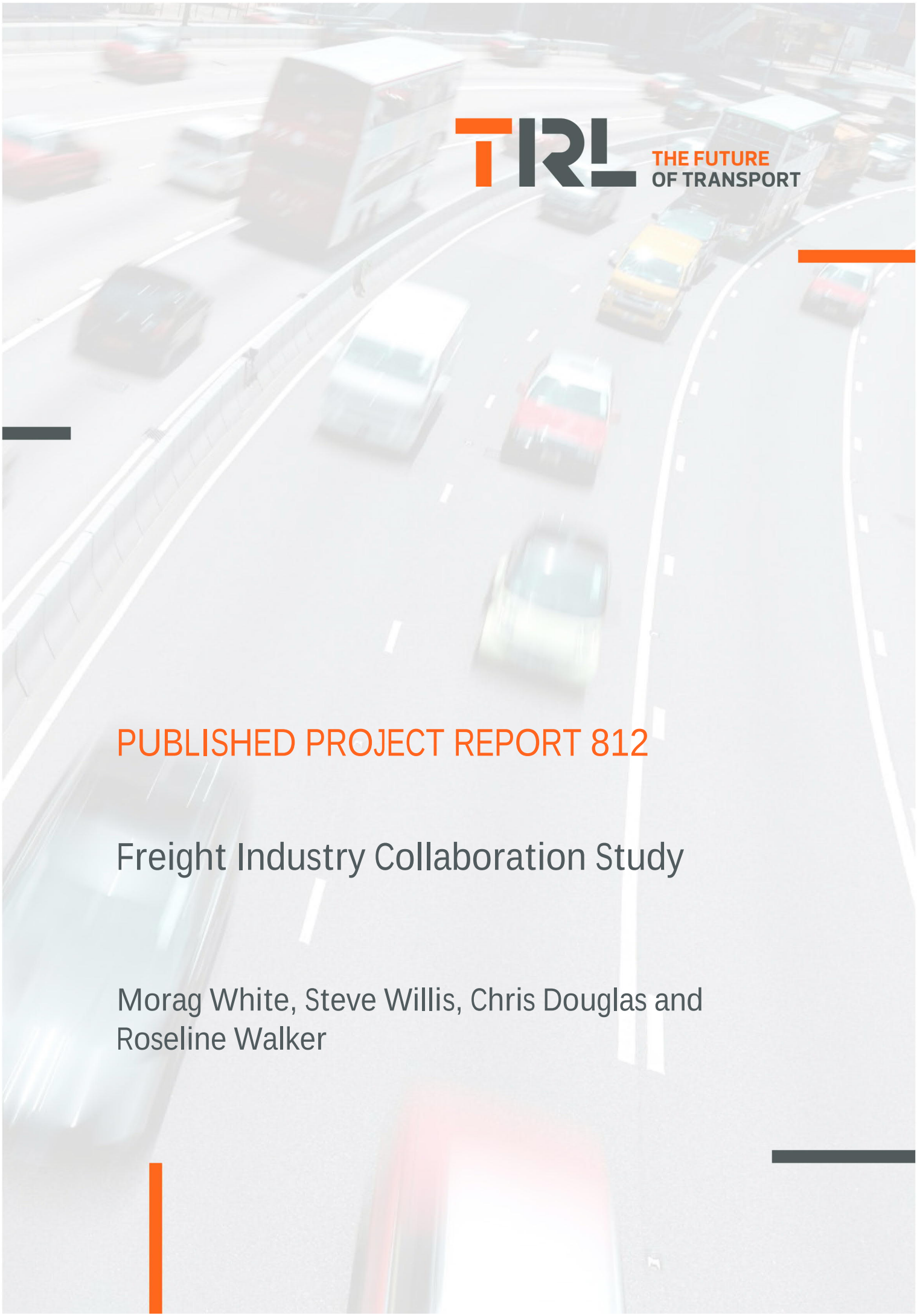


THE FUTURE OF TRANSPORT

PUBLISHED PROJECT REPORT 812

# Freight Industry Collaboration Study

Morag White, Steve Willis, Chris Douglas and Roseline Walker

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# Executive Summary

As an important enabler to the economy, the freight transport industry has a significant contribution to make towards meeting the UK's climate change targets. Heavy Goods Vehicles (HGVs) currently account for approximately 17% of Greenhouse Gas (GHG) emissions from road transport - and so road freight is a key area of focus in order to meet the target 80% reduction from 1990 levels by 2050.

Reducing the impact of GHG emissions from road freight has challenges, not least because of the considerable reliance we have on road freight for our economy to operate. A suite of measures should be considered by government and industry to support the achievement of the UK's climate change targets.

Collaboration is, in this context, a joint initiative of operators within the freight industry to work more closely together in order to reduce the number of HGVs on the road and therefore decrease levels of GHG emissions. This includes reduced empty running, and identifying routes and journeys where operators can consolidate their loads into single vehicle trips.

Both the literature review and the stakeholder survey undertaken as part of this study indicated that, whilst opportunities exist for collaboration between operators, in particular to reduce empty running, in practice there are a number of barriers to making this happen. This study has identified examples of empty routes being offered up for customers to fill, but barriers exist to achieving further collaboration at perhaps a more fundamental level than load filling. Examples of addressing supply chain inefficiencies further up the chain that result in reduced empty running are in evidence - but these tend to happen in specific sector pockets, in particular within the grocery sector. There are opportunities for these practices to be extended to other industry sectors.

This study has identified a number of barriers to wider industry collaboration. The changing structure of freight journeys has led to an increase in the number of deliveries being made as part of multi drops (a number of deliveries made as part of one journey), adding complexity to filling vehicles and arguably reducing the financial benefits for doing so (as the empty legs are shorter). Commercial sensitivities and a lack of comparable data restrict the capacity to undertake joint planning between separate individual operators. There are clear connectivity issues between parties within the supply chain, which reduce the ability of organisations to be as responsive as the market demands. Trust between "partners" was also identified as a potential issue, as some collaborators are concerned that there might not be a fair distribution of the cost benefits achieved through collaboration. Practical issues, such as load compatibility and imbalances in the volumes of regional freight, create less than ideal environments in which to collaborate and, in some ways, go to demonstrate that whilst loads may technically be empty, opportunities to fill them may not always be possible or desirable.

A key output from the research comprised a package of policy recommendations to encourage, facilitate and enable further collaboration to be undertaken – either through increasing awareness of the options or by trying to remove some of the perceived barriers. The recommendations include a Collaboration Promotion Programme focussed on trying to raise awareness of opportunities to collaborate among the key target audience(s), particularly the many own account fleet operators that do not specialise in transport and

distribution. Cross-industry and sector specific Working Groups have proven successful in some sectors and continue to be a way to create safe environments in which to promote collaboration. Approaches for raising awareness, encouraging organisations to work together, and incentivising best practice also need to be considered. This could include, for example, granting priority access to high utilisation vehicles or consolidation centre vehicles by allowing them the use of wider delivery windows, bus lanes or providing better parking up areas.

Finally, during the study, it became clear that whilst the focus of the work was on HGV freight activity and its contribution to GHG emissions, there has been recent growth in van activity and this too needs to be addressed in terms of its contribution to climate change objectives.

In conclusion this research has highlighted that the complexities of the road freight industry mean that many of the “easy wins” have already been taken and now the focus will need to be on more fundamental changes to encourage operators to work together in a constructive environment to allow the sharing of benefits to be realised by all stakeholders.

# 1 Introduction

## 1.1 Study Overview

### 1.1.1 Why was the study commissioned?

Transport has a significant contribution to make to the decarbonisation of the UK economy and has an important role to play in the UK achieving its 2008 Climate Change Act targets of an 80% reduction in greenhouse gas (GHG) emissions from 1990 levels by 2050.

The freight transport industry is recognised as an important employer and an enabler to creating a strong and efficient economy. Indeed, in 2013, £22.9 billion was generated by road freight (Department For Transport, 2015). That said, freight transport also has significant impacts on communities and the environment; road freight impacts on congestion and as a result on air quality and local quality of life. The main focus for this study is the impact freight has on the UK's GHG emissions. Heavy Goods Vehicles (HGVs) currently account for around 17% of GHG emissions from road transport and road freight is therefore a key area of focus in order to meet the 2050 target.

There are considerable challenges associated with reducing GHG emissions from HGVs. There are a number of reasons for this, not least that there are technical issues in calculating emissions, meaning understanding and comparing operations is difficult. In addition, businesses working together can be thwarted by the compatibility of vehicles and operational practices and engaging with industry operators, particularly small and medium-sized (SME) operators, can be challenging.

A combination of interventions is likely to be needed to reduce the impact of freight transport on UK GHG emissions. However, there is currently a limited evidence base on the cost effectiveness, $CO_2$ abatement potential and wider impacts (e.g. air quality) of available interventions. Therefore, the Department for Transport (DfT) is looking to develop an evidence base to inform future policy decisions.

DfT is currently undertaking a Freight Carbon Review to identify a range of options for decarbonising road freight. This study has been commissioned to inform the Freight Carbon Review's evidence base.

### 1.1.2 What is collaboration?

Collaboration is, in the context of this study, a joint initiative of operators within the freight industry to work more closely together in order to reduce the number of HGVs on the road and therefore decrease GHG emissions. This includes reduced empty running, and identifying routes and journeys where operators can consolidate their loads into a single vehicle trip. Whilst this collaboration can occur through direct relationships between operators, there are also a number of third party organisations that facilitate collaborative behaviour. These include collaboration orchestrators such as Tri-Visor who act as facilitators to bring companies together to work on mutually beneficial projects and more traditional freight exchange companies, such as Pall-Ex who bring together hauliers that have space to offer with customers who need palletised products moved.

Collaboration can operate either vertically between companies at different levels in the supply chain or horizontally between companies at similar levels in the chain, including between competitors. Collaboration goes beyond the basic groupage service that logistics providers perform or that is undertaken between organisations. It can involve shippers adjusting schedules/modifying their operations to maximise load consolidation opportunities.

DfT is keen to understand the extent to which industry collaboration in the road freight sector can reduce GHG emissions over the period to 2032 and in the longer term to 2050. This will involve identifying examples where industry collaboration has already successfully occurred and understanding the barriers to and the potential for further collaboration, the costs involved, the GHG emissions reduction potential and the wider environmental benefits.

Through commissioning this study DfT aimed to understand what policy measures might be required to encourage industry collaboration and the estimated costs and benefits.

## 1.2 Key Definitions

It is important to have a shared understanding of the terms referred to within the report:

- Efficiency can be defined as using the least number of full vehicles over the least possible mileages. Overall this will lead to the least amount of fuel used to move the most goods.
- Inefficiency is running vehicles at less than optimal fill over more than minimal mileages with high levels of downtime or excessive fuel use. Put more simply it can be seen as a deviation from efficiency as defined above.
- The critical Key Performance Indicators (KPIs) that help measure efficiency are empty running and vehicle fill by weight, volume or deck length.
- A tonne-kilometre, abbreviated as tkm, is a unit of measure of freight transport which represents the transport of one tonne of goods (including packaging and unladen of intermodal transport units) by a given transport mode (road, rail, air, sea, inland waterways, pipeline etc.) over a distance of one kilometre.
- Empty running refers to a vehicle which is running empty of product, recycling; defective products and so could potentially be used for another load.
- In terms of levels of vehicle fill, each operation will have its own limiting factor(s). These include weight, volume or deck length. Heavier loads (like steel) will max out by weight, lighter loads (like cereal boxes) will max out by volume and others in-between will max out by deck length used.

In this report we have focused on a number of key methods of collaboration all of which come under the guise of partnerships. Whilst this is a rather broad heading, in this context it refers to the framework by which organisations can share resources or best practice. Partnerships approaches can include sharing best practice, supporting the development in expertise between organisations, and pooling resources. It also covers businesses joining together to identify opportunities to work together, for example through partnerships to share vehicles to reduce overall fleet size. Examples of partnerships include:

- Route scheduling/planning that allow for more efficient supply chains

All organisations that undertake logistics will do some form of route scheduling and planning as part of their supply chain operations. How effectively this is done will vary and it may be the case that optimum supply chain planning can only be achieved through collaborating with other parts of the business' wider supply chain, for example by working vertically with suppliers and customers to optimise order cycles and delivery schedules.

- Backhauling to reduce empty running

The objective of this is to minimise the amount of empty running through returning from a delivery with a load. An extension of this may be "forward hauling" where a vehicle is empty whilst 'en-route' to pick up a load and therefore the objective of forward hauling is to reduce the amount of time this leg of the trip is empty. This can be considered as either a means to fill completely empty loads or to increase loads for vehicles running under capacity. This can be arranged between organisations independently or through the use of a freight exchange.

- Freight Exchange

A freight exchange is an online service for haulage companies, logistics providers, freight forwarders and transport companies. It allows haulage companies to search a database of available freight that needs to be delivered and advertise their available vehicle capacity. Such systems provide a platform that allows carriers to communicate freight traffic information to fellow operators such as transporters, forwarders and logistics companies. Many large companies now use online platforms periodically to put several months' worth of freight transport requirements out to tender as well as individual routes or specific journeys. Online systems are normally subscription-based with a small charge for advertising and searching.

Examples include:

HAULAGE Exchange

TimoCom

PALLEX

- Consolidation centres

Consolidation centres are logistics facilities from which consolidated deliveries are carried out. These facilities enable companies to group loads with one another and allow goods to be delivered on appropriate vehicles with a high level of load utilisation.

- Delivery and Servicing Plans

Delivery and Servicing Plans are designed to reduce the number of goods vehicle trips generated by premises or wider areas of multiple premises. They are based on the principles

of best practice in procurement, ensuring that goods are ordered within a single organisation and potentially across multiple organisations in partnership to reduce the total number of trips generated to serve those premises. Key to note here is that in general one organisation acts as the lead supplier – other suppliers channel their products through this lead one to consolidate inbound deliveries to offices and other public buildings.

## 1.3 The Structure of the Industry

In order to understand the potential opportunities to improve efficiency through collaboration, as measured by empty running and vehicle fill, it is important to understand how the industry is structured. The road freight industry is made up of a number of fragmented parts.

'Own account' organisations run HGVs as part of their business but logistics services are not their main purpose. Here they simply distribute their own goods. This group accounted for 53% of all businesses needing operator licences in 2013-14. However, only 28% of all HGVs are operated by own account organisations (MotorTransport, 2015). So this sector includes a large number of organisations operating relatively small fleets.

In addition to 'own account' operators there are traditional haulage organisations whose sole purpose is to provide transportation services – these can be specialists in a specific industry, or work across sectors. For the purposes of this report we have termed such organisations 'third party operators'. These organisations can solely provide transportation or can provide a wider range of logistics services, including multi-modal freight transport. Within this industry, as with own account, there are a large number of SME operators, as well as some very large organisations.

1% of all operator licences are held by operators with HGV fleets of 50 or more, which account for 28% of all vehicles specified to operator licence holders (MotorTransport, 2015). So while these operators are small in number, their fleets are large.

The average number of vehicles specified to each operator licence is 4.3 - demonstrating the large proportion of smaller operators in the industry (MotorTransport, 2015). Further to this, a Centre for Sustainable Road Freight study found that most freight operators (87%) employ fewer than 10 people and only 55 road haulage companies employ more than 250 workers (MotorTransport, 2015).

The research and conclusions in this study will take into consideration the diversity in the size and nature of operators, in order to assess the potential for collaboration to reduce empty running.

## 1.4 Report structure

This report will first outline the methodology that was used to conduct the literature review, the stakeholder surveys and the cost/benefit analysis, summarising the approach taken and challenges faced. It will then provide an overview of the findings from the literature review and the conclusions that can be drawn about levels of empty running, current opportunities and barriers, and examples of effective collaboration. Findings from the literature review will be supplemented with the evidence from the industry surveys conducted during the study. From both the literature review and the surveys, the report will pull together some of

the critical findings in relation to the benefits of collaboration. Here we will also draw on the cost/benefit analysis. Finally, the report will conclude with a set of recommendations for both government and industry to help improve levels of collaboration in order to reduce levels of empty running and improve vehicle load.

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# 2 Methodology

## 2.1 Literature Review

The first stage of this study was to conduct a literature review. The initial method used to access key literature was through the TRL library and information centre. The TRL Information Centre is a unique information resource covering all aspects of transport research. This was supported by online searches using researchers experienced in the area of transport management.

The review specifically:

- Examined literature for evidence and explanation of the current levels of empty running, less than full vehicle loading and current levels of collaboration
- Sought to determine the size of the opportunity for collaboration and its potential impact on GHG emissions
- Examined key trade press titles such as Commercial Motor, The Grocer and Fleet News and other publications to establish current views on barriers to collaboration
- Examined trade association data to ascertain views on potential opportunities for collaboration
- Examined relevant industry produced codes of practice and similar literature
- Reviewed the barriers to collaboration by sector to identify any differences or areas of greater potential

## 2.2 Stakeholder Surveys

In parallel to the literature review task, we conducted a programme of industry engagement for the project.

We developed a range of survey materials including initial emails to participants and discussion guides for interviews across the consultation group. Discussion guides included a mixture of quantitative and qualitative questions. All survey materials were presented to the DfT for sign off prior to use and can be found in Appendix B.

We also developed a stakeholder contact list which included a number of operators, industry associations and freight exchange organisations/pallet exchange networks. Again, the stakeholder contact list was presented to the DfT for sign off prior to use.

In terms of operators, the list included both hire and reward and own account operators as well as a mix of large, medium and small operators. Operators were selected to represent a number of key sectors including General Haulage, Retail, Waste, Construction, and Aggregates.

It was important to cover a wide range of operators in terms of size, geography and industry sector, to ensure that a fair perspective was achieved and to identify where the greatest potential for enhanced collaboration exists.

Due to time constraints, we agreed to conduct a mixture of face to face and telephone interviews.

Across the key stakeholder groups, the aim was to speak to a breakdown of the following stakeholders:

- 10 industry associations
- 50 operators
- 10 freight exchange/pallet exchange networks

Details of the results of the stakeholder survey are contained in Section 4 and whist it was challenging in the timeframes to meet the number or responses hoped for, a very good range of stakeholders were consulted.

Further to this a workshop was facilitated by the DfT and the Freight Transport Association (FTA) where some of the initial conclusions were discussed and additional opinions gathered. These have also been included in this report.

## 2.3 Cost Benefit Analysis (CBA)

Further to the literature review and stakeholder surveys, we also conducted a Cost Benefit Analysis (CBA) exercise to enable us to estimate the economic costs and benefits of increased collaboration to reduce empty running, including through the use of freight exchanges, termed here as Freight Exchange Centres (FEC).

A CBA is a systematic process for calculating and comparing the benefits and costs of a project or investment. It has two purposes:

- To determine whether it is a sound investment/decision (i.e. the justification for/feasibility of the decision); and
- To provide a basis for comparing projects. It involves comparing the total expected cost of each option against the total expected benefits, to see whether the benefits outweigh the costs, and by how much.

We have also considered estimates of Freight Consolidation Centres (FCC) and Delivery and Servicing Plans (DSP) in terms of the costs to industry and benefits from carbon savings[1]. The scope of the CBA focused on the use of FECs by operators and as such the analysis does not include any costs associated with using a FCC or setting up a DSP; visibility of these costs is limited due to company confidentiality. It is important to recognise that there are other forms of collaboration referenced within the report that could be measured within a CBA analysis.

Due to a lack of certain relevant data it was not possible to calculate all the costs and benefits in the analyses undertaken; this is unusual for a CBA. As a result TRL has used published data sources for many of the analyses or made assumptions based on our

[1] See section 1.2 for definitions

experience. For example the company analyses depended on FTA and DfT published data which is general to the sector rather than specific to the companies considered.

A CBA can provide added insight into whether a particular course of action is likely to be beneficial. In this case the two beneficiaries that have been considered are:

- Freight operators; and
- Society in general.

The expected benefits to freight operators are financial, notably a reduction in fuel costs as a result of less mileage travelled, due to lower levels of empty running or fewer journeys in total. Ideally the backload will replace another trip, therefore generating a substantial reduction in vehicle-km overall. Indeed from an operator's perspective the overall objective of using any form of freight collaboration services would be to reduce costs, whether it involves a FEC, FCC or a DSP approach.

Further technical details about CBA are covered in Appendix D.

To support the CBA, a spreadsheet tool was developed in order to summarise the main costs and benefits of freight operators collaborating. The details of the tool are outlined in Appendix E.

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# 3 Literature Review Analysis

## 3.1 Previous research identified

In conducting the literature review, we found that there was limited existing research related to collaboration and in particular empty running.

There were a couple of key documents that have proved to be the source of most of the information presented below. These were:

- An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector, The Centre for Sustainable Road Freight (SRF), 2015
- SRF Roadmap – part 1, road freight transport in the UK, 2013

Alan McKinnon is an eminent expert in this field and as such his work has also formed a key part of the literature review.

A full list of the resources referenced within the Literature Review can be found in Appendix A.

## 3.2 Size of the Opportunity

Our research uncovered that while many sectors of the UK road freight industry are working towards reducing emissions, existing approaches tend to be in sector-specific silos, and could be made more effective through collaborative solutions. As an example, the grocery sector has undertaken a significant amount of work to estimate and generate load sharing solutions. One such example is the work of the Efficient Consumer Response (ECR) programme managed by the Institute of Grocery Distribution (IGD) on collaborative working. As well as industry responses to the challenges, there are individual examples of effective collaboration such as the Nestle-United Biscuits project. Here the two businesses are saving 280,000km of road miles, approximately 95,000 litres of diesel and 250 tonnes of $CO_2$ each year. This is in addition to making a financial saving of £300,000 every year through working together on back and forward hauling.

The ECR programme began in Europe in the mid-1990s and focused new principles of collaborative management along the supply chain. It was understood that companies can serve consumers better, faster and at less cost by working together with trading partners. To better serve the consumer, ECR set out to challenge traditional models and break down non-productive barriers. ECR covers the whole process of supply, not just the logistics and distribution element and principally operates within the grocery sector.

A further observation is that whilst much focus has been placed on vehicle technology development, even a highly fuel efficient truck completing an empty run generates unnecessary emissions, and its presence on the road can contribute to issues with traffic flow, safety, and local amenity.

With that in mind, collaboration within the road freight sector appears to have considerable potential. Indeed, the Centre for Sustainable Road Freight (SRF), claims the road freight industry could save £160 million in fuel a year and prevent 426,000 tonnes of carbon emissions, if it were able to reduce the empty running to the lowest levels recorded at 27.2% for rigid and 25.2% for articulated trucks (Piecyk M, 2013).

SRF also highlights that whilst freight movements are increasing, the numbers of loads remain down on previous years and so empty running is increasing. SRF identified that the proportion of empty kilometres driven has increased by around 3% over the last 13 years. Recent figures show that almost a third of HGV kilometres were driven without a load, when they could have been carrying on average 10.4 tonnes of goods per truck (Piecyk M, 2013). The Commercial Motor magazine observed that between 1984 and 2001, empty running fell consistently from 31% to 26%. This in part was due to increased journey lengths (making it more commercially worthwhile to backhaul), increased transport costs, an increase in reverse logistics, as well as increased use of back loading either as part of internal supply chain improvements (retailers picking up from suppliers on return from store deliveries) or use of load matching services. Since then, however, levels of empty running have climbed again and now stand just short of 29% (Commercial Motor, 2014).

The SRF report commissioned by Committee on Climate Change (CCC) on demand side fuel savings highlights that management efforts could play a significant role in reducing GHG emissions. This report found that there is the potential for demand-side measures to reduce emissions by around 34% of baseline HGV emissions by 2035. The bulk of the savings are from measures to improve operator efficiency, with the remainder being from logistics measures (which includes backhauling), as detailed in Figure 1 (Dr P. Greening, 2015). It is worth highlighting here the term 'synchronised consolidation' refers to the practice of shippers adjusting / relaxing their schedules to increase the potential to combine loads / pick up backloads. The SRF report equates synchronised consolidation with 'horizontal collaboration'.

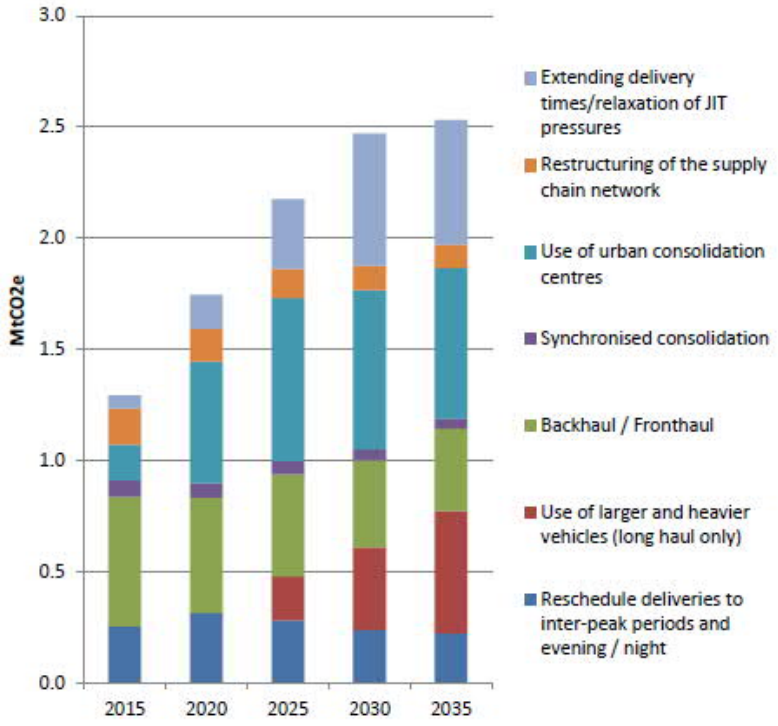



Figure 1 : Modelled $CO_2$ savings from logistics measures – central take up (Dr P. Greening, 2015)

## 3.3 Understanding the opportunity

McKinnon and Ge in 2006 identified that of over 8,995 HGV grocery trips they analysed, 2,272 were totally empty (McKinnon A. C., 2006) – suggesting 25.3% empty running[2] which is lower than the previously quoted statistics of just under 30%. The analysis specifically excluded shorter journeys as the potential for backhaul is limited on very short leg journeys. Removing the shorter journeys and the capacity/vehicle mismatches, McKinnon and Ge (2006) concluded that approximately 2% of empty journeys could be backhauled resulting in only a 2% reduction in km driven. This was due to operational restrictions in a sector that has short average trip lengths, tight scheduling and variable use of refrigeration.

By 2011, however, research commissioned by ECR entitled Starfish, which gathered transport data from 27 large fast moving consumer goods companies, identified a theoretical opportunity to reduce kilometres driven by 7.9% through backhauling. This could only be achieved, however, if time constraints were relaxed, which would then have allowed for greater operational flexibility and therefore more opportunities to backload. This is based on the retail sector as no alternative evidence was found from other sectors (Dr Andrew Palmer, 2011).

So, whilst government statistics suggest that 30% of journeys are running empty, based on the research we have consulted, the size of the opportunity may be significantly less than this in reality.

Much empty running occurs as a result of structural factors for example from geographical imbalances in freight traffic flows or delivery schedules that are too tight to allow for a backloading operation. There is therefore going to remain a substantial amount of empty running. A Delphi survey of the views of 100 logistics experts in 2007-08 suggested that empty running might be reduced to around 20% by 2020 (M Piecyk, 2010), though this projection has proved to be over-optimistic.

The factors listed in the SRF report relate to individual businesses trying to raise their vehicle load factor in isolation (McKinnon A. , 2015). If companies were to collaborate and share vehicle capacity, the opportunities for improving utilisation could be significantly enhanced. This was demonstrated by the modelling work undertaken by the Starfish project. Here, the most basic of the collaborative scenarios modelled such as simple pickups on a returned empty load, reduced HGV-km by roughly 1% and fuel consumption by 0.8%. Other more radical scenarios, involving the channelling of freight through regional consolidation centres, yielded around 5% savings in both HGV-km and fuel consumption.

## 3.4 Limitations to the measurement

Measuring the benefit of collaboration is challenging, not least due to issues around the availability of data. One key challenge is that collaboration takes a number of different forms and identifying the benefits from specific individual actions can be difficult. That said,

[2] Empty running was defined in the same way as Continuing Survey of Road Goods Transport as carrying zero tonnes for whole journey from origin to destination.

data is available on empty running and vehicle utilisation which will help indicate the size of the opportunity for backhauling.

The way in which vehicle utilisation is measured is key to understanding the potential for backhauling. Using either weight or volume as the measure can be a misleading indicator because loads can be maxed out by either. This means, for example, that a vehicle that is half laden by volume, and therefore presents an apparent opportunity for backhauling, may have reached its weight limit, thus removing this opportunity. Agreeing a common standard for measuring vehicle fill, therefore it is important for different elements of the supply chain to be able to collaborate to fill loads better. The SRF report also noted this stating that around 70% of tonne-km moved in trucks were constrained by weight and / or volume, increasing from 61% in 2001 (Dr P. Greening, 2015), which suggests that there are still opportunities to improve vehicle utilisation. That said, as the SRF report notes, the ability to make use of the space is not as simple as increasing collaboration because there are other limitations such as time constraints or restrictions on customer requirements (Dr P. Greening, 2015).

Exploring this further, Continuing Survey of Road Goods Transport (CSRGT) data demonstrates that larger vehicles tend to be better utilised, as identified in Figure 2 below. This is weight-based 'lading factor' data and hence gives only a partial view - and volume also needs to be considered. This is demonstrated in Figure 3. The main caveat to this data is that it has been gathered by survey rather than a potentially more accurate electronic recording and does not measure opportunity – this is discussed further within the study.

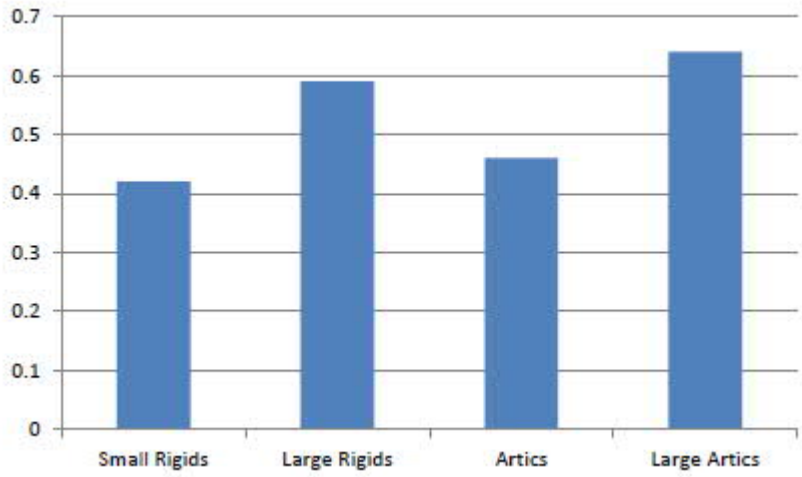



Figure 2: Average HGV capacity utilisation (loading factor) by vehicle type (Department For Transport, 2015)

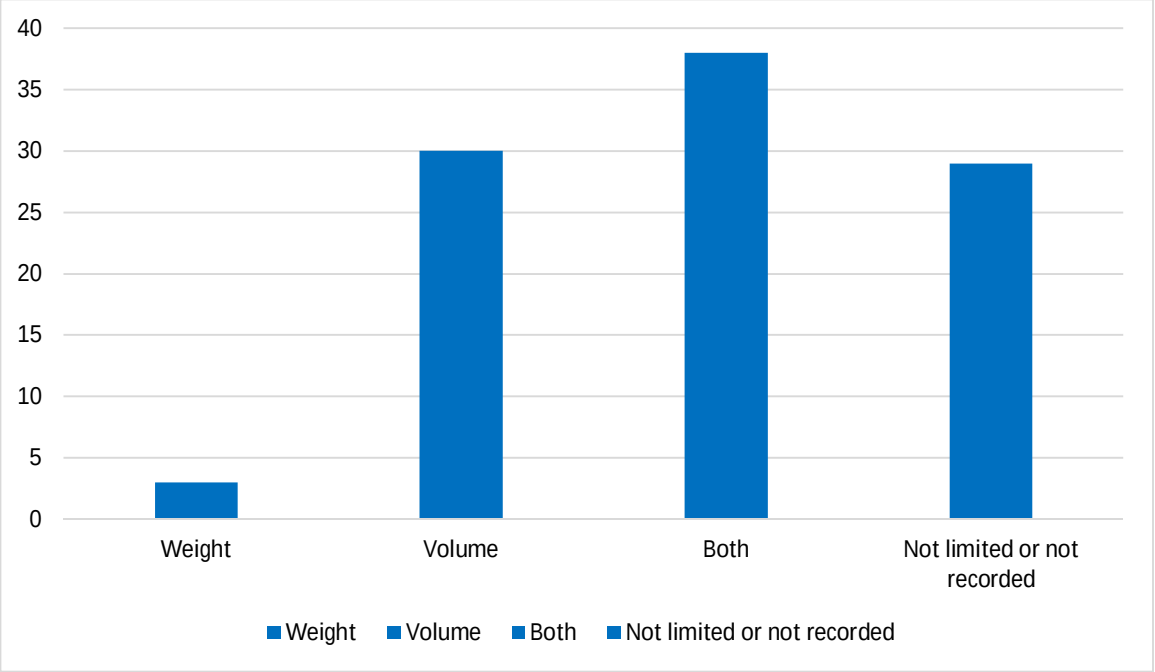



Figure 3: HGV vehicle utilisation by weight and volume (Department for Transport, 2012)

The chart in Figure 4 below provides a useful summary of the proportion of journeys that are run empty for each category of HGV transporting particular commodity groups.

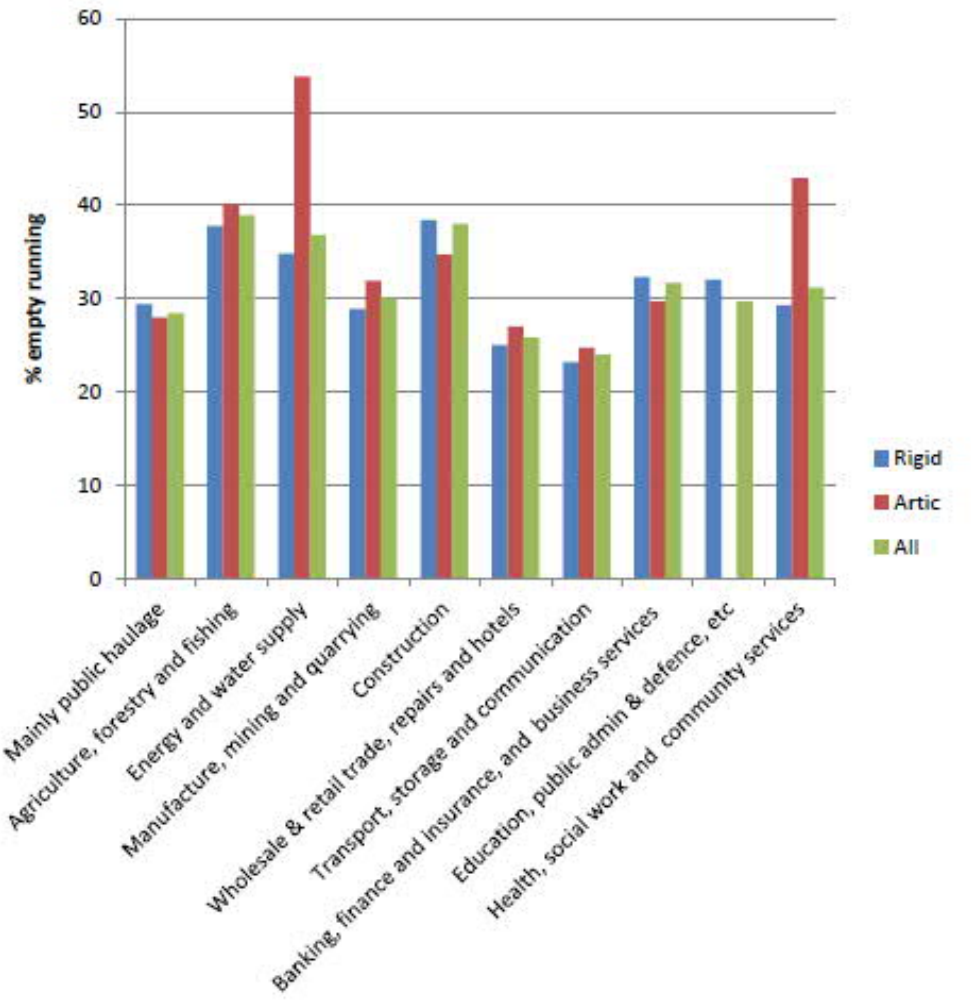



Figure 4: Percentage of HGV Km running empty by sector in 2013. (Dr P. Greening, 2015)

Figure 4 highlights the potential opportunity for sectors where the greatest improvement in empty running might be realised. However, as explored later in this report, there may well be constraints on certain sectors, such as the chilled goods or timber industries, which hinder collaboration on back loading. These constraints relate to vehicle specification requirements, as well as short average haul lengths and tight delivery scheduling.

There is a key distinction between those companies with logistics as their sole activity (hire and reward operators) and those who run HGVs as a means to facilitate their core business (own account). This differing focus is reflected in the load capacity numbers that show the hire and reward sector has above average load capacity utilisation although still runs 30% of its km empty. This is significant in as much as, whilst they are they are already achieving a high level of load capacity they do also account for 54% of the artics used for long haul, and 72% of the total long haul tonne-km. It is worth noting that vehicles going out of their way to reduce empty shorter distance journeys pose a greater challenge to justify than longer haul and this tends to apply to smaller, more urban delivery vehicles. This is reflected in the reduced capacity utilisation on the smaller vehicles in Figure 2. This is because any extra km driven to collect the backhaul incur larger percentage increases in total journeys than those experienced in longer journeys.

Even where companies, such as manufacturers and retailers, outsource their logistics they can still engage in horizontal collaboration. This approach can be helpful for organisations that use the same logistics service provider to integrate their loads. The shippers can usually increase the economic and environmental benefit from such collaboration by engaging in what the EU collaboration initiative "CO3" called 'collaborative synchronisation', where the collaborating businesses adjust their schedules, and sometimes routeing, to maximise opportunities for combining loads. This process can be modelled and managed by a neutral 'trustee' such as an industry body or 'supply chain orchestrator' such as Tri Vizor.

## 3.5 Barriers to uptake

Whilst there are clearly opportunities for increased collaboration in future, the literature review also highlighted a number of key barriers to collaboration:

- The changing structure of journeys highlights an increasing number of deliveries being made as part of a single trip (multi-drops) (Piecyk M, 2013). For the purposes of collaboration this adds extra complications as the vehicle fill varies throughout the trip and adds complexity to sharing or combining loads. However, this can serve to strengthen the case for collaboration on urban distribution – for example by using a consolidation centre.
- There is a lack of data available on the benefits of collaboration. This in part could be as a result of the perceived confidentiality of such information, as well as a lack of comparable standard data that can be shared. The issue was noted within the SRF report, which highlighted that a lack of comparable data restricts the ability to undertake joint planning. Further to this, the SRF report identified that Local Authorities can find it difficult to see the benefits of consolidation centres, as local vehicle flows are not understood making benefits harder to identify. The main constraint on urban consolidation centres is the difficulty of operating them viably without a public subsidy as has been seen in the Bristol Consolidation centre (see section 3.6 on case studies).
- There are clear connectivity issues between parties within the supply chain – especially in the SME arena, that restrict the ability to see real time information and create an agile and responsive supply chain which is the mainstay of efficient logistics operations (Davies, 2007). This in part could be due to lack of a shared platform to exchange information between different parties on the collaboration opportunities (Irina Harris, 2013).
- It was found that collaboration could be seen as anti-competitive and avoided for fear of contravening competition law. This was investigated by a legal team working on the EU CO3 project. It concluded that EU law condones this practice where it benefits consumers and the wider community (Frans Cruijssen, 2012).
- Trust between "partners" was also identified as a potential problem, and linked with this was the concern that there might not be a fair distribution of the cost benefits achieved through collaboration.
- There are clear regional imbalances in freight movement, with high volumes of loads from the north going south and less in reverse. This makes it more difficult to find backloads. Road hauliers have traditionally used a practice called 'triangulation' to

deal with this inter-regional traffic imbalance problem. This refers to the practice of a vehicle diverting from its main back route to a 3rd point in order to pick up a return load, potentially increasing the mileage but reducing the amount of empty running and making the journey profitable.

- Load compatibility can restrict the ability for loads to be shared. This can be exacerbated by physical restrictions at the point of delivery or by specialist kit requirements. The Nestle – United Biscuits collaboration project, however, demonstrates how companies moving similar products with similar handling equipment on similar types of vehicle can effectively work together to cut empty running by a substantial margin.

These barriers have differing degrees of significance and impact upon some sectors more than others. The SRF report found that some sectors find collaboration more difficult than others, which suggests that barriers are harder to overcome for some sectors than others.

## 3.6 Case Studies of Industry Collaboration

The literature review identified many examples of industry collaboration, although these were confined in the main to the food and grocery sector. This in itself highlights the opportunity to raise awareness and develop further case studies outside this sector.

Pall-Ex – use of consolidation and outsourcing logistics (Institute of Grocery Distrbution)

An unidentified retailer choose to work in partnership with Pall-Ex and its 100 strong network of the UK's leading hauliers, delivering a whole range of beauty and skincare products to some 300 shops across the country. By using Pall-Ex, greater flexibility was achieved in terms of flowing deliveries from their regional distribution centres, allowing Pall-Ex to distribute goods quickly.

By choosing to outsource through a palletised freight distribution network, the retailer has calculated that they make annual savings of 890 tonnes of $CO_2$.

Prior to working with Pall-Ex, the retailer involved ran its own fleet comprising of 14 permanent vehicles, rising to 40-50 during seasonal peaks. The changes allowed the vehicle fleet to be reduced.

Because Pall-Ex has a rigorous vetting procedure, demonstrating they can meet or exceed the requirements in terms of service and quality, this means that some of the barriers to collaboration are overcome and the retailer could work in confidence knowing that their service would not be compromised - indeed it was improved.

Nestle and United Biscuits – reducing empty running (Institute of Grocery Distrbution)

In October 2007, United Biscuits transported the first load of Nestlé products from Nestlé's York factory to its own distribution centre in Bardon. This venture enables United Biscuits to transport on Nestle's behalf and has resulted in an annual saving of 280,000km of road miles, approximately 95,000 litres of diesel and 250 tonnes of $CO_2$, as well as generating a financial saving of £300,000 every year through working together on back and forward hauling. These two competing organisations, agreed at a top level that they compete on the shelf and not in the back of a lorry and as such worked through the cultural and service barriers that would previously have prevented this level of collaboration.

Kimberley Clark – transport consolidation (Institute of Grocery Distrbution)

Discussions between two manufacturers identified that both were receiving less than full load orders for some smaller customers, and were not able to maximise optimisation of these deliveries due to the geographical delivery areas. Both companies had a desire to improve efficiency on those deliveries. Analysis showed commonality of delivery locations and compatible order profiles, and that significant reductions in empty km could be achieved through consolidation of these less than full load deliveries. Whilst not quantified, the operators reported savings on km and reduced transport costs.

Sainsbury's/NFT – depot consolidation (Institute of Grocery Distrbution)

Logistics operator NFT initially approached Sainsbury's with a proposal to collect and consolidate suppliers' products through one of three transhipment "hubs" strategically located within the UK. This enabled a reduction to inbound Regional Distribution Centre (RDC) deliveries by optimising vehicle fill on each load as well as utilising the same vehicles to collect supplier's product on route following an RDC delivery.

Over 240 manufacturers across 120 collection points were involved in the process and as a result average vehicle fill has increased by 20% during that time, therefore reducing empty running substantially. By utilising Sainsbury's secondary store fleet to undertake primary collections and deliveries which now account for 26% of all journeys, it has further reduced Sainsbury's carbon footprint (5.4 million km saved per annum which is equivalent to 4.6 million kg $CO_2$). On the other side, using some of the primary NFT fleet to undertake store deliveries has further reduced km and $CO_2$ emissions (2.2 million km which is equivalent to 1.9 million kg of $CO_2$).

Almo – delivery and servicing plans (Transport for London)

The offices of Almo have moved £40,000 worth of orders to one of their suppliers that deliver outside of peak hours, resulting in reduced congestion both on-site and locally. Almo also worked with its suppliers to consolidate deliveries. This led to deliveries being reduced from the main supplier by two-thirds.

Emirates Stadium – delivery and servicing plans (Transport for London)

Emirates Stadium switched its milk and dairy supplier, so that all dairy products are delivered along with other catering supplies. This reduced the time staff spend dealing with deliveries and also saves the company money by having fewer invoices to process as well as reducing vehicle movements.

Bristol/Bath Consolidation Centre (DHL, 2016)

The development of the DHL Bristol and Bath consolidation centre not only enabled consolidation of deliveries, it also had the additional benefit of allowing the "last mile" deliveries to be made by electric vehicles.

The project was instigated because urban deliveries have specific issues which can include delivery time restrictions, access issues to service areas, maximising the use of available sales space and so resulting in limited stockroom/storage space as well as security concerns and maximising retail staff time.

Whilst the project is still being subsidised, the centre has achieved a number of its aims namely achieving a reduction of 78% in vehicle movements and, as result, it has saved 154 tonnes of $CO_2$ and 5 tonnes of $NO_x$ from saving over 17,900 vehicle trips.

Transport for London – Delivery and Servicing Plan (Transport for London)

Studies have shown that the planned growth of London will lead to a 15% increase in demand for freight and servicing requirements by 2025. To meet this demand, Transport for London (TfL) has developed the "London Freight Plan" which aims to co-ordinate the role of freight in London's growth. One of the key projects includes the concept of Delivery and Servicing Plans (DSPs). These increase operational efficiency of buildings by improving relationships between building operators and their supply chain. Transport for London (TfL) has implemented a DSP for one of its own offices in Southwark, London, often referred to as the Palestra building. DSPs are a key tool in the delivery of the Freight Plan, designed to cut $CO_2$ emissions, congestion, collisions and overall freight costs by reducing delivery trips (especially during peak periods) and ensuring use of safe and legal loading facilities. The actions in this plan include measures to reduce deliveries, consolidation of deliveries and increasing out-of-hours delivery activity.

Wisbech Roadways – transport consolidation (Department for Transport, 2006)

Wisbech Roadways is a consortium of three relatively small, long-established East Anglian hauliers who joined together to enable them to tender for larger contracts, that individually they could not have previously serviced. In their first contract they were able to demonstrate not only a profitable partnership but one that enabled them to create an efficient supply chain where empty running was lower(19%) and vehicle fill (85%) was higher than the industry average and resulted in taking vehicles off the roads.

National confectioner – transport collaboration

This organisation ran a fleet of vehicles during the day to service their shops and realised that for a significant proportion of the time the vehicles were not being used. Not only was this inefficient but it represented a missed opportunity. The organisation changed its operator licence so that it could carry other organisations' goods and entered into a contact with one of their customers to undertake overnight deliveries for them to some of their regional stores, thereby creating a revenue stream and minimising downtime for their assets. Further to this the company then organised with a direct competitor to bring back a return load from store deliveries thereby adding further revenue to the operation as well as reducing overall road miles. Not only did this help to utilise the company's assets, and reduce overall supply chain mileage, it enabled it to better understand its logistics and the company subsequently outsourced some of its stores in geographically extreme places to reduce costs and improve overall efficiency.

TNT Olympic studies – out of hours deliveries (Transport for London, 2016)

During the Olympics businesses across London had to work differently as daytime journeys were severely affected by temporary road changes. As part of the solution deliveries and collections were made outside normal working hours. Transport for London (TfL) worked with the business community and London boroughs to identify best practice for out-of-hours activity and demonstrate how the needs of residents and businesses could be balanced successfully.

TNT undertakes daily deliveries of stationery to premises across London on behalf of Staples. The City of London, with its high density of office premises, is a key delivery area for the TNT - Staples multi-drop operation.

Currently, all TNT stationery deliveries to Staples' customers within the City are carried out during daytime hours. However, in order to service City office premises efficiently and reliably during the Games period, deliveries were made between midnight and 6am. For the purposes of a trial to demonstrate how this could be done, a 4am delivery was made for ten nights to two premises. To support the concept of an exemplar trial, TNT offered to use an electric vehicle to perform deliveries throughout its duration. The trial ran for ten nights and was completed successfully, with nightly deliveries to multiple locations, using the electric vehicle and a driver fully briefed on the Quiet Delivery Code of Practice.

Superdrug/Next – transport consolidation (TTR ltd, 2011)

As part of the Quiet Deliveries Demonstration Scheme Superdrug reviewed and adjusted its delivery schedules whist not causing a disturbance to local residents in the area. Whilst in the end the out of hours trial did not proceed, as a result of this project Superdrug and Next started discussions which resulted in the two businesses sharing a vehicle. Whilst this was driven by physical unloading challenges it meant that loads were consolidated and a vehicle was taken off the road to the benefit of both organisations.

London Boroughs Consolidation Centre – consolidation (Transport for London, 2016)

A feasibility study carried out on behalf of Camden, Waltham Forest and Enfield Councils focused on obtaining supply chain savings and environmental benefits through procurement.

The study recommended the use of a London Boroughs Consolidation Centre (LBCC) which is a facility that channels suppliers' deliveries into one central point. The goods are then sorted onto fewer vehicles for the final 'leg' (last mile) of the journey to Council sites, on a just in time basis. The LBCC is not designed to be a warehouse for long term storage.

The LBCC is a shared resource between London boroughs of Camden, Enfield, Waltham Forest and Islington. When it first opened, only four suppliers were delivering to the LBCC. Since Camden's move to its new civic building at Pancras Square, the number of suppliers using the LBCC has increased to 72.

Two vehicles are currently making the final delivery to council buildings. Vehicles are now operating at 80% or higher utilisation. In the first 12 months of operation, the LBCC consolidated 51,000 items for delivery fulfilling 9,700 orders. Only 0.64% of items were returned.

The centre has introduced a Nissan electric commercial vehicle, which is likely to further improve its environmental performance




As short delivery distances are travelled, the adoption of electric vehicle technology (see photo above (Transport for London, 2016) will lead to substantial environmental benefits.

Currently the project is seeing a number of benefits:

- Procurement savings from reduced supply distances
- Procurement savings from a reduction in the number of 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:
    - 41% reduction in $CO_2$ emissions
    - 51% reduction in NOx emissions
    - 61% reduction in PM
- Over 70% vehicle capacity utilisation has been achieved
- Scheduled deliveries, easing the burden on receptions and post rooms and freeing up staff for more productive tasks.

Sainsbury's and Bournemouth – out of hours deliveries (TTR ltd, 2011)

In November 2009, the DfT established a consortium, in partnership with the Freight Transport Association (FTA) and the Noise Abatement Society (NAS), in order to investigate and promote the potential benefits from relaxation of delivery curfews for quiet deliveries. The Quiet Deliveries Demonstration Scheme consortium has overseen the whole scheme which has involved the setting up, running and reporting on quiet delivery demonstration trials at an intended six retail premises across England. One of those premises was Sainsbury's at Bournemouth. The trial has successfully demonstrated that night-time deliveries can be undertaken without adversely affecting neighbouring residents and, following the trial, the delivery times have remained as they were, overseen by both parties who continue to monitor store delivery performance. Sainsbury's reported improvements in fuel consumption of 5.7% for night-time operations compared to daytime equivalents.

Sutton Council – Delivery and Servicing Plan (Sutton Borough Council, 2010)

In 2010 Sutton Council adopted a Delivery and Servicing plan with the principal aim "to minimise the negative impacts of goods delivery and servicing transport generated by the

Council's operations." To support the attainment of this aim, the following objectives were identified:

- Reduce the frequency of trips associated with delivery of goods and equipment servicing for council operations through the use of responsible procurement strategy and departmental practice;
- Minimise the negative impacts of the council's fleet vehicles;
- Ensure low carbon, safe, legal and environmental best practice for delivery and servicing transport generated by the council's suppliers and couriers;
- Promote good practice to other local employers and the community, and set the standard in delivery and servicing.

It was expected that it would achieve a carbon saving of at least 37,700kg $CO_2$ through identified actions. In addition over time, as contracts for services with significant delivery or servicing transport impacts came up for review, the procedures established as a result of this plan would mean that further reductions are identified.

## 3.7 Key Conclusions

The literature review has highlighted that smaller vehicles generally tend to be associated with greater empty running (Figure 2), as they are generally used for shorter journeys making backhauling less attractive. However there are key opportunities for collaboration using larger HGVs run by third party operators or very large own account operators, given that they command 54% of the artics used for long haul and account for 72% of the total long haul tonne-kms (McKinnon A. , 2015). This finding was further validated by the CBA, which showed that it was the larger vehicles undertaking longer distances that represent the greatest opportunity, even though this part of the HGV sector already has the better empty running rates. In the short term this part of the industry is also potentially more open to collaborative working.

The literature review highlighted an appetite within certain sectors, for example the grocery and fast moving consumer goods sectors, to collaborate. However, there is less evidence of the benefits for smaller operators. The barriers here are greater as the cost for setting up collaborative schemes could make the process cost prohibitive.

The barriers to collaboration are well documented and in some cases are being addressed such as through the Institute of Grocery Distribution Efficient Consumer Response work, but again this tends to happen in silos or is driven by specific local initiatives. Therefore, whilst larger operators may still present the biggest potential wins in terms of carbon reduction it is the large number of SMEs that collectively could make some considerable improvements to their efficiency.

The research suggests that larger organisations should not be excluded from any interventions simply because they are already "good at what they do"– a small % improvement in their operations can have a big impact. It is also important that further focus is given to SMEs who command a large number of operators but individually have less of an effect (but have a large collective impact).

It is clear that different interventions would appeal to different types of organisation. For example consolidation centres appear to work for smaller organisations that would otherwise conduct “last mile” deliveries with part loads, but are potentially less suited to organisations that already carry full loads and would not benefit from urban consolidation to the same extent. This was demonstrated in a study undertaken in 2010 for the DfT on Freight Consolidation (Department for Transport, 2010).

# 4 Stakeholder Surveys Results

In order to validate the information gathered as part of the literature review and to develop some of the conclusions more fully a stakeholder survey was undertaken. The following section reviews this process and the results of the stakeholder discussions.

## 4.1 Stakeholder Sample

175 companies were initially contacted to seek their input to this research. Of those companies, 47 ultimately participated in the study. These included a mix of operators, industry associations and freight exchange and pallet exchange networks. We have broken these down as can be seen in the three charts within this section.

1. Breakdown of sectors interviewed (Figure 5)
2. Breakdown between small, medium and large organisations (Figure 6)
3. Breakdown between third party operators and own account (Figure 7)

Of the 47 participants; 4 were from industry associations, 4 were from freight exchange companies (see section 1.2 for a definition) and 39 were operators.

A breakdown of the final count is as follows;

- Total number of Operator interviews completed = 39
- Total number of industry associations interviews completed = 4
- Total number of online freight exchange and pallet exchange network interviews completed = 4

To ensure that the information gathered from the operator interviews was representative of the industry at large, views were taken across various sectors, sizes and types of operator (hire and reward and own account). See breakdowns below:

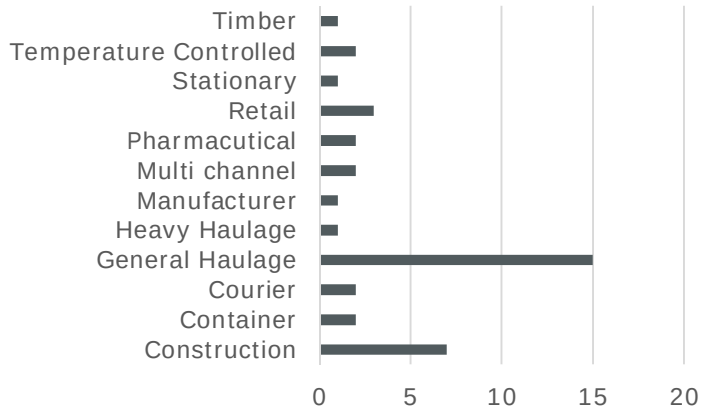



Figure 5: Breakdown of interviews by operator sector

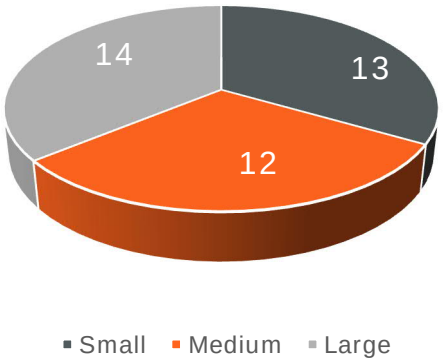



Figure 6: Breakdown of interviews by operator size

(Small: less than 50 employees, Medium: 51 – 249, Large: over 250)

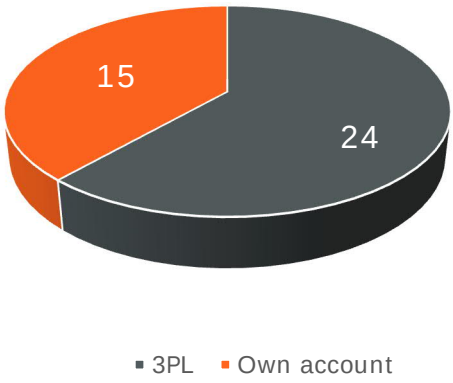



Figure 7: Breakdown of interviews by operator type

A summary of the interview questions are set out below (see also Appendix B):

- Fleet composition: No. of HGVs operated, size, weight and type.
- Costs: Fixed/variable: Salaries, training, fuel, maintenance, vehicle purchasing, fuel
- How would they define empty running?
- How would they define collaboration between operators?
- Do they undertake any form of collaboration and if so, what form of collaboration is it?
- If not, have they considered it or tried it?
    - What was the result?
    - Would they consider it again?
    - If no, why not?

- To what extent would they be able to collaborate?
- Empty running: Current levels, future potential levels
- What do they perceive as the barriers to collaboration?
    - How could they remove those barriers?
    - What could central government do to remove those barriers?
    - What could central government do to encourage more collaboration? (Financial and non-financial interventions)
- Could they collaborate with their own sector and would there be opportunities between sectors?
    - What information would be needed in order to enable collaboration e.g. shared loads, back-loading?
    - How much could be saved (£ and Litres of fuel) if the best fit were achieved between operators?
    - If collaboration is undertaken what costs are there in association with this (e.g. cost of membership to load sharing organisation, staff etc.)?

## 4.2 Current levels of collaboration

From the stakeholder interviews completed, the overall view was that collaboration does take place across the industry but that there is potential to do more. It is difficult to quantify the specific level of collaboration due to a variation in individuals' definitions of collaboration. It was evident from discussions that collaboration is viewed differently amongst not only the different sectors but also individual companies. Larger operators appeared to view working with preferred suppliers, either as an integrated supply chain or as an ad-hoc arrangement, as a form of collaboration, but also working alongside industry associations with regards to best practice and shared learnings. This was especially evident amongst organisations in the construction industry that cited collaboration with competitors in order to raise industry standards. Examples such as the Mineral Products Association (MPA), Freight Fleet Operators Recognition Scheme (FORS) and Construction Logistics and Cyclist Safety (CLOCS) were quoted as evidence of competitors working together.

Conversely, SMEs tended to be more focussed on collaboration in terms of working in partnership with other organisations to share loads, often on a purely commercial basis through organisations such as online freight exchange organisations, a physical network of partners (such as Pall-Ex) or other independent operators to resolve part of their supply chain issues. This may take the form of finding potential revenue in the form of back-loads or losing a non-profitable or inefficient journeys to a third party, better placed to serve more remote and peripheral areas. Where this was in place, it was used to good effect. Arguably the use of freight exchanges is not purely about partnerships where joint assets are used, however they are a means by which empty journeys can be reduced.

The industry associations felt that there was a very significant degree of collaboration already underway within their operator membership – with consolidation of loads in parcels, pallet networks (small and medium operators involved) being exceptionally high.

## 4.3 Potential for further collaboration

There were extremely positive comments made regarding the future potential growth of industry collaboration and the need to reduce, where possible, empty running.

Both the construction sector and the parcel sector believe there are significant benefits to working together within their own sectors to maximise load capacity though shared fleet and resource usage. They felt that these sectors require a collaboration forum, similar to that of the construction health and safety groups mentioned above (MPA, FORS and CLOCS), but with an objective to reduce GHG emissions through a change to the route to market from silos to joint ventures. These collaborative initiatives are much more advanced in the Fast Moving Consumer Goods (FMCG) and grocery sectors.

The parcel sector talked very much about the 'courier's courier' whereby all couriers carry each other's consignments, and felt this to be a positive and obvious intervention. Importantly, they suggested that by pooling their assets and utilising spare capacity, this would not necessarily be a financial burden on the industry, in fact quite the opposite.

The retail companies currently utilise their reverse logistics model to a high level by returning assets, recyclable waste, pallets etc. from the store back to the operating base. On average, it would appear that outbound loads from Regional Distribution Centres are close to 100% full by either weight/volume/deck length and around 90% of in-bound vehicles have some form of goods – either, salvage, packaging, returns etc. from their stores or a back loaded product from suppliers' premises. However, they felt that further improvements could be made and that there was the potential to grow the level of backhauling to fully utilise their in-bound vehicle capacity.

An industry association expanded on the above stating that supermarket dedicated supply chains are an increasing and significant part of the UK road freight sector and they may have scope for further collaboration – but it is not clear how far the collaboration could go here as these organisations evolve fairly rapidly and may have some reticence about restricting themselves to long term collaborative relationships.

The industry associations also felt that in some sectors there could be significant benefits from end customers collaborating on procurement e.g. waste/recycling contracts which they considered to be particularly inefficient in urban areas.

The freight exchange representatives felt extremely positive about the future of collaboration and the need to fully utilise available vehicle space. They expressed positive views regarding 'last mile deliveries' and the potential growth within this area but recognised that there was still work to be done to promote this area.

## 4.4 Barriers to further collaboration

Whilst it was generally agreed that more could be done to collaborate across the freight industry, there were numerous barriers cited that would need to be addressed to enable more effective collaboration.

- Discussions with the operators have highlighted that consumer trends have changed significantly in recent years, which in turn has caused a number of changes in the logistics sector. As opening times extend and consumer expectations grow around product availability, so has the need to meet these demands. This has come in the

shape of an increase in the number of deliveries being made but with fewer goods per drop. For the purposes of collaboration this adds extra complications as the vehicle fill varies throughout the trip and adds complexity of wanting to share or combine loads.

- Service Level Agreements (SLAs) were highlighted as a major barrier - especially around delivery times. This inhibits a haulier from pursuing additional work, as any delay in re-loading could impact the main client's delivery. There are examples of financial penalty clauses within some SLAs for such occurrences and where service levels fall below agreed targets, contracts have been lost.
- Even in the absence of strict SLAs, the need to provide a good level of customer service was felt to be a key barrier to further collaboration. SMEs were concerned that increasing backhauling could be a distraction from their core business, which, in many cases, is not primarily transport and distribution. This was felt most strongly within the Hire & Reward sector, which has the potential to incorporate more collaboration. Concerns here were that any potential disruption to the planned journey through one-off collections and deliveries has the potential to jeopardise the service expectation of their own regular customers. Interviewees declared that customer requirements can play a significant part in deciding whether backhauling or shared resources can be undertaken. This is due to tight delivery times, the urgency of deliveries, and perceived security risks.
- One key barrier related to a lack of data available on the opportunities and benefits of collaboration. Those interviewed suggested that information within the logistics industry is generally poor. There appeared to be a lack of awareness regarding the low levels of vehicle fill and high levels of empty running across the industry.
- Many operators expressed their concerns over compatible IT systems and considered this to be a major barrier between parties within the supply chain – this issue was cited most noticeably but not exclusively by SME organisations.
- Trust was highlighted as a potential problem by some respondents, who felt that competitors may use the opportunity to under-cut them for future or new work if they shared potentially sensitive commercial information. However, it should be noted that where forward or backhauling occurs through freight exchange companies, there are strict guidelines and rules with regards this practice and where members fail to adhere to them, they are removed from the group.
- There are clear regional imbalances in freight movement, with high volumes of loads out of the north going south and less in reverse. This provides increased challenges for getting return loads and was especially relevant within the timber industry, whose vehicles travel fully freighted outward from the Scottish highlands travelling to the south of England but return empty.
- Discussions with the smaller operators highlighted that cost is also an issue. Resources are required to manage collaboration and this is challenging within the freight SME environment where there are tight margins. Costs can include additional IT, insurance requirements and so on. In addition, it is not always cost effective to pick up returned loads – whilst there may well be carbon savings it may not stack up from a cost perspective. Industry associations also highlighted this, suggesting that

effective back-loading and groupage is an activity that requires dedicated staff and for this, an investment is required. The perceived cost of being a member of a freight exchange was identified as a further barrier, although the CBA suggests that in many cases there is a positive cost outcome. It may be therefore that it is more a lack of awareness of this as a potential solution that could be the real barrier rather than cost in all cases.

- All three groups highlighted load compatibility as a restriction on what can be shared. The need to refrigerate loads and track their temperature is a barrier to sharing and those in the aggregate industry felt that some of their vehicles, mixers and tippers in particular, were not compatible with other sectors within the industry.
- A key operational issue cited was around the Working Time Directive and the fact that additional collection / drops on a delivery round may cause a driver to exceed their working hours, thereby necessitating expensive back-up resources.
- The industry bodies felt that boardroom culture was perhaps the biggest barrier to further collaboration, whether this is reducing empty running, consolidation or other forms of partnership. This also relates to management concerns over brand identity and concerns over brand protection.

## 4.5 How can barriers be overcome?

Survey participants suggested how barriers could be overcome, as detailed below:

- Concerns over branding could easily be resolved through use of independent third parties and non-liveried vehicles.
- Service level agreement issues (such as delivery frequencies) could be resolved if companies thought more strategically about the whole supply chain, rather than focus on the last leg.
- Consolidation could help with maintaining the frequency of deliveries by reducing costs through shared loads.
- Incentives for fully freighted vehicles, including use of bus lanes, taxation breaks, and support for out of hour's deliveries, could encourage wider collaboration.
- Investment towards shared IT system infrastructure could help overcome data compatibility issues.
- Standardisation within industry schemes would be beneficial. The example given was by the construction companies who state that FORS recommend a reversing system on a switch, which allows the driver to silence it. This would be expected when reversing during night time hours, especially in a residential area. With CLOCS it recommends that the reversing system cannot be switched off.
- Awareness could be raised of potential solutions and the real costs and implications rather than the perceived costs. This may be the case, in particular, for freight exchanges.

## 4.6 Sector specific issues for collaboration

Throughout the interviews no one sector or operation type gave evidence regarding being unable to collaborate. Limitations were identified around niche markets, antiques in particular, where it was suggested that there are only three to four SME hauliers who specialise in this field and very limited work available. This creates fierce competition and, as such, no collaboration between similar companies. That said, operators in this sector do look to collaborate across other sectors to find additional revenues for returning vehicles.

However, there are examples where certain operations currently do not collaborate and as previously stated within the findings of this study, choose not to. The main reasons behind this are:

- Service Level Agreements could be jeopardised if delays are incurred by collaboration partners.
- Certain agreements between supplier and haulier state no mixed goods due to concerns over security or cross contamination. The haulier will inevitably negotiate a rate that allows for the lost revenue to be compensated for. In other words, they are explicitly being paid to run empty.
- Bespoke vehicles required:
    - As an example, McDonald's require cooking oil to be removed from outlets and returned to Regional Distribution Centres. The oil is contained in vessels underneath the vehicle. General haulage companies would not have these bespoke vehicles and as such, could not offer that service.
    - Timber haulage vehicles are generally 'skeleton' trailers and are limited to return loads of pipes or telegraph poles. There are more of these vehicles leaving Scotland than there are loads returning. Cross sector collaboration is not suitable. However, those operators who run more standard type vehicles; curtain-siders, flat-beds, from the saw-mills, will look to back-haul at every opportunity from across all suitable sectors.
- Tanker operations have strict guidelines regarding contamination. The obvious examples are mixed fuels (diesel, unleaded, aviation etc.), food grade tankers, and agricultural industry vehicles, for example those that deliver animal feed in but cannot take out materials intended for human consumption.
- There are a number of cost related barriers with resource and IT costs being significant factors. However from a daily operational perspective, several operators noted that if a company considers that the distance to the back-load is excessive, and as such they would be spending additional money, they can make the decision to run empty.
- There is a lack of trust or belief that sharing loads or freight exchange websites actually achieve the reductions in carbon or cost savings expected. This view was generally put forward by smaller operators who potentially have less appetite for risk or change.

- For some industries collaboration can be particularly difficult where the destination frequently changes, such as in construction where changing locations for construction sites makes it hard to plan for strategic/long term collaboration.

## 4.7 Where should the future focus lie?

With regard to future focus, survey participants identified a number of areas that they considered presented the greatest opportunities to support improved collaboration and efficiency.

Whilst there is appetite amongst construction and parcel operators to collaborate with competitors, there appears to be a disconnect between operational staff and those in more senior decision-making and strategic planning positions and often at board level, which may require some form of package of solutions to bring parties together.

In addition, for the construction industry, supply chains are often bound by site working hours which are often determined by local authority permissions, which may reduce the opportunity to collaborate to the fullest extent.

Our research showed that SMEs and micro businesses would co-operate more on goods deliveries inbound and outbound, particularly if there were financial benefits.

The temperature controlled sector appears to have potential for collaboration growth, although there are challenges around the types of goods being carried.

Generally, IT system uptake by the freight industry, whether this be own account or third party operator/haulier could be improved both in terms of speed of uptake and quality of application. This is spread across all sizes of business - not just smaller businesses which is sometimes the perception (e.g. costs of change, implementation or upgrades sometimes make larger companies move more slowly).

Based on the interviews, it was found that there was appetite for developing a more open access system for load sharing, vehicle fill monitoring and then giving operators access to it. Whilst these opportunities do exist already, they are not always known about, particularly amongst own account operators.

## 4.8 The Costs and Potential Benefits of Collaboration

The results from the cost-benefit analysis (CBA) are summarised in this section. For operators, the cost savings, while present, might not on their own be sufficient to encourage them to participate in collaboration initiatives; other advantages may need to be demonstrated, including any additional cost savings not included in the analysis since their scale is uncertain at present.

In undertaking the CBA two assumptions designed to represent different scenarios were adopted; a small (1%) reduction in mileage as a result of participation in freight collaboration scheme and a larger decrease (5%). These were chosen to demonstrate the impact of two possible reductions in mileage and hence fuel used (so reducing operator costs) – a low and a high reduction. The analysis is sensitive to the mileage savings assumed but there is little data, at present, to suggest how large those savings might be in practice. We have assumed no change in MPG which would further reduce operator costs. Likewise

we have assumed that the base level of HGV mileages also remains constant as does the cost of membership of the freight exchange centre (FEC) (£240 p.a.). Variations in other operational costs (e.g. fuel prices, vehicle maintenance costs, personnel, training and insurance expenses etc.) faced by freight operators and the value of carbon savings will also impact on the CBA outputs. These assumptions enable easier analysis but could be altered in the spreadsheet for more detailed research.

Three carbon prices[3] have been applied in the spreadsheet: the low, central and the high values from BEIS's non-traded sector carbon values for policy appraisal in real 2015 terms.

More information is needed to fully understand the cost-effectiveness of freight exchange centres but the outputs from the CBA illustrate some of the potential impacts.

### 4.8.1 Articulated vehicles - national results

Applying national data for 44 tonne articulated vehicles (with a 3-axle trailer/2 axle curtain-sided semi-trailer), the sum of the present value of the total operator benefits in fuel savings of a 1% reduction in base mileage (over the average six year HGV ownership period) are lower than the annual cost of membership of a freight exchange. While about £920 of fuel costs would be saved over six years the costs of participation in a freight collaboration scheme would be around £1,300, so an operator would be unlikely to recoup subscription costs. As a result the BCRs calculated are low: less than 1 for both the low and central values of carbon saved and only 1.13 using the high value for carbon.

However a 5% reduction in the base mileage would be beneficial. While the membership costs of the scheme would remain the same, the value of fuel savings would approach £4,600 giving the operators a net gain of over £3,000 over six years. As a result the BCRs are high: 4.2 (low value for carbon emissions), 4.92 (central) and 5.65 (high carbon value). These values are high and, so long as this level of mileage reductions can be achieved, and maintained, would justify participation in a freight exchange. In this scenario the value of the fuel and carbon saved would be almost £1,000 over the six years (low value for carbon emissions), £1,900 (central carbon value) or £2,900 (high carbon value).

The carbon cost-effectiveness[4] for artic vehicles at the 1% reduction in mileage is: £62.58 (per tonne of carbon abated) improving to -£101 with a 5% reduction in mileage. This calculation is independent of any changes to the value of carbon reduced but rather it indicates the carbon cost effectiveness of membership of the FEC. In this case with a 1% reduction in mileage it would cost more to reduce carbon emissions than the savings generated. With a 5% reduction the savings generated in carbon emissions outweigh the costs incurred.

[3] Carbon prices are the values used for policy appraisal. There is no market for carbon emitted in the transport sector. It is the value placed on emitting one tonne of $CO_2$ into the atmosphere.

[4] Measured as: [(PV of costs minus PV of fuel saved)/(Total carbon saved)]. A negative value shows that for the expenditure incurred the value of the reduction is worthwhile.

With an artic HGV stock of 120,500[5] vehicles, substantial benefits to society as a result of reductions in carbon emissions could be accumulated over a six year period if the mileage of all were to be reduced. These are summarised in Table 1:

| Indicator (All artic vehicles) | Average annual savings (thousands) |
|---|---|
| | |
| Total $CO_2$ emissions savings tonnes (1% base mileage reduction) | 775,000 |
| Total $CO_2$ emissions savings tonnes (5% base mileage reduction) | 3,875,000 |
| Total Value of $CO_2$ savings (1% base mileage reduction) low carbon value | £23,134 |
| Total Value of $CO_2$ savings (5% base mileage reduction) low carbon value | £115,671 |
| Total Value of $CO_2$ savings (1% base mileage reduction) central carbon value | £45,920 |
| Total Value of $CO_2$ savings (5% base mileage reduction) central carbon value | £229,600 |
| Total Value of $CO_2$ savings (1% base mileage reduction) high carbon value | £,69,187 |
| Total Value of $CO_2$ savings (5% base mileage reduction) high carbon value | £345,936 |

Table 1: Carbon savings of artics

Clearly the greater the reductions in mileage achieved the higher the financial benefits to operators, and society also secures greater benefits as well.

### 4.8.2 Rigid vehicles – national results

For rigid vehicles (4 axle rigid tipper 32 tonnes gvw) the results are less promising, but nevertheless potentially beneficial. In this case, the present value of the fuel saved is two-thirds of that for artics under the 1% reduction in the base mileage scenario. While the PV of the costs of membership of the freight exchange scheme are assumed to be the same as for artic vehicles, i.e. a PV of £1,300, the present value of the fuel savings would only be about £670. This may be due to the lower mileage that rigid vehicles typically operate. As a result the BCRs for rigids are lower than for artics, below 1.00 (and lower): 0.62 (applying the low value of carbon saved, 0.72 (applying the central value) and only 0.83 (using the high value).

If a 5% reduction in base mileage for rigid vehicles is assumed, participation in a freight exchange centre becomes worthwhile. The PV of costs of participation is the same as previously (£1,300) while the sum of the PV of fuel saved is about much more (£3,370). The BCRs become: 3.37 (applying the low value of carbon saved), 4.19 (applying the central value) and 5.03 (using the high value). While these are below those recorded for artic vehicles, they are nevertheless impressive.

Longer haul duty cycles give greater opportunities for fuel cost savings by collaboration; shorter distances, for example those often made using rigid vehicles, do not offer the same

[5] Domestic Road Freight Statistics - United Kingdom, Department for Transport, Oct 20, 2016

opportunities for fuel cost savings although our analysis suggests it is still advantageous for operators to participate in some form of freight collaboration if significant mileage reductions (5%) can be secured.

The carbon cost-effectiveness for rigid vehicles at the 1% reduction in mileage is: 137 (£/tonne of $CO_2$) improving to -86 (£/tonne of $CO_2$) with a 5% reduction in mileage.

With a rigid HGV stock of 276,300[6] vehicles substantial benefits to society as a result of reductions in carbon emissions could be accumulated over a six year period. Due to the larger number of vehicles in this category the overall societal benefits are greater than for artics. These benefits are summarised in Table 2:

| Indicator (All rigid vehicles) | Average annual savings (thousands) |
|---|---|
| | |
| Total $CO_2$ emissions savings tonnes (1% base mileage reduction) | 1,309,000 |
| Total $CO_2$ emissions savings tonnes (5% base mileage reduction) | 6,544,000 |
| Total Value of $CO_2$ savings (1% base mileage reduction) low carbon value | £39,062 |
| Total Value of $CO_2$ savings (5% base mileage reduction) low carbon value | £302,045 |
| Total Value of $CO_2$ savings (1% base mileage reduction) central carbon value | £77,536 |
| Total Value of $CO_2$ savings (5% base mileage reduction) central carbon value | £601,148 |
| Total Value of $CO_2$ savings (1% base mileage reduction) high carbon value | £116,823 |
| Total Value of $CO_2$ savings (5% base mileage reduction) high carbon value | £907,759 |

Table 2: Carbon savings of rigid vehicles

Again these are potentially high savings but are dependent on securing, and maintaining, the reductions in mileage travelled by rigid vehicles.

### 4.8.3 Example companies

In order to supplement the national data for artic and rigid vehicles, CBA spreadsheets were also developed for the freight operators which had been interviewed. It must be noted, however, that much of the required data was unavailable due to it not being in the form required or due to concerns regarding company confidentiality. Thus national data has been applied as a surrogate in cases where information is missing in order to assist the analysis. Based on the evidence gathered from individual companies the outputs from the CBA also indicate a positive outcome for operators from involvement in a freight exchange, especially

[6] Domestic Road Freight Statistics - United Kingdom, Department for Transport, Oct 20, 2016

at relatively high level of reductions in mileage. Some examples are reported and results for each company are summarised in the tables on the following pages. A brief description of the companies can be found in Appendix 6.

For example, a large waste own account company with 90 artic vehicles would incur higher costs by being a member of a freight exchange than the resultant fuel cost savings with only a 1% reduction in base mileage. Nevertheless due to the value of the carbon savings it would still generate a BCR of 1.17 (central carbon value) or 1.34 (high carbon value). These may not be sufficiently high to warrant participation in a freight collaboration scheme. With a 5% reduction in base mileage however, the fuel cost savings would easily cover the cost of membership of a freight exchange: the PV of fuel saved would be about £5,450 while the costs of exchange membership are assumed to be £1,300. There would be some societal benefits from carbon reduction with a 1% reduction in base mileage but the BCR easily exceeds 1.0 when the higher value of carbon is applied: a BCR of 5.83 (central carbon value) and 6.70 (high carbon value) compared to 1.17 and 1.34 respectively with a 1% reduction in mileage. Table 3 and Table 4 below summarise the net benefits of fuel saved after deducting the costs of membership of an FEC[7].

| Company | Artic or Rigid | PV[8] of fuel saved - 1%[9] £ | PV of carbon saved[10] - 1% £ | CCE[11] - 1% | BCR[12] |
|---|---|---|---|---|---|
| A | Artic | 1,089 | 453 | 31 | 1.17 |
| B | Artic | 109 | 45 | 1,587 | 0.12 |
| C | Artic | 1226 | 510 | 11 | 1.31 |
| D | Artic | 610 | 254 | 166 | 0.65 |
| E | Rigid | 821 | 342 | 87 | 0.88 |
| F | Rigid | 627 | 261 | 158 | 0.67 |
| G | Rigid | 613 | 255 | 165 | 0.66 |
| H | Artic | 544 | 227 | 203 | 0.58 |

Table 3: Summary of company cost benefit – 1% reduction in fuel use

[7] Cost assumed to be £240pa per vehicle.

[8] Present value,

[9] 1% reduction in mileage

[10] Central carbon value

[11] Carbon Cost-effectiveness

[12] Benefit Cost Ratio (central carbon value)

| Company | Artic or Rigid | PV of fuel saved - 5% £ | PV of carbon saved - 5% £ | CCE - 5% | BCR |
|---|---|---|---|---|---|
| A | Artic | 5,448 | 2,268 | -108 | 5.82 |
| B | Artic | 545 | 227 | 203 | 0.58 |
| C | Artic | 6,129 | 2551 | -112 | 6.56 |
| D | Artic | 3,051 | 1,270 | -81 | 3.26 |
| E | Rigid | 4,107 | 1,709 | -96 | 4.39 |
| F | Rigid | 3,134 | 1,304 | -82 | 3.35 |
| G | Rigid | 3,065 | 1,276 | -81 | 3.28 |
| H | Artic | 2,724 | 1,134 | -73 | 2.91 |

Table 4: Summary of company benefits – 5% reduction in fuel use

These tables demonstrate that the higher the mileage reductions achieved the greater the benefits both for the company but also for society at large. Of course cost effectiveness might vary by type of operator or duty cycle but at the moment insufficient data is available to better understand these impacts.

### 4.8.4 Conclusions

These results should be seen as being indicative given the assumptions and data used. Varying some of the assumptions and also the data applied could lead to different results, and hence interpretation. For example cost savings might arise as a result of improvements in fuel technology, with benefits both to operators and society in general. This could reduce the benefits of collaboration as the savings in fuel used and $CO_2$ emissions would be lower. However over the time period analysed here we do not anticipate any significant technological advances that will substantially reduce fuel usage.

Because of the limitations of this analysis it should be recognised that the benefits of a freight exchange to reduce empty running, both for operators and the general public, could actually be greater than those calculated. Benefits not included in our analysis could encourage more freight operators to participate in collaboration with others. These include the possible reduction in personnel costs due to the need to employ fewer drivers, fewer costs of recruiting new drivers, reduced maintenance costs, delaying the purchase new vehicles, reductions in the need to hire HGVs for occasional loads and possibly lower insurance costs. In other words should participation in a freight exchange scheme generate a positive BCR, in reality the benefits could be higher.

There appears to be greater benefits for companies with artic vehicles than for rigids. This is due to the higher mileages that artics are driven (about 75,000 miles pa) compared to rigids (about 55,000 miles pa). Clearly a 1% or 5% reduction in mileage will have a greater effect on the costs of operating a vehicle that is driven farther, which generally is the case for artics compared to rigids. In all cases it seems that the societal benefits are clear but it is only beneficial to the cost profile of individual companies if base mileage reductions are

relatively large and maintained (i.e. a 5% pa reduction I mileage). This conclusion was further endorsed by the SRF report and the IGD's ECR 'reducing wasted miles' report.

The analysis shows that, under certain assumptions, joining a freight exchange centre could have benefits for freight operators as well as for society more widely. Such benefits can be achieved as a result on-going reductions in fuel costs which may be achievable by some companies. In general, the greater the reductions in mileage achieved the higher the financial benefits to operators, and society also secures greater benefits as well.

In many of the scenarios considered the government may not be required to subsidise participation in a freight exchange centre. Nevertheless other types of government intervention might be needed to overcome non-cost barriers.

### 4.8.5 Consolidation Centres

Previous research has identified potential savings of 4.3% in mileage from using consolidation centres[13]. Using this as a basis a company could expect to see a saving of almost £3,000 per vehicle in fuel for rigids and with higher savings (almost £4,000) for artics over a six year period. No data on the costs of participation in a freight consolidation centre are available, but it is recognised that if these gross savings could be made, they would need to be set against any additional costs to the operator from involvement in a freight consolidation centre. Added to this are savings in GHG emissions. Such potential savings from using a freight consolidation centre would be based on voluntarily working rather than participation being mandated through regulation.

### 4.8.6 Delivery and Servicing Plans

Mileage savings as a result of Delivery Servicing Plans (DPSs) are less well documented centrally. Although there are numerous case studies, fuel savings are difficult to extract from these. Given the fact that the principle is the same as a consolidation centre, it could be a fair conclusion to suggest a similar mileage saving (4.3%) could be expected and this is the assumption that has been used.

In terms of the CBA the impacts will be largely the same as for a FCC, assuming the same reduction in mileage and no cost of membership of a delivery and servicing plan. (Due to company confidentiality the costs of FCC membership are unknown so the data for delivery and servicing plans will be the same as for FCC participation).

### 4.8.7 Back or forward hauling

Included in the cost table below is an example of the savings that could be generated through back or forward hauling, if entered into independently between two companies. This would incur little cost, other than management time. As noted in section 3.3, the potential reduction in mileage ranges from 2% to 7.9%. The analysis below identifies two scenarios (1%pa and 5%pa reduction) to reflect this variation. These costs could potentially be minimal and have assumed to be zero in this study (because there is no available

[13] Dr P. Greening, 2015

information on costs of backhauling). As a result because the present value of the cost per vehicle by 2020 in a back or forward hauling scheme has been assumed to be zero the BCR cannot be calculated.

Table 5 highlights a summary of the potential savings of the options assessed in this report (applying the central value of carbon savings):

| Policy | Vehicle Type | PV of cost per vehicle by 2020 | PV of saving per vehicle by 2020 | BCR | Mileage reduction | Value of carbon reduction by vehicle | Tonnes of carbon reduction by vehicle |
|---|---|---|---|---|---|---|---|
| Freight Exchange | 44 tonne artic | £1,323 | £919 | 0.98 | 1% | £382 | 6.46 |
| | 32 tonne 4-axle rigid | £1,323 | £674 | 0.72 | 1% | £281 | 4.74 |
| | 44 tonne artic | £1,323 | £4,597 | 0.98 | 5% | £1,913 | 32.30 |
| | 32 tonne 4-axle rigid | £1,323 | £3,371 | 3.61 | 5% | £1,403 | 23.68 |
| Back or forward hauling (see section 4.8.7) | 44 tonne artic | 0 (Assumption) | £919 | Unknown in this study | 1% | £382 | 6.46 |
| | 32 tonne 4-axle rigid | 0 (Assumption) | £674 | Unknown in this study | 1% | £281 | 4.74 |
| | 44 tonne artic | 0 (Assumption) | £4,597 | Unknown in this study | 5% | £1,913 | 32.30 |
| | 32 tonne 4-axle rigid | 0 (Assumption) | £3,371 | Unknown in this study | 5% | £1,403 | 23.68 |
| Consolidation Centres (see section 4.8.5) | 44 tonne artic | Unknown in this study | £3,953 | Unknown in this study | 4.3% | £1,645 | 27.77 |
| | 32 tonne 4-axle rigid | Unknown in this study | £2,899 | Unknown in this study | 4.3% | £1,747 | 20.37 |
| Delivery and servicing plans (see section 4.8.6) | 44 tonne artic | Minimal, but unknown in this study | £3,953 | Unknown in this study | 4.3% | £1,646 | 27.77 |
| | 32 tonne 4-axle rigid | Minimal, but unknown in this study | £2,899 | Unknown in this study | 4.3% | £1,747 | 20.37 |

Table 5: Summary of savings

Against the benefits from freight collaboration scheme participation must be set the costs incurred by operators. At present such costs are very uncertain either because such schemes are uncommon or since the information is company confidential. Furthermore over time some of these costs could reduce as a result of economies of scale due to higher levels of participation by operators. Apart from the cost of involvement in a freight consolidation

centre the costs appear to be generally modest in scale. The known and assumed costs are summarised in Table 6.

| Policy | Vehicle Type | PV of cost per vehicle by 2020 |
|---|---|---|
| Freight Exchange | 44 tonne artic | £1,323 |
| | 32 tonne 4-axle rigid | £1,323 |
| | 44 tonne artic | £1,323 |
| | 32 tonne 4-axle rigid | £1,323 |
| Back or forward hauling (see section 4.8.7) | 44 tonne artic | Minimal, assumed to be zero in this study |
| | 32 tonne 4-axle rigid | Minimal, assumed to be zero in this study |
| | 44 tonne artic | Minimal, assumed to be zero in this study |
| | 32 tonne 4-axle rigid | Minimal, assumed to be zero in this study |
| Consolidation Centres (see section 4.8.5) | 44 tonne artic | Unknown in this study |
| | 32 tonne 4-axle rigid | Unknown in this study |
| Delivery and servicing plans (see section 4.8.6) | 44 tonne artic | Minimal, but unknown in this study |
| | 32 tonne 4-axle rigid | Minimal, but unknown in this study |

Table 6: Known and assumed costs

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# 5 Conclusions and potential benefits from greater collaboration

## 5.1 Key conclusions from the research

Drawing on the findings within the Literature Review and the Stakeholder Surveys a number of key conclusions can be drawn:

- Collaboration is a broad term. It can range from the basic sharing of a vehicle resource to the establishment of strategic partnerships between the largest companies to improve efficiency.
- There are examples of collaboration, although limited to some sectors such as grocery (see section 3.6 for case studies).
- Feedback from the operators surveyed highlighted that many felt that operators could do more to increase the level of collaboration and as such there are still opportunities to reduce empty running and improve vehicle utilisation.
- There are some data available to demonstrate current levels of utilisation and empty running, although this is high level. There is however limited evidence on the benefits of collaboration.
- Collaboration practices are not systematic and feel uncoordinated and dependent on individual businesses (and individuals in those businesses) taking a creative approach to working with others.
- Large hire and reward operators specialise in trying to maximise utilisation and already work with sub-contractors and partners to streamline operations.
- Large own account operators such as Nestle and Sainsbury's demonstrate some of the best examples of good practices, (see section 3.6 on case studies).
- Smaller hire and reward operators have to work hard to collaborate through unofficial partnerships and official networks (like pallet networks with umbrella brand and shared systems).
- Small own account operators are large in number and run small fleets as a secondary or tertiary part of their business and potentially have much to gain through collaboration to improve performance, but do not always know how to approach it.
- There are many barriers to wider collaboration across different sized operators and within different sectors. Commercial sensitivities are high up the list, as are the challenges associated with changing existing complex operational structures.
- Service level agreements can be a disincentive for backhauling as customer service expectations often override logistic decisions.
- Freight exchange centres can play a role in helping operators reduce their empty running.
- Some operational types offer little potential for logistical collaboration due to difficulties in finding appropriate collaboration solutions to reduce empty miles e.g. tankers and the chilled/frozen food supply chain.

- Some sectors show an explicit reluctance/lack of willingness to consider collaboration to reduce empty miles e.g. the aggregates, construction and waste industries. In part this is due to concerns about the commercial consequences - but also there is a lack of compatibility in terms of vehicle or customer requirements, which prevents greater collaboration.

# 6 Recommendations

## 6.1 Government Interventions

There are a number of suggested interventions that Government could make in order to encourage collaboration and reduce empty miles. What is clear is that the larger organisations cannot be excluded from any interventions simply because they are already "good at what they do"– a small percentage improvement in their operations would have a big impact. However, interventions will also need to focus on the large number of SMEs (own account and hire and reward) who collectively have a significant impact. Through these interventions awareness, focus and encouragement would be given, although not limited to, specific collaborative actions including:

- Backhauling (including the potential to use commercial freight exchanges as well as more partnership approaches)
- Consolidation of loads through joint initiatives or a third party, which could be through a consolidation centre or through consolidation at partner locations
- Delivery Servicing Plans

Potential interventions identified through this study include:

- Collaboration Promotion Programme – this would be a Government funded programme, focussed on raising awareness of opportunities to collaborate among the key target audience(s), particularly the many own account fleet operators who do not specialise in transport and distribution. This is where empty running and under-utilisation is very evident. The programme would focus around an online portal. It would be promoted to all restricted licence holders (own account operators) as primary targets (but open to all) and explain collaboration concepts, give examples of successful collaboration approaches, initiate a matchmaking/brokering service where members can make links with like-minded companies and identify potential collaboration partners, share ordering, share resource, pool vehicles and share best practice examples, then run a series of workshops to bring parties together and disseminate the guidance material. The programme could be used to run a before and after pilot trial where operators use different methods of collaboration and can record data and demonstrate benefits. We recommend that other engagement tools be developed by the DfT, which would sit under this banner. These tools are discussed below.
- Department for Transport Guide to Collaboration - It would be useful to develop some industry guidance on collaboration. Within the stakeholder surveys perception of costs were identified as a barrier and so breaking down this perception would be helpful. It is also clear that, whilst some industries such as the grocery sector are effectively collaborating, this is not true of all industries. Therefore guidance from DfT could promote collaboration within the sectors that currently collaborate less frequently. Information on creating common standards for road freight data, which includes definitions of available KPI's could help break down some of the hurdles for SMEs. It could provide guidance on outsourcing and implementing Delivery Servicing Plans. It could also help raise awareness of available options in order to collaborate

as, whilst there are a number of commercial platforms available, not all companies (especially SMEs) have a good awareness of these.

- This would require a technical specialist to develop a number of case studies across a variety of sectors and sizes of operation. It would also create an opportunity to provide guidance on the legal position of partnership working which has been expressed as a specific barrier. The primary target would be the SME own account operators, rather than the larger organisations or the smaller hire and reward businesses, although it could be a route for these organisations to showcase their operations. The guide would need to be both driven and endorsed by industry and whilst it could be read as an innovative, standalone document; it could also be the anchor point of a DfT facilitated programme of engagement and activity to support the sector. Key to the success of the guide would be the means by which it was communicated to industry, especially the SME audience. This would require the engagement of industry bodies which include non-transport bodies that would reach manufactures and other non-transport specific sectors, chambers of commerce, and local networking organisations to reach out to the smaller operators. A further route to contacting own account operators could be through the operators licensing process with the opportunity to engage with SMEs also being available through this route. As part of this process there would be a need to encourage and guide Local Authorities regarding the importance of transport to the economy and to carbon and air quality objectives. This is in particular by way of the effective use of consolidation centres, delivery and servicing plans but also through out of hour's deliveries and local road network planning. Having more Local Authority and transport operator engagement would be critical.

  Table 7 below highlights some of the routes to business engagement and their advantages:

| Route to market | Advantages |
|---|---|
| Industry bodies: FTA | National, experience in the sector with large membership and database to access, credible |
| Industry bodies: RHA | National, experience in the haulier sector with large membership, credible, good access to SMEs |
| Professional bodies: CILT | National, reaches individuals as well as organisations, credible |
| Business groups: including BRC | National, could potentially access own account businesses better |
| Non logistics industry groups: including manufacturing | Could potentially access own account businesses better |
| Small business groups: Federation of Small Businesses | Has access to target audience within the SME community, effective tools to reach out to SME's and has experience of appealing to this group |
| Industry suppliers | Could cover, part fund and depending on supplier would have access to a wide range of organisations. Could help to encourage specific solutions to issues of collaboration e.g. perceived issues around use of freight exchanges |

| Route to market | Advantages |
|---|---|
| Trade Press | Good experience of engaging audience and a route to promoting activities and already very well-known and respected |
| DfT or other government body such as BEIS | Central, independent, credible |

Table 7: Routes to business engagement

- Cross Industry Working Groups - In parallel with the above, the DfT could look to implement cross industry working groups. There are some interesting examples of where this has worked extremely well, including the European Logistics Users Providers and Enablers Group (ELUPEG) which has been promoting collaboration at a European level for over ten years. Both this and the working group recommendation below need to consider own account operators with specific sector areas for focus.
- Sector Specific Working Groups - Further to the above, it would also be worth considering initiating sector specific working groups as some of the barriers and opportunities would be best explored within specific sectors. The CLOCS programme is a good example of a working group used to resolve safety issues specifically within the construction sector. A further example is the collaborative work of the Efficient Consumer Response (ECR) programme managed by the Institute of Grocery Distribution (IGD). Through this programme senior management from major players within the grocery sector were challenged to share their expertise in order to resolve wider industry challenges, such as sustainable distribution.
- Delivery Servicing Plans for Public Sector Operations - For all public operations, especially the health service, the creation of Delivery Servicing Plans would help to reduce deliveries and "force" consolidation and transport sharing. Taking this wider, more regional Delivery and Servicing Plans for certain congested areas could also encourage the introduction of consolidation centres and could have potential links to Air Quality Management Areas and form part of local transport and land use planning policies.
- Incentives - As alluded to above (planning guidance), there should be an introduction of incentives to encourage companies to collaborate. This could be that priority access is given to high utilisation vehicles or consolidation centre vehicles and could entail allowing them the use of wider delivery windows, bus lanes or providing better parking up areas. In addition companies could be enabled to deliver out of hours if they are willing to go over and above the standard requirements e.g. through investment in quieter trucks. In addition the use of consolidation centres could be incentivised by offering an element of financial subsidy. These suggestions are hard to implement given the array of vested interests and there are challenges around policing these; however, finding the right incentives to encourage collaboration would be a useful tool. Implementation could be by way of "approved schemes" with Local Authorities or Highways England. This is exemplified by the Bath Consolidation centre where their vehicles are given better access which in turn provides a better service to those organisations using the consolidation centre. The longer term solution to this would be automated data collection on vehicle fill. This

would allow for incentives to be given on performance and would also supply real world vehicle fill information which would improve on existing vehicle fill data collection which is prone to inaccuracy and does not cover the more complex dimensions of empty running (i.e. it only considers weight, not volume or deck length). The DfT could investigate electronic monitoring as measured by weight, volume and deck length. Aside from encouraging operators to collaborate, incentives such as out of hours deliveries would also have carbon benefits in themselves. The benefits of out of hour's activities are numerous. In particular Transport for London's Out of Hours trials showed that a 3.2% saving in fuel can be made as a result of moving just one delivery from daytime to out of hours and the DfT/Freight Transport Association Quiet Deliveries Demonstration Scheme showed that one retailer experienced a 5.7% saving in fuel as a result of night-time deliveries vs daytime. The extent to which out of hours deliveries could be utilised is unknown, however, as a hypothetical example a large retailer who delivers to its 1200 stores during the day and achieves a 4.5% improvement by replacing one of these deliveries into an out of hours timeslot could result in a reduction of 2.2 million (2,237,085) litres of fuel and 5995 tonnes (5,995,388 kg) CO2 in a year[14].

Similarly allowing laden or consolidated vehicles to use bus lanes could enable HGV average speeds during congested periods to improve and as a result use less fuel. The advantages to transport operators from using bus lanes allows for improved MPG through achieving more optimal duty cycles, reduced idling (we know a vehicle uses circa 2 litres an hour idling) and improved productivity. Improved parking up areas are less about efficiency but ease of operation that would incentivise operators – that said there is an implied carbon saving if vehicles can avoid driving extra mileage to find a safe parking area.

- Further study on the van freight sector. During this Study it became clear that whilst the focus of the work was on HGV freight activity and its contribution to carbon, there has been recent growth in van activity. Indeed in the 2015 Road Freight Statistics the fall in freight activity by smaller HGVs was in part attributed to the increase in light van traffic which covered 45 billion vehicle miles in 2014, the highest level ever (Department For Transport, 2015). This is 5.6% higher than in 2013, and 20.2% higher than 10 years ago, although not all of these vans would be carrying freight. It is therefore suggested that consideration be made as to how this freight activity contributes to emissions.

[14] The calculation was based on an average return trip mileage for each store x 1200 to give total operational mileage run, divided by 8.0 for average truck mpg to calculate total gallons consumed, multiplied by 4.54 for total litres consumed, then calculate 4.5% of total fuel consumed as fuel saved, then multiply by 2.68 to achieve kgs CO2 saved.

## 6.2 Policy Interventions Summary

| Policy | Ease of implementation | Cost of implementation | Contribution to carbon reductions | Comments |
|---|---|---|---|---|
| Incentives – Use of bus lanes/priority lanes, out of hour's deliveries, parking controls. | Hard | High | Significant | Incentives are around the encouragement to businesses to change the way they operate by providing a desirable consequence of that action. This is especially attractive for urban areas but can also be a useful tool in other environments<br>As a hypothetical example a large retailer who delivers to its 1200 stores during the day and achieves a 4.5% improvement by replacing one of these deliveries into an out of hours timeslot could result in a reduction of 2.2 million (2,237,085) litres of fuel and 5995 tonnes (5,995,388 kg) CO2 in a year. |
| Department for Transport - Guide to Collaboration | Easy | Low | Medium | The impact will depend on the level of engagement, however, given that research and stakeholder interviews suggested that awareness, understanding and experience is preventing organisations from attempting collaboration, a guide to combat this would be beneficial. This is particularly the case if it were to be integrated to the recommended Collaboration Programme where it could contribute to improve confidence and capability within the industry. |
| Cross Industry Working Groups | Medium | Low-Medium | Medium | Cost of implementation and the impact depends on the programme of works that is planned by the groups, such as freight movement studies, awareness programmes and feasibility studies. |
| Sector Specific Working Groups | Medium | Low - Medium | Medium | Again, the cost of implementation and the impact depends on the programme of works that is planned by the groups, such as freight movement studies, awareness programmes and feasibility studies. |
| Collaboration | Medium | Medium - High | Medium | Implementation costs and |

| Policy | Ease of implementation | Cost of implementation | Contribution to carbon reductions | Comments |
|---|---|---|---|---|
| Promotion Programme | | | | benefits depend on the level of activity. As an example, the Freight Best Practice Programme reported savings of £190m achieved through implementing measures to improve efficiency which was more than non-users. On average, organisations saved £41,000 compared to £12,000 saved by organisations that do not use the programme; this equalled 210,500 litres of fuel per annum saving 588 tonnes of $CO_2$. |
| Delivery Servicing Plans for Public Sector Operations | Medium | Low - Medium | Low | The Emirates Stadium example suggested that they had reduced their deliveries by two thirds. |

Table 8: Policy Interventions Summary

## 6.3 Industry Interventions

Further to government interventions, there are also ways in which industry could achieve greater collaboration and these should be explored through some of the Government policy recommendations. Through the stakeholder interviews and the case studies it is clear that this is happening to varying degrees, but in summary, especially in the own account SME environment, industry needs to consider more systematically some of interventions mentioned in this study, which can be summarised as:

- Explore potential to share resources either at a local level or because of other synergies such as product type, service requirements
- Review whether or not own account operators really need to run a fleet compared to using a carrier. This is particularly the case for the smaller operator who may not have thought more strategically about their logistics structure in the past
- Explore potential to collect goods from suppliers using their own vehicles. This would mean a change from their restricted operator's licence to a standard one (complying with additional requirements) to enable carriage of goods for third parties
- Assess whether or not consolidation centres could help with last mile logistics
- Assess whether remote and peripheral delivery destinations could be better served through a pallet network or contract haulier
- Explore how Freight Exchange Centres could assist with backloads to reduce empty running where direct collaboration may not be available

# Appendix A Bibliography


Commercial Motor. (2014). The Best of CM Investigates: Why is empty running on the rise?

Davies, A. (2007). Assessing the impact of ICT on UK general haulage companies.

Department for Transport. (2006). Profit Through Partnership.

Department for Transport. (2010). Freight Consolidation Centre Study.

Department for Transport. (2012). Road Freight Statistics.

Department For Transport. (2015). Continuing Survey of Road Goods Transport.

Department for Transport. (2015). Domestic Road Freight Statistics - United Kingdom.

Department For Transport. (2015). Road Freight Economic, Environmental and Safety Statistics 2014.

DHL. (2016).

Dr Andrew Palmer, D. A. (2011). An Analysis of the Opportunities for Improving Transport Efficiency through Multi-lateral Collaboration in FMCG Supply Chains .

Dr P. Greening, D. M. (2015). An assessment of the potential for demand-side fuel savings in the Heavy Goods Vehicle (HGV) sector.

Frans Cruijssen, A. B. (2012). Operational and Legal Framework for Collaboration.

Institute of Grocery Distrbution. (n.d.). www.IGD.com. Retrieved September 2016

Irina Harris, Y. W. (2013). ICT in multimodal transport and technological trends: Unleashing potential for the future.

M Piecyk, A. M. (2010). Forecasting the carbon footprint of road freight transport in 2020. International Journal of Production Economics,.

McKinnon, A. (2015). Optimizing the road freight transport system. Global logistics: New directions in supply chain management.

McKinnon, A. C. (2006). The potential for reducing empty running by trucks: a retrospective analysis. International Journal of Physical Distribution & Logistics Management.

MotorTransport. (2015). Overview of the UK Commercial Vehicle Industry.

Piecyk M, M. A. (2013). SRF Roadmap – part 1, Road freight transport in the UK Technical Report, CUED/C-SRF/TR.1.

Sutton Borough Council. (2010). Borough Delivery and Servicing Plan.

Transport for London. (2016). www.tfl.gov.uk.

Transport for London. (n.d.). Delivery and Servicing Plans - making freight work for you.

TTR ltd. (2011). Quiet Delvieries Demonstration Scheme. Department for Transport.

# Appendix B Stakeholder Survey Materials

Text for initial email participants

Title: Department for Transport Freight Sector Industry Collaboration Study request to participate

In line with the UK's 2050 Carbon Reduction Targets, the government is considering a range of new policy interventions, including GHG emissions reductions from freight. As such, the Department for Transport is currently undertaking a Freight Carbon Review and one of the areas identified for further research is the potential for increased industry collaboration to reduce the number of HGV's on the road and therefore decrease the levels of GHG emissions.

The Department for Transport is seeking the views of operators on how to improve vehicle productivity, maximise vehicle fill and reduce empty running.

We are embarking on a programme of industry engagement interviews so that the views of key operators are taken into consideration.

We would like to invite you to participate in this process through taking part in a short (face-to-face/telephone – delete as necessary) interview with one of the members of our team to help us to better understand your views on industry collaboration. These interviews will be taking place WC 30th May and WC 6th June. The interview will take approximately (1 hour/30 mins – delete as necessary). We will be contacting you by telephone to arrange a time convenient to yourselves. We will as well as provide an outline of the areas we would like to cover in advance of our discussion.

We look forward to hearing from you.

Yours faithfully

Morag White/Steve Willis/Ros Walker/Alan West

TTR Ltd, on behalf of Department for Transport

Confirmation text for face to face interviews

Title: Department for Transport Freight Sector Industry Collaboration Study: Meeting arrangements and agenda

Thank you for agreeing to participate in the Department for Transport Freight Sector Industry Collaboration Study. We look forward to meeting you on (Date) at (time) at (Venue). We anticipate this taking about an hour of your time. To help focus the discussion, we have attached an outline of the areas we would like to address, as well as some key information needed to better understand the potential impact of collaboration. This information will be anonymised and not attributed to you in the report unless we have prior agreement from yourselves.

Thank you once again and please do get in touch of you have any questions.

Morag White/Steve Willis/Ros Walker/Alan West

TTR Ltd, on behalf of Department for Transport

Confirmation text for telephone interviews

Title: Department for Transport Freight Sector Industry Collaboration Study: Telephone interview arrangements and agenda

Thank you for agreeing to participate in the Department for Transport Freight Sector Industry Collaboration Study. We look forward to talking you on (Date) at (time). We anticipate this taking about half an hour of your time. To help focus the discussion, we have attached an outline of the areas we would like to address, as well as some key information needed to better understand the potential impact of collaboration. This information will be anonymised and not attributed to you in the report unless we have prior agreement from yourselves.

Thank you once again and please do get in touch of you have any questions.

Morag White/Steve Willis/Ros Walker/Alan West

TTR Ltd, on behalf of Department for Transport

Discussion guides for interviews (Operators)

Title: Department for Transport Freight Sector Industry Collaboration Study Questionnaire - Operators

Interview Background: In line with the UK's 2050 Carbon Reduction Targets, the government is considering a range of new policy interventions, including GHG emissions reductions from freight. As such, the Department of Transport is currently undertaking a Freight Carbon Review and one of the areas identified for further research is the potential for increased industry collaboration to reduce the number of HGV's on the road and therefore decrease the levels of GHG emissions.

This study will be investigating ways in which industry operators' work in partnership with each other or with 3rd parties in order to improve vehicle productivity, maximise vehicle fill and reduce empty running.

It is important to the Department that the views of the key stakeholders including industry operators are taken into consideration.

Below are a number of areas which we would like to discuss with you during the interview. If you get a chance, please review these in advance of the interview. Please note cost information need only be high level rather than detailed. It's also worth knowing that unless we specifically ask you all information and opinions will be ammonised:

1. How many HGV's do you have? (See spreadsheet provided as part of the previous email). We will go through the attached spreadsheet.
2. What are your training costs per annum for those involved in the transport operations?
3. What are the personnel costs, such as salaries per annum for all those involved in the transport operations?
4. How would you define empty running?

5. What would you define as being collaboration between operators?
6. Do you believe that you undertake any form of collaboration and what form of collaboration is it?
7. If no, have you considered it or tried it?
8. If no, why not?
9. To what extent would you be able to collaborate (what's the best you could expect to reduce empty running to)? What is "best"?
10. What do you perceive the barriers to collaboration to be?
11. How could you remove those barriers?
12. What could central government do to remove those barriers and encourage more collaboration? (Financial and non-financial interventions)
13. Could you collaborate with your own sector or would there be opportunities between sectors?
14. What information would you need to know in order to enable collaboration e.g. shared loads, backloading?
15. How much do you think you as an operator could save (£ and Litres) if you achieved the best level of collaboration with others in your operation?
16. If you undertake collaboration what costs are there in association with this (e.g. cost of membership to load sharing organisation, staff etc.)? If you don't do any, what costs do you think there may be?

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# Appendix C Cost/Benefit Analysis template

## Costs/Benefit Tab

| DfT Freight Collaboration Costs and Benefits | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Operators | | | | | | | | | | | |
| Costs | | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| | Capital costs | | | | | | | | | | | |
| 1 | Purchase cost of HGVs | | | | | | | | | | | |
| 2 | Cost of hire of HGVs | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Operational costs | | | | | | | | | | | | |
| 3 | Cost of fuel used | | | | | | | | | | | |
| 4 | Cost of vehicle maintenance | | | | | | | | | | | |
| 5 | Personnel Costs | | | | | | | | | | | |
| 6 | Training costs | | | | | | | | | | | |
| 7 | Insurance costs | | | | | | | | | | | |
| 8 | Cost of exchange company subscription | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Benefits | | | | | | | | | | | | |
| 9 | Fuel cost savings | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | Freight Exchange | | | | | | | | | | | |
| Costs | | | | | | | | | | | | |
| | Capital costs | | | | | | | | | | | |
| 1 | Systems/IT costs | | | | | | | | | | | |
| 2 | Additional equiptment | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | Operational costs | | | | | | | | | | | |
| 3 | Additional staff | | | | | | | | | | | |
| 2 | Subscription costs | | | | | | | | | | | |
| 5 | Cost of maintenance of IT/additional equiptment | | | | | | | | | | | |
| 6 | Labour costs | | | | | | | | | | | |
| 7 | Training costs | | | | | | | | | | | |
| 8 | Insurance costs | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Benefits | | | | | | | | | | | | |
| 1 | Fuel savings (litres) | | | | | | | | | | | |
| 2 | Carbon emmision reductions | | | | | | | | | | | |
| 3 | Air quality improvements | | | | | | | | | | | |
| 4 | Road accident reductions | | | | | | | | | | | |
| 5 | Congestion reduction | | | | | | | | | | | |

## Fleet Profile Tab

| Company | Number of vechiles | Type of vechile (rigid, artic, refirderated, weight) | Trailer length and shape | Average milage per vechile per annum | Cost of vechiles | Duty cycle for vechile type | Total Fuel use (litres) for vechile type | Average journey distance for the vechile type | % trips (round trip) that have an empty leg for vechile type | What is the empty distance? | Cost of all maintance for vechile type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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Data and Assumptions

All CBA depends upon the quality of the data used in the analysis and a range of assumptions on which it is based. The data applied has come from four main sources:

- Department for Transport (DfT)
- Department of Business, Energy and Industrial Strategy (BEIS)
- Freight Transport Association (FTA)
- Freight operators (for specific examples)

Due to the variability in the quality of the company data the spreadsheet has also had to rely on published information for completeness.

The spreadsheet calculated 2 scenarios:

- A simple 1% reduction in the base (i.e. initial mileage)
- A simple 5% reduction in the base

It should be noted that this is just one example as a baseline for comparison - overall mileage using a freight exchange could increase since not every backload will fall on the return to base.

Data can be adjusted in order to conduct sensitivity analyses using different assumptions. In the spreadsheet, while some data for 2015 is provided, the forecasts consider the period 2016-2020. Two particular vehicle types have been reviewed:

- articulated vehicle (44 tonne artic, 3 axle tractor, 3 axle curtain semi-trailer); and
- rigid vehicle (3 axle rigid of over 26t gvw box or curtain sided).

These vehicle types are typical for the freight industry. The spreadsheet could easily be adjusted to analyse the impacts of other vehicle types. Calculations are based on individual vehicles. If more vehicles are involved in a freight exchange the opportunities for reducing empty backhauling could increase thereby securing greater benefits both for operators and society in general. However, excessive freight capacity could drive down rates and still mean empty running if there is significant competition.

The main assumptions applied in the analysis are that:

- Data from operators is reasonably reliable.
- A time period of 5 years for potential impacts to be assessed is reasonable. Freight operators working in a highly competitive market tend to focus on short term benefits (although Government often considers longer-term impacts as well).
- Financial data in forthcoming years has not been discounted so as to keep the analysis straightforward. Since both the costs and benefits occur at similar times this assumption seems reasonable.
- No additional costs as a result of, for example, higher insurance premiums or training, are incurred by operators.

- No additional societal benefits as a result of fewer road accidents or air quality improvements arise.
- Fuel costs have been inflated by 5% pa. This is particularly important since the cost of fuel is where the main benefit to operators is likely to arise. Given that fuel prices have been low for a couple of years but are now starting to rise, such an assumption seems plausible.
- Average distance travelled by HGVs is also assumed to grow, even with use of a freight exchange, the demand for freight services is a derived demand dependent on changes in other sectors of the economy. Economic growth in the UK has been slow since the recession and, given the uncertainties relating to the country's relationship with its main overseas market - the European Union - future growth in lorry miles may not be forthcoming. Hence two levels of lower mileage (and hence fuel cost savings) have been assumed: a 1% and a 5% reduction. Total mileage as a member of a freight exchange could increase, not decrease, due to extra stem miles run to collect and the same following delivery. However, empty running mileage will probably reduce as an overall proportion of total mileage run. Thus an assumption of increases in mileage is feasible with membership of a freight exchange helping to lower that increase.
- Personnel and training costs rise by 5%pa. Labour costs have been relatively static since the recession but a 5%pa rise seems plausible.
- Vehicles are purchased in 2015 and depreciation costs are incurred over six years. This is an average lifespan for vehicles. Should vehicles be operating longer then, assuming that GHG emissions do not worsen; benefits would be greater since the average operating cost per year would be lower.

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# Appendix D Cost-Benefit Analysis – Technical Summary

In a CBA, the benefits and costs of a proposed investment are expressed in monetary terms based on the market price, and are generally adjusted for the time value of money, so that all flows of benefits and flows of project costs over time (which tend to occur at different points in time) are expressed on a common basis in terms of their net present value (NPV).

The benefit-cost ratio (BCR) summarises the overall value for money of a project or proposal. The BCR takes into account the amount of monetary gain realised by a project versus the amount it costs to execute the project. All benefits and costs are expressed in discounted present values and, should the BCR exceed one (1.0), then the proposal is considered viable and a good investment with higher BCRs generally assumed to represent a better investment.

We have calculated the Present Value (PV) of the cost of exchange company subscription and benefits of fuel and carbon saved over the period 2015-20. The basic costs of operation (e.g. depreciation, fuel used, maintenance, personnel and training) have been kept static over the time period for simplicity. Some other data (e.g. mileage and MPG) has also been unchanged over the period for ease of use. In reality, of course, such data will vary over time due to a range of external factors such as international oil price increases and technology improvements. The spreadsheet can easily accommodate such changes in data inputs.

The cost of participation in a FEC involves an annual fee (rather than a one-off capital cost) and the benefits (both to the operator and society) are expected to arise every year. The recommended UK public service discount rate is currently 3.5%; at this rate £1,000 of either costs or benefits in 2015 would decline over time and be valued at £842 in 2020.

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# Appendix E Spreadsheet Tool

In order to ensure that the spreadsheets represent the costs facing freight operators, both capital and operating costs have been included thus making it a more complete picture of the benefits and costs. The main capital costs considered are: the purchase cost of HGVs (depreciated over six years) or the cost of the hire of HGVs. These are used to generate the annual capital cost for an individual vehicle. We have assumed that HGVs have been purchased in 2015 and that depreciation occurs over the year of purchase (2015) and the following 5 years until 2020. The impact of greater collaboration would be unlikely to have an effect on the upfront costs for an operator unless purchases of new vehicles are delayed as a result. Anticipated vehicle life of HGVs is usually 5-6 years[15] but this may be extended if mileage is reduced as a result of being involved in a freight exchange scheme.

In terms of operational costs calculated the following are included: the cost of fuel used; the costs of vehicle maintenance and tyres; personnel costs; training costs; as well as the costs of insurance, VED (Vehicle Excise Duty), RUL (Road User Licence). In addition, the costs of subscription to a freight exchange centre are included to complete the components of the total operating costs. The cost of participation in a FEC involves an annual fee (rather than a one-off capital cost) and the benefits (both to the operator and society) are expected to arise every year (the cost of participating in a freight exchange has been estimated provided to TRL by an operator to be £240[16] per vehicle pa.) It is assumed that all vehicles undertake the same mileage and so for the national analysis we have applied an average mileage.

We have calculated the Present Value (PV) of the cost of exchange company subscription and benefits of fuel and carbon saved over the period 2015-20. The basic costs of operation (e.g. depreciation, fuel used, maintenance, personnel and training) have been kept static over the time period for simplicity. Some other data (e.g. mileage and MPG) has also been unchanged over the period for ease of use. In reality, of course, such data will vary over time due to a range of external factors such as international oil price increases and technology improvements. The spreadsheet can easily accommodate such changes in data inputs.

Total undiscounted costs are calculated in the spreadsheet and adjusted by the social time preference discount rate to generate the discounted total costs per year. This is then summed over six years (2015-2020) to produce the sum of the present value of the costs of engaging in a freight collaboration system. The recommended UK public service discount rate is currently 3.5%; at this rate the NPV £1,000 of either costs or benefits in 2015 would decline over time and be valued at £842 in 2020.

Since a major benefit from freight collaboration will be lower mileage, and hence a reduction in the fuel used, two reductions in base mileage are calculated: a 1% and a 5% reduction in mileage. The main benefit to operators is the value of the fuel saved due to lower vehicle mileage. These two assumptions are designed to represent different scenarios; a small reduction and a larger decrease in mileage as a result of participation in freight

[15] Vehicle Costing, CPC Notes, Freight Transport Association, January 2010

[16] The NPV of the cost of £240 per vehicle per annum is £1,324 when discounted over five years

collaboration. If a small reduction in mileage generates cost savings for operators, and benefits for society in the form of carbon savings, then a larger decrease will be even more beneficial. These are illustrative reductions: a 1% reduction in mileage is relatively small but indicates what might happen if the benefits from being involved in a FEC are small, for example if haul distances are short. The larger, 5% reduction is considered achievable with effective collaboration and is only slightly above the mileage reductions that have been claimed for the use of Freight Consolidation Centres (Dr P. Greening, 2015).

In addition to the benefits to freight operators calculated in the CBA spreadsheet there are other potential benefits not included that could influence the decision of an operator to take part in a scheme. These include:

- A reduction in personnel costs due to the need to employ fewer drivers and other staff. Participation in a freight collaboration scheme could reduce the need for as many drivers as at present. Due to the costs of recruiting new drivers, or making full-time employees redundant, it would be understandable if firms would reduce their use of agency or part-time workers, rather than full-time staff, or simply improve their driver utilisation.
- Reduced maintenance costs due to lower vehicle mileage and hence lower levels of vehicle wear and tear.
- Lower mileage could lead to operators not needing to purchase new vehicles as frequently as previously.
- Load sharing could reduce the need to hire HGVs on an occasional basis to cope with irregular loads, generating lower capital expenditure.
- Lower insurance costs could be a further benefit of lower vehicle mileage.

These potential benefits to an operator have not been included in the CBA which focusses on the reductions in mileage and associated fuel costs, so any additional cost savings that might be experienced by freight operators involved in a collaboration scheme are not considered here. Against these benefits must be set the possibility of higher costs of insurance or higher wear and tear due to the need to move freight for other operators. Some costs, such as personnel and training, are unlikely to change significantly as a result of involvement in a freight exchange centre. Due to uncertainty over such costs this analysis only calculates the possible financial benefits of reduced mileage and fuel use associated with different levels of mileage reduction.

Mileage reductions may not necessarily occur for all parties or at the time of using a FEC since mileage may increase for the company undertaking the backload in order to access a pick up point although the % of empty running should be reduced and the overall vehicle-km between the collaborators would also be reduced. Whether an individual operator would receive these benefits depends on the location of backload pick-up points, additional mileage driven, additional fuel used, etc. It is assumed that such cost reductions offset any additional mileage to a greater or lesser extent.

Our approach has been cautious in its estimation of the benefits to freight operators by not making unrealistic assumptions over the level of fuel cost savings that could be made. However, if the reductions in fuel costs justify participation in a freight collaboration scheme

then it must be recognised that there could be additional benefits, in the form of cost savings, to operators as outlined above.

The main benefit to society from freight collaboration would be a reduction in CO2 emissions. The sum of the present value of the carbon saved is summed over the same six year period as for the costs (for the non-traded low, central and high carbon values derived from the former Department for Energy & Climate Change)[17]. The carbon values are used as a benchmark to help identify policies and measures which could help meet the UK's climate change targets cost-effectively. Using the high carbon value reflects the pressure to reduce carbon emissions. The carbon cost-effectiveness[18] is calculated as is the BCR (Benefit-Cost Ratio) (again for the low, central and high carbon values). For the national data spreadsheet the total value of carbon emissions savings is also calculated for both the 1% and 5% reductions in baseline mileage using both the low, central and high estimates of carbon values for the artic vehicle stock (120,000 HGVs) and also the rigid vehicle stock (276,300 HGVs). The data for the number of artic and rigid vehicles is based on the numbers registered by the DfT at the end of 2015 (Department for Transport, 2015). This data is likely to vary over time with fluctuations in the economy but for the purpose of this analysis no variation has been included in the totals.

There could also be other significant societal benefits from less mileage being driven, including for example: reductions in road traffic accidents; improvements in air quality due to reduced emission of particulate matter and NOx and reduced congestion. For simplicity this analysis only considers the impact of the potential for reductions in carbon emissions.

Because of the limitations of this analysis it should be recognised that the benefits of freight collaboration, both for operators and the general public, could actually be greater than those calculated. In other words, should the impact generate a positive BCR in this analysis, in reality the benefits to operators and/or society as a whole could well be higher. Thus this analysis should be seen as only one input into the decision making process.

The CBA input data comes from a variety of sources: the Department for Transport; BEIS, the Freight Transport Association; and individual companies. Where assumptions have been applied, for example in the estimated costs of membership of a freight exchange centre, these have been provided by TRL. All data is calculated for individual vehicles on a per annum basis for both artic and rigid vehicles. The analysis of national data has focused on two types of vehicle: 33 tonne gvw articulated vehicles (2 axle tractor or 2 axle curtain-sided semi-trailer) and 4 axle rigid tipper 32 tonnes gvw.

The CBA spreadsheet can easily be adapted for different types of goods vehicle, different time periods as well as alternative values of carbon and operating or capital costs.

[17] Data_tables_1-20_supporting_the_toolkit_and_the_guidance, Department for Energy & Climate Change, Sept 2015

[18] The carbon cost effectiveness is the net cost of saving a tonne of carbon

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# Appendix F Cost-Benefit Analysis – Company examples

| Company | Company description |
|---|---|
| A | Metal recycling company operating 90 vehicles throughout the UK, as well as having international operations. The core business is the recycling of scrap metal from a range of sources. The UK business operates mainly artics |
| B | SME general haulage operating 10 vehicles, abnormal load and crane movements, operating throughout the UK, mainly operating with artics |
| C | SME general haulage operating 120 vehicles, container movements and refrigerated transport operating throughout the UK, mainly operating with artics |
| D | SME for general haulage operating 11 vehicles – ranging from small loads to larger cargo, operating through the UK and with international operations.<br>Information provided rates to their artic operations. |
| E | Large UK based 3rd Party Logistics operator with 1,360 vehicles with a mix of operations from grocer to fuel. Data gathered was for the South East convenience grocery sector using rigid vehicles |
| F | Large international business operating 5 vehicles - consists of services such as International Freight Forwarding (by air or ocean), Contract Logistics (such as Warehousing), and Transportation (such as trucking). The UK business operates a cross range of vehicles, but data provided was for their rigid vehicle operations |
| G | Logistics services primarily to the UK construction industry, operating 3 vehicles, information was provided for their rigid fleet operations |
| H | Large UK based 3rd Party Logistics operator of 640 vehicles - with a mix of operations from grocer to fuel. Data gathered was for the tanker operations |

# Freight Industry Collaboration Study

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