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Review of Survey Techniques Used in Urban Freight Studies

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CONTENTS

1. Introduction

This report is based on a review of survey techniques used in studies in which data has been collected to obtain an understanding of road-based urban freight transport activities and patterns of operation. Studies from the UK and other countries have been included in this literature review.

While it may be thought that relatively few such studies have been conducted, approximately 60 such studies have been identified as taking place in the UK and approximately 100 elsewhere since the 1960s. In addition, other studies have been carried out in order to assess industry and policy maker opinions about urban freight transport (Lawson and Strathman, 2002), however this type of study and survey work is not the focus of this report.

Gaining an understanding of road-based urban freight transport activities is an important element in determining the current sustainability of such activity (in economic, social and environmental terms) and how best to go about enhancing its sustainability. By reviewing the existing survey work in this subject it has been possible to draw together the methodologies developed and implemented. This should therefore be of help in understanding which techniques are most commonly used, the strengths and limitations of the various techniques, and in assessing the most suitable urban freight survey techniques for a given study (depending on the type of information required).

Section 2 provides a brief discussion of freight data collection efforts, especially in urban areas.

Section 3 explains the approach taken in the literature review. It provides details of the countries and decades in which the studies reviewed were carried out.

Section 4 considers the various urban freight transport topics have been subject to data collection via survey work.

Section 5 presents the survey techniques and methods that can be used to study urban freight activities. It includes details of the survey techniques used in the studies reviewed (by country and by decade).

Section 6 provides details of the focus of the studies reviewed, together with the purpose of the studies, the means by which the survey work was carried out, the sample sizes and response rates, as well as the geographical areas and business types included.

Section 7 presents an assessment of the advantages and disadvantages of the various methods by which urban freight survey techniques can be conducted, together with an evaluation of merits of the various types of urban freight surveys.

Section 8 provides some concluding thoughts and observations based on the research presented in this report.

The appendices provide further details about each of the individual urban freight studies reviewed.

A separate report as part of this same Green Logistics project has reviewed the results of 30 UK urban freight studies carried out in the last decade in order to attempt to provide insight into urban freight activities in our towns and cities. The results of 7 UK urban freight studies carried out in the 1970s (between 1970 and 1975) are also presented and compared with the recent UK studies. This provides insight into the extent of similarity and difference in urban freight operations over this 25-35 year period (Allen et al, 2008).

We intend to produce an additional report that contains all the urban freight survey forms that we have obtained during the course of carrying out this research.

Another report offering guidance and recommendations in carrying out urban freight survey work is planned for 2009 as part of the Green Logistics project.

2. Urban freight data collection efforts

Many urban policy makers are reliant on vehicle traffic counts to form opinions and determine policy approaches for urban freight transport on a day-to-day basis. This provides little insight into factors including:

- the goods and service flows that such vehicle activity supports,
- the specific purpose of these vehicle trips,
- the establishments that are generating the demand for these trips and their goods and service requirements,
- the supply chain decisions that results in these trips happening in these vehicles, at these times and days,
- the routes taken by these vehicles
- the types of trip patterns performed (e.g. multi-drop as opposed to single drop),
- details about the loading, unloading and parking activities associated with these trips.

Urban freight transport is made up of numerous activities and parties, resulting in a complex subject area to study in order to obtain an understanding of such issues.

One of the major complications of studying freight as opposed to passenger transport is that it comprises both i) goods and services that are produced and consumed in an urban system and ii) transport vehicle activity that supports the flow of these goods and services. In a small number of cases, goods and services will travel on the same vehicle from the point of production to the point of consumption but usually goods and services are associated with several different vehicle trips, and vice versa, goods vehicles are used to carry a wide range of different goods and service. Although much urban freight transport research is focused on vehicle activity (as it is vehicles that cause traffic and environmental impacts), it is important to bear in mind that the demand for urban freight transport activity is derived from the demand for goods and service flows.

In many urban freight transport studies that attempt to go beyond vehicle traffic counts, the focus is limited to goods vehicle activity (and sometimes this is further limited to either just core goods delivery trips, or core goods delivery and collection trips, ignoring ancillary goods delivery trips, goods transfers between establishments, money delivery and collection trips, waste collection trips and other collection trips for reverse goods flows). However, urban freight transport also includes vehicle trips made in order to carry out a wide range of servicing tasks (concerned with issues such as public utilities, telecommunications, cleaning services, equipment maintenance, and electrical and plumbing services). These service tasks are carried out in a range of vehicle types from motorcycles and cars to light and heavy goods vehicles. Relatively few urban freight studies have concerned themselves with the study of these service activities and the associated vehicle activity.

National surveys of freight transport operations are conducted in many countries (such as the Continuing Survey of Road Goods Transport in Britain, and commodity flow studies in the USA). Although these surveys do collect data about urban freight activities in the urban area they are usually not very useful for gaining a better understanding of freight transport in particular urban areas for several reasons: i) the sample size in any particular urban area is likely to be small, ii) it is often difficult to disaggregate the data from the overall dataset, and iii) the type of data collected about in these surveys does not provide the detailed information often required for urban freight analysis. Therefore, specific data collection exercises are usually required to gain the necessary insight into urban freight transport.

In terms of the availability of previous urban freight data efforts, it is worth noting that despite the fact that relatively little such data has been collected (in relation to personal travel, and

traffic data in general), that this data is normally not publicly available for use in other studies. This is due to the fact that the data is not archived in a single location, and ownership and confidentiality issues surrounding the data are often complex. The majority of the urban freight transport data collection efforts that have taken place have been funded by the public sector (including local, regional and national government departments, research bodies and other public sector agencies. However these bodies often commission the work from consultants and/or academics and do not usually retain the data at the end of the study. The only output that is often available from such work is usually a report or paper which only provides summary statistics and results. In some cases, especially for older studies even such reports are difficult to locate and in some cases copies no longer seem to exist.

As Ogden (1992) has noted it is not possible to make definitive comments about the data needs when studying urban freight transport. These will vary depending on the issue/s concerned, the planning and policy framework in which the issue arises, established practice in data collection, and the availability of previously collected data.

3. Review of urban freight data collection, survey techniques and methods

An international literature review of previous studies that collected urban freight data was carried out. At the outset the authors expected to find relatively few such studies, however more than 160 such studies worldwide were identified. Difficulties encountered during this literature review included: i) that no previous such international reviews appear to have been attempted (only a few reviews that mention studies in one or a few countries seem to exist), ii) that publications of many urban freight studies are not publicly available (as they were commissioned by local, regional or national governments and were never published), iii) among the older studies, even those that were published as a paper or report are not always still available, iv) such studies are written in the national language resulting in comprehension difficulties for the authors, v) the only mention of some studies is a brief overview of the study in another report or paper – therefore only summary details of the study are available in such cases.

Several reports and papers obtained that have summarised selected urban freight studies in one or more countries were identified in the literature review. However as noted above these studies tend to only summarise a small number of studies rather than attempting to provide a comprehensive listing of all such surveys carried out within the country. These publications cover studies in the following countries: America (Victoria and Walton, 2004); Canada and America (Jessup, Casavant and Lawson, 2004; McCabe, Roorda, and Kwan, 2008), Canada, America and Australia (Kriger, Tan and Clavelle, 2007; Woudsma, 2001), and France, Germany, the Netherlands and Italy (Patier and Routhier, 2008). However these publications tend to be more focused on discussing urban freight data needs rather than reviewing previous urban freight data collection efforts.

In addition, work carried out in data collection in eleven European countries as part of the BESTUFS project also provided details of further urban freight studies (Browne and Allen, 2006) as did the BESTUFS report on urban freight (Schoemaker et al., 2006)..

Table 3.1 shows the number of studies that collected urban freight data identified during the literature review by country and by the decade in which they were carried out. It is not possible to present details about each of the 162 studies reviewed in the main report. However Appendices 1-3 provide details about each individual study.

Table 3.1: Number of studies reviewed collecting urban freight data by country and decade

Country	1960-1969	1970-1979	1980-1989	1990-1999	2000-2008	Total
Australia	0	0	0	1	3	4
Austria	0	0	0	1	0	1
Belgium	0	0	0	1	2	3
Canada	0	1	2	1	3	7
France	0	1	0	5	1	7
Germany	0	1	0	10	2	13
Guatemala	0	0	0	1	0	1
Ireland	0	0	0	0	2	2
Italy	0	0	0	4	11	15
Japan	0	0	0	1	4	5
Mexico	0	0	0	0	1	1
Portugal	0	0	0	0	2	2
Spain	0	0	0	2	5	7
Sweden	0	0	0	1	0	1
Switzerland	0	0	0	2	1	3
The Netherlands	0	0	2	8	5	15
UK	2	14	2	6	33	57
USA	1	0	2	9	6	18
Total	**3**	**17**	**8**	**53**	**81**	**162**

Table 3.1 indicates that more urban freight studies that involve data collection have taken place in the UK than elsewhere. This is partly explained by the authors' greater familiarity with such studies in the UK than elsewhere, especially of studies that have not been published. However, based on the review of studies and contacts with researchers in other countries that the authors have carried out as part of this study we do believe that more urban freight studies have been carried out in the UK than in other countries. Other countries in which a sizeable number of such urban freight studies have been carried out include USA, the Netherlands, Germany and Italy.

The review indicates that few urban freight studies involving data collection took place during the 1960s. During the 1970s the number of studies increased markedly in the UK with work supported by the national government and Greater London Council. However this increase in the UK was not replicated elsewhere. Relatively few studies took place in the 1980s, including in the UK where national and urban government support for such work diminished significantly. The 1990s witnessed a marked increase in urban freight survey work in several countries including Germany, USA, the Netherlands, France, the UK and Italy.

This trend has increased in Italy and especially in the UK during the first eight years of the 2000s, with more urban freight studies taking place over this period in these two countries than in any previous decade. In other countries such as Spain, Portugal, Japan, Canada, Australia and Ireland the number of such studies has also increased. However in other countries the number of such studies has either remained relatively stable (USA, the Netherlands), or has fallen (such as in Germany and France).

4. Aspects of urban freight activity subject to data collection

The urban freight studies that have been identified during the literature review are all concerned with roadborne freight rather than other modes. This reflects the importance of road freight compared with other modes in terms of tonnes lifted and moved, in terms of the mode used for final delivery and collection, and in social and environmental impacts imposed.

Examining the urban freight surveys reviewed as part of this research, the following aspects of urban freight transport have been subject to data collection via surveys:

- Vehicle delivery/collection trips at establishments in the urban area
- Goods flows to/from establishments in the urban area
- Service trips to establishments in the urban area
- Trip details and patterns of goods vehicles in the urban area
- Trip details and patterns of service vehicles in the urban area
- Loading/unloading activity of goods vehicles in the urban area
- Parking activity of service vehicles in the urban area
- Conveyance of goods between vehicles and establishments in the urban area
- Origin location of goods flow/vehicle trip to establishment in the urban area
- Ordering and stockholding arrangements at urban establishment
- Supply chain management between establishments, their suppliers and freight transport operators

Table 4.1 provides details of the specific topics about which data can be collected for each of these aspects of urban freight transport.

Table 4.1: Specific topics for data collection in urban freight studies

Aspects of urban freight transport	Specific topics about which data can be collected
Vehicle delivery/collection trips at establishments in the urban area	Type of establishment Size of establishment Employees at establishment No. of deliveries/collections Delivery/collection frequency Size/type of delivery/collection No. of waste collections Other deliveries/collections Time of day Variation by day of week Variation during year Type/size of vehicle Whether vehicles deliver and collect jointly Type of vehicle operator (own account, logistic company, parcels carrier etc.) Whether vehicles based at establishment Vehicle types/sizes Deliveries/home deliveries made by vehicles at the establishment
Goods flows to/from establishments in the urban area	Type of establishment Size of establishment Employees at establishment Type and quantity of goods

	delivered/collected Frequency of goods flow Time of day Variation by day of week Variation during year
Service trips to establishments in the urban area	Type and number of service trips received Time of day Variation by day of week Variation during year Type/size of vehicle Time taken to carry out service
Trip details and patterns of goods/service vehicles in the urban area	Type of operator Vehicle type Vehicle weight Type of goods carried and delivered/collected Type of establishments/land use served Type of vehicle round (single / multi-drop; deliveries / collections) No. of stops per round No. of rounds per day Distance between stops Journey time Vehicle speed Driving time: stationary time Journey length Vehicle crew size Vehicle load factor Empty running Vehicle time utilisation Start and finish time Origin and destination/s Type and quantity of goods/equipment carried Fuel consumption
Loading/unloading activity of goods vehicles in the urban area	Type of vehicle Time of day Load/unload/ location (on- & off-street etc.) Time taken to load/unload Dwell time of vehicle Number of deliveries/collections by driver from vehicle without moving it Legal : illegal loading activities Type of contravention during loading
Parking activity of service vehicles in the urban area	Type of vehicle Time of day Parking location (on- & off-street etc.) Time taken for service Dwell time of vehicle Number of servicing task by driver without moving vehicle Legal : illegal parking activities Type of contravention during parking

Movement of goods between vehicles and establishments in the urban area	Method of goods handling from vehicle to establishment Type of delivery packaging used Proximity of location to delivery/collection point Quantity of goods End destination for delivery (shop floor, stock room etc.) Whether staff from establishment need to be present Whether signature is required Whether goods have to be checked by receiver
Origin location of goods flow/vehicle trip to establishment in the urban area	Origin of goods Origin of delivery journey Type/land use of establishment vehicle despatched from
Ordering and stockholding arrangements at urban premises	Whether stock is held Size of stockholding space Order lead times Ordering system
Supply chain management between establishments, their suppliers and freight transport operators	Type of supply chain No. of dispatch points to establishment Whether delivery/collection is regular or ad hoc Who organises delivery/collection time Who resolves delivery/collection problems

5. Survey techniques used to collect urban freight data

The urban freight data outlined in Table 4.1 has been collected using several different survey techniques in the surveyed reviewed. These can be summarised into the following list of data collection techniques:

- Establishment survey
- Commodity flow survey
- Freight operator survey
- Driver survey
- Roadside interview survey
- Vehicle observation survey
- Parking survey
- Vehicle trip diaries
- GPS survey
- Suppliers survey
- Service provider survey

In addition, vehicle traffic counts are commonly used in conjunction with the above techniques as a means of understanding the proportion of all road traffic accounted for by commercial vehicles by time of day and day of week.

A brief summary of each of these urban freight survey techniques is provided below.

Survey technique	**Establishment survey**
Explanation	Main method used in studies to collect data about total goods vehicle trips to/from particular establishments, and variation by time, day and month. Can also be used to capture data about type of goods delivered/collected. Also allows collection of information about the delivery/collection process but some respondents not very sure about issues including: vehicle types, time taken to load/unload, where vehicle stopped, method of goods movement from vehicle, and origin of vehicle/goods.
How it is conducted	Face-to-face, telephone or self-completion
Which aspects of urban freight it is most suited to addressing	• Vehicle delivery/collection trips at establishments in the urban area • Goods flows to/from establishments in the urban area • Service trips to establishments in the urban area • Loading/unloading activity of goods vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area • Origin location of goods flow/vehicle trip to establishment in the urban area • Ordering and stockholding arrangements at urban establishment • Supply chain management between establishments, their suppliers and freight transport operators

Survey technique	**Commodity flow survey**
Explanation	Similar to establishment survey, but used to collect detailed information about type and quantity of goods flowing to/from particular establishments rather than focusing on goods vehicle trips.
How it is conducted	Face-to-face, telephone or self-completion
Which aspects of urban freight it is most suited to addressing	Goods flows to/from establishments in the urban area

Survey technique	**Freight operator survey**
Explanation	Provides the opportunity for collecting wide ranging data about the pattern of the companies' goods vehicle activities in the urban area. Allows opportunity to obtain data about the entire fleet rather than a single vehicle or round (as in vehicle trip diary – the two type of survey can be used in conjunction). Can be used to collect data about loading/unloading activity and movement of goods from vehicle to establishment but this is usually best gathered via a driver survey or vehicle observation survey.
How it is conducted	Face-to-face, telephone or self-completion
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of goods vehicles in the urban area • Loading/unloading activity of goods vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area • Origin location of goods flow/vehicle trip to establishment in the urban area

Survey technique	**Driver survey**
Explanation	Used to gather data about the driver's overall trip pattern, as well as information about the loading/unloading/servicing activity in the street in which the survey takes place and in general (including time taken, loading/parking locations, methods of moving goods from vehicle etc). Usually conducted at establishments receiving collections/deliveries, with driver intercepted after carrying out work before they drive away.
How it is conducted	Face-to-face or self-completion
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of goods vehicles in the urban area • Loading/unloading activity of goods vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area • Origin location of goods flow/vehicle trip to establishment in the urban area

Survey technique	**Roadside interview survey**
Explanation	Normally involves working with police or suitable law enforcement agency to pull over moving vehicles/drivers and interview them at the roadside about their current trip. Typically used to capture data about origin/destination, trip purpose, goods carried, and vehicle type. Usually a relatively brief survey so as not to disrupt drivers and avoid causing unnecessary traffic congestion. Far less used than it used to be due to cost and need for other agency involvement.
How it is conducted	Face-to-face
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of goods vehicles in the urban area • Origin location of goods flow/vehicle trip to establishment in the urban area

Survey technique	**Vehicle observation survey**
Explanation	Involves surveyor/s being positioned on street at establishments to record data about total goods vehicle trips to/from establishments by time of day (and can be used to study variation by day of week). Can also capture information about vehicle type, time taken for delivery/collection/servicing, methods of moving goods from vehicle etc). Difficult to capture details of all goods delivery/collection trips using this technique if more than one location is used to access establishment (e.g. rear or side access as well as frontage). Also, only captures data for as long as surveyors present so usually misses activity outside the normal working day (so can be combined with establishment survey to capture all delivery/collection trips). Can prove difficult to determine the establishments at which delivery/collection is taking place if vehicle/driver visits several establishments without moving vehicle. Can provide better quality information about vehicle activity on the street than establishment survey.
How it is conducted	Surveyor observation either in real-time or at a later date using film/camera footage
Which aspects of urban freight it is most suited to addressing	• Vehicle delivery/collection trips at establishments in the urban area • Service trips to establishments in the urban area • Loading/unloading activity of goods vehicles in the urban area • Parking activity of service vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area

Survey technique	**Parking survey**
Explanation	Similar to vehicle observation survey but only used to capture information about vehicle loading/unloading/parking activity, (such as vehicle type, time taken, illegal activity etc.) rather than total delivery/collection trips at establishments, and method of moving goods from vehicle. Can also be used to study use of space allocated for goods/service vehicles by other road users.
How it is conducted	Surveyor observation either in real-time or at a later date using film/camera footage
Which aspects of urban freight it is most suited to addressing	• Loading/unloading activity of goods vehicles in the urban area • Parking activity of service vehicles in the urban area • Parking activity of other road users in space used by goods and service vehicles

Survey technique	**Vehicle trip diaries**
Explanation	Used to collect detailed information about the activities of a single vehicle (usually over a single day or a few days). Can provide data about exact locations served, route, arrival and departure times, time taken for delivery/collection/servicing, type of goods/service etc.)
How it is conducted	Self completion by driver or other suitably informed employee of freight operator
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of goods vehicles in the urban area • Trip details and patterns of service vehicles in the urban area • Loading/unloading activity of goods vehicles in the urban area • Parking activity of service vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area

Survey technique	**GPS survey**
Explanation	Equipment can provider data on vehicle location at frequent intervals (thereby providing route information), as well as speed. Can also be used to record stops for loading/unloading/parking.
How it is conducted	Equipment / transmitter fitted in vehicle
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of goods vehicles in the urban area • Trip details and patterns of service vehicles in the urban area • Loading/unloading activity of goods vehicles in the urban area • Parking activity of service vehicles in the urban area

Survey technique	**Suppliers survey**
Explanation	Used to gather information from suppliers about the goods they dispatch to urban establishments and the vehicle activity that supports this goods flow. If used, then typically used in conjunction with establishment survey (with establishments identifying key suppliers). Can provide more detailed information about vehicle activity if supplier operates goods vehicle to make deliveries (if so then similar to information captured by freight operator survey).
How it is conducted	Face-to-face, telephone or self-completion
Which aspects of urban freight it is most suited to addressing	• Goods flows to/from establishments in the urban area • Trip details and patterns of goods vehicles in the urban area • Loading/unloading activity of goods vehicles in the urban area • Movement of goods between vehicles and establishments in the urban area • Origin location of goods flow/vehicle trip to establishment in the urban area • (Transport-related data above usually only available from suppliers operating their own vehicles)

Survey technique	**Service provider survey**
Explanation	Similar to freight operator survey, providing wide ranging data about the pattern of the companies' service activities and supporting vehicle activity in the urban area. Allows opportunity to obtain data about the entire fleet rather than a single vehicle or round (as in vehicle trip diary – the two type of survey can be used in conjunction). Can be used to collect data about vehicle parking activity..
How it is conducted	Face-to-face, telephone or self-completion
Which aspects of urban freight it is most suited to addressing	• Trip details and patterns of service vehicles in the urban area • Parking activity of service vehicles in the urban area

Survey technique	**Vehicle traffic counts**
Explanation	Road vehicle traffic is counted and disaggregated by vehicle type. This can provide details of types of goods vehicles on selected roads or routes, or crossing specified cordons by time of day and day of week. The area covered by the traffic counts can range from a single road up to an entire urban area.
How it is conducted	This can be achieved either by manual counts (i.e. the use of surveyors positioned at the road side who count vehicles a they pass by) or automated counts (which can use either sensors in the roads or camera technology in conjunction with computing software). The extent of the vehicle type disaggregation is dependent on the needs of the study, and the method used for collecting the traffic data. In manual counts the extent of disaggregation may be limited by the degree of expertise of the surveyors. In automated counts disaggregation may be limited by the sophistication of the technology. For instance, road sensors that quantify vehicle length cannot easily distinguish between vehicles of similar length such as cars as light goods vehicles.
Which aspects of urban freight it is most suited to addressing	Only provides data about goods vehicles travelling on the selected roads/ in the selected areas surveyed. Does not provide information about trip purpose (i.e. whether the vehicle is being used to make goods deliveries, collections, to provide a service), whether the vehicle will visit establishments in the survey area or is just passing through, or the origin or destination of the trip. Only provides insight into the spread of goods vehicles traffic flows by time, day, and month and the proportion of total traffic flow they account for.

Table 5.1 shows the type of survey techniques used in those studies reviewed by country. It should be noted that more than one survey technique was used in some studies and therefore the total number of surveys used (274) exceeds the total number of studies reviewed (162). Table 5.2 shows the same results but by date of study rather than by country.

In the studies reviewed, establishment surveys can be seen to be the most commonly conducted, followed by freight operator surveys, vehicle observation surveys, driver surveys and roadside interview surveys, and vehicle trip diaries. Five or less examples of all other types of survey (commodity flow surveys, parking surveys, GPS surveys, suppliers surveys and service providers surveys) were identified. Three of the survey types were exclusively used in the UK (parking surveys, suppliers surveys and service providers surveys).

Commodity flow surveys have only been used in Canada, Australia and the Netherlands in urban freight studies.

Several of the studies reviewed followed up the survey work with qualitative interviews and/or focus group sessions in order to attempt to better understand some of the decision-making processes involved in urban freight activity and relationships between parties in the supply chain.

The vast majority of the 162 studies reviewed that used surveys to collect urban freight data were one-off studies. Only five of the studies reviewed carried out survey work on a regular basis.

Table 5.1: Survey techniques used in urban freight studies reviewed by country

	Establishment survey	Commodity flow survey	Freight operator survey	Driver survey	Roadside interview survey	Vehicle observation survey	Parking survey	Vehicle trip diary	GPS survey	Suppliers survey	Service providers survey	Traffic count	Total
Australia	1	1	1	1	1	0	0	0	1	0	0	0	6
Austria	1	0	1	0	0	0	0	0	0	0	0	1	3
Belgium	2	0	0	1	0	1	0	0	0	0	0	1	5
Canada	0	3	2	1	3	0	0	1	1	0	0	4	15
France	7	0	3	4	0	3	0	0	0	0	0	0	17
Germany	7	0	6	2	1	0	0	1	0	0	0	2	19
Guatemala	0	0	0	0	1	0	0	0	0	0	0	0	1
Ireland	2	0	0	1	0	0	0	0	0	0	0	0	3
Italy	14	0	6	0	6	0	0	1	0	0	0	3	30
Japan	2	0	0	2	0	2	0	0	0	0	0	1	7
Mexico	0	0	1	1	0	0	0	0	0	0	0	0	2
Portugal	1	0	0	0	0	1	0	0	0	0	0	0	2
Spain	4	0	2	0	0	1	0	0	0	0	0	4	11
Sweden	1	0	0	0	0	0	0	0	0	0	0	0	1
Switzerland	0	0	1	0	0	0	0	0	0	0	0	2	3
The Netherlands	7	1	0	1	0	0	0	1	0	0	0	0	10
UK	40	0	11	13	7	20	5	3	1	1	1	19	121
USA	3	0	5	0	5	0	0	4	0	0	0	1	18
Total	**92**	**5**	**39**	**27**	**24**	**28**	**5**	**11**	**3**	**1**	**1**	**38**	**274**

Table 5.2: Survey techniques used in urban freight studies reviewed by decade

Decade	Establishment survey	Commodity flow survey	Freight operator survey	Driver survey	Roadside interview survey	Vehicle observation survey	Parking survey	Vehicle trip diary	GPS survey	Suppliers survey	Service providers survey	Traffic count	Total
1960-1969	1	0	2	1	2	0	0	0	0	0	0	1	7
1970-1979	11	0	2	3	4	7	0	2	0	0	0	8	37
1980-1989	2	0	3	0	1	0	1	1	0	0	0	2	10
1990-1999	23	1	18	8	6	5	0	4	0	0	0	13	78
2000-2008	55	4	14	15	11	16	4	4	3	1	1	14	142
Total	**92**	**5**	**39**	**26**	**24**	**27**	**5**	**11**	**3**	**1**	**1**	**38**	**274**

6. Other aspects of the urban freight studies reviewed

6.1 Focus of data collection

The studies reviewed were examined to determine whether they were primarily concerned with data collection into:

- vehicle rounds (i.e. aspects of the journeys of goods vehicles working in the urban area),
- vehicle activity at urban establishments (i.e. vehicle activity to, from and at establishments including loading/unloading activity, or
- commodity flow (i.e. the flow of goods in the urban area).

Some studies were only focused on one of these aspects of urban freight, while some were primarily concerned with more than one (and used more than one survey technique in order to do this). The results are shown in Table 6.1 for the studies reviewed by country, and in Table 6.1 by decade. It was not possible to discern which of these three aspects of urban freight was concentrated on in 24 of the studies reviewed. Therefore the results in Tables 6.1 and 6.2 are for 138 of the studies.

Table 6.1: Key focus of survey work in urban freight studies reviewed by country

	Vehicle activity at urban establishments	Vehicle rounds	Commodity flow	Total
Australia	1	3	1	5
Austria	1	0	0	1
Belgium	2	0	0	2
Canada	0	7	3	10
France	6	4	0	10
Germany	6	8	0	14
Guatemala	0	1	0	1
Ireland	1	0	0	1
Italy	14	6	0	20
Japan	5	0	0	5
Mexico	0	1	0	1
Portugal	2	0	0	2
Spain	5	0	0	5
Sweden	1	0	0	1
Switzerland	0	0	0	0
The Netherlands	5	2	1	8
UK	45	14	1	60
USA	3	12	0	15
Total	**97**	**58**	**7**	**161**

Table 6.2: Key focus of survey work in urban freight studies reviewed by decade

Decade	Vehicle activity at urban establishments	Vehicle rounds	Commodity flow	Total
1960-1969	1	2	0	3
1970-1979	12	2	0	14
1980-1989	1	4	0	5
1990-1999	24	20	1	45
2000-2008	59	30	5	94
Total	**97**	**58**	**6**	**161**

The results indicate that vehicle activity at urban establishments is most often the primary focus of the data collection efforts. The importance of the focus on this activity has become increasingly pronounced since the 1990s. A key focus on vehicle rounds is the next most important. Commodity flow has only been a key focus of seven out of 138 studies.

6.2 Purpose of urban freight studies

The studies reviewed were examined to determine the purpose of the data collection efforts. Three main purposes were defined in the review: i) for policy-decision making, ii) for understanding and for research purposes (including the development of new survey techniques), and iii) for use in urban freight modelling. Some studies had more than one purpose for data collection.

Table 6.3 and 6.4 show the results of the analysis of study purpose by country and by decade respectively. In 35 of the 162 studies it was not possible to discern the purpose of the data collection, so Tables 6.3 and 6.4 show the purpose for 127 studies. Some of the studies had more than one purpose so the number shown in Tables 6.3 and 6.4 exceeds the 127 studies reviewed.

Table 6.3: Purpose of data collection in urban freight studies reviewed by country

	For policy decision-making	For understanding /research	For modelling	Total
Australia	0	2	2	4
Austria	0	1	0	1
Belgium	1	1	1	3
Canada	1	6	2	9
France	0	4	3	7
Germany	0	4	0	4
Guatemala	0	0	0	0
Ireland	1	2	0	3
Italy	1	11	3	15
Japan	2	4	1	7
Mexico	1	1	0	2
Portugal	1	2	1	4
Spain	3	4	3	10
Sweden	0	0	0	0
Switzerland	1	2	0	3
The Netherlands	0	4	2	6
UK	26	36	11	73
USA	3	9	7	19
Total	**41**	**93**	**36**	**170**

Table 6.4: Purpose of data collection in urban freight studies reviewed by decade

Decade	For policy decision-making	For understanding /research	For modelling	Total
1960-1969	0	3	1	4
1970-1979	7	11	2	20
1980-1989	3	4	2	9
1990-1999	5	22	12	39
2000-2008	26	53	19	98
Total	**41**	**93**	**36**	**170**

The results indicate that the most important purpose for collecting data in urban freight studies has been to gain understanding and for research purposes. Collecting data for policy-decision-making and for obtaining inputs to models are approximately equal in importance (in terms of the number of studies for which these were the main objective of the data collection efforts).

6.3 Means of carrying out urban freight surveys

Survey work can be carried out by different means, either self-completion or by direct contact with the respondent (i.e. interview). Self-completion questionnaires were traditionally printed on paper and either posted/to and collected from respondents in person or sent via the postal system. However, the advent of the internet has now allowed the potential for

online self-completion questionnaires. Interview surveys approach can be carried out either face-to-face or by telephone. They can involve either the surveyor simply reading out questions and writing responses to closed questions, or can involve the opportunity to discuss and clarify respondent's answers, as well as to ask open questions and discuss qualitative questions and issues.

Obviously some urban freight survey techniques only have one means of eliciting the information from respondents. For instance in the case of roadside interviews the respondents are questioned face-to-face. Vehicle trip diaries are typically self-completion questionnaires; however one example of face-to-face trip diaries was identified in which surveyors travelled in the vehicles with the drivers. In the case of GPS surveys there is not necessarily any need to question the respondent, as the equipment is recording vehicle operating data continuously. Surveying of the driver is only necessary in the case of GPS surveys if additional data is required to that provided by the equipment.

Table 6.5 shows the means by which the surveys were carried out in the 96 of the studies reviewed (details of the means by which the survey was carried out were unavailable for 66 studies). In some studies both self-completion and interview approaches were used. In some of these cases both approaches were used for a single survey, while in other studies that involved more than one type of survey different approaches were used for different surveys. In cases where interviews and self-completion approaches were used in a single survey, this typically involved an initial attempt to interview respondents, with the surveyor leaving a questionnaire for self-completion if this was not possible. The results indicate that the interview approach has been used more extensively than the self completion approach.

Table 6.5: Means by which surveys were carried out in the urban freight studies reviewed

Means of surveying	Number of studies
Self-completion	31
Interview	49
Interview and self-completion	16
Not reported	66
Total	**162**

6.4 Number of respondents

The number of survey respondents varied significantly in the studies reviewed. The majority of studies involve relatively small sample sizes and numbers of respondents (which in most cases is due to the size of the project budget and the cost per survey, but in a small number of cases is due to the small population size – such as the number of shops in a small town). Table 6.6 shows the range of respondent numbers by type of survey.

Table 6.6: Number of respondents in urban freight studies reviewed by type of survey

Type of survey	Minimum respondents	Maximum respondents	Average respondents	Standard deviation	Number of surveys
Establishment survey	7	3,240	456	666	61
Commodity flow survey	28	4,324	2,090	2,099	4
Freight operator survey	6	2,200	252	528	18
Driver survey	3	9,946	975	2,240	20
Vehicle trip diary (trip logs)	150	3,506	875	1,184	7
Vehicle observation survey	20	270	85	123	4
Roadside interview survey	249	147,000	19,434	39,250	13
Supplier survey	8	124	50	64	3
Service provider survey	5	13	9	6	2

6.5 Response rates

Response rates were not reported in many of the documents reviewed about urban freight studies. However, information was available from 49 of the 162 studies and this has been analysed. Table 6.7 shows the response rates for the various types of surveys carried out in these urban freight studies.

Table 6.7: Response rates in urban freight studies reviewed by type of survey

Type of survey	Means of carrying out	Range of response rates (%)	Average response rate (%)	Standard deviation	No. of surveys studied
Establishment surveys	All	5-88	38	24.7	35
Establishment surveys	Self-completion only	5-58	25	16.5	19
Establishment surveys	Interview only	16-88	59	22.3	11
Commodity flow survey	All	25-31	28	4.2	2
Freight operator surveys	All	13-79	38	22.6	12
Freight operator surveys	Self-completion only	14-79	35	22.3	7
Freight operator surveys	Interview only	43	43	0	1
Driver surveys	All	6-100	54	34.0	8
Vehicle trip diaries	Self-completion only	30	30	0	2
Supplier surveys	All	19-29	24	7.1	2
Service providers surveys	Self-completion only	19	19	0	1

Table 6.7 indicates the wide range in response rates for establishment, commodity flow, freight operator and drivers surveys. The results also indicate the higher average response rates achieved in interview surveys compared with self-completion surveys for establishment and freight operator surveys.

In the case of the driver surveys analysed some of these may well have been compulsory (i.e. similar to a roadside interview survey organised with the police), which would account for the response rates of 94% and 100% in two of the surveys.

The overall average response rates for establishment and freight operator surveys were the same (38% in both cases).

6.6 Geographical and business coverage

By reviewing the studies it has been possible to identify the geographical area covered by the study for 103 out of 162 studies. In addition it has been possible to identify the type of businesses included in the study in 82 out of 162 studies. The results are shown in Tables 6.8 and 6.9.

Table 6.8: Geographical area covered by the urban freight studies reviewed

Geographical area covered	Number of studies
Single street	15
Small area	9
City/town centre	27
Larger business / shopping area	8
City/town-wide	27
Several / many / all urban areas	5
Individual establishments	12
Total	**103**

Table 6.9: Types of businesses included in the urban freight studies reviewed

Types of businesses	Number of studies
Just retail	28
Mostly retail	20
No retail	4
Wide range of businesses	30
Total	**82**

Table 6.8 indicates that the most commonly studied geographical areas in the urban freight studies reviewed are the town/city centre and the entire town/city, followed by a single street. Few studies (5) have examined more than one urban area either in the same city or in different cities. Twelve studies have examined establishments based in a variety of urban areas rather than focusing on a single urban area.

As indicated in Table 6.9, the majority of urban freight studies have focused solely or mostly on freight activity to/from retail establishments. However 30 studies have focused on a wide range of business types in addition to retail. Few studies have excluded consideration of the retail sector entirely.

7. Comparison of different urban freight survey techniques and methods

This section is concerned with an assessment of the advantages and disadvantages of the various methods by which urban freight survey techniques can be conducted, together with an evaluation of merits of the various types of urban freight surveys.

Section 5 presented the different survey techniques that have been used in urban freight transport research and provided a summary of each of these techniques. These were summarised into the following list of data collection techniques:

- Establishment survey
- Commodity flow survey
- Freight operator survey
- Driver survey
- Roadside interview survey
- Vehicle observation survey
- Parking survey
- Vehicle trip diaries
- GPS survey
- Suppliers survey
- Service provider survey
- Vehicle traffic counts (which are commonly used in conjunction with the above techniques as a means of understanding the proportion of all road traffic accounted for by commercial vehicles by time of day and day of week)

Table 7.1 provides a summary of the methods by which each of these urban freight survey techniques can be conducted. This shows that for many of the techniques there is a choice to be made between either a self-completion survey and an interview survey.

In the case of a self-completion survey there are three options: i) a post, fax or email survey (i.e. the questionnaire is sent by post, fax or email to the respondents, who then completes and returns it, ii) a post, fax or email survey with an initial phone call to obtain agreement to participate and reminder phone call(s), and iii) a self-completion in which the respondent is visited in person to obtain agreement to participate, the questionnaire is left with them, and then collected in person at a later date.

In the case of interview surveys there are two approaches: i) a telephone interview, and ii) a face-to-face interview. In the case of interviews initial contact may be made by telephone or in person to obtain agreement to participate and to arrange a suitable time for the interview. In addition, the respondent may be sent/given a copy of the survey form in advance to acquaint themselves with.

For some urban freight survey techniques there is no choice to be made. For instance a roadside interview survey is conducted face-to-face.

In some of the other survey techniques which involve observation of freight activities such as vehicle observation surveys and parking surveys, it is necessary to decide whether to conduct these in person (i.e. with trained surveyors present) or to record the activity onto a medium such as film and then analyse it at a later date.

Table 7.1: Methods by which urban freight survey techniques can be conducted

Survey technique	Methods of carrying out
Establishment survey	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person) • Telephone interview • Face-to-face interview
Commodity flow survey	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person) • Telephone interview • Face-to-face interview
Freight operator survey	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person) • Telephone interview • Face-to-face interview
Driver survey	• Self-completion (left in person) • Face-to-face interview
Roadside interview survey	• Face-to-face interview
Vehicle observation survey	• In person observation • Observation using film/camera
Parking survey	• In person observation • Observation using film/camera
Vehicle trip diaries	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person)
GPS survey	• Equipment / transmitter fitted in vehicle
Suppliers survey	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person) • Telephone interview • Face-to-face interview
Service providers survey	• Self-completion (post, fax or email) • Self-completion (post, fax or email with initial and reminder phone call) • Self-completion (left & collected in person) • Telephone interview • Face-to-face interview
Vehicle traffic counts	• Manual (in-person) counts • Automated counts (using sensors, film, cameras or other technology)

Table 7.2 provides an overview of the advantages and disadvantages of the various methods by which urban freight survey techniques can be conduced. This is based on advantages and disadvantages of methods identified in other studies (Victoria and Walton, 2004; Fischer and Han, 2001; Lawson and Strathman, 2002; Lau, 1995) together with the additional fields and comments by the authors of this report.

Table 7.3 provides an overall evaluation of the urban freight survey techniques available to researchers, attempting to indicate resource requirements (for data collection not analysis), breadth/depth of data collection potential, sample size possible with a limited budget, and value for money.

Table 7.2: Advantages and disadvantages of methods for conducting urban freight surveys

Survey Method	Advantages	Disadvantages
Face-to-face interviews and telephone surveys (for wide range of survey techniques including establishment, commodity flow, vehicle operator, shipper and service provider surveys)	High response rate compared with self-completion due to personal contact. Can provide better quality, more detailed information than self-completion method. Provides opportunity to query responses. Good for open-ended questions and in-depth discussion about responses. Easier to make follow-up contacts. Telephone surveys offer better opportunity to survey over large geographical area than face-to-face. Face-to-face allows more in-depth discussion and use of other techniques (such as supply chain mapping etc.).	More expensive and time consuming per respondent than self-completion (especially face-to-face). Can prove too expensive for a large sample size (especially face-to-face). Often difficult to obtain initial and participation and requires call backs.
Self-completion surveys (for wide range of survey techniques including establishment, commodity flow, vehicle operator, shipper and service provider surveys)	Lower cost method than interviews of self-completion with initial contact. Permits larger and more representative samples than interviews. Offers better opportunity to survey over large geographical area than face-to-face interviews.	Generally lower response rates than with interviews or self-completion with initial contact. Difficult to ensure right person in organisation will respond. No way of knowing whether respondent understood question in way intended. No opportunity to check/clarify or discuss responses. Difficult to interpret non-responses to questions. Not good for open-ended questions.
Self-completion with initial contact and reminder by phone call or in-person (for wide range of survey techniques including establishment, commodity flow, vehicle operator, shipper and service provider surveys)	Lower cost method than interviews -effective method. Can provide better response rate than basic self-completion method. Phone/in-person follow-up can allow opportunity to clarify/discuss responses (but difficult to achieve in practice). Offers better opportunity to survey over large geographical area than face-to-face interviews.	More expensive than basic self-completion method. Other disadvantages same as basic self-completion method.

Roadside (face-to-face) interviews instead of vehicle trip diaries (self-completion) (for obtaining vehicle journey data)	High response rate. Can provide information on trip purpose, goods carried and origin/destination, and route.	Disruption to traffic flow. Staffing requirements are high making it expensive No opportunity for follow-up with respondents. Requires involvement of police and/or other bodies. Does not provide details about entire journey and stops.
In-person observation instead of using film/camera (for vehicle observation/parking surveys)	Potential to cause traffic/delivery disruption No risk of equipment/recording failure. Provides actual data about number and timing of deliveries and collections unlike establishment survey.	Staffing requirements are high making it expensive. Limited to hours/days of observation, so does not capture all activity. Neither in-person nor film observation can capture all delivery and collection activity especially if not vehicles stopping off-street or in side roads.
Manual traffic counts instead of automated traffic counts	Some potential to cause traffic disruption. Complete disaggregation of vehicle type possible if trained surveyors used. Vehicles not wrongly identified. No risk of equipment failure.	Staffing requirements are high making it expensive. Difficult to collect traffic count data at many locations without it being very expensive.

Note: Based on Victoria and Walton, 2004; Fischer and Han, 2001; Lawson and Strathman, 2002; Lau, 1995 together with the authors of this report.

Table 7.3: Evaluation of urban freight survey techniques available

Survey type	Equipment Costs	Labour costs	Response rates*	Sample size possible with limited budget	Breadth/depth of urban freight data collection possible	Value for money
Establishment survey	0	✓✓ - ✓✓✓	✓ - ✓✓✓	✓	✓✓✓	✓✓ - ✓✓✓
Commodity flow survey	0	✓✓ - ✓✓✓	✓ - ✓✓✓	✓	✓✓	✓✓
Freight operator survey	0	✓✓ - ✓✓✓	✓ - ✓✓✓	✓	✓✓✓	✓✓ - ✓✓✓
Driver survey	0	✓✓ - ✓✓✓	✓✓ - ✓✓✓	✓ - ✓✓	✓✓	✓ - ✓✓
Roadside interview survey	0	✓✓✓	✓✓✓	✓✓	✓	✓
Vehicle observation survey in person	0	✓✓✓	✓✓✓	✓✓ - ✓✓✓	✓✓✓	✓✓ - ✓✓✓
Vehicle observation survey using film/camera	✓✓✓	0	✓✓✓	✓✓ - ✓✓✓	✓✓✓	✓ - ✓✓
Parking survey	0	✓✓✓	✓✓✓	✓✓ - ✓✓✓	✓	✓ - ✓✓
Vehicle trip diaries	0	0	✓ - ✓✓	✓	✓✓✓	✓✓ - ✓✓✓
GPS survey	✓✓	0	✓ - ✓✓✓	✓	✓✓	✓✓ - ✓✓✓
Suppliers survey	0	✓✓ - ✓✓✓	✓ - ✓✓✓	✓	✓✓	✓ - ✓✓
Service provider survey	0	✓✓ - ✓✓✓	✓ - ✓✓✓	✓	✓✓	✓ - ✓✓
Road traffic counts - manual	0	✓✓✓	✓✓✓	✓✓✓	✓	✓
Road traffic counts - automated	✓✓✓	0	✓✓✓	✓✓✓	✓	✓

Notes:
0 - nothing
✓ - low
✓✓ - medium
✓✓✓ - high

* - response rates for several survey techniques range from ✓ - ✓✓✓ (i.e. low to high). This reflects the fact that the response rate will depend on the method used (i.e. self-completion, self-completion with initial contact and follow-up, or face-to-face/telephone interview).

8. Concluding thoughts and observations

Urban freight transport studies have only been taking place for approximately 50 years and in relatively small numbers internationally according to the results of this literature review (although more studies are likely to have taken place than have been identified in the review). To date, many urban freight study reports are not publicly available (many have not been formally published as they were commissioned by a client and were only ever provided to that client), and none of the raw data from these studies is publicly available.

Trying to locate urban freight study reports for the purposes of producing this review has been time consuming. Trying to obtain publications and data after the completion of such studies is currently extremely complicated and difficult as often both the individual managing the project in the commissioning body as well as the personnel in the body carrying out the survey are no longer working in these organisations (and often they are the only people able to locate such documents and data).

As most urban freight studies are commissioned using public funding it would seem sensible: i) to ensure that reports and other publications (as well as datasets) from urban freight studies are made publicly available, and ii) that these reports and other publications are pooled in an accessible place so that they can be referred to by researchers and policy makers now and in the future. A repository should be established to house both publications related to these studies and data sets (in a similar manner to American traffic count data and reports that are now made available online).

The research and consultancy community that is engaged in carrying out urban freight studies that involve urban freight data collection is still relatively small and is still learning how to make improvements to survey techniques. There is major scope to learn from previous studies, and the data collection techniques of others. For instance, making available survey forms and methodologies from previous studies will assist current and future researchers in determining a suitable survey design for their studies and in appropriate phrasing for questions. We intend to produce another study to accompany this study that contains all the urban freight survey forms that we have obtained during the course of this work as a starting point.

The review indicates that more urban freight studies involving data collection have taken place in the UK than in any other country. This is partly due to the authors' greater familiarity with such studies in the UK than elsewhere, especially in the case of studies that have not been formally published. Other countries in which a sizeable number of such urban freight studies have been carried out include USA, the Netherlands, Germany and Italy.

Urban freight studies involving data collection seem to have commenced during the 1960s in the UK and USA. During the 1970s the number of studies increased markedly in the UK. However this increase in the UK was not replicated elsewhere. Relatively few studies took place in the 1980s, including in the UK where national and urban government support for such work appears to have diminished significantly. The 1990s witnessed a marked increase in urban freight survey work in several countries including Germany, USA, the Netherlands, France, the UK and Italy. This trend has continued and even increased in Italy and especially in the UK during the first eight years of the 2000s, with more urban freight studies taking place over this period in these two countries than in any previous decade. In other countries including Spain, Portugal, Japan, Canada, Australia and Ireland the number of such studies has also increased. However in other countries the number of such studies has either remained relatively stable (USA, the Netherlands), or has fallen (such as in Germany and France).

Only five of the 162 studies reviewed carried out survey work on a regular basis, all the rest were one-off studies. This reduces the opportunity and ability to track trends in urban freight activity over time. The most important purpose for collecting data in urban freight studies appears to have been to gain understanding and for research purposes. Collecting data for policy-decision-making and for obtaining inputs to models seem to be approximately equal in importance (in terms of the number of studies for which these were the main objective of the data collection efforts).

The results indicate that vehicle activity at urban establishments is most often the primary focus of the data collection efforts in urban freight studies. The importance of the focus on this activity has become increasingly pronounced since the 1990s. A primary focus on vehicle rounds is the next most important. Commodity flow has only been the primary focus of seven out of 138 studies for which this information was available.

In the studies reviewed, establishment surveys have been the most commonly used survey technique, followed by freight operator surveys, vehicle observation surveys, driver surveys and roadside interview surveys, and vehicle trip diaries. Few examples (five or less) of all other types of survey technique (commodity flow surveys, parking surveys, GPS surveys, suppliers surveys and service providers surveys) were identified. Three of the survey types were exclusively used in the UK (parking surveys, suppliers surveys and service providers surveys). Commodity flow surveys have only been used in Canada, Australia and the Netherlands in urban freight studies. Several of the studies reviewed followed up the survey work with qualitative interviews and/or focus group sessions in order to attempt to better understand some of the decision-making processes involved in urban freight activity and relationships between parties in the supply chain.

Some studies have used self-completion approaches (postal, fax and email) to collect data while other have used interview approaches (face-to-face and telephone). In some studies both self-completion and interview approaches were used (sometimes for a single survey, while in other cases for different types of survey). The results indicate that the interview approach has been used more extensively than the self completion approach.

The sample sizes for the surveys carried out in the studies reviewed varies, both between studies (presumably determined by the size of the budget) and between survey techniques (as some techniques can yield a larger sample for the same cost than another technique – but often with a less detailed response). The majority of studies involve relatively small sample sizes

There is a wide variation in response rates for establishment, commodity flow, freight operator and drivers surveys among the studies reviewed. The results indicate a higher average response rates achieved in interview surveys compared with self-completion surveys for establishment and freight operator surveys. The overall average response rates for establishment and freight operator surveys were the same (38% in both cases).

The geographical area examined varies between studies from an entire town/city to a single street. The majority of these urban freight studies have focused solely or mostly on freight activity to/from retail establishments.

When discussing vehicle movements to and from urban establishments, many of the studies reviewed are rather unclear about what is included and not included (in terms of whether all types of deliveries and collections are included or not). Relatively few of the studies reviewed have collected data about service trips to urban establishments despite the growing importance of these trips in terms of sustaining the establishments, traffic flow, and parking issues (only 17 out of the 162 studies).

Establishment and vehicle observation surveys offer the most efficient and cost-effective methods for obtaining understanding of a wide range of issues associated with urban freight deliveries and collections from the perspective of establishments in a specific urban area. These techniques can provide insight into the frequency of goods vehicles deliveries and collections by time of day and day of week, the activities involved in the loading/unloading process, and the freight requirements of individual establishments.

As mentioned, in the studies reviewed, there has been less research into vehicle rounds compared to goods vehicle activity at urban establishments. Current understanding of vehicle rounds and operating patterns associated with different types of goods and servicing activity in urban areas is relatively poor. Although government-led national data collection efforts (such as vehicle trip diaries collected as part of the CSRGT) can provide insight into these vehicle operating patterns at a national scale, disaggregation of urban operations from this national data is often not possible due to small sample sizes and the lack of data collection about rounds involving five or more stops. This information could be best collected through the use of driver surveys, vehicle trip diaries and the possibilities offered by GPS equipment.

Road traffic counts can provide insight into the scale of goods vehicle flows in a given area by time of day and day of week, but not about the trip purpose, and origin/destination. Roadside interview surveys can provide insight into the trip purpose and often into the previous and next destination, but often due to time limitations not into vehicle operating pattern and ultimate origin/destination and all intermediate stops. These two survey approaches appear to offer less value for money in terms of providing insight into urban freight activities (and the purpose and detail of these activities including loading/unloading operations) than the other survey techniques reviewed.

Where there are two survey techniques that can be used to collect the same urban freight data (such as establishment surveys and vehicle observation surveys) there is a need to compare and validate these techniques to determine the accuracy of each, and to investigate how both can potentially be enhanced to make up for any shortcomings they have.

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Appendix 1: Details of individual studies reviewed that have collected urban freight data (part I)

Appendices 1-3 provide details of individual studies reviewed that have collected data about urban freight operations. Wherever possible, reports and papers produced as part of the study have been used in order to collate information about them. However this has not been possible in all cases. If such documentation is not available then it has been necessary to use secondary publications that refer to the study. In the cases in which primary publications from urban freight studies have not been obtained it is usually far more difficult to determine various details about the study in terms of factors such as its purpose, geographic coverage, business coverage, survey techniques used and the size of the survey. Blank cells in the table reflect information that it was not possible to obtain about the studies reviewed.

This appendix provides details of:

- the city and country in which the study was carried out
- the year of the study
- the primary focus of the data collection in the study
- the types of survey used in the study
- the number of respondents to the survey work
- the response rates to the survey work

City	Country	Year of study	Survey type	Primary focus of survey work	No.of respondents	Response rate
Sydney	Australia	1991-1992	driver survey	Vehicle rounds	9,946 vehicles, completing 24,882 trips	
Sydney	Australia	2005-2006	vehicle trip diary	Vehicle rounds	1 vehicle over 8 months	
Melbourne	Australia	2006	vehicle trip diary; GPS survey	Vehicle rounds	one-weeks worth of GPS data were collected for 30 trucks, i.e., 210 truck-days of data (all over 3.5 tonnes).	
Melbourne	Australia	2007	establishment survey; commodity flow survey; freight operator survey; roadside interview survey	Vehicle activity at urban establishments / Commodity flow		
Vienna	Austria	1998	establishment survey; freight operator survey; traffic counts	Vehicle activity at urban establishments		
Brussels	Belgium	1996-1998	Traffic counts	Traffic counts		
Ghent	Belgium	2004	establishment survey	Vehicle activity at urban establishments	215 establishments	

Liege	Belgium	2004	establishment survey; driver survey; vehicle observation survey	Vehicle activity at urban establishments	120 establishments; 313 delivery drivers	
Calgary	Canada	1974	roadside interview survey; traffic counts	Vehicle rounds		
Toronto	Canada	1987	freight operator survey	Vehicle rounds	103 establishments interviewed, 1731 surveys returned	
Ottawa	Canada	1989	freight operator survey, traffic counts	Vehicle rounds		
Vancouver	Canada	1990	vehicle trip diaries	Vehicle rounds		
Calgary	Canada	2000-2001	commodity flow survey; vehicle trip diary; roadside interview survey, traffic counts	Vehicle rounds / Commodity flow	3,107 establishments in city and 304 establishments in region; 5000 trucks in roadside interviews	Overall refusal rate only 2.4% (see appendix A)
Edmonton	Canada	2001-2002	commodity flow survey; vehicle trip diary; roadside interview survey, traffic counts	Vehicle rounds / Commodity flow	4,324 establishments (3,515 in urban areas and 809 in the region), 6,500 trucks in roadside interviews	31% of establishments
Peel	Canada	2006-2007	commodity flow survey; driver survey; vehicle trip diary; GPS survey	Vehicle rounds / Commodity flow	597 establishments; 86 drivers	25% establishments; 27% drivers
Aix-en-Provence, Metz Thionville	France	1970	establishment survey	Vehicle activity at urban establishments		
Bordeaux	France	1994	establishment survey; freight operator survey; driver survey	Vehicle activity at urban establishments / Vehicle rounds	1,500 establishments, 900 drivers	
Marseilles	France	1997	establishment survey; freight operator survey; driver survey	Vehicle activity at urban establishments / Vehicle rounds	1,500 establishments, 800 drivers	
Dijon	France	1997	establishment survey; freight operator survey; driver survey	Vehicle activity at urban establishments / Vehicle rounds	1,000 establishments, 400 drivers	
Paris	France	1990s	establishment survey; vehicle observation survey	Vehicle activity at urban establishments		
Lyon	France	1990s	establishment survey; vehicle observation survey			
Ile de France	France	2000-2002	establishment survey; driver survey; vehicle observation survey	Vehicle activity at urban establishments / Vehicle rounds	2,950 drivers; 3,240 establishments	

German town centres	Germany	1976	establishment survey			
Hannover	Germany	1994	driver survey; traffic counts		350 drivers	
Cologne	Germany	1994	freight operator survey	Vehicle rounds		
Dusseldorf	Germany	1994-1995	freight operator survey	Vehicle rounds		17% of operators
Munich	Germany	1995	establishment survey; freight operator survey; vehicle trip diairies; roadside interview survey; traffic counts	Vehicle activity at urban establishments / Vehicle rounds		58% establishments; 79% operators
Dortmund	Germany	1995	freight operator survey	Vehicle rounds		
Bielefeld	Germany	1995	establishment survey	Vehicle activity at urban establishments		11% of establishments
Stuttgart	Germany	1996	freight operator survey	Vehicle rounds		14% of operators
Munster	Germany	1998	establishment survey	Vehicle activity at urban establishments		14% of establishments
Hamburg	Germany	1998	freight operator survey			47% of operators
Kassel	Germany	1990s	establishment survey; driver survey; vehicle trip diaries	Vehicle activity at urban establishments / Vehicle rounds		
Hamburg	Germany	2001	establishment survey; vehicle trip diairies	Vehicle activity at urban establishments / Vehicle rounds	Establishment surveys: 537 self-completion, 220 face-to-face interviews	Establishment surveys: 36% self-completion, 40% interviews, vehicle diaries: 30%
Dresden	Germany	2001	establishment survey; vehicle trip diairies	Vehicle activity at urban establishments / Vehicle rounds	Establishment surveys: 856 face-to-face interviews	Establishment survey: 42% interviews, vehicle diary: 30%
Guatemala City	Guatemala	1990s	roadside interview survey	Vehicle rounds	5276 observations	
Dublin	Ireland	2003	establishment survey	Vehicle activity at urban establishments	50 establishments responded to postal questionnaire	10% of establishments
Cork	Ireland	2004	establishment survey; driver survey			

Genoa	Italy	1990s	establishment survey	Vehicle activity at urban establishments	226 establishments	63% of establishments
Bologna	Italy	1995	establishment survey; traffic counts	Vehicle activity at urban establishments		
Palermo	Italy	1990s	establishment survey	Vehicle activity at urban establishments	1833 establishments	
Rome	Italy	1999	establishment survey; roadside interview survey, traffic counts	Vehicle activity at urban establishments	250 retailers in survey, 790 drivers in roadside survey	
Milan	Italy	2000 & 2002	establishment survey; roadside interview survey, traffic counts	Vehicle activity at urban establishments		
Bologna	Italy	2004	establishment survey; freight operator survey; roadside interview survey	Vehicle activity at urban establishments / Vehicle rounds	315 establishments	
Brescia	Italy	2004	establishment survey; freight operator survey	Vehicle activity at urban establishments		
Parma	Italy	2004	establishment survey	Vehicle activity at urban establishments	360 establishments	
Vicenza	Italy	2004	establishment survey; freight operator survey; roadside interview survey	Vehicle activity at urban establishments	243 retail establishments; 670 production establishments; 19 freight operators	
Taranto	Italy	2004	establishment survey; roadside interview survey	Vehicle activity at urban establishments / Vehicle rounds		
Udine	Italy	2004	establishment survey; freight operator survey; roadside interview survey	Vehicle activity at urban establishments / Vehicle rounds		
Modina	Italy	2004	establishment survey; freight operator survey	Vehicle activity at urban establishments / Vehicle rounds	182 establishments; 50 warehouses; 30 freight operators	
Piacenza	Italy	2004	establishment survey; freight operator survey	Vehicle activity at urban establishments / Vehicle rounds	320 establishments; 40 warehouses; 219 drivers; 19 freight operators	
Reggio Calabria	Italy	2000s	establishment survey	Vehicle activity at urban establishments	approximately 1000 establishments	
Italian cities	Italy	2000s	vehicle trip diaries	Vehicle rounds		
Hiroshima City	Japan	1996-1997	driver survey; vehicle observation survey; traffic counts	Vehicle activity at urban establishments	144 drivers	

Tokyo	Japan	2000	establishment survey; freight observation survey	Vehicle activity at urban establishments	shops in one shopping street, 6 department stores and 3 commercial office blocks	
Tokyo	Japan	2002	vehicle trip diairies; GPS	Vehicle activity at urban establishments		
Tokyo	Japan	2003	establishment survey; vehicle observation survey	Vehicle activity at urban establishments		
Kyoto City	Japan	2000s	driver survey	Vehicle activity at urban establishments		
Mexico City	Mexico	2004	freight operator survey; driver survey	Vehicle rounds	1649 drivers and logistics managers	
Lisbon	Portugal	2005	vehicle observation survey	Vehicle activity at urban establishments		
Porto	Portugal	2000s	establishment survey	Vehicle activity at urban establishments		
Barcelona	Spain	1991	establishment survey; freight operator survey; traffic counts	Vehicle activity at urban establishments	Freight operator surveys: 226 meetings (10% of the total amount of companies in the area of study), establishment surveys: 1,350 meetings (2.9 % of the total amount in Barcelona)	
Barcelona	Spain	1997	establishment survey; freight operator survey; traffic counts	Vehicle activity at urban establishments	Establishment surveys: 1,350 meetings (2.9 % of the total amount in Barcelona), Transport operator surveys: 52 postal surveys,	
Granada	Spain	2000s	vehicle observation survey	Vehicle activity at urban establishments		
Seville	Spain	2003	establishment survey	Vehicle activity at urban establishments		
Malaga	Spain	2000s	establishment survey	Vehicle activity at urban establishments		
Seville	Spain	2005	Traffic counts	Traffic counts		
Zaragoza	Spain	2005	Traffic counts	Traffic counts		
Stockholm	Sweden	1998	establishment survey	Vehicle activity at urban establishments		
Basel	Switzerland	1990s	freight operator survey			
Berne	Switzerland	1997	vehicle trip diairies; traffic counts		781 vehicles	94% of vehicles
Zurich	Switzerland	2003	Traffic counts	Traffic counts		

Five Dutch cities	The Netherlands	1982	establishment survey			
Leiden, Arnhem	The Netherlands	1987				
Arhem, Maastricht	The Netherlands	1991				
Venlo	The Netherlands	1992				
Tilburg	The Netherlands	1992				
Maastricht	The Netherlands	1993				
Haarlem	The Netherlands	1995	establishment survey	Vehicle activity at urban establishments		
Dutch cities	The Netherlands	1995				
Utrecht	The Netherlands	1999	establishment survey; commodity flow survey	Vehicle activity at urban establishments / Commodity flow		169 establishments
Groningen, Amsterdam, Tilburg, Den Bosch	The Netherlands	1999				
Amsterdam, Utrecht, Rotterdam, Alphen aan den Rijn, Apeldoorn	The Netherlands	2001-2002	establishment survey; driver survey	Vehicle activity at urban establishments / Vehicle rounds	For Amsterdam, Alphen, Apeldoorn and Rotterdam: 237 establishments, 124 shippers, 110 transport companies, and 315 drivers.	For Amsterdam, Alphen, Apeldoorn and Rotterdam: 8% establishments, 29% shippers, 35% transport companies, 100% for drivers
Randstaad and other Dutch urban areas	The Netherlands	2001	establishment survey	Vehicle activity at urban establishments	1529 establishments	15% of establishments
Dutch cities	The Netherlands	2004	vehicle trip diaries	Vehicle rounds	14 retailers	
Dutch cities - Buck Consulting	The Netherlands	2005	establishment survey			
Den Haag	The Netherlands	2006	establishment survey	Vehicle activity at urban establishments	252 establishments	
London	UK	1962	freight operator survey; roadside interview survey; traffic counts	Vehicle rounds	24,000 vehicles	
St Albans & Welwyn Garden City	UK	1967	establishment survey; driver survey; freight operator survey	Vehicle activity at urban establishments		
Wembley, London	UK	1970	establishment survey; vehicle observation survey; driver survey; traffic counts	Vehicle activity at urban establishments		

Hammersmith, London	UK	1970	establishment survey; vehicle observation survey; driver survey; traffic counts	Vehicle activity at urban establishments	174 establishments	
Watford	UK	1971	establishment survey; vehicle observation survey; driver survey; traffic counts	Vehicle activity at urban establishments	40 establishments, 80 drivers	88% establishments
London	UK	1971	freight operator survey; roadside interview survey; traffic counts			
Swindon	UK	1973	vehicle trip diaries; roadside interview survey; traffic counts	Vehicle activity at urban establishments	internally based vehicles: 1283 journey records, 4787 roadside interviews, interviews with 52 goods vehicle operators	45% of internal vehicles
Camberley	UK	1973	establishment survey; vehicle observation survey	Vehicle activity at urban establishments	80 establishments	
Newbury	UK	1973	establishment survey; vehicle observation survey	Vehicle activity at urban establishments	84 establishments	
Putney, London	UK	1973	establishment survey; vehicle observation survey	Vehicle activity at urban establishments	79 establishments	
Hull	UK	1973-1974	vehicle trip diaries; roadside interview survey; traffic counts	Vehicle activity at urban establishments	internally based vehicles: 1283 journey records, 4787 roadside interviews, interviews with 250 goods vehicle operators	
Greenwich & Lewisham, London	UK	1974-1975	establishment survey; vehicle observation survey; traffic counts	Vehicle activity at urban establishments	455 establishments; 301 vehicle trip logs, 686 interviews with visiting drivers	
Chichester	UK	1974	establishment survey; freight operator survey	Vehicle activity at urban establishments / Vehicle rounds		
Bradford	UK	1975				
Barnsley	UK	1976				
Hull, Jarrow/South Shields, Nottingham/Derby, Newcastle/Gateshead, Southampton/Portsmouth	UK	1977-1979	establishment survey	Vehicle activity at urban establishments	2300 establishments	49% of establishments
London	UK	1981-1982	freight operator survey; roadside interview survey; traffic counts	Vehicle rounds	3851 vehicles (inc, 575 roundsman questionnaires)	
Oxford Street, London	UK	1985	establishment survey; parking survey	Vehicle activity at urban establishments	195 establishments	46% of establishments

TRICS	UK	1990s onwards	vehicle observation survey	Vehicle activity at urban establishments	Approx. 2000 establishments, and 4300 surveys	
London (TRAVL)	UK	1991 onwards	establishment survey; driver survey; vehicle observation survey; traffic counts	Vehicle activity at urban establishments	Approx. 400 surveys	
London	UK	1991	roadside interview survey; traffic counts			
Winchester	UK	1994				
Winchester, Southampton, Leeds	UK	1996	establishment survey	Vehicle activity at urban establishments	197 establishments	27% of establishments
Norwich and London	UK	1998-1999	establishment survey; freight operator survey; service provider survey	Vehicle activity at urban establishments / vehicle rounds	58 establishments, 7 freight companies, 8 suppliers/wholesalers, 5 service companies	
Birmingham, Basingstoke & Norwich	UK	2001	freight operator survey; vehicle trip diaries; GPS survey; parking survey; traffic counts	Vehicle rounds	7 operators performing 120 vehicle rounds over 3 days with a total of 2286 collections and deliveries on these rounds	
Norwich	UK	2001	establishment survey; driver survey; parking survey; traffic counts	Vehicle activity at urban establishments / vehicle rounds	21 establishments, 35 drivers	
Winchester	UK	2001	establishment survey	Vehicle activity at urban establishments	133 establishments	33% of establishments
Covent Garden, London	UK	2001	establishment survey	Vehicle activity at urban establishments	112 establishments	73% of establishments
West Midlands	UK	2001		Vehicle rounds / Commodity flow		
London	UK	2001	roadside interview survey; traffic counts	Vehicle rounds	117,000 LGVs and 30,000 HGVs	
Wiltshire	UK	2001	establishment survey; driver survey	Vehicle activity at urban establishments / Vehicle rounds	80 establishments; 70 drivers	5% establishments
Park Royal, London	UK	2002	establishment survey; parking survey; traffic counts	Vehicle activity at urban establishments	64 establishments	16% of establishments
Paisley	UK	2002	establishment survey; freight operator survey; vehicle observation survey; traffic counts	Vehicle activity at urban establishments / Vehicle rounds		
Bexleyheath, London	UK	2003-2004	establishment survey; parking survey	Vehicle activity at urban establishments	21 establishments, 35 drivers	8% of establishments

Torbay	UK	2003	establishment survey	Vehicle activity at urban establishments	34 establishments, 30 drivers	21% establishments, 6% drivers
Winchester	UK	2003	establishment survey; suppliers survey; freight operators survey; service providers survey	Vehicle activity at urban establishments / Vehicle rounds	74 establishments; 13 service providers; 19 suppliers; 6 couriers	18% establishments; 29% service providers; 19% suppliers
Bristol	UK	2003	establishment survey	Vehicle activity at urban establishments	118 establishments	86% of establishments
Reading	UK	2003	establishment survey; vehicle observation survey; traffic counts	Vehicle activity at urban establishments	31 establishments	61% of establishments
Ealing, London	UK	2004	vehicle observation survey	Vehicle activity at urban establishments		
Colchester	UK	2005	establishment survey	Vehicle activity at urban establishments	244 establishments	31% of establishments
Chichester, Horsham, Worthing and Crawley	UK	2005	establishment survey	Vehicle activity at urban establishments	51 establishments	53% of establishments
Covent Garden, London	UK	2005	vehicle observation survey	Vehicle activity at urban establishments		
Wallington, London	UK	2005	establishment survey; vehicle observation survey; driver survey	Vehicle activity at urban establishments	100 establishements; 270 vehicles observed, 80 drivers of these vehicle interviewed	77% of establishments, 30% of drivers
Southwark & Lewisham, London	UK	2005	freight operator survey	Vehicle rounds	82 operators	13% of operators
Croydon & Sutton, London	UK	2006	establishment survey	Vehicle activity at urban establishments	183 establishments (121 in Croydon + 62 in Sutton)	39% of establishments
Catford, London	UK	2006	establishment survey; vehicle observation survey	Vehicle activity at urban establishments	45 establishments	23% of establishments
Westminster & Croydon, London	UK	2006	freight operator survey	Vehicle rounds	126 operators	4% of operators
Wandsworth, London	UK	2006	establishment survey; driver survey; vehicle observation survey	Vehicle activity at urban establishments	26 deliveries observed; establishments surveyed not stated	
Croydon, London	UK	2006-2007	establishment survey; driver survey; vehicle observation survey	Vehicle activity at urban establishments	10 establishments (all retailers)	
Kingston, London	UK	2006-2007	establishment survey; driver survey; vehicle	Vehicle activity at urban establishments	12 establishments (all retailers); 20 deliveries observed	

			observation survey			
Lewisham, London	UK	2006	establishment survey; vehicle observation survey	Vehicle activity at urban establishments	7 establishments (all retailers); 24 deliveries observed	
Merton, London	UK	2006-2007	establishment survey; driver survey; vehicle observation survey	Vehicle activity at urban establishments	15 establishments (all retailers); 3 drivers	
Bromley, London	UK	2007	establishment survey	Vehicle activity at urban establishments	98 establishments	70% of establishments
London wholesale produce markets	UK	2007	establishment survey; driver survey; traffic counts	Vehicle activity at urban establishments	321 establishments; 2053 drivers	61% establishments; 51% drivers
Central London	UK	2007-2008	establishment survey	Vehicle activity at urban establishments	22 establishments	
Southampton and Winchester	UK	2008	establishment survey; freight operator survey	Vehicle activity at urban establishments / Vehicle rounds		
Lisson Grove, London	UK	2008	establishment survey; traffic counts	Vehicle activity at urban establishments		67% of establishments
New York/Tri-State Region	USA	1963/1964	roadside interview survey	Vehicle rounds	14400 vehicle drivers	80% of drivers
Minneapolis	USA	1981				
Chicago	USA	1986	vehicle trip diaries	Vehicle rounds	3,506 owners/operators	25% of operators
San Antonio	USA	1990				
Phoenix	USA	1991	vehicle trip diaries	Vehicle rounds	720 owners/operators	30% of operators
New York	USA	1991	roadside interview survey	Vehicle rounds		
Alameda County	USA	1991	freight operator survey; roadside interview survey; traffic counts	Vehicle rounds	2,200 operators; 8,000 roadside interviews	79% of operators
El Paso	USA	1994	freight operator survey	Vehicle rounds	188 operators	43% of operators
Houston & Galveston	USA	1994	freight operator survey	Vehicle rounds	900 operators	35-40% of operators
Atlanta	USA	1996	vehicle trip diaries	Vehicle rounds	152 operators (covering 744 vehicles and 4,136 trips)	15% of operators
New York	USA	1997	establishment survey	Vehicle activity at urban establishments	28 establishments	

New York	USA	1997	freight operator survey; shipper survey	Vehicle rounds	74 companies (59 shippers operating vehicles and 15 freight operators)	
Washington	USA	2002	roadside interview survey	Vehicle rounds	28,00 truck drivers	
Portland	USA	2003	freight operator survey; roadside interview survey	Vehicle rounds	182 operators; 249 roadside interviews	32% of operators
Denver	USA	2000s			30956	
New Orleans	USA	2005	establishment survey	Vehicle activity at urban establishments	170 establishments	11% of establishments
Knox County	USA	2000s	vehicle trip diaries	Vehicle rounds	3 freight operators, 493 vehicles, 22139 trips	
New York	USA	2006	establishment survey	Vehicle activity at urban establishments	68 establishments	11% of establishments

Appendix 2: Details of individual studies reviewed that have collected urban freight data (part II)

This appendix provides details of:

- the geographical area covered in study (only one option ticked for each study)
- the types of business included in study (only one option ticked for each study)

In the case of no cells being ticked for geographical area or businesses included in a particular study this is due to the unavailability of the relevant information.

City	Country	Year of study	Geographical coverage of study							Business coverage			
			Single street	Small area	city / town centre	Larger business / shopping area	City/town-wide	Several / many / all urban areas	Individual establish-ments	Just retail	Mostly retail	No retail	Wide range of businesses
Sydney	Australia	1991-1992					✓						
Sydney	Australia	2005-2006					✓						✓
Melbourne	Australia	2006					✓						✓
Melbourne	Australia	2007					✓						
Vienna	Austria	1998											
Brussels	Belgium	1996-1998											
Ghent	Belgium	2004								✓			
Liege	Belgium	2004			✓					✓			
Calgary	Canada	1974											
Toronto	Canada	1987											

Ottawa	Canada	1989											
Vancouver	Canada	1990											
Calgary	Canada	2000-2001					✓						✓
Edmonton	Canada	2001-2002					✓						✓
Peel	Canada	2006-2007					✓						✓
Aix-en-Provence, Metz Thionville	France	1970					✓						✓
Bordeaux	France	1994											
Marseilles	France	1997											
Dijon	France	1997											
Paris	France	1990s								✓			
Lyon	France	1990s										✓	
Ile de France	France	2000-2002											
German town centres	Germany	1976											
Hannover	Germany	1994			✓								
Cologne	Germany	1994											
Dusseldorf	Germany	1994-1995											

Munich	Germany	1995											
Dortmund	Germany	1995											
Bielefeld	Germany	1995											
Stuttgart	Germany	1996											
Munster	Germany	1998											
Hamburg	Germany	1998											
Kassel	Germany	1990s			✓					✓			
Hamburg	Germany	2001							✓				
Dresden	Germany	2001							✓				
Guatemala City	Guatemala	1990s					✓						
Dublin	Ireland	2003				✓							✓
Cork	Ireland	2004		✓							✓		
Genoa	Italy	1990s		✓									✓
Bologna	Italy	1995			✓					✓			
Palermo	Italy	1990s								✓			
Rome	Italy	1999					✓			✓			

Milan	Italy	2000 & 2002											
Bologna	Italy	2004			✓					✓			
Brescia	Italy	2004			✓					✓			
Parma	Italy	2004			✓					✓			
Vicenza	Italy	2004			✓								✓
Taranto	Italy	2004			✓								
Udine	Italy	2004			✓								
Modina	Italy	2004			✓								✓
Piacenza	Italy	2004			✓						✓		
Reggio Calabria	Italy	2000s								✓			
Italian cities	Italy	2000s											
Hiroshima City	Japan	1996-1997			✓								
Tokyo	Japan	2000							✓				✓
Tokyo	Japan	2002							✓				✓
Tokyo	Japan	2003					✓						✓
Kyoto City	Japan	2000s			✓								
Mexico City	Mexico	2004											

Lisbon	Portugal	2005	✓							✓			
Porto	Portugal	2000s											
Barcelona	Spain	1991											
Barcelona	Spain	1997											
Granada	Spain	2000s											
Seville	Spain	2003											
Malaga	Spain	2000s											
Seville	Spain	2005											
Zaragoza	Spain	2005											
Stockholm	Sweden	1998											
Basel	Switzerland	1990s											
Berne	Switzerland	1997			✓								
Zurich	Switzerland	2003											
Five Dutch cities	The Netherlands	1982											
Leiden, Arnhem	The Netherlands	1987											
Arhem, Maastricht	The Netherlands	1991											
Venlo	The Netherlands	1992											
Tilburg	The Netherlands	1992											
Maastricht	The Netherlands	1993											
Haarlem	The Netherlands	1995											✓

Dutch cities	The Netherlands	1995								✓			
Utrecht	The Netherlands	1999								✓			
Groningen, Amsterdam, Tilburg, Den Bosch	The Netherlands	1999											
Amsterdam, Utrecht, Rotterdam, Alphen aan den Rijn, Apeldoorn	The Netherlands	2001-2002			✓					✓			
Randstaad and other Dutch urban areas	The Netherlands	2001							✓			✓	
Dutch cities	The Netherlands	2004								✓			
Dutch cities - Buck Consulting	The Netherlands	2005									✓		
Den Haag	The Netherlands	2006											
London	UK	1962					✓						
St Albans & Welwyn Garden City	UK	1967		✓						✓			
Wembley, London	UK	1970	✓							✓			
Hammersmith, London	UK	1970	✓							✓			
Watford	UK	1971		✓						✓			
London	UK	1971					✓						
Swindon	UK	1973					✓						✓
Camberley	UK	1973	✓								✓		

Newbury	UK	1973	✓								✓		
Putney, London	UK	1973	✓								✓		
Hull	UK	1973-1974					✓						✓
Greenwich & Lewisham, London	UK	1974-1975				✓							✓
Chichester	UK	1974			✓					✓			
Bradford	UK	1975											
Barnsley	UK	1976											
Hull, Jarrow/South Shields, Nottingham/Derby, Newcastle/Gateshead, Southampton/Portsmouth	UK	1977-1979							✓				✓
London	UK	1981-1982					✓						
Oxford Street, London	UK	1985	✓										✓
TRICS	UK	1990s onwards							✓				
London (TRAVL)	UK	1991 onwards							✓				
London	UK	1991					✓						
Winchester	UK	1994											
Winchester, Southampton, Leeds	UK	1996			✓					✓			
Norwich and London	UK	1998-1999				✓					✓		
Birmingham, Basingstoke & Norwich	UK	2001					✓						✓

Norwich	UK	2001	✓								✓		
Winchester	UK	2001				✓							✓
Covent Garden, London	UK	2001		✓							✓		
West Midlands	UK	2001						✓					✓
London	UK	2001					✓						
Wiltshire	UK	2001						✓					✓
Park Royal, London	UK	2002				✓					✓		
Paisley	UK	2002			✓								✓
Bexleyheath, London	UK	2003-2004	✓								✓		
Torbay	UK	2003					✓						✓
Winchester	UK	2003					✓						✓
Bristol	UK	2003		✓						✓			
Reading	UK	2003		✓									✓
Ealing, London	UK	2004				✓					✓		
Colchester	UK	2005			✓								✓

Chichester, Horsham, Worthing and Crawley	UK	2005				✓					✓		
Covent Garden, London	UK	2005		✓							✓		
Wallington, London	UK	2005			✓								✓
Southwark & Lewisham, London	UK	2005							✓				
Croydon & Sutton, London	UK	2006			✓					✓			
Catford, London	UK	2006		✓							✓		
Westminster & Croydon, London	UK	2006							✓				
Wandsworth, London	UK	2006	✓								✓		
Croydon, London	UK	2006-2007	✓								✓		
Kingston, London	UK	2006-2007	✓								✓		
Lewisham, London	UK	2006	✓								✓		
Merton, London	UK	2006-2007	✓								✓		
Bromley, London	UK	2007			✓					✓			
London wholesale produce markets	UK	2007							✓			✓	
Central London	UK	2007-2008							✓	✓			
Southampton and Winchester	UK	2008			✓					✓			
Lisson Grove, London	UK	2008	✓							✓			
New York/Tri-State Region	USA	1963/1964					✓						
Minneapolis	USA	1981											

Chicago	USA	1986						✓					
San Antonio	USA	1990											
Phoenix	USA	1991					✓						
New York	USA	1991				✓							
Alameda County	USA	1991											
El Paso	USA	1994											
Houston & Galveston	USA	1994					✓						
Atlanta	USA	1996					✓						
New York	USA	1997			✓							✓	
New York	USA	1997			✓								
Washington	USA	2002						✓					
Portland	USA	2003					✓						
Denver	USA	2000s											
New Orleans	USA	2005					✓						✓
Knox County	USA	2000s						✓					
New York	USA	2006			✓								

Appendix 3: Details of individual studies reviewed that have collected urban freight data (part III)

This appendix provides details of:

- the reason for carrying out the study (cases in which studies seem to have more than one purpose are indicated)
- who the study was for
- the reference for the study

The source shown is either for a study report or paper based on the study, or in cases where neither could be obtained it refers to a secondary publications that refers to the study.

City	Country	Year of study	Reason for carrying out study			Who was study	Source
			For policy decision-making	For understanding /research	For modelling		
Sydney	Australia	1991-1992		✓		City authority	Taylor and Ogden, 1998
Sydney	Australia	2005-2006		✓		Academic - student	Figliozzi et al., 2006
Melbourne	Australia	2006			✓	Academic	Greaves and Figliozzi, 2007
Melbourne	Australia	2007			✓	City and regional authority	Bowyer et al., 2007
Vienna	Austria	1998		✓			Ruesch and Glücker, 2000
Brussels	Belgium	1996-1998			✓	City Authority	Debauche and Decock, 2006
Ghent	Belgium	2004	✓			City Authority	Debauche and Decock, 2006
Liege	Belgium	2004		✓		City Authority	Debauche, 2007; Debauche and Decock, 2006
Calgary	Canada	1974		✓			Woudsma, 2001
Toronto	Canada	1987		✓			Woudsma, 2001
Ottawa	Canada	1989	✓	✓			Woudsma, 2001

Vancouver	Canada	1990		✓			Woudsma, 2001
Calgary	Canada	2000-2001			✓	City and regional authority	International Results Group, 2001, City of Calgary, 2001, Hunt and Stefan, 2005; Stefan et al., 2006
Edmonton	Canada	2001-2002		✓		City and regional authority	City of Edmonton & Alberta Transportation, 2003; Hunt et al., 2006
Peel	Canada	2006-2007		✓	✓		McCabe et al., 2008
Aix-en-Provence, Metz Thionville	France	1970					Masson, 1970
Bordeaux	France	1994		✓	✓	Government	Patier and Routhier, 2008; Patier and Routhier, 2006.
Marseilles	France	1997		✓	✓	Government	Patier and Routhier, 2008; Patier and Routhier, 2006.
Dijon	France	1997		✓	✓	Government	Patier and Routhier, 2008; Patier and Routhier, 2006.
Paris	France	1990s				Could ask Christophe for details	Patier and Routhier, 2006
Lyon	France	1990s					Patier and Routhier, 2006
Ile de France	France	2000-2002		✓			Patier and Routhier, 2008
German town centres	Germany	1976					Schwerdtfeger, 1976
Hannover	Germany	1994		✓		City authority	Sustrate, 1999
Cologne	Germany	1994				City authority	Binnenbruck, 2006
Dusseldorf	Germany	1994-1995				City authority	Binnenbruck, 2006
Munich	Germany	1995				City authority	Friedrich et al., 2003; Binnenbruck, 2006

Dortmund	Germany	1995				City authority	Binnenbruck, 2006
Bielefeld	Germany	1995				City authority	Binnenbruck, 2006
Stuttgart	Germany	1996				City authority	Binnenbruck, 2006
Munster	Germany	1998				City authority	Binnenbruck, 2006
Hamburg	Germany	1998				City authority	Binnenbruck, 2006
Kassel	Germany	1990s		✓		City Logistics scheme partners	Kohler, 1999
Hamburg	Germany	2001		✓			Wermuth et al., 2004; Steinmeyer, 2003
Dresden	Germany	2001		✓			Wermuth et al., 2004; Steinmeyer, 2003
Guatemala City	Guatemala	1990s				City authority	Holguin-Veras and Thorson, 2000
Dublin	Ireland	2003		✓		Academic	O'Mahony et al., 2004
Cork	Ireland	2004	✓	✓			James, 2005
Genoa	Italy	1990s		✓		Academic	Galaverna et al., 1995
Bologna	Italy	1995		✓		City authority	Monticelli, 1997
Palermo	Italy	1990s					CSST, 1998
Rome	Italy	1999	✓	✓		City authority	STA, 1999-2000
Milan	Italy	2000 & 2002		✓	✓		Musso, 2006
Bologna	Italy	2004			✓	City authority / regional government	Musso, 2006

Brescia	Italy	2004		✓		City authority / regional government	Gentile and Vigo, 2006
Parma	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Vicenza	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Taranto	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Udine	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Modina	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Piacenza	Italy	2004		✓		City authority / regional government	Regione Emilia-Romagna, 2005
Reggio Calabria	Italy	2000s					Regione Emilia-Romagna, 2005
Italian cities	Italy	2000s			✓		Russo et al., 2007
Hiroshima City	Japan	1996-1997	✓			National Government	Mizutani, 1999,
Tokyo	Japan	2000		✓			Iwao et al., 2001
Tokyo	Japan	2002		✓			Sinarimbo et al., 2004
Tokyo	Japan	2003	✓	✓		City Authority	Shimuzu et al., 2007
Kyoto City	Japan	2000s		✓	✓		Aiura and Taniguchi, 2006
Mexico City	Mexico	2004	✓	✓			Lozano et al., 2006
Lisbon	Portugal	2005	✓	✓		National government	Macario et al., 2007; Macário et al., 2007
Porto	Portugal	2000s		✓	✓		Melo and Costa, 2007

Barcelona	Spain	1991		✓		City authority	Muñuzuri, 2006
Barcelona	Spain	1997	✓	✓		City authority	Muñuzuri, 2006
Granada	Spain	2000s	✓	✓		City authority	Muñuzuri, 2006
Seville	Spain	2003			✓	Academic	Muñuzuri, 2006
Malaga	Spain	2000s	✓	✓		City authority	Muñuzuri, 2006
Seville	Spain	2005			✓	Academic	Muñuzuri, 2006
Zaragoza	Spain	2005			✓	Academic	Muñuzuri, 2006
Stockholm	Sweden	1998				City Authority	BESTUFS, 2006; Rand Europe, 2002
Basel	Switzerland	1990s	✓				Abel, 2006
Berne	Switzerland	1997		✓		City Authority	COST 321, 1998; Abel, 2006
Zurich	Switzerland	2003		✓		City Authority	Abel, 2006
Five Dutch cities	The Netherlands	1982					DHV, 1982
Leiden, Arnhem	The Netherlands	1987					DHV et al., 1987
Arhem, Maastricht	The Netherlands	1991					Coopers & Lybrand, 1991a and 1991b
Venlo	The Netherlands	1992					Hoofdbedrijfschap Detailhandel (HBD), 1992.
Tilburg	The Netherlands	1992					Akker et al., 1992
Maastricht	The Netherlands	1993					Oranjewoud, 1993
Haarlem	The Netherlands	1995					Heidemij Advies, 1995
Dutch cities	The Netherlands	1995					Hoofdbedrijfschap Detailhandel (HBD), 1995
Utrecht	The Netherlands	1999		✓			DHV, 1999; Boerkamps, 2002
Groningen, Amsterdam, Tilburg, Den Bosch	The Netherlands	1999					SSZ, 2000; PSD, 2000; Oranjewoud, 2000.

Amsterdam, Utrecht, Rotterdam, Alphen aan den Rijn, Apeldoorn	The Netherlands	2001-2002		✓	✓	Knowledge Centre (public-private)	Boerkamps and Oosterhout, 2003; Vleugel, 2006
Randstaad and other Dutch urban areas	The Netherlands	2001		✓	✓	National government	Iding et al., 2002
Dutch cities	The Netherlands	2004		✓		Academic	Quak and de Koster, 2006
Dutch cities - Buck Consulting	The Netherlands	2005					Colon, 2007
Den Haag	The Netherlands	2006					Govera Stedinet, 2006
London	UK	1962		✓	✓	City authority / National Government	London County Council, 1964
St Albans & Welwyn Garden City	UK	1967		✓		Company/academic	Baker, 1970
Wembley, London	UK	1970				Metropolitan authority	Metra Consulting Group, 1973b
Hammersmith, London	UK	1970				Metropolitan authority / national government	Metra Consulting Group, 1973a
Watford	UK	1971		✓		Trade association	Jennings et al., 1972
London	UK	1971		✓	✓	City authority	
Swindon	UK	1973	✓	✓	✓	Government Research Agency	Hitchcock et al., 1974
Camberley	UK	1973	✓	✓		Government Research Agency	Christie et al., 1973a
Newbury	UK	1973	✓	✓		Government Research Agency	Christie et al., 1973a
Putney, London	UK	1973	✓	✓		Government Research Agency	Christie et al., 1973b
Hull	UK	1973-1974	✓	✓		Government Research Agency	Bartlett and Christie, 1978; Wilbur Smith and Associates and P-E Consulting, 1977.

Greenwich & Lewisham, London	UK	1974-1975	✓	✓			Hasell and Christie, 1978
Chichester	UK	1974	✓	✓		County Council	Nathaniel Lichfield and Partners, 1975
Bradford	UK	1975					Wytconsult, 1975
Barnsley	UK	1976					Urquhart, 1976
Hull, Jarrow/South Shields, Nottingham/Derby, Newcastle/Gateshead, Southampton/Portsmouth	UK	1977-1979		✓		Government Research Agency	Bartlett and Newton, 1982
London	UK	1981-1982		✓	✓	City authority	Greater London Council, 1981
Oxford Street, London	UK	1985	✓	✓		Borough	Polytechnic of Central London, 1985
TRICS	UK	1990s onwards			✓	Private company	
London (TRAVL)	UK	1991 onwards			✓	City authority	London Councils, 2008
London	UK	1991		✓	✓	National government	London Research Centre and Department of Transport, 1994
Winchester	UK	1994					Oscar Faber TPA, 1994
Winchester, Southampton, Leeds	UK	1996		✓		Academic - student	Edwards, 1997.
Norwich and London	UK	1998-1999		✓		Academic	Allen et al., 2000
Birmingham, Basingstoke & Norwich	UK	2001		✓	✓	Academic	Allen et al., 2003
Norwich	UK	2001	✓	✓		County Council	Allen et al., 2003
Winchester	UK	2001		✓		County Council	Cherrett et al., 2002
Covent Garden, London	UK	2001	✓	✓		Borough	Tyler, 2001
West Midlands	UK	2001			✓	Regional Authority	TTR, 2001

London	UK	2001		✓	✓	City authority	WSP & Katalysis, 2002
Wiltshire	UK	2001	✓			County Council	TTR, 2001
Park Royal, London	UK	2002		✓		Borough / FQP	MVA, 2002
Paisley	UK	2002				County Council	
Bexleyheath, London	UK	2003-2004	✓			Borough / FQP	Intermodality, 2004
Torbay	UK	2003	✓			County Council	Devon County Council private communication
Winchester	UK	2003		✓		County Council	Cherrett and Smyth, 2003
Bristol	UK	2003	✓	✓		City authority	TTR, 2004
Reading	UK	2003		✓		City authority	Peter Brett Associates, 2003
Ealing, London	UK	2004		✓		Borough / FQP	MVA, 2004
Colchester	UK	2005	✓	✓		County Council / City Council	Steer Davies Gleave, 2005
Chichester, Horsham, Worthing and Crawley	UK	2005	✓			County Council	Cherrett and Hickford, 2005
Covent Garden, London	UK	2005		✓		Academic - student	Salgado, 2005
Wallington, London	UK	2005		✓		Transport authority	MVA, 2005.
Southwark & Lewisham, London	UK	2005		✓		Boroughs	Browne, et al., 2005

Croydon & Sutton, London	UK	2006	✓			FQP	TTR, 2007
Catford, London	UK	2006		✓		Borough	Peter Brett Associates, 2006
Westminster & Croydon, London	UK	2006		✓		City Authority	Synovate, 2006
Wandsworth, London	UK	2006	✓			Borough / FQP	TTR, 2007
Croydon, London	UK	2006-2007	✓			Borough / FQP	TTR, 2007
Kingston, London	UK	2006-2007	✓			Borough / FQP	TTR, 2007
Lewisham, London	UK	2006	✓			Borough / FQP	TTR, 2007
Merton, London	UK	2006-2007	✓			Borough / FQP	TTR, 2007
Bromley, London	UK	2007	✓			FQP	TTR, 2007
London wholesale produce markets	UK	2007	✓	✓	✓	City authority	MVA, 2007.
Central London	UK	2007-2008	✓			FQP	TTR, 2008
Southampton and Winchester	UK	2008		✓		Academic	
Lisson Grove, London	UK	2008	✓	✓		Borough	Westminster City Council, 2008
New York/Tri-State Region	USA	1963/1964		✓		Public planning agency	Teas Wood, 1970
Minneapolis	USA	1981					US Department Of Transportation, 1995.
Chicago	USA	1986	✓		✓		US Department Of Transportation, 1995.
San Antonio	USA	1990					US Department Of Transportation, 1995.
Phoenix	USA	1991			✓	Regional authority	Ruiter, 1992
New York	USA	1991	✓	✓		Port Authority	Jessep et al., 2004
Alameda County	USA	1991			✓	City authority	Jessep et al., 2004

El Paso	USA	1994			✓	City authority / regional government	Jessep et al., 2004
Houston & Galveston	USA	1994			✓	City authority	Jessep et al., 2004
Atlanta	USA	1996		✓	✓	City authority	Ross et al., 1998
New York	USA	1997		✓		City Authority	Morris and Kornhauser, 2000; Morris, 2004
New York	USA	1997		✓		City Authority	Morris et al., 1999; Morris et al., 1998
Washington	USA	2002		✓		Regional authority	Jessep et al., 2004
Portland	USA	2003	✓		✓	Regional authority	Jessep et al., 2004
Denver	USA	2000s					Holguin-Veras and Patil, 2005
New Orleans	USA	2005		✓		City Authority	Parsons and Cleckley, 2006
Knox County	USA	2000s		✓		Academic	Protopapas et al., 2005
New York	USA	2006		✓		City authority	Holguín-Veras et al., 2006