UNIVERSITY OF WESTMINSTER

A framework for considering policies to encourage sustainable urban freight traffic and goods/service flows

Summary Report

A research project funded by the EPSRC as part of the Sustainable Cities Programme

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The views expressed in the report are entirely those of the authors.

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1. Introduction

This is a summary report of the project, entitled "A framework for considering policies to encourage sustainable urban freight traffic and goods/service flows" (Grant reference number: GR/L 77201), which was funded by the EPSRC as part of their Sustainable Cities Programme. The project commenced in April 1998 and was completed in June 1999. The research was carried out by the Transport Studies Group at the University of Westminster. Norfolk County Council collaborated in the project.

Urban freight transport is an extremely important activity in the context of urban life: it is fundamental to sustaining our life style and serves industrial and trade activities, which are essential to wealth generation. Efficient freight transport can play a significant role in the competitiveness of an urban area and is, in itself, an important element of the urban economy, both in terms of the income it generates and the employment levels it supports. However, freight transport is responsible for traffic and environmental impacts in urban areas (such as contributing to congestion levels, pollution, noise, fossil fuel use etc.). Freight transport is, therefore, an important factor in the consideration of urban sustainability: it sustains the economic life of the city, but is also responsible for a number of social and environmental impacts that threaten its environmental sustainability.

Environmentalists and policy advisors have been expressing concerns about urban freight transport and its environmental consequences in recent years. However, this has so far resulted in very little new research or policy initiatives. In fact, there has been little research into urban freight transport in UK towns and cities since the 1970s. In the years since then there have been significant changes and developments in the ways in which freight operations are carried out and the concerns about the negative environmental and social impacts of freight vehicle activity. First, distribution and logistics systems have changed considerably, with a significant degree of centralisation in manufacturing sites, stockholding points and retailing. Supply chain structures have also changed substantially, especially for larger companies where many have taken increasing control over the supply chain and the distribution of goods to their premises. Second, the stockholding patterns, and hence the goods delivery patterns required by manufacturers, retailers and other urban premises, have changed substantially, with a tendency towards more frequent, smaller deliveries. This move towards more frequent deliveries has resulted in a growing use of smaller freight vehicles. Third, the level of current concerns about the environmental impacts of our urban activities, and especially our urban transport systems, were not present at the time of the earlier studies. It is now widely acknowledged that new urban sustainability policies are necessary if urban areas are to continue to be desirable places in which to live, work and spend our leisure time. Fourth, there has been a major growth in the demand for, and the outsourcing of service activities in the last 10 to 20 years, which has resulted in a substantial growth in service vehicle movements in urban areas. Greater understanding of the goods and service requirements of urban premises and the freight and service operations that provide for these needs is essential if urban areas in the UK are to continue to be viable, both economically and environmentally.

Until about two or three years ago, the UK central government published and said little about freight transport in general, and in particular about ***urban*** freight transport. The considerations that did take place in the then Department of Transport were to do with goods vehicle activity rather than to do with logistics and distribution systems. These considerations tended to focus on controlling and restricting goods vehicle activities rather than addressing issues about how to assist them and make them more efficient. Freight-related policies that did exist tended to be compartmentalised and modally-based.

The government is now attempting to rectify this situation and a Freight Distribution and Logistics Unit has been established in the DETR. This Unit was responsible for the publication of a daughter document to the 1998 Transport White Paper entitled "Sustainable Distribution", which was the first

public attempt by UK central government to demonstrate understanding of the modern logistics and distribution systems being used to supply goods in the UK. It also included a section on the distribution of goods in urban areas and several ideas about possible areas of research and initiatives that could be carried out.

Many local authorities in the UK do not have a freight transport policy to the same extent that they have one for public transport. Their freight-thinking has tended to take place as a reaction to problems, usually arising from complaints made by residents, rather than taking a proactive position and developing a coherent freight strategy. However, they are now being encouraged by central Government to focus greater attention on freight transport and to include consideration of freight transport and its sustainability in their Local Transport Plans.

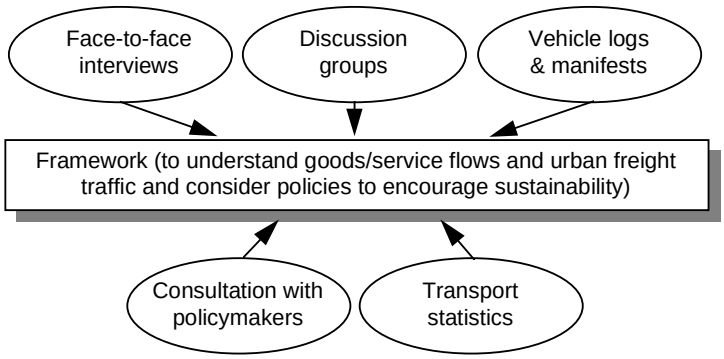
2. Aim of the project

The key aim of the research was to develop and apply a Framework for understanding urban freight transport in its broadest sense, that would reflect the breadth of freight and service-related transport activity in urban areas, and which could be used as a basis for exploring ways of making the sector more sustainable. The intention was to do more than simply study vehicle activity. Instead, the project would examine all the freight and commercial service requirements of a sample of urban premises and investigate how, through logistics decision-making in the supply chain, these requirements are met by vehicle activity in the urban area, and thereby identify links between: (i) physical freight transport movements in an urban area, and (ii) company/organisation activities, behaviour and demand for goods and services. This required the adoption of a supply chain perspective in the research. It was felt that by taking a broad definition of urban freight transport and a supply chain perspective it would be possible to: (i) better understand why freight vehicle activity takes place in the way that it currently does, and (ii) research which policy measures implemented by local authorities and initiatives introduced by companies could potentially play an important role in bringing about more sustainable patterns of freight transport in towns.

3. Methodology and extent of research

The research techniques employed in the study are shown in Figure 1. These fed into the development of the Framework devised and applied in the project to investigate goods and service flows and freight vehicle activity in urban areas and to consider policy measures and company initiatives that could help to make urban freight transport more sustainable.

Figure 1: The research techniques used in the project



The project concentrated on premises located in Norwich and was supported by Norfolk County Council, Norwich City Council, Broadland District Council and South Norfolk District Council. This was supplemented by research at premises in parts of London in order to compare similarities and differences between the two cities. The following types of participant were included in the surveys:

- owners/managers of a range of different types of premises
- managers of suppliers and wholesalers supplying goods to premises in the area
- goods vehicle drivers and service engineers working in the area

- managers of freight transport companies supplying goods in the area
- managers of service companies visiting premises in the area
- policy makers with responsibility for transport policy in the area

Table 1 shows the types of survey instruments used in the project and the types of participant to which they were applied. Table 2 shows the extent of the primary research carried out in the project.

Table 1: Survey instruments used with different groups of participants

	Face-to-face interviews	Consultation meeting	Discussion groups	Vehicle activity logs/vehicle manifests	Norwich forum session
Managers/owners of premises					
Managers of suppliers and wholesalers					
Goods vehicle drivers and service engineers					
Managers of freight transport companies					
Managers of service companies					
Policy makers					

Table 2: Extent of primary research carried out in the project

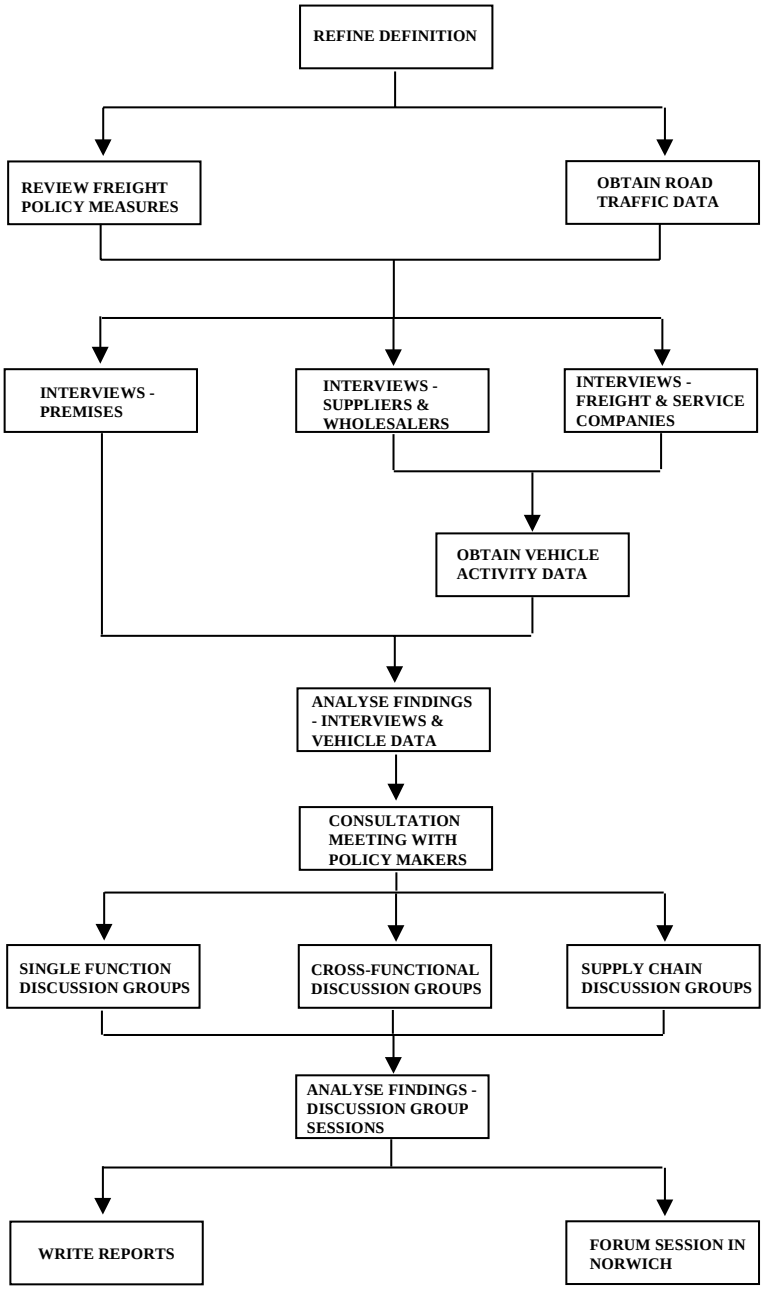
Primary research technique	Extent and coverage
Face-to-face interviews	58 interviews held in Norwich and London with owners/managers of premises receiving goods and services
	8 interviews in Norwich and London with managers of suppliers and wholesalers providing goods to premises
	7 interviews in Norwich and London with managers of freight transport companies carrying out collection and delivery work to premises
	5 interviews in Norwich and London with managers of service companies providing services to premises
Consultation meeting	1 meeting held with policy makers (8 participants)
Discussion groups	7 discussion group sessions (4 to 8 participants in each)
Vehicle activity logs/vehicle manifests	Vehicle logs and manifests from 6 freight transport companies

The sample of urban premises included in the face-to-face interviews was diverse in terms of the range of functions included (e.g. shops, factories, offices, warehouses etc.). It was decided that the function of the premises studied should be wide-ranging (rather than limiting the research solely to retail premises, as has been the case in some previous studies) so as to gain a fuller understanding of the diversity of the urban freight and service requirements of an urban area. Forty-two of the premises studied were retailers, nine were leisure premises (i.e. hotels, restaurants, cinema, public houses), three were manufacturing premises, three were office/administrative premises and one was a warehouse.

Independently-owned premises as well as premises owned by large companies, their have multiple premises, were included in the research (many previous research projects, especially those concerned with supply chain organisation and management, have limited their scope to the latter). This was important as it was felt that the scale and ownership of the premises could have a bearing on the

goods supply system used and vehicle activity pattern. The research has subsequently demonstrated that the scale of the company that owns the urban premises can affect the supply chain structure within which the premises operates, and this in turn affects the freight vehicle trip generation and vehicle activity pattern at the premises. Figure 2 shows the sequence in which the research activities included in the project were carried out.

Figure 2: Sequence of research activities in project



4. Definition of urban freight transport

The definition of urban freight transport used in this research was broader than that typically used in other freight research, in terms of the type of vehicles, the range of goods vehicle movements, and the other type of vehicle activities included. The definition used encompassed:

i. all types and sizes of goods vehicles (light vans as well as heavy goods vehicles) and other motorised road vehicles (including cars, mopeds etc.) used for goods collections and deliveries at premises in the urban area;

ii. all types of goods vehicle movements to and from urban premises including goods transfers between premises, ancillary goods deliveries to urban premises (such as stationery, plastic bags, display material, light bulbs, etc.), money collections and deliveries, waste collections and home deliveries made from urban premises to customers;
iii. service vehicle trips and other vehicle trips for commercial purposes which are essential to the functioning of urban premises.

This broader definition of urban freight transport has proved extremely helpful in thinking about how the functioning of urban premises would be affected by transport-related policy changes in terms of the entire range of commercial vehicle activity taking place at these premises. Traditional definitions of urban freight transport fail to recognise the importance of service vehicle trips to premises. As the research has demonstrated, in some cases these service trips can be of greater importance to the functioning of premises than a typical goods delivery. Until now, most urban freight research has ignored the growth in van traffic and the trip purpose of these vehicles. The definition used in the research has also made it possible to quantify the totality of vehicle trips for commercial purposes at a sample of urban premises and hence to determine the relative number of the different types of vehicle trips at different premises.

By excluding some types of mode/vehicles and activities from the definition of "urban freight transport" in earlier studies, some goods and service movements, which are of fundamental importance to the functioning of the urban area, fail to be researched and understood. This is problematic for several reasons:

i. it results in a lack of understanding by policy makers of some of the key goods and service flows necessary to bring about urban vitality and how these flows take place. Without this understanding it is difficult for policy makers to devise suitable policy measures that allow these flows to take place efficiently and thereby encourage urban vitality;
ii. not identifying the trip purpose of van and car movements results in all these movements being treated the same in policy terms. For example, any restrictions imposed on car movements in the urban area affect all cars equally unless certain car trip purposes are identified as being more important than others and this is reflected in the policy. Failure to recognise some of these trips as providing goods and services to premises in the urban area and reflecting this in transport policies can cause inefficiencies in, and disruptions to, the vehicle trips providing these flows and prevent the goods and services from being provided as and when needed;
iii. it results in a failure to understand the full environmental and social impacts of "urban freight transport" movements.

By conducting interviews with respondents at different premises and at transport and service companies we identified a wide range of goods transport movements to premises. In addition to the goods vehicle trips delivering and collecting the "core" goods[1] associated with the premises, there are a number of other goods vehicle trips that can take place. It therefore became apparent early in the work that when talking to premises it was necessary to further sub-divide goods vehicle trips to and from the premises into the following categories:

- Core goods deliveries to premises
- Core goods collections from premises
- Core and ancillary goods transfers between premises
- Ancillary goods deliveries to premises
- Money collection and delivery

1. "Core" goods are the goods that are of fundamental importance to the activity carried out at the premises. In the case of retail premises, the "core" goods are the goods sold to final customers. In the case of a warehouse, the "core" goods are the goods delivered by suppliers which are to be supplied from the warehouse to other premises. In the case of manufacturing premises, the "core" goods are the goods used in the production process.

- Waste collections from premises
- Postal collection and delivery by Royal Mail
- Other goods collected from premises (in addition to core goods, waste and Royal Mail post)
- Home deliveries (goods despatched from premises to their customers)

Service trips are distinguished from good trips in the definition used in the research in the following way: service trips are those trips in which the main purpose is to carry out a servicing activity at the premises, rather than solely deliver or collect goods. Examples of service trips to urban premises include computer equipment servicing, photocopier servicing, cash register servicing, security and fire alarms servicing, plant care services, lift and escalator servicing, air conditioning servicing, towel and dry cleaning services, and general cleaning services. Many service providers have to take equipment and tools to the premises where the service is to be provided. These service trips can, of course, also involve the person who is providing the service taking goods to or from the premises where the service is performed (such as parts for machinery that is being repaired, or new plants in the case of a plant care service company).

Two types of other trip for commercial purposes were identified during the course of the research. These are:

- trips made to premises by sales representatives;
- trips made to premises by employees of the companies who are not normally based at the premises - such as regional/area managers (we did not study the journey to work pattern of staff who regularly work at the premises in the project).

5. Core goods collections/deliveries to/from urban premises

"Core" goods are the goods that are of fundamental importance to the activity carried out at the premises. In the case of retail premises, the "core" goods are the goods sold to final customers. In the case of a warehouse, the "core" goods are the goods delivered by suppliers which are to be supplied from the warehouse to other premises. In the case of manufacturing premises, the "core" goods are the goods used in the production process.

5.1 Number of core goods vehicle movements at urban premises

During the project we have studied the following factors which all have an important bearing on the total number of vehicle movements required for core goods collections and deliveries at each of the premises surveyed:

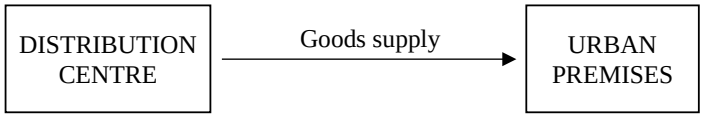
- Goods supply systems used by premises
- Type of land use
- Size of premises
- Combined collection and delivery of core goods
- Range and variety of products used/sold
- Frequency of delivery (which is in turn dependent on the time sensitivity of goods received, the turnover of goods, the stockholding policy and storage space at the premises, and the goods reordering policy/system)

5.1.1 Goods supply systems used by premises

From the research conducted we have identified three goods supply systems used by the premises studied:

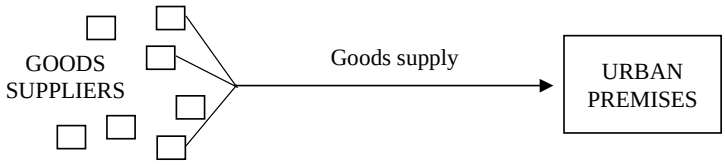
i. those premises that receive all their goods from a single final point of despatch (which we have referred to as a *centralised system of goods supply* - see Figure 3).

Figure 3: Goods supply system - centralised



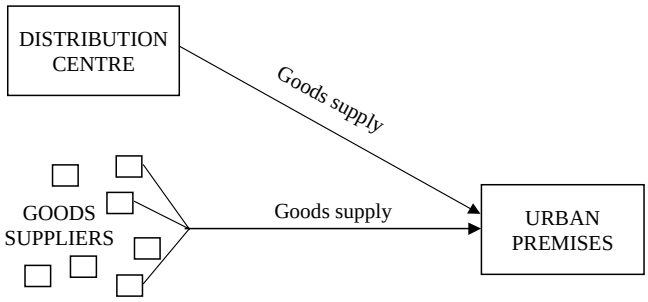
ii. those premises that receive goods from several or many final points of despatch with different vehicles delivering goods to the premises from each final point of despatch (which we have referred to as a *decentralised system of goods supply* - see Figure 4).

Figure 4: Goods supply system - decentralised



iii. those premises that receive a significant proportion of their goods from one final point of despatch and the rest of their goods from a number of different final points of despatch (which we have referred to as a *hybrid system of goods supply* - see Figure 5).

Figure 5: Goods supply system - hybrid



Of the 58 urban premises studied in the project, 12 use a centralised system of goods supply, 16 use a decentralised system of goods supply, and 30 premises use a hybrid system of goods supply. The findings suggest that the degree of centralisation in the supply of goods to the premises does influence the number of vehicle deliveries and collections of core goods at the premises. Centralised goods supply systems tend to generate fewer goods vehicle collections and deliveries at premises than decentralised and hybrid supply systems (see Table 3). This has highlighted the scope for reducing the number of urban goods vehicle trips by altering the goods supply systems used by urban premises. Of those premises studied:

- only one independently owned premises receive all of their goods supply from a single point of despatch (i.e. uses a centralised goods supply system) and no independently owned premises have an internally centralised goods supply system;
- a sizeable proportion of independently owned premises receive goods via a decentralised system of goods supply;
- Some premises owned by large companies with multiple premises (such as multiple retailers) receive all their goods supply from a single point of despatch (i.e. they use a centralised goods supply system);
- none of the premises owned by large companies with multiple premises use a decentralised system of goods supply (instead they use either a centralised or hybrid goods supply system).

Table 3: Relationship between goods supply system and vehicle collections/deliveries

Number of points of despatch from which core goods are received at premises studied	Number of collections and deliveries of core goods at premises studied (vehicle trips per week)
1	1-15
2-5	2-24
6-10	4-60
11-25	5-400
26-50	11-159
More than 50	18-190

However, it should be noted that we found instances of premises that received goods from fewer points of despatch than other premises generating more core goods vehicle collections and deliveries per week.

5.1.2 Type of land use

The type of land use also influences the number of goods vehicle movements at premises. The number of vehicle deliveries and collections of core goods at the premises with different land uses surveyed in Norwich and London is shown in Table 4.

Table 4: Core goods vehicle movements at different land uses

Type of land use	Number of core goods deliveries & collections per week
Retail	1-190
Cafes and restaurants	3-17
Public houses	13-26
Hotels	50
Cinema	12
Office	50-80
Warehousing	150
Industrial	87-400

Among the premises with different land uses that we surveyed, industrial land uses tend to generate more core goods vehicle collections and deliveries than most retail premises. As would be expected, the one warehouse studied also generates a relatively high number of goods deliveries. The two offices surveyed (which were large offices) also generate more vehicle collections and deliveries of core goods (50 vehicle movements per week in one case and 80 movements in the other) than many retail premises, but not as many as the most of the industrial premises. However, there was marked variability in the number of collections and deliveries of core goods received by any single type of land use.

5.1.3 Size of premises

As can be seen from Table 5, the size of the premises also influences the number of vehicle collections and deliveries of core goods at premises studied. Some of the very large premises receive large numbers of collections and deliveries.

Table 5: Size of premises

Size of premises	Number of core goods deliveries and collections per week
Very small - Less than 500 square feet	10-36
Small - Between 500 and 999 square feet	1-50
Medium - Between 1,000 and 4,999 square feet	1-159
Medium/large - Between 5,000 and 9,999 square feet	1-10
Large - Between 10,000 and 19,999 square feet	3-80
Very large - More than 20,000 square feet	12-400

However, many small and very small premises receive as many deliveries as far larger premises. For example:

- a market stall interviewed receives three times as many goods vehicle deliveries per week as a very large clothing, furnishings and food retailer;
- a small florist receives more goods vehicle deliveries per week than an out-of-town electrical and electronic superstore;
- a small chemist shop receives more goods vehicle deliveries than a large purpose-built office block.

5.1.4 Combined collection and delivery of core goods

If the delivery vehicle, which delivers core goods to the premises also collects any goods that need to be transported back to its depot, this helps to reduce the total number of vehicle collection and deliveries of core goods needed at the premises. However, by making collections at the premises as well as deliveries this increases the time taken at each premises and can reduce the number of deliveries a vehicle is capable of making in a day. At 35 of the 58 premises studied all of the core goods delivery vehicles also collect goods that need to be returned.

5.1.5 Range and variety of products used/sold

The range and variety of goods used or sold by premises is another factor that plays a part in explaining the number of core goods vehicle collections and deliveries to those premises.

The term “product range” is used in this context to mean the number of completely different categories of product used and/or sold by the premises. Examples of different categories of product include distinct products such as books, clothes, food, compact discs, electrical equipment etc. The greater the product range, the greater the number of different manufacturing sectors the goods are sourced from.

The term “product variety” is used in this context to mean the number of different types of product within any one-product category used and/or sold by premises. For example, newspapers are a product category. There are a number of different *varieties* of newspaper available in most newsagents such as The Times, The Independent, The Sun, The Mirror etc. Similarly, within the product category of shoes, there is a often a wide range of shapes, styles, colours and sizes available in many high street shoe shops. It usually follows that the greater the product variety, the greater the number of different suppliers within that manufacturing sector, from which goods are sourced.

It is important to make this distinction between “product range” and “product variety”, because it is often assumed that a small product range implies relatively simple purchasing and logistical operations. However, this is not necessarily the case if the product variety within that small product range is large. For instance, in the case of a book shop, it may only sell one main category of products, namely books. It could easily be assumed and often is that, as all the products flowing to and from the shop fall into one product category and are therefore relatively similar in shape and size,

the logistical arrangements are also relatively simple to organise and operate. However, this point of view ignores the fact that the shop may have as many as 150,000 different book titles in stock at any time (as well as several different editions of a single title in the case of popular titles), that it can order books not in stock from a list of books currently in print that extends to several million different titles, and that these books are published by thousands of different national and international publishers. By comparison, a supermarket may sell 30,000 different product items in total. As a result, the logistical arrangements are anything but simple for a book shop.

5.1.6 Delivery frequency for core goods at premises

The delivery frequency of any particular core good that is used or sold at a premises (i.e. the rate at which the good is replenished) depends upon a number of factors:

- time sensitivity of goods received
- turnover of goods (demand/sales level)
- stockholding policy and space at the premises
- goods reordering policy/system

The more time-sensitive the product is, the more frequently replacement stock will be needed. Therefore the supply of time-sensitive products to premises tends to generate more frequent goods vehicle deliveries than products which are either less or not at all time-sensitive. Also, the more time-sensitive a product is, the greater the likelihood that the product will have to either: (i) be disposed of as waste in the case of products that physically deteriorate, or (ii) be returned to the supplier in the case of products which lose their value to customers over time. This disposal or return of time-sensitive products also has implications for goods vehicle trip generation rates.

The rate at which premises either sell (in the case of a shop or other premises selling goods) or use (in the case of an office or factory) core goods also affects the frequency of delivery of goods. Stockholding space available at premises and the stockholding policy adopted by the business will also have an important bearing on the frequency of goods vehicle deliveries to those premises. The greater the quantity of stock of a given product held at the premises, the less frequent the need to place orders for replacement stock of that product. The less frequent the order placement, the less frequent the goods vehicle deliveries.

If premises hold relatively small quantities of stock on-site, it is important that they receive goods at the premises as soon as possible after placing an order, this minimises the amount of lost sales (in the case of a retail premises) or minimises the disruption to the production process (in the case of a manufacturing site). Companies placing orders are therefore keen for order lead times to be as short as possible.

From the interviews conducted it is clear that many of the premises studied (retail and others) hold relatively little, and in some cases no stock on-site. The ability to hold stock is obviously dependent upon the space available for storage. From the interviews it is apparent that stockholding space available at retail premises has reduced in the last five to ten years at a sizeable proportion of retail premises. Approximately forty percent of all the premises studied have reduced the quantity of the stock held over this period. Those premises that have reduced stockholding levels tend to have taken steps to help ensure that they do not suffer “stock outs” (i.e. run out of stock). For many of these premises this has involved improving the organisation of their reordering process so that orders can be placed more easily, faster, and more frequently, and that goods are delivered to their premises more frequently.

5.2 Time of goods deliveries at premises

Table 6 shows the delivery times at premises studied and illustrates that the vast majority of deliveries take place during the working day (i.e. between 8 am and 5 p.m.). Only two premises

studied receive deliveries during the night. When this issue of out-of-hours deliveries was discussed, few owners and managers of premises were keen to receive deliveries at these times. This is due to the fact that they perceive the need to have staff on-site to receive deliveries and do not think that they would be able to get sufficient productivity from these staff at these times to justify it.

Table 6: Delivery times

Time of delivery	Number of respondents
All deliveries AM	23
Most deliveries AM, others PM	7
Deliveries at lunch time	2
All deliveries PM	1
Most deliveries PM, others AM	1
Anytime during working day	22
Night	2

While 22 out of 58 of the premises receive goods at anytime throughout the working day, a similar number receive all their deliveries in the morning. There is a marked preference for morning deliveries at many of the premises. They like to receive goods at or close to the start of the working day so that: (i) they receive the deliveries as soon as possible (reducing the time their customers have to wait for goods in the case of a shop, or the time they have to wait for products that they need to work with/require in the case of a factory or office), and (ii) so that they can begin their working day by unpacking and sorting deliveries while the premises are relatively quiet.

As a result, a significant proportion of urban goods deliveries takes place during the morning. Although some of the deliveries take place during the very early morning before the morning traffic peak and in the later morning after the morning traffic peak has subsided, undoubtedly a sizeable amount of this work does coincide with the morning traffic peak. This has been reflected by the discussion group sessions and interviews with suppliers, wholesalers, receivers, transport companies and their drivers carried out during the project. By operating during the morning traffic peak, these distribution operations are both adding to the traffic problem and subject to its negative effects. The efficiency of these operations is hampered by the slow average urban traffic speeds during peak times. However, these operations take place at this time of day due to the requirements of receivers who want to receive goods at the start of their working day and also to vehicle operating time restrictions.

5.3 Whether delivery takes place on- or off-street

If the vehicle has to be parked on-street during the delivery to the premises it is likely to take longer, prove more difficult for the driver, and cause more disruption to other road users and pedestrians, than if the premises has an off-street loading/unloading facility. Approximately 60% of the premises studied did not have off-street loading/unloading facilities for goods vehicles.

5.4 Single-drop and multi-drop - findings from the research

The overwhelming majority of premises studied during the research receive their goods deliveries on vehicles performing multi-drop rounds. This is shown in Table 7.

Table 7: Receivers served by single- and multi-drop operations

Type of delivery	Number of premises
Premises receiving all deliveries from vehicles performing multi-drop work	48
Premises receiving all deliveries from vehicles performing single-drop work	8
Premises receiving deliveries from vehicles performing both single- and multi-drop work	2

Of the eight premises receiving goods deliveries from vehicle performing single-drop deliveries, seven are premises owned by large companies with many premises, and are among the largest premises studied. Seven of these premises operate centralised or hybrid goods supply systems and the vehicles delivering to all eight premises carry full vehicle loads (i.e. the vehicles are fully rather than partly loaded). Four of the eight premises are shops, three are factories and one is a distribution centre/warehouse.

The vehicles performing multi-drop deliveries to the 48 premises studied are operated by a range of different types of companies. Some of the delivery operations are carried out by suppliers and wholesalers, some by freight transport companies, and some by the company owning the premises themselves.

There is an important distinction between the type of multi-drop rounds being performed by these vehicles. Two distinct types of multi-drop rounds were identified during the research:

i. multi-drop rounds on which the vehicle visits a number of different premises that have no commercial relationship with each other. We found examples of this type of round being performed by suppliers, wholesalers, express and parcels companies and third party distribution companies. Of the 48 premises receiving multi-drop deliveries, 34 receive their deliveries by this type of multi-drop round.
ii. multi-drop rounds on which the vehicle visits a number of different premises all of which have a commercial relationship with each other (i.e. all premises are owned by the same company or group). All the premises receiving goods deliveries from this type of multi-drop round have internally centralised goods supply systems with goods being despatched from their own distribution centres to the premises. We found examples of this type of round being performed by third party distribution companies and by the company owning the premises themselves. Of the 48 premises receiving multi-drop deliveries, 14 receive their deliveries by this type of multi-drop round.

5.5 Goods vehicle dwell time

Much of the urban freight transport research that has been carried out in the past has tended to concentrate on goods vehicles movement. Far less consideration has been given to goods vehicles while they are stationary, despite this being an essential part of making collections and deliveries. This subject is an important part of urban goods vehicle operations for several reasons: (i) the necessity for the driver to find somewhere to park the vehicle, (ii) the time that the vehicle spends stationery can far outweigh the time spent in motion, and (iii) the problems and traffic disruption that stationery goods vehicles can cause.

During the research it has been possible to identify several key factors that affect the dwell time of the goods vehicle when loading/unloading is taking place and which could be reduced if the operation was conducted differently. These include:

- the distance from the vehicle parking place to the premises (for vehicles parked on-street);
- whether the shipper/receiver assists with loading/unloading;
- whether goods are pre-picked for each receiving premises before being loaded onto the vehicle;
- the extent to which the shipper/receiver checks the goods and the system used;
- whether the driver requires signature for delivery;
- the number of other deliveries/collections taking place at the premises/in the area at the same time.

The vehicle dwell time (i.e. the time the vehicle is stationery while the driver is making deliveries or collections) and the time taken to make a delivery or collection at the premises are not the same. This is because there are several activities carried out by the driver before and after visiting the premises and, therefore, the dwell time of the vehicle exceeds the time taken for delivery/collection at the premises (such as unloading the goods from the vehicle, closing the vehicle doors and locking the

vehicle, conveying the goods from the vehicle to the premises, returning to the vehicle after the collection/delivery and replacing any handling equipment used in the vehicle). Also, in instances in which a driver has to make several deliveries to premises that are either collocated or located close to each other, it is usual for the driver to perform all of these deliveries without moving the vehicle (i.e. to leave the vehicle in the same stationery position). This is most common in city centre locations where there is most likely to be a high density of deliveries, premises are relatively small (so distance between premises is small) and there are few parking places available. For these reasons it is often quicker for the driver not to move the vehicle between deliveries.

Table 8 shows the time taken for deliveries at several of the premises studied. As indicated by the table, at many premises the time taken for deliveries fluctuates widely depending upon the size of the delivery.

Table 8: Average time taken for deliveries and delivery quantities for a range of premises

Type of premises	Average time taken for delivery at premises (minutes)	Average quantity delivered (or range)
Florist	15	Full van load
Off-licence	120-180	6 pallets (440-600 cases)
Chemist	30	7-8 roll cages & 12 plastic cartons
Book shop	5-60	1-30 boxes
Stationers	30	3 roll cages
Pub (Drink delivery)	15-30	10-12 kegs & 12-15 cases
(Food delivery)	5	
Pub (Drink delivery)	30-120	Variable, tanker pumps beer in
(Food delivery)	5	
Convenience grocer	2-15	1-40 boxes to 5-10 roll cages
Fast food restaurant	30-120	4-15 pallets
Clothes shop	15-30	1500 items (80% hanging, 20% boxed)
Clothing/food shop	30-45	Full articulated lorry load
Furniture shop	5-120	1 cabinet to 50 three piece suites
Gift shop	5-10	1-40 boxes

6. Other goods trips to and from premises

6.1 Goods transfers between premises

All except six of the premises owned by large companies (with multiple premises), which were able to provide information about this issue, transfer core and/or ancillary goods between their premises. Thus most companies with two or more premises performing the same or similar functions have the facility to perform goods transfers between these premises when necessary. Of the 31 premises that do perform goods transfers, 15 transfer goods between themselves and other branches in their company on a regular basis, while 16 make transfers on an occasional basis. The method by which these goods transfers are carried out vary between premises surveyed, as shown in Table 9.

Table 9: Main method of transferring goods between similar premises at premises surveyed

Method of transferring goods between premises	Number of respondents
On core goods vehicle collecting or delivering to premises	6
Additional trip by vehicle based at one of the premises	13
Additional trip by vehicle not based at either premises	8
By post	1
By staff on foot	3

Table 10 shows the frequency with which goods transfer trips take place at a selection of those premises at which the goods transfer generates additional vehicle trips.

Table 10: Frequency of goods transfers between premises that generate additional vehicle trips

Premises	Number of goods transfer vehicle trips per week
Florist	10
Off-licence	10
Pizza restaurant	10
Office	5
Computer shop	3
Convenience grocer	1

6.2 Ancillary goods deliveries to premises

Ancillary goods are those goods required by the premises in order to function on a day-to-day basis but which are not the core goods connected with the premises (i.e. not goods sold to customers in the case of a retail premises, and not goods used in the production process in the case of a factory). Ancillary goods include items such as till rolls, stationery, plastic and paper bags, printer cartridges, display material, light bulbs, cleaning materials, in-house and customer magazines, publicity material, product information, and paperwork and administration sent from head office.

Of the 50 premises that provided details of ancillary goods deliveries, 28 receive separate vehicle deliveries specifically for ancillary goods. Seven premises receive ancillary goods both as separate deliveries and also combined with deliveries of core goods. Twelve premises receive all their ancillary goods as part of core goods deliveries, while at 3 of the premises studied ancillary goods are purchased and transported by staff from the premises in their own vehicles.

6.3 Money collections and deliveries at the premises

Some premises are visited by specialist money collection and delivery vehicles in order to safely remove the cash from the premises and to provide the premises with a float. The premises found to be generating these specialist money collection and delivery vehicle trips are all owned by large companies, with all branches in the company receiving this service. None of the independent premises studied receive visits from money collection/delivery vehicles.

In total, 17 of the 58 premises studied receive regular visits from money collection and delivery vehicles; large companies own all these 17 premises with multiple premises (made up of 15 shops, one hotel and one cinema). At all 17 premises these visits by a money collection and delivery vehicles take place on a daily basis.

6.4 Waste collections from premises

All of the premises studied require some form of waste to be collected with a range of different waste collection services being used:

- general refuse collection services (provided by either the local authority or a private waste firm)
- specialist waste collection (e.g. chemicals, medical waste etc.)
- recycling collection services (e.g. for paper, cardboard, glass etc.)

The number of different waste collection services used by premises studied is shown in Table 11. All the premises which provided details of waste collection services use at least a general refuse collection service.

Table 11: Number of waste collection services used by premises surveyed

Number of waste collection services used	Number of premises
1	38
2	13
3	1
Not known	6

Table 12 shows the frequency of waste collection vehicle trips to the premises surveyed which were able to supply details.

Table 12: Number of vehicle trips per week to the premises to collect waste

Number of waste collection vehicle visits to the premises	Number of premises
1 trip per week or less	12
2-5 trips per week	13
6-10 trips per week	20
More than 10 trips per week	2

6.5 Home deliveries (goods despatched from urban premises to customers)

Table 13 shows the number of retail premises studied that offer home delivery services from their shop to customers' homes or premises.

Table 13: Does the shop offer a home delivery service in which goods are delivered to the customers from the shop?

Home delivery service offered?	Number of premises
Yes (official service)	24
Yes (unofficial service)*	1
No, but will post goods to customer if requested	5
No, but may do soon	16
No	2

N.B. * - unofficial in the sense that this shop is part of multiple retailers who have not implemented this as a standard service, but the shop staff are personally prepared to offer this service.

As can be seen from Table 13, approximately half of all retail premises studied already offer delivery services to customers' homes from the shop. These home shopping systems tend to result in an increase in the goods vehicle trips generated by shops. Home delivery is carried out by motorised road transport vehicles (either goods vehicles, cars, taxis or motorcycles) at 18 of the 25 retail premises offering home delivery services.

Table 14 shows the frequency of home delivery vehicle trips made by some of the retail premises that were able to provide data.

Table 14: Home delivery vehicle trips made from the premises

Type of premises	Number of home delivery vehicle trips per week made from the premises
Florist	20 delivery rounds to 350 customers per week
Off-licence	20 delivery rounds per week to 100 customers plus deliveries on-foot
Pizza Restaurant	400 deliveries to customer per week
Printing and photocopying shop	15 delivery rounds per week
Variety store	Deliveries to 50-100 customers per week
Furniture shop	Deliveries to 75 customers per week
Builders merchant	55 delivery rounds per week

6.6 Comparison of core goods collections/deliveries and other goods trips at the premises

Table 15 shows the total number of goods movements performed by vehicles in a typical week at some of the urban premises surveyed. It provides an opportunity to compare the number of core goods collections and deliveries with other types of goods movements.

The information gathered about current goods flows at urban premises and the vehicle activities that support these flows has helped to quantify how and when this vehicle activity takes place at a wide range of different premises. It demonstrates:

i. that there are significant differences in the total number and timing of goods vehicle movements at seemingly similar types of premises (for example, the number of goods vehicle collections and deliveries range from 9 per week at a fast food restaurant to 23 per week at a public house to 320 per week at a pizza restaurant).

ii. that the relative number of different types of goods trips varies between premises (for example at some premises interviewed waste vehicle collections outnumber core goods deliveries, while at others core goods deliveries are up to 50 times greater than waste vehicle collections). As can be seen from Table 15, at some premises, the other goods movements are significantly greater than the core goods collections and deliveries, thereby illustrating the importance of studying all goods movements if a better understanding of goods trip generation is to be achieved.

Table 15: Relative number of goods vehicle trips at premises

Type of premises	Number of vehicle collections and deliveries of "core" goods (per week)	All other goods-related vehicle trips at (per week)	Total goods-related vehicle trips at premises (per week)
Pizza restaurant	3	317	320
Convenience grocer	159	22	181
Furniture shop	46	42	88
Book shop	40	19	59
Off-licence	2	37	39
Public house	26	9	35
Computer shop	18	16	34
Florist	10	22	32
Newsagent	25	7	32
Print/photocopy shop	6	16	22
Fruit and veg.shop	7	5	12
Clothes shop	2	17	19

7. Vehicle trips for servicing and other commercial activities

7.1 Vehicle trips for service activities

This project has also researched the service requirements of urban premises and the resultant service vehicle activity. This subject has received very little research attention in the past. Service companies have been interviewed and included in discussion group sessions to discover how they plan their vehicle activities, the pressures they face from customers and the transport problems that they experience.

Many of the urban premises studied have a wide range of service requirements that generate vehicle movements. These requirements can include, for example, computer equipment servicing, photocopier servicing, cash register servicing, security and fire alarms servicing, lift and escalator servicing, air conditioning servicing, towel and dry cleaning services, and general cleaning services.

From the research it is apparent that the service requirements of urban premises can be as, and in some cases more, important than goods collections and deliveries in terms of the successful functioning of the premises. This is especially true of those services related to high technology equipment such as computers, photocopiers and security systems. Therefore policy makers need to be aware of these activities and their importance. It could be argued that any operating advantages provided to goods vehicles in urban areas, on the grounds that they are performing essential operations (such as being able to use bus lanes and stop in areas where parking is banned), should also be made available to some or all categories of service vehicles.

From the interviews carried out with premises it has been possible to identify four categories of vehicle trips made to premises in order to carry out service activities: (i) quotation, (ii) installation, (iii) planned servicing/maintenance, and (iv) ad hoc servicing/emergency maintenance. In some service companies each of these four categories of service trips are carried out by the same service engineers/providers and vehicles, but in other service companies different staff and vehicle fleets are responsible for each category of service trip. From our interviews it would appear that the size of the service company and the time-sensitivity of the equipment/service concerned have an important bearing on whether the service company has different staff and vehicles for each category of service trip. Generally, the larger the service company and the more time-sensitive the service provided, the greater the likelihood that the service company will organise itself into separate divisions for each category of service trip.

Most service vehicles tend to operate in a similar pattern to multi-drop goods vehicles. The service engineer/provider will be issued with a list of customers to visit at the start of their working day and they will visit each in turn, driving from one to the next. This is typically the case for installations and planned servicing, but for emergency servicing the service engineer/provider will often only be informed of the premises they need to visit during the course of their working day.

Although engineers/providers tend to carry a certain quantity of key parts in their vehicles at all times, they will not always have the required components in their car or van to wholly rectify the problem in the case of unplanned maintenance trips. They must therefore obtain these required parts at very short notice and for these situations service companies tend to use a range of different systems for getting parts to customers' premises.

Service companies interviewed during the research used cars, vans and small lorries (3.5 to 7.5 tonnes gross vehicle weight) to provide services to their customers' premises. The only regular servicing provided to premises on foot is window cleaning, but even for this a vehicle may be parked somewhere close by.

Table 16 shows the extent to which a range of different service activities that generate vehicle trips are used by the premises surveyed, and the frequency of planned service vehicle trips.

Table 16: Vehicle trips for servicing activities made to premises surveyed

Type of service	% of premises surveyed which receive service vehicle trips for this purpose	Of those premises that receive service trips: are they supplied on planned or ad hoc basis (% of premises surveyed)	Average number of planned vehicle trips for those premises using service (per year)
Computer equipment	56%	Planned: 32% Ad hoc: 64%	2 per year
Photocopier	30%	Planned: 81% Ad hoc: 19%	44 per year
Security/fire alarms	92%	Planned: 76% Ad hoc: 24%	6 per year
Air conditioning	42%	Planned: 64% Ad hoc: 26%	4 per year
Vending machines	26%	Planned: 85% Ad hoc: 15%	44 per year
Window cleaning	72%	Planned: 100% Ad hoc: 0%	79 per year
Florist/plant care	8%	Planned: 100% Ad hoc: 0%	240 per year
Towel/linen supplies	8%	Planned: 100% Ad hoc: 0%	156 per year
Pest control	25%	Planned: 91% Ad hoc: 9%	11 per year

7.2 Vehicle trips for other commercial purposes

Vehicle trips for other commercial purposes (in addition to goods and service trips) are also made to some of the premises studied on a regular basis. These trips are:

- vehicle trips made by sales representatives from suppliers and wholesalers
- vehicle trips made by employees of the company visiting the premises (such as Area and Regional Managers)

The vast majority of premises studied (44 out of 53 of the premises surveyed) receive work-related visits from sales representatives and company employees who travel to the premises by car or van. Table 17 shows the frequency of trips by sales representatives by car to the premises surveyed where information was available. On average, premises visited by sales representatives receive seven such trips per week.

Table 17: Frequency of trips by sales representatives to premises surveyed

Frequency of visits to premises	Number of premises
A few per year	5
1-4 trips per week	10
5-10 trips per week	9
11-20 trips per week	5
21-50 trips per week	1
100 trips per week	1

These trips all take place during the normal working day at the premises surveyed. Some sales representatives visit premises at approximately the same time on the same day each week, others book an appointment in advance of their arrival and others simply turn up without notifying the premises and wait, if necessary, until the person they want to see becomes available.

8. Problems experienced by goods and service vehicle operations in urban areas

The research has attempted to gain a detailed understanding of the problems experienced by goods and service vehicles in urban areas. From the individual interviews and discussion group sessions that have been carried our during the project it is possible to derive six categories of problems experienced by goods and service vehicle operations:

- Traffic flow/congestion problems
- Transport policy-related problems
- Parking and loading/unloading problems
- Customer/receiver-related problems
- Problems of freight transport and service companies' own making
- Other issues that cause problems

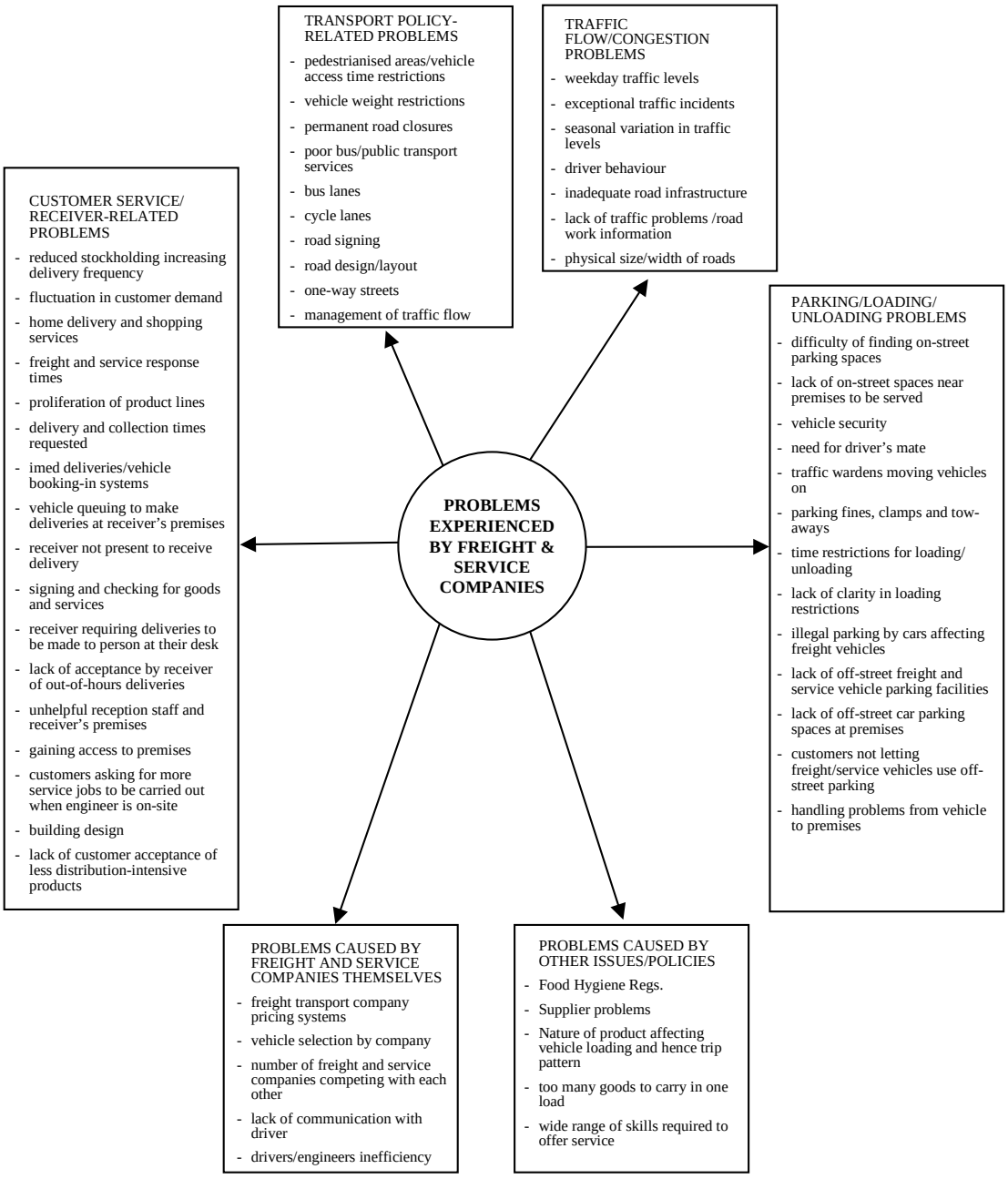
Figure 6 shows the individual problems that participants experience within each of these six categories. It would appear from the research that companies find it more difficult to carry out goods and service activities in London than they do in Norwich (both in terms of parking and loading/unloading problems and also in terms of traffic flow/congestion problems).

The transport problems experienced by service companies tend to differ from those experienced by freight transport companies. The freight transport companies that have participated in the research have tended to view the constraints on the movement of their vehicles (as a result of traffic levels and congestion) and existing transport policies (such as vehicle access time and vehicle size restrictions) as most problematic when operating vehicles in the urban area. By contrast, the service companies that have participated in the project have tended to view parking difficulties when visiting customers' premises in urban areas as by far the greatest problem that they experience, largely because existing parking/loading regulations do not cater for their needs.

This distinction between the transport problems experienced by service companies and freight transport in urban areas implies that a sustainable freight strategy needs to distinguish between the problems experienced by goods vehicles and service vehicles, and reflect this in policy-making terms. For example, policy measures could be introduced to alleviate the problems many service companies appear to experience in parking their vehicles in close proximity to the premises being visited without being fined or having their vehicles clamped or towed away.

Four of the eight service companies interviewed use cars, without liveries. This has survey implications, as it is not possible to distinguish between different car trip purposes by observation. Instead it is necessary to actually communicate with the driver of the vehicle to determine trip purpose. This also has policy implications, as it makes it difficult to prevent policy measures aimed at influencing the use of private cars from also affecting service companies using cars.

Figure 6: Problems experienced by freight and service vehicle operations



9. Environmental sustainability and the ease/efficiency of urban freight transport

The Government is keen to identify transport policy measures which will reduce the environmental impacts of urban freight and service operations and which also make freight and service transport operations more efficient. The discussion group technique used in the research has proved helpful in identifying which transport policy measures could deliver both economic and environmental benefits (such as allowing freight vehicles to use bus lanes, and improving road signing and roadwork/traffic information). It has also indicated that some policy measures are likely to prove unattractive to one or more companies in the supply chain (such as enlarging or increasing the number of pedestrianised areas, introducing more stringent vehicle size/weight restrictions, and imposing more parking/loading restrictions).

There are three plausible goals for urban freight transport policies that address both economic and environmental concerns in an attempt to make freight transport more sustainable:

i. to maximise the ease and efficiency with which goods and service vehicle activities can be performed without worsening the environmental and social impacts that they impose on the urban area;
ii. to minimise the environmental and social impacts caused by goods and service vehicles in urban areas without worsening the ease and efficiency with which these vehicle activities can be performed;
iii. to improve the ease and efficiency with which goods and service vehicle activities can be performed and at the same time reduce the environmental and social impacts that they impose on the urban area.

When considering how to reduce the environmental and social impacts caused by goods and service transport it is important to determine which impact(s) need to be reduced and the means by which the activity causing those impacts can be altered. We are currently in a position in the UK in which many policy makers are still considering which impact(s) they most want to reduce. When this decision has been made it is then necessary to determine suitable policy measures for achieving these impact reductions.

Within the project it has been possible to research the following issues by interviewing a wide range of companies and also by holding discussion group sessions:

- policy measures that could make goods and service operations in urban areas easier to perform and more efficient;
- policy measures that could make goods and service operations in urban areas more difficult to perform and less efficient;
- company initiatives that could either make goods and service operations in urban areas easier to perform (for one or more parties in the same supply chain) and/or result in both environmental and economic benefits.

It is important to recognise that if goods and service vehicle operations become easier to perform, and hence more economically efficient as a result of new policy measures and/or company initiatives, it is not necessarily the case that this will also lead to the operations becoming more environmentally and socially sustainable. In fact, in some cases the reverse is true; as some operations become easier to perform their environmental impact increases (for example, if at its most extreme, all regulations and restrictions governing the use of goods and service vehicles in urban areas were abolished, these operations would become easier to perform, but some of the environmental impacts that these operations caused would rise - many current restrictions are in place for good reason).

It is obviously more desirable to attempt to identify policy measures and company initiatives that have the twin effects of making goods and service vehicle activities more efficient and that also result in a reduction of the social and environmental impacts that these operations cause.

Measures that reduce one environmental impact of urban freight may well increase another impact (for instance banning heavy goods vehicles from an urban area may be beneficial in terms of visual intrusion, physical intimidation and noise, but may lead to a greater total number of trips performed by smaller vehicles and hence more fossil fuel use and pollutant emissions). In determining appropriate measures to reduce the impacts of urban freight transport it is necessary to understand the particular problems that the measures need to alleviate in the specific urban area in question. There are unlikely to be universally applicable solutions.

9.1 Policy measures that may make urban freight operations easier and more efficient to perform

Below is a list of policy measures that some or all participants identified as means by which policy makers could make it easier to perform urban freight operations and that would result in greater operational efficiency. Many of these measures also have the potential to make urban freight transport operations more environmentally sustainable.

- Relaxing loading/unloading time restrictions
- Allowing freight/service vehicles into pedestrianised areas which currently have vehicle access restrictions
- Relaxing freight vehicle size/weight restrictions
- Improving on-street loading/parking facilities for freight and service vehicles
- Allowing freight/service vehicles to use bus lanes
- Allowing longer hours for freight and service vehicle access (e.g. remove any out-of-hours curfews)
- Car use reduction strategies
- Better enforcement of parking regulations for private cars
- Improved traffic/roadwork information
- Road infrastructure/building/bypasses
- Improved road signing
- Lorry routes
- Improving access to back of premises
- Yellow boxes - traffic management
- Traffic calming - traffic management
- Traffic light sequencing
- Fixed width restrictions
- Policies to improve public transport
- Designing freight/service vehicle facilities into building design/planning permission
- Encourage relocation of premises to less dense areas
- Park and ride depositories
- Urban transhipment centre
- Quality Partnerships

9.2 Policy measures that may make urban freight operations more difficult and less efficient to perform

Below is a list of policy measures that policy makers may potentially introduce in an attempt to make urban freight transport more environmentally sustainable. Most participants felt that these measures are likely to make it more difficult to carry out goods and service vehicle operations in urban areas and could reduce the efficiency of these operations.

- New/enlarged pedestrianised areas (greater vehicle access time restrictions)
- Lower speed limits in urban areas
- Greater vehicle weight/size restrictions
- More loading/unloading time/parking restrictions
- Urban transhipment centres
- Alternatively-powered vehicles
- More bus/cycles lanes
- Urban road user charging

9.3 Company initiatives that may make urban freight operations more efficient and more environmentally sustainable

As well as policy measures that can be implemented by central and local government to help make freight and service transport more efficient and at the same time more environmentally sustainable, there are a number of initiatives that can be taken by companies themselves to improve efficiency which would also make vehicles operations more environmentally sustainable. The research has identified many initiatives that companies could implement, either within their company or in the supply chains in which they operate, in order to achieve the twin goals of reducing the environmental impact of freight transport operations and, at the same time, making these operations more efficient. The list of these company initiatives is shown below.

- Self-imposed collection and delivery time bans
- Receiving premises helping to unload vehicle
- Receiver not needing to check deliveries
- Finding the right person at the receiver's premises
- Staff at the premises making deliveries/consolidating collections
- Receivers relaxing need for early morning delivery/being more realistic/truthful about when they really need delivery
- Receivers operating timed delivery systems efficiently
- Premises accepting out of hours collections and deliveries
- Days of week that premises accept collections and deliveries
- Premises allowing goods and service vehicles to use off-street facilities where they exist
- Communication systems with shippers and receivers about distribution matters
- Freight and service operators buying the right type/size of vehicle for the operation
- Urban container concept
- Companies encouraging employees to use public transport for journey to work
- Service companies obtaining as much information as possible when the problem is reported
- Using IT or common sense to allocate job to best suited engineers
- Communication with the driver/engineer
- Routeing and scheduling
- Pricing by suppliers/wholesalers to deter single drop trips delivering small quantities
- Operating fewer but larger premises/distribution centres/warehouses
- Smooth, reliable supply from suppliers to transport company/supplier
- Virtual transhipment / 'City logistics' systems
- Shared user distribution
- Use of local suppliers/consolidated deliveries from them
- Driver efficiency
- Premises receiving fewer, bigger deliveries
- Combined collection and delivery trips
- Consolidation of goods to be returned
- Achieving backloads for returning vehicles
- Goods vehicles/drivers providing equipment and parts to service engineers
- Premises using fewer goods suppliers
- Use of vehicle telematics and data capture
- Modal shift
- Vehicle fuel efficiency
- The use of cleaner and alternative vehicle fuels
- Designing more environmentally-friendly vehicles
- Driver training/driver safety
- Design of freight vehicle reception facilities at premises

The company initiatives listed above vary in terms of: (i) responsibility for action - i.e. which party or parties in the supply chain need to change their operations to realise the initiative, and (ii) support for the initiative - i.e. which other party or parties in the supply chain need to support the initiative in order for it to be successful. Of the company initiatives listed:

- some require the action of one party in the supply chain and the support of none of the others (these are the easiest to achieve in managerial and implementation terms as long as they are commercially viable);
- some require the action of one party in the supply chain and the support of other parties such as retailers, goods suppliers and freight transport companies (these are more difficult to achieve in managerial and implementation terms as they require dialogue and agreement between supply chain parties);
- some require the action of more than one party in the supply chain to jointly implement changes to their operations so that the new more sustainable approach is feasible (these can prove more difficult as they require inter-company agreement and joint planning and working). The initiatives can result in additional resource requirements, such as labour or capital equipment, for one or more of the parties and in these cases, in order for such changes to be implemented, it will be necessary that one of the following happens: (i) an improvement in some aspect of service or a reduction in operating costs to make the switch commercially viable, (ii) any cost savings by one party in the supply chain are divided so as to compensate those parties that incur higher costs as a result of the change, or (iii) the change in practice will have to be encouraged or made compulsory by central or local government (either through fiscal measures and price signals or by direct regulation).

The company initiatives also vary in terms of the time it would take to bring about the desired effect. For instance, the benefits of driver training programmes are immediate, whereas modal shift from road to rail and its associated benefits would take far longer to achieve.

10. Recommendations and conclusions

10.1 Researching urban freight transport

- There has been previous research into: (i) the macro environmental and economic benefits of company initiatives and policy measures in the field of urban freight transport, and (ii) supply chain organisation and decision-making. However, little research has brought these subjects together in order to understand the decision-making factors that influence urban freight vehicle activity. The Framework developed and used in the project has proved successful in identifying the decision-making processes and the range of issues that influence vehicle activity. It has helped to simplify understanding and bring some order to a subject that is very complex due to the variety of participants and diversity of activities involved.
- The supply chain approach[2] adopted in developing the Framework, coupled with the combination of research techniques used in the project proved to be very useful in gaining an understanding of: (i) the relationship between goods/service flows and vehicle activity, (ii) the decision-making process that takes place between supply chain parties that determines how and why vehicle activity takes place in the way that it does, (iii) how supply chains would potentially react to new transport policy measures and the effect that this would have on vehicle activity, (iv) how supply chains or individual companies in the supply chain could potentially alter their behaviour to reduce environmental impacts of vehicle operations and the barriers to these changes being implemented, and (v) how changes to urban freight transport could be discussed and planned by supply chain parties, and policy makers.
- The research has included all the supply chain participants involved in the flow of goods and services to premises in the urban area - namely manufacturers and wholesalers, freight transport companies, service companies, waste collection companies, and a diverse range of urban premises receiving and despatching goods and receiving services. The research results reflect the advantages of including all supply chain participants in the research, both in terms of understanding the rationale for the current vehicle operations and also for considering the likely impacts of potential policies and how companies or supply chain parties could implement initiatives that lead to greater sustainability, and the barriers to doing so.
- The research has attempted to gather the thoughts, comments and ideas of a range of personnel in the supply chain, not just managers. For instance, in the case of freight transport companies this has included drivers, operational managers/planners and strategic managers. For service companies, both service engineers and operational managers have been included and, in the case of receiving premises, operational staff responsible for receipt and despatch, managers of the premises, and distribution/logistics directors (where such a role exists within the company) have participated. This has proved extremely useful as the research has shown that often personnel with different responsibilities within the same company have completely different perspectives and knowledge about supply chain operations and different insight into the efficiency of freight and service operations. For example, operational and strategic managers from freight and service companies tend to be far less aware than drivers or engineers about day-to-day vehicle operating problems in urban areas. However, as would be expected, these managers are far more knowledgeable about planning and organisational issues, and about how inter-company decisions are reached. Therefore, to fully understand urban freight and service operations and problems experienced, it is necessary to include a wide range of different personnel from each company.

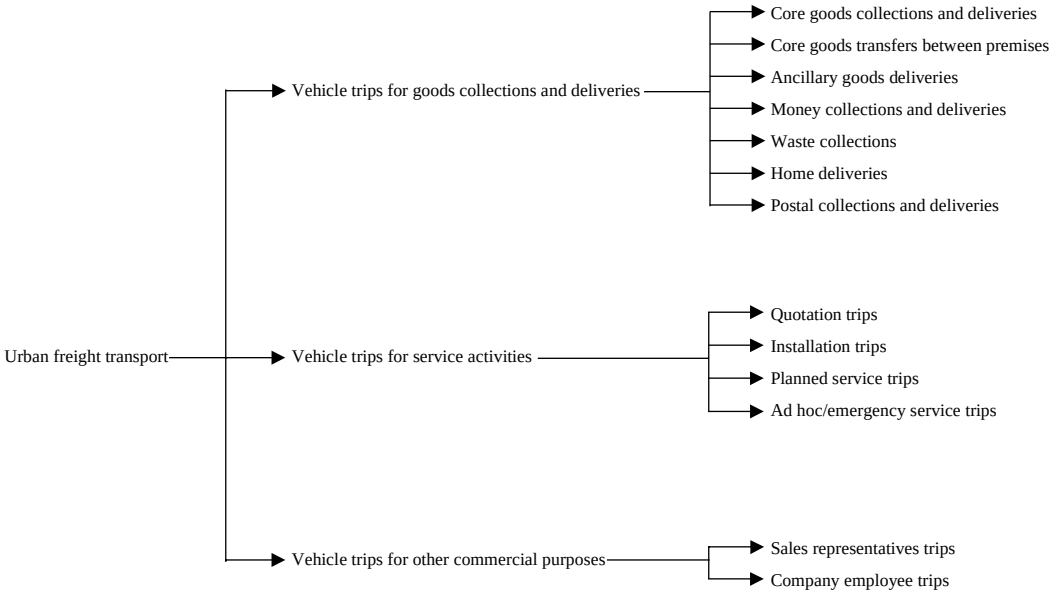
10.2 Definition of urban freight transport

- Adopting a broader than usual definition of urban freight transport has proved extremely helpful in understanding the functioning of urban premises and how these premises would be affected by transport-related policy changes (see Figure 7). Traditional definitions of urban freight transport

2. The supply chain approach adopted in the research comprised the examination of the goods and service flows and vehicle activity to/from individual premises in the urban area, and included the study of the companies involved in supplying those goods and services.

fail to recognise the importance of service vehicle trips to premises which, as the research has demonstrated, can in some cases be of greater importance to an urban premises than a typical goods delivery. Until now, most urban freight research has ignored the growth in van traffic in urban areas and the trip purpose of these vehicles. The definition used in the research has also made it possible to quantify the totality of vehicle trips for commercial purposes at a sample of urban premises and hence to determine the relative number of the different types of vehicle trips at different premises.

Figure 7: Definition of urban freight transport used in the project



- The definition used has made it possible to identify that current "freight" transport policies are somewhat irrational, in the sense that they treat different types of goods and service activities in an unequal manner. Vehicles used to provide services to urban premises tend to receive less policy assistance in terms of on-street parking than do vehicles used to make on-street deliveries to the same premises. Also, if a car is used to provide goods or services to a premises, it can enjoy less policy assistance than a van or lorry. The reason for this difference in treatment is two-fold: (i) in some cases, it is due to a lack of understanding on the part of policy makers about the importance of service activities, or the use of cars for goods and service transport, and (ii) it is also due to the need to produce workable and easily enforced policy measures; for instance, it is extremely difficult to distinguish between cars being used for personal use and cars being used to provide essential services and to thereby grant exemptions and operating advantages to the latter.
- By using this broader definition of urban freight transport it has been possible to demonstrate that the transport problems experienced by: (i) freight transport companies, and (ii) service companies tend to differ.

10.3 Current urban freight transport operations and problems experienced

- The qualitative information and data collected during the course of the research on: (i) current urban goods/service flows and the transport activity that supports this, and (ii) the policy measures and company initiatives that could play a part in making urban freight and service transport activity more sustainable, has proved useful to the local authorities involved in the project as it has helped them: to better understand urban freight and service operations, to think about urban freight strategies and policies, and to consider the suitability of different policy measures. The Framework could be used by other local authorities seeking to address urban freight transport issues.

- The information gathered about current goods flows at urban premises and the vehicle activities that support these flows has shown that: (i) there are significant differences in the total number and timing of goods and service vehicle movements at seemingly similar types of premises, and (ii) the relative number of different types of goods trips differs significantly at different premises.
- Much of the previous urban freight research has concentrated on vehicle deliveries and collections of "core" goods at urban premises. However this project has demonstrated that at some premises, other types of goods movements are significantly greater in number than the "core" goods collections and deliveries. This illustrates the importance of studying all goods movements if a better understanding of goods vehicle activity and goods trip generation is to be achieved.
- The project has researched in detail the service requirements of urban premises and the resultant service vehicle activity. This subject has received very little research attention in the past. The work has indicated that urban premises require a wide range of service requirements that generate vehicle movements.
- The service requirements of urban premises can be as, and in some cases more, important than goods collections and deliveries. This is especially true of those services related to high technology equipment such as computers, photocopiers and security systems.
- The research has identified a wide range of problems experienced by freight transport and service companies in carrying out their operations in urban areas. Much previous research has been focused on problems caused by these activities, rather than considering the problems that they experience. If working relationships between local authorities and freight transport and service companies, such as the Quality Partnerships for Urban Distribution concept are to prove successful, it is necessary that local authorities better understand the specific problems faced by operators in urban areas.
- Some of the transport problems experienced by service companies tend to be different to the problems of freight transport companies - service vehicles tend to be far more adversely affected by parking problems than traffic flow problems. Consideration of the parking needs of service vehicles and how these could best be provided for would benefit from further research.

10.4 Policy measures for urban freight transport

- The research into goods flows in individual supply chains and the related goods vehicle activity has shown that some supply chains are already being operated almost as efficiently as possible, in terms of vehicle trip generation. Therefore trip numbers in these supply chains could not be further reduced. This implies that if, as the Government is currently stating, efficiency in freight transport operations is to be encouraged and promoted by sustainable transport policies, it is important that policy makers consider the supply chain when devising suitable policy measures and recognise the existing efficiency of operations at a supply chain level, rather than simply focusing on individual goods vehicle activity in urban areas.
- There is a need for both central and local government to continue to develop a more balanced view of freight transport that takes account of the economic and social importance of goods and service transport, and which encompasses a better understanding of the problems experienced by goods and service vehicle operations.
- Local authorities should attempt to develop urban freight policies and, where possible, devise suitable policy measures that will bring about reductions in the environmental impacts of freight transport and which at the same time either improve, or at least do not worsen, the operational efficiency of urban freight operations. In the past too much policy emphasis has been placed on preventing and restricting these vehicle operations. However, this is not to suggest that all future freight policy measures that need to be implemented will be able to balance both environmental and economic considerations. Situations will always arise in which it is necessary to introduce policy measure(s) which have to prevent and/or restrict urban freight operations in a specific urban area for environmental reasons (and which will result in freight transport operations becoming more difficult to perform and/or less efficient).

- There is a need for policy makers who work in areas that are directly related to transport (such as town planning, architecture, housing, and economic development) to take into account the goods and service requirements of urban premises in their work and decision-making.
- As urban road space becomes increasingly congested it will be necessary for central government and local authorities to decide where goods and service vehicles should be positioned in their hierarchies of prioritisation for road vehicles. Reassessment of the importance and priority afforded to some road vehicles will be required in order to determine whether current policies that favour particular categories of road traffic are desirable (for example, the exemptions and benefits afforded to taxis that are not given to goods and service vehicles). Goods and service vehicle activity is clearly essential to the urban economy and the lifestyle of inhabitants of the urban area, but these vehicles tend not to be given high priority in policy terms.
- The research has helped to establish the likely operational response of companies to a wide range of policy measures; this should prove beneficial to local authorities in thinking about potential policy measures.
- The research suggests that many service companies may be using unliveried cars to provide their services to urban premises. Policy makers need to consider how to treat these vehicles in policy terms (i.e. should they be considered as freight transport vehicles or private cars?). If they are to be treated as freight transport vehicles, it is necessary to decide how to identify these vehicles so that they benefit from any measures implemented to make goods and service vehicle activities easier to perform.
- Policy makers need to pay more attention to the indirect impacts on goods and service vehicle operations of existing transport policy measures aimed at buses, taxis and pedestrians. Too little consideration has been given to the indirect effects of non-freight transport policy on urban freight operations.
- The White Paper “A New Deal for Transport: Better for Everyone” places the emphasis for urban freight transport policy on local authorities. Although there is much that local authorities can do to improve the economic and environmental sustainability of urban freight transport, there is also a need for policy formulation at a wider geographical scale to ensure that urban freight transport policies are consistent at the regional and national levels. Otherwise, policies may well be implemented that, although environmentally and economically optimal at a local level, are sub-optimal at a regional or national level.
- Local authorities need to place increased emphasis on urban freight transport policy in order to successfully develop their new Local Transport Plans. They need to devise suitable inducements to encourage companies to participate in Quality Partnerships for Urban Distribution. These inducements should not be limited to goods and service vehicle operators, but should also extend to the urban premises which are visited by these vehicles. This will require imaginative thinking about monetary incentives for premises which are, for instance, prepared to alter the times at which they are prepared to receive these vehicles and are prepared to alter their goods supply systems and stockholding arrangements so as to reduce the frequency of vehicle collections and deliveries. These monetary incentives could be made available through national taxation systems or commercial rates levied on premises.

10.5 Role of company initiatives

- The research into urban freight transport has identified a wide range of company initiatives that could be taken which would bring about both a reduction in the environmental impacts of vehicle activity and an improvement of the efficiency of the operations.
- Some company initiatives, which could result in environmental and economic benefits, only require the action of one party in the supply chain and are therefore the easiest to achieve in managerial and implementation terms.
- Other company initiatives require the action of one party in the supply chain and the support of other parties, or require more than one party in the supply chain to jointly implement changes to

their operations for the new approach to be feasible. These initiatives are more difficult to achieve as they can require dialogue, agreement and joint working between supply chain parties.

- The discussion group sessions have helped to establish that some company initiatives that require the involvement of more than one party in the supply chain will not necessarily appeal to them all. This is because the operational or financial benefits that would be derived from the initiative would all accrue to one party. In the case of some of the initiatives discussed, which yield net financial and/or operational benefits in the supply chain as a whole (for example, out-of-hours deliveries, and staff at receiving premises helping to unload delivery vehicles/distribute goods within the premises), one supply chain party would actually experience increased costs as a result of the initiative. This represents a barrier to the implementation of initiatives that would, in macro terms, have environmental and economic benefits. In order to remove this barrier it is important to establish ways in which the benefits could be shared between the supply chain parties in order that such initiatives are implemented.
- Many company initiatives that could be introduced require agreement and operational changes at the point of goods delivery. However, if the delivery to the premises is made by a third party freight transport company on behalf of a supplier or wholesaler, then the transport company's customer is in fact the sender rather than the receiver of the goods. In this situation, communication between the transport company and the receiving premises tends to be limited or non-existent. This lack of a contractual arrangement between the transporter and receiver makes it difficult to discuss and reach agreement about changing arrangements such as, for example, the times at which deliveries are made, and the need for checking and signing for deliveries.

10.6 Working relationships between policy makers and industry

- Policy makers in central and local government need to develop a better understanding of current urban goods and service vehicle activities and the role that they play in the economic vitality and efficiency of urban businesses and the urban area itself. This requires a two-fold change in perspective: (i) away from the traditional view of seeing freight transport as a problem to seeing it as an essential activity, and (ii) the adoption of a supply chain view rather than simply focusing attention and policy on individual vehicle activity. It is necessary to understand why vehicle activity takes place in the manner that it does (i.e. what goods and service activities are provided and what decision-making factors determine the time, frequency, and location of the vehicle activity) in order to ensure that policy measures which alter that pattern of activity are not detrimental to the urban economy.
- Policy makers also need to develop greater understanding of the environmental and social impacts associated with goods and service vehicle activities in urban areas that they want policies to address. They need to determine, preferably in conjunction with other interested parties (such as the industry and the research community), which aspects of urban freight transport activity need to be influenced in order to alter these impacts in the desired manner (i.e. is it vehicle size, trip numbers, kilometres performed, location of activities, times of activities etc.) - this is a prerequisite to determining suitable urban freight transport policies.
- It is clear from the research that many of the participants, working in goods distribution and service provision, as well as in retailing and manufacturing, are sceptical about central and local government's desire to positively improve urban freight transport by putting in place policies that will help to make it function more efficiently. Many of them are also sceptical about the likelihood of local authorities entering into meaningful dialogues with them on urban freight transport.
- As well as industry tending to perceive central government and local authorities as insensitive to their needs and problems, the research also suggests that freight transport and service companies are not well informed about government policy and thinking about goods and service transport issues. Very few of the participants were aware of the existence of "Sustainable Distribution" published by the DETR, and there is little, if any, awareness about its content.
- Despite this, many of the company representatives who were involved in the research felt that, if central and local government were truly committed to achieving a better and more efficient

operating environment for goods and service vehicles, the opportunity to meet with local authority representatives and to try to jointly find solutions and improvements would be most welcome. Many of the participants are, however, extremely busy, and they were very clear in expressing that if their involvement and participation is required at meetings and working groups, they would have to be certain that it would ultimately result in worthwhile benefits and improvements for their companies.

- Most participants felt that the notion of government assisting goods and service vehicle operations in urban areas in return for freight and service companies reducing the environmental impact of their operations in some way (such as, for instance, investing in quieter, cleaner vehicles, driver training etc.) was a reasonable approach. However, central and local government still have much work to do to persuade companies that concepts such as "Quality Partnership for Urban Distribution" will lead to improvements in vehicle operations for freight transport and service companies.
- The project team participated in a Freight Forum organised by Norfolk County Council and Norwich City Council at the end of the project. This event comprised relevant policy makers from the local authorities with responsibility for the Norwich urban area and invited representatives of freight, manufacturing and retail companies with a presence in Norwich. The purpose of the Forum was to instigate a discussion about the freight transport-related problems experienced by companies in Norwich and to identify policy measures that could help to overcome these problems. The Forum proved to be very successful and will be continued with other similar meetings and working groups.

10.7 Areas for future research

As well as the research implications of the comments and conclusions in sections 10.1 to 10.6, there are a number of other specific issues concerned with urban freight transport that require research attention.

- Further research into service companies' activities and the vehicle operations that support these activities is required. Despite our research, there are still many opportunities to carry out further research to better understand the full range of services and their related vehicle activity patterns.
- More detailed research is required into how potential urban freight transport policy measures and company initiatives are likely to change the pattern of vehicle operations and their environmental impact and level of efficiency. Only by gaining greater understanding in this field will it possible to devise truly sustainable (in environmental and economic terms) urban freight transport strategies. Tools need to be developed to assist policy makers in better understanding current urban goods and service operations, and in examining the likely consequences and outcomes of different policy measures.
- Some of the policy measures investigated in the research are worthy of further detailed research and feasibility studies. This includes measures such as the urban transhipment centre concept, allowing urban freight vehicles to use bus lanes, and parking facilities for service vehicles (see the Third Working Report for further details).
- A number of the potential company initiatives developed during the research would also benefit from further study. These include initiatives such as out-of-hours delivery systems, and greater assistance from receivers with deliveries to them (see the Third Working Report for further details). A key issue requiring further investigation is the method by which economic and operational benefits that would derive from some of these initiatives could be shared between the supply chain parties so as to make them attractive to all parties and thereby ensure their implementation.
- The discussion group research technique developed and applied in the project proved extremely helpful in improving our understanding of the decision-making process that takes place within supply chains, individual companies and by employees of those companies (e.g. drivers, service engineers, etc.). It proved very effective for: (i) researching the rationale for current supply chain operations, (ii) examining how supply chain operations could change both proactively (i.e.

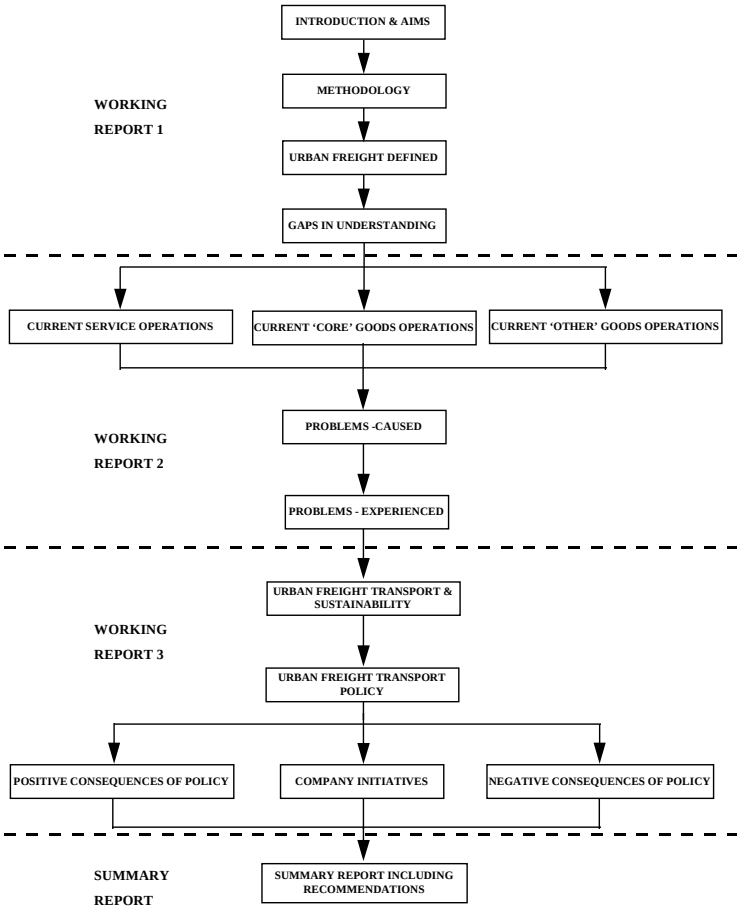
initiatives that companies and the supply chains within which they work could implement) and reactively (i.e. how supply chains would be likely to react to new policy measures), and (iii) investigating the barriers and obstacles to achieving change in supply chain operations. The benefits of these discussion group sessions outweighed the difficulties involved in organising them. This research technique is capable of producing beneficial results if applied to other issues within freight transport and logistics.

- The project did not investigate the freight transport activities of final customers in transporting goods purchased in shops in the urban area to their homes. This transport activity represents another important category of freight transport movements in urban areas that is not currently well understood by researchers and policy makers and which would benefit from research.
- Further research into the efficiency of different types of trip pattern for goods collections and deliveries in urban areas would be beneficial in both economic and environmental terms. This would involve investigation of the relative efficiency of multi-drop delivery rounds performed over long distances, with poorly loaded single-drop deliveries, and the effects urban transhipment systems have on vehicle efficiency.
- There are currently many gaps in urban freight data collection. Even when data does exist, the sample sizes involved tend to be relatively small. Greater data collection, on topics about which limited data already exists, as well as topics about which no data exists, would add to our understanding of urban freight transport (see the First Working Report for more details).

11. Other reports available from the project

The research carried out during the project has been written up in three Working Reports. Figure 8 shows how the complete set of reports is structured and what topics are covered by each.

Figure 8: Layout of Working Reports



All of the Working Reports are obtainable from the website of the Transport Studies Group at the University of Westminster. Site address: http://www.westminster.ac.uk /transport/

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