Improving the efficiency of freight movements:

the contribution to UK economic growth

Interim Report

Nick Gazzard
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The ITC would also like to record its gratitude to all our Core Benefactors: a list of whom can be found on the main ITC website (www.theitc.org.uk). Their generous support has made this research possible.

Foreword from the ITC Project Chairman

The Independent Transport Commission intends, in this interim report, to identify several important ways and means by which the UK freight and logistics industry might improve its efficiency. The particular focus is on three key areas: empty container movements, innovative distribution from sea port estates and the potential of better urban freight distribution networks. This has thrown up significant, new insights into the importance to the UK economy of freight operations and planning, so often the Cinderella of UK transport policy.

The facts unearthed are quite startling, and never before has the importance of getting UK policy imperatives to recognize, align and support the role played by the UK freight and logistics industry been better demonstrated than by the content of this research project. I commend this report to every policy maker who is remotely concerned with the efficient operation of the UK's economy.

There are, as a consequence of the report, some proposals for some new initiatives which the ITC will now discuss with Government and other relevant institutions, to take forward into the next phase of the research programme. I am pleased to be associated with this work and look forward to seeing it progress through to its next stage.

Nicholas Finney OBE
Chairman of the Freight Working Group
Independent Transport Commission

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Interim Report

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Executive Summary

Introduction

1. This interim report from the ITC was commissioned in 2013 as part of its 'Freight and Logistics' research programme. It emerged from a recognition that the freight and logistics industry faced significant pressure from environmental legislation, cost pressures and rapid changes in global connectivity patterns.

Terms of reference

2. The ITC felt that it was important first to understand the extent to which research work already existed on the challenges faced by companies, both domestically and internationally. We were particularly interested in three interlinked topics:

- ***Urban freight distribution priorities*** and the impact of national and local freight restrictions applying in city regions. In addition, we wanted to identify case studies which show best practice.
- The extent to which ***port-centric warehousing and distribution*** was developing and what effects this might be having on consolidation and distribution centres, particularly in the West Midlands.
- ***The movement of empty containers*** around the UK and the problems created by a mismatch of container supplies to demand

3. A lead researcher, Nick Gazzard of Incept Consulting, was appointed to conduct the work under the guidance of the ITC steering group and funding was provided for additional temporary assistance. This interim report outlines their initial findings and provides the background for further research in these areas.

Methodology

4. The research programme started with investigation into all relevant published studies on matters relating to the chosen topics. Over 228 papers and articles were recorded, studied and assessed. The interim report contains many references to the content of those papers. There then followed a series of interviews and meetings with a wide range of operators, academics, policy makers and logistics suppliers.

Key findings summarised

5. The global and UK logistics industry is undergoing rapid and significant change. The growth of on-line shopping (Business to Consumer and Business to Business) commerce is fragmenting traditional supply chains. Furthermore, company CEOs are reported as preparing for re-shoring up to 50% of production back from Asia to the USA and EU.

6. Major changes are happening in shipping line fleet size and configuration, while we are also seeing port sector consolidation and new mega port hub developments coupled with further port centric logistics.

7. Long term rises in commodity, fuel and energy prices are driving up costs. Sustainability policies and the impact of freight movements on pollution, environment and congestion are all adding to increasing "taxation" in the form of further regulation, adding up to 20% to logistics costs.

The size and importance of the UK logistics sector

8. The UK freight and logistics sector is of considerable importance to the UK economy. In 2011, employment in the UK sector averaged around 2 million in about 150,000 companies with estimated revenues of around £75 billion.

9. UK logistics performance is currently competitive with the rest of the world. However, 'real' UK logistics costs appear to be under-estimated particularly in certain sectors and in commoditized low margin sectors; changes in costs can also have a very significant impact on sector profitability. Some global manufacturers state that their logistics costs now exceed their production costs (excluding raw materials).

10. An examination of the available research papers suggests that there are problems with the way that data is collected in the sector and with the ways that the economic measurements are conducted. Understanding the performance, value, efficiency and appropriate policy framework for the UK logistics industry requires better and common statistical measurements to be made available.

Urban freight transport (UFT)

11. UFT is primarily concerned with the distribution of goods at the end of the supply chain and is essential to urban economies for the replenishment of food and other retail goods in shops, fuel to petrol stations, postal deliveries and the removal of waste. Although a vital part of the urban economy, it carries with it some negative impacts, such as increased road congestion, poorer air quality, noise pollution and accidents.

12. The problems are growing with the trend towards on-line shopping. Estimates predict up to 25% of grocery shopping will be online by 2016. Typically, inefficiencies in distribution within urban areas lead to low load factors and high empty running, slower journey times due to congestion, multiple deliveries to one customer by different operators and long dwell times at loading/unloading points.

13. City planners, urban transport departments and national and local political organizations have somewhat belatedly recognized the growing difficulties presented by the needs of the urban population for goods and services and the "Quality of life" impact of delivering these. Policies are quite often restrictive (e.g. bans on night time deliveries) but do not actually address the problem, and increasing demands on road space mean that congestion is likely to worsen.

14. Solutions to the problems presented include the trend towards electric powered vehicles, which can contribute towards lower emissions and noise pollution; freight demand modelling to optimise delivery patterns; and new operational practices to improve efficiency. There is also evidence that this is being tackled by greater attention to the advantages of Urban Consolidation Centres.

Port centric logistics and inter-modal policy

15. As an island economy, the UK relies heavily on international shipping services to import and export capital goods and materials. Our deep sea container ports are largely centred in the South and East of England, which handle 70% of containerised imports. However, distribution patterns indicate that the large warehousing complexes in the West Midlands still dominate with 43% of the total.

16. Re-shoring of manufacturing volumes is a significant trend and could lead to a decrease in global trade as a percentage of global GDP over the next decade. However growing consumer markets in countries like India and China will tend to mask the effect, and the UK may find itself exporting more high value goods whilst importing more raw materials. The implications for the logistics industry could be profound and a number of port owners and developers are focusing on ways to ensure that their port estates adapt to the potential impact of re-shoring and the changing nature of on-shore distribution.

17. This is focusing attention back onto Port centric logistics (PCL) and the commercial evidence indicates that PCL is not just a trend. The business case for PCL appears strong, since the costs of handling and transportation of products appear to be reduced significantly, and it is also accompanied by better use of rail freight movements. Investment in PCL, however, puts pressure on the function and placement of intermodal transfer depots and evidence suggests that the Government and local planning authorities need to progress investment more quickly. Ports continue to look at local markets for opportunities to take costs out of the supply chain, while land value and rental costs remain key considerations as part of overall long-term distribution and warehousing costs.

18. The ITC's examination of published reports on PCL found a slightly disturbing "circularity " of data whereby new reports built on previous reports without much evidence of hard original data or new data research.

Reducing empty container movements

19. An inherent trade imbalance means that the volume of inward bound containers to the UK is approximately twice as great as the volume used for export. This results in a large number of empty container movements causing additional freight costs and port congestion: a problem worsening as container traffic into UK ports continues to increase.

20. Empty container trips are difficult to avoid, partly because the export cargoes may be in a different location for loading, and partly because container owners require carriers and shippers to return the container to locations that minimise the possibility for re-use. Although empty re-use can almost halve the cost of simply returning empty containers to the place of origin, and computer models are now in use to improve the positioning of containers, re-use is proving difficult to achieve.

21. Solutions to this problem will offer environmental and cost benefits, and could require better information sharing and collaboration between shippers, shipping lines and ports. More accurate forecasting of empty containers in terminals and demand would be beneficial, as well as external management of container movements. However, as with the other areas of research, there is a shortage of hard empirical data. This currently makes it risky to make predictions and evaluate the best options for planners and the industry itself.

22. Additional difficulties have been identified due to the considerable mix of container sizes and types, including a disparity between inland retail containers and maritime containers. This problem has been well illustrated in the mismatch between container supplies into and out of Scotland where the export demands for Scottish Whisky and associated products cannot be matched with the surplus of import containers servicing the retail industry. This is examined in the report but has been identified as a potential future case study for the ITC to explore.

Recommendations

A. DATA

23. The ITC would like to hold a seminar with representatives of the logistics industry, the ports industry, academic institutions specialising in transport and logistics, and the Government to discuss the statistical challenges uncovered by this interim report. Its purpose would be to see whether, by collaborative action, agreement could be reached on common terminology to be introduced.

24. In addition, the ITC would like to discuss the issue of "missing" data to see if steps can be taken to examine what work might be involved in commissioning further studies to fill the gaps in knowledge identified.

B. URBAN FREIGHT TRANSPORT

25. Further work is required to bring forward best practice in urban distribution policy and the ITC is planning to hold further meetings and discussion sessions with the leading urban distribution providers, government advisors and those local authorities engaged in finding policy solutions. The intention will be to draw wider attention to the challenges presented by increasing urban distribution of freight, as well as to the various innovative solutions emerging.

C. PORT CENTRIC DISTRIBUTION

26. On port centric distribution, the ITC would like to examine the data made available through the interim report in more detail and, following discussions with government and the industry, commission further research work into case studies either independently or collaboratively. Such research would be of use to planners and developers including government departments.

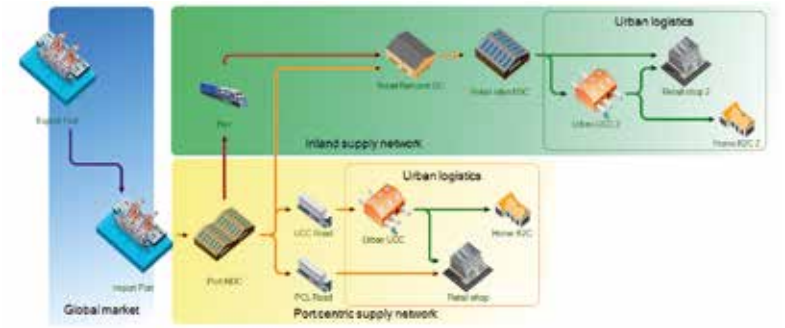
D. EMPTY CONTAINER MOVEMENTS

27. On the movement of empty containers, the ITC would like to participate in a case study exploring the movement of empty containers in and out of Scotland to see if it is possible to reduce the current shortage of container supplies to the Scottish Whisky industry. This work could lead towards examination of alternative strategies for building further collaboration between shippers and shipping lines.

1. Introduction

1.1 The UK freight and logistics sector is critically important to the competitiveness and growth of the economy as a whole. The global and UK logistics industry is undergoing dramatic changes, which in turn present significant new opportunities and challenges for the UK. The ITC commissioned new research based on extensive consultations. The purpose of this research and a supporting programme was to identify

Figure 1: The supply chain transport links for port centric and inland network models, and their relationships to urban logistics



"The barriers and the enablers which may contribute to improving the efficiency of UK freight movements and to the overall UK economic growth".

1.2 The research topics identified to be of greatest interest were port centric logistics, empty container movements and urban freight logistics.

1.3 While this paper does not aim to provide an integrated, systemic examination of all freight and logistics topics, and the links between these areas are not necessarily obvious, they are in fact conjoined, (see **Fig 1**) and thus it is critically important they are viewed as interactively co-dependent, within the context of the UK freight and logistics sector.

1.4 Some of the key global mega-trends considered in this research are:

- **The growth of on-line shopping (B2C) and business to business (B2B) commerce are fragmenting traditional supply chains**
- **Port sector consolidation and new mega port developments and the drive for Port Centric Logistics**
- **Planned shifts in re-shoring of up to 50% of production from Asia to the USA and EU & competition with Eastern Europe**
- **Long term rises in commodity, fuel and energy costs driving transport and production costs up at double digit rates**
- **Shipping sector consolidation and the (potential) development of global shipping alliances such as P3 with related impacts on capacity, shipping rates and port selection**
- **Sustainability and people considerations such as pollution, global warming, congestion, accidents and population growth Pressures on Government spending may cause increased taxation due to a transfer of external costs e.g. pollution and congestion to the transport and freight sector estimated to potentially add up to 20% to logistics costs**[1]

1 Andersson, Fridell & Halldorsson LRN 2013

1.5 The medium and long term response to these challenges and opportunities in terms of UK Government policy development and execution, coupled with the sectors ability to innovate, invest and capture value, will constitute a key success factor for the future growth and profitability of the UK economy. Despite the size of the UK logistics and freight industry, and its critical contribution to the UK economy, it is often said that the industry is a Cinderella sector, treated like a poor cousin by successive governments.

1.6 The challenges for the UK industry include long standing weaknesses in UK freight governance, policy innovation, planning, infrastructure development, and available research and statistics. Given these accelerating global pressures, the pace of change and the challenges the UK industry currently faces, there is a growing risk the metaphorical clock will strike twelve before the UK logistics sector is in the best position to respond.

1.7 The nature of global shipping operations is changing rapidly, with the emergence of supersized container ships, and carrier alliances. The ports are investing heavily in infrastructure aimed to provide "Port Centric Logistics", which has the potential to transform existing supply networks. The drive to reduce costs in international logistics is also increasing the pressure to reduce empty container movements, which in turn could be in part enabled by port centric logistics.

1.8 The growth in internet shopping (B2C) and electronic business to business (B2B) commerce, combined with increasing delivery frequency in high street logistics is changing the overall intensity of urban logistics, with consequent increases in congestion and pollution.

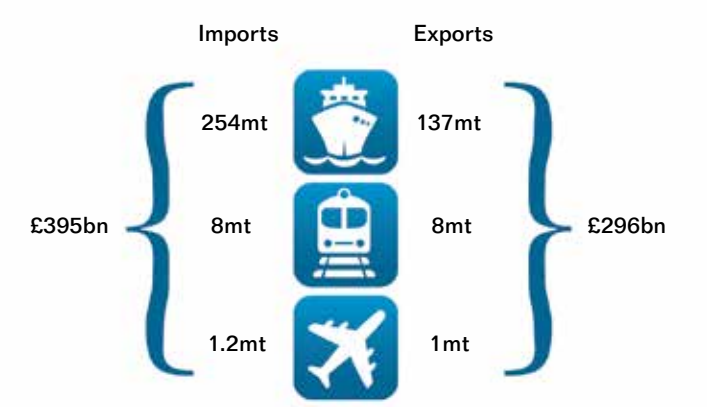
1.9 The use of rail freight in containerised inter-modal transport from Ports is growing strongly. Rail transport into urban logistics hubs via inter-modal rail hubs has also been successfully tried in several international initiatives as a strategy for reducing congestion. So the changes in existing hub and spoke, port centric and urban logistics are interactively linked, and this is potentially very significant.

1.10 This research examines the current long term trends, explores the findings and practical input from the industry and intends to provide useful output for policy makers, industry and academics. It has involved initial consultations, and a workshop. This was followed up by an extensive literature review of 228 papers and articles. The initial findings will be considered in workshops and meetings with the academic, industry and NGO's who have engaged and their feedback will be considered for the final documents.

2. The importance of the UK logistics sector

2.1 The sector is crucial to the UK economy. In 2011 it employed around 2.3 million people in up to 196,000 companies[2], with estimated revenues of £61-£86.5bn (billion). In 2009 the sector supported UK exports of £296bn and imports of £395bn[3] (**Fig 2**). So the UK logistics sector is a critical enabler of economic growth. The comparative efficiency of a country's logistics chain is considered by the UN to be "of vital importance in enhancing competitiveness"[4].

Figure 2: Mode of transport for UK imports and exports
Source: Open for maritime business, Maritime 2013



2.2 Global logistics costs across different countries typically range from 10-33% of GDP with an average of 14.3%[5] and have been in long-term global decline. In the period 1993 – 2003 European freight generated 8% higher costs (tonne Km's per unit of GDP), while the UK costs fell by 12.7%, but in the USA between 1980 – 2002 "tonne miles per dollar" of real GDP dropped by 35%[6] providing the US economy with a significant advantage.

2.3 Recently, due to increasing energy costs and finished goods inventories, global and UK logistics costs have begun to rise rapidly. For example, USA logistics costs rose by 10.4% in 2010[7]. UK logistics performance is currently globally competitive with a cost of 10.6%[8] of GDP (with only the USA performing better in UN rankings), but UK HGV operating costs rose by 4% in 2011[9]. With estimated logistics costs of $122bn the efficiency of UK operators versus the global average has given the UK a cost advantage in the region of 3.4% of GDP relative to the rest of the world (NB. Estimates of global and UK GDP and logistics costs vary, even between the Government and leading research organisations we quote. This underlines the problems in availability of robust, consistent data in sector analysis)

2 UK Sector Analysis 2012 Dept for Business Innovation and Skills / UK Commission for Employment and Skills (UKCES) Assessment

3 UK Freight Transport Report 2013 Market Research.com / UKFT 2013 / Britain in 2013 The nation in focus annual magazine of the Economic and Social research Council

4 United Nations, 2002: 22

5 UN Unice analysis of global logistics costs 2009

6 McKinnon / US Bureau of Transport statistics 2004

7 CSCMP Wilson 2011

8 UN Unice analysis of global logistics costs 2009

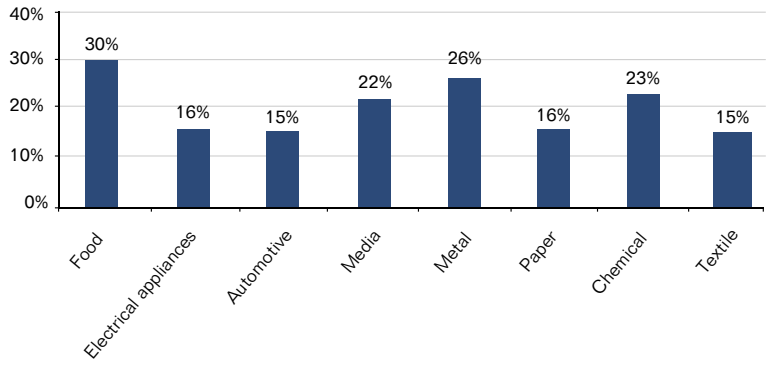
9 FTA Logistics report 2012

2.4 Research shows that improved freight transport efficiency enhances the productivity of the overall economy[10]. Some research estimated that a 25% reduction in transport costs as a percentage of GDP from 20% to 15% is equivalent to a permanent increase in domestic consumption of just above 1.5%[11]. On this basis a 15% reduction in UK logistics costs (given that logistics costs are about 10% of GDP this is equivalent to about 1.5% of GDP of £1613bn[12]) would contribute approximately £7.5bn or 0.45% in equivalent growth for the UK economy, underlining how potentially crucial the sector is to growth in the UK economy. So, any future cost increases would have a serious negative impact on UK economic growth due to increased prices of goods, freight and transport services.

2.5 Considering the importance to the economy, "real" UK logistics costs may be under-estimated in several ways. Many industry sector specific costs are far higher than the global average (see **Fig 3** which relates to European costs). In commoditised low margin sectors, changes in costs can be even more critical to sector profitability.

2.6 Manufacturing costs have historically been far higher than logistics, driving centralisation of production. Recently Procter and Gamble stated their logistics costs now exceeded production costs (excluding raw materials). Not only does this presage a change in the strategic priority of logistics in corporate planning, but indicates that logistics costs being measured as a percentage of GDP is potentially very misleading.

Figure 3: Logistics costs per sector in Europe
Source: ELA 2007



10 Lakshmanan and Anderson 2002: 3
11 Ravn and Mazzenga (2004: 657)
12 ONS GDP at current / market prices Second estimate of GDP Q1 2014

2.7 A research paper conducted for the US Highways agency in 2006 stated "The most commonly cited estimate of logistics costs is not inherently related to GDP because it is neither a measure of how much of GDP is consumed by logistics nor is it a measure of how much logistics contributes to GDP"[13]. So, while it is true to say logistics costs are equal to a given % of GDP, it is incorrect to say they account for, or consume a given % of GDP.

2.8 This may not seem important, but GDP includes revenues from sectors which don't actually "move" anything e.g. financial services, so understanding these distinctions is critical to understanding the relationship between logistics and GDP. If GDP were redefined to only include "moving GDP" i.e. the revenues associated with physical goods being moved, the share of GDP consumed would be far higher, and its significance greater. This GDP perception "problem" is further compounded by a related problem caused by the units in which freight activity is measured, which is typically in the units carried e.g. containers, tonnes, parcels or cases.

2.9 There are real difficulties when comparing statistics that measure volume as distinct from weight. For example, the conclusions drawn from data indicating that air freight carries only 2.3m tonnes of goods compared with 8.2m containers through ports, might be different considering that IATA estimate air freight carries 35% of world trade by value, or UK ports account for around £20bn of trade with the EU. Or that UK Retailers in the fast moving consumer goods industry (FMCG) often achieve better than 80% vehicle utilisation by cube[14], where UK statistics indicate HGV's achieve 59% utilisation by weight[15]. Yet the FMCG industry may be significantly more demanding than other sectors within the overall economy[16]. So understanding the performance, value, efficiency and future needs of the UK logistics sector must have better statistics available, in appropriate units to allow meaningful analysis.

13 Logistics Costs and U.S. Gross Domestic Product - Federal Highway Administration Department of Transportation / Macrosys 2005

14 On haulage leg to first delivery, subsequent loading efficiency can be lower

15 FTA Logistics report 2012

16 Havenga – Stellenbosch University - South African FMCG Logistics costs 2012

3. Research programme focus areas

3.1 The ITC identified three important areas of concern and interest which were not well represented by current research and activity for the initial research.

3.2 Urban and local freight distribution

3.2.1 **AREAS TO INVESTIGATE:** Local (urban) distribution suffers from inefficiency, congestion and unreliable journey times. Urban logistics operates within extensive legal operational restrictions aimed to reduce noise, accidents and congestion. Journey planning is complex and often sub-optimal. Van or light commercial vehicle (LCV) traffic is rising significantly and LCV load efficiency is typically poor. (DfT research indicates 39% of van KM's are driven with vehicles 75% empty, causing decreasing logistics efficiency and making a significant contribution to rising UK transport CO2 emissions).

3.2.2 **FOCUS:** Investigate the current global and UK situation and related economic impacts to explore trends, successful strategies and initiatives, and those which have failed, and the reasons why.

These will be compared and contrasted with current UK policy and industry practice, and opportunities to develop more efficient local distribution operations, practices identified, and where possible the benefits quantified.

New urban electric delivery vehicle courtesy of UPS

3.3 The impact of port centric logistics

3.3.1 **AREAS TO INVESTIGATE:** Global shipping economics are being transformed by excess capacity and meta-shifts in shipping markets. As a consequence, the sector is consolidating by using larger vessels and containers, coupled with a concentration on bigger ports able to handle these larger ships[17].

3.3.2 In addition, UK ports have potential as manufacturing sites and excess storage capacity in relation to specific logistics needs. This may, in relation to re-shoring of manufacturing and recent changes in UK trade balances, provide a substantial driver for port centric logistics, in conjunction with the potential to re-purpose storage capacity near major cities, where warehouse space and planning are generally restricted.

3.3.3 The ability to achieve shift to lower energy intensive freight transport modes will require changes in infrastructure, which in turn will require more rapid planning processes and an integrated UK freight network plan. In addition, as demand for short-sea, inland waterways and rail services are currently below commercial thresholds for investment returns, their development may require "pump-priming" investment, and the benefits of this economically and environmentally must be quantified.

3.3.4 **FOCUS:** Investigate the impact of these changes on intermodal policy and other transport modes, and consider the evidence for the related potential benefits and issues. Examine whether freight infrastructure and policy may be inhibitors, or prove unfit to support the consequent changes in logistics networks, or the demands of larger vehicles and containers.

17 Image of Triple E class container ship from Maersk

3.4 Reducing empty container movements

3.4.1 **AREAS TO INVESTIGATE:** The industry suffers considerable cost inefficiencies driven by a serious, but changing imbalance between import and export cargoes. This results in many low value road journeys carrying empty containers. It also causes congestion at ports and other consolidation centres, where empty containers have to be stored until they are relocated.

3.4.2 **FOCUS:** To examine the recent impacts on empty flows and changes in UK export volumes from the global recession, and consider the potential for the repatriation of manufacturing to Europe and the UK, coupled with changes in regional demand for empty containers, and the potential to exploit this.

3.5 The development of ports, manufacturing, city logistics and inter-modal shift are all conjoined and co-dependent, and this has been considered and explored as far as possible in the research.

4. Urban and local freight transport

4.1 Overview

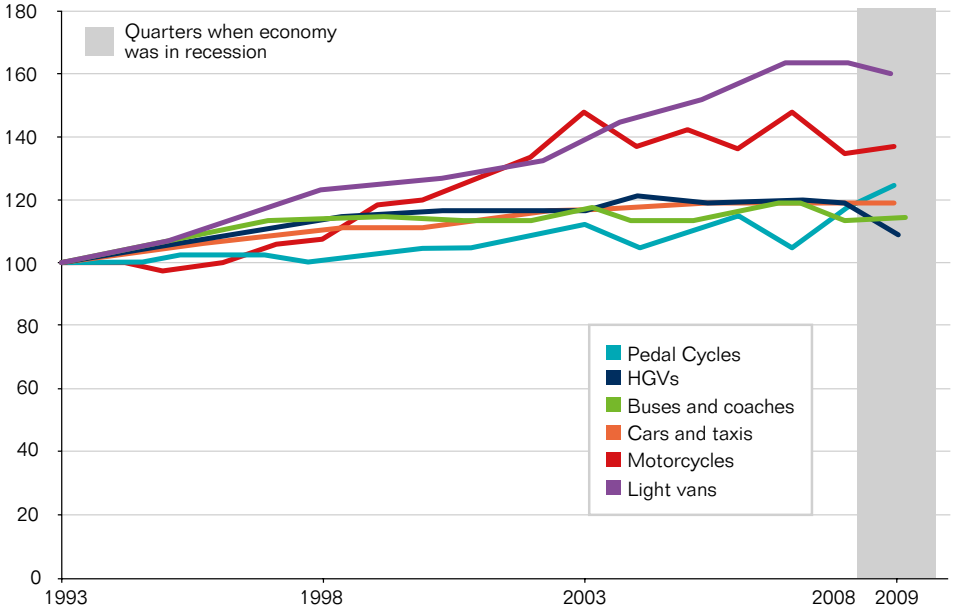
4.1.1 Urban Freight Transport (UFT) is defined as "the movement of freight vehicles whose primary purpose is to carry goods into, out and within urban areas"[18]. UFT is primarily concerned with the distribution of goods at the end of the supply chain. UFT is essential to urban economies, as it is required to replenish food and other retail goods in shops, fuel to petrol stations, deliver documents, parcels and other supplies to offices and to remove household waste from urban areas[19]. Although UFT pays an important role in supporting urban economies, the growth of related urban traffic movements has a number of negative effects in increasing road congestion, poorer air quality, rising greenhouse gas (GHG) emissions, noise pollution and accidents[20].

4.1.2 Until recent years little attention was given to freight transport issues by city planners, urban transport departments and politicians yet the Eddington Study estimated that road congestion reduces gross domestic product (GDP) by around £7-8 billion every year and that it could amount to as much as £25 billion by 2025. Recent trends have shown that light van traffic has increased more rapidly than other forms of road traffic (**Fig 4**).

Figure 4: Change in the UK road traffic 1993-2009
Source: Department for Transport

Traffic on public roads:[1] by vehicle type

Great Britain. Index numbers (1993=100)



Billion vehicle kilometres

18 DG move European Commission: Study on Urban Freight Transport" (2012) MDS Transmodal Limited

19 Browne M., Piotrowska M., Woodburn A. and Allen J, 2007, Literature review WM9: Part I - Urban freight transport.

20 Study of urban freight transport – Final report

4.1.3 Now, UFT is changing very rapidly, and policy needs to catch up. For example, some 13 percent of people are now doing their grocery shopping on-line, but this currently only accounts for around 5% of spend, as grocery was one of the last areas of retail to go on-line. Bernstein research estimates that up to 25% of USA consumer spending in the future will be on-line, and the IGD (Institute of Gross Redistribution) predicts that on-line grocery sales will double by 2016 in the UK. The volumes in the retail industry are huge and, assuming that increased spend correlates to similar increased volumes, based on the 6.3bn cases of goods that were distributed to shops in the UK in 2010, we will see the equivalent of up to 630 extra million cases of goods being delivered to homes instead of shops by 2016. This could mean in the region of 1.7 million additional van journeys per year.

4.1.4 Not only will this add significant traffic to urban areas, by removing volumes from shops and hub distribution centres, but will also moves freight from large HGV's to small vans, which are more energy intensive and expensive relative to payloads. The inefficiency in distribution in urban areas is typically exhibited in the following ways:

- Low load factors and high empty running
- Slowing journey times due to congestion
- A high number of deliveries made to individual premises within a given time period by multiple vehicles, often by different operators
- Long dwell times at loading and unloading points[21].

4.1.5 As a general rule, large-scale retail distribution and courier/express services tend to be more efficient than very fragmented distribution services to small retailers, offices and in the HoReCa (hotel, restaurant and catering) sector where just-in-time, small size deliveries are more prevalent. Also, Business to Customer (B2C) e-commerce, where businesses sell to the general public though the internet, is leading to the increasing fragmentation of purchase channels, and an increasing number of UFT movements to deliver parcels to residential areas and offices[22].

4.1.6 The growth in the use of the Internet has led to the rapid development of e-commerce, which currently appears to be one of the fastest growing marketing channels for different kinds of products and services. In the UK, online shopping (B2C) in 2007 represented approximately 5% share of the total retail sales, while an average of 90% of retailers use "distance" sales channels.

The distribution model applied differs based on the type of purchased goods, yet one of the biggest challenges in B2C e-commerce is the last mile delivery to the customer. Alleviating the impact of these changes requires change and investment in new transport infrastructure (e.g. Increasing urban road network, rail and waterway connections, underground and tram systems), transhipment or intermodal centre, urban consolidation centres, collection points, nearby delivery zones.

21 MDS Transmodal, 2012, European Commission: Study on Urban Freight Transport

22 MDS Transmodal Limited, DG Move European Commission: Study on Urban Freight Transport, (2012)

4.2 Road pricing and charges

4.2.1 Road pricing in the context of urban areas, or else the internalisation of external costs, is probably the most effective market-based measure in the long-term to develop sustainable urban distribution. Nevertheless, it will require implementation through a comprehensive infrastructure charging scheme that includes the strategic networks and the urban road network. While congestion charges provide incentives for urban freight operators to move to more sustainable urban distribution practice, but if a system of comprehensive road pricing were introduced in urban areas, congestion charges would not be required.

4.2.2 Road pricing in the UK is 10 or 25% lower than other European countries, and the revenue is not typically hypothecated to transport expenditure. Ideally any net revenues from road pricing schemes should be used to improve urban mobility, support modal shift and reductions in bottlenecks and encourage a switch of some strategic traffic in urban areas to rail and possibly waterborne freight.

4.2.3 While Low Emission Zones and other measures could contribute to more sustainable and cost efficient local level freight transport[23], since the solutions to the root causes of the problems are typically beyond individual operators control and resources to remedy, many of the measures/policies to reduce the negative effects of freight transport implemented in UK cities have not always been effective.

4.3 Planning and infrastructure

4.3.1 Land use planning, e.g. for urban logistics centres, offers significant potential for better UFL operations where city authorities through a holistic approach adopt policies that take into account the demand that is generated by new developments and the needs of the freight industry, is another measure. Measures to provide infrastructure are highly significant for the transport of freight for last mile delivery in some cities. Due to its inherent flexibility, road freight transport will remain the most important mode for the last mile deliveries and collections in urban areas.

4.3.2 Therefore, investment in the design and development of on-street loading and uploading bays, and in rail-connected distribution parks and cost-effective technologies at local level may provide significant economic benefits. Last but not least, alternative technologies, in relation to building new more sustainable, quieter vehicles, materials, operations and effective driver training, information and communication system, are the most promising approach.

4.3.3 Policy recommendations to drive the reduction of noise pollution from freight movements include making night deliveries and avoiding peak periods by using time windows which limit freight vehicles to certain times of the day or specific areas (e.g. quiet areas, pedestrianized zones), with an exemption (in each region used by city authorities) for those vehicles operating from urban consolidation centres.

23 European Commission: Study on Urban Freight Transport" (2012) DG Move, MDS Transmodal

4.3.4 These policies illustrate the problems in trying to manage problems without solving their root causes. Night-time delivery restrictions are implemented to avoid loading and uploading activities that might disturb local residents. However, they reduce operational and cost efficiencies, and contribute significantly to traffic congestion at peak times. They also lead to poorer utilisation of vehicles, and consequent increases in HGV journeys. For example, night time regulation of the road network in London, known as London Lorry Control Scheme, requires vehicles to use certain roads, take much less direct routes to avoid passing close to houses, on specific times and week days[24].

4.3.5 While time windows are effective in reducing the circulation of freight vehicles, but typically increase the overall costs of distribution, it would also be possible to overcome the problem with night deliveries using road freight vehicles, equipment and processes which provide low noise operations. When necessary, time windows should be made as wide as possible. When considering the volume of traffic that causes congestion, peaks of freight traffic often coincide with those of passenger traffic, as shown in surveys in Italian cities, which indicate freight traffic peaks during the periods 8am-11am and 3pm-5pm.

4.3.6 Ideally size and weight restrictions for road freight vehicles would only be applied in urban areas where larger vehicles would be unsafe or inappropriate (e.g. in narrow streets in heritage cities) to avoid the use of larger numbers of smaller vehicles that contribute to greater road traffic congestion, CO2 emissions and leading to sub-optimal efficiency in "last mile" distribution, as larger vehicles are normally more efficient as they carry more goods per vehicle movement.

4.4 Mode shift and alternative energy for vehicles

4.4.1 In the next 20 years the number of electric vehicles (EV) will significantly increase and will reach more than 40 million in the EU. The potential of integrating electric vehicles (EVs) in the goods distribution in urban areas, may offer promising opportunities for urban logistics operations to become both more efficient and more environmentally sustainable.

4.4.2 At the same time, this will limit the number of heavy and light combustion engine logistics vehicles in the city centers. This will have a positive effect on the air pollution and the noise levels making it healthier to live and work in the city, reducing noise levels by 1-2 dB, greenhouse gases by 30 – 40% and the overall air pollution by up to 60%[25]. Small electric trains for urban transportation and electric bikes as commuter tools, apart from the benefits aforementioned will also allow night delivery, but EV's require fast charging stations and infrastructure for charging.

4.4.3 Companies such as DHL, TNT and UPS have stated that they are very close to the tipping point of changing to all EV's for urban logistics, as the gap in operating costs is closing with petrol and diesel vehicles. New designs of urban electric vehicle are now emerging (**Fig 5**). Small changes in costs of financing and incentives could tip this balance. Local charging infrastructure would also be needed, but this is not proving problematic to provide, assuming UK energy grid capacity is available.

24 MDS Transmodal Limited, DG Move European Commission: Study on Urban Freight Transport, (2012).

25 Future electric scenarios for urban logistics / Safe urban logistics

4.4.4 As to alternative fuels, vehicles running on cleaner fuels produce fewer harmful emissions, and can offer some savings on fuel costs, compared with petrol or diesel. They have recently started using, in particular, Compressed Natural Gas (CNG) and bio-diesel. Based on modelled savings comparing bio-diesel and CNG, the overall savings and particularly the CO2 savings derived from CNG alternation outweigh those of bio-diesel. It is even more favourable in long distance haulage, however it is not renewable, and the costs of implementation, maintenance and the scarcity of refuelling points continue to hamper CNG adoption.

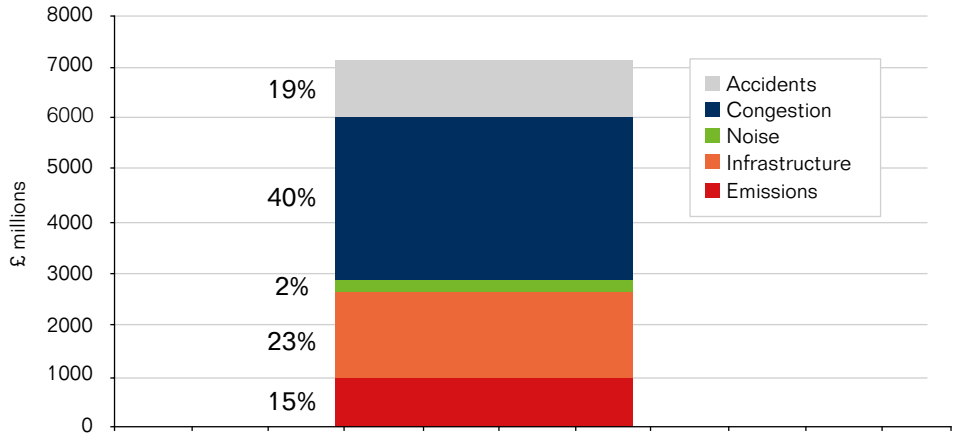
Figure 5: New urban electric delivery vehicle
Source: UPS

4.4.5 Many sustainable urban logistics strategies include co-siting with road and rail interchanges. This offers significant potential benefits in CO2 emissions, congestion, pollution and both internal and external costs. However, the lack of suitable sites, prerequisite planning processes and investment, these are unlikely to materialise in a meaningful time frame.

4.5 Externalities, congestion and pollution

4.5.1 The UK Government has a long established policy seeking to encourage freight off congested roads to rail or water. The policies effects are limited by the capacity and responsiveness in the rail freight industry and available infrastructure. As shown in **Figure 6** the external costs and impacts of road freight are a substantial burden to the UK economy. This is a "circular" problem, as 40% of the total external UK costs of HGV activity are attributable to congestion[26], and congestion is a function of the low capacity of the UK road network relative to usage (shown in **Fig 7**).

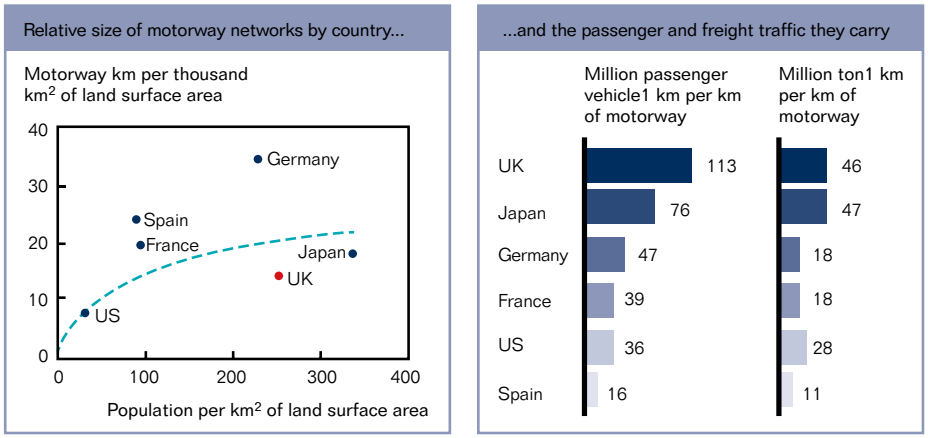
Figure 6: Total external costs of HGV activity in UK



4.5.2 But road investment would have to rise significantly to ease traffic flows, and taxes on HGV's would have to rise by around 50% to fully internalise existing infrastructure, environment and congestion costs, let alone increased investment. Despite this, it is very difficult to find UK research quantifying the cost of noise and emissions produced by urban freight vehicles to the community and economy. Traffic congestion also has an adverse effect on duel consumption and CO2 emissions[27].

Figure 7: Intensity of road network use
Source: Central Intelligence Agency World Factbook

Congestion on national road networks



1 passenger vehicle and ton kilometre data is for all road types nationally

26 Piecyk, M. and McKinnon, A.C. (2007), Internalising the External Costs of Road Freight Transport in the UK.
27 Piecyk, M. and McKinnon, A.C. (2007) "Internalising the external costs of road freight transport in the UK."

4.5.3 So urban freight traffic is actually more polluting than long-distance freight traffic as fuel consumption increases sharply when vehicles make frequent stops. While the share of freight vehicles in the total traffic flows is not usually very high, the circulation of freight vehicles in urban areas can produce significant air pollution, a source of health problems such as asthma and heart disease. In London it is estimated to result in 4,300 premature deaths per annum[28].

4.5.4 While the European Commission has pressured the UK to implement strategies to reduce the country's air pollution levels, London still has the highest levels of nitrogen dioxide of any European capital[29]. More than three quarters of London's main roads having illegal levels of air pollution[30]. Campaigners estimate that around 90% of the nitrogen dioxide is produced by diesel-powered vehicles. Since the UK failed to meet EU standards by cutting the levels of the pollutant NO_2 it has been threatened by the European Commission in 2011 with a fine of £300m[31].

4.6 Possible solutions

4.6.1 The use of targeted subsidies and investments could encourage the development of sustainable urban distribution, and provide cost advantages for private sector stakeholders. One key element of most strategies are urban consolidation centres.

4.6.2 An Urban Consolidation Centre (UCC) is a logistics facility in which a range of value-added logistics and retail services can be provided in close proximity to the area that it serves (e.g. a city centre, town or specific site like a shopping centre). Many logistics companies can deliver goods destined for the area to a UCC, which then makes consolidated deliveries into that area"[32]. So logistics companies with deliveries scheduled for the urban area or site are able to transfer their loads at a UCC and avoid entering the congested urban area.

4.6.3 Generally evidence from research like Bestufs[33] indicates that successful development of urban consolidation centres is more likely where city authorities provide incentives to encourage the use of Urban Consolidation Centres (UCCs) through regulatory differentiation in favour of vehicles operating from UCCs, rather than direct capital and operating subsidies to private sector operators. Research also proposes policy makers should also consider how the planning system could be used to encourage consolidation of loads, without city authorities requiring deliveries to be made via a UCC.

4.6.4 State-of-the-art on urban freight demand modelling can optimise truck, commodity and delivery mix[34]. Cranfield's ABi3L initiative is a good example, using intelligent predictive modelling scenarios can help assess policy and economic impacts on network development, covering road, rail and ports. While still in its Initial stage, the project has delivered a calibrated UK freight model with a pilot looking at Port Centric warehousing in Liverpool which showed it would attract traffic and assessed the impact on other areas.

28 Vidal, J. 2013"London air pollution dangerously high, campaigners warn" www.theguardian.com/environment/2013/oct/04/london-air-pollution-nitrogen-dioxide

29 Air Pollution: 78% of London At Illegal Levels" (2013), Clean Air London Simon Birkett http://www.lbc.co.uk/air-pollution-78-of-london-boroughs-at-illegal-level-77537

30 http://www.londonair.org.uk/LondonAir/Default.aspx

31 European Commission: Study on Urban Freight Transport" (2012). MDS Transmodal Limited

32 Allen, J., Thorne, G. and Browne, M., 2007, BESTUFS – Good Practice Guide on Urban Freight Transport, www.bestufs.net

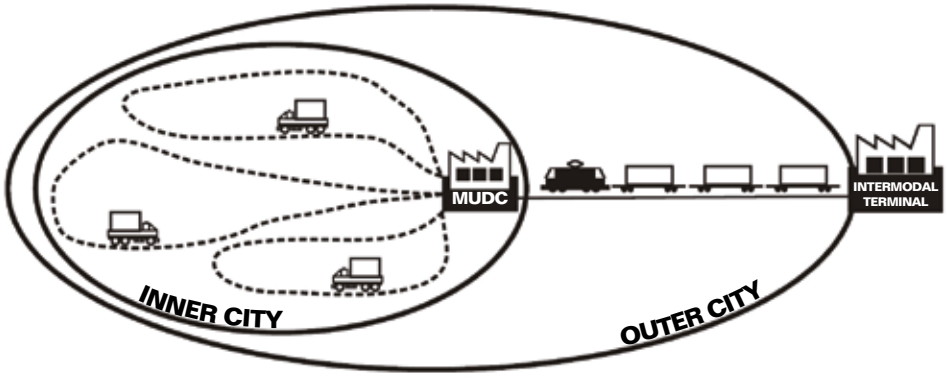
33 BESTUFS Policy and Research Recommendations I Huschebeck M (PTV), Julian Allen (UoW)

34 Comi A., Site P.D., Filippi F. and Nuzzolo A., 2012, Urban freight transport demand modelling: a state of the art

4.6.5 There has been considerable work done on sustainable urban distribution concepts which combine maximising the economic efficiency of distribution in urban areas, while minimising the environmental and social impacts. Based on the sustainable core goals of Common European Transport Policy, the freight vision for 2050 is to reduce greenhouse gas (GHG) emissions, fossil fuel dependency, accidents and congestion.

4.6.6 Some European and UK cities have demonstrated the potential in innovative schemes based around rail for urban distribution of goods. **Figure 8** depicts how multi-modal urban distribution centres (MUDC), located inside the central area of the city, operate and how goods are transferred via rail and low-emission road vehicles (LEV) to their final destination. The urban road network is "decongested" and environmental and energy benefits are gained due to the reduced number of vehicle-kilometres travelled and the combined use of rail with LEVs for final deliveries.

Figure 8: Operation of multi-modal urban distribution centres.
Source: European Commission, Study on Urban Freight Transport (2012) MDS Transmodal.



4.6.7 Alternative methods of distributing goods are being engaged by many European cities. Zurich and have been explored in other cities. Dresden use trams (light urban rail) for freight transport. Paris is considering the use of dedicated freight trams, and has already developed rail freight terminals at an inner city location using conventional wagons[35], while other cities afflicted by severe traffic congestion, including Lyon, Bordeaux and Nice, are actively looking to replicate the Parisian example[36].

4.6.8 Other successful examples of rail freight initiatives are found in research in Rome, Berlin, Vienna and Belgium. Two initiatives were introduced by Utrecht in an attempt to reduce the number of vans and other goods vehicle movements in the city. One was the so called "beer boat" which is electrically–powered (with a diesel auxiliary engine), has proved that the cost of the service for its customers is lower than using LGVs making multiple trips, and the "cargohopper" an electric powered goods vehicle which since April 2009 has delivered light-weight retail goods.

35 Browne, M., Woodburn, A., Piotrowska, M. and Allen, J. (2013) "A review of rail freight initiatives in the urban supply chain"

36 Paris pushes urban freight experiment" (2008) http://www.railwaygazette.com/news/single-view/view/paris-pushes-urban-freight-experiment.html

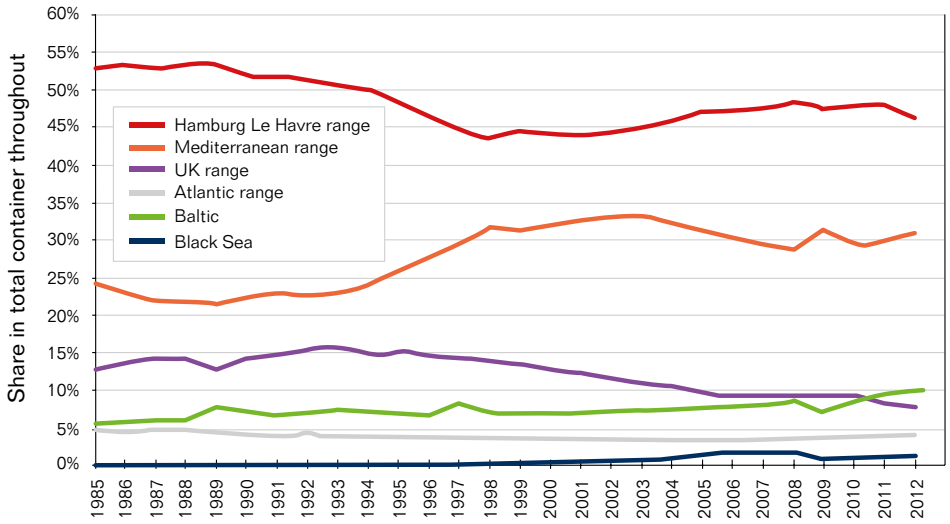
5. Port-centric logistics and inter-modal policy

5.1 Overview

5.1.1 The UK ports industry is significant handling 501 million tonnes (Mt) of freight traffic in 2012, with an average major container ports utilisation of 75%[37] That is more than eight tonnes (a small lorry-load) for every person in the UK. However, the UK has an imbalance of export trade with the rest of the world, which causes a high level of UK imports relative to export traffic, which may make the UK potentially appear less attractive to international shipping companies than a country like Germany which has stronger exports, because the UK offers lower outbound export volumes to carriers.

5.1.2 Eight of the ten largest ports in the world are now to be found in China, and Europe has several very large harbours. As the largest exporter of goods moving on container services, Shanghai, China ranks as number one in the top fifty global container ports. On the same ranking of the top 50 world container ports[38] Felixstowe takes 36th place.

Figure 9: Trends in container freight shares
Source: MDST World cargo database



37 It's not time to panic about UK port capacity – although there will be losers" (2013)
38 Top 50 world container ports", World Shipping Council

5.1.3 UK ports are in fierce competition with major traditional European port competitors, such as Rotterdam, Hamburg and Antwerp, and growing Mediterranean and Eastern European ports. While several UK ports have experienced growth in the number of containers handled since the recession, the overall UK share of container freight throughput in ports (**Figure 9**) has been in long term decline relative to global and European averages, according to the MDST World Cargo Database[39]. Addressing this is important: with EU 2030 container traffic predicted to rise by 50%[40] the UK could gain a 2.8m twenty-foot equivalent unit (TEU) container growth from this, before other developments such as further build-outs of Felixstowe and London Gateway are included. To put this in perspective, the largest current UK container trade lane is around 3.5m TEU per year.

5.1.4 Port productivity rankings and comparisons are often misleading, as the methodology and results can be biased by the operations and size of the port. For example, the UK partially unloads many vessels which will continue part loaded to other ports, and the ratio of overall time taken, to vessels, to containers unloaded would be lower, even if it is actually done faster per container.

5.1.5 While EU port productivity varies significantly, in a JOC report in 2012 on global port productivity no UK port featured in the global top 20 rankings of port productivity per berth[41] and only Southampton in the top 20 for the European & Middle East Area (EMEA). This position improves on a measure of containers moved while the vessel is in port, where Southampton is in the top 20 global and EMEA rankings, and Felixstowe is in the top 20 EMEA rankings. Since recent investments in cranes and other handling equipment several UK ports have world class potential productivity in terms of handling efficiency, so there is clearly work to be done on how to ensure our best productivity is recognised, to improve the methodology used to determine global rankings and comparisons, and remedy genuinely weaker areas of productivity.

5.1.6 The UK has seen a growth of 45% in imported unitised non-bulk goods between and 1996-2009 while domestic growth in tonnes lifted in the same period has only been 3%[42] In addition, while 43% of the largest warehouses in the UK are in the Midlands, 70% of containerised imports come through the Southern ports, which only had 19% of the largest warehouses in their catchment. Only 4% of >50,000 m2 distribution centres are in counties with any deep water container ports, and only 8% in counties with any unitised port traffic[43].

39 Notteboom,T.(2013)"Recent traffic dynamics in the European container port system". Port Technology International, Issue 58, 2013.

40 European ports: an engine for growth" (2013)

41 JOC Big Ships, tight supply chains 2012

42 MDS Transmodal port centric analysis 2011

43 MDS Transmodal port centric analysis 2011

5.2 The ports industry is experiencing rapid change

5.2.1 The industry is experiencing rapid change, as recently the shipping market has seen the addition of large numbers of super-sized triple E class container ships. These are capable of carrying 18,000 TEU's (around 3x the capacity of the largest current ships). Assuming the Triple-E's consume 164 tonnes of fuel a day (excluding diesel), the estimated cost of the giant vessels would be 35% lower than a typical 13,100 TEU vessel on a per TEU carried basis, which accounts for $218/TEU versus $333/TEU[44].

5.2.2 While slow steaming of ships of similar size can prove more economical, provided there is sufficient cargo to fill them, if you add intermediate fuel oil (IFO) bunker and ship operating cost savings together triple-E vessels are a massive 30% cheaper than 13,100 TEU ships on a round voyage ships. So, the economies of scale offered by the new 18,000 TEU vessels are so great they are unlikely to be ignored in future strategies[45], and consequently the increasing fleet of triple E vessels is adding significant capacity to the market, which has seen container shipping prices collapse due to overcapacity (with some recent signs of price recovery).

5.2.3 These ships require very large ports, quays and deep water to allow them to dock, and this in turn, requires significant investment by the ports. During a difficult economic period, ports invested more than £1.4bn between 2007 and 2011. Much more investment is in the pipeline and more still is consented, as it is crucial for the ports to retain and grow their carrier business, and with it, their critical mass.

5.2.4 Today, ports can no longer expect to attract cargo simply because they are natural gateways to rich hinterlands[46]. New ports such as London Gateway and developments such as Teesport are being constructed and others such as Felixstowe are being transformed and altering their strategies in order to adopt the emerging concept of port-centric logistics to exploit the anticipated cost and value advantages.

5.2.5 "While the big ship capacity may be in balance, the smaller berths that have been handling smaller Asia-UK vessels will lose traffic. The market isn't growing so there will have to be under-utilised berth capacity across some ports," Neil Davidson, senior analyst of ports and terminals at Drewry Maritime Research concluded[47]. So, retaining and growing container volumes in the future is critical to UK ports remaining competitive, as they must have sufficient economies of scale to continue to allow cost competitive performance to attract these larger vessels and counter the power of new shipper alliances.

44 http://www.worldslargestship.com/

45 "Why size matters", http://www.lloydsloadinglist.com/freight-directory/people/why-size-matters/20018076355.htm#.UlQwPVDwnzk

46 Monios, J. and Wilmsmeier, G. (2012). "Counterbalancing peripherality and concentration: An analysis of the UK container port system"

47 It is not time to panic about UK port capacity – although there will be losers" (2013)

5.2.6 In addition to these changes, a recent MIT Supply Chain Innovation survey concludes that nearly half of United States manufacturers are considering re-shoring (Simchi-Levi, 2012). Free (2012) in a supply side survey report that 40% of United States manufacturers won previously offshored manufacturing businesses in the first few months of 2012. McMeekin and McMackin (2012) quote studies from various consulting groups (such as BCG and PWC), confirming that 50% of executives at companies with turnover of more than $10 billion are planning or actively considering re-shoring, which could create 2 to 3 million jobs and $100 billion of local output as early as 2015[48].

5.2.7 The key driving forces of these re-shoring initiatives are cited as rising Chinese wages, higher international transport costs and quality challenges. Proximity to markets also allows responsiveness to local needs, while the utilisation of available local production capacity is favoured in a challenging global economic environment. These trends are expected to result in a decrease of global trade as a percentage of global GDP in the next few years.

5.2.8 So there is an opportunity to both capture increasing manufacturing volumes, and meet the demand for lower cost, more sustainable port logistics, but this requires a different approach to using ports known as "port-centric logistics".

5.3 What are port centric logistics?

5.3.1 Port Centric Logistics (PCL) can be defined as "the provision of distribution and other value-adding logistics services at ports"[49], or as "the intelligent/selective application of assets and services, within or adjacent to major deep sea container ports, to generate significant reductions in supply chain costs, improved product availability. In reality, it is both"[50].

5.3.2 The shift to multi-mode freight transport and port based warehouses promise the potential to dramatically change the UK logistics network and offer multiple benefits to adopters of this relatively new approach. It has been shown that improved freight transport productivity enhances the productivity of the overall economy[51] and logistics costs are a major driver for national competitiveness[52]. MDS Transmodal estimated in 2011 that port centric logistics versus traditional Midlands based logistics models had a potential cost advantage on transport of £67 per vehicle load, and a reduction of 160 tonnes of CO2e per 1,000 loads. The Port-centric business model logic simply represents ports going back to what they did pre-containerisation, which is unloading, unpacking and storing cargo at the port, ready for onward despatch to where it's needed. In the past, when goods were imported, they would be taken straight from the port to one or two distribution centres many miles inland and then redistributed from there.

48 McMeekin and McMackin, Reshoring US Manufacturing: A wave of the present, businessclimate.com (2012)

49 Mangan, J., Laiwani, C. & Fynes, B. (2008), "Port-centric logistics", International Journal of Logistics Management, Vol. 19, p.36.

50 SCC Associates quoted by Prof Alan McKinnon in his 'Ports in the Logistics chain' presentation, BPAC (2011)

51 Lakshmanan, TR. and Anderson, WP (2002). "Transportation infrastructure, Freight services and Economic growth: a synopsis of a white paper".

52 Randasila, K. and Ojala, L. (2012). "Measurement of national-level logistics costs and performance"

5.3.3 The role of the port in PCL expands as it turns from a simple transhipment hub into an important logistics node[53] which can serve both the domestic and international market. In the UK context, the conventional wisdom was to transport full containers inland to the 'golden triangle' (UK's premier location for logistics and distribution operations in the British Midlands) for consolidation and onward despatch to satellite distribution centres or to the processor. This involved a laden journey of the container from the port by road or rail and an empty haul back to the port for restitution.

5.3.4 The PCL concept eliminates much of the relatively costly inland transport section of the supply chain, and offers reduced environmental impact, as freight is shipped nearer to its point of consumption, rather than being transported to an additional location for trans-shipment. Also, HGVs typically produce 63g of CO2 for every tonne of freight transported per kilometre, which drops to just over 26g CO2 for rail freight – a reduction of nearly 60 per cent. By taking HGV's off the road, PCL would also reduce traffic congestion.

5.3.5 The four factors that drive and challenge the growth of intermodal freight transportation are hyper-competition in supply chains, a focus on changing customer requirements, knowledge and skills for new operational and information technologies, and better management of coordination and integration of existing infrastructure and provision for resources by private and public sectors[54].

5.3.6 Many organisations are recognising that switching freight to greener modes of transport not only improves sustainability and demonstrates corporate social responsibility, but also helps reduce supply chain risk, improve reliability and provide operational benefits. The operating costs associated with non-road modes in certain situations are often lower, particularly for large shipments moving long distances. But switching freight to rail or water typically requires new facilities or handling equipment, or new connections to the rail and waterway networks. These involve capital expenditure and the cost of change can deter organisations from realising potential benefits.

5.4 Proof of concept

5.4.1 The literature review on PCL conducted by the ITC for this research found much discussion of the potential cost savings, environmental and operational benefits, and increased competitive advantages that port-centric logistics may yield. This research also revealed that there has been little previous research and little empirical evidence for most of the findings[55]. Most of the papers in fact referred to each other, instead of providing novel research or hard evidence.

53 Mangan, J (2008), "Port-centric logistics: Opportunity for Ports?

54 DeWitt W. and Clinger J., Intermodal Freight Transportation, Transportation Research Board (2000)

55 Valantasis-Kanellos, N., Piecyk, M. & Song, D.W. (2013), "The port centric logistics concept: a systematic literature review".

5.4.2 However promising it appears, PCL has a number of different business models, with little independent empirical research to confirm the performance versus the potential of the concept. That being said, the growth in PCL clearly indicates there are problems and opportunities in the logistics freight sector which leading companies believe PCL strategies address. The success of retailer driven port centric models in the UK is evident from the growth in volumes and port facilities, the huge amounts invested in infrastructure and the contracts that have already been signed. It has been estimated that the UK Haulage industry could save over 40 million miles of empty journeys by making use of the spare capacity of their vehicles returning to base vacant. This could cut carbon emissions in the UK by as much as 8% and significantly contribute to the UKs carbon emissions pledge.

5.4.3 So the development of PCL is intended to provide advantages relative to current business models, to help ease the cost pressures in post-recession market conditions—especially for end users grappling with the challenges of the recession and accommodate multiple channels to market. These deep water ports aim to bring exporters more efficiently to their markets, and bring import warehousing of goods much closer to major population centres.

5.4.4 Some major retailers have already established major dedicated port side import facilities. For example, Tesco now have four dedicated rail services and doubled some of its national haulage by rail, while ASDA has reduced its delivery mileage by 2million road miles a year (a total of 19m road miles since 2005) using these types of PCL services. Tesco has a 1m sq ft facility and Asda-Walmart also occupies a 360,000 sq ft import centre at Teesport. In 2006 Asda-Walmart saved more than 8 million road miles by adopting the port-centric concept[56]. Sainsbury and the BAP Group is based at Felixstowe instead of their previous inland RDC, while Nissan has a close working relationship with the Port of Tyne; Port of Tyne commercial director (logistics) John Tye commented "In this way, Nissan has eliminated an entire transport leg. It just makes so much sense." The port of Felixstowe has doubled its rail capacity and based on the number of freight train movements per day, take the equivalent of around 1.75 million HGV miles each year off the strategic road network.

5.4.5 The recent development of the London Gateway port 25 miles from central London on the river Thames, is part of a £1.5bn project. The owners DP World estimate the development will add up to £3.2bn to the UK economy, and offer 50 per cent higher port productivity than conventional operations. In January 2014 DP World claimed their analysis of PCL benefits indicated potential savings of up to £500 per unit (container)[57] versus traditional logistics models. However, Marks & Spencer decided in May 2014 to abandon their plans to build a £200m distribution centre at London Gateway citing time and planning constraints[58]. While M&S stressed they will use the port and have not ruled out a presence in the future, and a contract to develop a large shared cargo handling centre by 2015 has been awarded, the decision underlines the economic risks of delays in the planning process, and the fine economic balances of this emerging business model.

56 http://www.prlog.org/11013513-pd-ports-leads-the-way-again-as-portcentric-logistics-moves-into-second-phase.html

57 DP World / Peter Ward, Times Raconteur supply chain strategies supplement 21st of January 2014 Page 5

58 Guardian 20th of May 2014 Gwyn Topham and Zoe Wood

5.4.6 Equally, this does not demonstrate a fundamental problem in the PCL concept, as many retailers do not have sufficient sales volumes or ranges of imported products to warrant their own dedicated PCL portside import facility. In these circumstances 3PL operators, such as DHL and Eddie Stobart acquire and operate shared user facilities for several occupiers. There is constant growth on the container trade by these global 3PLs, which thrive on reducing supply chain costs, providing better service and greater confidence in cargo availability[59].

5.4.7 It should also be noted, particularly in relation to the recent trend in "re-shoring" that while the deep sea container market receives the most attention when considering port centric benefits and difficulties, more conventional cargoes, particularly in the bulk and palletised configuration can also benefit from sophisticated port centric logistics planning.

5.4.8 The port of Tilbury in East London, as well as having a significant deep sea container facility, has several good examples of this type of approach. Cemex have a major production plant in the port estate, around which many of the UK's largest Builders merchants are located. Value added services are provided where received cargo is reworked, processed or stored before onward distribution. Tilbury is engaged in the development of global level port centric logistics by working with international supply chains to examine ways of consolidating cargo from different trade routes and then provide integration with specialised handling and logistics services to ensure the most rapid and efficient onward distribution of products. This approach is increasingly being adopted by many port operators.

5.4.9 Outbound distribution by sea to other ports near target markets is an option increasingly chosen and much effort is directed towards identifying, improving and maximising sustainable and cost effective solutions, including rail or even barges. Lidl and Corus Steel logistics services are provided by PD Ports. The specialist tea and coffee company Taylors of Harrogate has agreed to import 100% of its products through PD Ports Teesport, after a successful trial proved that using facilities specially provided for them on the port was both highly efficient and cost-effective[60]. Other port-centric users include Co-op Clothing Company, Argos, JML, Samsung/NYK and Tetley.

5.4.10 Peel Ports new development at Liverpool 2 will have a Port Centric Logistics facility after its completion in 2015. This will represent a £350m investment in two deep-water container terminals. It has been estimated that the project will create 408 direct jobs and 4,630 indirect jobs, and will add £5bn of gross value to the local economy[61]. The new facility is the only one of its kind planned for the west coast of Britain and as such, it is anticipated to bring customers to the North West, as it is centrally located in the most densely populated region of the UK outside London, serving a population of 20 million in just over 2 hour's drive. Peel estimates carbon savings from increased use of the railways and the Manchester Ship Canal and net savings of 150m road miles a year.

59 Thought Leadership, 2012, http://www.portcentricity.com/majumdar.html

60 Helene Lyall, PD Ports presentation at 'Freight by Water' conference, Hull (October 2010)

61 http://www.liverpool2.com/community-engagement/benefits

5.4.11 Rail can be more competitive for the hinterland transport of containers than semi-trailers, and rail shuttle systems decrease transport costs, relieves congestion and decreases CO2 emissions[62]. However, the profitability of container rail shuttle systems depends on the distances and rail loading critical mass, so there are still significant opportunities for road semi-trailer transport, and some consider that ports often overlook the potential of increasing their turnover from Roll-on/Roll-off (RoRo) traffic. **Table 1** summarises the benefits of PCL.

Table 1: Summary of benefits of Port-Centric Logistics

Cost Saving	Environmental Benefits	Increased Competitive Advantage	Operational Benefits
Transportation cost 1: containers never leave the port-reduction of empty runs	Balance increase of road kilometres out	Ports change from passive to active	Faster repositioning of containers
Transportation cost 2: use rail and canals	Help ports to seek government support for infrastructure	Additional value added services will increase the revenue	Full weight capacity utilisation of containers – no weight restrictions within port premises compered to road
Warehousing costs	Reduce road miles	Increased cargo throughput	Faster distribution
Lower operational costs	Reduce CO2 emissions	Ports can become more integrated	Ease of road congestion
Faster and more efficient deliveries by bypassing RDCs	Deliver to the retailers' DCs directly	Warehouses in the proximity of ports	Elimination of empty runs
Direct replenishments		Enter new market segments	Reduce double-handling of the containers
Reduction of storage cost		Increase service levels	Reduces risk of damaged for the cargo
Reduced fuel consumption	Reduce CO2 emissions	Hub status against feeder ports	Reduce number of trucks
Reduces labour and land cost		Optimise the inbound supply chain	Shared storage facilities
Reduced inventory levels		Visibility of inventory for the cargo owners	Increased inventory visibility
Less damaged goods		Single point control solution	Reduction in shipment delays
Elimination of demurrage fees		Increase supply chain efficiency	
Reduce capital cost			

62 Woxenius, J. and Bergqvist, R. (2011) Comparing maritime containers and semi-trailers in the context of hinterland transport by rail.

5.4.12 For those who have been quick to embrace the concept of PCL, the costs of handling and transportation of products appear to have been significantly reduced. Ports continue to look at local markets for opportunities to take costs out of the supply chain, and Port-centric solutions can fit with the business model of any size of port, whether it is small, medium or large. Many observers predict the development of import centres will be a continuing trend in the marketplace and expect them to be of a scale over 500,000 sq ft as retailers expand product ranges and diversity of goods sold, while also seeking and needing to hold larger buffer stocks to ensure stock availability[63].

5.5 Policy implications

5.5.1 Commercial evidence indicates that PCL is not just a trend. The business case for the need for the port for port centric logistics appears stronger than ever, against a backdrop of the growing trend in re-shoring manufacturing, the challenging global economic climate, fuel price rises and excess shipping capacity along with the demand for better prices and customer service. But there are also major costs involved in terms of investment and barriers in planning policy and governmental issues.

5.5.2 While the UK government has a stated aim to maintain effective ports for trade, by developing the National Policy Statement for Ports, and further to increase the number of vessels registered in the UK, in order to develop an internationally competitive maritime sector. The Shipping Minister, following interim measures introduced for the year 2011-2013, announced that a budget of only £12 million a year will be specifically provided for maritime sector, while declaring "The UK is reducing regulation, delivering the right conditions for growth and prosperity and is the most competitive place to do business". He also stated "We are taking action to boost our already excellent access to our major ports. Through Port developments including London Gateway, Felixstowe, Liverpool and Southampton – we are investing in the road and rail networks that connect airports and sea ports. We are working together with the private sector to deliver the vital connectivity which customers and businesses today demand."

5.5.3 Stephen Taylor, director of PortCentric Logistics Partners, believes that recent Government announcements on a simplification of the UK's planning processes will help move PCL forward. "This has been a headache for a lot of developers in terms of getting planning permission through," he says. "If they are looking to build a new warehouse, they don't want to wait three years for the planning process to go through; they want to make the decision and create the facilities quickly." However others claim that bureaucracy will still deter immediate action on infrastructure investments, as it requires a strategic plan which takes years before it can win final approval from the UK government.

63 Steve Williams (2011) " Port Centric operations: an increasing trend in the UK logistics market" http://www.lsh.co.uk/commercial-property-viewpoints/2011/09/port-centric-operations-an-increasing-trend-in-the-uk-logistics-market

5.5.4 Despite the investments of UK and overseas businesses in the North East, the Government has not planned for significant new investment in the North East and the East Coast Main Line (ECML) which are critical for freight growth on rail. Northern UK ports employers, the rail community and major retailers suggest that the country needs to change traditional thinking about how best to move goods within the UK, act with responsible and decisive vision, and develop more sustainable/efficient transport methods. In terms of reducing cost, carbon emissions and congestion, an investment in the vital ECML rail line would have a significant positive impact on many UK businesses. Proponents of PCL argue that by bringing cargo for delivery to Northern port locations via the sea, and then transferring to shorter distance rail movements for tertiary delivery, retailers will see a significant reduction in shipment delays because their products will not be caught up in UK Southern port and road congestion. This would reduce their inventories, which are currently one of the drivers of rising costs. They could also benefit from lower overall transport, land and labour costs in the Northern regions. All of which will help retailers significantly cut their supply chain costs.

5.5.5 Ports adopting PCL represent a planning challenge for companies and government (national and local) to consider issues such as where to locate regional and urban distribution centres, connect rail and other modes efficiently, and how to deal with congestion and sustainability issues. Policies will also need to deal with the impacts of new shipping company alliances, which are already changing the commercial landscape for UK ports. An integrated intermodal transport system is a critical factor in the successful execution of PCL supply chains, both domestically and internationally[64]. It adds speed and agility to the supply chain, as optimal locations for intermodal rail/road terminals minimise total transport costs, noise and congestion[65].

5.5.6 While the Government recognises this barrier, and offers Freight Facilities Grants to help organisations make the change. FFGs put a cash value on the environmental benefits of removing HGV's from all public roads. The grant can assist operators in paying for the cost of setting up the new facilities required for rail or water. Equally, the capital expenditure may be beyond the scale of such grants. HS2 promises the potential to enable more freight services to operate more frequently and increase the economies of scale of freight on rail. This in turn could help retailers reduce costs and manufacturers to drive export growth by being more price competitive in the future[66].

5.5.7 Port centric logistics has great potential for regional regeneration in that many are located in areas of the UK most affected by the decline of traditional industries. One example is the closure of the Corus steel plant near Redcar, which at the time left Teesport facing an uncertain future[67]. During 2009 Containerships made Teesport its hub for Mediterranean and Baltic services, and shipping companies BG Freight and Evergreen also established new services[68] which have seen considerable new traffic, jobs and investment in the port, again underling the importance to the UK economy of the PCL concept.

64 DeWitt W. and Clinger J., Intermodal Freight Transportation

65 Caris A, Macharis C. and Janssens G.J (2008) Planning Problems in Intermodal Freight Transport:Accomplishments and Prospects,Transportation Planning and Technology, 31:3, 277-302.

66 How will HS2 imoact the freight industry in the UK?" (2013), www.deliveryquotecompare.com/news/will-hs2-impact-freight-industry-uk

67 www.bbc.co.uk/tees/content/articles/2007/08/29/teesport_feature.shtml

68 www.darlingtonandstocktontimes.co.uk/business/4853464.Teesport_firm_says_jobs_are_secure_despite_Corus_closure/

5.5.8 While recent DfT investment announcements included £30 million for road improvements to Immingham Port on the Humber, the East Coast ports of the Humber, Tees, Tyne and Grangemouth still have not seen money committed for urgently needed rail gauge enhancements to link these ports to the East Coast Main Line (ECML). The ECML is the crucial rail link that runs along the East Coast of the UK from London to Scotland, and has yet to receive any serious investment for freight. According to estimates, a relatively small £100 million investment in rail freight capability on the ECML would allow the UK to effectively handle an ever increasing demand for imported containerized goods through east coast ports on the Tyne, Tees and Humber. Those in the North East, argue that as a matter of strategic transport investment, their request for a £100 million investment in the ECML is a relative "drop" in the UK's transport budget bucket.

5.5.9 The UK Department for Transport (DfT) increased light dues rise from 35p (per nrt) to 41p in between 2009 and April 2010[69]. Light dues are fees charged for maintenance of navigation aids such as lighthouses. The level of light dues levied on ships in the UK is considered at risk of deterring vessels from calling at UK ports, since such taxes are not applied in most European Union member states. The shipping industry has argued the budget increase for the General Lighthouse Authorities by 7pc to almost £103m in 2010 was "wholly unacceptable"[70] and actions should be considered to deliver sustainable and progressive reductions in light dues over the long term. Significant changes to reduce the burden of light dues have recently been announced, including a reduction to 40p (per nrt), agreement with the Irish Government to pay for Irish lights in 2015 and a complete restructuring of pension arrangements for GLA's.

5.5.10 Overall, much of Government freight policy activity, however significant remains essentially tactical, and the UK lacks a coherent national and regional plan to ensure the capacity and infrastructure to support the development of UK freight networks is developed sufficiently rapidly.

69 www.maritimeuk.org/2012/01/light-dues/

70 Osborne, A. "Shipping lines 'aghast' over UK light dues rise" (2009) http://www.telegraph.co.uk/finance/newsbysector/transport/5533692/Shipping-lines-aghast-over-UK-light-dues-rise.html

6. Reducing empty container movements

6.1 Overview

6.1.1 Container shipping has experienced rapid development over the past few decades. The economic development of Asia, and in particular China, has driven growth in container trade globally. In the 15 years from 1990 to 2005 worldwide ocean container traffic increased by 277.4 million TEUs. The growth in container traffic in the UK ports has been significant with an 18.6% increase from 2009 to 2011[71].

6.1.2 However, due to trade imbalances in the UK, for every two loaded TEU's imported, less than one loaded export TEU is shipped out. These empty container movements are a long term, but accelerating issue for the UK that needs to be addressed, as it causes significant additional freight costs and port congestion. The problem has been growing for many years in line with the trade imbalance and growth in imports and containerisation per **Figures 10, 11 and 12.**

Figure 10: Container Port Traffic (TEU: 20 foot equivalent units)
Source: worldbank.org

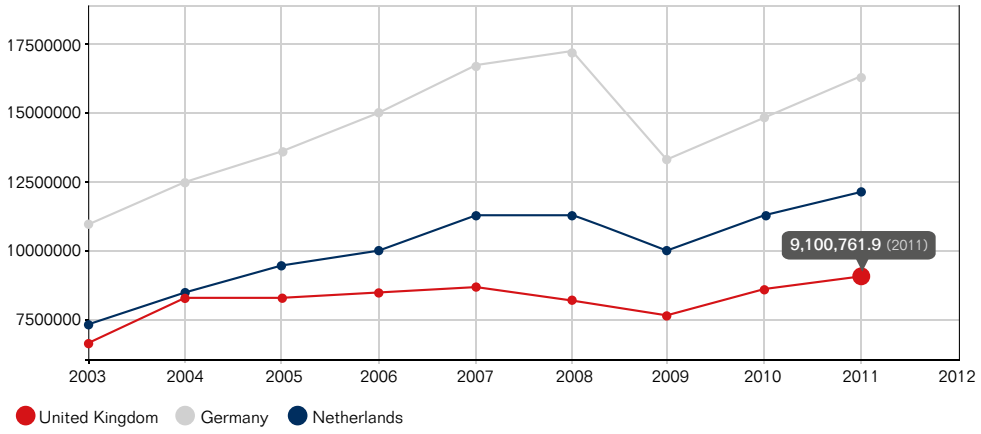
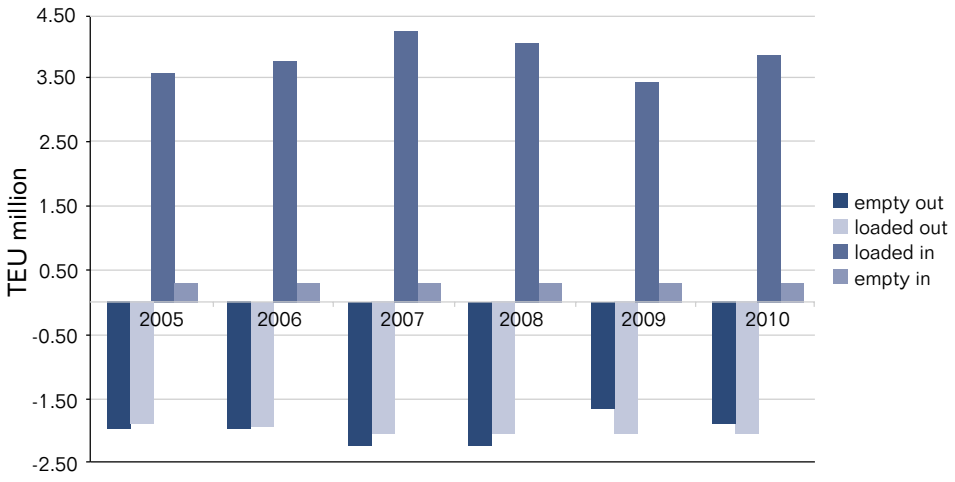


Figure 11: Container Movement imbalances
Source: Woodburn



71 Container Port traffic, The World Bank, data.worldbank.org.

Figure 12: Container Movement imbalances
Source: based on Dft (2006)

UK container traffic, 1985 - 2004

	1985	1990	1995	2000	2001	2002	2003	2004
tonnage (millions)	23.7	34.5	47.6	51.6	51.7	51.1	51.3	56.4
Containers (millions)	2.13	2.84	3.64	4.32	4.45	4.49	4.51	4.90
TEU (millions)	3.05	3.97	5.36	6.71	6.98	7.22	7.30	7.99
TEU per container	1.43	1.40	1.47	1.55	1.57	1.61	1.62	1.63
% of containers empty	21	19	15	19	21	24	28	28

6.1.3 The empty container trips occur for various reasons, including contractual agreements between shippers, consignees and carriers (who are generally the owners of shipping containers) which may require all containers to be returned to the carrier's port terminal, whether they are loaded or empty.

6.1.4 The traditional process for inbound and outbound cargo is that loaded containers are collected from the carrier's terminal and delivered to the consignee. They are then typically returned empty to the carrier's terminal, often by the same carrier. Logistics service providers (LSP's) may then pick up empty containers required by an exporter from the terminal and deliver these empty containers to an exporter for loading. After a container has been loaded, an LSP will transport the loaded container to the carrier's terminal where it will be stacked at the pier prior to loading on to a container ship.

6.1.5 In the USA research found that, in the case of both export and import cargo, at least two-thirds of the required truck trips involve empty container movements, either for empty pickup or empty return[72]. The time the containers were delayed in the USA was estimated to be in the range of 40-50 days. Demurrage costs (daily rental fees beyond certain limits) are in the range of $4 per day, and empty container handling movements can be $20 per move, so these costs are both significant, and avoidable. Typical outbound costs for USA to European port operations shown in **Fig 13** indicate the type of time consumed and costs associated with loaded containers[73] and many of these will occur for both empty return and outbound movements.

Figure 13: Typical container movement costs
Source: UN UNECE analysis (2009)

Sequence	Time (Hours)	Cost US$
Moving container from loading ramp to storage	1	80.00
Container waiting for pickup after loading	48	12.00
Loading container on road trailer	1	62.00
Road transport to port terminal	33	360.00
Transfer from road trailer to stack	-	80.00
Waiting in stack	50	40.00
Unstacking and transfer to terminal trailer	-	88.00
Transfer / loading onto ship	-	240.00
Container travel time (NY to Rotterdam)	154	1840.00
Transfer / unloading off ship	1	192.00
Transfer to stack	-	60.00
Waiting in stack / transfer to road trailer	106	90.00
Clearance and inspection	2	10.00
Road transport, port terminal to inland depot	14	220.00
Storage in inland depots	30	-
Moving container to consignee	2	40.00
Total hours / days	**442 hrs / 19 days**	**3,414.00**

72 Logistics of empty cargo containers - P.I. Le Dam Hanh Department of Civil and Environmental Engineering University of Southern California 2003

73 UN UNECE Analysis example 2009

6.1.6 Empty containers spend the highest average dwell time in the container terminals and are probably the single largest contributor to the congestion at and around marine ports[74]. Efforts have been made over time to reduce the movement and dwell time by optimising empty container re-use and several business and mathematical models and techniques have been developed[75].

6.1.7 The repositioning movements are assessed on a basis driven by various business models. Repositioning takes place either at a regional (i.e. between importers, exporters, intermodal terminals, inland depots and ports) or a global (i.e. between deep sea ports) level. In most intermodal transportation networks repositioning takes place at both levels. The emptied import containers, however, can be reused for export loads without first being returned to the marine terminals.

6.1.8 Operational issues such as import/export timing, location mismatch and legal issues such as "off-hiring" of leased containers are often barriers for empty reuse implementation. Li et al (2007) stress that because of the characteristics of the global industry any allocation method should consider the transportation of empty containers by the transit port. The cost of empty reuse is almost half the cost of typical operations (not reusing empty containers, returning them immediately to the place of origin). So empty reuse is desirable to all the parties involved, yet actually very hard to achieve.

6.2 Possible solutions and benefits in empty containers

6.2.1 While the underlying problem is the UK balance of imports and exports, the costs and problems caused by empty containers can be significantly reduced using various methods.

6.2.2 As the length of time taken to move containers around inland is a key cost driver, increasing their speed of passage, and availability at the point of demand would help reduce the cost of empty movements. Work undertaken by H. Jula et al. (2004) developed optimisation techniques to minimise empty travel[76] using two methodologies: street-turn (AKA triangulation) and depot-direct. In short, these mean that when time is critical, empty reuse is shifted towards depot-direct container movements, where containers are returned to the lessor's depot rather than the marine terminal. This suits the PCL model, since the waiting time is minimal in this methodology. When the traveling cost and traffic congestion are the important factors, street-turn methodology (demand driven movement of containers to different users, as opposed to return to the port of origin) provides the best match between supply and demand of empties. This work demonstrated that more accurate forecasting of empty containers in ports, and planning relative to demand for their use would enable container ports to develop more cost efficient plans for the repositioning of empty containers.

74 Mallon, L.G., Magaddino, J.P., 2001. An integrated approach to managing local container traffic growth in the Long Beach-Los Angeles port complex, Phase II. Technical Report, Metrans Report 00-17, CA, USA.

75 Jula H. et al., 2004. "empty Port dynamic container reuse".

76 H. Jula et al., Port dynamic empty container reuse, Transportation Research Part E, 2004

6.2.3 Alternatively, Song and Carter (2009) found that managing more efficient empty container repositioning can be better achieved by effective management of the overall network (external management), in contrast to efficient internal management; as this only focuses on the optimisation of container fleet within a single company[77]. This type of collaborative management strategy between shipping lines can create significant cost savings and improvements in performance (i.e. less uncertainty in demand, and elapsed time)[78]. The challenge to shipping companies is to find ways to share information and successfully allocate surplus empty containers from supply port locations to demand port locations to use the minimum number of empty containers[79].

6.2.4 Again, although the trade imbalance is the root cause, the dynamic nature and external uncertainties may cause significant empty container movements even on balanced trade routes. Based on flow balancing, Song and Carter (2009), explored four strategies for empty container repositioning. Their findings revealed that route-coordination is much more important than the container-sharing mechanism in reducing empty container repositioning costs. A crucial issue on the implementation of any strategy is the intensive information communication that is required and the involvement of multiple players.

6.2.5 Container types, blind spots in the supply chain, carrier operational and strategic practices, and market dynamics are other factors that also affect the empty container movements[80].

6.2.6 Considering the large number of empty containers in UK ports, increased empty container reuse would have an enormous impact on the economy. Apart from the reductions on costs and the number of truck trips, it will reduce noise, emissions and traffic, and there will therefore be significant environmental effects.

6.2.7 Port-Centric Logistics (PCL) avoids the slow handling and return of empty containers by unpacking the container at the receiving port and holding the stock in port located warehouses. A variation on this is the shipment of containers to national distribution centres for unpacking using rail, with rapid turnaround and return. This would eradicate considerable UK road freight mileage that occurs when delivering to traditional inland import centres such as in the Midlands. So, the mega-trend of PCL may alleviate the empty container problems. A future investigation may also examine the percentage of trucks visiting ports terminals that are involved in more than two hours waiting time, which causes air pollution, wasted energy, labour and increased maintenance costs[81].

77 Song D.P. and Carter J., 2009, Empty container repositioning in liner shipping.

78 Song D.D., 2007, Analysis of a collaborative strategy in container fleet management.

79 Li J.A., Leung S.C.H., Wu Y. and Liu K., (2007), Allocation of empty containers between multi-ports.

80 Song D.P. and Carter J., 2009, Empty container repositioning in liner shipping.

81 Barton, M.E. 2001. 24/7 operation by marine terminals in California: how to make it happen. CITT Industry Stakeholder Workshop One, Metrans Report, CA USA.

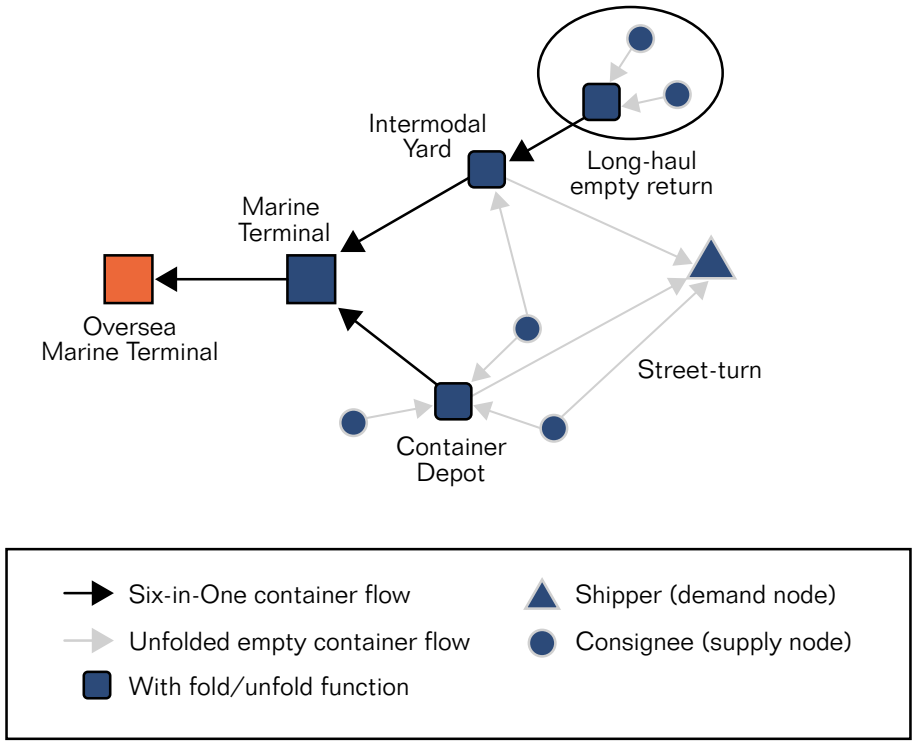
6.2.8 It has been suggested that common intermediate temporary locations for empty container re-distribution could also be used, where open and subscriber web based systems such as interbox, TailGate and eModal could match availability to demand, thus avoiding the confidentiality issues related to customer demand transparency.

The benefits of these types of systems include:

- Integrated container tracking between terminals and user locations
- Increasing productivity and reducing "turn time" through the use of coordinated availability planning
- Better co-ordinate modal planning to improve efficiencies
- Improve multimodal coordination using standardized data systems

6.2.9 The use of collapsible containers has also been explored[82] (the process flow is indicated in **Fig 14**). While this demonstrates that these containers are capable of delivering transport cost savings, the cost of equipment and barriers to market entry have so far limited the growth of a market for collapsible containers.

Figure 14: Process flow for collapsible containers.
Source: Konings and Thijs (2001)



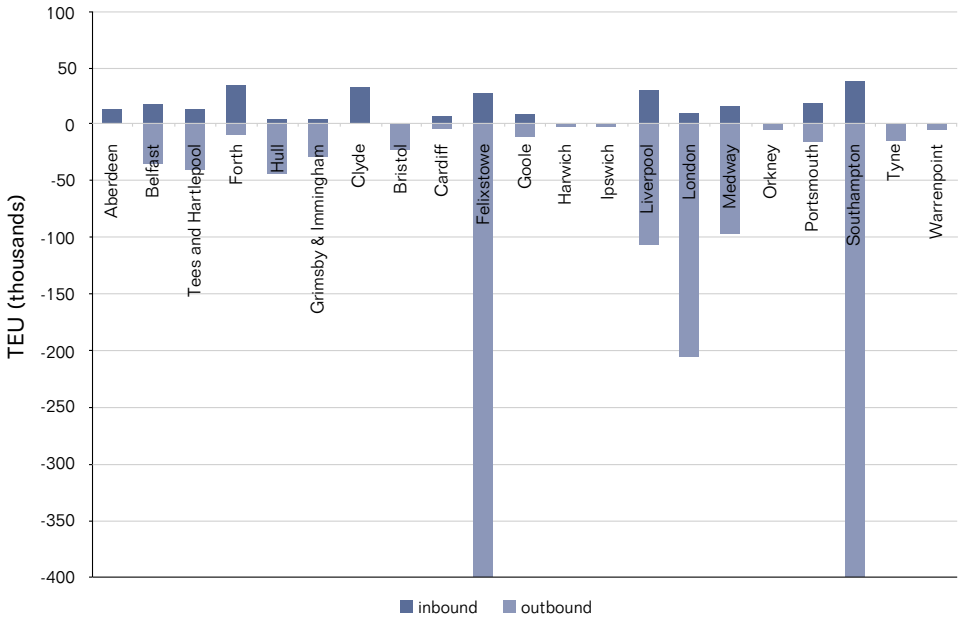
82 Rob Konings and Remmelt Thijs (2001) Foldable Containers: A New Perspective on Reducing Container-Repositioning Costs: Technology, Logistics and Economic Issues, EJTIR 1, No.4, pp. 333-352

6.2.10 There may also be limited opportunities to exploit trade imbalances within the UK. For example Scotland exports two tonnes by road for every tonne imported from the EU. And it "imports" 1.2 tonnes from England for every 1 tonne "exported". This regional imbalance of trade has meant that Scottish outbound transport rates are typically lower than the rest of the UK and EU[83]. Amazon's recent decision to site their largest European DC in Fife was undoubtedly driven in part by this phenomenon. (This can also be true of other regions, for example in London, where Procter & Gamble manufacture all the global volume for one of their brands in a London factory, a decision influenced by outbound shipping costs due to the UK trade imbalance).

6.2.11 Whisky companies also have the option of despatching export containers by short-sea feeder services to deep-sea ports such as Rotterdam and Antwerp rather than sending them by rail to English deep-sea ports like Felixstowe. This creates a very competitive market for outbound freight services from Scotland which is clearly beneficial to exporters. However, the absolute volume of existing movements precludes a significant rebalancing of UK movements from this type of imbalance / opportunity until overall UK export volumes grow.

Also Northbound imports to Scotland come mostly as 45ft pallet-wide road trailers or swap bodies (and now rail containers) as they are retail and other movements from distribution centres in the midlands, while the majority of Scotland's exports leave as 20ft/40ft maritime containers either through ports or on rail.

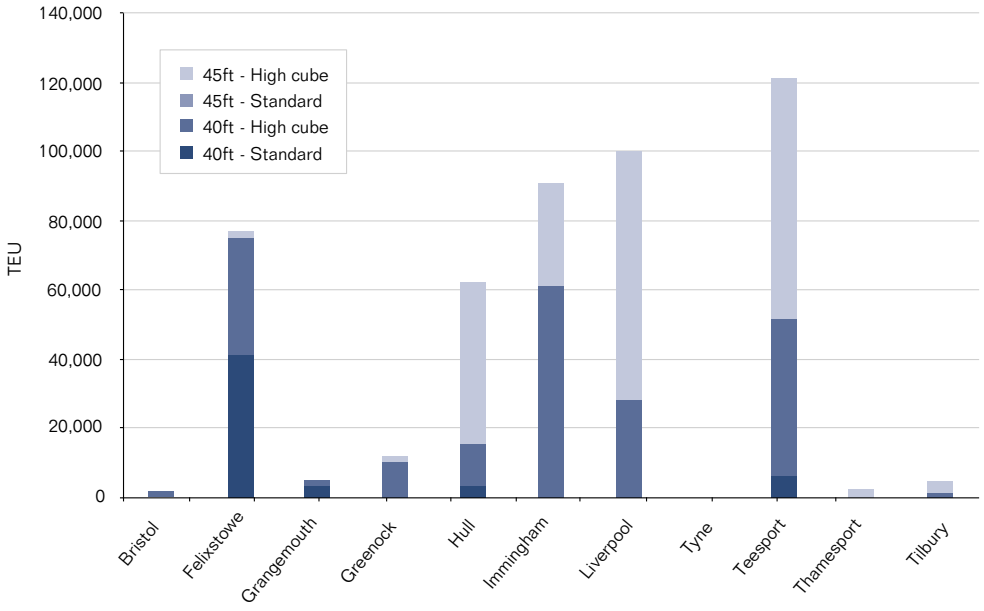
Figure 15: Empty Container movements in the UK, by port and import/export.
Source: Monios and Wilmsmeier, 'The operational dynamics', TRI, (2012)



6.2.12 Thus empty boxes must be repositioned to Scottish ports such as Grangemouth, incurring additional costs to Scottish exporters. This is a UK level problem and is under discussion currently to try to find solutions. The available data is a challenge, and badly needs further research. The chart on empty movements shows the location of the imbalances is in a small number of mainly Southern Ports and Liverpool, and these vastly outweigh the Scottish and other Ports surplus.

6.2.13 Another significant area of complexity in managing empty movements is the mix of container sizes. These now include a range of high cube containers, some of which are not possible to move on certain rail lines due to gauge clearance issues, and on some HGV's due to EU restrictions. The chart below **(Fig 16)** shows the mix of container types through the different UK ports[84] and each of these container types will require specific logistics configurations to handle. The majority of ISO containers used on deep sea routes are 20ft and 40ft long. These are mostly 8ft wide and either 8ft6" high or increasingly 9ft6" high known as "high-cube". They are used on imports from the Far East where the contents are loaded loose in the container, but for intra-European loads this is impractical, as labour costs determine that loads must be palletised.

Figure 16: Container type mix by UK Port
Source: Monios and Wilmsmeier, 'The operational dynamics', TRI, (2012)'



84 The operational dynamics of container types in regional British Port development strategies - Monios J. Wilmsmeier G. Transport Research Institute, Edinburgh Napier University

6.2.14 In recent years, "pallet-wide" containers have been developed on European short sea routes. These pallet-wide 40ft containers accommodate 30 euro pallets rather than 25 in standard width and are the preferred option. It has been moved in Europe to make 45ft pallet-wide maritime containers the industry standard (Bouley 2012). Problems exist because most deep-sea ships cannot accommodate these containers in their cellular holds and EU directive 96/53/EC forbids standard 45ft long containers on lorries (although modified designs with chamfered corners are acceptable)"[85]. It has been forecast that 65-70% of 40ft containers will be high-cubes by 2023 (Network Rail, 2007), thus more detailed data on high-cube movements would contribute to the planning debate. In 2005/6 almost 25% of deep sea containers went by rail but less than 5% of short sea containers utilised rail (Network Rail, 2007).

6.2.15 This may relate partly to the historical lack of suitable connecting infrastructure. At the start of 2009 high cube containers could only travel unrestricted from the UK's busiest port at Felixstowe to London and Peterborough and on the West Coast route from London and the Thames ports to the Midlands, the North West and Glasgow.

6.2.16 Recently, considerable progress has been made under the aegis of the Strategic Freight Network. In addition to the opening of the Southampton route, 2011 saw gauge clearance from Felixstowe through Peterborough to the West Coast route at Nuneaton, with other schemes under development. It is intended that clearance of the East Coast route northwards from Doncaster to the Scottish Central belt will be completed during 2014 although planning is still in progress. Gauge clearance programmes like this can drive increased use of rail freight. After the route was opened to high cube containers from Southampton to the Midlands, rail's market share increased from 30% to 36%[86].

6.2.17 The literature review also identified a complex study into the relationship of UK rail services to container market development which identified a number of opportunities to reduce empty movements, but equally a number of complex barriers and interdependencies.

6.2.18 It is clear that the resolution of the problem requires a multi-faceted, internationally coherent selection of equipment and systems. It is equally clear that innovations in equipment and international standards will be equally as important enablers as improvements in operations and collaboration.

85 The operational dynamics of container types in regoional British Port development strategies - Monios J. Wilmsmeier G. Transport Research Institute, Edinburgh Napier University

86 Network Rail Cleland, I 2012 quoted in Rail Engineer Showing your gauge Stacey, M 2012

7. Summary observations

7.1 This research clearly shows the importance of the UK freight and logistics sector to the growth and competitiveness of overall economy. The future policy, planning and operational needs of the industry have proved to be highly complex, and this research has identified a number of significant opportunities, problems and risks in making predictions, and evaluating options to inform UK industry and government planning and actions.

7.2 One of the chief risks is that analysing the logistics sector in relation to policy development presents a virtually infinite rabbit hole into which policy makers and academics often fall. This often creates a paradox, where the policy driven need to empirically test theories and quantify return on investment, relative to the economic, environmental and social benefits, cannot actually be accurately satisfied due to the lack of suitable data, coupled with the extreme complexity of the logistics sector.

7.3 Another key risk is that the lack of independent (e.g. Government funded) research and statistics on the sector creates a knowledge vacuum which a range of interested, and often partisan parties attempt to fill. The quality of research and case studies thus provided varies enormously, and outside of peer reviewed material from reputable organisations, the content can be unreliable, and often contradictory to other material.

7.4 The lack of a reasonably detailed, common strategic framework and programme also engenders a fragmented, trend and theme driven research landscape, with multiple organisations targeting the same areas, as they follow the fashions in funding preferences. In the literature review for this paper, we found a positive glut of papers in some areas, contrasting with a famine in others, where the subject matter was of equal or even greater importance.

7.5 Considering the size of the sector there is relatively little useful data in the public domain. While other sectors enjoy significant focus and economic evaluation, there appears to be little depth to the analysis of the logistics sector. **Core UK data sources for sector employment, gross value added, productivity and economic impacts often vary by more than the total GVA or employment for other UK industries.**

7.6 The UK sector groupings for logistics economic activity within transport are likely to distort even high level analysis, and the units of reporting are often not actually useful in planning, for example tonnes of freight, where increasingly unit or cubic throughput is the driver of freight volumes, not mass.

7.7 In future, the industry is highly likely to need to become further operationally integrated, and use more shared infrastructure. But the industry operates on infrastructure which has an asymmetrical mix of public and private ownership and control. This creates problems in the competitive landscape, and in planning and funding network investments, particularly as most need land for facilities, and require integration of the different modes of transport. Increasingly, major UK freight infrastructure developments will be beyond the purse and control of private companies.

8. Overall recommendations

8.1 Given the importance of, and pace of change in the sector the need to improve our policy and industry planning is urgent. There are very clear areas which require focus, and these cannot be adequately dealt with by piecemeal policy initiatives, and individual private sector initiatives.

8.2 From our research and extensive consultations with industry, academics and leading organisations, the following consistent themes for recommendations has emerged:

8.3 **An independent UK freight planning working group should be set up** combining leading industry, academics, government, standards and expert organisation representatives should be urgently set up, with a remit to develop a programme to provide objective, meaningful guidance for policy makers, researchers, statisticians and industry with a particular focus on:-

- Global trends in freight, their impact on the UK economy and industry, and consequent industry needs to innovate, operate, compete and grow
- The development, funding and operations of integrated multi-mode, sustainable shared urban logistics hubs
- Requirements in planning, investment and policy to transform UK freight network agility, transport mode interoperability (mode shift) and sustainability
- Evaluate the opportunities and impacts of different port centric and traditional logistics network configurations, in relation to UK manufacturing strategy, urban logistics and mode shift
- Assessment of the scope and effectiveness of existing policy, and the identification of improvements and specific fut ure policy interventions required to support the development of the freight and logistics sector

8.4 **Guided by the working group an integrated programme of research should be commissioned** to provide coherent, independent and expert insights into future UK network operations and needs, to better support planning, and identify and provide accurate and improved operational statistics.

8.5 **A high-level integrated plan and related policy for the UK freight and logistics sector should be developed** which would aim to improve, and integrate existing policy initiatives into a future framework, with sufficient detail and pragmatism to be capable of successful implementation.

8.6 **Government departmental activities on freight transport and planning should be better coordinated.**

Appendix 1 – Primary Data Collection: interviews and meetings

Interviews are a research instrument and a very common mode of collecting primary data, either for quantitative or qualitative research, since they are a good mechanism or tool for the researcher to collect empirical data in particular.

Physical meetings in which the programme and the specific research were discussed occurred with the following during 2013-14, and we acknowledge our gratitude to them:

1. **CILT UK PPC UK Freight planning work group** – Professor Alan Braithwaite (Visiting Professor and Interim Director of Supply Chain Research Centre Cranfield), Jolyon Drury (Chair of PPC), Stephen Rinsler (FCILT), Angus Johnston (Freightliner) Daniel Parker-Klein (Head of policy CILT) and David Coombes (FCILT). The programme was discussed in depth, and the development and operation of a parallel programme within the CILT work group agreed. The research consultation document was also circulated and feedback provided.
2. **Westminster University – Professor Mike Browne** (Professor of Logistics) and **Dr Allan Woodburn** (Principal Lecturer in Freight and Logistics) in the Transport Studies Department.
3. **Heriot Watt University / Kühne Logistics University** – Professor Alan McKinnon (Head of Logistics and Dean of Programs at the Kühne Logistics University).
4. **Bircham Dyson Bell** – Robbie Owen (Partner). This session had a particular focus on freight planning, and UK planning policy.
5. **ASDA** – Alex Linton (Import supply manager central logistics) and Lee Hodgkin (Supply chain manager transport planning, global logistics) Particular focus on empty containers and urban logistics.
6. **Rail Freight Group** – Maggie Simpson (Executive Director). Met in July 2013 and participated in written feedback to research consultation.
7. **CILT PPC** – The ITC Research programme has liaison updates at all recent PPC meetings, and a summary of the high-level programme content and progress was discussed with good feedback and support from many members.
8. **Forth Ports Ltd** – Perry Glading (COO) Extensive discussion of UK situation, and programme specifics.
9. **Email responses were also received from:** Cardiff Business School - Andrew Potter (Reader in Transport and logistics).

The interviews were all semi-structured. A questionnaire was used to structure the interview although not all questions were answered by all the interviewees. Feedback from an ITC Discussion Evening held in July 2013 was also used in the preparation of this report. For an account of the discussion evening please visit: **http://www.theitc.org.uk/dyn.php?page=71 .**

Appendix 2: Bibliography of reports and sources consulted

A. General freight and logistics

1. Anuj Prakash & S.G.Deshmukh. (2010) Horizontal Collaboration in Flexible Supply Chain: A Simulation Study.
2. BARCLAYS (2012) Corporate Banking UK Transport and Logistics Sector outlook First quarter.
3. Barclays Bank UK Transport and Logistics Sector Outlook Q1 2012
4. BESTLOG (Establishing a Dissemination and Promotion Platform for Logistics Best Practice),
5. Bilbao, A. M. (2011). Environmental impact analysis of alternative pallet management systems. Thesis, Rochester Institute of Technology.
6. Bouhlel, S.O Slimane I, Mzoughi M, Garrouch K. (2011) An Investigation into the Consumers' Sensitivity of the Logistics Efficiency. International Journal of Business Administration.
7. Cambridgeshire Transport Commission. (2009). Independent Transport Commission Report for Cambridgeshire County Council.
8. CARAVEL, http://www.civitas-caravel.org
9. CBI A vision for rebalancing the economy – 2011
10. CER Towards a common market for rail services Ludewig J CER 2010
11. CITY FREIGHT project information available at http://ec.europa.eu/transport/extra
12. City Logistics, www.eu-portal.net
13. COMETA (Commercial Vehicle Electronic and Telematic Architecture),
14. Cost curve for GHG Reduction - McKinsey and Co 2007
15. COST321 (1998) "Urban Goods Transport", Final Report (Brussels, European Commission),
16. De-Carbonising Freight transport – Heriot Watt – McKinnon 2009
17. eDRUL (e-Commerce Enabled Demand Responsive Urban Logistics), http://srvweb01.softeco.
18. FIDEUS (Freight Innovative Delivery in European Urban Space), http://213.21.184.250/Fideus
19. Finest – Future of logistics / internet enabled optimization of transport and logistics networks – EU 7th framework report Zahlmann M. 2011
20. FLEETMAP (Fleet Mobile Application Protocol), http://www.ptv.de/fleetmap
21. Freight Transport Association, and PWC. (2012). The Logistics Report 2012.

22. FTA Logistics report 2012 / Bunker index

23. Fuel price report: UK and overseas prices" (2013)

24. Further Activities (IV), http://www.bestufs.net

25. FV-2000 (Quality of Freight Village Structure and Operations),

26. Guidance on measuring and reporting Greenhouse Gas (GHG) emissions from freight transport operations. CILT, Defra, DfT, Freight by Water, Food Storage and Distribution Federation, FTA, IGD, RHA, Rail Freight Group.

27. How local authorities can include freight in their transport planning process - Logistics Research Network (LRN) Conference, Cranfield, UK Maria Lindholm (Institutionen för teknikens ekonomi och organisation, Logistik och transport); Erica Ballantyne

28. http://ange.archangelis.com/typo3/niches/

29. http://people.hofstra.edu/geotrans/eng/ch2en/conc2en/ch2c1en.html

30. http://www.cakeboxx-technologies.com/

31. http://www.ciltuk.org.uk/ContactUs/Press.aspx

32. http://www.freight-online.co.uk/

33. http://www.freight-village.com/fv2000/

34. http://www.londoncouncils.gov.uk/services/lept/links/freight.htm

35. http://www.sg-hldgs.co.jp/english/csr/report/environment/transportation03.html

36. http://www.tfl.gov.uk/microsites/freight/

37. http://www.tfl.gov.uk/microsites/freight/water_freight.aspx

38. http://www.theaa.com/motoring_advice/fuel/

39. http://www.utopia-eu.com

40. Huschebeck, M. (2004) "BEST Urban Freight Solutions"

41. Huschebeck, M. and Allen, J. (2005) "BEST Urban Freight Solutions II", Deliverable D1.1: BESTUFS Policy and Research Recommendations I, http://www.bestufs.net

42. Improving rail's energy efficiency – RSSB 2005

43. Innovation in Logistics Services – Cranfield 2007 – Mena, Christopher, Johnson and FuJia

44. Internalising the external costs of road freight transport in the UK – Heriot Watt McKinnon / Piecyk 2007

45. Johnson, L. (2012) Too Late for two degrees? Low carbon economy index 2012.

46. Latest trends in global trade and the business case for port Centric logistics – MDS Transmodal Garratt 2011

47. London Low Emission Zone Initiative website, http://www.tfl.gov.uk/tfl /low-emission-zone/

48. Material, www.eu-portal.net

49. MEASURING THE VALUE OF THE FREIGHT TRANSPORT SECTOR TO THE SCOTTISH ECONOMY 2006 Steer Davies Gleave

50. Memedovic, O. Ojala, L. Rodrigue, J. Naula, T. (2008). Fuelling the global value chains: what role for logistics capabilities?

51. Mena, C. Christopher, M. Johnson, M. and Jia, F. (2007) .Innovation in Logistics Services.

52. MOBILIS, http://www.civitas-mobilis.org/

53. Modelling the full costs of an intermodal and road freight transport network Milan Janic OTB research institute Delft 2006

54. NICHES (New and Innovative Concepts for Helping European transport Sustainability),

55. PORTAL (2003) "Inner Urban Freight Transport and City Logistics", PORTAL Transport Research

56. Ports in the logistics chain – Heriot Watt BPA Conference paper Orkney 2011

57. Rail charging levels in Europe CESifo – DICE 2005

58. Rail Freight "Getting on the right track" IME 2008

59. Ringer L. (2011). A vision for rebalancing the economy C B I .

60. Road haulage industry costs and taxes – UK HMG Butcher / Seely / Bolton & Beale 2008

61. Schäffeler, U. (2003) Summary of Projects and Results from Topic Inner Urban Freight Transport

62. Short Haul Freight on track for profits in Scotland – FBP 2009

63. SMILE, http://www.civitas-initiative.org/project_sheet?lan=en&id=1

64. Solutions In Global Logistics and Distribution Planning (Ed, Waters, D.) Kogan Page, London, pp. 308-320

65. SST–2007–TREN–1 SST.2007.2.2.4. Maritime and logistics co-ordination platform SKEMA Coordination Action "Sustainable Knowledge Platform for the European Maritime and Logistics Industry"

66. SUCCESS, http://www.civitas-initiative.org/project_sheet?lan=en&id=4

67. SURFF (Sustainable Urban and Regional Freight Flows), http://www.euroweb.net/surff/

68. TELLUS (Transport and Environment Alliance for Urban Sustainability), http://www.tellus-cities.net/

69. Transport & Travel Research Ltd, (2011). Bank, Cornhill and Leadenhall Street Corridor Freight Study. Version 1.0

70. TRKC (Transport Research Knowledge Centre) website, http://ec.europa.eu/transport/extra

71. UN Unice analysis of global logistics costs 2009

72. Urban Consolidation Centres', http://www.rmd.dft.gov.uk/project.asp?intProjectID=12079

73. Urban Freight Transport and Logistics – An overview of the European research and policy, covering research needs, programmes, results, policy implications and future research – University of Westminster were major contributors

74. UTOPIA (Urban Transport: Options for Propulsion systems and Instruments for Analysis),

75. Value and importance of rail freight – Network Rail 2010

76. Webb, M. and Armstrong, G. (2009). Travel Plan Plus. Cambridge Country Council.

77. Whiteing, T., Browne, M. and Allen, J. (2003) "City logistics: the continuing search for sustainable

B. Freight and the UK economy

1. At best, the world economy is on the brick of recession, (2009), http://www.economist.com/node/12381879

2. Baker, P. and Sleeman, J. (2011) The impact of economic and supply chain trends on British warehousing, Logistics Research Network 2011 Conference.

3. Being interviewed (2013)

4. Braithwaite A., 2011, UK Freight transport: setting a coherent strategy and direction for 2020 and beyond.

5. Braithwaite A., 2011, UK Freight transport: setting a coherent strategy and direction for 2020 and beyond.

6. Britain in 2013 – the nation in focus, (2013) Annual magazine of the Economic and Social research Council

7. Browne, M. et al. The potential for rail to make a significant contribution to urban freight operations.

8. BSL Management Consultants. (2008) Rail Infrastructure Cost Benchmarking. Brief LICB-gap analysis and cost driver assessment.

9. CER, Rail transport has significant potential to lower CO2 emissions through modal shift, concludes new study, Press Release N.16, http://www.uic.org/com/IMG/pdf/cp16_en-2.pdf

10. Confidence prevails in UK logistics industry but short termism stunting innovation, (2012), www.barclays.com

11. Consolidation in the logistics industry expected to increase as foreign ownership grows, (2011), group.barclays.com

12. Department for Transport, Statistics

13. Department for Transport. Transport Statistics Great Britain: 2010.

14. Dr. Johannes Ludewig. (2010) Towards a common market for rail services: the next steps.

15. European Intermodal Association. Intermodal Freight Transport & Logistics Best Practices

16. Eurotunnel, (2013). Eurotunnel launches ETICA to help develop intermodal rail freight. Press release. http://www.eurotunnelgroup.com/uploadedFiles/assets-uk/Media/Press-Releases/2013-Press-Releases/130530-ETICA-UK.pdf

17. Freight Industry Times, 2013, www.freight-online.co.uk.

18. Haywood, R. (2007). Britain' s national railway network: fit for purpose in the 21st century?. Journal of Transport Geography 15 198-216

19. http://businesscasestudies.co.uk/case-studies/by-industry/logistics.html#axzz2iMA9mo4O

20. http://data.worldbank.org/indicator/NE.IMP.GNFS.ZS

21. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Freight_transport_statistics

22. http://www.bbc.co.uk/news/business-24579046

23. http://www.cedelft.eu/publicatie/potential_of_modal_shift_to_rail_transport/1163?PHPSESSID=ad7fe617ec22e1c58e8017aa58bf4227

24. http://www.freight-online.co.uk/rail/content/12365/philippa_edmunds_freight_on_rail

25. http://www.lcfd.co.uk/about-the-project/make-the-modal-shift-to-rail

26. http://www.logisticsqualifications.eu/?p=3030

27. http://www.networkrail.co.uk/aspx/10439.aspx

28. http://www.prnewswire.co.uk/news-releases/new-report-claims-31-growth-in-freight-forwarding-market-is-greatly-misleading-215801691.html

29. http://www.sg-hldgs.co.jp/english/csr/report/environment/transportation03.html

30. http://www.tfl.gov.uk/microsites/freight/rail_freight.aspx

31. http://www.theguardian.com/news/datablog/2009/nov/25/gdp-uk-1948-growth-economy

32. http://www.tradingeconomics.com/united-kingdom/gdp-growth

33. http://www.uic.org/spip.php?article3029

34. https://cdm.unfccc.int/methodologies DB/4DOIK2WYP8P3AGAVJKT0CHY1NXJ4QP

35. Industrial Strategy: UK Sector Analysis. 2012. Department for Business Innovation and Skills

36. International Trade Statistics 2012, World Trade Organization.

37. Is transport doing enough to reduce its carbon emissions? (2011), http://www.rfg.org.uk/news/transport-doing-enough-reduce-its-carbon-emissions

38. Kallas, S. (2013), "Connecting Europe: the next stage", European Commission Database: Press Release

39. Kirkup, J. (2013), "Osborne: We've saved the economy and proved Labour wrong", http://www.telegraph.co.uk/news/politics/georgeosborne/10295060/Osborne-Weve-saved-the-economy-and-proved-Labour-wrong.html

40. London freight plan - sustainable freight distribution: a plan for London (2007), Transport for London.

41. McKinnon, A. and Piecyk, M. (2012) "Scottish Logistics Report"

42. MDS Transmodal (2011) "Reaching our carbon reduction targets in the freight industry"

43. O'Reilly, J. (2013) "Trucking perspectives 2013" www.inboundlogitics.com/3pl, pp. 47-65

44. ONS, Social Trends 41.

45. Open for maritime business (2013), Maritime UK

46. Potential of modal shift to rail transport (2011), TRT Trasporti e territorio SRL.

47. Reis, V., Meier, J. F., Pace, G., and Palacin, R. (2013) Rail and multi-modal transport. Research in Transportation Economics 41, pp. 17-30.

48. RSSB. Whole life carbon footprint of the rail industry (2010) Research Brief R&D Programme.

49. Spending Review: Energy and transport to get share of £100bn (2013), http://www.bbc.co.uk/news/uk-politics-23074245

50. Stittle, J. (2004). Accounting for UK rail freight track charges: privatisation, politics and the pursuit of private sector vested interests. Accounting Forum 28 403-425

51. Survey predicts greater spend from logistics sector, (2013), http://www.hsssearch.co.uk/page_348637.asp

52. The recession of 2007-2009 (2012), www.bls.gov/spotlight

53. The recovery is here-make sure it lasts (2013), http://www.telegraph.co.uk/comment/telegraph-view/10323290/The-recovery-is-here-now-make-sure-it-lasts.html

54. Top 50 world container ports, World Shipping Council, http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports

55. Transport and Logistics, 2012, www.qfinance.com

56. Transport and the economy: third report of session 20101-11, House of Commons Transport Committee, Vol.1

57. Trends in the Transport Sector 2012. OECD Publishing.

58. United Kingdom Freight Transport Report 2013 (2013), Market Research.com

59. Value and importance of rail freight (2013), networkrail.co.uk

60. When did the recession begin, http://spectator.org/blog/2011/06/09/when-did-this-recession-begin

61. Woodburn A. Julian Allen, Michael Browne & Jacques Leonardi, (2012), The impact of globalisation on international road and rail freight transport activity Past trends and future perspectives. OECD/ITF Global Forum on Sustainable Development: Transport and Environment in a Globalising World.

62. Woodburn, A. (2007). Appropriate indicators of rail freight activity and market share: A review of UK practice and recommendations for change. Transport policy 14 59-69

C. Urban freight transport

1. 10 years of London's congestion charge - a success or disappointment?, (2013), http://roadpricing.blogspot.gr/2013/02/10-years-of-londons-congestion-charge.html
2. AEA Anderson, R. Milnes, R. Crosbie, A. Van Best Practice Pilot Programme. (2009) Department for Transport.
3. Air Pollution: 78% of London At Illegal Levels (2013), http://www.lbc.co.uk/air-pollution-78-of-london-boroughs-at-illegal-level-77537
4. Allen, J., Thorne, G. and Browne, M., 2007, BESTUFS – Good Practice Guide on Urban Freight Transport, www.bestufs.net
5. Annual Road Traffic Estimates: Great Britain 2012, Statistical Release.
6. Behrends, S. (2012). The urban context of intermodal road-rail transport – Threat or opportunity for modal shift?, Procedia – Social and Behavioral Sciences 39, pp. 463-475.
7. Braithwaite A., (2011), "UK Freight transport: setting a coherent strategy and direction for 2020 and beyond".
8. Britain in 2013 – the nation in focus (2013), Annual magazine of the Economic and Social Research Council.
9. Browne M., Piotrowska M., Woodburn A. and Allen J, 2007, Literature review WM9: Part I - Urban freight transport.
10. Browne, M., Woodburn, A., Piotrowska, M. and Allen, J. (2013) "A review of rail freight initiatives in the urban supply chain"
11. Central Intelligence Agency World Factbook
12. Comi A., Site P.D., Filippi F. and Nuzzolo A., 2012, Urban freight transport demand modelling: a state of the art
13. Davies, I. Mason, R. Lalwani, C. (2007) Assessing the impact of ICT on UK general Haulage companies.
14. Department for Transport. (2011) Road Freight Statistics notes and definitions.
15. Department for Transport.(2009) Low Carbon Transport: A Greener Future.
16. DeWitt, W. and Clinger, J. () Intermodal Freight Transport. A1B05: Committee on Intermodal Freight Transport, Transportation in the New Millennium.
17. DfT, "Cost of noise: Economic analysis", https://www.gov.uk/noise-pollution-economic-analysis
18. Dr David Quarmby and Colin Buchanan & Partners. (2006) Transport Policy for Cities-challenges and opportunities.
19. European Commission: Study on Urban Freight Transport (2012), DG Move, MDS Transmodal
20. Future electric scenarios for urban logistics, Safe urban logistics
21. Global Transport Scenarios 2050, (2011), World Energy Council
22. Goodwin, P. (2004) The economic costs of road traffic congestion. UCL

23. Holter, A., Liimatainen, H., McKinnon, A. and Edwards, J. () Double-deck Trailers: A cost-benefit model estimating environmental and financial savings.

24. http://www.freight-online.co.uk/news_and_events/content/12393/rha_response_outlines_that_the_uk_needs_a_quality_road_network_to_be_open_for_business

25. http://www.londonair.org.uk/LondonAir/Default.aspx

26. Janic, M. (2007). Modelling the full costs of an intermodal and road freight transport network. Transportation Research Part D 12, pp.33-44.

27. Leach, David Z. and Savage, Christopher J. (2012) High capacity vehicles: an assessment of their potential environmental, economic and practical impact if introduced to UK roads. In: Proceedings of the 17th Annual Logistics Research Network Conference. Chartered Institute of Logistics and Transport. ISBN 9781904564447.

28. Leonardi, J. Baumgartner, M. (2004) CO2 efficiency in road freight transportation: Status quo, measures and potential.

29. Mayor of London., The Low Emission Zone. Cleaner air for Greater London. Transport for London.

30. McCarthy, M. (2000) "Hidden cost of the freight trade: pollution in the air, congestion in cities and danger on the roads", http://www.independent.co.uk/environment/hidden-cost-of-the-freight-trade-pollution-in-the-air-congestion-in-cities-and-danger-on-the-roads-621951.html

31. McKinnon, A. and Ge, Y. (2006) The potential for reducing empty running by trucks: a retrospective analysis.

32. McKinnon, A. (2005) The economic and environmental benefits of increasing maximum truck weight: the British experience.

33. McKinnon, A. (2006) The Decoupling of Road Freight Transport and Economic Growth Trends in the UK:An Exploratory Analysis.

34. McKinnon, A. (2010) Optimizing the road freight transport system, Chapter 17 pp. 284-300, from book Global Logistics: New Directions in Supply Chain Management, Kogan Page.

35. McKinnon, AC. (2009)Reducing the Carbon Footprint of Road Freight Transport

36. Mills. J et al. (2011). Keeping Britain Moving: The United Kingdom's transport infrastructure needs. McKinsey&Company.

37. Office for National Statistics

38. Outcomes of the UN Rio+20 Earth Summit. 2013. House of Commons.

39. Paris pushes urban freight experiment (2008) http://www.railwaygazette.com/news/single-view/view/paris-pushes-urban-freight-experiment.html

40. Piecyk M. and McKinnon, A.C. (2007) "Internalising the External Costs of Road Freight Transport in the UK", Heriot-Watt University.

41. Piecyk, M and McKinnon, AC (2009) Environmental Impact of Road Freight Transport in 2020: Full report of a Delphi survey, Heriot-Watt University, Edinburgh

42. Piecyk, M. and McKinnon, A. (2007). Internalising the External Costs of Road Freight Transport in the UK.

43. Road Freight Statistics (2008). The Van Sector. Section 3.

44. Robson, Jonathan James, Dawn Fisher, Andrew Palmer, Professor Alan McKinnon. (2007). Reducing the External Costs of the Domestic Transportation of food by the food Industry.

45. Shakantu, W. M., Muya, M., Tookey, J. E., and Bowen P. A. Evaluating truck empty running in construction: a case study from Cape Town, South Africa. The Australian Journal of Construction Economics and Building [Vol 8, No 2].

46. Shuxin, Z. and Hongfei, J. (2011). Research on agent-based approaches to freight transport scheduling. International Conference on Transportation, Mechanical, and Electrical Engineering (TMEE).

47. Spending Review: Energy and transport to get share of £100bn (2013), www.bbc.co.uk

48. Steer Davies Gleave. MEASURING THE VALUE OF THE FREIGHT TRANSPORT SECTOR TO THE SCOTTISH ECONOMY (2006)

49. Study of urban freight transport – Final report

50. The Economic Costs of Congestion, Board Paper.

51. Vidal, J. (2013) "London air pollution dangerously high, campaigners warn" http://www.theguardian.com/environment/2013/oct/04/london-air-pollution-nitrogen-dioxide

52. Wichser, J., Weidmann, U., Fires, N., and Nash, A. (2007) Strategies for increasing intermodal freight transport between eastern and western Europe. Association of European Transport and contributors.

53. Woodburn, A. G. (2003). A logistical perspective on the potential for modal shift of freight from road to rail in Great Britain. International Journal of Transport Management 1 237-245

54. WPL (2009). Cost of congestion outweighs cost of Workplace Parking Levy schemes.

55. Zahlmann M. (2011) Future Internet enabled optimisasion of transport and logistics networks.

D. Port centric logistics and intermodal policy

1. £1bn misdirected UK transport projects could be jamming UK economy (2008), http://www2.pdports.co.uk/Incidents/IFRAME_news.aspx?ID=130

2. Brett, D. (2013). "Forecest mid-September box rates rise fails to bear fruit"

3. Caris A., Macharis C. and Janssens G.J (2008) Planning Problems in Intermodal Freight Transport: Accomplishments and Prospects, Transportation Planning and Technology, 31:3, 277-302.

4. Department for Transport. (2007) Reducing the Environmental Impact of Distribution.

5. Department for Transport. Efficient Intermodal Terminals Deliver Supply Chain Benefits. Freight Best Practice: Case study.

6. DeWitt W. and Clinger J., Intermodal Freight Transportation
7. Drewry Maritime Research, (2013), "Shipping costs set to fall".
8. European ports: an engine for growth, (2013), http://www.safety4sea.com/page/16158/9/european-ports:-an-engine-for-growth
9. Freight Best Practice, Department for Transport, "Freight Facilities Grants – What Can I Get?"
10. Giannikas, V. & McFarlane, D. (2012), Product Intelligence in Intermodal Transportation: The Dynamic Routing Problem, in 'LDIC 2012: 3rd International Conference on Dynamics in Logistics', Bremen, Germany.
11. Gilman, S. (2003) Sustainability and national policy in UK port development.
12. Global Freight Rates Plunge, Report Finds, (2013), www.mareinelink.com
13. How will HS2 impact the freight industry in the UK? (2013), http://www.deliveryquotecompare.com/news/will-hs2-impact-freight-industry-uk/
14. http://peelports.co.uk/about-us
15. http://www.bbc.co.uk/tees/content/articles/2007/08/29/teesport_feature.shtml
16. http://www.darlingtonandstocktontimes.co.uk/business/4853464.Teesport_firm_says_jobs_are_secure_despite_Corus_closure/
17. http://www.freight-online.co.uk/news_and_events/content/12387/summit_hears_london_gateway_will_add_value_to_the_supply_chain_not_cost
18. http://www.joc.com/port-news/port-productivity/uk-ports%E2%80%99-combined-freight-traffic-dropped-4-percent-2012_20130702.html
19. http://www.liverpool2.com/community-engagement/benefits
20. http://www.lloydsloadinglist.com/freight-directory/people/special-report-what-north-south-divide/20017963333.htm#.UlQsGlDwnzk
21. http://www.londongateway.com/
22. http://www.londongateway.com/about-us/media/news-releases/marksandspencer
23. http://www.maritimeuk.org/2012/01/light-dues/
24. http://www.prlog.org/11013513-pd-ports-leads-the-way-again-as-portcentric-logistics-moves-into-second-phase.html
25. http://www.trinityhouse.co.uk/th/about/funding.html
26. http://www.ukports.com/shipping-transportation.php
27. http://www.worldslargestship.com/
28. http://www.xeneta.com/
29. It is not time to panic about UK port capacity – although there will be losers (2013), http://theloadstar.co.uk/its-not-time-to-panic-about-uk-port-capacity-although-there-will-be-losers/
30. Khan, O. (2010). "Port-centric Logistics: The Supply Chain of the Future"
31. Lakshmanan, TR. and Anderson, WP (2002). "Transportation infrastructure, Freight services and Economic growth: a synopsis of a white paper".

32. Liverpool City Region, Local Enterprise Partnership (2013). SUPERPORT.

33. Liverpool City Region, SuperPort Centric Logistics.

34. Logistics Property (2012). Trains, ships and… containers. Storage Handling Distribution

35. Maersk, CMA CGM and MSC best positioned for transpacific rates war, http://www.forwardingworld.com/news/1370372739/Maersk,-CMA-CGM-and-MSC-best-positioned-for-transpacific-rates-war/

36. Malinen, K. (2011). Cost savings on container import process. Bachelor's thesis. Tampere University of Applied Science.

37. Mangan, J. (2008), "Port-centric Logistics: Opportunities for ports?"

38. Mangan, J., Laiwani, C. & Fynes, B. (2008), "Port-centric logistics", International Journal of Logistics Management, Vol. 19, p.36.

39. McKinnon, A. (2011) Decarbonising the Maritime Supply Chain. Freight Transport Association.

40. McKinnon, A. (2011). Ports in the Logisitcs Chain – Opportunities to Reduce Carbon Emissions. British Ports Association Conference.

41. McKinnon, A. Carbon Emission Factors for Shipping.

42. Monios, J. and Wilmsmeier, G. (2012). "Counterbalancing peripherality and concentration: An analysis of the UK container port system"

43. Monios, J. and Wilmsmeier, G. (2013) The operational dynamics of container types in regional British port development strategies.

44. Notteboom,T.(2013). "Recent traffic dynamics in the European container port system". Port Technology International, Issue 58, 2013.

45. Osborne, A. "Shipping lines 'aghast' over UK light dues rise" (2009) http://www.telegraph.co.uk/finance/newsbysector/transport/5533692/Shipping-lines-aghast-over-UK-light-dues-rise.html

46. Oxford Economics (2013). Investment and productivity growth at UKMPG ports.

47. Paris, C. (2013). "Shipping rates under pressure", online.wsj.com

48. Randasila, K. and Ojala, L. (2012). "Measurement of national-level logistics costs and performance"

49. Rethink Freight Charge Says UK-Based Group (2009)

50. SCFI: Asia-Northern Europe Rates Jump Ahead of GRI, (2013), www.joc.com

51. Shanghai Shipping Exchange

52. Steve Williams (2011) " Port Centric operations: an increasing trend in the UK logistics market" http://www.lsh.co.uk/commercial-property-viewpoints/2011/09/port-centric-operations-an-increasing-trend-in-the-uk-logistics-market

53. Tarifes Conditions of Application of the Tarifes and of rates setting (2012)

54. The world bank, "Container port traffic"

55. Thought Leadership, 2012, http://www.portcentricity.com/majumdar.html

56. Top 50 world container ports, World Shipping Council, http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports

57. Valantasis-Kanellos, N., Piecyk, M. & Song, D.W. (2013), "The port centric logistics concept: a systematic literature review".

58. Why size matters, http://www.lloydsloadinglist.com/freight-directory/people/why-size-matters/20018076355.htm#.UlQwPVDwnzk

59. Woxenius, J. and Bergqvist, R. (2011) Comparing maritime containers and semi-trailers in the context of hinterland transport by rail.

60. Woxenius, J., & Bergqvist, R. (2011). Comparing maritime containers and semi-trailers in the context of hinterland transport by rail. Journal of Transport Geography 19 680-688

E. Empty container movements

1. Armour, D. (2011). Working with containers. Freight Transport Association.

2. Barton, M.E., 2001. 24/7 operation by marine terminals in southern California: how to make it happen. CITT Industry Stakeholder Workshop One, Metrans Report, CA, USA.

3. Braekers, K., Janssens, G. K., and Caris, A. () Integrating empty container allocation with vehicle routing in intermodal transport.

4. Container Port traffic, The World Bank, data.worldbank.org.

5. Crainic et al., 1993, Dynamic and stochastic models for the allocation of empty containers. Operations Research 41 (1), 102-126.

6. Department for Transport (2005). Key Performance Indicators for the Pallet Sector. Freight best practice.

7. Department for Transport. (2012). Road Transport Forecasts 2011. Results from the Department for Transport' s National Transport Model container depot locations under stochastic demand. Research in Transport Economics 42 50-60

8. Diaz, R., Talley, W. and Tulpule, M. (2011) Forecasting Empty Container Volumes. The Asian Journal of Shipping and Logistics. Vol 27, pp. 217-236.

9. Dong, J.-X. and Song D.-P. (2008) Effectiveness of an Empty Container Repositioning Policy with Flexible Destination Ports.

10. Francesco, M. D., Crainic, T. G. and Zuddas, Paola. (2008) The Effect of Multi-Scenario Policies on Empty Container Repositioning under Uncertainty and Data Shortage. CIRRELT.

11. H. Jula et al., Port dynamic empty container reuse, Transportation Research Part E, 2004

12. Jula H. et al., 2004. "Empty Port dynamic container reuse".

13. Jula, H., Chassiakos, A. and Ioannou, P. (2004) Port dynamic empty container reuse. Transportation Research Part E.

14. Li ,J.-A. ,Leung, S. C.H., Wu, Y. and Liu, K. (2007). Allocation of empty containers multi-ports.

15. Li J.A., Leung S.C.H., Wu Y. and Liu K., (2007), Allocation of empty containers between multi-ports.

16. Logistics of empty cargo containers - P.I. Le Dam Hanh Department of Civil and Environmental Engineering University of Southern California 2003

17. Mallon, L.G., Magaddino, J.P., 2001. An integrated approach to managing local container traffic growth in the Long Beach-Los Angeles port complex, Phase II. Technical Report, Metrans Report 00-17, CA, USA.

18. McKinnon, Scottish logistics report 2012

19. Monios, J. and Wilmsmeier, G. "The operational dynamics of container types in regional British Port development strategies", Transport Research Institute, Edinburgh Napier University

20. P.I.Le Dam Hanh. (2003)The Logistics of Empty Cargo Containers in the Southern California Region

21. Rob Konings and Remmelt Thijs (2001) Foldable Containers: A New Perspective on Reducing Container-Repositioning Costs: Technology, Logistics and Economic Issues, EJTIR 1, No.4, pp. 333-352

22. Song D.D., 2007, Analysis of a collaborative strategy in container fleet management.

23. Song D.P. and Carter J. (2009), "Empty container repositioning in liner shipping".

24. Song, Dong-Ping and Carter, J. (2009). Empty container repositioning in liner shipping.

25. Song,Dong-Ping. Earl, C. (2008) Optimal empty repositioning and fleet –sizing for two –depot service systems.

26. UN UNECE Analysis example 2009

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Nick specialises in value chain strategy and cost/CO2 modelling for end-to-end logistics and retail networks. He is a fellow of CILT, a member of the CILT public policies committee, and was an official consultant to the ECR profit impact task force for six years. A regular presenter at conferences Nick has published papers and articles with CILT, DEFRA, DfT, ECR Europe, Cranfield University, Heriot Watt University, IGD, Gower, Financial Times, Freight News and Materials World among others.

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Freight transport policy is moving centre stage from its former Cinderella status in economic thinking and planning. This report is an important part of the process of raising the visibility of freight and logistics in infrastructure investment, environmental and societal regulation. I welcome this report as a valuable contribution to the debate and have been pleased to provide some modest support in its preparation.

Professor Alan Braithwaite
Cranfield University

This new ITC report is a very welcome addition to the debate on the future development of logistics in the UK. It reviews a large body of evidence and highlights the opportunities for overhauling freight transport operations within our cities and the hinterlands of our major ports. There are important messages here for the politicians, planners and managers responsible for keeping UK logistics efficient and competitive.

Professor Alan McKinnon
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