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Reducing social and environmental impacts of urban freight transport: A review of some major cities

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Abstract

This paper reviews the options available to policy makers in their efforts to reduce the negative impacts of urban freight transport. After providing a summary of the categories of negative impacts that can be targeted together with the specific policy initiatives available, it reviews the actions taken by policy makers across in cities within four countries (UK, Japan, the Netherlands and France). In the case of the UK and Japan attention is focused on a single city as an exemplar of some of the developments. In the case of the Netherlands and France the discussion is wider.

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1. Introduction

Road-based transportation systems are causing a variety of social, environmental and economic impacts in many cities across the world including traffic congestion, air pollution, noise pollution, and the consequences of traffic accidents. In addition, these transportation systems are contributing to greenhouse gas emissions. At the city level these impacts are resulting in problems including premature mortality, disability, aggravation of respiratory and cardiovascular disease, and sleep disturbance. Meanwhile at a

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global scale these impacts are argued to be contributing to climate change effects. Urban freight transport is a contributor to all of these negative impacts, and has increased its impacts over recent decades as urban populations have grown resulting in the demand for ever-more freight flows to support these inhabitants and the resident businesses.

This paper reviews the options available to policy makers in their efforts to reduce the negative impacts of urban freight transport. It provides a summary of the categories of negative impacts that can be targeted together with the specific policy initiatives available. The actions taken by policy makers in several major cities are reviewed.

1.1. Trends in urbanisation and freight transport demand

Due to their large populations and extensive commercial establishments, urban areas require large quantities of goods and services for commercial and domestic use. The growing importance of urban freight transport is related to increases in urban populations and continued economic growth in urban areas. This results in increasing levels of demand for freight transport services.

Throughout the twentieth century the rate of urbanisation continued to accelerate across the world. The global proportion of urban population increased from 13 per cent in 1900, to 29 per cent in 1950 and 49 per cent in 2005. Sixty per cent of the global population is expected to live in urban areas by 2030 [1]. This process of urbanisation together with population growth has resulted in urban dwellers increasing in total number from 220 million in 1900, to 732 million in 1950, to 3.2 billion by 2005 [1].

In 2005, 74 per cent of the population of more developed regions lived in urban areas, compared with 43 per cent in less developed regions. However, as a result of economic development, urbanisation is forecast to continue and by 2030, it is estimated that urban areas will account for 56 per cent of the population in less developed regions, compared with 81 per cent in developed regions. However, due to the size of population, less developed regions had a greater total number of urban dwellers than more developed regions in 2005 (2.3 billion people compared with 0.9 billion). It is forecast that by 2030 Asia will have the greatest number of urban dwellers, followed by Africa, and these two continents will account for almost 70 per cent of the world's urban population [1].

All towns and cities require the supply of goods and services, and the removal of waste products and hence are dependent on urban freight transport. There are many similarities in the nature of these freight operations between urban areas across the world. However, some variations do exist depending on urban attributes including: the type and quality of transport infrastructure, the degree of vehicle motorisation, the prevailing traffic levels, the degree of automation in vehicle loading/unloading and materials handling, the extent of freight transport regulation by government, and the organisation and operation of waste collection services [2].

1.2. Addressing the negative impacts of urban freight transport

A variety of negative social, environmental and economic impacts of urban freight transport can be targeted by policy makers. These include traffic congestion, local air pollution, greenhouse gas emissions, noise disturbance, and safety. In attempting to reduce the scale of these negative impacts, policy makers can implement a range of initiatives that are intended to alter urban freight operations. Some of these initiatives will only address a single impact, while others will address several impacts at the same time.

Features of urban freight transport that can be altered in order to reduce negative impacts are shown in Fig. 1 together with the negative impacts they are related to. Fig. 1 shows that the total vehicle kilometres (and journeys) travelled are the feature of urban freight transport with connections to the greatest number of negative impacts (it is related to all the negative impacts).

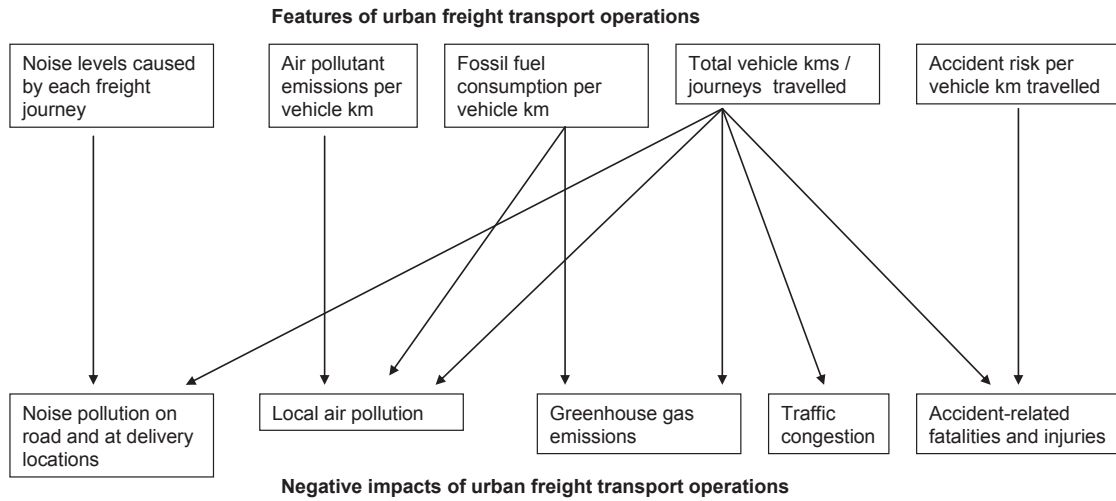


Fig. 1. Relationship between features and negative impacts of urban freight transport

Table 1 shows the specific policy measures that are related to the various features of urban freight transport.

Table 1. Features of urban freight that lead to negative impacts and the associated initiatives that can be used to change them (Source: authors' own)

Features of urban freight transport leading to negative impacts	Initiatives that can result in reduced impacts	Lowest govt level at which initiative typically implemented
Total vehicle kms / journeys by road in urban area	Load consolidation	Urban
	Ordering and delivery frequency	Urban
	Modal shift	National / urban
	Fuel taxes	National
	Location of activities (Land use)	Urban
	Congestion charge	Urban
	Parking regulations/On street loading spaces	Urban
	Real time traffic information	Urban
Fossil fuel consumption per vehicle km	Driver behaviour	Urban
	Vehicle engine design	International / national
	Vehicle design (Aerodynamics)	International / national
	Additions of biofuels to petroleum mix	National
	Matching vehicles to loads	Urban
	Use of vehicles powered by non-fossil fuels (inc bicycles)	National / urban
	Use of bicycles	Urban
Local pollutant emissions per vehicle km	Vehicle engine emissions standards (Euro standards plus other initiatives)	International
	Use of traps and filters	National
	Low emissions zones	Urban
Noise levels caused by each freight journey	Driver behaviour	Urban
	Vehicle design	International / national
	Ability to switch off built in reversing signals etc.	Urban
	Design of vehicle reception areas	Urban
	Loading time restrictions	Urban
Accident risk per vehicle km	Driver behaviour	Urban
	Vehicle design (wing mirrors)	Urban
	Cyclists wearing fluorescent clothing	Urban

Various initiatives have been implemented in different cities across the world [3]. The following sections of this paper review the initiatives implemented by city authorities to reduce social and environmental impacts of urban freight transport in the following countries/cities: London, UK; Yokohama, Japan; Utrecht, the Netherlands; and a number of cities in France.

2. UK: London

A range of initiatives have been implemented by policy makers in London to help reduce the negative social, environmental and economic impacts of freight transport, especially in relation to reducing emissions of greenhouse gases and local air pollutants. The vast majority of these have been implemented since the introduction of a Mayor of London in 2000. This was assisted by the formation of a freight unit in Transport for London, an executive body of the Mayor. The TfL London Freight Plan contains seven high-level aims [4]:

Economy

Support London's growth in population and economic activity;
 Improve the efficiency of freight distribution and servicing within London;
 Balance the needs of freight and servicing with those of other transport users and demands for London's resources.

Environment

Improve air quality in London and contribution to climate change by reducing emissions of local air pollutants and CO₂ caused by freight and servicing;
 Improve quality of life in London by minimising the impact of noise and vibrations caused by freight and servicing.

Society

Improve health and safety in London by reducing the number of deaths and injuries associated with freight movement and servicing;
 Improve quality of life in London by reducing the negative impacts of freight and servicing on communities.

The freight transport initiatives that have been implemented at a London-level are:

- Freight Operator Recognition Scheme (FORS)
- Delivery and Servicing Plans (DSPs) and Construction Logistics Plans (CLPs)
- London Construction Consolidation Centre (LCCC)
- City of London Urban Consolidation Centre (UCC)
- London Lorry Control Scheme [5]
- London Low Emission Zone (LEZ) [6] [7]
- London Congestion Charging Scheme [8]
- Quiet Deliveries Demonstration Scheme (QDDS) [9]
- Initiatives to reduce accidents between lorries and cyclists [10] [11]

The first four of these initiatives are summarised below.

2.1. Freight Operator Recognition Scheme (FORS)

The Freight Operator Recognition (FORS) Scheme was launched by TfL in 2006. It is a key part of the London Freight Plan. FORS is a membership scheme that is available free of charge to any company operating vans or lorries in London. FORS provides operators with practical advice and guidance to help reduce fuel consumption, CO₂ emissions, vehicle collisions, and penalty charges.

This is achieved through improving driver behaviour, vehicle and fleet management, and safety and efficiency in transport operations. The programme is delivered through company training, workshops and electronic guides and tools. Three levels of FORS membership are available: bronze, silver and gold. To gain bronze membership operators need to demonstrate that they have put in place the specified FORS management systems, policies and procedures on: drivers and driver management, vehicle maintenance and fleet management, transport operations, and performance management. Achieving silver and gold membership levels also requires the on-going provision of operational data for benchmarking purposes, and producing and achieving an excellence plan detailing the steps that will be taken to operations becoming even safer, greener and more efficient, together with on-going independent assessment [12] [13].

2.2. *Delivery and Servicing Plans (DSPs) and Construction Logistics Plans (CLPs)*

Delivery and Servicing Plans (DSPs) and Construction Logistics Plans (CLPs) were introduced by TfL in 2008. DSPs are intended to provide a framework to better manage all types of freight vehicle movement to and from individual buildings of all types (including shops, offices, factories, and depots). They are the equivalent of a staff workplace travel plan for freight. By better managing freight flows and freight-related vehicle activity at sites the safety, efficiency and reliability of deliveries to that location will be improved. DSPs are designed to cut CO₂ emissions, congestion, collisions and overall freight costs by reducing delivery and collection journeys at sites (especially during peak periods) and ensuring use of safe and legal loading facilities. These journeys are reduced by changing procurement practices in terms of the way materials and supplies are ordered at the site and also by better stock control and management of the delivery process [4] [14].

A pilot DSP project was carried out at one of TfL's main offices in central London in order to investigate the potential benefits of the approach. This resulted in a 20% reduction in the total number of delivery journeys to the site. Stationery supplies to the site were reduced from twice daily to three visits a week, and daily paper records deliveries were also reduced from daily to three times per week. Catering deliveries were also reduced by 40% [15]. CLPs are similar to DSPs but provide a framework for freight vehicle movements to and from construction sites in London [16].

2.3. *London Construction Consolidation Centre (LCCC)*

A two-year trial project referred to as the London Construction Consolidation Centre (LCCC) operated from 2005 to 2007. The LCCC was a 5,000 sq. m. facility located in South Bermondsey, approximately five kilometres south of the City of London. Its objective was to serve four major construction sites in the City of London. It was intended for a rapid flow, on a just-in-time basis, of material from suppliers to site with storage time limited to ten days. The LCCC was intended to reduce the number of deliveries going directly to the construction sites and thereby reducing traffic congestion and vehicle emissions. The main reason for carrying out this LCCC project was to assess the potential benefits that such a scheme could bring (Transport for London et al., 2008f).

For those materials delivered via the LCCC, it is estimated there was a 60-70 per cent reduction in the number of vehicles delivering to the four construction sites. It is estimated that this resulted in a 70-80 per cent reduction in CO₂ emissions for these flows. Taking account of all deliveries from suppliers, there was a reduction of approximately 40 per cent in total vehicle deliveries to the Unilever House building site. This was considered the best managed site in that it had the lowest proportion of deliveries direct [17]. The vast majority of deliveries from the LCCC to construction sites were made in rigid goods

vehicles. Consolidating goods at the LCCC eliminated the use of articulated goods vehicles for site delivery, and significantly reduced the use of vans.

2.4. City of London Urban Consolidation Centre (UCC)

In 2009 a major supplier of stationary and other office products to businesses in the UK made the decision to trial a new urban delivery system in the City of London in order to reduce the environmental impacts of their delivery operation. This decision was taken as part of the company's corporate social responsibility and environmental efforts [18]. However, it was also necessary for the new scheme to meet customer needs cost-effectively if it was to be adopted on a permanent basis [19]. The trial was supported by the Clear Zone Partnership which comprises the London Borough of Camden, the City of London and the City of Westminster.

The trial involved the use of an urban micro-consolidation centre located within the City of London together with electrically-assisted tricycles and electric vans. The customers to whom deliveries were made were all located in the City of London which is the historic core of London with an area of 2.9km². Neither of these electric vehicles resulted in any fossil fuel consumption or CO₂ emissions as the electricity they used was produced from renewable sources.

The results show that the use of the micro-consolidation centre together with the complete replacement of the diesel van fleet by electrically-assisted tricycles and electric vans led to a reduction of 20 per cent in the total distance driven per parcel delivered between the suburban depot and the customer delivery locations. Total CO₂ equivalent emissions per parcel delivered was 54 per cent lower than before the trial. This was due to the reduction in the total distance travelled per parcel and the use of electric vehicles whose batteries are charged with electricity from carbon-free sources [20].

3. Japan: Yokohama

A cooperative delivery system with a consolidation centre has been implemented by an association of retail shop owners of Motomachi Shopping Street in Yokohama, Japan. While there are several cooperative delivery systems in Japan, this is the first one in which a retailers' association, consisting of about 300 shops, is responsible for managing the system partly supported by Yokohama City Government and local police. The objectives of the system is to improve the environment (such as air quality and noise), to ensure road space for pedestrians, and the prevention of road traffic accidents. It is intended that these objectives are achieved by reducing the number of trucks driving to and parking at the shopping street [21].

3.1. Consolidation centre

There was a heavy concentration of car traffic in Motomachi Street (i.e. 500 vehicles/day of through traffic), and the volume was increasing. Despite the increasing traffic volume, there were no sufficient parking spaces in the area, which led to many vehicles parking illegally on the street. This situation resulted in a deterioration in the environment (such as air quality and noise) and traffic safety problems.

A project team of shop owners involving stakeholders concerned was established in 1999. It identified problems to be solved, and selected appropriate tasks that could be implemented in three years, namely establishing a cooperative delivery system with a consolidation centre, securing parking space for freight vehicles, eliminating illegal parking vehicles, improving street crossings, and introducing low-emission vehicles.

The project team consisted of the Motomachi Shopping Street Association, the trade association for truck carriers (Kanagawa Trucking Association), neighbourhood community, local police, local road authority and the related organizations of Yokohama City Government. The team carried out a traffic survey and questionnaire investigation. In 2000, a social experiment for cooperative delivery system was performed for 10 days. After a couple of years of consultation, the consolidation centre was installed and they started operation from June 2004.

The consolidation centre is located one kilometre away from Motomachi Street. The truck carriers are requested to deliver their parcels destined for Motomachi Street to the consolidation centre, where a newly established operator of the cooperative delivery system tranships the parcels to low emission vehicles. At three eco-cargo stations they tranship the parcels to man-powered carts, and deliver them to the shops. They also pick-up parcels at the shops and deliver them to the truck carriers who have a trade agreement with the shipping shops (see Fig. 2). Almost all truck carriers (around 20 companies) joined the system, paying 150 JPY for the delivery/pick-up of each parcel.

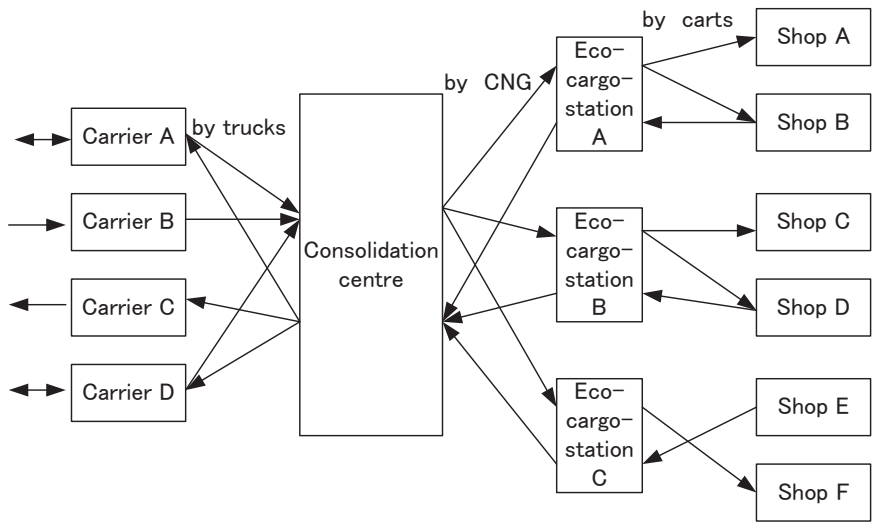


Fig. 2. Cooperative delivery system with consolidation centre

3.2. Low emission vehicles

Low-emission vehicles (compressed natural gas (CNG) vehicles), are used for the transport between the consolidation centre and the eco-cargo-stations, while man-powered carts are used for the delivery/pick-up to and from the shops at Motomachi Street. Yokohama City Government subsidized the purchase of the CNG vehicles.

The cooperative delivery system can reduce the local pollutant emissions not only by decreasing total vehicle kilometres by increasing the load factor of cooperative vehicles compared with carriers’ trucks, but also through the lower emissions per vehicle kilometre of CNG vehicles and man-powered carts compared with diesel-powered trucks.

4. The Netherlands

Three urban distribution initiatives have been implemented in several Dutch cities: i) low emission zones, ii) consolidation by means of city logistics services, and iii) new or alternative vehicle use. Each of these is discussed in turn below, and then a case study of Utrecht is presented.

4.1. *Low emission zones*

To improve the air quality twelve Dutch cities have installed low emission zones (also referred to as “environmental zones”). In 2006, these cities and the ministers of Transport and Environment signed an agreement to permit this. These zones can only be accessed by vehicles meeting Euro IV engine standards. Although these zones have a positive effect on air quality, the results are lower than expected. Reasons for this include that new vehicles are less clean than was expected, and a lot of older vehicles can still access these zones because they have been given a permit to do so.

4.2. *Consolidation by means of city logistics services*

In the Netherlands there has been a long tradition of supporting consolidation centres and city logistics services. Most of them were actively supported by the government but did not achieve their intended outcomes in terms of environmental improvements. More recently, market-led schemes have been developed which are achieving greater success. Two such initiatives are “greencity distribution” and “Binnenstadservice”.

Greencity distribution is a joint cooperation between different transport companies. They consolidate their deliveries for large national operating clients and offer services in a large number of cities, including The Hague and Amsterdam. This results in the increased efficiency of vehicle operations, and hence in a reduction in vehicle kilometres.

Binnenstadservice (to be translated as inner-city services) started business in April 2008 in the Dutch city of Nijmegen. This initiative focuses on receivers rather than carriers. Receivers, mostly shop owners, ask binnenstadservice to receive their goods from carriers and then to deliver the goods when they are needed by the shop owner. A consolidation centre is set up to enable this operation. This service is currently established in eight cities in the Netherlands, including Rotterdam and Utrecht.

4.3. *New or alternative vehicle use*

New vehicles for transporting goods in urban areas have been introduced by some operators. These vehicles are adapted for use in urban areas and they are green in terms of their fuel sources (such as electricity or liquid natural gas (LNG)). The idea of using special vehicles for urban distribution is not new. However, it has now actually been implemented and used commercially in Dutch cities. For example, see details of the Cargohopper and beer boat in Utrecht below. Similarly, in the city of Amsterdam a boat (MokumMariteam) is used for city logistics purposes.

In the Netherlands the PIEK programme ran from 1999 to 2009. It was a national programme to promote early morning, evening and night delivery. This PIEK programme supports and promotes the use of more quiet vehicles and low noise loading and unloading of vehicles. These vehicles and equipment are developed and implemented with national government support.

4.4. Utrecht

Utrecht is the fourth largest city in the Netherlands with a population of 300,000, a service-based economy and a medieval city centre. Efforts have been made to address freight transport impacts in Utrecht over the twenty years that have been based on innovative but practical approaches involving private sector involvement and regional co-operation with neighbouring cities and business associations. A Freight Transport Action Plan has been developed in 2010 to address making transport smarter in the city; in making it smarter it is also intended to address issues including air quality and climate change. The Plan helps to provide coherence to on-going and new initiatives implemented in the city. It attempts to overcome the need for expensive infrastructure-based solutions as well as the need for many prohibitive restrictions (as these require enforcement which can be costly and can have unintended consequences). The role of the city authority is to stimulate interest and involvement in initiatives, facilitate the involvement of private sector organisations as well as other public bodies, carry out feasibility studies, and provide legal and other guidance [22]. The initiatives that have been taken in Utrecht have involved private sector investment and operation. The city was the winner of Dutch Urban Freight Distribution Award 2009. Initiatives implemented in Utrecht include [22] [23]:

The CABU (advisory committee on city distribution) was formed in the 1990s to help discuss urban freight problems and generate potential solutions. It facilitates private sector involvement in urban freight considerations in the city.

There are four City Distribution Centres (CDCs), operated and funded by private-sector logistics companies that are officially recognised by the city authority. Vehicles operated from these CDCs are allowed to use bus lanes and are not subject to existing time restrictions in the pedestrianised area. To be a recognised CDC the centre must serve at least 100 delivery addresses in the inner-city on an average working day, must be located no more than 10 kilometres from the inner-city, and environmentally-friendly vehicles must be operated from the centre.

The beer boat and inner city distribution plan including road goods vehicle axle weight restrictions – these were introduced to overcome the problems caused by road-based goods vehicles which were responsible for damage to cellars and bridges when delivering to bars and restaurants in the old parts of the inner city.

The Cargohopper vehicle (a small electric road train which pulls three trailers that carry containers loaded with packages) which is used for distribution within the city centre – this is a private initiative run by an existing operator but which originated from a meeting organised by the city authority. The containers are preloaded at a consolidation centre outside the city and transported to a hub located in the inner city close to their intended delivery area by means of a regular truck. At the hub the containers are loaded onto the Cargohopper trailers and are then delivered by the Cargohopper. The Cargohopper has been operational in Utrecht for two years and in June 2011 a second vehicle will be introduced. These vehicles, which are built by Divaco, can be used during the existing time restrictions in the pedestrianised area.

Binnenstadservice also provides a consolidation centre service and final delivery operation in Utrecht. In addition to deliveries the company also offers storage, home delivery to consumers, return logistics, packing, ticketing and pricing services.

A collection point network based in local stores - customers can collect their home deliveries and other parcels. This scheme reduces parcel delivery vehicle kilometres in residential areas and the associated impacts.

A Low Emission Zone was introduced in Utrecht in 2007 which requires that vehicles have Euro IV engines (or Euro III with retrofitted particulate trap and if not older than 8 years) in order to enter the city.

Using the PIEK programme approach, the city authority is working with supermarkets to investigate the potential to use quiet, cleaner trucks for deliveries.

5. France

The French situation is not typical because the state has played an important role in urban logistics research. Since 1993 a significant budget has been devoted within the national programme entitled “*Marchandises en Ville*”. In addition, through the CNRS, researchers concerned with transport are active within many research institutes and universities.

To support this field by providing cities with appropriate analytical tools the Ministry of Transport commissioned LET (a CNRS research centre) to carry out a number of major surveys in 1993. The surveys provided both insights into the level of activity and the basis for the model FRETURB that allows diagnosis and simulation of urban freight and service activity.

About 30 French cities (and some outside France) have used the FRETURB model. The tool has allowed them to understand the freight vehicle flows, the loading times, the location of activities, the environmental impacts of urban freight and so on. The results have then been used to prepare plans to manage these activities in the various cities.

More and more in France the cities are engaging in experiments to resolve some of the dysfunctional aspects that the surveys have identified and to remove the brakes that inhibit the uptake of good practice. The main fields for initiatives have been: regulation, vehicle reception, shared use of space and facilities, consolidation and the location of activities.

5.1. Regulation

Traffic circulation and parking (loading) is controlled by the mayor (in each city) and thus there are many local initiatives. Paris, Lyon and other large cities have reviewed the existing regulations to make them more consistent and coherent. In Paris there were 130 regulations affecting access, loading and unloading etc. many based on different criteria such as weight or size of the vehicle and often at different times. At the same time a review of loading bays was carried out and their function was redefined (and in some cases the size was changed) in order to make them much more useful from a logistics perspective. Restrictions on vehicle access have been standardized based on the surface area of the vehicle (29 m sq. has been adopted because this is the standard for a fire engine). These two flagship measures have been accompanied by changes to the signing to assist information and routeing. CERTU have published a guide to delivery bays defining questions such as location, signing, access standards and design. Since 2011 many smaller towns and cities have adopted these norms - for example Bayonne (pop 47,000) and Neuville sur Saône (pop. 14,000). The result has been better visibility, safety and a time gain for the delivery drivers.

In 2010 Greater Lyon was involved in an experiment about the “loading bay of the future” that allowed operators to reserve the space 24 hours in advance. This in turn led to more efficient trips and routes in the city. The next step is to make this a dynamic process to allow for changes to schedules and optimisation of the allocation of loading ‘slots’. The results have been a 40% reduction in double parking for deliveries, less congestion and pollution in the city centre, optimized trips and an improved image for the city.

5.2. Introducing air quality action zones (ZAPA)

From 2012, France will begin to introduce zones with priority actions for air quality - “Zones d'Actions Prioritaires pour l'Air” (ZAPA). The objective is to limit or forbid access to certain zones by the most polluting vehicles as already happens in London, Berlin and Stockholm for example (and where PM10 levels have fallen by 19 %, 25 % et 40 %, respectively). Eight cities have received state support to put in place their projects and others will join after 2012. Cities of different sizes will take actions: Paris, Lyon, Bordeaux, Nice, Aix en Provence. However, implementation (which should happen during 2012) poses some technical problems and issues of equity. A major debate is currently taking place.

5.3. Sharing space

An interesting example of shared space comes from Paris. On the banks of the Seine a cement plant providing construction material has been redesigned to enable the space to be used for industrial activity during certain times and then the same space can be used by walkers and for recreational use. The site has been cleverly designed and has a sophisticated lighting scheme in place at night. As a result an industrial site in the city centre that can be reached on public transport by the workforce and minimizes the distance over which the products have to be moved on the cities roads.

5.4. Consolidation: Urban logistics spaces

In France only La Rochelle and Monaco have an active Urban Consolidation Centre. The many examples of failures across Europe in the 1990s inhibited the introduction of UCCs in France. Within the national research programme in France there has been an analysis of the need for urban logistics space “Espace Logistique Urbain” (ELU). A typology of ELUs has been derived that categorises their functionality, size and location.

La Rochelle has pioneered clean transport experiments and in 2001 a fleet of electric vans was introduced to deliver from the UCC to the city centre. Since the initial project there has been significant reorganization and the city has awarded the management of the UCC to the public transport operator holding the concession in La Rochelle. This is an exceptional case in France where the transport of people is entirely a public sector activity while the transport of goods is within the private sector.

Other consolidation experiments have been realized utilizing the ELU approach and adapted to local conditions. Marseille has created an urban logistics zone at the terminus of the tramway in the city near the port. The site is fully integrated into the urban landscape and numerous specialist operators are located there to carry out urban distribution operations. A public-private company has been created with 50% owned by the Department of Paris to ensure that all the urban delivery operations respect the highest environmental standards. The award winning building has various innovative features (e.g. half of the 1,000 m² roof has photovoltaic panels producing 320 MWh a year). This initiative has avoided the emission of 2,500 tonnes of CO₂ since it was inaugurated in 2009. The example is very important because in most French cities logistics activities are being pushed further away from the centre (leading in turn to more vehicle kilometres required to serve the city).

Bordeaux, Paris, Lyon, Clermont Ferrand, Rouen, Montpellier and other cities have introduced local logistics points known as “Espaces Logistiques de Proximité” (ELP). These small spaces of between 500 to 1,000 m² serve as a type of micro-consolidation point. Served by a large vehicle the loads are consolidated by a single operator that delivers in, say, two or three arrondissements in Paris and perhaps 10-15 kilometres in the case of Bordeaux, Lyon and Rouen. Most of the projects have been initiated by

the private sector but because of the need to use public space for the ELP itself (e.g. a car park or other public space) the role of the city is important. The city rents the space at a special “logistics price” that does not reflect the true market value. In this way cities are helping to ensure that logistics activities can take place at the heart of the city. The final delivery can be made by very small electric vehicles (2 or 3 wheels). The observed results show a drop in the circulation of large vehicles in the city centre and a reduction in congestion and pollution. In addition they lead to some extra jobs and a better image for the city.

5.5. Good practice

A Charter of Good Practice for Transport and Goods Delivery in Paris was signed in June 2006. The founding members included the four categories of organisations (1: shippers and receivers; 2: rail and river services; 3: transporters and distribution companies; 4: the City of Paris). The Charter was the result of a lot of discussion and negotiations which also involved the Paris Police responsible for the enforcement of regulations. The Charter is linked to the Movement Plan for Paris (Plan de Déplacements de Paris) which sets out the strategy for people and goods movement in Paris over a 15 year period. The founding principles of the Charter are based on ‘give-give’ between the public and private sectors in order to arrive at a ‘win-win’ conclusion. Thus each side has to be willing to change and to work actively within a public-private partnership in order to ensure efficient urban logistics but also a logistics operation that is adapted for the urban environment. Important principles include: respect for the environment, optimizing the logistics chain, professionalizing the delivery bays, valuing the profession of delivery driver and so on. The Charter was signed by 50 different organizations and a steering committee has been established (an evaluation is to be carried out every three years).

To promote the Charter a certain number of regulations have been elaborated. These include: respecting the bus lanes, stopping time duration in the loading bays limited to 30 minutes (based on a control disc in the vehicle), using clean vehicles (Euro 3 January 2007, Euro 4 in 2009, Euro 5 in 2010). Night delivery in the time slot from 22:00 to 07:00 is accepted (but the vehicle must be less than 43 square metres).

The city of Toulouse has also introduced a similar good practice Charter. The potential benefits of this type of Charter are considerable because they can lead to much stronger cooperation between organizations that often adopt opposing views and perspectives. By working together a virtuous circle is established.

5.6. Night delivery

Since 2006 night delivery to book shops has been initiated in Paris within the framework of the Charter and with some financial support from ADEME (l’Agence De l’Environnement et de la Maitrise de l’Energie). About 20 bookshops in Paris and the inner suburbs receive night deliveries. An evaluation has been carried out and the results are very positive for all the links in the chain (economic, social and environmental). Other experiments have been started with transport operators in the grocery sector to deliver to the small supermarkets by night using clean vehicles. The city has given some regulatory dispensation and monitoring was conducted to measure the acceptability of the initiative. Operators were required to ensure that vehicle performance in terms of pollution and especially noise was met the PIEK standards (for vehicles and material handling noise).

6. Conclusion

The range of initiatives, experiments, tests and pilot projects is impressive. Categorising these developments we can see the variety that exists: regulation, sharing space and time, encouraging cooperating, changing behaviour, stimulating the public and private sector to work together. Several points emerge from this review of four countries and several cities.

First, it is clear that the level of interest and the resources devoted to improving urban freight and city logistics operations is increasing year by year and we now have a very rich range of tests, trails and established projects to draw on. The development and growth is circular since the more evidence that exists about what can be done then the more willingness there appears to be to try to do something.

Second, the initiatives take place at several different levels: local, city-wide, regional, national and international (in a few cases). This is important because it is essential to retain the engagement of the cities and for them the problems are often local. However, what also emerges from this summary of initiatives is that there are developments that can be adapted and transferred from city to city. The existence of the BESTUFS project was a key initiative in supporting this at a European level.

The third point that emerges is that timing will often be different as a result of both different problems in cities but also as a result of different priorities at a political level (driven in turn by the response to pressure from citizens and others). For example, it is clear that the rolling out of air quality zones has taken place at very different times across countries. Ideally, the later initiatives would learn from the earlier ones but of course this can still be difficult because of the lack of comparable data and also the rather different traditions concerning the role and power of the state.

Fourth, it is interesting that the focus of research varies across the countries reviewed. In France, the early emphasis on surveys and the construction of FRETURB has been an important step to later analysis and evaluation initiatives. In other countries the emphasis has been more about understanding and changing behaviour or encouraging public-private partnerships.

A common point to the policy initiatives discussed has been that the starting point is often a problem (or at any rate a perceived problem). However, the discussion about the nature of the problem and the range of possible solutions (available and required) is becoming much more sophisticated. This review has highlighted the rich range of tools and tests that are being applied (in just four countries) and we can expect to see this continue to develop during the next 10 years.

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