# Understanding retail supply chains to enable 'greener' logistics.

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# UNDERSTANDING RETAIL SUPPLY CHAINS TO ENABLE 'GREENER' LOGISTICS

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## Introduction

Over the past 30 years, there have been many urban freight surveys undertaken by local authorities across the UK, in an attempt to understand freight issues at the local level (Allen et al., 2008). Many of these focused on the supply chains delivering 'core' goods to retailers whilst some made an attempt to go further and quantify the impacts of service vehicle activity to gain a more complete picture of freight vehicle impacts serving our central business districts. This paper describes the findings from a business managers survey undertaken with retailers in Winchester High Street in 2008 (n=83, 69%), designed to quantify the logistics associated with the supply of core goods, material take-back (customer returns, stock transfers, WEEE, residual waste and recyclate) and other services. The findings are set in context with other surveys that have been undertaken to highlight the characteristics of Winchester and aid understanding in what new and novel systems might bring about a more sustainable approach to managing freight in an urban setting.

## Background

As part of the EPSRC funded Green Logistics project, the businesses on Winchester High Street were chosen to investigate collective retail supply chain impacts acting on an urban centre. At the time, Winchester City Council was gathering information to help in the development of the Town Access Plan, and an understanding of how retail supply chains served the area was needed. This could potentially lead to a more equitable allocation of infrastructure and specific freight facilities to the wider benefit of businesses across the city. At the time the main data collection was undertaken (April 2008), there were 120 businesses trading on Winchester High Street, of which 83 (69%) were involved in the survey (Table 1). An interview based questionnaire was directed to 107 store managers, excluding all banks and building societies (Table 1).

| Business Categories | Total no. businesses | No. Businesses surveyed | % Surveyed |
|---|---|---|---|
| Banks/Building Societies | 13 | 0 | 0 |
| Charity shops | 4 | 4 | 100 |
| Clothing Retail | 17 | 15 | 88 |
| Food/drink | 9 | 6 | 67 |
| Footwear | 4 | 3 | 75 |
| Jewellers | 6 | 6 | 100 |
| Mobile Phones | 7 | 6 | 86 |
| Opticians | 5 | 3 | 60 |
| Other Retail | 34 | 28 | 82 |
| Other Services | 14 | 8 | 57 |
| Public house/restaurant | 7 | 4 | 57 |
| **Total** | **120** | **83** | **69** |

Table 1: Businesses on Winchester High Street

### Vehicle activity associated with core goods deliveries

The most common commercial (otherwise referred to as 'freight') vehicle trip made into retail centres is associated with delivering 'core goods'. The definition of 'core goods' is those that are of fundamental importance to the main commercial activity being undertaken by the business. There are many mechanisms by which core goods deliveries are made to businesses in an urban centre, dependent on the types of supply chains used (centralised, decentralised, hybrid), which also dictates the level and type of take-back (returns/waste logistics) that occurs using back-loading.

### Core goods deliveries by business type

From the sample of respondents, there were approximately 458 core goods delivery vehicle arrivals each week (79 respondents, ranging from less than 1 per week to around 50), at an average of 5.8 per business per week, (median across the business categories, 4.4). Charity shops, clothing retailers and 'other services' (including estate agents and travel agencies) received the least number of weekly core

goods deliveries (less than 3 per week on average), while food and drink retailers and footwear retailers received over 7 deliveries per week on average. Using the average number of weekly core goods deliveries by business type, and substituting for the non-respondents, across the 120 businesses on the High Street, 618 core goods delivery visits may be made each week. The results across 26 other studies dating back to 1996 (reported in Allen at al., 2008) suggested a mean of 9.2 deliveries per week to the average business (standard deviation, 5.8). The average number of deliveries can become inflated by small numbers of establishments receiving large numbers of deliveries. Looking at the median figure across these surveys suggests that 7.9 core goods deliveries might be made to the typical business on a weekly basis. This suggests that Winchester, with its large number of smaller, independent businesses is generating considerably less core goods vehicle activity per business per week compared to the average urban centre studied previously in the UK (4.4 median weekly deliveries compared to 7.9). A key problem with making cross-survey comparisons between urban freight surveys is the different classifications of business used and the 'UK Standards Industrial Classification of Economic Activities – SIC 2007' business classification system should be used wherever possible.

**Core goods deliveries by store size**

One might assume that larger stores are responsible for more delivery activity based on their sales area. The size of each business, in terms of sales floor area ($m^2$), was estimated from drawings of the High Street (extracted from EDINA mapping) and knowledge of the number of sales floors each store had through physical inspection. Across all the business categories, the results suggested that there did not appear to be a strong correlation between store size and the number of core goods deliveries received per week (0.13), the average business from the sample receiving 2.05 deliveries per week per $100m^2$. A logical explanation would be that larger stores may tend to use larger delivery vehicles and may also consolidate loads more where they are served from a distribution centre in a centralised distribution system. Smaller stores, particularly when served through decentralised distribution systems may receive more deliveries from a range of different suppliers using smaller vehicles.

When looking in more detail by business category, the results suggested that mobile phone stores ($77m^2$) and jewellers ($86m^2$) were the smallest in terms of sales area but generated the greatest number of weekly core goods movements per $100m^2$ sales area (7.29 and 4.67 respectively). When comparing against other UK studies looking into the relationship between store size and freight vehicle activity (e.g. Newbury, Camberley and Putney (1973), Wallington (2005), Ealing (2004) summarised in Allen et al., 2008), the Winchester businesses generally appeared to be receiving less deliveries per $100m^2$ but this could have been down to the definition of 'goods vehicle trip' which may have included collections as well as deliveries in the previous studies. Surveys in Wallington and Ealing suggested that the average across all shops, financial institutions and cafes/restaurants was 5.6 and 7 vehicle visits per $100m^2$ per week.

The Winchester data do suggest that certain types of small, specialist retailer (in terms of retail sales space) could be responsible for significant freight vehicle generation on a high street. The assumption at the Local Authority level can often be that large, national chain stores, present on a high street can be associated with significant proportions of the freight vehicle activity, whether it be for core goods delivery or service provision. In a lot of cases, these types of business, serviced through centralised distribution systems, can be linked with large rigid or articulated goods vehicle deliveries on a scheduled basis. However, the results from Winchester suggest that smaller, specialist stores can be responsible for considerable freight vehicle activity, albeit in vans and in terms of town planning, one should not assume that larger retailers (over $500m^2$ sales area) are the most likely generators of freight delivery traffic, and should therefore get preferential treatment in terms of access/infrastructure provision.

**Core goods deliveries by type of supply chain and vehicle type**

The method of goods supply can also impact on the number of core goods deliveries made. Allen at al., (2000) identified three types of goods supply system from establishment studies in Norwich and London (*Centralised Distribution Systems*, where businesses receive goods from a single point; *Decentralised Distribution Systems*, where businesses receive goods from several points of dispatch and *Hybrid Supply Systems*, combining both of the above). The results from the 79 businesses in Winchester supplying data on their main supplier/logistics provider suggested that 49% were served through a centralised system, with 51% being served through decentralised systems (multiple suppliers). Only 1 business claimed to operate through a hybrid system. There were no obvious trends

observed by business type, however, all businesses in the pubs/restaurants and footwear categories received deliveries through decentralised networks, perhaps highlighting the range of suppliers products sold.

The results also suggested that businesses using decentralised logistics systems received significantly more weekly core goods deliveries (9.1) compared to centralised stores (3.6), $T_{(39)}$=3.05, p=0.003, around three times the number. Similar results were found in the 1999 Norwich and London studies where decentralised served stores generated 14.2 weekly core goods deliveries on average (Median, 10) with centralised served stores receiving 4.5 (median, 2.5), Allen et al., 2008. Across the 37 decentralised stores in the Winchester High Street study, the results suggested that 1 supplier/logistics provider accounted for 68% of the vehicle activity to that business (median = 75%), SD 27. A 2 by 2 homogeneity Chi-squared test showed that there were no significant differences in the proportions of artics/rigids and vans used by businesses served by centralised and decentralised systems ($x^2$ = 0.57 and $x^2_{(0.05)}$ (1df) = 3.84). There was also no evidence of any relationship between the floor area of the store and the type of distribution system employed. One might expect larger stores to belong to large multiples and therefore be more inclined to use centralised systems but this was not found to be the case on Winchester High Street ($T_{(42)}$=0.92, p>0.36).

On average across the respondents (centralised and decentralised systems incorporated), one provider was responsible for 82% of the delivery vehicle activity to their business, equating to 3.1 deliveries out of 5.8 on average per week. In 58% of cases, vans were used to make these deliveries with the smaller businesses (in terms of sales area), namely mobile phone stores, jewellers and charity shops all receiving over 65% of their most frequent deliveries by van. Thirty one percent of the delivery activity was undertaken by rigid lorries with only 4% by articulated vehicles, emphasising the issues associated with delivering into a restricted historic city centre. The 2001 Winchester freight study (Cherrett et al., 2002) showed that significantly more rigid vehicles were used for making core food deliveries and that vans were the mode of choice in the service sector, (estate agents, travel agents, solicitors, recruitment agents etc.), $x^2$ = 252 and $x^2_{(0.05)}$ (9df) = 21.7. In nine out of the twelve establishment surveys involving retailers undertaken since 2001 (Allen et al., 2008), vans ('light goods vehicles') were the most commonly used vehicle type, perhaps suggesting the influence of the major carriers on store deliveries and also the issues accessing often congested urban centres with larger delivery vehicles.

**Core goods deliveries by day, month and time interval**

Results from the 2008 and 2001 Winchester studies suggest that Tuesdays and Wednesdays saw the greatest delivery vehicle activity (just over 20% of the businesses in the 2008 High Street survey received deliveries on Tuesdays), with significantly less being undertaken at the weekends ($x^2$ = 88.02 and $x^2_{(0.05)}$ (10df) = 18.3, based on the 2001 data). There is still considerable variability however, and 19% of the High Street respondents stated that their deliveries were not made on fixed days and could vary from week depending on stock levels and sales. This is slightly at odds with the results from other urban freight studies (Allen et al., 2008) which found that Friday generally accounted for the most delivery activity (8 out of 15 studies), whilst Monday tended to be the quietest day for freight vehicle activity. The results from the 2008 Winchester High Street study suggested that 87% of the High Street businesses considered December to be their busiest trading month with February being the quietest period. Similar peak business patterns in the run up to Christmas were noted in studies at Bexleyheath (2003), Colchester (2005) and in Chichester, Crawley, Horsham and Worthing (West Sussex, 2005), Allen et al. (2008).

Of key interest in terms of freight planning is to what extent the numbers of deliveries per week increases during these peak periods, and how the mean size of the delivery changes. The results from the 2001 Winchester freight survey suggested that across the 110 retail and service businesses in the survey, 25% more deliveries would be made to the average business during a peak trading week (2.4 deliveries per week in addition to 9.7). This implies that the estimate of between 525 and 704 non-peak weekly core goods deliveries made to the 120 business on Winchester High Street could increase to between 656 and 880 per week in the build up to Christmas. A one-way Analysis of Variance (ANOVA) test showed that there were significant differences between the clothing, food, 'other retail', personal services and 'other services' business categories in the ratio of additional peak period weekly deliveries to the typical non-peak number, ($F_{(4,93)}$ = 2.7, P=0.035, Mse = 0.19), with the average clothing retailer receiving 51% more deliveries during the pre-Christmas period. This was in

contrast to food retailers (not including pubs and restaurants) who only saw an 8% increase on average.

The 2008 Winchester study found that out of the 75 businesses on the High Street that provided data on peak period volumes from their main supplier/logistics provider, 21% (across all business categories) received additional delivery vehicles, whilst 57% saw increases in consignment sizes but no increases in the number of deliveries made. Only 4 businesses (5%) claimed to experience both situations. This has highlighted that although one would expect a retailer to receive more core goods deliveries in the build up to Christmas (looking across all their supplier base), their primary goods supplier, responsible for up to 82% of their stock, may not generate additional vehicle visits during this period but may just increase the mean consignment size. A study of retailers in Broadmead. Bristol (2003) attempted to gauge the quantity of stock delivered to businesses during their peak trading week (Allen et al., 2008). Retailers expecting at least a doubling in the quantity of goods delivered were cards and gifts shops, clothing retailers, entertainment retailers, food, home furnishings and jewellery stores and toy shops. Similar findings came out of studies of retailers in Bromley and Croydon/Sutton (2007) where a 28% and 50% increase, respectively, in the quantity of consignments delivered during the peak week were reported.

Studies of freight delivery in urban centres suggest that the 06:00 to 12:00 period generates the most activity (49%) but many businesses appear to receive deliveries and collections throughout the working day (Allen et al., 2008). Retailers appear to have a preference for morning deliveries, beginning the working day by unpacking and sorting stock while the premises are relatively quiet. Work by Allen et al., (2000) also suggested that a sizeable amount of delivery activity takes place during the morning peak period, often adding to congestion problems caused by commuter traffic. There were no significant differences found between the individual business categories in terms of the delivery time of the most common logistics provider/supplier. Research undertaken by McKinnon (1999) suggested that food retailers receive the majority of their deliveries between 05:00 and 09:00. The influence suppliers and carriers have on the transport decision was evident by the fact that 26% of businesses did not have a set delivery time arranged and the goods could arrive at any time during the working day. The Covent Garden study (Tyler, 2001) suggested that only 40% of the respondents (mainly small independent retailers) had any control over delivery times which was a feeling echoed in Colchester (Steer Davies Gleave, 2005) where only 31% felt they had any control.

**Core goods deliveries: Mean dwell times and unloading locations**

A detailed understanding of freight vehicle dwell times is important if any type of co-ordinated delivery and service plan is to be drawn up as part of the future Town Access Plan. A knowledge of how freight uses the current delivery bays and the extent of on-street deliveries, which may contravene the current waiting policy is essential in order to better plan for delivery and service vehicle provision in the future. The results suggested that across the 58% of businesses on Winchester High Street receiving vans from their most common provider, the mean dwell times of vehicles unloading core goods was not significantly quicker (16 minutes) compared to the 31% using rigid lorries (18 minutes), $T_{(41)}=1.96$, $p=0.056$. Articulated lorries recorded the longest dwell times, (36 minutes). Logistics providers and couriers recorded the shortest mean van dwell times of 9 minutes and 8 minutes respectively. These are in line with other studies where the average dwell times ranged from 8 to 34 minutes (Allen et al., 2000). Where vehicles were owned by the business concerned, the dwell times were found to be considerably longer (over 20 minutes) suggesting that deliveries might involve multiple consignments or be more complex owing to the nature of the goods or the activity of the vehicle whilst at the premises. Across all the business categories, the results suggested that there did not appear to be a strong correlation between store size and the mean dwell time of core goods delivery vehicles (0.12). Also, the mean dwell times of vehicles coming from decentralised distribution systems were not significantly quicker (14.5 minutes) compared to those from centralised systems (16.9 minutes), $T_{(71)}=0.76$, $p=0.45$. One might expect vehicles in centralised systems to be more involved in material take-back to the distribution centre (either product returns, stock returns, recyclate return or a combination) and would therefore record a longer mean dwell time compared to vehicles operating through a decentralised system which may operate on multi-drop rounds.

The longest dwell times were associated with charity shops (26.3 mins), food and drink retail (22.5 mins) and for 'other retail' (20.5 mins) with an overall average across all business types of 16 minutes. Jewellers, mobile phone retailers and opticians recorded the quickest dwell times (10 minutes on average). This perhaps highlights the impact of smaller consignment sizes and the influence of the

couriers in these particular supply chains. Nevertheless, the results suggested that approximately 173 hours of delivery activity took place whilst serving the 120 businesses on the High Street each week, and 73% of respondents stated that this unloading took place on-street (public roads). Only 20% of businesses used loading bays either at the rear of the store or elsewhere. As part of the west Sussex freight study (Cherrett and Hickford, 2005), the average business was found to generate 54 minutes of standing vehicle time per day over a six day trading week related to core goods and service visits, with 58% of this taking place on-street). Studies in Reading (2003), Ealing (2004) and Wallington (2005), (Allen et al., 2008) found that 86%, 69% and 20% respectively of on-street deliveries contravened loading restrictions.

**Back loading utilisation**

Looking specifically at the back-loading of the main supplier's/logistics provider's vehicles used by each business in Winchester High Street, 41% stated that they did not utilise any back-loading capability for the take back of customer returns, stock or recyclate. Of the 79 businesses responding to this issue, 39% stated that they sometimes used the main suppliers/logistics provider's delivery vehicles to specifically back-load customer returns. While these were predominantly scheduled deliveries, 80% of these back-loads were 'on demand', indicating that the back-loading of customer returns tends to be used on an 'as needed' basis, rather than as a matter of course. Back-loading stock for return to the supplier/distribution centre was also cited as an activity undertaken by 45% of the respondents while 42% had at some time back-loaded stock for rotation to other stores. Of those that indicated the destination of these stock returns, most were taken to a Distribution Centre, presumably for consolidation and re-allocation. In terms of the 'gate keeping' function in-store (the extent to which customer returns are checked at the store level to see if they can be returned to grade-A stock, repaired, cannibalised or disposed), 28% of the managers stated that they did not inspect any returns to clarify their status. Of the 72% that did undertake some form of gate-keeping in-store, 60% attempted to return items to Grade-A stock for re-sale rather than sending them elsewhere, with 17% returning items to either the supplier directly or to a distribution centre.

Only 15 of the respondents (18%) claimed to back-load any waste or recyclate using the main supplier's/logistics provider's delivery vehicles. Of the 238 weekly core goods deliveries received by the 79 respondents from their main supplier/logistics provider, approximately 37 vehicles per week (16%) serving 12 retailers always back-loaded returns (related to customer returns or stock returns) according to the store manager. Of the 83 respondents, 19 retailers (23%) said they used 'dedicated' returns collectors, with ANC, City Link, Hays DX, DPD UK, DHL, Parcel Force and Parcel Line being some of the major carriers mentioned as providing such services.

**Vehicle activity associated with service visits**

Freight vehicle activity in a retail centre is commonly construed as being 'core goods' related. In order to get a complete picture of commercial vehicle movements and to fully understand their influence, it is important to quantify the impacts of service vehicles which support the business activity on a daily basis. The Winchester High Street business managers were questioned about service vehicle activity to their premises. The results suggested that on top of the estimated 618 core goods deliveries received during a typical week by 107 businesses on the High Street (5.8/week/business on average), an additional 814 service visits (7.6/week/business) may also take place. These findings mirror those from the West Sussex towns surveys (Cherrett and Hickford, 2005) which suggested that service visits made up 56% of the freight vehicle activity during a typical week. Looking across the findings from both the 2008 and 2001 Winchester surveys, the most common service visits were for post delivery (3.3/business/week on average) and waste collection (2.4/business/week). Other service visits which typically occur on a weekly basis are for cleaning (the inside of the premises), window cleaning, delivery of ancillary products (for the essential operation of the business) and dedicated mail collections. From the 2001 Winchester study, the financial and 'other services' business categories received the most service vehicle activity, recording 12.8 service visits per week on average.

Over 70% of the service visits were made by motorised transport, of which approximately 52% were vans. Of interest is that the mean dwell time across all service types was 35 minutes, and bear similarities to the West Sussex Towns surveys (Figure 1) where lift/escalator maintenance, cleaning, computer maintenance, security and pest control all took over 40 minutes on average. The West Sussex surveys suggested that each business could generate 2.5 hours of service vehicle stationary time per week which could be directly outside the premises or in local car parks. Service vehicle activity is clearly a significant contributor to urban freight movements and due to its very nature, often

requires vehicles to be parked close to the premises being served. In terms of business processes that could be targeted to reduce overall freight vehicle impacts, centrally co-ordinating elements of service provision (e.g. for cleaning or equipment maintenance), or providing improved, more flexible parking provision for service vehicles could be more beneficial to reducing overall freight impacts than focusing on core goods deliveries. In the case of the latter, Winchester City Council implemented a 'pay-as-you-leave' charging system at the central car parks designed to encourage short-stay service vehicles to park off-street.

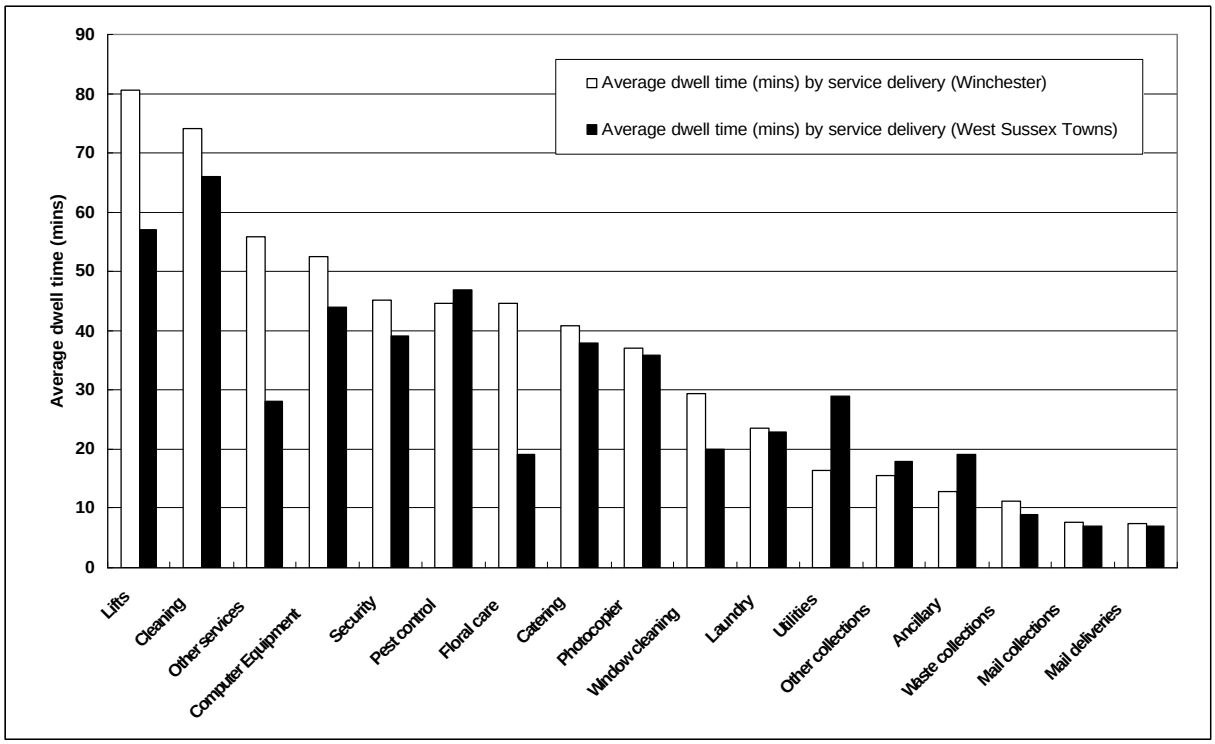


Figure 1: Mean dwell time (minutes) by type of service visit in the Winchester (2001) and West Sussex Towns surveys (Chichester, Crawley, Horsham, Worthing), 2005.

**Strategies for promoting 'greener' logistics**

The findings from the 2008 Winchester study suggest that the average High Street business can expect 5.8 core goods and 7.6 service visits per week (non peak trading period). Given the predominantly on-street, kerbside nature of these activities, there is considerable dwell time taken up by freight vehicles on a daily basis, with the associated impacts on other road users. The findings have also suggested that vehicle activity differs depending on the type of business being served, with smaller independent retailers often generating significantly more weekly vehicle arrivals compared to larger multiples. Of interest was the fact that across the respondents, a single logistics provider/supplier was responsible for 82% of the delivery vehicle activity to the average business. The supply chain characteristics of these 'premier' providers warrant further investigation in an urban setting to determine any synergies that could be exploited (joint working, co-ordinated delivery times, consolidated take-back opportunities).

Consolidation centres offer a tried and tested route for optimising and consolidating the movement of core goods into urban centres across different supply chains (Browne et al., 2005). Their long-term survival however depends on the viability of the underlying business model, as a consolidation centre is often seen as a cost-adding activity, requiring local authority subsidy to fully function. In terms of urban freight planning and addressing 'green logistics' in a retail setting, an alternative could be to move the focus away from the logistics of core goods supply and concentrate on how service provision, and its associated logistics, could be improved. Given the fact that the average business on Winchester High Street received 2.4 waste collections per week and that across a sample of 74 retailers, over 17 separate waste contractors were involved in recyclate removal alone, material 'take-back' could be one service area that could be optimised.

Back-loading is the obvious answer to this in which any spare capacity available on the delivery vehicles is utilised to take-back recyclate, stock and customer returns. This practice suits certain types of operations where individual suppliers in decentralised systems might use their own fleets to take-back material to their manufacturing point, but more commonly in centralised systems, where logistics providers remove recyclate, stock and returns back to a distribution centre for sortation and onward movement. In a drive to promote more sustainable logistics, could some of the larger retailers employing centralised distribution systems back-load recyclate on behalf of their high street neighbours, particularly to help small-medium sized enterprises (SMEs)? Many of the larger High Street names utilise their delivery vehicles in this way, consolidating their own recyclate (cardboard and plastics) for return to the distribution centre and onward re-use markets for financial gain. To transport other businesses' waste, a waste carrier's licence would be required by the main logistics provider. Because the delivery operations are so time critical, any consolidated recyclate presented by neighbouring businesses would have to be in the correct format and presented at the right time for fast effective turnaround. Other potential barriers could involve available capacity to remove recyclate during peak business periods and how variable volumes might impact on subsequent deliveries. The possible impact on a company's brand image associated with the carriage of recyclate from potential rivals may also be a limiting factor. Despite these issues, the potential recyclate volumes that could be extracted would make it financially attractive to major retailers as a back-loading option, and could significantly impact on the amount of third-party waste collection vehicle activity.

Delivery vehicles could also be used to service a recyclate 'groupage' point which could be a distribution centre, a multi-user consolidation centre or an adapted facility (e.g. a designated area in a park-and-ride site). In this concept, delivery vehicles might get preferential access to loading bays or specific delivery slots in return for agreeing to take-back consolidated recyclate from neighbouring businesses to the groupage point. The recyclate would then be collected by a contractor for onward carriage and treatment. This again would reduce the amount of waste collection vehicle activity in the retail centre but would require a co-ordinating body to liaise between logistics providers, retailers and waste contractors to co-ordinate take-back loads through the groupage point. The local authority would have to play a significant part in this process and offer incentives to the logistics providers who may not necessarily gain financially from the recyclate value.

An option already being used by some local waste collection authorities (WCAs) is to utilise the existing domestic household waste collection fleets to undertake joint domestic/commercial waste collections. This is not common practice because commercial waste has to be classified separately from domestic waste and does not contribute to a local authority's recycling targets, leaving little incentive for WCAs to collect it. Also, waste disposal authorities (WDAs) may charge WCAs considerably more for disposing of commercial waste than for domestic waste. New Forest District Council operates such a scheme where commercial waste is collected as part of the domestic rounds from SMEs who have pre-registered with the council and have acquired a 'duty of care' certificate (defined under the Control of Pollution Act 1974, the Collection and Disposal of Waste Regulations 1984 and the Environmental Protection Act 1990). Clear sacks (100L) are available for the collection of recyclable material (charged per sack) and the SMEs have to purchase Council Trade Recycling Stickers and attach one to every sack to distinguish them. The WCA then quantifies the weight of commercial waste collected by referring to the amount of bags sold and by assuming a mean weight for a 100L bag (8kg). For mixed use developments, particularly in historic city centres, such a scheme could reduce the number of refuse collection vehicles and the associated mileage travelled. Research undertaken by McLeod and Cherrett (2007) looking at theoretical joint domestic/commercial collection rounds across Hart and Rushmoor suggested that a commercial waste load of 3.9 tonnes/fortnight could be readily accommodated on the existing domestic rounds, without increasing the number of trips required to the waste disposal site.

Local authorities would have to be the key drivers of such 'green logistics' strategies, being prepared to stipulate that in certain areas, freight management (be it for core goods delivery or for service activity) will be undertaken in a particular way, perhaps using certain recognised processes/contractors for the benefit of all businesses in that area. In that sense, the local authority would act as the management 'landlord', similar to those running large multi-retailer shopping centres. Freight 'service plans', similar to the 'delivery and servicing plans' being developed by Transport for London (TFL, 2009) are a move in this direction.

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