The logistics perspective: End-to-end journey case studies (HTML version)

Table of contents

July 2008

Introduction

The Logistics Perspective: End-to-end journey case studies is part of the Department for Transportâs Towards a Sustainable Transport System (TaSTS) program. TaSTS was published in October 2007 and it sets out proposals for a new approach to strategic transport planning for the period beyond 2014 in light of the Eddington and Stern reports. The case studies are part of a wider body of work in response to TaSTS that is being undertaken by the Department, including an upcoming freight and logistics document.

The end-to-end journeys respond to the Eddington principle of understanding transport in the context of the whole journey. A "top-down" analytical perspective of the logistics sector does not alone bring out the full complexity or diversity of transport chains, nor does it necessarily identify key issues important to freight users and providers. Working with a wide range of partners, the case studies are an attempt to increase the understanding of logistics activities by looking at whole journeys rather than isolated components of the transport chain. The aim of this approach is to bring out the full complexity, interaction and diversity of transport chains by examining selected flows from origin, through all the links in the journey, to the final destination of the goods.

We have now completed six case studies that were selected to range across sectors, commodities, modes, gateways and networks. These six studies look at:

- how a sofa from China is delivered to a home in Newcastle (including deep-sea container transport) (PDF);
- how coal from Russia is delivered to a power station in the Aire Valley (PDF);
- how lamb from Scotland is exported to France (including ro-ro transport) (PDF);
- how wine from California gets to the store in Manchester (PDF);
- the collection and return for an electrical device from London to Rome (by air freight) (PDF); and
- how a city centre construction site is supplied with concrete (PDF)

Each analysis reflects one or more journeys by, or for, a British business. They seek to enhance the understanding of freight activities and issues from the user and operator perspective, to place issues in their proper context and ultimately better inform future policy making.

The Logistics Perspective: End-to-end journey case studies is complemented by the Departmentâs other end-to-end journey analysis of container, ro-ro and aviation journeys. (To be available on the Department for Transport website and accessible here: End to End Journey Analysis).

We know that no single journey or case study is representative of any given sector in what is a diverse industry with a range of different-sized operators, with varying market share, operational practices, business methods and aims. The benefit of each of the end-to-end case studies is that they highlight the complexity of freight and logistics across the various sectors and they highlight that there are competing goals and challenges for industry and Government to prioritise.

Structure of the studies

Each end-to-end case study begins with an introduction of the market specific to each journey. This draws on key data and statistics to inform the reader about the state of that market. These are key facts that set the scene and provide context for the rest of end-to-end case study analysis.

The scenario is explained. This details the specifics of the end-to-end journey that is the subject of the case study. This is followed by a detailed explanation of the steps in the journey - divided into key segments, such as changes in mode, passage through a gateway or unloading of goods. The precise segments vary for each study, but the aim throughout is to identify the impacts of particular issues on the whole journey. For example, a road haulier transporting a container from a maritime port to an import centre may experience a 30 minute delay on the motorway due to congestion in a four hour journey, this needs to be understood in light of the whole journey and the fact that the driver may have waited at the port for one hour to collect the container and could be held up for another hour at the delivery point. This illustrates one of the benefits of the end-to-end case study analysis because it demonstrates how time is used over an entire journey.

The explanation of each journey is based on the experiences of our stakeholders, who range from retailers to road hauliers (hire reward and owner account); rail freight operators, aggregate movers, cement suppliers, air couriers, freight forwarders, power station operators, coal mine operators and ports operators. In total, the Department has engaged with 26 different stakeholders specifically for the end-to-end freight journey analysis.

In the studies we have incorporated supporting data that informs and broadens the single user experience of the case study into a perspective that would apply to a wider range of users. For example, the air freight case study considers the movement of goods by road to the airport and underpins the import role that our roads play in supporting air freight: we therefore provide supporting journey time data that shows the journey times undertaken between city and airport over a one month period. This places the case study in an appropriate context.

Next steps

We are happy to receive comments in writing about these case studies. Please respond before the 12th September 2008 to:

James Williams
Department for Transport
2/15, Great Minster House
76 Marsham Street
London, SW1P 4DR

Email: james.williams@dft.gsi.gov.uk

Comments received will be collated and may help inform further case studies or other work undertaken by the Department. We are also undertaking further end-to-end journey case studies that will be included in a second edition of The Logistics Perspective: End-to-end journey case studies likely to be published in the winter.

Key Messages

Many shared themes run through more than one of the case studies. These themes range from major policy issues, to recognition of some of the practical day-to-day business concerns for freight providers. Specifics can include the price of fuel, planning around drivers' hours, lorry parking and meeting delivery windows. This section summarises some of the key messages that the Department has taken from this work.

This is not intended to be a comprehensive list as we do expect that other matters will arise, or become more visible, as we continue with additional case studies.

1. Journey reliability can (but not always) be more important than journey time

Each case study examines the use of time because time has a value both generally and in terms of reliability. This is not just about unexpected delays, which can result in unplanned lost time, but it is also about the time planned into supply chains to allow for anticipated delay. The studies suggest that predictability of journeys is often of much greater importance to freight users and providers than the total time taken for any given journey.

This is highlighted by the interplay between the actual journey time and the planned journey time when undertaking the transport of HGVs between Britain and France on the Dover Straits route. The user experience reported to us highlighted that the journey time across the Channel can vary from one to three hours. The operator reaction to this is that significant slack time is being planned into journeys as a

compensation for the variation in the time it takes to cross the Channel. From a route planning perspective most journeys allow three hours for the crossing.

There are other freight journeys where reliability and speed are both vital. An example is the overnight air freight courier market that optimises multiple modes to achieve the delivery deadlines specified by customers. Express couriers offer customers late collections and specified delivery deadlines. The latest collection times are dependent on where the customer is located, the network operated by the courier company and the performance of the road network linking the customer (and the courier company) to the airport.

The case studies indicate that the causes of unplanned time loss on journeys are diverse and vary according to the commodity being transported. Some stakeholders have indicated that congestion of the national networks is a serious issue, but they have also indicated that it needs to be seen in the context of a number of other issues that operators and customers have to address.

Two of the most cited causes in the case studies of unplanned time lost are incidents at ports (such as crane failure or the late arrival of a vessel) and loading or unloading delays at distribution centres. In the construction industry the most cited reasons for delays are clients not ready to accept a delivery, traffic accidents and road works.

We have also been informed that anticipated road congestion is often planned into the time operators allow to for journeys. This increases journey time reliability but at the cost of decreasing productivity and asset utilisation. This is illustrated in the Construction case study that showed that the average daily number of deliveries made by concrete mixers in London is only at 80% of the UK national average (despite the kilometres travelled being shorter); this is planned into the way vehicles are used, but it reduces productivity and results in operators placing more concrete mixers on the road.

It should also be noted that for a significant time within many of the end-to-end journeys studied, that goods were stationary or not in transit. For example, from making the order to delivery, the sofas from China were only on the road in the UK for 2% of the time, over a quarter of the time was spent in transit at sea, but the majority of time spent from order was spent collecting the raw materials and manufacturing the sofas.

2. Vehicle utilisation rates - and scope for further improvement - vary between and within sectors

Vehicle utilisation is the extent to which a vehicle undertakes a journey with a maximum load. This is measured either by volume or weight capacity of the vehicle, depending on the sector.

Vehicle utilisation can vary by mode, by which point of the distribution chain the vehicle is being employed in, as well as by commodity.

Primary legs (e.g. factory to distribution centre) usually have the highest vehicle utilisation because they are most likely to be moving one commodity in bulk. Secondary legs (e.g. from national distribution centre to regional distribution centre or local warehouse) also often achieve high utilisation because they can share many of the characteristics of primary legs, particularly in a road context. Tertiary deliveries (e.g. deliveries to stores) generally have the most variable utilisation and are the highest cost segment of the end-to-end journey. Tertiary deliveries are likely to have lower load factors, can make several drops

and are more likely to be delivering during periods of higher congestion. This effect was highlighted in both the Construction and the Container end-to-end studies.

With certain commodities, such as coal or aggregates for instance, vehicles are often fully loaded in one direction, but are 100% empty the other. In effect the vehicle utilisation will be limited in such circumstances to no more than 50%.

3. Only some journeys have the potential to take back loads - and scope for improvement appears limited

The key message is that filling return journeys has productivity, efficiency and environmental advantages that stakeholders are keen to exploit. The end-to-end case studies instanced a number of occasions where potentially empty runs were at least partially filled. For example, in the wine case study the lorry making the delivery to the store was filled with used packaging and locally sourced products to take back to the regional distribution centre.

However, our studies show that many supply chains did not carry back loads, usually for clear practical reasons. For example, coal trains return empty to the ports despite the fact that a common by-product of coal-burning â gypsum â requires onward transportation. The coal wagons cannot be used to transport gypsum because it would contaminate the wagons and the gypsum is transported to other locations, not to where the coal trains need to pick up the next load.

There are opportunities to increase back-loading and asset utilisation that can be promoted by investing in improved transport planning and optimisation software. For example, by sharing information and consolidating loads between operators. However, although the savings can be significant, the cost of these improvements can be relatively high, especially for small companies, and it can be difficult to build trust between competing operators and users.

4. Changes to delivery windows could deliver important benefits

For road freight there can be economic and environmental advantages in undertaking freight journeys outside peak periods of congestion. However, it is also the case that across all of the end-to-end case studies that used road there was a point where the goods had to be transported during periods of congestion. On each occasion (wine delivery to the store, sofa delivery to the home, concrete delivery to the construction site and collection and delivery of the couriered factory part in a light industrial area) the goods were moved during a peak hour because it was a requirement of the customer.

The Food and Drink case study highlighted the recent trial in Wandsworth (one of a number of recent trials) that demonstrated the economic and environmental benefits associated with undertaking freight deliveries when there is low congestion. It also demonstrated that, with the right approaches to the control of noise, some night time deliveries can be made without disturbing local communities. Some retailers are enthusiastic about night deliveries but have expressed concern that the current night delivery rules are inconsistent and that operators are reluctant to invest in quieter delivery vehicles unless they have certainty that they can deliver at night.

The growing trend towards "just in time" deliveries has had an impact on when deliveries are being made across many sectors. The air freight sector, especially the express market, is generally the most time sensitive freight market. Air is a valued business tool and is an important support for economic productivity and competitiveness as it moves high-value goods and items that have a high operational value (such as spare parts required to maintain the operation of a production line). However, due to the tight, and sometimes inflexible, timescales imposed by customer expectations, there are limited opportunities for air freight to change delivery windows.

Coal-fired power stations also operate lean supply chains that ensure as much of the coal supply as possible is made when the coal is needed to burn, rather than placing the coal into stockpiles. The customers in this market feel that it is essential that the supply chain is resilient and the journey times reliable to facilitate this.

Each end-to-end journey has a diverse range of service providers that can often have different perspectives. For example, vehicle booking systems (VBS) are a mechanism used by some port operators to manage port congestion, however these systems can place more pressure on road hauliers who must balance the port VBS slot with the requirements for loading or unloading at customers' premises. In addition to the initial scheduling burden, the VBS is also an administrative burden on hauliers who have responsibility for booking and rescheduling.

Likewise, at distribution centres and warehouses, delivery windows can vary from 30 minutes to three hours. A 30 minute delivery window is a short period to reach when balancing VBS, port delays, variable road conditions and other unforeseen circumstances; while three hour delivery windows are very wide but the haulier may not always know how quickly the goods will be loaded or unloaded. This makes it a challenge for hauliers to plan realistically and productively.

This is not an easy area in which to make changes. But it is clear from our studies that there is considerable scope to improve the effectiveness of delivery windows and mechanisms across supply chains - from distribution centres and ports through to local stores.

5. The environmental performance of freight varies significantly between sectors and modes. Trade-offs need to be made between different impacts

The environmental performance of freight is an important consideration and the impact of freight transport varies considerably across modes. Air freight produces the highest greenhouse gases per unit of cargo moved. In the Air Freight case study the return journey of the electronic device would produce an estimated 1.24 kilograms of CO2 per tonne km. By contrast, lorries emit 0.16 kilograms of CO2 per tonne km and rail emits 0.04 kilograms of CO2 per tonne km[1]. But this variation in impacts between modes should also be seen alongside the commercial need, in the case of the Air Freight case study, the need for the quick return of the goods to support production.

The Air Freight case study also demonstrates that there are trade-offs between different environmental impacts. In the case study, the freight aircraft returned to Britain in the early hours and landed at Luton due to the night flight restrictions at Heathrow. After 7am the aircraft then flies empty from Luton to Heathrow to commence the dayâs operations. This illustrates the complexity of balancing competing goals that are both desirable: in this instance reducing night-time noise impacts to improve the quality of life for residents nearby to Heathrow is balanced against the need to reduce greenhouse gas emissions through

eliminating additional flights.

The end-to-end case studies also identified opportunities for improvements that would increase both productivity and environmental performance. The Coal case study shows that the supply of coal by rail is reliable and cost-effective, however average speeds recorded in a week of around 15 mph, with frequent slowing down and stopping en-route indicates that there are opportunities for rail freight to perform better, increase productivity and reduce greenhouse gas emissions. The weekâs data of freight journeys from Immingham to power stations in the Aire Valley supports this assertion. It recorded average speeds of between 15 and 17 mph and average journey times that range between 2.5 and 5.3 hours (to Drax Power Station). There is a significant environmental cost associated with the frequent breaking of a freight train and the greenhouse gases that this emits and, at the same time, is an inefficient use of assets deployed. This is a clear example of the alignment of both environmental and productivity goals.

6. Many mode shift opportunities are already being taken and the scope for further modal shift varies significantly between sectors of the industry

Mode shift is the transfer of goods from one mode to another mode of transport. In this context it is in reference to the desire to move goods by lower emitting modes of transport (in broad terms such as from air to road or from road to rail or waterborne freight).

The market generally uses the most efficient mode to address the customers' needs: the wine case study illustrates the various ways different modes can be employed and that case study emphasises the workability and commercial viability of utilising short sea shipping and rail in the bulk liquid and container sectors when appropriate. Certain commodities lend themselves more easily to rail or waterborne transport: hence, for example, coal is the largest commodity moved by rail in the UK. Likewise, in the construction case study the aggregates and cement are moved by water and rail and yet the final delivery of concrete is almost always, of necessity, by road.

The mode shift opportunity from road to rail had been considered by the business involved in the Container end-to-end case study, however that journey between the Port of Felixstowe and the import centre in Kettering was not economic by rail. That is not always the case as there are many instances where rail competes effectively with road.

Conversely, there are times when mode shift is not a realistic proposition. In the case study of the slaughtered lambs from Shropshire to France there is no viable alternative rail service available. So the scope for mode shift is best considered in the context of particular addressable market sectors. The locations of distribution centres and interchanges between modes will be a key factor in business decisions on modal choice.

[1] DfT estimates 2008

The Case Studies

Case Study 1: A deep-sea container end-to-end freight journey

How a sofa from China is delivered to a home in Newcastle (PDF)

Case Study 2: A coal end-to-end freight journey

How coal from Russia is delivered to a power station in the Aire Valley (PDF)

Case Study 3: A ro-ro end-to-end freight journey

How lamb from Scotland is exported to France (PDF)

Case Study 4: A food and drink end-to-end freight journey

How wine from California gets to the store in Manchester (PDF)

Case Study 5: An air freight end-to-end journey

The collection and return for an electrical device from London to Rome (PDF)

Case Study 6: A construction end-to-end freight journey

How a city centre construction site is supplied with concrete (PDF)