on UFT would be significant, assuming that what is effectively good practice in facilities management and procurement is not already being followed. The key issue is how to disseminate this best practice to a wider audience; TfL is hoping that local authorities will implement DSPs (the London Borough of Sutton has already



for example) and that planning authorities in London will require occupiers of new office developments to develop a DSP to secure planning permissions (just as they are often required to implement green travel plans for their employees). It is working with the British Institute of Facilities Management to promote DSPs to its members and a number of private sector businesses in London have secured cost benefits through the adoption of some of the ideas included in TfL's guidance.

The city of Gothenburg also sought to persuade businesses to consolidate their deliveries in the Lundby area of the city and, in addition, a group of organisations in the Lindholmen area of the city have required their suppliers to deliver to an UCC which then delivers consolidated loads to the individual premises. More details of these initiatives, and several others, are provided in Case Study 5 below.

## CASE STUDY 5

### Gothenburg: a mix of regulation & innovation

#### *Introduction*

Gothenburg, the second largest city in Sweden with a population of about 500,000, has implemented a number of innovative measures in relation to urban freight transport. These have included:

- A pilot on the regulation of load factors for freight vehicles;
- A scheme in the Lundby area of the city to encourage businesses to order goods so as to reduce the number of deliveries;
- The development of a Local Freight Network; and
- A consolidation centre in the Lindholmen area of the city.

The municipality has played a key role in all new practices and schemes by focusing on starting a process of communication with other actors involved in goods distribution. The attention paid to sustainability, efficiency and environmental issues in goods distribution goes hand in hand with the successful management of traffic congestion in the city as a whole (which has addressed congestion in the city centre by banning car parking in some streets and making car parking expensive for visitors). This appears to be due, in part, to a consensus among politicians on sustainable transport issues and pride on the part of both politicians and citizens in their city's sustainability policies. The city also employs an official who is able to specialise in freight issues.

#### *Existing measures and on-going freight issues*

One key strategy that has been pursued in Gothenburg is the **Local Freight Network**, a very similar concept to a Freight Quality Partnership, in which the traffic and planning units of the municipality, transport and logistics companies, retailers, real estate owners and universities all participate. Periodic meetings are held where issues and solutions are discussed. Dialogue among stakeholders is the key objective of the Network, which helps reduce opposition to decisions taken by the municipality, as all stakeholders participate in the policy making process.

In some streets in the centre of Gothenburg the city has implemented the **Gångfartsområde** scheme where pedestrians take priority and cars cannot travel faster than walking speed and are not allowed to park. Freight vehicles only are allowed to park to load or unload goods. This scheme, allied to high car parking charges in neighbouring areas, has discouraged car use and helped to reduce road congestion, while not preventing freight vehicles from making deliveries in the city centre.

The city centre of Gothenburg has a **time window** for goods vehicles which allows deliveries in certain streets only between 07.00 and 11.00 to protect shopping areas from goods distribution traffic when shops are open to the public. There is also a **vehicle length restriction** for goods vehicles with a maximum of 10 metres. Currently, the municipality is planning to restrict the time window further to 07.00-10.00, but any decision will be taken after a dialogue within the Local Freight Network.

The **lack of on-street parking space** is an issue in the centre of Gothenburg and trucks often have to be parked far away from the delivery point, which increases the time required for the unloading operations and makes the distribution service less efficient. Another issue that results from parking far away from receivers' premises is that the risk of theft is increased.

#### *New UFT measures*

The city has developed a number of schemes to try to reduce the number of freight vehicles entering the city in order to reduce congestion and environmental emissions.

In Gothenburg a scheme based on the **regulation of load factors** has been piloted, with the voluntary participation of a few transport companies. The scheme sought to incentivise hauliers to achieve a pre-defined load factor by offering:

- Conveniently located and reserved loading/unloading spaces (which are particularly appreciated by drivers);
- The use of priority lanes that are usually reserved for buses and high-occupancy cars; and
- Access to streets that are otherwise prohibited for freight vehicles.

The results of the pilot showed that transport companies that were granted the incentives could benefit from reduced journey times due to the availability of reserved loading and unloading spaces and the other advantages provided by the municipality. However, it was not possible to prove any significant improvement in the load factor compared to before the scheme was implemented. This means that the incentives were not enough to achieve changes in behaviour and higher efficiency in terms of load factor.

The pilot also showed that it is easier to impose a load factor target on large companies which can fulfil it more easily (e.g. postal services, express couriers, which generally already have high load factors) than on small companies (which might have only a couple of deliveries in the central area). The fact that the measure cannot be applied equally reduces its acceptability to operators. After the pilot, it was decided not to proceed to full-scale implementation and the municipality is considering the implementation of incentives (such as the use of priority lanes) for environmentally-friendly vehicles based on the type of fuel/propulsion used rather than on load factors.

The city of Gothenburg has also promoted the Lundby Mobility Management Centre, which has been responsible for a measure that informs and persuades companies in the Lundby area to consolidate ordering procedures for office materials and therefore **consolidate orders into fewer deliveries**. The aim was to reduce the number of deliveries and therefore the number of goods vehicles travelling to the Lundby area. Instead of ordering when a need arose, companies were persuaded to consolidate orders and reduce the frequency of restocking. It was a challenge to find companies at first that were interested in the concept but then the companies easily changed their behaviour and the measure has been considered to be highly successful. The companies do not incur additional costs for implementing the measure and they are able to exploit their involvement in the scheme for marketing purposes.

The city has also developed the concept of **consolidation of loads** by recruiting a number of organisations (mainly schools) in the Lindholmen area to participate on a voluntary basis in a consolidation scheme where the organisations instruct their suppliers to deliver goods to a consolidation centre, where the goods are unloaded and consolidated with other goods into loads for delivery by an electric vehicle. A third party logistics provider operates the consolidation service on a commercial basis, which also collects waste for the participating organisations. Only food and loads larger than two pallets are excluded from the service. The service opened in 2008 and is still operational.

The main challenges faced by the consolidation scheme are of an organisational and commercial nature. The participating entities pay for the service and individual contracts are signed between each entity and the service provider. The greatest problem is the allocation of the cost of the service to individual customers. Currently, a mixture of criteria including floor space for offices and number of students for schools is used. The willingness to pay originates from the desire of the entities to remove goods vehicles from the area so that the area is more attractive environment in which to work or study. There is also the pride involved in having adopted a sustainable practice and the marketing opportunities it provides.

#### *Conclusion*

The city of Gothenburg has implemented some traditional regulatory measures, such as time windows and vehicle length restrictions to reduce congestion and provide an attractive environment for residents and shoppers in the city centre. The city has had a strong focus on consultation with stakeholders before the implementation of any new measures and has enjoyed a degree of political consensus on how to deal with transport-related measures as well as being able to employ staff that can specialise in freight issues.

The city has also introduced some innovative measures to incentivise transport operators to increase load factors and, with more success, to encourage customers of UFT services to consolidate deliveries, either through more efficient procurement practices or through requiring their transport operators to deliver to a consolidation centre.

Delivery Service Plans, as implemented in both London and Gothenburg provide an effective way to consolidate demand for UFT because they reduce the number of deliveries required but can also lead to cost savings for businesses. So far these initiatives have been voluntary, but there may be scope for city authorities to make them a planning requirement for new office and retail developments, just as in some countries new large-scale developments only receive planning permissions once the developer has developed, and commits to implementing, a Green Travel Plan to reduce the impact of employees travel patterns on the local road network.

#### **BEST PRACTICE RECOMMENDATION: DELIVERY SERVICE PLANS**

City authorities (Metropolises and Other large Urban Zones) should initiate schemes to encourage large organisations to develop Delivery Service Plans that can lead to the consolidation of demand for UFT into fewer loads.

City authorities, along with other relevant planning bodies, should also consider whether the developers of office or retail developments should be required by planning rules to develop and then implement Delivery Service Plans that minimise freight movements to and from their premises, just as they are increasingly required to develop Green Travel Plans in relation to employees' journey to work.

## *Consolidation of UFT supply: Urban Consolidation Centres*

### Introduction

Urban Consolidation Centres (UCCs) are distribution centres on the edge of urban areas that receive freight from a number of different transport operators with loads for a variety of customers in the urban area and then consolidate the freight into “full” loads for “last mile” deliveries. Although the development and operation of UCCs is usually a mixed measure (involving some infrastructure and often the application of new technology), we have chosen to include UCCs in “management and other measures” because their success or failure is ultimately based on the ability of logistics companies to market and operate a freight transport service that meets the needs of its customers at a competitive price.

There appears to be a degree of scepticism about the commercial viability of UCCs and one of the conclusions in a study for the UK Department for Transport in 2005 that examined available evaluations of 67 UCCs was that there is a need for public subsidy because, “... there is no strong evidence that any self-financing scheme yet exists.”

There are two main types of consolidation centre:

- UCCs for the consolidation of retail deliveries in city centres;
- UCCs for the consolidation of construction materials for development sites in urban areas (so-called Construction Consolidation Centres).

### Retail consolidation centres

The primary objective of retail consolidation centres from the point of view of city authorities is to maximise load factors in delivery vehicles so that fewer vehicles have to operate in city centres and consequently vehicle kilometres, emissions and road congestion are reduced. For this reason UCCs are often subsidised, perhaps by providing a grant towards the cost of the delivery vehicles or by providing short-term operating subsidy for an operator after a public tender process.

UCCs are most likely to provide benefits in terms of sustainable distribution where retail markets are fragmented or where there are a large number of small and medium-sized retail outlets alongside large chain stores. At the Broadmead Shopping Centre in Bristol, the UCC service is targeted at small and medium-sized outlets because the large chains already have sufficient volumes to justify full loads.

The retail market in the centre of Rome provides an example of a relatively fragmented retail market with a very large number of small and medium-sized shops in an historic city centre. The UFT demand simulation model developed by Tor Vergata University of Rome was used in the study to assess the potential impact of the development of a UCC close to the city centre that would be able to provide a consolidation service to the retail sector located in the centre. The results of the modelling suggest that the availability of a UCC, using electric vehicles for “last mile” deliveries, would reduce CO<sub>2</sub> emissions from freight vehicles in the centre of Rome by 24%, NO<sub>x</sub> by 27%, PM<sub>2.5</sub> by 42% and total monetized externalities by 26%.

Indirect subsidies are often provided to UCC operations by allowing wider time windows for UCC vehicles to make deliveries, by exempting the UCC vehicles from congestion access charges and even, in the case of Vicenza in Italy, providing the vehicles with a monopoly on access to the city centre. Bremen established a UCC in 1994 and has used EU funding to purchase “green” delivery

vehicles and for the development of ICT to optimise delivery flows to and from the UCC. Bristol City Council has allowed UCC vehicles at its Broadmead Shopping Centre access to make deliveries at times when other vehicles are banned and has also provided some operating subsidy (although the amount of subsidy provided has gradually fallen as the service becomes more established). The ECOPORTO in Ferrara provides a consolidation service for perishable goods that are delivered into the city centre and uses 51 methane-powered vehicles; the service receives an indirect subsidy as the UCC vehicles are allowed to make deliveries at anytime between 06.00 and 17.30 (compared to 06.00-11.00 and 15.30-17.30 for other vehicles) and through an 80% reduction in the congestion charge.

## CASE STUDY 6

### Parma: urban consolidation for the food industry

#### *Introduction*

Parma, the capital of Italy's "food valley", has a 2.6 km<sup>2</sup> historical city centre with 21,000 residents out of the city's total population of about 180,000. The city centre generates high daily traffic flows of both passengers and goods. In order to protect the historic city centre and reduce congestion the city of Parma has for many years initiated projects to improve traffic conditions and sustainability through initiatives such as car sharing, mobility management activities and promoting the use of electric vehicles. As regards UFT, in 2004 the City of Parma launched an initiative called ECOLOGISTICS in order to identify, in partnership with the private sector (through trade associations), sustainable solutions to deliver goods in the city centre. The objectives of the urban consolidation scheme are to reduce congestion and improve air quality in the city centre by rationalising distribution of a variety of goods including fresh food products which are often excluded from current city logistic projects.

During the period 2001-05 the Emilia Romagna region was the lead partner of the City Ports project, which promoted the development of effective and efficient interventions for the sustainable distribution of goods within cities such as Parma. Within the City Ports project, the Municipality of Parma worked on a pilot project to reorganise and regulate the transport of goods in the city centre and a survey to characterise the movement of urban freight in the city was undertaken during 2004-05. Trade associations and freight companies were then involved to find a joint solution. Parma has been working within a regional policy for urban logistics that promoted interventions in all medium-sized and large cities in Emilia Romagna and the region has made funds available to Parma to fund the ECOLOGISTICS project.

The Agro-industrial and Logistic Centre of Parma (CAL), which was originally conceived as the Parma wholesale fruit and vegetable market, was identified as the partner best able to manage "last mile" goods distribution within the ECOLOGISTICS project as it was already carrying out some deliveries to independent greengrocers in the city centre and had spare warehousing capacity.

#### *UFT measures*

The ECOLOGISTICS initiative, which started in December 2006, consists of two integrated measures:

- An urban consolidation service (called "Ecocity") for the city centre of Parma with a UCC provided by CAL;
- Restricted access to the city centre for all other vehicles to incentivise use of the Ecocity service, although other vehicles that meet certain requirements can also operate there.

The Ecocity urban consolidation service uses a 5,000 m<sup>2</sup> warehouse (300 m<sup>2</sup> of which is refrigerated) with loading/unloading ramps, located within CAL; the warehouse is located adjacent to strategic road links but also close to the city centre. It deploys 16 methane-powered vehicles (owned by the Municipality of Parma and provided to CAL on a free loan), an IT system to manage ordering, labelling, optimisation of loads and a routing

and fleet monitoring system using GPS-GPRS technology for tracking and tracing of vehicles.

The Ecocity service is targeted at private sector logistics operators, traders, wholesale dealers and couriers and has attracted 80 customers, mainly transport companies (third party providers) rather than shippers or receivers, and handles food retail products for both independent stores and retail chains, supplies for HoReCa, packaged cargo, parcels and garments. Ecocity is one of the few urban consolidation services in Europe that addresses food products (including fresh food) and it is believed to be the only one in Italy used by supermarket chains. Before using Ecocity, retail chains made delivery trips to distribute goods not only to the city centre but also to other stores in the wider Province of Parma. By using Ecocity, retail chain vehicles do not have to enter the centre of Parma, improving the efficiency of trips between distribution centres and the stores located in the Province of Parma as a whole.

The Ecocity service is not compulsory, but transport operators (own account and third party providers) that want to access the city centre to load/unload goods have to “credit” their vehicles by satisfying the following requirements:

- Make deliveries of the following type of goods: fresh/dry food products, packaged cargo, garments, HoReCa. (i.e. the same goods handled by Ecocity);
- Use eco-friendly vehicles (GPL, methane, biofuel or electric) and be Euro 3, Euro 4 or Euro 5;
- Use of light goods vehicles only (< 3.5 tonnes gross vehicle weight);
- Have a load factor of at least 70% (by weight or volume);
- Fit geo-positioning systems to allow their vehicles to be tracked and monitored by the city council.

Vehicles that meet these requirements (and have been “accredited” by the city council) are allowed to access the city centre between 06.00 and 22.00; express couriers operating in Parma have, for example, ensured that their vehicles have been accredited. The CAL UCC warehouse facility does not have a monopoly either, in that the ECOLOGISTICS project allows the owners of other logistics platforms to accredit their facilities and compete with the Ecocity service.

ICT has been fully integrated into the Ecocity service and CAL developed a legacy information system able to manage the order cycle so that customers (carriers) can book the delivery service and/or warehousing and delivery service via different communication means. Data are then inserted into the system, which executes the shipping procedure (identification of delivery, labelling, delivery scheduling and execution). The system is also able to provide the delivery status to customers. Procedures for the optimisation of loading and routing are planned and need to be integrated into the system. CAL also integrated into the system a vehicle tracking and tracing capability and all their vehicles are equipped with a GPS/GPRS unit, programmed according to CAL protocols. This vehicle tracking and tracing system allows the City of Parma to check the delivery fulfilment requirements and conduct impact analysis.

Other transport operators that want access to the city centre to load/unload goods have to state that their vehicles satisfy the necessary requirements. These statements have legal implications if found to be untrue. All vehicles entering the city centre are subject to random inspection. One of these requirements is the mandatory on-board system for monitoring by the city council, which allows the Municipality to monitor the number of trips and their duration and to estimate the environmental impact of freight traffic. This data is received by the CAL system and then passed on directly to the council. It is more difficult from a practical point of view to ensure that the minimum 70% load factor is being respected and CAL is working with ICT consultants to find a way to measure and monitor load factors.

The Ecocity service has increased its consolidated deliveries from 1,300 in its first year of operation to 5,400 deliveries (1,675 tonnes of goods) in 2008. The service covered its operating costs in 2009 and in the future new investments in the service will be made without the need for further public funding.

### *Conclusion*

The ECOLOGISTICS initiative provides an example of the use of regulations to restrict access to a historic city centre for freight vehicles, allied with the initial use of direct public subsidy and on-going indirect subsidy to an

operator of a UCC to secure more consolidated deliveries of food products and other goods into the centre of a city. The UCC in Parma now appears to be able to operate without additional direct subsidy and other operators can invest in accredited vehicles and logistics platforms to provide services that compete with CAL.

Key success factors for the ECOLOGISTICS initiative appear to be:

- Stakeholder consultation to overcome the critical issues and to make the ECOLOGISTICS project more acceptable.
- Indirect subsidies through the introduction of access restrictions for UFT and a direct subsidy through the free loan of a fleet of low emission vehicles;
- Flexibility of the ECOLOGISTICS initiative, which allows operators the opportunity to “accredit” their own vehicles or use the “last-mile” service of an already accredited logistics platform. It also allows the owners of other logistics platforms to accredit their platform to operate in competition with CAL.
- The availability of an existing and underutilised logistics infrastructure (CAL), with good connections to the strategic road network and close to the city centre, which before the beginning of the ECOLOGISTICS initiative was already carrying out some deliveries to the city centre.
- A strong political commitment to realize the ECOLOGISTICS initiative.

Long-term direct subsidies to consolidation operations may be anti-competitive in that they usually provide public funding to specific private sector operators and inevitably place a burden on the public purse. It is likely to be in the interest of all stakeholders if retail UCCs could be operated on a commercial basis with, if necessary, indirect assistance provided by the city authority through a policy of differentiation. This is the model that has been followed in Utrecht where a private sector logistics operator has started a consolidation service into the city centre using an electric vehicle without any direct public subsidy but with the indirect assistance of exemptions from a number of regulations (see Case Study 5).

From the point of view of the logistics companies that operate the UCC service, the key requirement of the UCC concept is that it provides a service that adds value for their customers, either by reducing overall costs or by providing added value benefits in terms of reliability of delivery, frequency of delivery, off-site storage, added value activities etc. Transport chains based on consolidation are competing with direct road deliveries and there are additional costs involved in transferring freight from an in-coming vehicle to the UCC-based vehicle, and in providing the consolidation centre, which have to be included in the price charged to the final customer. These additional costs need to be offset by benefits that are seen to be of higher value than the additional costs.

Key success factors for commercially viable retail UCCs appear to be:

- A concentration of retail activity in a relatively small area, so there is a critical mass of traffic available for consolidation on individual vehicles making frequent deliveries;
- A “promoter” of the service, which may be a private sector logistics provider and/or another organisation with an interest in developing consolidated deliveries (city authority, shopping centre manager, landowner);
- The provision of added value services at the UCC, such as off-store storage and pre-tail activities that can help to provide tangible benefits to outweigh the additional costs;
- An indirect subsidy which provides some tangible reduction in costs or increased benefits to the customers of the service while offering the same advantage to all private sector operators

of UCCs.

- The availability of a warehouse in a suitable location to provide the physical infrastructure for the UCC.

#### **Regents Street Retail Consolidation Centre, London**

A consolidation centre has been developed in North London that consolidates stock deliveries for stores in Regents Street in London. The UCC is operated by a logistics provider called Clipper Logistics without (as far as we are aware) any direct subsidy, although one of the economic drivers behind the UCC is that the total cost of the London Congestion Charge paid by vehicles that would otherwise make deliveries to Regents Street in any working day is reduced. The landlord for the stores is the Crown Estate (a public sector body that operates in the commercial sector), which may have had a role in recruiting its tenants to use the service.

In order to justify the cost involved in using the consolidation service, the logistics company describes the commercial advantages of the consolidation of the service as being:

- Off-store storage at a lower rent than in central London, leaving more space for displaying a wider variety of retail goods;
- “Pre-tail” added value services so that goods are ready for sale when they arrive at the store and store staff can focus on assisting customers;
- Frequent and rapid deliveries because the UCC is only 20km from the stores;
- Reduced carbon footprint for each store.

The scheme appears to have been able to demonstrate commercial benefits for customers because an initial 2-year pilot has been extended to a 3-year contract.

In conclusion, UCCs are, in theory, an effective means to improve the efficiency of UFT where the UFT market is fragmented, characterised by a large number of deliveries by vehicles with low load factors to a large number of different locations in an urban area. However, many UCCs have struggled to operate on a commercial basis without some degree of start-up funding and on-going operating subsidy, mainly because consolidation involves additional handling and additional cost for customers compared to direct (even inefficient) deliveries. In addition, the external costs of direct deliveries are not internalised into the costs charged to customers and consolidation involves a loss of control, brand recognition and market sensitive data for the logistics operators that use a consolidation service.

The following case study on the history of an UCC in Bremen highlights some of the practical difficulties involved in implementing a UCC in practice.



## CASE STUDY 7

### Bremen: improving air quality & implementing an UCC

#### *Introduction*

Located in north-western Germany, Bremen is the second most populous city in North Germany with more than 500,000 inhabitants. With a major harbour on the river Weser, Bremen has a long tradition as a trading city and has a well developed logistics sector with significant commercial vehicle traffic flows.

#### *Key UFT issues*

The main concern of the city authorities relates to emissions and air quality rather than traffic congestion. As the city has a high modal share for cycling and walking (about 25% and 21% respectively in 2008), Bremen only has an issue with air quality from PM<sub>10</sub> and NO<sub>2</sub> and the main sources of PM<sub>10</sub> have been identified as being HGVs and construction sites. For this reason the Senate of the Free Hanseatic City of Bremen drew up the Clean Air Action Plan (CAAP) in 2006, which includes a number of measures to address both passenger and freight transport, and is mainly aimed at directly reducing the polluting emissions from inner city traffic by raising road users' awareness.

#### *The implementation of the Bremen LEZ*

Within the CAAP the city introduced a low emission zone (LEZ) in January 2009. Vehicles (both commercial vehicles and cars) were given a red, yellow or green sticker depending on whether they were compliant with Euro II, Euro III and higher than Euro III emission standards respectively. The LEZ restrictions were imposed in three phases. In the first phase (January 2009 – January 2010) vehicles compliant with only Euro I were banned from accessing the LEZ. In the second phase vehicles with a red sticker (Euro II) were banned (January 2010 – June 2011). From July 2011 only vehicles with a green label are allowed to enter the LEZ (higher than Euro III).

To avoid placing too great a compliance burden on hauliers and businesses in the city centre, the Municipality of Bremen decided to offer a "fleet-wide agreement", based on the fact that it is not important that each vehicle in the fleet is "clean", but that the fleet on average meets certain emission standards. Each vehicle of the fleet is given a score according to the Euro emission standard it complies with. If the fleet reaches a certain total score, then all vehicles of the fleet can access the LEZ. The agreements are made by the freight transport operator signing a contract with the city council, in which a company declares the emission standards of the fleet of vehicles they use to deliver in the LEZ (both of their own fleet and of third party hauliers that make deliveries on their behalf) and spot checks can be made by the city authority to verify the company's declaration.

#### *Incentives to introduce "clean" UFT vehicles*

The City of Bremen has focused on the creation of additional incentives for the use of "clean" freight vehicles accessing the central and pedestrianised areas of the city. It has implemented the following measures:

- Creation of an environmental loading point, which provides extended access to the pedestrian area of the city only to "clean" freight vehicles; this was the result of consultation between the city and the freight industry in a Green Transport Working Group. The measure, which was implemented in 2007, involved the creation of two 8.5 metre dedicated parking bays close to the pedestrian zone in the Old City of Bremen for the exclusive use of Euro V vehicles. This encouraged DHL Deutsche Post to buy five IVECO Daily CNG delivery vans, which comply with the highest European emission standard (EEV, Enhanced Environmental Vehicle). Unfortunately, the dedicated use of the ELP for Euro V vehicles cannot be enforced because national laws in Germany do not allow public parking space to be dedicated to any particular user.
- Since 2003 the local energy provider, SWB, started a campaign called "Bremer Offensive-das Erdgasfahrzeug" ("Bremen's Push for CNG Vehicles") targeting private households and fleet operators to raise awareness and encourage the use of CNG vehicles as well as to improve the fuelling infrastructure. In 2011 there are four CNG filling stations in Bremen and in 2010 the first seven tonne CNG trucks started to operate in the streets of Bremen.

### *The Güterverkehrszentrum (GVZ) and Inner City Consolidation Service (ICCS)*

The Bremen GVZ is an example of an Urban Logistics Zone (or “freight village”) and was first implemented in 1985. The GVZ is currently extends over about 500 hectares (of which about 220 hectares have been allocated) and hosts 135 companies with a total of 8,000 employees. The GVZ has tri-modal facilities (road, rail and waterborne connections), is located near the airport (6 km away) and has about 1.2 million square metres of warehouse space. All the companies in the GVZ are privately owned except for the GVZ Development Company (GVZe) which has a 30% public participation and 40 private shareholders. The GVZe manages the site and looks after and represents the interests of the companies operating there.

The GVZe has also managed projects such as the City Logistics project, which started in 1991 as a private sector initiative to implement a consolidation service for inner city deliveries. The project was driven by the need to ensure efficient deliveries into the city centre at a time when deliveries could take between two and five hours due to problems in finding parking spaces and restrictive time windows for deliveries. The key driver for this collaboration between logistics providers was therefore the need to reduce costs.

Stakeholders interviewed in Bremen for this study estimated that about 70% of freight delivered into the city centre was delivered direct (because it goes, for example, to large chain stores) with relatively high load factors without needing to pass through a consolidation centre. Of the 30% that could potentially pass through a UCC, only about 10% actually used the consolidation service, with the other 90% being organised through logistics providers’ own networks.

However, in spite of an initially sustainable business model, competition issues prevented more and more logistics providers from co-operating, and, in the end, led to the decision to discontinue the consolidation service from the GVZ. A major issue was the visibility of each logistics providers’ operation to the consolidation operator and therefore the lack of data confidentiality; in addition, the logistics providers became increasingly keen to use their own branded vehicles to carry out deliveries in the city centre. Finally, from about 2000 road congestion in the city of Bremen declined due to measures to reduce passenger car traffic, so that direct deliveries could be carried out more cost-effectively by each company.

In 2002 the City Logistics project was restarted as an initiative within the EU funded VIVALDI project, but the market conditions set out above, and problems with the use of environmentally-friendly vehicles for city freight distribution, led to the end of the of the scheme in 2006. The GVZe is discussing the possibility of restarting the City Logistics project using, for example, more environmentally-friendly solutions (electric vehicles), but currently there is no significant collaboration between companies. Delivery time restrictions in the city centre are expected to become stricter in the future, and, consequently, new solutions for the inner city delivery service and logistics activities in general have to be found together with the development of new technologies and better performing truck fleets. It is also important to find solutions to the competition issues and to ensure interoperability of telematics. It is possible that any initiative would be assisted by highlighting the logistics providers’ interest in promoting their image as “green” logistics operators.

In our opinion, the development of UCCs should be left as far as possible to the market to avoid market distortions and poor value for money, rather than being funded directly by the public sector. The development of UCCs should be based on the entrepreneurial initiative of operators (particularly offering added value services as well as consolidated deliveries), assisted by indirect incentives provided by city authorities rather than direct subsidies. The incentives provided by city authorities to assist the development of UCCs could be more generous time windows for deliveries, exemptions from access charging regimes and privileged use of priority lanes.

The example provided by the Cargohopper service in Utrecht is particularly interesting as it involves a private sector logistics provider that has been able to develop a “last mile” delivery service into the city centre using an electric vehicle with no direct subsidy based on an existing critical mass of traffic (provided by an existing pallet-load network, which gives the operator geographic exclusivity within the private network) and by taking advantage of incentives to use electric vehicles provided by the City of Utrecht (see Case Study 5 above).

A further indirect means to encourage the development of UCCs would be to require the developers of retail developments to include provisions for an UCC in their planning applications, so that the landlord would require lessees to use a consolidation service if they wish to open a retail outlet in that location.

#### BEST PRACTICE RECOMMENDATION: URBAN CONSOLIDATION CENTRES

City authorities should, wherever possible, focus on providing incentives to encourage the use of UCCs through regulatory differentiation in favour of vehicles operating from UCCs, rather than direct capital and operating subsidies to private sector operators. They should also consider how the planning system could be used to encourage consolidation of loads, without city authorities requiring deliveries to be made via a UCC.

#### Construction Consolidation Centres

Construction Consolidation Centres (CCCs) are specialised distribution centres on the edge of urban areas that receive construction materials from a number of different transport operators with loads for development sites in urban areas and then consolidate the construction materials into “full” loads for individual sites for delivery on a “just in time” basis. A CCC has been developed in London and, following a 2-year trial which was supported by London’s mobility agency, the centre is now operated without subsidy by a private company. Another example is provided by plans to use a CCC for a major redevelopment scheme around Utrecht Central Station.

The public benefits from these CCCs are that fewer vehicles have to make deliveries to individual sites; in London about 70% fewer vehicles make deliveries to individual construction sites as a direct result of the existence of the CCC and this led to 75% lower GHG emissions. However, the CCC in London also appears to provide direct commercial benefits to developers and their contractors as a result of the availability of the consolidation service:

- Just-in-time deliveries (essentially providing enough materials for a day’s work) to sites which may have restricted storage space for materials;
- High delivery performance and accuracy, particularly due to the relatively short distance between the CCC and the development sites;
- Improved construction site productivity, including a reduction in the amount of materials that are wasted and fewer accidents;
- Reverse logistics for reuse, recycling or disposal of waste materials;
- Reduction in the total payments of the London Congestion Charge.

The commercial viability of the CCC in London is likely to be linked to the historically low level of logistics efficiency in the construction industry, as described in Chapter 3, which allows the CCC to provide significant efficiency gains for its customers.

In England and Wales, the use of CCCs can be made a condition of planning consent for development schemes and, for major construction schemes, the planning system could therefore provide a means to reduce the impact of construction traffic on the urban road network through a requirement to use a CCC.

### *Last mile deliveries by bicycle*

Deliveries of low volume and weight goods are being carried out by bicycle and tricycle in some cities, although this is not innovative in the sense that this mode is a traditional form of transport for postal services throughout Europe. The most high-profile initiative is La Petite Reine (a private company) in France, which operates delivery services using “cargocycles” in Paris, Bordeaux, Rouen, Dijon and Lyon, with a franchised service operating in Geneva.

#### **La Petite Reine and Urban Logistics Spaces in Paris**

The La Petite Reine business model in Paris is based on providing last mile deliveries by “Cargocycle” from two Urban Logistics Spaces located in underground car parks close to the centre of the city.

The goods need to be low volume and lightweight, cannot be transported over long distances and the services are likely to be most viable in densely populated urban areas such as the centre of Paris.

The company is likely to operate in niche markets because of the lack of economies of scale that are available from the use of the Cargocycles. These appear to be:

- Home delivery services for local shops: out-sourcing of home deliveries by retail outlets;
- Business to business deliveries within the city: effectively an intra-Paris courier service;
- Home deliveries for express courier services and internet retail companies: where the goods are transferred from larger road vehicle to the Cargocycles at the Urban Logistics Space.

The economics of the service seem to rely on the Urban Logistics Spaces being provided by the city authorities at a low rental compared to market rates and so the service benefits from an indirect subsidy.

The transfer from large vehicles to very small vehicles for “last mile” deliveries is often not cost effective when net externalities are not taken into account. The apparent commercial success of La Petite Reine for “last mile” deliveries in the courier and home delivery sectors may partly reflect the

indirect subsidy it receives from the city authorities but also the increasing willingness of some businesses and consumers to make more sustainable choices in relation to their deliveries.

### *Consolidation of supply for e-commerce: Pick-up Points*

Given the increasing importance of e-commerce and the issue of failed deliveries to residential addresses, express couriers have set up networks of pick up points in residential areas and at other convenient locations for customers to collect packets and parcels containing goods that have been bought on the Internet. DHL, for example, has established a network of secure pick up points in many major cities in Germany under the Packstation initiative. This approach removes the need for the rescheduling of failed deliveries to home addresses and also allows the courier or parcel operator to have shorter delivery rounds and therefore reduce emissions. In the context of overall urban mobility, pick up and drop off points are best located at locations that are regularly visited by customers anyway, such as railway stations, so that additional car journeys are not generated. The network could also be extended to other convenient locations that consumers visit anyway and are have extended opening hours, such as supermarkets.

#### **BEST PRACTICE RECOMMENDATION: PICK UP POINTS**

City authorities should collaborate with the private sector courier and parcels operators to develop networks of pick up points for e-commerce parcels, particularly in Metropolises and Other Large Urban Areas, in locations that are convenient for customers but also minimise the use of private cars by customers to pick up e-commerce goods.

### *Lorry routing & signage*

A practical activity for FQPs that provides benefits for both transport operators and the wider economy is the development of lorry routing strategies, where city authorities work with freight transport stakeholders to determine the most appropriate routes between the strategic road network and major origins and destinations of traffic located in urban areas, such as shopping centres, ports, intermodal rail terminals and industrial parks.

The benefits of developing a lorry routing strategy are reduced use of roads that are not suitable for freight traffic (resulting in less road congestion) and reduced journey times for transport operators.

The information on the recommended freight routes can then be communicated to the transport operators (including, in particular, the drivers) and their customers in the following ways:

- The publication of maps, which can be available for download from the Internet;
- The use of physical road signage;
- The use of ICT to provide real-time information direct to drivers' cabs, particularly to warn them of congestion on parts of the urban road network and suggesting alternative routes.

- SatNav systems, where the base data specifically includes routes which are suitable for HGVs, and conversely roads which are unsuitable for HGVs.

Lorry routing strategies have been developed by a number of Freight Quality Partnerships in the UK and the City of Tallinn has also developed a strategy to improve HGV traffic flows between the Port of Tallinn and the strategic road network using signage and a GPS-based real-time information system that can communicate directly with drivers in their cabs (see Case Study 8 below).

## CASE STUDY 8

### Tallinn: lorry routing for strategic traffic

#### *Introduction*

Tallinn is the capital of Estonia, with a population of about 400,000 and is a major ferry port linking the Baltic States and Russia with Finland and Sweden. The city centre is located between a lake and the sea, a distance of less than 2.4km at one point, and this part of the city, just east of the Tallinn Old Harbour port area, can be a traffic bottleneck. Although some two thirds of the total freight traffic passing through or close to the city centre is estimated to be traffic between city districts, trucks passing through Tallinn Old Harbour to/from ferry services to Finland, Sweden and Russia can contribute to the congestion; this is likely to be the case in particular when ferry services arrive at the port.



Photo: MDS Transmodal

#### **HGV on strategic route from Tallinn ferry terminals**

#### *The UFT issues*

The congestion caused by strategic ferry traffic is due to the limited availability of alternative routes between Tallinn Old Harbour and the strategic road network exacerbated by the lack of clear signage, often leading to trucks taking wrong or unsuitable routes and causing additional congestion, environmental pollution and safety problems in the city centre. The signs that existed previously were of different types and from various eras, often having been installed at the time of road construction/maintenance work.

The city council and the University of Tallinn have for some years been carrying out regular surveys of freight traffic to and from the port and elsewhere in the city to establish the volumes of freight using particular routes. For 35% of the trucks leaving the port the initial destination is Tallinn itself, but the other 65% are heading for other Estonian cities or Latvia, Lithuania, Poland, the Czech Republic and Hungary, with some bound for Russia and even Turkey. A study was also carried out of the signage for the ferry traffic and the results suggested there was a lack of a clear and consistent approach to signage for freight or other traffic heading to the port whereas, apart from in the area close to the port, traffic heading away from it was better served with information.

#### *The measures*

Measures were then planned using CIVITAS funding to combine new signage for traffic to and from the port areas with, as an innovative aspect, the provision of regularly updated information via GPS in the event of any problems (due to accidents, bad weather or road maintenance). The measures are being implemented through a partnership of the city council, the University of Tallinn and the port.

The signage was designed to indicate directions for traffic leaving the port using the names of towns and cities in Estonia, while inbound signage indicates directions to Stockholm and Helsinki. The implementation of the signage was completed by summer 2011, although the city council will be seeking feedback from truck drivers so that, if necessary, adjustments can be made. Traffic flows will be monitored so that a comparison can be made with the ex ante position.



Photo: MDS Transmodal

#### **Signage for ferry traffic on the approach to the Port of Tallinn**

Following feedback on the routing and signage, the GPS can then be developed and implemented. This will focus on the needs of truck drivers by providing easily accessible information to help achieve smooth traffic flows and avoid conflict between port traffic and other city traffic due to one-off events on the signed routes. Information about available truck routes and the GPS arrangements will be provided on the ferries (in the buffets, at reception, on notice boards and on leaflets), with instructions for downloading the free 'Navi' map into a truck's GPS. The 'Navi' map information will provide regularly updated information on the preferred routes for trucks when travelling to or from the port, taking account of special situations such as road construction and temporary restrictions etc. The measure is planned to benefit truckers, local people and businesses, with less congestion caused by port traffic, improved road safety and some reduction in emissions.

#### *Conclusion*

The measures being applied in Tallinn relate to a specific issue: ensuring that strategic ferry traffic uses the most appropriate routes when travelling to and from the Port of Tallinn, which is located close to the city centre. The

measures that are being adopted use both traditional techniques (defining preferred lorry routes and signing them appropriately) and a more innovative technique (the Navi-map GPS solution) to provide real-time information on traffic conditions on the preferred lorry routes due to one-off problems which cannot be catered for by standard road signs. The measures should contribute to the reduction of congestion in the city of Tallinn, leading to lower environmental emissions.

#### BEST PRACTICE RECOMMENDATION: HGV ROUTING STRATEGIES & SIGNAGE

City authorities should seek to maximise the use of the existing appropriate road network for HGVs in urban areas by planning and implementing HGV routing strategies, involving establishing preferred routes to and from major origins and destinations of freight traffic and providing traditional signage to assist HGV drivers in way-finding.

#### *Night-time deliveries*

A partnership approach between the public and private sectors can be effective in developing night-time deliveries, where city authorities allow transport operators to make deliveries at night as long as they take measures to limit noise that might disturb the sleep of residents. This concept has been pioneered by the PIEK scheme in the Netherlands, but similar schemes, usually based on the PIEK standards, have been implemented by retail chains in London (Sainsburys), in Belgium (Colruyt Group) and in Barcelona (Mercadona, Condis and Lidl) and in a number of French and Dutch cities.

The major public benefit is that night-time deliveries help to reduce congestion during peak day time traffic periods, particularly as fewer deliveries are required when the roads are uncongested during the night. As long as staff are available to receive deliveries (or the infrastructure is in place to allow unattended deliveries), there can be significant benefits to transport operators and the receivers of goods:

- More predictable journey times and therefore arrival times for vehicles due to the lower levels of road congestion;
- Savings in driving time and increased utilisation of vehicles and drivers for the transport operators, which should lead to cost reductions for the stores;
- Improved product availability when the stores open, leading to more sales.

However, there are also some significant investment costs required in quieter trucks, in loading and unloading equipment both on the trucks and at the store, in driver training and in management procedures. The city authorities in Barcelona spent about €50,000 per site to adapt road infrastructure, monitor noise levels and consult with residents. The Colruyt Group has invested about €650,000 in noise reducing equipment for its fleet of trucks and on enclosed delivery bays at its stores.



The success of night-time deliveries seems to rely on the willingness of transport operators and their customers to invest in low noise equipment, the adoption of and strict adherence to best practice (provided by the PIEK standards) and effective consultation with local residents. The measure appears to be quite risky for transport operators and their customers because of the up-front investment that is usually required, the need for effective consultation with residents to explain the benefits and the highly localized issues that can be generated in relation to noise levels. For example, while a trial at a Sainsbury's supermarket in Wandsworth in South London in 2007 resulted in no complaints about noise from local residents, a very similar trial in Beckenham in South London, again by Sainsbury's, was abandoned after ten weeks following complaints from residents who had not been informed of the existence of and reasons for the trial.

Another factor is the availability of staff at night. This would not normally be an issue for logistics service providers (including drivers) as they are accustomed to night time operating. It may be more of an issue for in-house operators and retail staff where there is no precedent of night time working, and for small to medium sized businesses. Any significant move towards night-time deliveries to secure more sustainable urban distribution would require consultation with social partners because of the impact on workers in the retail and transport industry.

In conclusion, in certain circumstances, night deliveries can be effective in reducing congestion during the day, while providing operational benefits and cost savings for transport operators and their customers (mainly major retailers). However, in some countries night delivery schemes appear to be quite risky for the freight industry because of the amount of additional investment required in low noise equipment and the risk that operations will still disturb residents' sleep. Any such schemes need to be developed by the freight industry through close partnership working between the city authorities and in consultation with local residents and their political representatives.

#### **BEST PRACTICE RECOMMENDATION: NIGHT-TIME DELIVERIES**

City authorities should encourage the use of night-time deliveries where this will reduce day-time traffic congestion and where the initiative is understood by, and acceptable to, local residents. As the implementation of night-time deliveries by private sector operators may involve some capital investment, the city authorities need to develop proposals for night-time deliveries in close partnership with the transport operators and their customers, local residents who might be disturbed by the deliveries and their political representatives.

It appears that the development of night time deliveries could be facilitated in the future by the inclusion of low noise loading and unloading equipment for freight vehicles within existing manufacturing standards for freight vehicles to reduce the investment cost involved for operators and make new generations of UFT vehicles automatically more suitable for night-time deliveries. As it relates to manufacturing specifications and would have a significant impact on the extent to which electric vehicles can in the future be used for UFT, there is a case for the EU to take the initiative in this area by carrying out a cost-benefit analysis of the introduction of low noise standards for all freight vehicles. This issue is considered further in Chapter 5.

#### **4.8 Conclusion: the advantages of the collaborative approach**

Public authorities are increasingly recognizing the importance of involving private actors in the policy-making process in order to secure their objectives as well as taking into account private sector interests during the definition of policy measures. In particular, the current trend is to use consultative planning where government and private actors work together in order to identify the necessary measures to be implemented to achieve the relevant objectives. This planning process aims to combine the advantages of the top-down and bottom-up approaches in the promotion and implementation of the measures, and allows policy-makers to become better informed about how the logistics industry works.

Table 4 provides an overview of these collaborative measures, showing objectives and actors. The main approach to promote the participation of private actors in the policy planning process is the institution of consultation forums (such as Freight Quality Partnerships) through which, first of all, information and knowledge is shared between public and private actors, and secondly, public and private measures are coordinated in order to avoid counter-productive actions. This also strengthens the commitment of private actors to the final measures, in terms of their acceptance of the policies and their willingness to implement them and share the costs and risks involved.

**Table 4. Collaborative measures, specific objectives and actors**

<b>UFT measures</b>	<b>Specific Object</b>	<b>Actors concerned</b>
<i>Consultation Forums</i> <i>FQP</i>	Gaining freight industry support for freight strategies and initiatives	All supply chain actors
<i>Telematics applications</i> <i>Traffic information and maps</i> <i>Lorry lanes</i> <i>Infrastructure improvements</i> <i>Simplification &amp; harmonisation of vehicle weight, size and construction regulations</i>	Improving journey reliability of goods vehicles	Transport providers and retailers
<i>Congestion and parking charging</i> <i>Night deliveries</i> <i>UCC</i>	Reducing goods vehicle trips and kilometres	Retailers and transport providers
<i>Providing on-street loading bays</i> <i>Parking areas</i> <i>Nearby Delivery Area</i> <i>UCC</i>	Assisting urban deliveries	Transport providers and truck drivers
<i>Zoning</i> <i>Relocation of freight generators</i> <i>Delivery Service Plans</i>	Consolidate freight transport demand	Producers and retailers
<i>Work limits</i> <i>Driving courses</i>	Improve the working conditions / habits of drivers	Truck and van drivers
<i>Vehicle weight, size and emissions standards regulations</i> <i>Time window</i> <i>Night deliveries</i> <i>Environmental zones</i> <i>Fuel taxation and alternative fuel incentives</i> <i>Infrastructure improvements</i> <i>Off-street loading bays</i> <i>Road design and layout</i> <i>Use of environmentally-friendly vehicles</i>	Reducing environmental impacts and the risk of accidents involving goods vehicles	Citizens, visitors

Source: elaboration from Browne et al. (2007).

The collaborative approach that is increasingly being adopted is essential, given that UFT plays a key role in the economic life of urban areas and is almost entirely operated by the private sector. The road freight sector, in particular, is highly competitive and has to be focused on minimising costs to generate a commercial return; these market forces are very powerful and can be harnessed to the benefit of both the UFT sector and society as a whole. The collaborative approach is more likely to ensure that measures that are introduced provide suitable incentives for transport operators to behave in ways that are commercially as well as socially beneficial, while not distorting the market for the provision of UFT. Examples of practical measures that have been adopted through this approach have included lorry routing/signage strategies and night-time deliveries.

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Collaboration in the supply of UFT through the consolidation of loads has initially been led by the public sector, but with mixed results. However, more private sector- and logistics-led UCCs which demonstrate added value benefits or reduced costs (to balance the additional costs involved in consolidation) may be providing more commercially sustainable business models for the future, even if indirect assistance may be required from city authorities.

However, collaboration in demand for UFT through procurement that leads to fewer, less frequent deliveries could secure huge benefits in reducing congestion and environmental emissions in urban areas, as well as reduce costs for businesses and this is a key area for further work in the next few years.

A summary of the main management measures that could be regarded as “best practice” in terms of moving towards more sustainable UFT at a local level are provided in tabular form below.

**Summary of management and other measures**

MEASURE	ECONOMIC IMPACTS		ENVIRONMENTAL, HEALTH & SAFETY IMPACTS				VALUE FOR MONEY FOR PUBLIC SECTOR	TRANSFER-ABILITY ACROSS EU	FOR URBAN AREA TYPES *
	UFT operational costs	Road congestion	Air quality	GHG	Noise	Health & Safety			
Developing Urban Logistics Plans (ULPs)	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1, 2 & 3
Developing Freight Quality Partnerships, involving effective consultation	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1, 2 & 3
On-line one-stop shops for freight	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1 & 2
Indirect subsidies to support UCCs	Lower	Lower	Better	Lower	Lower	Neutral	Good	High	1, 2 & 3
Planning permission requirements for CCCs for major construction sites	Lower	Lower	Better	Better	Lower	Higher	Good	Moderate +	1, 2, & 3
Planning permission requirements for DSPs	Lower	Lower	Better	Lower	Lower	Neutral	Good	Moderate +	1, 2, & 3
Encouraging DSPs for existing businesses	Lower	Lower	Better	Lower	Lower	Neutral	Good	High	1,2 & 3
Developing network of e-commerce pick-up points	Lower	Lower	Better	Lower	Lower	Neutral	Good (if provided by private sector)	Moderate ++	1, 2 & 3
Lorry routing & signage strategies	Lower	Lower	Better	Lower	Lower	Higher	Good	High	1 & 2
Facilitating night-time deliveries	Lower	Lower	Better	Lower	Neutral	Neutral	Good	Moderate ++	1, 2 & 3
* 1= Metropolis 2 = Other Large Urban Zone; 3 = Smaller Heritage Urban Area; 4 = Other Smaller Urban Area + (depends on planning rules in different Member States) ++(may be cultural differences)									

The summary highlights the number of relatively low-cost management measures that can be implemented by city authorities in partnership and consultation with UFT operators, their customers and other stakeholders to promote more sustainable UFT. The key horizontal measure is the adoption of a process to develop an Urban Logistics Plan (ULP) in consultation with the freight industry and other stakeholders that sets out an integrated strategy to secure sustainable urban distribution over the long term. Other key measures will be those that facilitate collaboration between receivers of freight in urban areas to procure consolidated deliveries into urban areas, such as DSPs, and indirect measures to assist UFT operators to offer consolidated services for “last mile” deliveries based on their entrepreneurial initiative. Most of these measures focus on a partnership

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between the city authorities and the freight industry and their customers to develop improvements for the long-term and do not provide “quick-wins.” This, in turn, emphasises the importance of the Urban Logistics Plans which can provide a long-term vision for local communities to develop measures and practices that secure more sustainable urban distribution. However, in areas such as the introduction of LEVs, ITS and infrastructure charging, measures at a European level in partnership with Member States are likely to be required to achieve the vision for UFT that was set out by the European Commission in its 2011 Transport White Paper.

Overall, city authorities should in our opinion move away from stricter regulation of UFT and focus on planning-led policies (combining effective transport planning and land use planning for freight) and a greater focus in the short-term on ways to encourage the private sector (if necessary through indirect subsidies) to consolidate orders and deliveries.

## 5 EUROPEAN POLICY ON URBAN FREIGHT TRANSPORT

### 5.1 Introduction

This chapter describes our recommendations for policy measures at the European level in the area of UFT, which have been developed within the context of the European Commission's vision for UFT that is set out in its March 2011 Transport White Paper.

The chapter begins therefore by describing the European Commission's policy objectives and vision for UFT up to 2050 and then sets out in detail our recommendations for policy measures that will help Europe to move towards the achievement of these goals. The recommended policy measures were developed by the consultancy team, but were discussed in draft form with industry and public sector consultees at a workshop in Brussels in October 2011.

### 5.2 The policy context and categorisation of recommended measures

#### *The European Commission's vision and policy goals for UFT*

This European Commission Transport White Paper (published March 2011) identifies a number of significant **issues** generated by transport, including the need to reduce GHG emissions to avoid significant climate change, congestion that has high economic costs, poor air quality which affects the health of European citizens and high dependence on fossil fuels which threatens Europe's energy security.

The **vision** for UFT that was set out in the White Paper describes a situation in which freight deliveries and collections in Europe's urban areas are in the future efficient both economically and environmentally in order to reduce emissions and use of fossil fuels and to minimise generalised costs for UFT operators and their customers. The vision includes:

- Minimising the number of freight movements and the distances required to carry them out;
- Using low emission urban trucks to carry out deliveries;
- Making maximum use of Intelligent Transport Systems (ITS) to increase the efficiency of deliveries;
- Reducing noise pollution from freight movements, so that road infrastructure could be used more efficiently by making night deliveries and avoiding morning and afternoon peak periods.

The Commission introduced the quantified **policy goal** for UFT of "essentially CO<sub>2</sub>-free city logistics in major urban centres by 2030", which is a more ambitious target in terms of CO<sub>2</sub> reduction than that included in the White Paper for passenger transport.

The other key goal included in the White Paper that is particularly relevant to UFT is that: "30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors." This is important for

this study because UFT measures at a local level should always be seen in the context of the total door-to-door transport chain rather than only in terms of “last mile” issues.

### *Categorisation of measures*

Our policy recommendations at a European level have been designed to support the achievement of the Commission’s vision for UFT in 2030, while also supporting a switch of a proportion of freight flows over 300km (i.e. flows to and from urban areas) to non-road modes. The recommended policy measures have been categorized as follows:

- **Efficient deliveries:** Encouraging the procurement and provision of efficient deliveries and collections in urban areas in terms of both internal and external costs.
- **Low emission vehicles:** Encouraging the development and take-up of low emission vehicles for “last mile” deliveries.
- **Intelligent Transport Systems:** Promoting the deployment of ITS to increase the efficiency of UFT.
- **Night deliveries:** Allowing the most efficient use of scarce road infrastructure by facilitating the development of night-time deliveries.
- **Intermodal transfer facilities:** Encouraging the development of facilities in urban areas for the transfer of freight between sustainable modes of transport for medium to long distance flows to road transport for “last mile” deliveries.
- **Developing and disseminating good practice** in UFT throughout Europe.

Our policy recommendations are also designed to be practical in the sense that they can be introduced using policy instruments that are already available, rather than requiring major pieces of new legislation or significant amounts of additional EU funding. Relevant existing policy instruments include Framework Programmes for Research and Technical Development (including CIVITAS), the Transport Trans-European Network (TEN-T) and the Marco Polo Programme. Many of the recommended measures are inspired by the need to maintain and promote the efficiency of the European Single Market.

### *Qualitative evaluation*

A qualitative evaluation of each policy recommendation has been carried out and the detailed results are provided in Appendix 2. The evaluation criteria were as follows:

- **Economic impact:** the extent to which the policy recommendation would lead to reduced costs for providers and customers of UFT, as well as wider economic benefits for society (e.g. lower levels of road traffic congestion).
- **Environmental impact:** the extent to which the policy recommendation would lead to reduced environmental emissions and noise pollution.
- **Subsidiarity:** the extent which the policy recommendation at a European level is required, given that urban mobility issues require locally designed measures to deal with local issues and mobility measures are usually a key competence of city authorities.
- **Proportionality:** the extent to which the policy recommendation at a European level is justified by the expected outcome;



- **Compatibility with general urban mobility:** the extent to which the policy recommendation is compatible with measures for improved passenger mobility in urban areas;
- **Feasibility:** the extent to which the policy recommendation can be implemented from a technical and economic/financial point of view.

### 5.3 Recommendation 1: Efficient deliveries

#### *The issue*

One of the main reasons for inefficient UFT, characterised by low load factors, a low number of deliveries on delivery rounds and long dwell times, is that UFT operators and their customers are not sufficiently incentivized through transport pricing mechanisms to increase efficiency. For this reason a vicious circle is generated where city authorities, observing the apparent inefficiency of UFT operations in their city, impose regulations on the freight industry in an attempt to “control” UFT activities, sometimes with results that only exacerbate the problem. Given that most of the freight industry and its customers are in the private sector, the most effective way to incentivize the development of more sustainable UFT practices (and reduce the amount of regulation) is to use the pricing mechanism through the internalisation of external costs into the price of freight transport in urban areas and beyond.

#### *Description*

Internalisation of external costs is where the user of transport infrastructure is charged for the net external costs imposed on society by its use – the social cost of environmental emissions and noise pollution, the economic cost of congestion, the cost of infrastructure construction and maintenance, the economic and social costs of accidents - that are not included in the market price of freight transport, while taking into account existing levels of relevant taxation. In an urban context, this concept would be most relevant to road freight transport because it is the dominant mode for “last mile” deliveries. The application of a policy of internalizing external costs in the road transport sector is generally called “road pricing”. There are no examples of the application of road pricing in a comprehensive way in any European city<sup>6</sup>, although a system of road pricing for freight has been introduced for the motorway network in Germany and Austria and will be introduced for freight vehicles on the motorway and trunk road network in France in 2013.

For road pricing to be effective in securing more sustainable UFT, the prices that would be charged to transport operators would need to reflect the different social and economic costs imposed by different types of vehicle at different times of the day and week and take into account the distance travelled. This means that ICT/IIS needs to be deployed to allow electronic monitoring of the movements of vehicles by the charging authority and to make payment and collection of the charges cost-effective.

#### *Summary of the evaluation results*

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<sup>6</sup> Although a system of road pricing has been implemented in Singapore since 1998, in a particular socio-economic and political context.

Road pricing, if applied to the whole European road network, has a number of key advantages for securing sustainable freight distribution as it follows many of the “golden rules” for an efficient charge on UFT:

- **Price signals:** It provides the “right” price signals to the operators and customers of freight transport (by increasing the financial cost of freight transport to its full social cost) to encourage them to provide and use more efficient freight services. This would be achieved by the operators offering their customers less frequent deliveries with higher load factors at a lower price, by greater use of low or zero emission vehicles with lower externalities (and therefore lower costs), greater collaboration between SMEs to increase load factors through consolidation of deliveries and through greater use of rail and waterborne freight transport for longer distance freight movements.
- **Justified:** Road pricing is justified by the quantified externalities generated by freight movements and has the clear public policy objectives of, in particular, reducing road congestion and emissions.
- **Equitable** between freight vehicles and other users of urban transport infrastructure, as long as it is applied to all vehicles.
- **Economic to collect** if it can be collected automatically and cost effectively using ITS/ICT.
- **Convenient to pay for the freight operators**, based on the application of ICT and ITS.
- **Certain:** The amount of the charge per kilometre on particular roads at different times of the day could be transparent for the UFT operators, so they can adopt strategies and make investments in response to the charge.

Full-scale road pricing applied to urban areas, as well as to inter-urban and long distance transport, remains the most appropriate medium- to long-term policy measure to provide price signals to UFT operators and their customers to secure more sustainable UFT. Given the levels of road congestion that are often experienced in many urban areas in peak hours and the levels of air pollution and CO<sub>2</sub> emissions in urban areas, road pricing (based on the type of vehicle, the time of day, day of the week and the distance travelled on particular roads) is likely to lead to a significant increase in the variable cost of road freight movements in urban areas.

As the freight industry is highly competitive and responds to price signals through market mechanisms, this would have the effect of encouraging greater use of collaboration and consolidation to reduce the cost per unit of goods transported and encourage the use of more environmentally-friendly vehicles. Through normal market mechanisms, any increase in costs would have to be passed on to customers, which would encourage them to adopt procurement and supply chain strategies that minimise the delivery costs. It would also have the advantage of removing the justification for direct or indirect public subsidies for UFT, which can distort freight markets, and would remove the need for other forms of charging and regulation such as congestion charging and Low Emission Zones. Regulation would therefore be simplified, with regulatory measures being mainly deployed to ensure the safety of road users and limiting damage to the physical environment.

Finally, the introduction of road pricing is likely to encourage a switch of some strategic traffic to and from urban areas to rail and waterborne freight, which would help to increase the sustainability of the whole transport chain, not just for the “last mile.”

Some stakeholders consulted during the study have suggested that the UFT operators who would pay the charges are not able to adapt their UFT operations to receive deliveries at times when road prices would be lower because the timing of deliveries is stipulated by their customers. In reality, while the demand for freight itself is inelastic (i.e. it does not change in response to changes in prices), the need for both operators and their customers to minimise the cost of freight transport would lead to operators (in order to remain competitive and/or secure greater market share) offering their customers the option to receive deliveries at non-peak times at a lower cost. Some of these customers would then choose to change their supply chain strategy to take advantage of the lower costs that are being offered to them by their suppliers in order to increase profitability.

Some stakeholders have also suggested that freight operators may not be able to pass on any additional costs from road charges to their customers and so they would have no effect on patterns of demand for freight transport in urban areas. Beyond the short-term, however, the charges would have to be passed on through market forces as to imply otherwise would suggest that providers of UFT services would be able to operate without covering their costs and/or making a return on their investment.

Any system of road pricing should be adopted using electronic measurement and payment technologies on a consistent basis throughout Europe to reduce costs for all the stakeholders involved. This means that the EU needs to take the lead role in terms of developing the most appropriate technology, determining the charges based on the best available knowledge on the external costs involved and to monitor implementation to ensure there are no distortions in the functioning of the Single Market.

Any system of urban road pricing should apply to all road vehicles not just to freight vehicles. There are likely to be strong arguments in favour of the hypothecation (or ear-marking) of net revenues to improvements to transport infrastructure and public transport projects as they will help to reduce road congestion, but from the viewpoint of securing sustainable UFT the most important point is that the market receives the appropriate price signals to adapt their behaviour.

There is likely to be political resistance to the concept of road pricing for all road users because of the perception of road pricing as being “just another tax” on citizens and there would also be concerns about the impact of the additional costs on the European economy. However, such a system of road pricing should replace existing forms of taxation on the ownership and use of road vehicles, including fuel duty, so that the main impact on road users as a whole is likely to be a re-distribution of charges rather than a significant overall increase.

The major issue that emerges from the evaluation is the lack of political acceptability of the introduction of road pricing. This suggests that the need for, and the advantages of, road pricing as a policy to secure more sustainable distribution in urban areas, needs to be carefully explained to industry, the public and their elected representatives.

The other major issue would appear to be the significant up-front cost in terms of the provision of on-board equipment and developing IT systems to monitor and enforce payment. However, the technology is already available for GPS-based monitoring of road vehicles and it seems unlikely that

this technology could not be applied in an urban context. The involvement of the EU in promoting road pricing for UFT would help to reduce costs for all stakeholders by facilitating the use of standardised technology and interoperable technology throughout Europe.

#### EU POLICY RECOMMENDATION 1: INTERNALISATION OF EXTERNAL COSTS IN URBAN AREAS

The EU should continue to develop its policy of road pricing based on the internalisation of net external costs and it should be applied to all kinds of road vehicles that operate in urban areas as well as to strategic freight and passenger transport movements. The system should replace existing forms of taxation on the ownership and use of road vehicles, including duty on fuel, rather than being an additional charge. Any net revenues from the road pricing scheme should be used to improve urban mobility.

Timescale: Long-term (after 2020)

### 5.4 Recommendation 2: low emission vehicles (LEVs)

#### *The issue*

Conventional propulsion technologies that are used by UFT operators (principally diesel engines) lead to emissions of GHGs and other air pollutants and also generate noise pollution. Therefore greater use of LEVs would have a significant impact on air quality and noise levels in urban areas (thereby facilitating greater use of night deliveries) and would make a contribution to reducing the levels of GHGs in the atmosphere.

There is a risk that the market take-up of LEV technology is slow because of high capital costs, uncertainty about the maturity of the technology and the poor availability of refuelling infrastructure. This is mainly due to the lack of manufacturing economies of scale that could reduce unit costs and improve the investment case for refuelling infrastructure.

As well as the technological issues relating to LEVs and the knock-on impact on fleet investment strategies, a number of legal, regulatory and safety issues emerged from discussions with stakeholders during the course of the study:

- Safety issues relating to electric (and hybrid vehicles when using their batteries) due to their low noise levels and their handling characteristics compared to conventional vehicles;
- Whether the weight of batteries in some small electric vans, which makes them HGVs from a regulatory point of view, is a barrier to take up by operators because HGV-qualified drivers do not want to drive them.

In the future there are likely to be other operational and regulatory issues that emerge as LEVs become increasingly integrated into UFT operators' fleets and, where appropriate, European R&D activities should reflect this.

#### *The policy recommendation*

The policy recommendation is that there should continue to be funding of European industry to develop alternative fuel, vehicle and infrastructure technology for low emission but cost-effective technologies for UFT vehicles. This research, provided through the RTD Framework Programmes, would be provided on a technology neutral basis, as the most appropriate specific technology remains uncertain. The R&D work would include not only technological issues, but also how best to ensure widespread market take-up of the technology (including the impact on business models and operations), and safety issues.

### *Summary of evaluation results*

An integrated approach to R&D at a European level that considers technological issues, along with safety, operational and market issues, is most likely to secure the widespread take-up of low emission technology for UFT at a reasonable cost for the European freight transport industry and therefore secure reduced environmental emissions. The role of the EU is justified by the need to generate EU-wide economies of scale for the manufacture of LEVs and the need to ensure common standards for vehicles, fuels and infrastructure as well as operations to facilitate take-up and the smooth functioning of the Single Market. Legal powers and funding are already in place for EU involvement in this area.

#### **EU POLICY RECOMMENDATION 2: R&D INTO ZERO & LOW & EMISSION VEHICLES**

The EU should continue to fund integrated R&D on a technology-neutral basis into low emission vehicles, fuels and infrastructure for UFT, taking into account safety and legal considerations and also considering how to overcome barriers to their market take-up and use by industry and the public sector.

Timescale: Short- and medium-term (2012-20)

## **5.5 Recommendation 3: Intelligent Transport Systems**

### *The issue*

Existing ITS technologies have the potential to increase UFT efficiency to a significant extent by, for example, providing real-time data on road traffic conditions (including incidents and road works), allowing booking of on-street loading/unloading bays and controlling access to city centres. The required technology for Intelligent Transport Systems that could improve the efficiency and sustainability of UFT has been available for some time, but there has been relatively little deployment of the technology in urban areas.

In December 2010 the Commission Expert Group on ITS for the Urban Regions was established with a mandate to provide guidelines for the successful deployment of selected key ITS applications in urban areas, such as multi-modal travel information, smart ticketing, traffic management and urban

logistics. As well as the development of guidelines, the Expert Group is also collecting best practices and developing recommendations on possible standardization needs in the area of ITS to assist local, regional and national authorities to implement interoperable ITS applications at a local level.

### *Description*

The EU is in the process of implementing its ITS Action Plan, in partnership with Member States, city authorities and the private sector (through, for example, the work of the Expert Group on ITS), but one of the key issues that may slow its implementation is the availability of the most appropriate organisational, institutional and business models to facilitate the delivery of ITS at a local level.

### *Summary of results of evaluation*

The lack of suitable organisational, institutional and business models for the deployment of ITS at a local level appears to be a key barrier to the practical implementation of ITS. The availability and application of such models would facilitate the deployment of ITS that could, for example, provide real-time information on the status of the urban road network and facilitate the booking of on-street parking spaces, allowing UFT operators to increase the efficiency of UFT operations. This would lead to lower costs for UFT operators and for their customers, as well as wider environmental and economic benefits. The involvement of the EU in seeking to remove the organisational/institutional barriers to deployment of ITS is justified by its on-going work to ensure the deployment of interoperable ITS solutions across the EU, particularly as it reduces costs for industry and the public sector and ensures the smooth functioning of the Single Market. The implementation of ITS is likely to be acceptable to all stakeholders as long as it does not require significant up-front capital expenditure or on-going maintenance costs by the ITS providers (private or public) that cannot be recovered through user charges.

The deployment of ITS in urban areas could have a significant positive impact on urban mobility as a whole as it would allow UFT operators to react to urban traffic conditions in real time and so reduce road congestion and smooth traffic flows. The key issue could be the cost of capital expenditure and operating costs involved unless costs can be recovered through user charges.

#### **EU POLICY RECOMMENDATION 3: RESEARCH INTO ORGANISATIONAL, INSTITUTIONAL & BUSINESS MODELS FOR THE DEPLOYMENT OF ITS FOR UFT IN URBAN AREAS**

The EU should fund research into the most appropriate organisational, institutional and business models for the deployment of ITS to move towards the rapid implementation of ITS on an interoperable basis by the relevant local, regional and national authorities in partnership with private sector providers. The research should include consideration of including charges for ITS within road user charging schemes.

Timescale: Short-term (2012-15)

## 5.6 Recommendation 4: Night deliveries

### *The issue*

Night-time deliveries, perhaps using electric vehicles, could help to relieve peak day-time road congestion and therefore make better use of road infrastructure capacity. However, low noise operations requires all equipment (not just propulsion systems) to meet low noise standards. At the moment standard equipment used for handling and loading/unloading goods does not meet the low noise levels that would be required for night-time operations. This means that UFT operators and their customers have to make additional investments in specialised low noise equipment in order to be able to operate at night.

### *The measure*

Research into the benefits and costs of introducing standards for all road freight vehicles that automatically provide low noise operations (driving, loading and unloading operations) would be carried out, so that potential noise impacts from operation of the equipment (particularly at night, but also during the day) is minimised during the manufacture of the vehicles. This research would need to define what is meant by "low noise" equipment, building on the work of the PIEK initiative in the Netherlands, and would then consider the benefits and costs of adopting such standards in the manufacture of all vehicles for UFT operators, vehicle and equipment manufacturers, customers and the general public. The research would need to consider the extent to which night-time deliveries are likely to be required in the future, given the impact on residents and transport and retail workers, as well as the potential to reduce costs for businesses and to reduce day-time road congestion. If significant net benefits can be achieved, the EU would then need to consider how to facilitate the development and adoption of the required standards by the freight vehicle and equipment manufacturers.

### *Summary of results of evaluation*

The adoption of low noise equipment by vehicle and equipment manufacturers as standard would provide significant net benefits to stakeholders in that it should facilitate greater use of night-time deliveries in urban areas, reducing costs for UFT operators and their customers and reducing road congestion during the day-time peak; the latter would provide wider economic benefits for the urban area. A key economic impact would be the removal of the additional investment risk for UFT operators and their customers in purchasing non-standard low noise equipment. The adoption of low noise equipment as standard would reduce noise pollution from UFT operations for urban residents, visitors and workers at all times of the day and more night-time deliveries would reduce day-time congestion.

#### EU POLICY RECOMMENDATION 4: INVESTIGATION OF STANDARDS FOR LOW NOISE EQUIPMENT FOR FREIGHT VEHICLES

The EU should carry out a cost-benefit analysis for the inclusion of low noise equipment in manufacturing standards for freight vehicles and associated loading and unloading equipment, so that future generations of vehicles and other equipment are more likely to be suitable for night-time deliveries without additional capital investment.

Timescale: short-term (2012-15)

### 5.7 Recommendation 5: Intermodal transfer facilities (TEN-T)

#### *The issue*

The introduction of road pricing and greater adoption of LEVs for “last mile” deliveries would make it more likely that there will a transfer of freight between medium- and long-distance transport by whatever mode and road vehicles for final deliveries to city centres. This means that the development of more intermodal freight interchanges on the outskirts of major urban areas would facilitate greater use of rail and waterborne transport for these medium- and long-distance flows. There is also a need to support other key infrastructure priorities, such as the deployment of ITS (see Recommendation 3 above), to support the development of infrastructure for the refueling of LEVs (Recommendation 2) and to relieve bottlenecks on inter-urban networks.

#### *The policy recommendation*

TEN-T funding should be made available to high quality "projects of common interest" that support the development of sustainable UFT in the 83 urban nodes defined in the Proposal for the TEN-T Guidelines (published in October 2011). In urban areas these projects should relate to: (1) the development of intermodal freight interchanges within or close to urban nodes, often with associated warehousing, so that freight can be transported over medium and long distances by rail/waterborne transport and then transferred efficiently to road transport for “last mile” distribution; (2) re-fuelling infrastructure for freight LEVs in urban areas; (3) deployment of ITS that supports the efficiency of UFT operations by any mode; (4) the removal of bottlenecks on TEN-T links between urban nodes to improve the efficiency of the whole transport chain. The intermodal freight interchanges, located in logistics zones, would provide the opportunity to switch traffic from rail/waterborne freight transport directly to LEVs for “last mile” deliveries in city centres.

#### *Summary of evaluation results*

The part-funding of high quality TEN-T projects as described above in urban nodes should help to reduce road congestion in urban areas and on inter-urban routes, while also contributing to the development of medium and long distance traffic flows by more cost-effective rail and waterborne transport. This should reduce costs for UFT operators and their customers and provide wider



economic benefits in terms of lower congestion costs for other users of the infrastructure and lead to lower levels of air pollution and GHG.

The involvement of the EU in providing financial support for the development of the TEN-T is justified by the need to improve the functioning of the Single Market, which relies on high quality infrastructure links between and within Europe's urban nodes.

#### EU POLICY RECOMMENDATION 5: TEN-T FUNDING FOR UFT

The EU should fund projects of common interest in urban nodes on the TEN-T that:

- (1) develop intermodal freight interchanges for the transfer of freight between rail/waterborne transport for medium to long distance flows and road for “last mile” deliveries;
- (2) develop refuelling infrastructure for LEV freight vehicles;
- (3) deploy ITS that specifically improves the efficiency of UFT operations;
- (4) removes bottlenecks on inter-urban TEN-T links.

Timescale: Short, medium and long-term (2012-30)

## 5.8 Recommendations 6–9: Developing & disseminating “best practice” in UFT

### *Introduction*

UFT measures at a local level need to be developed following consultation with stakeholders and the development of Urban Logistics Plans so as to develop policy measures that are fully integrated with other policies such as land use, housing and passenger mobility. City authorities, in partnership with the private sector, can be a source of innovation in developing policy measures that promote sustainable UFT, but may lack funding to implement their ideas. There may be a lack of publicity for successful projects that promote sustainable UFT. Finally, there is a need to define and then disseminate “best practice” that has been developed in some cities and may generate benefits through being applied elsewhere in Europe.

### *Urban Logistics Plans*

The policy recommendation

The EU should develop guidelines for city authorities on how to develop Urban Logistics Plans (ULPs) within Sustainable Urban Mobility Plans (SUMPS), taking into account the local context. This would assist city authorities to develop freight expertise and would require them to carry out research on existing freight movements, complete ex ante and ex post evaluation of the impact of measures, carry out consultation on potential measures with all relevant stakeholders and ensure greater integration of planning for UFT with passenger transport, land use planning and other relevant policies. The completion of a ULP should become a requirement for further EU funding of UFT measures.

## Summary of evaluation results

The guidelines would set out how city authorities can use the ULP process to develop a greater understanding of UFT and its role in the functioning of their city's economy and ensure that policies and measures are fully integrated with wider planning and economic development policies over the long term. The guidelines would explain how cities can adopt policies and measures to promote the development of sustainable UFT that reduces the environmental impacts of freight movements without damaging the city's economy. The EU is able to provide guidelines for the development of ULPs that take into account pan-European experience, without prescribing detailed policies and measures at a local level. The role of the EU is also justified to ensure that EU funds from CIVITAS, TEN-T and Cohesion Funds are used to develop sustainable UFT measures and practices in an integrated way and to ensure value for money. The requirement to implement any UFT measures following the development of a ULP, as an integral part of a SUMP, should have a net positive impact on urban mobility by ensuring that freight issues are fully taken into account when developing urban mobility policies and measures.

### EU POLICY RECOMMENDATION 6: URBAN LOGISTICS PLANS

The EU should develop guidance on the development of Urban Logistics Plans as an integral part of Sustainable Urban Mobility Plans. The completion of a high quality ELP should be a prerequisite for the receipt of EU funding for UFT measures from CIVITAS, TEN-T and Cohesion Funds.

Timescale: Short-term (2012-15)

### *Supporting innovation in sustainable UFT: CIVITAS*

#### The policy recommendation

The EU should continue to fund the CIVITAS Programme, which provides funding for innovative urban mobility schemes throughout Europe, but there should be greater focus on some key UFT priorities where innovative demonstration projects and knowledge transfer is most appropriate: (1) development of high quality Urban Logistics Plans (ULPs) within Sustainable Urban Mobility Plans (SUMPS); (2) UFT measures that influence demand for UFT rather than regulating its supply; (3) demonstration projects to deploy ITS in urban areas that provide innovative solutions for UFT; (4) other highly innovative projects at a European level that facilitate sustainable UFT.

#### Summary of evaluation results

Based on a review of the documentation that was available to us when carrying out this study, rather than following a full programme evaluation, we believe that the CIVITAS Programme provides a valuable mechanism to assist city authorities in planning and implementing sustainable UFT projects. The greater recent emphasis on freight-related projects has helped to raise the profile of freight issues in cities in Europe. However, we believe that given the trends we have outlined in

Chapter 4 above and, in particular, the greater emphasis that is needed on innovation, collaboration and planning and implementation of ITS, some changes of emphasis are required in any follow-on Programme.

The CIVITAS Programme provides funding support for urban mobility programmes that include innovative measures to secure sustainable UFT, but in the future a more focused approach based on supporting the development of ULPs, demand-led measures and deploying innovative ITS solutions while providing scope for genuinely innovative (and therefore risky) measures at a European level (accompanied by effective dissemination of results) should provide the greatest benefits in terms of supporting more efficient UFT. Direct economic impacts will be higher at a European level with effective dissemination of results following a high quality ex post evaluation of the results of CIVITAS projects. The more focused approach explained above should provide the greatest benefits in terms of promoting more sustainable UFT by ensuring that any measures are implemented following consultation, data collection and research and are fully integrated with other policies (through ULPs), while supporting market-led measures that lead to lower numbers of freight movements and less road congestion.

#### EU POLICY RECOMMENDATION 7: CIVITAS PROGRAMME

The EU should focus on the following key priority areas within the CIVITAS Programme:

- (1) development of Urban Logistics Plans, including data collection and evaluation methodologies;
- (2) development of demand-side rather than supply-side UFT measures;
- (3) implementation of demonstrations of ITS projects in urban areas with specific UFT applications;
- (4) implementation of innovative UFT measures at a European level.

Effective dissemination of results, following a high quality ex post evaluation of results, is essential for the future success of the Programme.

Timescale: Short and medium-term (2012-20)

#### *Defining & disseminating best practice*

##### Policy recommendation

The European Commission should develop and disseminate "best practice" guidance on sustainable UFT measures and practices for city authorities, private sector UFT operators and their customers. As "best practice" evolves over time, it should be defined by a "committee of experts" in sustainable UFT, which would meet on an occasional basis. The "best practice" guidelines would then be disseminated through a "one stop shop" website, building on an existing website that is already visited by relevant stakeholders seeking information on sustainable UFT and sustainable mobility in urban areas (e.g. ELTIS). The on-line material would include information on: "best practice" in sustainable UFT policy measures; information on "best practice" in sustainable UFT operations; opportunities for European funding of sustainable UFT policy measures and operations; information on an annual award scheme for innovative sustainable UFT measures.

## Summary of evaluation results

In the medium to long term, the development of European "best practice" and its active dissemination through a "one stop shop" website would gradually (if indirectly) promote the development of measures in European cities that assist UFT operators to operate more efficiently (through reductions in congestion, for example), therefore reducing costs for their customers and reducing environmental externalities (air and noise pollution), with benefits for society as a whole.

The involvement of the EU in providing "best practice" guidance is likely to be welcomed by city authorities as it would be an information source that transfers knowledge and experience from around Europe to other cities at very low cost. The "best practice" guidance would reflect the fact that local contexts require local solutions.

### EU POLICY RECOMMENDATION 8: DEFINITION & DISSEMINATION OF BEST PRACTICE

The EU should develop "best practice" guidelines for sustainable UFT and then disseminate these guidelines by means of a single already established website that "showcases" examples of innovation in sustainable UFT measures and practices at a local level.

Timescale: Short medium and long-term (2012-30)

## *Promoting sustainable UFT in Europe*

### Policy recommendation

The European Commission should develop an annual award scheme for innovative sustainable UFT measures. The award, which would be a new award funded by the European Commission within an existing European logistics award scheme, would be for sustainable UFT measures and practices that have been implemented by the public and private sectors working in partnership in urban areas.

The European Commission should also promote sustainable UFT by making transport chains that involve urban deliveries and collections a "political priority" within the Marco Polo Programme. This would mean that a proportion of the total funding would be "reserved" for sustainable freight transport services that specifically include sustainable UFT practices (such as using electric vehicles for "last mile" deliveries) within long distance door-to-door transport chains.

## Summary of evaluation results

In the medium- to long-term, the development of an annual award would gradually (if indirectly) promote the development of measures in European cities that assist UFT operators and their customers to operate more efficiently (through reductions in congestion, for example), therefore reducing costs for their customers and reducing environmental externalities (air and noise pollution), with benefits for society as a whole. The role of the EU is justified by the need to publicise success in sustainable UFT at a local level to a pan-European audience.

**EU POLICY RECOMMENDATION 9: ANNUAL AWARD FOR SUSTAINABLE UFT**

The European Commission should promote the development of sustainable UFT through:

- An annual award scheme for sustainable UFT that "showcases" examples of innovation in sustainable UFT measures and practices at a local level.
- Making sustainable UFT a "political priority" within the Marco Polo Programme so that a proportion of the total funding is reserved for services that involve sustainable UFT practices within long distance door-to-door transport chains.

Timescale: Short and medium-term (2012-20)

**5.9 Conclusion: The role of the EU in the context of UFT**

When considering the most relevant policy recommendations to add value at a European level, there is tension between the principle of subsidiarity, which reflects local impacts of UFT on urban areas and local democracy, and the specific characteristics of the freight industry where "last mile" deliveries in urban areas are only the final leg in national, international and even intercontinental transport chains. Given the nature of these long-distance door-to-door transport chains and the (at least) pan-European markets for freight transport services and the trans-national nature of the challenge posed by climate change, the European Union has a clear role in promoting sustainable urban distribution while respecting the principle of subsidiarity.

The recommendations focus therefore on influencing the business environment in which UFT operates including, in particular, facilitating the take-up of private sector-led measures that increase logistical efficiency and, at the same time, reduce the impacts of UFT. In our opinion, the EU should also focus on introducing legislation that provides the private sector with appropriate price signals that encourages it to collaborate in the demand for and supply of UFT and promotes the widespread take-up of low emission vehicle technology.

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## APPENDIX 1: ORGANISATIONS CONSULTED DURING THE STUDY

Agenzia Mobilita' di Roma  
American Chamber of Commerce to the EU  
Atelier Parisien d'Urbanisme  
Cargohopper  
Chalmers University of Technology  
City of Barcelona  
City of Bremen  
City of Gothenburg  
City of Krakow  
City of Ljubljana  
City of Parma  
City of Tallinn  
City of Utrecht  
Community of European Railways  
CW-Logistik  
DB Schenker  
Deutsche Post DHL  
Eurocommerce  
European Express Association  
European Transport Workers Federation  
Federal Express International  
Institute for Transport and Logistics, Regione Emilia Romagna  
ISL Bremen  
La Poste  
POLIS  
Posteuropa  
RATP  
Transport For London  
UETR European Road Hauliers Association  
University of Westminster  
UPS Europe

**APPENDIX 2: RESULTS OF QUALITATIVE EVALUATION OF EUROPEAN POLICY RECOMMENDATIONS**

<b>RECOMMENDATION 1: Internalisation of external costs for freight</b>							
<b>DESCRIPTION</b>	The introduction of a pan-European system for the pricing of all modes of transport that internalises all external costs within the prices charged to customers of transport. In the context of UFT this would mainly mean the introduction of a comprehensive system of road pricing. The external costs charged to freight operators would be based on the distance travelled and vary according to the time of day and type and size of vehicle and would include the monetised values of external costs such as congestion, air pollution, GHG emissions, noise and accidents. To be introduced for both freight and passenger vehicles in urban areas as well as for inter-urban transport flows, using ITS and ICT to make payment and enforcement automatic and low cost and replacing existing taxes and charges on vehicles. Net revenues raised would be used for						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	Pricing would be fair from an economic point of view in that it would be related to the type of vehicle, the time of day, the day of the week and the distance travelled and would apply costs based on an agreed and accepted methodology. Other taxes on vehicles would be removed (vehicles excise, fuel duties etc.) All public subsidies to modes of transport would end, removing potential market distortions. Assuming that the impact would be to increase the cost of UFT by conventional vehicles (which is likely), the measure would lead in the medium term to an increase in private sector initiatives to reduce costs through more effective procurement of freight services, greater collaboration in the supply chain, more consolidation of loads and greater take-up of LEVs in order to minimise costs. Many pricing/regulatory measures (such as congestion charging and LEZs) would be redundant except where they relate to safety (e.g. avoiding conflicts between vehicles and pedestrians).	The response to fair and efficient pricing in urban areas by the providers and customers of UFT services would lead to some reduction in movements of road freight vehicles (through improved load factors), spreading of deliveries outside peak hours and greater use of LEVs, thereby reducing the negative externalities associated with UFT.	Fiscal/charging policy remains an area that is of significant concern to Member States and city authorities because of its impact on voter intentions. However, the EU has a clear role in facilitating road pricing across the EU to ensure that the technology employed is harmonised to avoid distortion of the Single Market and to minimise implementation costs.	Only the EU can develop a consistent methodology and technological standards to implement a pan-European system of fair and efficient transport pricing at a reasonable cost.	The concept of road pricing may be considered to be unfair by some road users, although it would mainly be a redistribution of the tax burden as it would replace existing taxation of motorists. Opposition would also be reduced if net revenues were used to improve general mobility in urban areas. There may also be concerns about UFT operators' privacy and the use of information obtained for the purposes of charging.	Should be technically feasible using satellite technology, allied to ICT and ITS. Technical standards and economies of scale through implementation across Europe should reduce costs. The cost of implementation would need to be met by Member States, rather than individual city authorities.	Road pricing would reduce some discretionary demand for passenger transport and would help to spread some demand across the day and away from peak hours. Net revenues would be used to improve road infrastructure and develop public transport. These would reduce road congestion and help freight operators to provide more efficient services to their customers.
<b>Conclusion</b>	++	++	-	+		0+	++
<b>TIMESCALE</b>	Long term (after 2020)						
<b>RECOMMENDATION</b>	The EU should continue to develop its policy of internalising external costs based on the internalisation of net external costs and it should be applied to all kinds of road vehicles that operate in urban areas as well as to strategic freight transport movements. The system should replace existing forms of taxation on the ownership and use of road vehicles, including duty on fuel, rather than being an additional charge. Any net revenues from the road pricing scheme should be used to improve urban mobility.						

<b>RECOMMENDATION 2: R&amp;D into Low Emission Vehicles (LEVs)</b>							
<b>DESCRIPTION</b>							
	<p>R&amp;D funding for European industry to research and develop alternative fuel, vehicle and infrastructure technology to secure low emission but cost-effective technologies for freight vehicles for use in urban areas. This research, provided through the RTD Framework Programmes, would be provided on a technology neutral basis as the most appropriate specific technology remains uncertain. The R&amp;D work includes not only technological issues, but also includes how best to ensure widespread market take-up of the technology, including the impact on business models and operations, and safety issues. The latter should include in the short-term: whether the weight of batteries for electric LGVs means that driver recruitment is more difficult because of the need to have drivers with HGV licences; operational safety for electric vehicles that are very quiet and have different driving characteristics compared to conventional vehicles. On-going research is required into the most cost-effective means to stimulate market take-up of LEVs for use in UFT operations, taking into account the cost to business and the public sector.</p>						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	<p>An integrated approach to R&amp;D at a European level that considers technological issues, along with safety, operational and market issues is most likely to secure the widespread take-up of low emission technology for UFT at a reasonable cost for the European freight transport industry.</p>	<p>An integrated approach to R&amp;D at a European level that considers technological issues, along with safety, operational and market issues is most likely to secure the widespread take-up of low emission technology for UFT.</p>	<p>The involvement of the EU in providing financial support to European industry to develop innovative technologies that reduce carbon emissions is generally accepted as within its mandate because of its importance for the functioning of the Single Market.</p>	<p>The role of the EU is justified by the need to generate EU-wide economies of scale for the manufacture of LEVs and the need to ensure common standards for vehicles, fuels and infrastructure as well as operations to facilitate take-up and the smooth functioning of the Single Market.</p>	<p>Likely to be acceptable to all stakeholders as it facilitates the take-up of the most suitable LEV technology for use in UFT, while adopting an integrated approach.</p>	<p>Legal powers and funding are already in place for EU involvement in this area.</p>	<p>In the long-term it is hoped that the R&amp;D activity will help to facilitate the widespread introduction of LEVs for UFT in urban areas and so will help to increase its environmental sustainability. However, it will not in itself reduce road congestion without other measures that improve load factors, reduce waiting times for deliveries and change patterns of demand for UFT.</p>
<b>Conclusion</b>	++	++	++	++	++	++	+
<b>TIMESCALE</b>	Short- and medium-term (2012-20)						
<b>RECOMMENDATION</b>	<p>The EU should continue to fund integrated R&amp;D on a technology-neutral basis into low emission vehicles, fuels and infrastructure for UFT, taking into account safety, legal considerations and also considering how to overcome barriers to their market take-up and use by industry and the public sector.</p>						

<b>RECOMMENDATION 3: Introduction of ITS in urban areas</b>							
<b>DESCRIPTION</b>							
<p>While required technology for ITS that could improve the efficiency and sustainability of UFT has been available for some time, there has been little deployment of the technology in urban areas. A key barrier to deployment appears to be the lack of organisational, institutional and business models to facilitate deployment at a local level. Further research is therefore required in these areas.</p>							
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	<p>UFT operators would have, for example, real-time information on the status of the urban road network, allowing them to maximise the efficiency of their operations. This would lead to more efficient UFT operations (more reliable journey times, less waiting time required for deliveries and collections), leading to lower costs for UFT operators and for their customers. The reduced costs of UFT for businesses and smoother traffic flows in urban areas would provide wider benefits for the urban economy.</p>	<p>UFT operators would have, for example, real-time information on the status of the urban road network, allowing them to maximise the efficiency of their operations. This would lead to more sustainable UFT because there would be lower emissions from vehicles experiencing congestion.</p>	<p>The involvement of the EU in implementing its Action Plan on ITS is generally accepted as within its mandate, given the need to ensure interoperability of solutions across the EU.</p>	<p>The role of the EU is justified by the need to ensure deployment of ITS solutions using common standards to ensure interoperability; this reduces costs for industry and the public sector and ensures the smooth functioning of the Single Market.</p>	<p>Likely to be acceptable to all stakeholders as long as it does not require significant up-front capital expenditure or on-going maintenance costs by the ITS providers (private or public) that cannot be recovered through user charges.</p>	<p>The technology is already available, the key issue for the deployment of ITS may be finding suitable institutional, organisational and business models for private or public sector investment in ITS. Where public investment is required in ITS, the cost could in the long-term be included in any system of comprehensive road pricing on a user pays basis. The proposed study would directly address these issues.</p>	<p>The deployment of ITS in urban areas could have a significant positive impact on urban mobility as a whole as it would allow UFT operators to react to urban traffic conditions in real time and so reduce road congestion and smooth traffic flows.</p>
<b>Conclusion</b>	++	++	++	++	+	++	++
<b>TIMESCALE</b>	Short-term (2012-15)						
<b>RECOMMENDATION</b>	<p>The EU should fund research into the most appropriate organizational, institutional and business models for the deployment of ITS to move towards the rapid implementation of ITS on an interoperable basis by the relevant local, regional and national authorities in partnership with private sector providers. The research should include consideration of including charges for ITS within road user charging schemes.</p>						

<b>RECOMMENDATION 4: Investigation of standards for low noise equipment for freight vehicles</b>							
<b>DESCRIPTION</b>	Research into the benefits and costs of introducing standards for all road freight vehicles that automatically provide low noise operations (driving, loading and unloading operations), so that potential noise impacts from operation of the equipment (particularly at night, but also during the day) is minimised during the manufacture of the vehicles. This research would need to define what is meant by "low noise" equipment, building on the work of the PIEK initiative in the Netherlands, and would then consider the benefits and costs of adopting such standards in the manufacture of all vehicles for UFT operators, vehicle and equipment manufacturers, customers and the general public. The research would need to consider the extent to which night-time deliveries are likely to be required in the future, given the impact on residents and transport and retail workers, as well as the potential to reduce costs for businesses and to reduce day-time road congestion. If significant net benefits can be achieved, the EU would then need to consider how to facilitate the development and adoption of the required standards by the freight vehicle and equipment manufacturers.						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	The adoption of low noise equipment by vehicle and equipment manufacturers as standard would provide significant net benefits to stakeholders in that it should facilitate greater use of night-time deliveries in urban areas, reducing costs for UFT operators and their customers and reducing road congestion during the day-time peak; the latter would provide wider economic benefits for the urban area. A key economic impact would be the removal of the additional investment risk for UFT operators and their customers in purchasing non-standard low noise equipment.	The adoption of low noise equipment as standard would reduce noise pollution from UFT operations for urban residents, visitors and workers at all times of the day. More night-time deliveries would reduce day-time congestion, reducing environmental emissions.	The EU has competence in this area because it has a direct role in providing standards for the pan-European transport equipment market, given its importance for the smooth functioning of the Single Market.	The role of the EU is justified by the need to generate EU-wide standards for low noise vehicles and equipment in the Single Market.	Likely to be acceptable to UFT operators, many of their customers and vehicle and equipment manufacturers as long as they can all either reduce costs or make an adequate economic return.	If the research shows there would be significant net benefits, then the EU could seek to work with industry to define and adopt the required standards.	If such standards can be defined and implemented, the effect would be to reduce the investment costs for developing night-time deliveries. This would have the effect of reducing day-time congestion by removing some freight vehicle movements from the road network.
<b>Conclusion</b>	++	++	++	++	++	++	+
<b>TIMESCALE</b>	Short-term (2012-15)						
<b>RECOMMENDATION</b>	The EU should carry out a cost-benefit analysis for the inclusion of low noise equipment in manufacturing standards for freight vehicles, so that future generations of vehicles are more likely to be suitable for making night-time deliveries without additional investment.						

<b>RECOMMENDATION 5: Transport Trans-European Network (TEN-T)</b>							
<b>DESCRIPTION</b>	TEN-T funding should be made available to high quality "projects of common interest" that support the development of sustainable UFT in the 83 urban nodes defined in the Proposal for the TEN-T Guidelines in October 2011. In urban areas these projects would relate to (1) deployment of ITS that supports the efficiency of UFT operations by any mode (2) refuelling infrastructure for freight LEVs in urban areas (3) the development of intermodal freight interchanges within or close to urban nodes, often with associated warehousing, so that freight can be transported over medium and long distances by rail/waterborne transport and then transferred efficiently to road transport for last mile distribution (4) the removal of bottlenecks on TEN-T links between urban nodes to improve the efficiency of the whole transport chain.						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	The part-funding of high quality TEN-T projects as described above in urban nodes should help to reduce road congestion in urban areas and on inter-urban routes, while also contributing to the development of medium and long distance traffic flows by more cost-effective rail and waterborne transport. This should reduce costs for UFT operators and their customers and provide wider economic benefits in terms of lower congestion costs for other users of the infrastructure.	The part-funding of high quality TEN-T projects as described above in urban nodes should help to smooth traffic flows and reduce congestion, while also helping to secure a shift of medium and long distance traffic flows from road to rail and waterborne transport. This should lead to lower levels of air pollution and GHG.	The involvement of the EU in providing financial support to the development of the TEN-T is justified by the need to improve the functioning of the Single Market, which relies on high quality infrastructure links between and within Europe's urban nodes.	The role of the EU is justified by the need to ensure the development of an EU-wide transport infrastructure network to allow the smooth functioning of the Single Market.	Likely to be acceptable to all stakeholders as it facilitates the development of infrastructure for UFT, while assisting Member States and city authorities in securing the required funding for infrastructure improvements.	Legal powers and funding are already in place for EU involvement in this area.	Facilitating the development of enhanced infrastructure for sustainable UFT in the largest urban areas in Europe should improve road traffic conditions within and between the urban areas and have a beneficial impact on overall urban mobility.
<b>Conclusion</b>	++	++	++	++	++	++	++
<b>TIMESCALE</b>	Short, medium and long-term (2012-30)						
<b>RECOMMENDATION</b>	The EU should fund projects of common interest in urban nodes on the TEN-T that: (1) develop intermodal freight interchanges for the transfer of freight between rail/waterborne transport for medium to long distance flows and road for last mile distribution; (2) develop refuelling infrastructure for LEV UFT vehicles; (3) deploy ITS that specifically improves the efficiency of UFT operations; (4) removes bottlenecks on inter-urban TEN-T links.						



<b>RECOMMENDATION 6: Urban Logistics Plans</b>							
<b>DESCRIPTION</b>	The EU develops guidelines for city authorities on how to develop Urban Logistics Plans (ULPs) within Sustainable Urban Mobility Plans (SUMPS), taking into account the local context. This would assist city authorities to develop freight expertise and would require them to carry out research on existing freight movements, complete ex ante and ex post evaluation of the impact of measures, carry out consultation on potential measures with all relevant stakeholders and ensure greater integration of planning for UFT with passenger transport and land use planning. The completion of a ULP becomes a requirement for further EU funding of UFT measures.						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	The guidelines would set out how city authorities can use the ULP process to develop a greater understanding of UFT and its role in the functioning of their city's economy and ensure that policies and measures are fully integrated with wider planning and economic development policies over the long term.	The guidelines would explain how cities can adopt policies and measures to promote the development of sustainable UFT that reduces the environmental impacts of freight movements without damaging the city's economy.	The EU is able to provide guidelines for the development of ULPs that take into account pan-European experience, without prescribing detailed policies and measures at a local level.	The role of the EU is justified to ensure that EU funds from CIVITAS, TEN-T and Cohesion Funds are used to develop sustainable UFT measures and practices in an integrated way and to ensure value for money.	Private sector UFT operators and their customers are likely to welcome the development of ULPs, which ensure that UFT is taken fully into consideration in the planning of urban mobility and which ensures they are fully consulted on UFT measures. City authorities are also likely to welcome guidance on how best to develop and implement UFT measures in an integrated way.	The guidance can be developed with the assistance of experts in the field of UFT and then disseminated by the Commission.	The requirement to implement any UFT measures following the development of a ULP, as an integral part of a SUMP, should have a net positive impact on urban mobility by ensuring that freight issues are fully taken into account when developing urban mobility policies and measures.
<b>Conclusion</b>	++	++	++	++	++	++	++
<b>TIMESCALE</b>	Short-term (2012-15)						
<b>RECOMMENDATION</b>	The EU should develop guidance on the development of Urban Logistics Plans as an integral part of Sustainable Urban Mobility Plans and the completion of a high quality ELP should be a prerequisite for the receipt of EU funding for UFT measures from CIVITAS, TEN-T and Cohesion Funds.						

<b>RECOMMENDATION 7: Changes to CIVITAS Programme</b>							
<b>DESCRIPTION</b>	The EU continues to fund the CIVITAS Programme, which provides funding for innovative urban mobility schemes throughout Europe, but there would be greater focus on some key UFT priorities where innovative demonstration projects and knowledge transfer is most appropriate: (1) development of high quality Urban Logistics Plans (ULPs) within Sustainable Urban Mobility Plans (SUMPS); (2) UFT measures that influence demand for UFT rather than regulating its supply; (3) demonstration projects to deploy ITS in urban areas that provide innovative solutions for UFT; (4) other highly innovative projects at a European level that facilitate sustainable UFT.						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	The CIVITAS Programme provides funding support for urban mobility programmes that include innovative measures to secure sustainable UFT, but in the future a more focused approach based on supporting the development of ULPs, demand-led measures and deploying innovative ITS solutions while providing scope for genuinely innovative (and therefore risky) measures at a European level (accompanied by effective dissemination of results) should provide the greatest benefits in terms of supporting more efficient UFT. Direct economic impacts will be higher at a European level with effective dissemination of results following a high quality ex post evaluation of the results of CIVITAS projects.	The more focused approach explained above should provide the greatest benefits in terms of promoting more sustainable UFT by ensuring that any measures are implemented following consultation and research and fully integrated with other policies (through ULPs), while supporting market-led measures that lead to lower numbers of freight movements and less road congestion. Direct environmental impacts will be higher with effective dissemination of results following a high quality ex post evaluation of the results of CIVITAS projects.	The EU already has legal powers to act in this area and, in consultation with the Member States and other stakeholders, is able to change the Programme's priorities.	The role of the EU is justified by the need to target EU funds from the CIVITAS Programme at key priority areas.	Should be acceptable to city authorities, as long as they are able to develop sufficient high quality projects that merit funding.	Can be implemented for the next CIVITAS Programme.	The requirement to implement UFT measures following the development of a ULP, as an integral part of a SUMP, should have a net positive impact on urban mobility.
<b>Conclusion</b>	+	+	++	++	++	++	++
<b>TIMESCALE</b>	Short- and medium term (2012-20)						
<b>RECOMMENDATION</b>	The EU should focus on the following key priority areas within the CIVITAS Programme: (1) development of Urban Logistics Plans; (2) development of demand-side rather than supply-side UFT measures; (3) innovative demonstration ITS projects in urban areas with specific UFT applications; (4) innovative UFT measures at a European level. Effective dissemination of results, following a high quality ex post evaluation of results, is essential for the future success of the Programme.						

<b>RECOMMENDATION 8: Promoting "best practice"</b>							
<b>DESCRIPTION</b>	<p>The European Commission develops and disseminates "best practice" guidance on sustainable UFT measures and practices for city authorities, private sector UFT operators and their customers. As "best practice" evolves over time, it is defined by a "committee of experts" in sustainable UFT, which meets on an occasional basis. The "best practice" guidelines are then disseminated through a one stop shop website, building on an existing website that is already visited by relevant stakeholders seeking information on sustainable UFT and sustainable mobility in urban areas (e.g. ELTIS). The on-line material includes: information on: "best practice" in sustainable UFT policy measures; information on best practice in sustainable UFT operations; opportunities for European funding of sustainable UFT policy measures and operations; information on an annual award scheme for innovative sustainable UFT measures.</p>						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	<p>In the medium to long term, the development of European "best practice" and its active dissemination through a one stop shop website should gradually (if indirectly) promote the development of measures in European cities that assist UFT operators to operate more efficiently (through reductions in congestion, for example), therefore reducing costs for their customers.</p>	<p>In the medium to long term, the development of European "best practice" and its active dissemination should gradually (if indirectly) promote the development of measures in European cities that assist UFT operators to operate in ways that reduce environmental externalities (air and noise pollution), with benefits for society as a whole.</p>	<p>The involvement of the EU in providing "best practice" guidance is likely to be welcomed by city authorities as it would be an information source that transfers knowledge and experience from around Europe to other cities at very low cost. The "best practice" guidance would reflect the fact that local contexts require local solutions.</p>	<p>The role of the EU is justified by the need to transfer "best practice" between cities throughout Europe to secure wider economic and environmental benefits at little expense.</p>	<p>Likely to be acceptable to all stakeholders as it facilitates the transfer of "best practice" across Europe, without seeking to impose single solutions on urban areas that will always need bespoke solutions for particular local contexts.</p>	<p>Legal powers and funding are already in place for EU involvement in this area.</p>	<p>Facilitating the transfer of "best practice" in sustainable UFT should help urban areas throughout Europe to develop measures that assist efficient UFT, while also reducing environmental and congestion impacts and therefore having a beneficial impact on overall urban mobility.</p>
<b>Conclusion</b>	+	+	++	++	++	++	++
<b>TIMESCALE</b>	Short, medium and long-term (2012-30)						
<b>RECOMMENDATION</b>	<p>The EU should develop "best practice" guidelines for sustainable UFT that should be disseminated by means of a single already established website that "showcases" examples of innovation in sustainable UFT measures and practices at a local level.</p>						

<b>RECOMMENDATION 9: Promoting sustainable UFT</b>							
<b>DESCRIPTION</b>	<p>The European Commission would promote sustainable UFT by: (1) Developing an annual award scheme for innovative sustainable UFT measures; the award, which would be a new award funded by the European Commission within an existing European logistics award scheme, would be for sustainable UFT measures and practices by the public and private sectors working in partnership in particular urban areas. (2) Making sustainable UFT a "political priority" within the Marco Polo Programme, so that a proportion of the total funding would be set aside for high quality sustainable transport chains involving "last mile" distribution.</p>						
<b>EVALUATION</b>	<b>Economic impact</b>	<b>Environmental impact</b>	<b>Subsidiarity</b>	<b>Proportionality</b>	<b>Stakeholder acceptability</b>	<b>Feasibility</b>	<b>Impact on urban mobility</b>
	In the medium to long term, the development of these two measures at a European level should gradually promote the development of measures in European cities that assist UFT operators and their customers to operate more efficiently (through reductions in congestion, for example), therefore reducing costs for their customers.	In the medium to long term, the development of the two measures for sustainable UFT should gradually (if indirectly) promote the development of measures in European cities that assist UFT operators to operate in ways that reduce environmental externalities (air and noise pollution), with benefits for society as a whole.	The involvement of the EU in promoting sustainable UFT would probably be welcomed by city authorities and private sector UFT operators as it would provide an incentive to develop innovative local sustainable UFT measures and practices, with recognition of success at a European level.	The role of the EU is justified by the need to publicise success in sustainable UFT at a local level to a pan-European audience.	Likely to be acceptable to all stakeholders as it supports and disseminates "success stories" in sustainable UFT across Europe.	Legal powers are likely to already be in place, while EU funding is not likely to be significant. "political priorities" can already be developed by the EU within the Marco Polo Programme.	Promoting success stories in sustainable UFT should help urban areas throughout Europe to develop similar measures and therefore have a beneficial impact on overall urban mobility.
<b>Conclusion</b>	+	+	++	++	++	++	++
<b>TIMESCALE</b>	Short and medium-term (2012-20)						
<b>RECOMMENDATION</b>	<p>The European Commission should promote the development of sustainable UFT through: (1) An annual award scheme for sustainable UFT that "showcases" examples of innovation in sustainable UFT measures and practices at a local level; (2) Makes sustainable UFT a "political priority" within the Marco Polo Programme so that a proportion of the total funding is reserved for services that involve sustainable UFT practices within long distance door-to-door transport chains.</p>						