

Rethinking deliveries report



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Executive summary

Study approach

Transport for London (TfL) commissioned Arup and WYG to carry out a study to identify and understand the range of consolidation solutions currently taking place, both in the UK and internationally. The study sought to define the different solutions employed and their requirements.

This report provides a review and analysis of the various consolidation solutions used within the UK and internationally using desk research and interviews. The report identifies the priority areas where greater use of consolidation solutions can be introduced in a cost-effective way and areas where uptake faces few barriers. This has been achieved by assessing the consolidation solutions used in different sectors of activity and considering how they could be used in the future by priority groups, as defined by TfL. A number of new case studies have been developed, such as those achievable through procurement practices, which are not widely known.

Key report findings

Evidence is available to demonstrate how consolidation solutions can address safety and security concerns, lead to operational efficiency gains and reductions in vehicle trips and greenhouse gas emissions. For example, the use of a Construction Consolidation Centre (CCC) produces significant benefits, including reductions in freight traffic to construction sites by over 70 per cent. An Urban Consolidation Centre (UCC) can achieve reductions in deliveries of regularly ordered goods like stationery to office buildings.

The use of the procurement process to force through the adoption of consolidation solutions can lead to behaviour change within organisations and their suppliers and logistics providers. Using solutions such as nominated carriers, collective and collaborative procurement and bunching orders is likely to be the most cost effective method to achieve an increase in consolidation. These solutions require the least amount of investment and have the highest probability of generating a financial return. As major purchasers of products and services, public sector organisations such as TfL, the Boroughs and the Greater London Authority (GLA) can lead the way by introducing such solutions within their organisations and be influencers of change. Similarly, landowners have the opportunity to influence the procurement behaviour of existing and future tenants.

The growth of e-commerce places additional strain on traditional delivery networks. Retailers are increasingly developing Click & Collect options as part of their service offering to their customers. Recognising the potential increase in footfall from customers visiting their stores (or affiliated stores within their wider chain) to collect their goods, some retailers are building new relationships with online e-tailers to expand their service offering even further. However, it is noted that this activity could result in an increased number of vehicle trips and an adverse effect on congestion and the environment as many consumers travel to a shop to collect their goods instead of one vehicle delivering to many consumers.

The trend in physical consolidation operations (i.e. UCCs and CCCs) has been to rent shared space in under-utilised warehouses. Many operations such as the Bristol and Bath UCC and the London Boroughs CC have received funding at the outset (and continue to do so) through public subsidies. There is

evidence available in the construction and retail sectors to demonstrate examples of centres that have made the transition from a publicly supported facility to becoming a commercial success and replicated in other areas (e.g. Wilson James CCC and the City of Brussels' UCC). Generally, the study found that many consolidation centres have ceased operating when public funding is no longer available as the transition from a publicly funded facility to a commercially viable centre has not been successful. Sustained long-term public (or private) funding may have to remain in place if physical consolidation facilities, as a public good, are to remain part of the overall solution.

Being a statutory consultee for major planning applications, TfL has the opportunity to influence the design of new developments. This influence should be exercised to its maximum potential to include consolidation solutions for new developments from the outset. For example, where possible and appropriate, the use of a CCC should be conditioned via the planning process.

Consolidation is frequently viewed in a negative light due to the perception that this activity causes delays to deliveries and adds costs. The results of this study has shown the need for an awareness campaign to dispel the 'myths' and to promote the different forms of consolidation and its benefits to different sectors and priority groups of individuals.

Introduction

1.1 Study aim

The aim of this study is to identify and understand the range of consolidation solutions currently taking place, both in the UK and internationally. The study also seeks to define the different solutions employed and their requirements. There clearly are opportunities for a wider implementation of consolidation solutions by organisations in both the private and public sectors.

1.2 Background

London's population is set to grow from 8.6 million today to around 10.1 million by 2030. This is the equivalent of absorbing the populations of Birmingham and Leeds and is forecast to mean an additional 5 million trips each day, on top of the 26 million trips already taking place. There will be increased demand and pressure for additional homes as well as places to work and play. Consequently, this will result in more developments being built and an associated increase in construction vehicle activity.

Further pressure will be placed on London's infrastructure, particularly on busy transport networks. A change in travel behaviour is already apparent with significant increased numbers of pedestrians and cyclists. The growth in cycling alone (almost doubled since 2000) has increased the number of vulnerable road users subjected to potential conflict with vehicles.

Unless mitigated, congestion in central London is expected to increase by around 60 per cent by 2031 due to population growth and a change in road space allocation (more space for cyclists). This will make it more difficult for goods and services to be delivered to businesses in London. It is also exacerbated by the fact that many van movements are believed to be under-utilised in terms of vehicle capacity, indicating that there are inefficiencies in a number of distribution related sectors.

When home delivery is not an option, people typically opt to have small items delivered to their workplace. When sent to the workplace, deliveries are consolidated and drastically reduce the number of failed first time deliveries, which are estimated to cost UK retailers, delivery companies and consumers between £790 million and £1 billion per year¹. However, this also leads to increased congestion and emissions in city centres as more vehicles are required to deliver non-business related goods. It also places an increased burden on the recipient business' goods-in or reception staff having to deal with personal deliveries on behalf of staff members.

Poor air quality, increasing congestion, coupled with decreasing capacity on London's roads are challenging issues that demand innovative solutions. One such innovation is the concept of consolidating goods, which is able to deliver significant safety, efficiency and environmental benefits.

¹ IMRG (2014) Understanding the importance of Click & Collect is crucial to retail success, <http://www.imrg.org/index.php?catalog=1943> [accessed 28.04.15]

The concept of consolidating goods to achieve cost efficiency is not new. It was first documented as a concept in the 1970s². Interest in this approach is increasing due to a significant rise in delivery activity, particularly by vans. This increase is generally caused by rising urban populations consuming more products as well as the exponential growth of e-commerce.

There are many different consolidation solutions and the most widely known takes place at Regional Distribution Centres (RDC) and UCC. Consolidation centres tend to attract considerable resistance from potential users, mostly due to the assumption that their use delays deliveries and adds cost. There is also a concern over a loss of control by the sender or receiver of the goods. As this study demonstrates, the myriad of different consolidation solutions available today can address these concerns and deliver positive, tangible benefits for all stakeholders.

Clearly, solutions need to be found to help mitigate some of these challenges. It is not possible to simply create more road space. An increase in consolidation activity could lead to more efficient supply chains and could contribute to a reduction in commercial vehicles on London's roads.

A better understanding of the potential role and nature of consolidation solutions is required to provide a plan to increase the use of these solutions, either voluntarily or as a condition as part of the planning process.

1.3 Study methodology

A framework was designed in order to list all the relevant search terms to be used when assessing information about consolidation schemes (see Table 1). It was used by the project team as a tool to ensure all aspects of consolidation activity were included in the report and that any gaps could be identified. The search examined consolidation activities carried out since 2010 within the UK, Europe and Internationally. The search was limited to all literature less than five years old.

Table 1: Search criteria

Key search terms included:

Freight consolidation; consolidation centre; high street retail consolidation; shopping centre consolidation; shopping mall consolidation; micro consolidation centre; construction consolidation centre; hospital consolidation centre; office consolidation centre; upstream consolidation; supplier consolidation; retailer consolidation; primary distribution consolidation; locker banks; locker boxes; waste consolidation centre; waste consolidation; out-of-hours deliveries; procurement consolidation; storage consolidation; delivery consolidation; carrier consolidation; joint procurement; joint purchasing; virtual consolidation; in-house consolidation; freight exchange system; freight exchange scheme; airport freight consolidation; supply chain procurement.

² Browne, M., Sweet, M., Woodburn, A., Allen, J, (2005) Urban Freight Consolidation Centres Final Report, Transport Studies Group, London.

The literature review was conducted utilising the resources and expertise of Arup and WYG staff. It was based on an extensive review of academic and non-academic literature relating to consolidation schemes that inform current best practice and provide lessons from unsuccessful attempts. It also includes existing information available to the authors from previous consultancy commissions.

Arup's and WYG's contacts and networks across Europe were used to access information about other initiatives that are taking place but which are not recorded in English speaking publications.

In total, over 80 publications were examined from a wide variety of journals, conference papers, PhD thesis and unpublished reports. These covered transport policies and practices, procurement, social and behavioural change and business practices.

Defining consolidation

2.1 What is consolidation?

Consolidation is usually defined as the process of rearranging and combining goods shipments into fewer deliveries. The goal is simple – reduce the number of vehicles carrying freight entering a city by making sure that their carrying capacity is fully utilised. Cadotte and Robicheaux³ described consolidation as:

“The distribution of freight in most urban areas is characterised by high concentrations of truck activity in central business districts. In this context, the movement of freight is typically performed by a very large number of delivery companies who duplicate each other’s paths with partially filled trucks and vans. In many communities, this results in unnecessarily high levels of congestion and pollution. It also raises the costs of distribution, which is passed on to consumers in higher product costs. Several decades ago, business organisations responded to this issue by forming shippers associations and freight forwarder operations in order to achieve savings by consolidating shipments”.

The concept itself may not be new but it has been developed and enhanced over the years into an increasing number of different forms of consolidation. Today, these different forms can be broadly defined as consisting of either ‘physical’ or ‘behavioural’ solutions (see Table 2).

Table 2: Consolidation solutions

Behavioural solutions	Physical solutions
Procurement led solutions	Urban consolidation centres
Upstream supply chain	Micro-consolidation centres
Click & collect at store	Locker boxes / locker banks
	Pick up drop off (PUDO) parcel shop

2.2 Procurement led solutions

2.2.1 Collective and collaborative procurement

Collective and collaborative procurement is used interchangeably but they can actually result in two different kinds of consolidation. The former consists of a group of organisations or businesses (e.g. members of a Business Improvement District or a Chamber of Commerce) who individually purchase goods and services from only a small, carefully selected choice of suppliers.

³ Cadotte, E.R., Robicheaux, R (1979) Institutional issues in urban freight consolidation, in International Journal of Physical Distribution & Materials Management, Vol.9 issue 4, pp.158-168.

For example, consolidation is achieved when this group purchase all their stationery supplies from a single supplier instead of multiple different suppliers. By using a single stationery supplier, fewer vehicles are needed to deliver these products in the area, which can also lead to a reduction in congestion.

Collaborative procurement refers to a group of organisations or businesses who agree to jointly purchase goods and services from only a small, carefully selected choice of suppliers. In other words, one contract per organisation but their orders are combined with other businesses' orders so that deliveries arrive together, on a single vehicle (e.g. delivery to an office block with multiple tenants).

For example, the disposal of waste generated by individual businesses is the responsibility of these businesses. As a consequence, many businesses appoint different waste contractors, even though they may be located on the same street. Procuring a single supplier for waste removal and recycling on the same street will result in a reduction in movements on that street. It also increases the levels of safety (particularly for cyclists and pedestrians), improves air quality and delivers financial benefits for the businesses involved in procuring these services.

A major benefit of purchasing goods and services through a consortium of like minded organisations is that it increases buying power and usually results in lower prices.

Case study examples:

London Borough of Camden – procurement

2.2.2 Increasing the size of orders

Across most towns and cities, space has been decreasing. Property and rental prices per square foot in London are some of the highest of any city in the world. Commercial premises are rarely designed with significant storage space for consumable items such as stationery and this has resulted in businesses frequently placing orders when stock is near depletion. This in turn leads to the requirement for more frequent deliveries. Businesses should make efforts to create an element of storage space and consider increasing the order size of fast moving consumable items to hold in stock to reduce the frequency of deliveries.

Case study examples:

London boroughs consolidation centre

2.2.3 Bunching orders

A simple solution that does not involve a major change in procurement processes is to agree with suppliers that regardless of the multiple number of orders placed during a given time period, the supplier only fulfils the orders on a given day or date. Individual orders are therefore combined so that they arrive together, on a single vehicle. This reduces the overall number of vehicle trips required and associated emissions.

2.2.4 Nominated carriers

A nominated carrier is where a carrier (delivery company) is selected and appointed / nominated by the purchaser. The purchaser instructs their suppliers to use only the nominated carrier for the delivery of goods. The supplier must use the carrier nominated by the purchaser. This is common practice has been used in the airfreight industry for decades and grants full control over delivery arrangements to the buyer / receiver.

The nominated carrier technique is suitable for all types of organisations. Its effectiveness is increased if businesses located in a specific area collaborate and agree to use the same nominated carrier for all their deliveries and collections. It eliminates the issue of a large number of carriers duplicating each other's paths in an area with partially filled trucks or vans.

A nominated carrier scheme also makes it easier to introduce retimed deliveries to premises where the owner and/or occupier is unable to provide staff members to receive goods during so-called 'unsociable' hours. When combined with the introduction of security protocols (e.g. Criminal Records Bureau checks for drivers), access to unmanned premises can be arranged with trusted carriers.

A good example of where this approach has been working for many years is within the Banking industry. The UK's major clearing Banks have contracted one logistics provider to collect and deliver sensitive documents such as cheques and legal correspondence to and from all their branches. This logistics activity predominantly takes place in the early hours of the morning and after the branches have closed in the evenings. Strict vetting and security protocols have been implemented and perfected to allow drivers access to branches, including the carrying of keys and access to alarm codes.

2.3 Upstream supply chain

The sharing of transport resources through collaboration between businesses can lead to a reduction in vehicle trips, financial and environmental savings. United Biscuits and Nestle, companies that compete with each other in a number of market sectors, have demonstrated upstream supply chain collaboration. The two companies share load capacity on vehicles on routes where the vehicle capacity is not fully utilised. One such single initiative (see case study in Appendix A) resulted in an annual saving of £250,000 in fuel costs and an annual reduction of 250 tonnes of CO₂.

Another example of supply chain collaboration is a pallet exchange. Several shippers and receivers, with each party assuming responsibility for the total inventory of pallets, exchange their pallets on a one-for-one basis. Each transaction is recorded and documented. Exchanging pallets in this way provides cost savings in terms of staff, off loading time, no capital outlay for one way pallets, storage costs and improved handling processes.

Case study examples:

Nestlé and United Biscuits (UK)

2.4 Collect+, Duddle and Click & Collect services

The exponential growth of e-commerce, coupled with the high failure rate of deliveries to homes, has led to the development of new delivery services by companies such as Collect+ and Duddle. These services consolidate deliveries from e-tailers to a single location with collections from the customer.

A growing number of retailers are offering Click & Collect services within their stores or car parks because it encourages consumers to order online and visit their stores to collect their deliveries. This practice reduces retailers e-fulfilment costs as their customers do the 'hard work' of getting the item to the end destination by collecting and transporting their purchases. Retailer, Argos and online retailer EBay, are working together to enable EBay customers to order their goods online and pick-up / drop off in an Argos store. The benefit to customers of this arrangement includes more flexibility and security; Argos benefits from a higher footfall within its stores.

Click & Collect services also reduce the number of delivery vehicles on the road as items are sent in bulk to collection points. However, this may also result in an increased number of consumer vehicle trips as not all trips are carried out by environmentally friendly forms of transport.

2.5 Urban consolidation centre (UCC)

Browne et al⁴ describe a UCC as:

"A UCC is a logistics facility that is situated in relatively close proximity to the urban area that it serves. The area it serves could be a city centre, an entire town or a specific site such as a shopping centre, airport, hospital or major construction site. Goods destined for these locations are dropped off at the UCC who sort and consolidate these goods and make the delivery to the final destination."

4 Allen, J., Browne, M., Woodburn, A., Leonardi, J. (2012) The Role of Urban Consolidation Centres in Sustainable Freight Transport, Transport Reviews: A Transnational Transdisciplinary Journal, DOI:10.1080/01441647.2012.688074

UCCs are beneficial in that they can reduce deliveries by up to 70% and can potentially reduce costs for both the purchaser and supplier. Many UCCs aim to reduce congestion and their own greenhouse gas emissions through the use of environmentally friendly vehicles (e.g. electric trucks and vans). There are also benefits to customers including higher visibility of goods, storage, dealing with waste and packaging, performing securing screening checks, bundling and re-packaging and inventory control.

Having all deliveries made to a consolidation centre (thereby reducing the number of deliveries arriving at a building) frees up staff time for more valuable and productive tasks. Consolidation centres also find it easier to schedule deliveries to arrive outside normal opening hours, thereby further reducing the disruptive impact on staff and customers (eg Regent Street).

Case study examples:

London boroughs consolidation centre

2.6 Micro consolidation centre

The consolidation of goods at a facility much closer to the delivery point (not outside the city boundaries as is typically the case with UCCs) is referred to as micro consolidation. Micro consolidation centres usually serve smaller size areas, handling relatively small and light weight goods.

One of the advantages of a micro consolidation centre is that larger size vehicles can drop off deliveries at the centre during less busy hours (e.g. during the night). This avoids the need to travel on congested roads and amongst vulnerable road users during busier times.

A further significant benefit is that the typical close proximity of the micro consolidation centre to the area served facilitates the use of current generation of clean vehicles such as cargo bikes or small electric vans.

In London, Gnewt Cargo is a logistics service provider operating last mile deliveries in Central London. As of June 2015, Gnewt Cargo was the single biggest operator of a 100% electric van fleet for urban freight in the UK. Gnewt is often described as the 'carrier's carrier' because it delivers parcels for several major parcel businesses (namely Hermes, TNT and DX). The area it covers focuses around the London Congestion Charge (LCC) zone.

In France, Geodis (a large Logistics company) has set up a series of micro consolidation centres in Paris, all using a combination of small electric vans and cargo cycles (see the Distripolis case study in Appendix A). Results are encouraging, with greenhouse gas emission savings of 85 per cent. Geodis intends to roll the concept out to some 30 towns and cities in France.

Case study examples:

Distripolis

2.7 Lockers

The concept of a locker bank was first developed for the servicing industry to enable tradesmen to collect spare parts without having to go to a warehouse. Lockers are now used as a point of consolidation for home deliveries. The recent increase in the installation of locker banks was in response to the large proportion of failed e-commerce deliveries to home addresses. Locker banks placed near or outside large residential buildings can be used as a common delivery point. This means that deliveries can be consolidated in one location, close to the final delivery address and accessed at a time that is convenient for the user. This enables delivery drivers to carry out multiple deliveries during a single stop and reduces the time, distance, fuel consumption and emissions generated. There are some locations, particularly within central railway stations where the use of locker banks may be prohibited due to safety reasons. This is a particular issue for London and tests are being undertaken to assess how well locker banks can withstand an act of terrorism. Other cities, including the City of Leuven, do not share the UK's same concerns and locker banks are available within the railway station. Deliveries to locker banks can also be made during less busy hours (e.g. during the night). This avoids the need to travel on congested roads and amongst vulnerable road users during busier times.

Case study examples:

Bentobox - Berlin

2.8 Case studies

The available literature and research reports have tended to focus on describing UCCs and their impacts and contributions towards more efficient deliveries at the expense of other types of consolidation. Solutions such as collective and collaborative procurement, upstream supply chain practices, micro consolidation, click and collect and locker boxes are yet to be examined to the same level of detail and their impacts analysed and reported.

The case studies accompanying this report reflect this imbalance. Furthermore, as the application of such solutions within a city logistics environment is still relatively new, it is an area that needs further attention due to the rapid increase in delivery activity.

A summary of the case studies included in Appendix A is outlined in Table 3.

Table 3: Case study summary

Name	Solution, sector, features, benefits
Heathrow Airport consolidation centre	<p>Consolidation solution: As part of their lease agreement, the airport retailers and their suppliers have access to the off-site consolidation centre.</p> <p>Sector: Retail</p> <p>Features: An overloaded central terminal area and single tunnel access. Poor infrastructure. A lengthy and unpredictable delivery service.</p> <p>Benefits: 66% reduction in the number of vehicle movements to airport terminals. Reduction of 22 tonnes of CO₂ emissions per year. Improved air quality. Reduced traffic and congestion and disruption.</p>
London boroughs consolidation centre	<p>Consolidation Solution: Consolidation of suppliers. Mandatory use of off-site consolidation centre for all council premises. Ban on staff receiving personal deliveries in the workplace. Reduced delivery schedule to buildings.</p> <p>Sector: Initially public sector organisations but now open to interest from all sectors</p> <p>Features: Poor air quality, congestion, inefficient supply chain, cost savings.</p> <p>Benefits: Procurement savings from reduced supply distances. Procurement savings from a reduction in suppliers. 46% reduction in the number of vehicle trips delivering to council sites. 45% reduction in the total distance travelled by delivery vehicles, resulting in decreased emissions. Over 70% utilisation in vehicle capacity. Scheduled deliveries, easing the burden on receptions and post rooms and freeing up staff for more productive tasks.</p>
One Hyde Park	<p>Consolidation solution: Construction consolidation centre</p> <p>Sector: Construction</p> <p>Features: Congestion (on and off-site), limited access points, limited capacity on-site for storage of materials, restricted lay-down space on site for materials, restricted hours for deliveries.</p> <p>Benefits: 66% reduction in on-site construction vehicle movements. 100% on-time deliveries. Effective waste management through reverse logistics. 13.8 tonnes of recyclable waste was returned to the consolidation centre.</p>

Name	Solution, sector, features, benefits
Veolia's temporary waste consolidation centre at the Olympic Park	<p>Consolidation solution: Temporary consolidation centre</p> <p>Sector: Waste consolidation</p> <p>Features: Mobilisation and construction of a waste consolidation centre in a short timeframe. Recovering 90% of all waste produced at the site.</p> <p>Benefits: Opportunity for the Olympic Delivery Authority (ODA) to raise the bar for standards of construction waste management on this scale and contribute to waste industry benchmarks for sporting venues. Over 95% of construction waste was recycled, equating to 28,970 tonnes of materials. Vehicle movements reduced by over 80%. 2,300 tonnes of timber, plasterboard, paper and card was removed from site by water. 124 tonnes of materials was re-used by local charities.</p>
Booker case study	<p>Consolidation solution: Recycling services (including cardboard, plastics, shrink-wrap and used cooking oil).</p> <p>Sector: Retail</p> <p>Features: Supporting Booker's customers with their environmental targets and helping them to save money.</p>
City of Bath urban consolidation centre	<p>Consolidation solution: a voluntary UCC serving the city's retailers and offices using electric vehicles. A delivery management system in place to increase the number of consolidated deliveries.</p> <p>Sector: Retail and offices</p> <p>Features: Poor air quality, noise pollution, damage to the fabric of historic buildings and tackle congestion.</p> <p>Benefits: Significant reductions in emissions, 55.7% reduction in vehicle fuel consumption, reduced noise pollution and significant reduction in delivery trips.</p>
Nestlé and United Biscuits (UK)	<p>Consolidation solution: collaboration between two competitors to eliminate empty trailer journeys.</p> <p>Sector: Food</p> <p>Features: Inefficient supply chain.</p> <p>Benefits: Elimination of 28,000kms of empty trailer journeys. 95,000 litres of fuel saved. Reduction of 250 tonnes of CO₂. £300,000 saved in fuel and other costs.</p>

Name	Solution, sector, features, benefits
Bentobox – Berlin (Germany)	<p>Consolidation solution: A locker bank that can be used as a mobile solution in residential districts, shopping and office areas.</p> <p>Sector: Retail</p> <p>Features: Poor air quality, noise pollution, road safety incidents.</p> <p>Benefits: No increased costs to service providers or their customers. Facilitates the replacement of vans with bikes. No deterioration in service levels. Facilitates out-of-hours movement of freight. Reduces congestion and emissions. Can result in earlier accessibility to goods for recipients. Reduces the number of failed deliveries, particularly in city residential areas and reduces the risks of road safety incidents.</p>
City of Brussels Urban consolidation centre (Belgium)	<p>Consolidation solution: Supplier deliveries are routed via a freight consolidation centre servicing Brussels City Centre</p> <p>Sector: Retail</p> <p>Features: Pollution, congestion, uncoordinated deliveries by multiple suppliers to independent retailers in Brussels</p> <p>Benefits: Reduction in freight vehicle trips into the city centre. Reduced emissions. Efficiency gains for delivery companies through reducing the time required for deliveries into the city.</p>
Copenhagen’s urban consolidation centre (Denmark)	<p>Consolidation solution: Establishment of an urban consolidation centre. Use of electric vehicles and delivery management system to increase the number of consolidated deliveries. Offering storage and other value added services to customers.</p> <p>Sector: Multi sector approach</p> <p>Features: Poor air quality, Copenhagen’s 2025 Plan for it to become carbon neutral by 2025, congestion.</p> <p>Benefits: Improving air quality, reducing congestion and supporting local government’s air quality management plan.</p>
Distripolis (Paris, France)	<p>Consolidation solution: GEODIS, a large road transport operator, set up a number of micro consolidation centres strategically located within the city centre of Paris. Electric and hybrid vehicles are used for the final mile deliveries.</p> <p>Sector: Multi sector approach</p> <p>Features: Congestion and pollution.</p> <p>Benefits: Reduced congestion, 85% fewer greenhouse gas and particulate matter emissions. Reduced noise.</p>

Name	Solution, sector, features, benefits
Hammarby Construction consolidation centre (Stockholm, Sweden)	<p>Consolidation solution: A compulsory storage and delivery facility for construction materials</p> <p>Sector: Construction</p> <p>Features: Congestion and poor air quality.</p> <p>Benefits: Reduced traffic and emissions. Vehicle load factor improved from 50% to 85%. Vehicle km per day reduced from 64 to 24km. Materials delivery time reduced from 60 minutes to 6 minutes.</p>
Municipality of Borlänge (Sweden)	<p>Consolidation solution: Goods (food) are now procured on an Ex-Works basis. The Municipality procures its own transport services for delivery of the goods, which are delivered to a single site distribution centre and consolidated for delivery. Deliveries are made during the night or early hours of the morning.</p> <p>Sector: Public</p> <p>Features: Road safety, trucks making deliveries to schools during day time, disruption to school staff having to receive deliveries during the day, poor air quality</p> <p>Benefits: Procurement savings through control of the supply chain. A reduction in 'food miles' through consolidation and planned vehicle routes. Up to 75% reduction in the number of individual deliveries made. Decrease in emissions. Scheduled out-of-hours deliveries, easing the burden on staff and freeing them for more productive tasks. An increase in food suppliers based locally, resulting in increased competition and lower food prices.</p>
Principality of Monaco's freight depot (Monaco)	<p>Consolidation solution: A compulsory freight consolidation depot for use by vehicles over 8.5 tonnes</p> <p>Sector: All</p> <p>Features: Poor air quality and congestion.</p> <p>Benefits: 26% reduction in fuel consumption by goods vehicles. 30% reduction in atmospheric pollution. 30% reduction in vehicle noise pollution. 38% reduction in traffic congestion. 42% reduction in the space used by vehicles making deliveries.</p>

Why consolidate?

This section examines the key reasons why organisations implement consolidation solutions. The key factors include safety, congestion, environment, operational efficiency, planning condition and security.

3.1 Safety

The Mayor of London issued the London Road Safety Plan 2020, which calls for a 40 per cent reduction in killed or seriously injured (KSI) people by 2020. This represents over 10,000 casualties over the period of the plan. An increase in consolidation activity can lead to reduced numbers of commercial vehicles on London's roads, which will be beneficial for vulnerable road users.

Approximately 600,000 cycling trips are currently taking place in London every day. TfL estimates that this could be increased up to a potential 4.3 million trips and is investing £913 million over the next few years to facilitate this step change in cycling. The Mayor is currently targeting an increase to 1.5 million cycling trips per day by 2026.

A significant and sustained increase in consolidation activity will help to reduce the number of commercial vehicles on London's roads. Considering the shift to more sustainable modes of travel (e.g. walking and cycling), a reduction of commercial vehicles, in particular HGV's, will help to reduce the risk to these vulnerable road users.

Case study examples:

Municipality of Borlänge (Sweden)

3.2 Congestion

Commercial vehicles represent 16 per cent of all traffic in London. However, during the morning peak, they make up 28 per cent of vehicles on the road. Consolidation and re-timing measures have been identified by the Roads Task Force as key tools to reduce the impacts of congestion⁵.

The convenience, ease and popularity of online shopping means that consumers today can expect to purchase and receive virtually anything they want, where and when they want it. According to PwC⁶, the UK parcels market has risen from about 1.3bn items in 2005 to 1.7bn items in 2012 and is expected to accelerate to 2.3bn items by 2023. This rising customer demand, facilitated by the growth of e-commerce is causing a significant increase in van activity in the Capital.

⁵ <https://tfl.gov.uk/cdn/static/cms/documents/londons-street-family-chapter-3-3.pdf> [accessed 13.07.15]

⁶ PwC (2013) The outlook for UK mail volumes to 2023

<http://www.royalmailgroup.com/sites/default/files/The%20outlook%20for%20UK%20mail%20volumes%20to%202023.pdf> [accessed 16.03.15]

It is clear that most retailers do not currently perceive traffic congestion as a problem that they are contributing to and will therefore not act until customer service levels are negatively impacted.

Case study examples:

Bath and Bristol urban consolidation centre

3.3 Environment

Environmental factors are a major driver of change in the transport sector. The Climate Change Act 2008 established a long-term framework to reduce the UK's greenhouse gas emissions by at least 80%, compared to 1990 levels, by 2050. The government's response to meet these targets was the Carbon Plan⁷. The Carbon Plan includes numerous measures for implementation in private and public transport including investment for low emission vehicles, green buses and fuel efficiency.

In March 2015, the Mayor approved the proposal for an Ultra Low Emission Zone (ULEZ), which will set new exhaust emissions standards and a daily non-compliance charge to encourage cleaner vehicles to drive in central London from September 2020. This was in response to data suggesting that thousands of Londoners die prematurely each year because of poor air quality.

Reducing vehicle trip lengths, promoting the use of low carbon vehicles and using more sustainable modes are important in addressing transport related emissions. An efficient supply chain and the use of modern logistics solutions is promoted.

The aim of consolidation is to reduce the number of commercial vehicles entering the city. Any environmental benefits achieved by increasing consolidation in its various forms will have positive effects on air quality.

Case study examples:

Principality of Monaco freight depot;

Copenhagen's urban consolidation centre;

Booker Cash and Carry

⁷ HM Government (2011) The Carbon Plan: Delivering our low carbon future, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf [accessed 16.03.15]

3.4 Operational efficiency

Consolidating products from their point of origin or at a consolidation centre can realise cost savings. This is a valuable process as it also helps to minimise commercial vehicle activity and the congestion and emissions associated with deliveries.

Increasing order sizes (e.g. buying in bulk) or instructing suppliers to make only one or two deliveries per week (instead of daily) will reduce the number of vehicle trips to a specific location. It can also generate financial savings for organisations.

A significant benefit for receivers using a consolidation solution is the convenience of receiving all their supplies as a single delivery. This frees up staff time to undertake other, more valuable and productive tasks. In many instances, consolidated deliveries can also be scheduled to arrive outside normal opening hours, which reduces the disruptive impact on staff and customers of dealing with deliveries. Further research is required to better understand the direct and opportunity costs derived from the services provided by consolidation.

Case study examples:

Nestlé and United Biscuits (UK)

3.5 Planning conditions

The Mayor of London published the draft Further Alterations to the London Plan in January 2014⁸ to address key housing and employment issues emerging from an analysis of census data released since the publication of the London Plan in July 2011, and which indicate a substantial increase in the capital's population. The plan addresses the key trends and challenges that London will have to address up to 2036.

The planning process can be used to stipulate the requirement to use consolidation solutions in both the construction and occupation stages. The use of a CCC in the construction phase has been proven to achieve cost benefits including quicker build time, less waste, improved security, reduced losses and damages. When a building is occupied, the use of a UCC can be mandated which, together with restrictions to delivery times, will minimise the negative impact of deliveries to the movement of traffic, cyclists and pedestrians in the immediate vicinity.

Landowners and property management agents have the opportunity to influence the procurement behaviour of existing and future tenants by requiring them to engage in collective or collaborative procurement practices as a condition of their tenancy or lease agreement.

8 Mayor of London (2014) Draft further alterations to the London Plan: the spatial development strategy for Greater London, <https://www.london.gov.uk/sites/default/files/FALP.pdf> [accessed 18.03.15]

3.6 Security

The use of consolidation centre enables security checks to be completed on all inbound goods at sites susceptible to terrorist attack. Items are scanned on receipt of delivery before being transferred to their final destination. Used successfully at Heathrow airport and within a financial institution in the City of London, this technique is also transferable to other large and/or high rise developments.

Case study examples:

Heathrow Airport consolidation centre

Sector based findings of consolidation activity

This section examines the role of consolidation solutions within different sectors. It focuses on the following sectors: construction, retail, waste, hospitality, health, residential and logistics sector (i.e. delivery companies).

4.1 Construction

The operation of a Construction Consolidation Centre (CCC) is relatively straight forward. Materials are delivered directly to the construction consolidation centre from the supplier. Materials are then combined into work packages for the construction site. All materials are checked to ensure they are as specified and damage-free, so the construction site team can be assured that all building materials delivered are immediately available as required and fit-for-purpose. The CCC then delivers the materials to the construction site. If the CCC operates reverse logistics, the delivery vehicle can be loaded with waste to take on the journey back.

The use of a CCC produces significant benefits, including reductions in freight traffic to construction sites by over 70 per cent. This was demonstrated both by the One Hyde Park and Stockholm Construction Consolidation Centre (Sweden) (see case studies in Appendix A). According to a report produced by WRAP⁹, CCCs increase productivity of site labour leading to an average of 6% productivity gain and reduce waste between 7-15% due to less material damage and shrinkage. Deliveries from the CCC are made 'just-in-time', which minimises on-site storage requirements and downtime, as the construction workers have what they need when they need it. CCC can also address security concerns at sites by ensuring everything is checked in advance. Road miles and carbon emissions of heavy construction traffic is also reduced through the use of a CCC.

In 2005, the London Construction Consolidation Centre (LCCC) was established by four project partners, including TfL, Wilson James Ltd, Stanhope Plc and Bovis Lend Lease¹⁰. It was located in South Bermondsey and its objective was to supply construction materials to major construction sites in London. The aim of the project was to understand and demonstrate the potential benefits and impacts reductions that such a scheme could provide. Following the success of the pilot project, Wilson James relocated the centre to a more accessible location in Silvertown, East London. The centre is the only consolidation centre in London dedicated to supporting the materials management for multiple construction projects in the capital. Since it started operating, the centre has reduced the number of suppliers vehicles travelling to the construction projects it supports by 68%.

Case study examples:

One Hyde Park

Hammarby construction consolidation centre (Stockholm)

⁹ Wrap, (2011) Using construction consolidation centres to reduce construction waste and carbon emissions, <http://www.wrap.org.uk/sites/files/wrap/CCC%20combined.pdf> [accessed 18.03.15]

¹⁰ TfL (2008) London Construction Consolidation Centre – Final Report, <https://tfl.gov.uk/cdn/static/cms/documents/lccc-final-report-july-2009.pdf> [accessed 18.03.15]

4.2 Retail

Freight consolidation by big retailers is advanced but takes place in isolation, each with separate carriers and third-party logistics service providers. The environmental impact of supply chains can be reduced when retailers share assets such as transport, warehouses and regional distribution centres. By building up high volumes of goods, retailers can make better use of trucks and possibly substitute them by more ecological means of transport.

Large retailers most often operate their own logistics services. Most of the retail chains organise their logistics plans to deliver goods to their stores. They are invariably engaged in Click & Collect as well as home delivery service offerings for their customers. The majority of the volume for the retail chains' stores is consolidated at a retail distribution centre and transported by private or dedicated carriers. Capacity utilisation rates on delivery vehicles operated by or on behalf of large retailers are usually very high.

For smaller, independent retailers, products are usually delivered by parcel carriers that deliver goods on behalf of a shipper from whom the retailer ordered. The retailer does not receive its goods in one consolidated load, but receives the goods from different suppliers via different carriers at different times of the day. In this context, retailers are rarely involved in consolidation practices and unaware that they cause unsustainable transport activity through the ordering of their goods. An independent retailer will usually receive several less-than-full truck or van load deliveries per day.

Existing consolidation services provided to retailers such as in Regent Street, Meadowhall Shopping Centre and Bristol and Bath (see case study in Appendix A) have reduced vehicle delivery journeys to individual retailers by over 70%. Regent Street and Meadowhall Shopping Centre consolidation centres operate on a commercial basis by focusing on the value-added services provided to retailers, like unpacked, shop-floor ready stock. The Bristol and Bath centre is in receipt of public sector funding from the two local authorities and the European Union (e.g. via funded projects and programmes such as CIVITAS). The centres have helped to reduce congestion and create a more pleasant environment for shoppers. The retailers have also benefited from having their recyclable waste removed by the consolidation centre vehicle.

Heathrow airport has seen a 75 per cent reduction in the number of vehicles delivering to the airport as a result of a consolidation scheme (see case study in Appendix A). Retailers operating within the airport receive more effective, on-time deliveries on high security shared-user vehicles. With such positive commercial and environmental benefits, this type of solution could be adopted not only by other airports but also by retailing operations with similar congestion problems such as those based in city centre locations. The consolidation scheme also addresses security concerns as all items are scanned and checked at the consolidation centre before being transported to the airport.

The food retail sector imposes constraints that do not apply to non-food supply chains, especially for goods that require temperature controlled technology. However, there are significant differences in the logistic practices adopted by large and small food outlets. Big outlets (e.g. restaurant chains) tend to organise their own logistics operations or adopt collective procurement practices in the constant pursuit of reducing costs.

For smaller outlets that are usually concentrated in inner city areas, collective procurement and consolidation are rarely adopted as a private initiative. Short lead times and specific handling requirements, as well as regulatory constraints, limit their economic viability. In addition, the high number of suppliers and receivers directly affects the feasibility of coordinating food logistics operations. As a result, the majority of consolidation activities focus on non-perishable goods.

Case study examples:

City of Brussels urban consolidation centre

Heathrow Airport

4.3 Waste

An increase in government regulations and the focus on sustainable logistics have also raised the profile of waste management within the supply chain. Although deliveries of goods are still receiving most attention, retailers are responsible for the entire life cycle of their products.

According to a survey conducted among high street businesses in Winchester in 2008, waste collection generated the second highest number of vehicle trips per business, second only to post deliveries. More specifically, each of the 74 business surveyed, was receiving on average 7.6 service visits per week, 2.4 of which were for waste collection. It was found that 17 different waste contractors were involved in the removal of recycling material alone.

Most recycling facilities merely collect recyclable materials from national and international retailers without any coordination of activities. Within the retail sector, there could be considerable benefits from coordinating waste take-back where competing retailers can identify common or compatible waste categories. One innovative example involves Booker Cash & Carry (see case study in Appendix A). They are now providing recycling facilities for their customers at their branches, enabling their customers to save up to £1,400 per year in fees.

Case study examples:

Veolia's temporary waste consolidation centre at the Olympics Park and Booker Cash and Carry

4.4 Hospitality

There is an opportunity to introduce more consolidation solutions into the food and drink sector within London. An innovative scheme in Borlänge, Sweden (see case study in Appendix A) decided to improve the food distribution system to its schools, kindergartens and adult social centres. All goods, including perishable products, are delivered to a locally procured distribution centre, which acts as a consolidation facility. This has reduced the number of individual deliveries made to receivers by 75 per cent. A significant reduction in 'food miles' and decreased emissions were achieved. Through scheduled out of hours deliveries the burden on staff was eased by freeing them for more productive tasks during the normal working day. Although the scheme in Sweden is aimed at the municipal sector, it can be adapted to the food and drink sector as a whole.

In the UK, there are examples of consolidation schemes operating within the hospitality sector. In 2006, Wetherspoon set up its own national distribution centre to minimise the number of deliveries to its pubs and control the frequency and timings of deliveries in and outbound. All deliveries and supplies are consolidated into one hub. Vehicles return from the pubs with recycled waste and its disposal is managed at the distribution centre.

Case study examples:

Nestlé and United Biscuits (UK)

4.5 Health

Despite the fact that there is a significant amount of literature dedicated to hospital logistics, there are very few examples (apart from NHS Supply Chain) of consolidation in the health sector.

Five per cent of all traffic within the UK can be attributed to the healthcare industry¹¹. In order to respond to the unpredictable nature of demand, hospitals often follow inefficient operating practices such as the holding of very large stock levels to prevent exhaustion of medical supplies. In cases when critical items that have been ordered are out of stock, additional ad-hoc deliveries are required, resulting in sub-optimal vehicle load factors.

4.6 Residential

The widespread adoption of online shopping over the past few years has generated a significant demand for dedicated delivery services to the end consumer. For the business to consumer market, home deliveries constitute the most problematic solution in terms costs and organisation. Home deliveries have significant environmental impacts, especially when the first delivery effort is not successful. According to Edwards et al¹², a second delivery attempt can increase emissions

¹¹ Bailey, G., Cherrett, T., Waterson, B., Long, R., (2013) The Hidden Life Saver? Unattended locker box logistics for faster and more efficient hospital supply, TRB 2013 Annual Meeting.

¹² Edwards, J., McKinnon, A., Cherrett, T., McLeod, F., Song, L., (2010) Carbon dioxide benefits of using collection-delivery points for failed home deliveries in the UK, Transportation Research Record 2191.

from 9% to 75% for an order depending on the delivery failure rate. In fact, the vast majority of emissions associated with failed home deliveries arise from the personal trip to the depot by a customer collecting a missed delivery. In the worst-case scenario, Edwards et al state a 25 miles journey to a depot emits the equivalent of 26 failed van deliveries in CO₂¹³.

Although home deliveries are usually the preferred option chosen by online shoppers, there are some alternatives that are quickly gaining popularity pick-up point networks or collection delivery point networks operate through local shops (convenience stores, railway stations, dry cleaners, newsagents) where packages are delivered for collection during the opening hours of their host businesses. This allows residents to collect their delivered items at a time that is convenient to them, without having to rearrange a delivery or drive to a local depot. Refer to Appendix A for an innovative example of mobile locker banks (Bentobox) and Click and Collect services.

Another preferred option chosen by some residents is to have their deliveries sent to their place of work as this guarantees their receipt of delivery and avoids returning home to find a failed delivery card. As the growth in e-commerce continues to rise, staff receiving their deliveries in the workplace places additional strain on the organisation's facilities management and mail room teams. It also creates additional costs for the organisation in terms of managing the delivery and raises concerns about liability and security. Whilst some organisations feel they are offering their staff an additional service and reducing the number of failed deliveries in residential areas; others have introduced policies preventing this activity. TfL and the London Borough of Camden are two such organisations that request their staff do not arrange for their personal deliveries to be sent to their place of work and recommend the use of Collect+, Doodle or Click and Collect services as alternative options.

Case study examples:

Bentobox (Germany)

4.7 Logistics (delivery companies)

Carriers are already used to organising their deliveries efficiently for economic and operational reasons and they see no need for additional consolidation measures. This reduces their willingness to participate in consolidation activities as they perceive that adding additional steps to their 'already efficient' processes detracts from the delivery on time performance they offer and adds additional costs.

According to van Rooijen and Quak¹⁴ only around 20 per cent of carriers are willing to use a UCC, which limits the commercial viability of such schemes. Even if policy restrictions are in place, many carriers still prefer to deliver directly to the stores.

¹³ Op.cit.

¹⁴ van Rooijen and Quak (2010) Local impacts of a new urban consolidation centre – the case of Binnerstadsservice, *Procedia Social and Behavioural Sciences*, 2, pp5967–5979.

Overview of key findings

Our research, together with a review of the Case study examples listed in Appendix A showed a number of key findings and lessons that have been learned from this study. These may be useful for other organisations that are planning to introduce a consolidation solution.

Our review of consolidation solutions shows that most UCCs started as a demonstrator project and needed either a subsidy, regulations or circumstances (e.g. historic towns with narrow streets) to operate longer term. Barriers to large-scale implementations of such schemes are often related to commercial viability and property or rental prices of centrally located logistics depots. The size, transferability, knowledge of business cases and involvement of the right stakeholders affect the chances of success too.

Until recently, very little work has focused on the potential benefits to large municipalities of consolidating deliveries off-site for inward delivery. As the London Borough's Consolidation Centre scheme demonstrates (see case studies in Appendix A), working with neighbouring organisations in joint procurement and consolidation has the potential over the longer term to reduce costs, streamline ordering processes, enhance collaborative working and minimise environmental impacts.

The benefits of micro consolidation centres and procurement driven solutions (e.g. collective / collaborate procurement, nominated carriers, bunching of orders) has hardly been reported on. This is surprising considering the potentially significant benefits achievable for relatively little investment.

Other advantages of consolidation include the possibility for smaller businesses to retime deliveries. Consolidation increases vehicle load rates and can facilitate the uptake of cleaner vehicles.

5.1 Lessons learned from successful schemes

The procurement process is a powerful tool which can force behaviour change. Using solutions such as nominating carriers, collective and collaborative procurement and bunching orders are likely to be the most cost effective methods to achieve consolidation. They require the least amount of investment and have the highest probability of generating a financial return. They do not affect the operation of a business, if anything, enhance it as they free up staff time for more productive tasks. Furthermore, they also achieve the benefits of a reduction in congestion, emissions and less risk to vulnerable road users.

Using the procurement process to request suppliers provide a variety of delivery options within their tender documents (e.g. daily deliveries, delivery to desk, delivery to a single consolidated address, collection of orders by the recipient and bulk delivery) results in greater transparency of delivery costs. For example, the delivery of multiple orders to a single central location enables suppliers to achieve savings, which could be shared with the purchaser.

Setting up a UCC requires investment in premises (or shared space), staff resources and vehicles. For cost reasons, the trend over recent years has been to rent shared space in under-utilised warehouses, car parks (for example Gnewt Cargo) and railway arches. Many centres have been funded at the outset through public subsidies and have ceased operations when this funding stream stopped as volumes of goods passing through the facility have not been sufficient. Sustained long-term public (or private) funding may have to remain in place, particularly for those centres that are required for security screening purposes.

Consolidation centres are most effective and sustainable if they offer additional services. For example, providing storage for retailers who lack space within their own premises or who have to rent storage space for stock items elsewhere. Other value-added services include providing a collection service for recyclable waste, pick and pack, label printing, security tag/RFID attachment to garments and the handling of store recalls (see 4.2 Retailers - Regent Street).

Multiple benefits are derived from consolidation schemes in the construction industry. The implementation of the London Construction Consolidation Centre (LCCC) demonstrated the number of vehicles travelling directly to the construction site reduced by 68%. The LCCC contributed to an improvement in delivery times, increased the reliability of deliveries which improved the productivity of the labour force on site. Although the use of CCC's is recommended for large developments, freight activity at smaller size construction projects is generally not included in this loop. It would be appropriate to investigate whether builders merchants (e.g. Jewson's) are providing or could provide consolidation services for smaller developments.

Existing consolidation centres deliver greater benefits to smaller businesses as they have smaller and more fragmented deliveries. This is a relatively unattractive market for general logistics and parcel delivery companies as they need to market this service to large numbers of customers to generate sufficient volumes. This type of activity may be more suited to final mile solution specialists.

Click & Collect, Locker Bank and PUDO services could reduce the number of vehicles on the road as items are sent in bulk to collection points. However, this may also result in an increased number of vehicle trips carried out by consumers and not all such trips are carried out using environmentally friendly forms of transport. It is therefore uncertain whether or not these types of services achieve the aims of consolidation.

5.2 Lessons learned from unsuccessful schemes

Only a very small number of consolidation centres continued to operate after the period of subsidy ended. When no structural long-term subsidies are available, or no regulatory conditions restrict transport operations, the likelihood of the creation of privately funded consolidation centre operations is low.

The imposition of regulations to support consolidation efforts does not guarantee their success. It is necessary to apply policies that provide incentives for promoting consolidation activity while supporting free competition.

As demonstrated by the Vicenza example¹⁵, where the city adopted extreme restrictive measures without linking them directly to the promotion of the UCC, such restrictions were imposed gradually, they did not take into account the competition between private transport companies. This approach led express carriers to take legal action and accuse the local authorities of abuse of power.

¹⁵ Ville, S., Gonzalez-Feliu, J., Dablanc, L, (2012) The limits of public policy interventions in urban logistics: the case of Vicenza (Italy) and lessons for other European cities, 12th World Conference on Transport Research, Jul 2010, Lisbon, Portugal. 13 p.,2010 <halshs-00742857>.

Recommendations

6.1 Introduction

It is clear that consolidation solutions can deliver environmental (air quality, congestion) and social benefits (more pleasant urban realm, safer for vulnerable road users). It is however also clear that the term 'consolidation' with regards to freight activity is frequently perceived by the business community in a negative light (extra costs). This study has reviewed different types of consolidation solutions and found that there are significant knowledge gaps regarding their effectiveness, costs and benefits and ability to facilitate behaviour change.

Dedicated consolidation centres (e.g. UCCs) are the most widely known form of consolidation solution and work well for dedicated supply chains e.g. supermarket RDC, but are the least viable for shared use. Many of the existing examples of UCCs have required public sector funding either for the initial start up phase or for ongoing day-to-day operations. Such funding support is difficult for public sector organisations to justify in times of budget cuts. Our study has highlighted a range of alternative solutions that can be employed. They deliver similar environmental and social benefits as consolidation centres and offer additional financial benefits as well. During these times of continued austerity, these alternative options should be explored.

6.2 Priority groups

TfL's Freight and Fleet team has identified a list of priority groups to be consulted about TfL's policies, programmes and future strategies. Representatives from such groups are invited to attend Freight Forum meetings as well as participate in any trials or events that take place. The groups are:

- TfL, Boroughs, GLA and other public sector organisations
- Construction / major projects
- Business Improvement Districts (BIDs) and area based businesses
- Retailers
- Consumers / residents
- Landowners, developer and managing agent
- Hospitality sector (i.e. hotels, cafes and restaurants)

6.3 Priorities

Identifying consolidation solutions to match each audience group, as defined above, is challenging, as there is not a 'one size fits all' solution for each group. A solution that may work for one organisation within an individual group, but may not be suitable for others. The remainder of this section examines each priority group in detail and identifies which type of consolidation solution is most suitable for their needs. A summary of the recommended solutions by audience type is in Table 4 below, together with an objective view of the scalability of each solution graded as High (H), Medium (M) and Low (L). This report identifies consolidation solutions that could be applied by different priority groups.

Table 4: Potential for use/uptake of consolidation solutions

SCALABILITY	CONSOLIDATION SOLUTION						
Priority group	Nominated carrier	Other procurement	Upstream supply chain	Micro-consolidation	Consolidation centre	Click & collect	Locker banks
Construction/major projects			M		H		
Business Improvement Districts and area-based businesses	H	H		H	H		L
Retailers	L		L			H	H
Consumers/residents						M	M
TfL, boroughs, Greater London Authority and other public sector organisations	H	H	M	H	H		L
Landowner/developer/managing agent	M	M		M	M		M
Hospitality sector	L	L	L		M		

Table 5: Scalability of internal TfL consolidation solutions

SCALABILITY	CONSOLIDATION SOLUTION						
Priority group	Nominated carrier	Other procurement	Upstream supply chain	Micro-consolidation	Consolidation centre	Click & collect	Locker banks
TfL	H	H			H	M	L

Table 6: Key recommendations

Recommendation	Action	Stakeholder group to prioritise
Raise awareness of consolidation solutions and highlight the benefits implementation can achieve.	Create a marketing campaign including tools, guidance, costs and benefits of different consolidations solutions and promote to a targeted audience.	All stakeholder groups
Work with identified stakeholders to implement consolidation solutions that require minimal costs eg procurement led, nominated carrier, planning permission conditions and contractual requirements within leases	<p>Develop working relationships and resources like Business Cases, on how to introduce solutions</p> <p>Publicise to embed as BAU</p>	<p>Primary Public sector BIDs¹⁶ & area based businesses</p> <p>Secondary Construction Landowners Retailers Hospitality</p>
Increase the use of urban consolidation centres	<p>Develop tools to enable stakeholders to mandate the use of UCC including financial models, case studies, examples of clauses to use in planning process, procurement contracts, lease / tenancy agreements. Training and approaches to publicise and secure use as BAU</p> <p>Identify disused land for micro consolidation solutions</p>	<p>Primary Boroughs Public Sector BIDS & area based businesses</p> <p>Secondary Landowners</p>

¹⁶ BIDs are geographical areas in which the local businesses have voted to invest in collectively to improve their trading environment. BIDs provide additional or improved services as identified and requested by local businesses. Services can include extra security, cleaning or environmental measures

Recommendation	Action	Stakeholder group to prioritise
Increase the use of construction consolidation centres	Develop tools to enable stakeholders to mandate the use of CCC including financial models, case studies, examples of clauses to use in planning process, procurement contracts, lease / tenancy agreements. Training and approaches to publicise and secure use as BAU	Primary Major developers / contractors Boroughs
Increase the use of locker banks	Review the possibility of installing unattended locker banks on disused land, car parks and railway stations. Publicise facilities already in existence to increase use	Primary TfL and Network Rail, BIDS, retailers
Large and medium sized employers to implement their own consolidation solutions	Develop a business case to examine other consolidation solutions, including trialling the use of a consolidation centre or joining an existing consolidation centre	Primary: TfL / largest employers Secondary Consolidation centre providers

Appendix A: Case studies

Case study: Heathrow Airport consolidation centre

Retail development within Heathrow airport has increased dramatically over the past ten years, but the infrastructure has seen little change to accommodate this growth. Terminals 1 to 4 at Heathrow were not designed for retail logistics; access is quite restricted and is shared with staff and passengers. There are also insufficient loading bays and limited back-room storage within the buildings themselves.

In 2000, Excel Logistics was chosen to run a consolidation centre trial at the airport. It was so successful that the company won a permanent contract one year later. All deliveries to Heathrow now pass through a mandatory off-site consolidation centre. Retailers receive deliveries according to a schedule or as and when required.

The off-site consolidation centre comprises of 2,325 m² of warehousing at the south east perimeter of the airport. The centre provides multi-temperature storage, covers eight delivery areas and a shuttle-based delivery schedule with a fixed timetable that delivers directly to the stores.

Operations carry on 24 hours a day, 365 days a year and incorporate an innovative recycling scheme. In total, 45,000 deliveries are made per annum and 190 stores are serviced. Heathrow airport has seen a significant reduction in the number of vehicle movements as a result of this scheme. On time delivery performance to the retail outlets is currently 95%. Heathrow has been able to set targets at full implementation of a 75% reduction in the number of vehicles delivering to the airport and a 90% use of vehicle load capacity.

Productivity has also improved greatly through better planning and, in addition to this, the amount of waste and pollutant emissions have decreased.

The impacts of the consolidation centre can be summarised as follows:

- A reduction in vehicles travelling to terminals and driving airside (reduction of 35 vehicle deliveries into the airport per week)
- Faster deliveries for distribution companies (at the consolidation centre compared with shops, calculated to be 234 hours per week saved in making deliveries)
- More frequent and reliable deliveries for retailers in the airport
- Vehicle kilometers reduction (approximately 560 fewer vehicle kilometers travelled per week)
- Reductions in CO₂, carbon monoxide, nitrogen oxide and particulate emissions (weekly reductions of 426 kg of CO₂, 1.06 kg non-methane volatile organic compounds, 3.79kg nitrogen oxide, and 0.28 kg of particulates).

The benefits that have been gained from using the consolidation centre are numerous. There is a 99% delivery success rate, overall project plan reliability has increased by 4% and total transport and logistics costs have been reduced, owing to the elimination of part loads and night-time deliveries, a decrease in supplier handling and a reduction in on-site storage requirements.

Case study: London boroughs consolidation centre

The London Boroughs of Camden, Enfield and Islington have a diverse community to serve and require a wide range of goods and services for their several hundred separate addresses including municipal buildings, libraries, schools, care homes, depots, offices, hostels, day and sports centres, commercial premises and households. Their supply chain consisted of suppliers delivering their goods directly to addresses in the area using their own transport or through parcel delivery and courier companies. In the summer of 2012 the Chief Procurement Officer at the London Borough of Camden embarked on a project to further explore the consolidation centre concept and the feasibility of such a solution for Camden and its borough partners. The project secured funding from two sources, the European Union and the Mayor's Air Quality Fund. The consolidation centre opened in January 2014 and is transitioning from project stage to a permanent solution.

The consolidation centre is located in Edmonton, within the borough of Enfield and provides easy access to the strategic road network. The facility, which is operated by a FORS accredited operator, is open Monday to Friday from 6.30am to 6pm and receives goods on behalf of the councils from its suppliers. The centre collates and consolidates the range of goods received and prepares them for onward delivery to the council's sites on planned and optimised delivery routes, utilising two low emission (Euro V) trucks. These vehicles will shortly be replaced by Euro VI or zero emission capable trucks.

The consolidation activity is performed utilising 2,000 sq. ft. (185 m²) of shared use warehousing space and employs two drivers, one warehouse person and part-time (12 hours/week) administrator. In March 2015, 87 suppliers and 19 delivery companies are using the facility. Throughput is currently between 400 to 500 items per day, of which 6% consist of pallets.

Suppliers deliver into the centre at pre-agreed time slots between 6.30am and 8am with a turnaround time of around 15 minutes per vehicle. Deliveries to end recipients who are spread over an area of 143 km² are made between 9.30am to 4pm. The vehicles capacity utilisation is maximised as they collect returns.

The centre is capable of handling a wide variety of goods, ranging from library books, furniture, gym equipment, retail products, facilities equipment, ICT equipment, documents and mail and cleaning supplies to records, linen, ambient foods, office supplies, stationery and public health literature. Feedback from both suppliers and customers has been positive.

Logistics knowledge within Camden and its partner boroughs was not as advanced as its procurement expertise. Lessons learned through the implementation of this solution include:

- The consolidation model should be procurement led and be included within tender documents.
- Delivery costs are not transparent to buyers.
- Negotiations with suppliers should take account of delivery supply chain savings as a result of suppliers reduced delivery costs.
- Deliveries 'to desk' are expensive and not necessary.

- A freight consolidation scheme can have a greater overall positive outcome than merely converting supplier's fleets to zero emission.
- The collection of waste or goods returns by the delivery vehicles on the return leg maximises the efficiency of the vehicles.
- Zero emission vehicles are not readily available on a short term hire basis.
- Emergency or 'rush' deliveries are not needed if stock levels are managed and orders are planned.
- Staff behaviour change is critically important – sufficient time should be allocated to communications so that staff understand the changes.
- Use a combination of communications channels – intranet, targeted emails, phone calls and workshops.
- Don't try to change too many processes all at once (e.g. minimum order volumes/values).
- Councils should work together with Universities, Business Improvement Districts, Hospitals, Offices and Retailers in their local areas to achieve maximum throughput. Once the facility is in place, adding volume increases the efficiency, cost effectiveness and environmental benefits for all.

Case study: One Hyde Park

Consisting of 86 apartments, spread over four pavilions overlooking Hyde Park and Knightsbridge, the OHP project commenced in July 2006 and was completed in October 2010. During the planning and construction phase, the contractor had implemented logistics best practice to improve material handling, recycling and efficiency.

OHP lies within a severely space-constrained construction site which leads to a number of issues including:

- severe traffic congestion on and off site
- limited access points to site
- limited capacity on site for storage of materials
- restricted lay-down space on site for materials
- limited working hours for deliveries
- neighbours.

Each of these had a detrimental impact on transport, building, costs, waste management, the environment and the ability to deliver the project on time.

Traditionally, a notable proportion of direct deliveries to construction sites are:

- late, sometimes by several hours
- not booked in for delivery
- cannot be accommodated at the site immediately, resulting in a vehicle having to return later.

In 60% of cases, this results in materials not arriving in the right place at the right time and in the right condition. Located in Wembley, the consolidation centre had 8000m² of internal and 3000m² of external storage space. It also provided short term secure storage for all materials used during the fit out phase of construction.

A penalty system, with a set fine per pallet, had been implemented for materials that were stored at the facility for longer than 28 days. This ensured that materials were not left on site beyond the agreed timescale. All specialist trade contractors were required (as a condition of their contract) to support and implement the plan and make full use of the facility.

Operations at the CCC were outsourced to a third party contractor whose responsibilities included:

- managing the delivery and safe storage of materials
- checking the condition of materials received at the facility
- storage of high value and easily damaged materials in a secure area
- delivery of all materials to site, as called off by the trade contractor
- ensuring trade contractors are satisfied with the condition of delivered material
- the return of packaging and pallets to the facility for storage until required for re-use or taken for recycling.

The use of the facility resulted in no materials delivered to the site being out of specification (i.e. materials that do not correspond to the original order made by the subcontractor). As part of the process, supplier deliveries arriving at the facility were logged and stored in the subcontractors designated area of the facility to be matched to the subcontractors' daily requirements.

Regular scheduled vehicle journeys to and from site allowed subcontractors to return any unused materials to the facility rather than temporarily re-sorting and storing materials on site where space was limited. This reduced the likelihood of both accidents and damage to materials. Furthermore, return journeys from the site itself were used to remove recyclable waste from the site to the facility, where it was processed, batched and sold to a waste contractor.

Materials often arrive at a typical construction site damaged as a result of poor handling in transit or insufficient control at point of dispatch. At the Wembley consolidation centre, goods were inspected for damage before being accepted and this process was again repeated at the OHP development. During the development period, no damage to material was recorded at either the consolidation centre or at the OHP development, resulting in zero damaged goods being returned to suppliers.

Case study: Veolia waste consolidation

The Queen Elizabeth Olympic Park is a sporting complex built for the London 2012 Olympics and Paralympics Games. The park is 2.5 km², approximately the same size as London's Hyde Park. The Park was effectively a collection of individual construction sites, each occupied by its own contractor within its own site boundary.

A Waste Consolidation Centre (WCC) was set up on site to achieve economies of scale and minimise the effects of several waste management services operating across the Park.

Veolia invested £1.2 million to build a temporary onsite waste consolidation center and which acted as a centralised waste management service. Veolia was responsible for providing all infrastructure and venue contractors with recycling and waste bins and skips. There was also an on-site management team and fleet of vehicles.

Their team was responsible for collection, consolidating, handling and bulking of materials from the park. Veolia was also responsible for providing hazardous waste collections and road sweeping. Where possible, they removed waste from the site by water via the River Lea, which was then processed at their facility in Essex.

The WCC consisted of two large covered 'sheds' to prevent the waste getting wet and to avoid light items being blown away. It also had a number of other bays outside, which could change size depending on the incoming waste streams from construction.

Process of collecting and consolidating construction waste

- Contractors segregate waste within their site boundary.
- The waste management contractor collected individual waste streams from contractors and transported the waste back to the WCC.
- Before entering the WCC, the waste collection vehicle was weighed on a weighbridge.
- At the WCC, construction waste was consolidated into bays of particular waste streams. Concrete was taken to the on-site crusher for use as aggregates
- When a suitable amount of waste stockpiled, this was then compacted into ISO containers.
- ISO containers were then loaded onto articulated bulkers and transported from site by road, or taken to the on-site wharf for removal by barge.

Waste was directly reprocessed at various facilities around London.

Legislation

To enable the WCC to operate legally, a Paragraph 27 exemption was in place under the Environmental Permitting Regulations 5. This allowed the waste management contractor to bale, compact, crush, and shred or pulverise waste at the WCC.

Lessons learned

- Waste had to be transported on internal roads from the WCC to the wharf, causing double-handling. This was one of the inevitable issues of a space restricted site but it was not an efficient way of handling waste.
- It is recommended that future projects focus on minimising waste through design, procurement and construction.
- Detailed forecasting and reporting is essential for best practice waste management.

Benefit

More than 95% of construction waste from the site was recycled – equivalent to 28,970 tones. Off-site vehicle movements were reduced by over 80% with 2,300 tons of timber, plasterboard, paper and card being removed from site by water. 100% of this waste was recycled and 124 tons of materials were re-used by local charities.

Case study: Booker Cash & Carry

Booker is one of the UK's largest cash and carry operators, offering branded and private-label goods which are sold to over 459,000 customers.

As Booker progressed on its own sustainability journey, it seemed that, while it had made good progress, many of its customers (principally local retailers, pubs, food outlets and small hotels) were struggling with their own environment sustainability objectives. Booker set out to find out why by talking to them, carrying out a series of focus groups and surveys.

It soon became clear that recycling rates, and the costs associated with commercial waste appeared to be the key concerns. Having identified its customers' needs, in 2011 Booker carried out a trial providing recycling centres in its branches to enable its customers to recycle cardboard and plastic.

Feedback from the trial was extremely positive and in 2012, Booker launched their commercial waste consolidation initiative nationally. Customers sign up on an annual basis and can then return their cardboard and plastic to their local branch as often as they need, free of charge.

The scheme allows Bookers customers to recycle their cardboard and shrink-wrap free of charge. All they have to do is sign up for the scheme, then drop their recycling materials off at their local wholesale branch. Booker then send the cardboard and shrink-wrap to their recycling centres using empty trucks that have just delivered food to their branches. This means that transporting the waste is 'zero carbon'.

Since Booker launched the scheme, over 7,500 customers have signed up, and between April 2012 and May 2013, an extra 3,000 tonnes of cardboard and shrink-wrap have been recycled. Each Booker branch has a 'Green Champion' who helps run the scheme. In the first two months of the scheme, over 5,000 customers signed up to the service and started to recycle their cardboard and plastic with Booker. The company forecast that this will rise to at least 10,000 and that Booker will recycle an additional 6000 tonnes of cardboard and up to 500 tonnes of plastic per year as a result.

Booker's used oil recycling scheme has also proved tremendously popular. Over 1 million litres of customers' used cooking oil has been recycled to create sustainable bio-diesel for Booker's fleet and for energy production at its Hatfield Distribution Centre.

Benefits

- Dramatically increases customer recycling rates
- Addresses the barriers preventing customers recycling more
- Educates customers about their impact on the environment, and the increasing costs of landfill
- Delivers enhanced levels of customer satisfaction and profit to Booker customers at low or no cost
- Supports them during a difficult economic period and helps local communities in the UK
- Gives Booker's sales and branch colleagues a new, value added service to encourage visits to branches

Case study: Bristol and Bath consolidation centre

The impact of heavy goods vehicles has long been a key concern for the City of Bath. The city became a UNESCO designated world heritage site in 1987 and has a crowded city centre environment. The city's theatres, museums and other cultural and sporting venues have helped to make it a major centre for tourism with more than one million staying visitors and 3.8 million day visitors to the city each year. The city has two universities and there are large service sector, information and communication technology and creative industries.

The busy retail environment generates a large number of freight deliveries. This results in poor air quality, noise and damage to the fabric of the historic buildings. In 2008, it was decided to create an urban freight consolidation centre for the City of Bath in order to reduce congestion by decreasing the number of vehicles required to deliver to city centre retailers and other businesses.

After a period of planning, an operator was appointed to set up and run the facility. It opened its doors in December 2010. The consolidation centre is ideally located close to junction 18 of the M5 near Bristol. Goods are consolidated for onwards dispatch in pre-arranged time slots using zero emission 9 tonne electric vehicles. The facility occupies 4,000 sq. ft. of space (371 m²) within a major distribution operator's existing warehouse.

Financials

In order to share overhead costs for the consolidation centre Bath & NE Somerset Council undertook a procurement exercise in partnership with neighbouring local authority, Bristol City Council to establish an operation to serve both cities. The service was free to businesses in Bath for an initial period of 15 months, after which a cost of £9 per cage and £12 per pallet was charged to participating businesses.

Benefits

The use of the electric truck helped reduce CO₂ and other pollutant emissions, by avoiding a number of trips to Bath that would have taken place by diesel-powered trucks and vans. In particular, the following cumulative reductions were obtained through the demonstration, from January 2011 to end of April 2012: CO 10₂,180 Kg, CO 61 Kg, NO_x 331 Kg and PM10s 10 Kg. The electric vehicle used by the Consolidation Centre achieved a 55.7% reduction in energy consumption compared to an equivalent diesel truck.

From January 2011 to end of April 2012 the number of delivery journeys into Bath was reduced by 1,016 and on average the number of deliveries to participating outlets has been reduced by 76%, exceeding the target of 70% set at the start of the project. The survey of Bath retailers participating in the consolidation scheme, offered as a free trial until the end of March 2012, found generally positive attitudes towards the scheme, satisfaction with the service offered, including recycling of packaging, and positive perceptions of the contractor and its staff.

Attitudes towards the fee structure were also positive, as most retailers claimed to have reduced their costs, and gained benefits, by joining the scheme. The survey of non-users of the scheme, albeit achieving a small sample size, revealed that barriers to joining the scheme include but are not limited to perceived costs. Other barriers, such as satisfaction with current delivery operators and issues with handling the delivered goods, were mentioned.

Users of the scheme showed high levels of satisfaction with the service provided and were positive about the demonstration. 81% of participating retailers surveyed were very likely to recommend the scheme to other businesses; the other 19% were quite likely to recommend the scheme. Almost all interviewed businesses confirmed that deliveries were made on time and they experienced no damages to their deliveries.

Lessons learned

Survey of non-users of the scheme revealed that the following barriers were perceived by the retailers towards joining the scheme:

- Perceived additional cost of freight deliveries
- Satisfaction with current delivery operators (and system)
- Satisfaction with the existing delivered goods handling procedures

Case study: Nestle and United Biscuits

Nestlé is the world's biggest food manufacturer. Worldwide, it manufactures a huge variety of products including cat food, baby food, hot and cold beverages, biscuits and snacks.

United Biscuits is the largest biscuit and snack food manufacturer in the UK. It has many well-known brands and in this sector of the grocery market is a direct competitor to Nestlé. As a result of this, in order to make their collaborative partnership a success, United Biscuits and Nestlé have had to break down the barriers that have traditionally stopped rival companies working together.

Representatives of Nestlé and United Biscuits initially met at a 'Speed Dating for Business' session. These workshops are held regularly with a view to bringing companies together to investigate opportunities to share transport resources. During previous sessions United Biscuits and Nestlé had identified partners to work with, but these were always retailers and non-competing manufacturers.

The two companies had always discounted working together because they were competitors. However, during a chance conversation at one of the speed dating sessions, both companies came to realise that they had similar requirements, with empty HGV runs on the York to Bardon (Leicestershire) route identified as a key challenge.

While their logistics operations were a good match physically, since the two businesses were rivals within the biscuit and snack food market there were still a number of significant barriers to overcome if they were to embark on a collaborative relationship.

Lessons learned

Through taking a pragmatic and flexible approach, with trust and honesty on both sides, the issues were resolved one at a time.

- Trailer livery – It was agreed that while branding is extremely important within Marketing, it is not as critical within Logistics, as once a trailer's doors are sealed and locked, nobody knows what it is carrying. This was therefore ruled out as an issue.
- Protection of new product launches: It can take a while to build up stock of new products and as a result stock will be distributed some time ahead of the launch. It is vital that during this time competitors don't find out about the forthcoming product. While this issue was key to resolve, the solution was simple. Trailers are loaded and sealed before the driver arrives and tipped out of sight of the driver. The driver never sees what he's carrying or the delivery paperwork and if there are any questions about what route the vehicle has taken, there is satellite tracking reporting to support any investigation. This process works well and has demonstrated that it is secure.
- Financial parity. The key to achieving financial parity is for businesses to understand their costs. Both Nestle and UB operate similar own fleets and as a result are very cost aware. Equally they were prepared to negotiate to reach a satisfactory compromise.
- Safe guarding competitive advantage. To avoid complex contractual arrangements, UB and Nestle agreed some basic rules of engagement and put clear boundaries in place to protect both parties' interests. In particular they decided from the outset to limit their collaborative partnership to internal freight movements only.

- Once these concerns were addressed, and a framework was in place, the project became the responsibility of the transport operations in both organisations to implement. The arrangement effectively sees United Biscuits acting as a haulier to Nestlé on the leg from Nestlé's York Factory to its Bardon Distribution Centre.

Benefits and impacts

- The barriers identified could easily have put an end to any prospect of the two companies working together. But there was senior level support for the idea and a commitment among the logistics teams in both organisations to make the collaborative relationship work. In the end, the view was that the companies competed on the shop shelf, not in the back of a lorry. Through this pragmatic and flexible approach, and with trust and honesty on both sides, all potential issues were resolved, one at a time. In October 2007, United Biscuits transported the first load of Nestlé products from Nestlé's York factory to its own distribution centre in Bardon. Since then, United Biscuits' vehicles have carried about 375 loads from York to Bardon, removing 96,500 km worth of empty truck loads from the road.
- On an annual basis the Nestlé and United Biscuits collaborative relationship saves just over 280,000 km of empty trailer movements. This equates to a saving of about 95,000 litres of diesel and 250 tonnes of CO₂, as well as a financial saving of £300,000. The Nestlé and United Biscuits collaborative relationship continues to develop and has been cited on a number of occasions as an example of best practice within the industry.

Case study: Bentobox

Berlin is the capital of Germany and with a population of over 3.5 million is its largest city. The city and its surrounding metropolitan area are experiencing a period of growth, with the density of its population already considered to be very high (3,994 inhabitants per km²). Although congestion is not considered to be as big an issue as in some European capital cities, there are nevertheless other transport related problems for which solutions need to be found. Air quality standards are not being met as emissions are being exceeded. Noise pollution is impacting the quality of life and road safety incidents have not demonstrated a decreasing trend in recent years.

In November 2011, as part of an EU project, a number of parties including local government, engineering and design organisations and a local delivery carrier collaborated to launch a test case using a new type of locker bank – the BentoBox. Essentially, a BentoBox is a modular design locker bank consisting of a fixed chassis that is subdivided into 6 removable compartmentalised multi-locker units on wheels. It is suitable for use in high density, small residential and mixed-use business and retail areas and is intended to integrate into the operations of courier, express and parcel carriers.

The BentoBox locker bank was positioned close to the inner city in a densely populated area. It was used both as a consolidation point for local couriers and as a collection and drop-off point for end users. In effect, the locker bank acted as a localised hub or storage point, facilitating first and last mile operations to be carried out by cargo bikes or on foot.

The local carrier loaded next day deliveries originating from outside the city for both businesses and consumers into the lockers during the night, eliminating the need for larger conventional vehicles to be deployed into the city centre during the day. Same day deliveries were effected using non-conventional vehicles (e.g. cargo bikes), with the locker banks being used as 'hubs' to enable couriers to restrict the distances they needed to travel between collections and deliveries. One courier could collect a parcel in one part of the city, drop it off at the BentoBox for collection by another courier who would deliver the parcel to another part of the city. This distribution method results in increased productivity and allows for deliveries to be consolidated or 'bundled' without increasing costs.

Unsuccessful deliveries ('sorry we missed you') were eliminated. By placing individual items into the lockers, automatic alerts are triggered notifying the recipient of delivery via SMS or email. This allows the recipient to collect their goods at a time of their choosing. As a result of the BentoBox, almost every light commercial vehicle that would normally have been used by the delivery company was able to be substituted with emission free and near silent cargo bikes. Service levels to customers and the carriers operations were not adversely affected.

Lessons learned

- Requires collaboration between local government and the private sector
- Requires a willingness to collaborate between carriers
- Political support would be advantageous
- The costs of installing and maintaining the lockers were offset through higher productivity
- There was no need to increase carriage prices for businesses and consumers
- Security

Deliveries in city centres are typically performed by a very large number of carriers and couriers who duplicate each other's paths with partially filled vehicles while each is in the process of picking up and delivering a large number of very small shipments. In many communities, the distribution structure results in unnecessarily high levels of congestion, pollution and energy consumption, as well as high distribution costs which are passed on to consumers and businesses in higher product costs. The BentoBox concept can help to reduce the number of duplicate journeys.

Case study: City of Brussels

“The achievement of efficient and sustainable freight deliveries in our Region is crucial if we want to improve the quality of life for the residents of Brussels. The increase in the use of waterways for freight deliveries, the concentration of multimodal logistics activities in the Schaerbeek site, north of Brussels, and the strategic implementation of urban distribution centres will help to redefine intelligent freight transport at a regional level. The LaMiLo project represents a step in the right direction”. Source: Minister-President of the Brussels Capital Region, Rudi Vervoort.

LaMilo (Last Mile Logistics) is a North West Europe project part-funded by European Regional Development Fund (ERDF) and aims to create a step change in freight deliveries by fully considering the ‘last mile’ of a supply chain.

Like many regions and cities within Europe, the Brussels- Capital Region is facing difficulties in organising the transport of goods, which is often uncoordinated. While freight accounts for a relatively small share of total traffic, it generates problems relating to accessibility, sustainability and safety in the city. The optimization of deliveries is thus essential to reduce the impact of freight traffic. In order to achieve this optimisation, the Region has developed a Strategic Plan for the transport of goods.

Brussels Mobilité, who are managing the project, is the administrative body responsible for infrastructure, public works and transport within the Ministry of the Brussels-Capital Region. It looks after transport strategies, facilities projects, renewal and maintenance of public spaces and regional roads (main roads and crossroads, tunnels and viaducts), infrastructure for public transport such as the metro network and taxis. It carries out projects that are essential to the quality of life in the Region and to its harmonious and sustainable development.

From September 2014, the CityDepot/TRI-VIZOR consortium, chosen for its experience running similar operations in Belgium, has been operating an urban consolidation centre located in the Port of Brussels.

Here, trucks arriving from all over Europe unload their goods in the early hours of the morning, usually between 6am and 9am. The goods are then scanned, sorted according to their destination and loaded onto low and zero emission vehicles for onward delivery to the stores between 10am and 3pm on the same day.

The carriers making the deliveries to the consolidation centre are charged a fee and as of November 2014, six carriers have already signed up to the scheme. By subcontracting the “last mile”, carriers benefit from reduced costs and delivery times, thus improving the service offered to their customers. The carriers drivers spend less time sitting in congested traffic, freeing them to take on other more productive work.

The scheme has demonstrated that there is a strong interest in Brussels in urban distribution from both the private and public sector. The Brussels Region has put sufficient support measures in place for the scheme to become a financially sustainable solution for the city. It is intended that the scheme will be replicated in the form of a multi-centre structure in Brussels.

Case study: Copenhagen

By 2025, Copenhagen aims to be the first capital city in the world to be carbon neutral. To reach this ambitious goal, the city council has adopted a comprehensive and targeted carbon reduction master plan, which aims to take the city's CO₂ emissions from its current level of around 2.5 million tonnes to under 1.2 million tonnes.

According to local research carried out, it is estimated that 750 trucks and vans enter the city centre every day and a third of these are in the city centre for less than 10 minutes. This is an indicator of inefficient supply chains and only serves to exacerbate city centre congestion, noise and air pollution.

Research and analysis carried in 2012 by local academic Transport Authority concluded that if one in every 10 deliveries was channelled through a consolidation centre, a reduction of 40% to 45% of on-street freight vehicles and a minimum 10% reduction in pollutant emissions could be achieved.

As a result of the research and analysis, a decision was taken to establish Urban Consolidation Centre on the outskirts (7 km from the city centre) of Copenhagen. A supplier (Citylogistik-kbh) was appointed set up and operate Copenhagen's first Freight Consolidation Centre.

The Urban Consolidation Centre currently takes inwards deliveries of multiple non-food pallets from Monday to Friday between the hours of 7am and 4pm. All multiple pallets are broken down, consolidated and delivered to the end user on zero emission electric vehicles.

The consolidation centre operator currently operates two delivery vehicles, a Peugeot partner van and a 3.5 tonne Modec truck with 2 delivery runs being made each day. Twelve retailers have signed up for the scheme already. The retailers are charged a monthly subscription fee. Up to 40% of the operating cost is currently subsidised by Copenhagen's Local Authority. It is estimated that at the current growth rate, the consolidation centre will achieve breakeven point within 3 years'.

Ultimate aim

From the point of view of the logistics company that operates the consolidation service, the main objective is that it provides a service that adds value for their customers, either by reducing overall costs or by providing added value benefits in terms of reliability of delivery, frequency of delivery, off-site storage or other value added activities.

Lessons learned

- The importance of financial sustainability of the business model is of prime importance to customers and other stakeholders.
- Understanding the importance of customer perception of consolidation and how it can create value for their business requires active stakeholder engagement and integration.
- Balancing financial sustainability with environment sustainability is a challenge faced by many organisations and requires careful planning

Case study: Distripolis

Distripolis adopts a new approach to urban deliveries. The concept harnesses expertise and innovation to create better living conditions in towns and cities.

GEODIS, a large road transport operator, is rolling out a scheme they named Distripolis. The scheme consists of Micro Consolidation Centres that are strategically located within the city centre of Paris, and which receive goods from a central depot (hub) by trucks. The final mile deliveries are performed with zero emission vehicles (battery powered – electric vans and tricycles).

Operation

- Consignments from Geodis's various networks are aggregated at a depot outside the city of Paris
- Eight micro consolidation centres in Paris, located throughout the city, receive freight for delivery in the city throughout the day
- Final mile deliveries are carried out with zero emission vehicles such as cargo bikes.

The closer the delivery depot (i.e. the micro consolidation centre) is to the delivery area that it covers, the more options there are available to use zero emission, small size vehicles to carry out the deliveries. As capacity on such vehicles is restricted, close proximity to the depot allows for multiple delivery trips. Delivery rounds are organised and optimised through a new route scheduling system that improves the quality of service for customers. The first tests have shown that this system cuts the distance covered by the delivery vehicles by 5%. It relies on a database containing the final addressees, with details of opening hours and accessibility that is used to schedule the rounds. Drivers can access the database which uses information in real time on the delivery conditions. Deliveries consist of both parcels and pallets with a maximum weight of 200 Kgs.

Barriers to implementation

- Availability of logistics bases in cities
- Market maturity and availability of a full range of electric vehicles

Benefit

- The environmental impact of Distripolis in Paris is reflected in:
- A 364-tonne reduction in CO₂
- An annual reduction of 1,747 tonnes of CO₂ equivalent. This equates to a full 85% reduction.
- The number of Geodis vehicles on the road has decreased by 20% and noise levels have reduced by 20 decibels per vehicle.
- Geodis plans to roll out Distripolis to some 30 towns and cities in France and a number of major European cities.

Case study: Stockholm construction consolidation centre

With 7,000 vehicles regularly clogging up the city centre of Stockholm, it was clear that action needed to be taken. The (Hammarby) Consolidation Centre (SHCC) was created for the duration of a redevelopment project.

The city funded 95% of the cost of the facility. Once operational, the benefits of the SHCC to its users became better understood and valued, allowing charges to be introduced. The end result was that the public share of funding reduced to 40 per cent by the end of the project, suggesting that there was an increasing willingness to pay for the service.

Solution

A facility to enable the temporary storage of goods and transportation from the center to each building site.

Operation

The SHCC offered 3,500 sq. m. of storage indoors and a further 4,000 sq. m. outside. It was located adjacent to the construction site, acting as a focal point for all delivery vehicles coming to the site. If flows had not been coordinated, 700 tonnes of materials would have been delivered into the site by 400 vehicles each day, with an average consignment size of 1.75 tonnes.

Financial

- Originally, 95 per cent of the project's funding came from the City of Stockholm authorities (including EU funds through the CIVITAS Trendsetter programme).
- The total budget for the 5-year project was 20 million SEK (approx. 2 million EUR). The funding from the EU amounted to 2.8 million SEK (280,000 EUR).
- There was a charge to the companies that delivered the goods. However, the transport charges were kept very low, since the main aim of the scheme was to reduce vehicle movements and their associated impacts. As a consequence, the charges related mainly to materials storage and value-added activities.
- The viability of the consolidation centre was crucially dependent upon support from the private sector, and in this regard, seems to have been more successful than a number of other schemes that have been 'imposed' on users.

Benefits

Reductions for deliveries from consolidation centre to site of:

- 90% in energy use
- 90% in CO₂ emissions
- 90% in NO_x
- 90% in PM
- 55dB (A) was regularly exceeded 260 times/day without the use of the consolidation Centre
- Instrumental in achieving on-time completion of new buildings

The project objectives identified for this scheme were fulfilled, although the 80 per cent reduction in small volume, direct deliveries was achieved only at peak times. The principal impacts were:

- A significant reduction in energy use, CO₂ and other air-borne pollutants;
- A significant reduction in noise levels;
- A reduction in vehicle distances from 64 kilometers a day to 26 kilometers a day per vehicle;
- a percentage increase of vehicle load factor from approximately 50% to 85%; and
- A reduction on stop time from approximately 60 minutes per trip to six minutes.

There were significant operational and environmental benefits. The reduced vehicle activity and faster delivery times combined to provide a 90 per cent reduction in CO₂ emissions. The SHCC was instrumental in achieving on-time completion of new buildings, and there were fewer problems than normal with regards to damaged or stolen goods.

Case study: Borlänge

Borlänge is situated in central Sweden and has a population of around 50,000. In 1999, Borlänge along with 3 other municipalities (Gagnef, Smedjebacken and Säter) decided to improve the food distribution system to its schools, kindergartens and adult social care centres. Their objective was to develop a distribution system that reduced environmental impacts. In order to achieve this, they broke the link between the suppliers of the products and the transport service providers.

Food distribution in the area was dominated by wholesalers delivering with their own or subcontractors vehicles, with small local producers mostly excluded. By segmenting the procurement of products (foods) and services (transport) and having the goods delivered to a locally procured distribution centre which also acts as a consolidation facility, Borlänge has reduced its costs and achieved positive environmental results.

Instead of numerous vehicles from different wholesalers making deliveries, all goods are now delivered on vehicles originating from one consolidation centre. A study by the Swedish University of Agricultural Sciences (SLU), concluded that through the average reduction of around 63% in vehicle trips, general savings of €200,000 p.a. were achieved.

Operation

All food products sourced from a variety of suppliers are collected from them and delivered to a locally based distribution centre. The products from these different suppliers are consolidated by delivery address and loaded onto low emission trucks whose routes are carefully pre-planned in order to minimise miles travelled. Vehicles depart the distribution centre during the night or early hours of the morning.

The delivery drivers have access to keys to allow them entry into the premises at the delivery addresses and will deliver the product directly to nominated storage areas (e.g. kitchens or fridges and freezers). None of the staff at the receiver's premises are required to help with the offloading or receipt of deliveries. This enables kitchen staff to immediately start food preparation as they arrive at work. In excess of 100 tonnes of food is delivered during the week, with each delivery point receiving 2 or more deliveries per week, as needed. Noise pollution, in particular at schools, has decreased significantly and the risk of road safety incidents is much reduced.

Segregating the procurement of products and services has opened the market for smaller, local food producers who did not have the distribution capabilities of the larger wholesalers. This has resulted in a further reduction in costs as well as food miles as more products are now sourced from the local region. Taking control over their own supply chain has enabled the municipalities to include new requirements in contracts with transport service providers relating to environmental standards (e.g. emission standards, types of fuel used or the type of tyres fitted to vehicles).

Lessons learned

- Persistence pays off. It took an innovative idea and the courage and persistence of staff and local politicians to implement a new sustainable model for urban food distribution.
- The public sector is an important business partner as a receiver of goods with the private sector as the supplier.
- The system of suppliers delivering goods in which the cost of delivery is included in the cost of the goods (also referred to as 'free delivery') can be challenged.
- The change from 'free delivery' to segmented procurement has enabled smaller producers (SME's) to compete.
- The transition is easier if the model forms part of an overall Delivery & Servicing Plan (DSP).
- Implementation was complex for all stakeholders involved, with resistance to change by the transport industry and large food wholesalers in particular.
- This distribution model is also suitable for independent schools, restaurants and cafés.

Case study: Monaco

As one of the world's most densely populated countries, traffic congestion in Monaco has become a major issue. Trucks and vans were seen as significant contributors to the problem. In order to reduce the number of freight vehicles operating in the Principality, the local government decided to procure a Consolidation Centre (the MoCC) to create a more efficient urban logistics system, coupled with a move towards electric vehicles.

The MoCC is a 1,300sq.m platform located on the south west edge of Monaco, located on land reclaimed from the sea. It is situated approximately 20 minutes from Monaco. The center handles deliveries and for both the retail and construction sectors. The use of the MoCC is mandatory for all vehicles over 8.5 tonnes wishing to enter Monaco. The Centre offers additional value-added services such as storage, order picking, delivery and collection.

Currently, goods vehicles under 8.5 tones may access the city at certain times only. At times when these vehicles are not allowed to deliver, drivers can make deliveries on foot.

Operation

The MoCC is a managed public service and operated by a private company.

The MoCC is located within a Logistics Park and which comprises of a dedicated 20,000 m² storage area located close to Monaco.

The Centre provides a range of services including customs clearance, storage, order picking, delivery, and collection. It is located approximately 20 minutes' drive from Monaco. The option is open to customers to collect their goods from the MoCC.

The MoCC has a staff of 8 and operates 5 vehicles (three 3.5 tonne vehicles, one 7.5 tonne vehicle, and one electric light duty vehicle).

The introduction of a compulsory use consolidation facility for Monaco has delivered significant benefits for the Principality. These include reductions of:

- 26% in fuel consumption
- 25% in NO_x
- 35% in CO
- 26% in SO₂
- 26% in CO₂
- 30% in PMs
- 30% in vehicle noise pollution

The MoCC scheme has resulted in a more efficient urban delivery system for the Principality of Monaco. Even though the scheme makes use of mostly diesel-powered goods vehicles, it has resulted in energy and emission reductions for urban freight. Other benefits include:

- 38% reduction in traffic congestion
- 42% reduction in space used by vehicles for delivery

Greater use of electric vehicles is planned as well as greater use of information systems. The Principality of Monaco may decide to further reduce the weight limit for goods vehicles entering Monaco in the future, which could result in a greater number of lighter vehicles having to use the consolidation centre.

The costs of the MoCC are shared between the Principality of Monaco which provides financial support and free warehouse space to the MoCC Operator. The MoCC employs drivers and handling staff as well as vehicles. Senders and recipients of goods are charged for deliveries, contributing towards the running costs of the MoCC.

How can you make a difference?

Contact:

✉ freight@tfl.gov.uk

🌐 tfl.gov.uk/info-for/freight/

View our consolidation film



tfl.gov.uk/socialmedia