

Future Potential for Modal Shift in the UK Rail Freight Market



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Quality information

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Executive Summary

The Department for Transport commissioned this report to understand the future growth potential in the UK rail freight market, in particular the scope for modal shift from road to rail. The study also investigated the policy measures required to realise this potential and assess the reduction in carbon emissions these measures may bring. One of the background drivers to this report has been the greater than expected rate of decline of traditional markets, especially coal movements, which has resulted industry and government needing to respond through exploiting opportunities enabled by this decline.

Chapter 2 assesses the market and potential for freight growth across a range of sectors and concludes that there is a need to move away from traditional coal and ore movements to alternative sectors. The analysis has identified Port Intermodal / Domestic Intermodal, Construction, Channel Tunnel traffic, express parcels and automotive as the most promising areas for expansion.

Chapter 3 covers a review of rail network capacity around infrastructure pinch points, route capacity, terminal location and resource availability. To focus the analysis the network was broken down into a number of key corridors such as the West Coast Main Line, East Coast Main Line, Great Western Main Line, Midland Main Line, Channel Tunnel, Trans Pennine, Cross Country and routes around London.

Chapter 4 presents the results of the Rail Freight Forecast developed by the study team, providing a high level forecast for the fourteen key commodities given the identified key constraints on the network in Chapter 3. It is important to note that this forecast is separate to and explicitly does not replace the Network Rail Freight Market Study (NR FMS) (2013) and

should be viewed as a complementary constrained forecast to the NR FMS unconstrained approach. The forecast model shows that there is clear potential for growth across a range of the commodities; however, much of this will occur on the road network unless some of the current identified constraints on the rail network are removed. In addition to its share of new traffic, there is a potential for some existing traffic to shift to rail should some of these constraints be removed. Chapter 5 evaluates the identified barriers to modal shift through five categories: Infrastructure Capacity, Cost Barriers, Flexibility Concerns, Awareness & Attitude and Skills and Training. Across these categories, 15 barriers in total were identified. The relationship between the identified barriers and the potential key growth sectors for the rail freight market are set out as understood through the consultation process which was undertaken with market participants.

Chapter 6 evaluates 27 different interventions that could encourage modal shift across seven categories; Investment and Infrastructure Schemes, Innovation and New Systems, Promotion, Marketing and Engagement, Facilitation and Funding, Regulatory Intervention, Further Studies, and Skills Access and Promotion. Each of the interventions are summarised in Table 6.1 along with their estimated priority, deliverability, scale of cost and timescale. Following this, there is an analysis of how each of the 27 interventions might overcome the identified barriers thereby enabling increased modal shift and lower carbon emissions. Table 6.3 then links the solutions, given the barriers they overcome, to the commodity movements most likely to be assisted by their implementation.

Chapter 7 covers the Carbon and Intervention Modelling aspects of the study. The modelling exercise supported

the environmental efficiency of rail freight by showing theoretical savings of up to 19% of current greenhouse gas emissions from HGVs assuming modal shift occurs. The modelling identified that by prioritisation of the high impact interventions set out in Chapter 8, significant savings could be made over the base scenario.

Chapter 8 identifies ten key interventions built up through the analysis of the previous chapters. The interventions identified are those which in the study team's opinion offer the greatest chance of successfully influencing the market to achieve the overall goals of rail freight growth and reduction in carbon impact and vary significantly in terms of timescale, cost and the difficulty of implementation.

The ten identified key interventions are as follows which range from physical infrastructure, technology, finance through to studies and further research:-

1. New Build Terminals
2. Capacity and Gauge Enhancement
3. Alternative Locomotive Technology
4. Financial Assistance
5. Rail Freight Conference Programme
6. Freight Path Improvement
7. Channel Freight Review
8. Large Project Procurement
9. Studies into Supply Chain Solutions
10. Strategic Freight Network.

As well as informing the Department for Transport's Rail Freight Strategy they will be considered as part of freight's contribution to the reduction in future UK carbon budgets.

1) Introduction

The Department for Transport (DfT) has commissioned this report to understand the future growth potential in the UK rail freight market, in particular the scope for modal shift from road to rail.

This report also investigates the policy measures required to realise this potential and assess the reduction in carbon emissions these measures may bring.

The UK has long-term carbon reduction targets in order to meet its 2050 Climate Change Act commitment. As road freight is a significant contributor (22%) of surface transport carbon emissions, the DfT is looking for ways of reducing pollutants from Heavy Goods Vehicles (HGVs)¹. One way is through modal shift to rail freight as it is more environmentally friendly than road and reduces carbon emissions by an estimated 76% as each freight train removes the equivalent of 25-76 HGVs from the roads.²

The rail freight sector delivers significant benefits to the UK economy and this has been quantified at £1.6bn per year in productivity gains, reduced congestion and environmental benefits. The five main Freight Operating Companies employ over 5,000 staff and have a combined turnover of around £850m³.

The immediate context for this study has been undertaken under the backdrop of a greater than expected rate of decline in coal volumes being moved on the UK rail network. The increased rate of decline of the traditional mainstay of the rail freight sector has caused an increased urgency for industry and Government to respond to the

emerging challenges and opportunities presented.

The rail freight sector now faces a situation where its ability and rate of innovation and growth of other markets needs to be significantly increased in order to fill the volume and revenue gap. This is crucial to provide the required revenues and profits in order to develop additional traffic opportunities to meet both its own, its customers, and Government objectives.

In addition to the structural changes facing the industry, rail freight needs to become more agile at competing with the main transport mode in the United Kingdom: road haulage.

The sector comprises a number of Freight Operating Companies (FOCs), logistics companies, wagon/locomotive leasing companies, and terminal operators, all of whom (except Direct Rail Services, a FOC) are private enterprises with their own specific priorities and objectives.

Many are multinational businesses, and the UK freight market is only one of many sectors that they are seeking to optimise, which may mean that their actions in the UK do not necessarily coincide with UK and government objectives. Thus the DfT has a key role in setting the overall strategic framework for the rail freight industry, both in providing guidance to the independent regulator on the policy objectives for users and Network Rail that it is seeking to achieve and through directing infrastructure investment in key parts of the network where provision of additional freight capacity has been identified as a priority. However, the DfT cannot and should not mandate specific market initiatives or their delivery.

At its heart, the rail industry, unlike the road sector, is characterised by having a relatively high asset cost base which has a long life. This needs to be matched to market sector demand and supply chain network characteristics which can change significantly during this asset life of rolling

¹ NAEI, *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990 – 2014*, (2016)

² Network Rail, *Value and Importance of Railfreight*, (2013)

³ Rail Delivery Group, *Freight Britain*, (2015)

Each freight train removes the equivalent of up to 76 HGVs from the British road network.

stock, infrastructure upgrades and terminal developments.

To assist in the achievement of the successful delivery of the strategy, the private sector requires stable and clear policy statements backed up by subsequent delivery of specific enhancements and initiatives. This is crucial to create and maintain the required confidence and encourage FOCs and other market participants, such as terminal developers in their forward investment planning. This is important in creating the right market place for users / customers to consider committing to extending the use of rail as part of the sustainability of their supply chains.

This commissioned report sets out to understand the future growth potential for UK rail freight and in particular the modal shift opportunity that exists and to provide policy options that would create a potential reduction in carbon emissions from the movement of freight.

In so doing the policy options help to inform the DfT Rail Freight Strategy to increase the agility of the rail freight sector in balancing the long term fixed cost asset life characteristics with the relatively shorter termism of market demand and configuration of the respective supply chain networks.

This paper therefore begins with an outline of the existing markets of rail freight and identifies certain sectors which provide the opportunity for rail to play a bigger role (Chapter 2). However, this potential growth is constrained by the existing capacity of the railway, and these limitations are laid out in Chapter 3. Chapter 4 takes the identified sectors and the constraints of the railway to provide low, medium and high forecasts for future rail freight use.

These barriers have been considered by the project team and a range of potential solutions to overcome them (either partially

or completely) have been developed. These are shown in Chapter 6, along with a high level assessment of their deliverability, timescale and cost.

Chapter 7 takes each of the interventions in turn and demonstrates the potential impact of these on both modal shift to rail and on carbon emissions from the freight sector (both road and rail).

Building on the previous chapters, Chapter 8 sets out what the key interventions identified are in terms of both modal shift and carbon emissions, to provide a list of priorities to be considered .

The Project team wishes to thank various industry stakeholders who have contributed to the study including those who attended the industry workshop kindly hosted by the DfT in May 2016. Comments from the workshop and from consultations are shown throughout the report where they demonstrate a certain, concise view on the topic under discussion. Where sources are not directly cited this is either due to confidentiality concerns or it is the considered opinion of the project team.

Readers should note that this report does not consider the possible impacts of the European Referendum held on 23rd June 2016. It is too early to consider the effect that leaving the EU will have on the UK economy and consequently on UK rail freight. This report therefore assumes a steady but small economic growth trend continuing over the next 5-15 years.

2) Assessment of Freight Growth & Market

The commodities moved by rail fall into numerous categories, with different needs, growth potential and future trajectories. As already outlined, coal is a market sector in which the future is one of notable decline, whilst other commodity sectors have brighter futures, and it is on these growth sectors that the rail freight strategy needs to focus.

- Automotive
- Non ESI Coal
- Industrial Minerals
- Domestic Waste
- Ore
- Network Rail Engineering
- Other Areas such as parcels and high speed freight

We have categorised the potential of each market using the definitions below:

2.1 Market Forecast by Commodity

This section examines the overall context of the market conditions in which each rail freight sector operates. It provides a market commentary on the existing state and immediate future of each commodity, which provides context for the more detailed forecasting in Chapter 4.

Rail freight currently moves a variety of different commodities. Several of these are either stagnating or are in decline, whilst others show more promising indicators for future growth. Based on the categories used by the Office of Rail and Road (ORR), the commodity groups are considered below in the following order:

- Electricity Supply Industry (ESI) Coal & Biomass
- Construction Materials (aggregates, cement etc.)
- Intermodal containers (Ports)
- Intermodal containers (Domestic)
- Channel Tunnel (all traffic)
- Metals
- Petroleum / oil
- Chemicals

Potential	Definition
Long-term decline	Flows of this commodity are forecast to decline as a result of changing economic circumstances
Static	Rail's market share will not change but overall volumes moved may vary depending on changes to the overall size of the market
Limited growth	Significant constraints in the market will prevent the sector from expanding
Slow growth	There is scope for rail's market share to grow as more flows convert to rail
Steady growth	Sector will grow in line with available capacity in the rail based logistics system – ports/network/terminal
Long-term growth	Sector will grow organically as the market expands to meet an anticipated increase in activity to support UK population growth

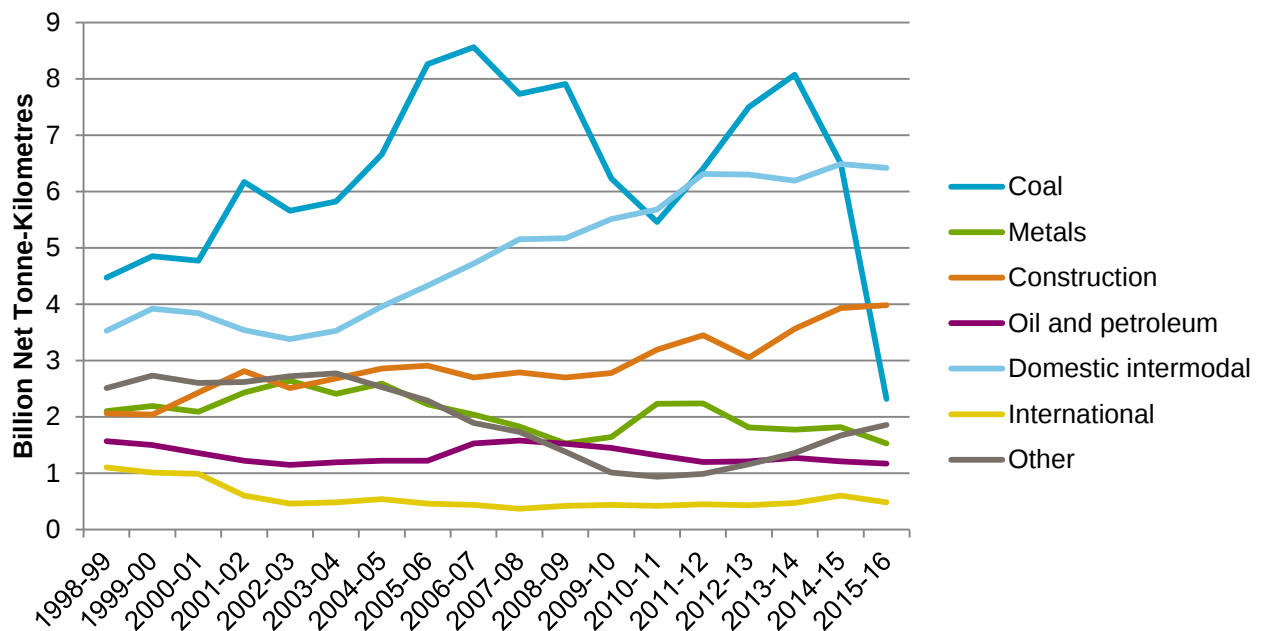


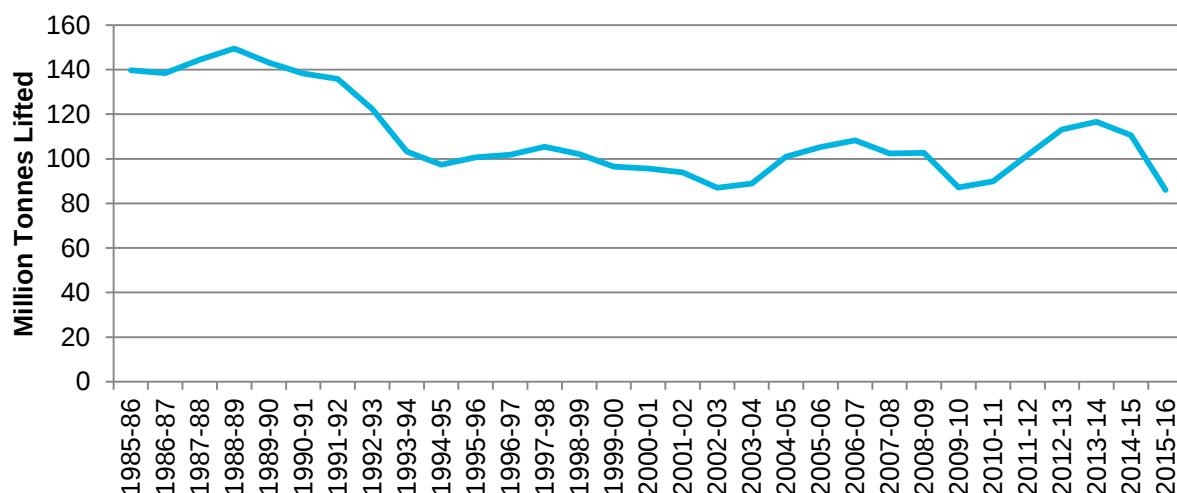
Figure 2.1: National rail freight moved by commodity 1998-2016 (DfT, 2016)

Figure 2.1 shows freight moved by commodity between 1998-2016. Over the period, coal, construction materials and domestic intermodal all increased whilst metals, oil & petroleum, international and other freight movements all decreased.⁴ However, overall, total billion tonne-kilometres increased by 22%. Construction materials grew by the greatest margin (96%) and international movements decreased by the greatest amount (40%).

It is worth noting that since the beginning of 2016, coal movements have decreased substantially, making the identification and growth of other sectors more important if the rail freight market is to avoid decline.

Figure 2.2: Total Rail freight lifted 1985-2016 (DfT, 2016)

Figure 2.2 shows that the total tonnage lifted by rail freight, whilst fluctuating has increased in the last 15 years to over 100 million tonnes. Fluctuations can be attributed in part to a changing data collection methodology. Freight lifted in 2016 is trending downwards due to the collapse of the coal market as discussed in the next section.



⁴ It should be noted that "domestic intermodal" in this graph includes movements from ports to internal destinations as these are moved entirely within the UK. Elsewhere in this report, these movements from ports are classified as "port intermodal". Therefore in these figures "International" relates only to movements through the Channel Tunnel.

2.1.1 ESI Coal, Biomass & Nuclear Energy

Coal for thermal power generation is in rapid decline from a recent high of 50 million tonnes lifted in 2013 to less than half of this volume in 2015 (caused by the closure of coal fired power stations). During May 2016, there was a short overnight period when no UK power generation was done by burning coal for the first time since 1882. Tonnage will continue to move, but at low levels for specialist flows only, assuming no change in current UK energy policy.

Short term growth in biomass will replace some coal volume but in smaller overall quantities due to changes in the subsidy strategy for biomass conversion. The biomass port of entry to the UK could be different to previous bulk coal flows and some routes may see growth which may be constrained by the capacity and capability of the rail network. Biomass is being handled through the Port of Tyne, the Humber ports and the Port of Liverpool and annual volumes to be moved by rail could reach 10-12 million tonnes by 2020.

Due to the need to keep biomass pellets dry, investment in covered handling facilities is needed at ports and power stations. New covered hopper wagons are now in use but more may be needed if journey distances and transit times increase. The thermal value of biomass is lower than coal, increasing the tonnage required per MWh generated, but conversely biomass cannot be easily stored and new generating investment is largely close to the ports.

In the long term therefore, as the majority of biomass pellet consumed by the power generation industry is imported, its transport by rail that may have a less certain future, as thermal power stations are replaced/renewed by newer smaller plants located close to port infrastructure. There will, additionally, continue to be a level of nuclear traffic associated with reprocessing and decommissioning. This may reduce over time as modern nuclear plants produce little or no waste.

Summary:

ESI Coal - Long-term decline due to the decline in coal-fired power generation.

Biomass – Static - Biomass traffic is expected to provide some alternative tonnage in the short to medium term. Longer term use of biomass will be subject to market conditions post the removal of subsidies, currently planned for 1 April 2027. It is anticipated this will remain a sustainable method of power generation beyond this date although at potentially lower levels than outlined above and so is according a static rating given it may go up or down dependent on government support.

Nuclear – Static- Nuclear flask traffic is expected to slowly decline as older nuclear plants are de-commissioned given the changes in modern plants requiring fewer facilities for off-site re-processing.

2.1.2 Construction Materials

Growing construction activity will result in increased demand for associated materials, usually transported in bulk. Rail freight plays a key role in aggregate and cement transport, and this is likely to increase in the future. The sector has risen from 15 million tonnes lifted in 2003 to almost 30 million tonnes in 2015. The pan-industry strategy of concentrating on fewer large production sites is a major driver of rail volume growth. However, the opportunity of moving this material by rail may be damaged due to a lack of terminal handling sites for bulk materials, as development activity moves from region to region.

Outside the rail sector, some of these flows will favour coastal shipping as an alternative mode.

The growth across the construction industry is likely to see an increased demand for:

- blocks
- construction waste
- bricks
- bagged products etc.
- slabs
- soils

All have rail potential but where volumes do not justify a new train load service, adding wagons for a different product to a current block train operation from an existing rail

terminal may increase the operational complexity. This could impact negatively on the efficiency of the original block train operation, if the additional product has separate loading / unloading points and may require different wagon types to be used.

Long term, if access pricing issues through the Channel Tunnel are addressed, there is also the potential for the import of stone and construction material into the London and south east, from quarries in the Nord pas de Calais region of France via the Channel Tunnel, rather than the traffic using coastal shipping.

Big infrastructure projects could provide an opportunity to utilise rail and showcase the benefits. There are very significant building projects in the UK potentially coming on stream including:

- HS2
- £15 billion Road Building Programme
- New Runway at a South East Airport
- New Nuclear Power Stations
- Crossrail 2

All of these proposed projects have the potential to use rail based aggregates supply as well as using rail to move material arising for disposal.



There is a need for better urban terminals and capacity to and from them, as well as making it easier and quicker to start up new flows and get them on the network.

A Rail Freight User in the Construction Industry



On a smaller individual scale, the need to provide new houses is a useful stimulus to the sector, it is estimated that for every 30 houses built, an additional aggregate train is required. Therefore the continued drive for

more housing can provide considerable opportunity to increase rail freight tonnage.

Overall, the sector has the opportunity to exploit improvements to the rail network, to become more efficient by using longer, heavier trains to enable higher tonnages to be hauled. The sector is aiming to operate trains at over 450m long conveying up to 2,600 tonnes.

Summary: Long-term growth, with potential for greater growth if utilised for large infrastructure projects.

2.1.3 Intermodal (Ports)

A continued rise in imports to the UK is likely due to rising population, people living longer, and growing GDP, with container import growth being a multiplier of GDP growth. This sector will therefore see organic growth, subject to capacity improvements at each major port, both in port infrastructure and on the connecting rail network. A core assumption therefore is that the overall volumes of deep sea containers landed at UK ports will continue to grow.

The move towards so-called “mega vessels” and larger (20,000TEU) ships may change the nature of current intermodal movements at UK ports, with fewer calls but a larger exchange of containers on each occasion. This will favour rail’s strength in moving large volumes quickly (notwithstanding the requirement for certain goods to be delivered to the customer quickly).

Information from ports users suggests that congestion on roads around the ports and on routes to and from the ports may also favour rail transport, as containers can be transported by rail from the port to a regional hub in order to clear the port quickly, and then the local delivery is conducted by road haulage. This could also work in reverse with empty containers returning to the ports for export.⁵ These facilities in Europe are often developed into entire ‘dry-ports’ where customs facilities, bonded warehousing etc.

⁵ Empty container exports from the UK are over a quarter of total TEUs exported, although this is geographically specialised, with Felixstowe (for example) handling more empty containers destined for the Far East whilst Scottish ports actually import empty containers in which to export whisky (see Monios, *Empty Container Repositioning for Scottish Shippers*, (2014).

are provided inland with regular shuttles to the quayside; enabling significant expansion of the port's hinterland and servicing area. These rail connected facilities have existed in the UK, in Willesden (London), Birmingham and Manchester for example.

However, whilst there is some capacity at terminals and on certain routes, significant growth in this sector would test the limits of the infrastructure both on the rail network, in the ports and at terminals. Existing terminals will require capacity enhancements, new terminals will need to be developed to match demand and there will need to be more capacity and paths for freight trains on the wider rail network.

Felixstowe and Southampton are the two biggest container ports in the UK and they have both improved their rail terminal facilities. Although approximately 30% of their throughput travels inland by rail, there is suppressed demand at both due to capacity restrictions, which if removed could see market share increase to 40%.

Meanwhile at other ports rail's modal share of the market is very low. Around 10% of deep-sea trade is taken by short-sea vessel to northern or Scottish ports, and very little if any of this uses rail for onward transport.

Once in the UK, intermodal containers may move by rail, road, coastal and inland shipping; these containers may then be triangulated by shippers or leasing companies for their next loaded journey, meaning that the outbound movement from the UK may be by a different route/mode compared to the inbound movement. This is exacerbated by the historic imbalance of trade in the UK, where more goods are imported than exported.

The development of northern ports could potentially introduce new traffic flows, depending on how well utilised these new facilities are, particularly if they attract additional volumes of feeder traffic to/from Dutch or Belgian ports. The northern ports additionally handle a significant volume of RoRo trade and European traffic in 45' boxes, which now dominate this east-west trade. Consultation with several port directors confirms that there is real interest in running additional rail services from ports

such as Teesport, Liverpool, the Tyne and the Humber. Typically there are constraints such as restricted loading gauge and lack of available train paths, especially on Trans Pennine routes, which are limiting the overall growth (including use of rail) at some of these ports. Given the perceived efficiencies by shipping lines associated with current operational practices it is likely that there will continue to be significant traffic using the three key ports in the south east.

Mode Shift Revenue Support (MSRS) grants are available from the government to support some of the more marginal movements, as a means of securing environmental benefits. The fund is currently around £18m p.a. (2016/17).

Furthermore, if the current issues around the Channel Tunnel are resolved then there might be some scope for Mainland European ports to act as an alternative "UK" port with boxes then railed through the tunnel to terminals in the UK.

Summary: Steady strong growth in this sector, with current trends in the industry indicating a potential increase for rail's role.

2.1.4 Intermodal (Domestic)

Rail based domestic intermodal is currently something of a niche market but it has growth potential. Led by Third Party Logistics Providers (3PLs), it is operating well for certain flows, often for the large supermarket retailers such as Asda, Tesco, Sainsburys and the Co-op. However this requires bespoke logistics solutions to be crafted by a multiplicity of suppliers in the logistics chain, controlled by individual large clients, who through their purchasing power are able to achieve considerable benefits from using rail. Furthermore it requires regular, stable volumes and sufficient critical mass to justify trainload operation for individual clients. Mode Shift Revenue Support grants are available from the government to support these movements, but domestic flows currently receive only a small proportion of the available funding.

Domestic intermodal traffic has not grown as quickly as would be anticipated to meet the

forecasts for 2023 in the Network Rail Freight Market Study (FMS), but the key element in kick starting the growth in this sector is the creation and linking of a network of rail-connected distribution concentrations (which may be Strategic Rail Freight Interchanges (SRFIs) or smaller regional terminals). Their creation is largely in the hands of the commercial property sector, which was hit hard by the 2009/10 recession and has only started to recover in the last few years. We are now, however, seeing substantial investment in such facilities, particularly for National Distribution Centres (NDC's) in the Golden Triangle⁶, at DIRFT 3 (Daventry) and East Midlands Airport, with Etwell (near Derby) and Four Ashes (near Stafford), together with others in the pipeline. There are signs therefore that this sector could be starting to develop.

There is a significant volume of long distance general haulage traffic operating on key routes, which has the potential to use rail, provided individual loads can be consolidated into train load quantities, which would allow gains to be made from more efficient use of HGVs on road haulage legs. This could also be further improved by more customer flexibility to accept deliveries throughout the day/night from the train rather than the current heavy concentration in the morning.

The current lack of SRFIs means that traffic has to be moved for longer trunk haul distances by road, as opposed to transferring to rail. In order to benefit from rail, a critical mass of traffic is required to create complete train load quantities, and there are currently few aggregation organisations in the UK to attract these smaller flows to rail. Adjusting this concept will require a number of potential changes, notably:

- Investment in specialist intermodal equipment (such as swap-bodies) in the transport chain to facilitate the movement of unitised (palletised) general haulage cargo rather than using readily available ISO

containers, which have capacity and payload constraints

- Siding to siding operation between rail connected warehousing on SRFIs (almost non-existent in the UK today) for the movement of unitised (palletised) cargo in conventional rail vans/load units.

However, either or both of these changes will require significant investment and motivation throughout the industry and the public sector.

Developers are pushing ahead with intermodal terminal schemes as a result of a demand in the retail/logistics industry for them. This is generally based on inbound supply chain movements from the ports, where rail has a clear cost advantage when containers can be unloaded virtually direct from train to warehouse avoiding a road haul from a distant terminal. What has not yet been grasped is that such rail-connected NDC's could make rail much more competitive in the next leg of the supply chain from NDC to Regional Distribution Centres (RDCs) or customer/store. The ability to put a container/swap body on rail for c. £20-£30 at such a rail-connected NDC, rather than c. £80-£150 if a road leg is involved to a nearby terminal, could lead to significant numbers of Midlands to Scotland/South East/South West trains which, so far, only a few companies have exploited. Tesco, for example, is one of a small number of companies which has adopted rail as part of their supply chain for certain flows. Under this scenario rail's competitive distances in the domestic haulage market come down from 300+ miles to sub 150 miles for inter-terminal movements. Given that the volumes moving over the latter band are five times greater than the former, the impact of this should not be under-estimated. Clearly, rail-connected NDC's are fundamental to creating this virtuous circle of growth.

The cost and timescale in providing connections to the rail network is a significant feature of these large projects, which may be out of the hands of the developers.

⁶ The 'Golden Triangle' refers to the prime logistics area, located in the Midlands and bounded by the M6, M1 and M42 motorways



The most important things for intermodal growth are warehouses co-located with terminals, competitive timing through fast paths and long, well-used services to bring down costs per box.

An Industrial and Logistics Hub Developer



There may be, opportunities for rail well in advance of such strategic investment. A rail connected Distribution Centre (DC) in the Golden Triangle could supply the London market with product picked around midnight arriving at a terminal in NW London around 04:00hrs. Small containers could be delivered from the terminal to central London stores for start of work, and internet orders could be delivered from the same terminal all by electric or gas powered vans. If required a portion of the train could then continue to Euston or other London terminals for local deliveries around the station area. A close to zero-carbon supply chain would result, using lower cost land and labour than would be the case with a DC in the South East as currently.

However all of this is reliant upon a network of terminals being developed by the private sector, and should some of these not be completed then it is likely that growth will be commensurately lower.

Summary: Slow growth is currently likely in this sector but further growth needs significant investment in terminals and equipment. Since the Network Rail Freight Market Study was issued in 2013, growth has been slower than anticipated. If this potential can be unlocked, there is an opportunity for a step change in domestic intermodal provided the 5 or 6 terminals which are at different stages of planning come on stream.

2.1.5 Channel Tunnel

As a result of economic recovery, Channel Tunnel rail freight traffic rose from 2,097 trains in 2010 to 2,911 in 2014. Due to a range of challenges such as security, coupled with strike action in France during the summer of 2015, the level of traffic has declined, although this is expected to be temporary. Nevertheless the tunnel does have strong medium to long term prospects to carry rail freight. The potential rail freight market which could use the Channel Tunnel has not been affected by negative market changes - the volume and potential is still there as evidenced by the following trends:

- Strong growth (4% p.a.) of UK to continental Europe goods vehicles movements recorded by DfT statistics since 2010.
- A long term trend of UK to continental Europe goods vehicles movements becoming more concentrated at the Dover Strait crossing points (i.e. the Port of Dover and Eurotunnel). Almost 88% of road freight on the Dover Strait is now in the hands of foreign registered hauliers, including many from Eastern Europe. Many of these have lower operating costs and competition is fierce.⁷

Long distance through trains from the UK to Europe such as Manchester to Italy could offer some of the best carbon abatement returns. But this will require ongoing collaboration to address outstanding issues (such as security, strike action and sub-optimal operation issues⁸) and even possibly a new commercial structure to mobilise and organise the market. The previously used structure of service development, using intermodal aggregators to develop the business when the Channel Tunnel opened, is currently non-existent.

⁷ Department for Transport, *RORO0102 – Road Goods Vehicles Travelling to Mainland Europe*, (2015)

⁸ Changes in standards for new European intermodal swap bodies has meant that as shippers replaced the original equipment acquired for Channel Tunnel traffic, the new units are slightly larger and cannot be accommodated on the Network Rail lines between the Channel Tunnel and London, where corresponding gauge enhancement work has not taken place since the commencement in 1994 of through rail freight services to Europe using the Channel Tunnel.

In terms of the addressable market for the Channel Tunnel rail freight sector, the average daily flow is over 6,500 (HGVs) passing through the Port of Dover and almost 4,000 per day using the “Le Shuttle” Eurotunnel service⁹. If a freight train accommodates up to the equivalent of 40 HGVs then a modal shift of just 1% generates enough for two to three trains per day.

Originally the tunnel was designed to take 6.2m tonnes of rail freight traffic (Intermodal/Automotive and conventional wagon load) per year, using 35 trains each way per day. However, in recent years the tunnel is only handling around 1 million tonnes per year, so is operating at much less than its potential capacity. This is at a time of growing road based volumes along the Dover-Calais corridor and high volumes of freight traffic using the “roll on roll off” services offered by Eurotunnel. The “Le Shuttle” freight services have proved popular with shippers and hauliers alike and extra services are being provided to meet this demand.

In France the ‘Autoroute Ferroviare’ (AFR) concept has been introduced from a new terminal in the Port of Calais to an existing (AFR) terminal at Le Boulou on the Spanish border. Using purpose built carrier wagons, a daily unaccompanied service is provided to move complete trailers. It would in theory be possible to extend these shuttle services to London using HS1 but there are currently no plans for this. Capacity on HS1 is very limited and only available overnight.

Potential future extensions of the concept, could see lorries being transported by rail via HS1 and HS2 to the Midlands, North and Scotland, thus releasing vital road space, however for this to occur a direct HS1 to HS2 link would need to be constructed. Furthermore there are no plans, at present, for HS2 to provide for rail freight services.

Automotive traffic through the Channel Tunnel is seen as a market with growth potential. Additionally, if UK steel-making capacity is reduced then there may be a correspondent growth of flows from

continental Europe, however these are susceptible to competition from short sea shipping.

Summary: Growth Potential – whilst likely to be limited in the short term, there is clear potential for increases assuming European Trade continues to grow and the security situation in Calais is resolved.

2.1.6 Metals

This sector is mainly contingent on the health of the UK steel industry although there are also movements of aluminium and scrap metal. If UK steel production at Scunthorpe and Port Talbot declines significantly, there is some opportunity for more semi-finished steel to be imported via the East Coast ports and via the Channel Tunnel from European steel-mills. Such steel product could include:

- long steel sections
- rails
- cold rolled coil for the car industry
- reinforcing bars

Historically there have been flows of imported steel via the East Coast ports which are moved by rail to inland terminals in the West Midlands.

Scrap traffic may have some growth potential as recycling increases and if UK steel production switches to scrap rather than blast furnace produced steel. There are rail flows of scrap from various rail heads to the ports for export such as through the terminal at the Port of Liverpool operated by European Metal Recycling.

Summary: This sector is likely to remain static at best or decline slowly. But some flows may change from UK production sites to port based import terminals.

2.1.7 Petroleum/Oil

There is likely to be a progressive reduction in the amount of fuel refined in the UK due to the continuing closure of petrol refineries, with the additional factor that movement by

⁹ (Source: Port of Dover, Annual Report 2014, Eurotunnel Group, Annual Report 2014).

pipeline remains the key transport mode for this commodity.

There are possibly some new flows that could result from on land oil discoveries or fracking, and perhaps new strategic flows within the oil sector. The anticipated volumes are possibly low enough to prevent new pipelines being constructed and the arising output would then have the potential to be moved by rail as this is more flexible than providing a fixed pipeline link.

Summary: This sector is likely to remain static at best or decline slowly, unless on-land production is realised which may result in some new flows

2.1.8 Chemicals

The movement of chemicals by rail has been in long-term decline, as users increasingly want small quantities of chemicals shipped to them more regularly, resulting in a shift to road haulage. Furthermore, chemical plants tend to be located on the coast with users located nearby, which support the use of sea and road modes over rail. As a hazard mitigation strategy, in recent years products tend to be manufactured on single sites, reducing the need for interplant transfers. The few remaining rail freight flows of chemicals in tank wagons are limited to industrial gases.

Summary: This sector is likely to remain static at best or decline slowly.

2.1.9 Automotive

UK car production is currently at an all-time high. There are currently around 10 pairs of trains carrying finished cars and vans operating on most weekdays. Interestingly much of this output is in exports, many of which go 'over the quay' close to the assembly plants, such as Nissan at Sunderland and the Port of Tyne, Jaguar Land Rover (JLR) in Halewood and Port of Liverpool.

There are a limited number of automotive factories in the UK; the location of new plants (mainly Japanese manufacturers) are

often away from rail lines and with traffic flows over distances where rail is unlikely to be competitive. Currently most Built Up Vehicle (BUV) distribution for the UK market is by road direct to the dealer. However, there is interest in moving more of the exports to the ports or via the Channel Tunnel by rail. Some import traffic moves by rail as back loads to inland distribution terminals.

There is a limited number of specialist rail vehicles available which are suitable for this trade. The trend for larger and more SUV type vehicles limits the number which can be loaded on rail vehicles due to the restrictions on the UK loading gauge, making movements by rail less competitive. A significant number of wagons suitable for use in the UK are currently in use on flows in Europe. These wagons are owned / managed by car transport logistics companies who determine how their fleets are to be deployed to meet the distribution contracts.

Imports from Europe tend to be via ship due to the way that logistics contracts are let, and a lack of availability of UK compatible car carrying wagons (although there is potential to utilise suitable European wagons). The industry is reluctant to invest in specific gauge limited specialist wagons that can only serve the UK market.

There is renewed optimism in the automotive sector which is planning new flows through the Channel Tunnel and potentially these could be two-way flows. Recent figures from Society of Motor Manufacturers and Traders (SMMT) shows that car production is at high levels with almost 150,000 units being manufactured in the UK each month. Of this some 75% of UK car production goes for export and as such represents significant volumes between the car assembly plant and the port of export. With the number of cars and vans on the road still growing this provides an optimistic view of the sector.

For inwards components from Europe, the automotive industry tends to use 4m high road trailers as these operate at the legal height limit for semi-trailers in mainland Europe. The equivalent intermodal loading

capacity of this would be in mega containers and the UK loading/structure gauge on the 'classic' rail network cannot readily accept the load unit/wagon combinations. Apart from the possible use on HS1 and potentially HS2, this equipment cannot operate on the UK rail network and therefore the opportunity to convert these flows to rail in the UK is less likely.

However, there is scope for growth in rail's market share at the key entry ports of Portbury, Southampton and Sheerness as imports of vehicles are greater than exports. Some car plants are or can be rail connected, such as Mini at Oxford, JLR at Halewood, and Honda via South Marston. Others could be connected in the future, such as Toyota at Burnaston (which could be accessed by the proposed Etwell SRFI), and Nissan, which is very close to the former Leamside line. Connecting the JLR factory at Solihull would need a long-term planning/land use/transport study to identify a suitable railhead and connection to the network but the volume of vehicle movements to Southampton is substantial.

There are two pairs of dedicated automotive component trains operating, associated with the Ford plant at Dagenham. More components could again be transported into plants; although this could require gauge clearance for certain components such as body pressings. It should be noted that a significant daily flow of automotive body pressing traffic was lost with the closure of the Rover Group factory at Longbridge.

Summary: Slow growth with scope for the rail share of the market to grow as more flows convert to rail especially where rail has been successful due to increases in demand. Need to consider connecting plants which do not yet have a rail link to the network.

2.1.10 Non-ESI Coal

This is a small sector which is in decline as industrial users move to less polluting fuel. Furthermore, the decline of steel-making in this industry has significantly reduced the demand for coal.

Whilst some specialist users may remain, there is not likely to be a great demand, and linked with the few domestic coal producers there is little potential for bulk movement.

Summary: Traffic in this commodity will decline as certain industrial processors change their energy source from coal to gas.

2.1.11 Industrial Minerals

Remaining industrial users, including existing flows of china clay within Cornwall and the current flow of sand for glass making, are likely to continue using rail. There is also the possibility of some new customers in these industries using rail freight as the raw materials are suited to rail.

However, industrial processes such as these may fall victim to high UK energy costs and continued reliance on offshore manufacturing capability.

Summary: This sector is likely to remain static or grow slowly.

2.1.12 Domestic Waste

As we recycle more, less waste is destined for landfill, which has been significantly impacted by environmental taxation. Sorted waste may have increased but is produced in smaller quantities over a wide area by local authorities. Some longer distance movements of waste by rail as feed stock for energy from waste plants are being developed.

Domestic waste is usually moved in trainload quantities using dedicated heavy duty containers, from local compaction facilities to recognised land fill facilities. The movement is 'intermodal' in that movement by a road vehicle (or internal movement vehicle) is involved at both ends of the journey; these may be internal to the rail terminals.

In addition baled waste (either mixed or separated), is transported in containers for export for processing. This is included in forecasts for standard intermodal (Ports) traffic.

Summary: This sector is likely to remain static but there are some new flows in prospect e.g. Merseyside to Teesside and London to Avonmouth.

2.1.13 Ore

The flow of imported iron ore is closely related to the health of the UK steel industry. If production continues to decline then the sole remaining bulk rail iron ore flow from Immingham to Scunthorpe could reduce or cease entirely. Whilst there are some other small flows these are not in significant volumes.

Summary: Contingent on the health of the UK Steel Industry, this commodity will either remain static, decline or could even cease completely.

2.1.14 Network Rail Engineering

This sector closely follows the railway modernisation and renewal programme and therefore reflects government spending on the rail sector. Whilst bulk movements of materials to distribution depots may increase, there is a risk that modern materials handling methods may result in more road/rail vehicle equipment use, reducing the need for rail based solutions. For significant infrastructure projects (the construction and the connections to HS2 network), Network Rail could be encouraged to use rail more for its requirements. The recent investment in new cranes and wagons could be a first move in this direction.

Summary: This will remain static or see slow growth, dependent on Network Rail's plans for modernisation work.

2.1.15 Other Areas

In addition to the flows identified above which are modelled in Chapter 4 there are other flows which may yet prove to be important parts of any future rail freight mix; however, currently the volumes concerned

do not merit modelling. These flows are briefly considered below.

Parcels

The growth of internet shopping (amongst other factors) has resulted in a significant increase in the number of parcels being moved around the UK. Royal Mail uses the rail network for the movement of parcels from London to Scotland via Warrington, as well as some other services. There could be interest from other parcel companies to share or imitate this service, though previous overnight trials for independent operators have not been successful.

The progressive introduction of modern passenger rolling stock has generally removed 'van' space from trains, which historically was used for the movement of ordinary and express parcel traffic using marginal capacity on existing passenger trains. The gradual introduction of driver only operation on trains has removed guards, who once would assist with the loading and unloading of parcels, from many trains.

Similarly the space originally utilised in most principal stations to handle parcels traffic has been absorbed into the station footprint, to provide additional passenger facilities and retail opportunities. Given the pressure on stations to manage the growing numbers of passengers, it is unlikely that there is now space available to support the infrastructure needed for a meaningful parcels operation to fit alongside increasing passenger numbers.

There have been some trials with moving parcels by passenger train but these have not yet developed into commercially viable service offerings. There are small flows on certain passenger trains where the higher speed and reliability of the train compares favourably to road, for example the delivery of specialist fish products from Cornwall to London. However, these flows remain very small in volume.

Developing this growing market sector represents an ongoing challenge for the rail sector.

Premium Freight

DfT has separately commissioned research looking at the market for high value premium parcels traffic carried on daytime passenger trains. The report, which is due to be published shortly, envisages limited passenger accommodation being used for the carriage of urgent product. A number of different methodologies to bring this to market are being explored, though all involve identification of one or more private sector participants to facilitate its introduction.

Urban logistics

Attempts to reduce vehicle deliveries in urban areas continue and this may result in proposals to develop rail-connected consolidation centres around the country, perhaps linked to regional SRFIs. However, this should be considered as a medium-term ambition until an economic model can be developed to make this cost effective.

There is a strong market for a successful and well planned product. However this initiative essentially addresses the needs of a different sector (small volume high value time sensitive consignments) from the wagon or trainload volumes of traffic that this strategy and the traditional rail freight sector deals in. The initiative is therefore considered to be outside the scope of this study and is not referenced in any of the forecasting work we have carried out.

Rail freight can play an important role in urban logistics if urban freight strategies support rail freight being used for long distance trunk haulage into rail terminals at night, be they consolidation centres, SRFIs located on the edge of conurbations or central mainline rail stations with final mile delivery by low emissions road vehicles or freight bikes.

Rail freight also has a role to play in servicing bulk terminals for delivering aggregates for the construction sector and removing domestic and industrial waste in cities.

These initiatives have the ability to assist in the reduction in urban pollution as well as reducing carbon emissions.

International high speed freight

Studies have suggested that there is considerable potential for a high speed parcels service from London to France and potentially other relatively near European capital cities, using HS1 and dedicated high speed rolling stock. A trial in 2012 using a SNCF Postal TGV set by the Eurocarex consortium from St Pancras demonstrated the feasibility of the concept.

2.2 Conclusion

With the loss or steep decline of traditional flows such as coal, ore and possibly steel, there is an urgent need for the rail freight industry to boost its presence in other market sectors if volumes moved by rail aren't to decline. Recognising that certain flows such as waste, petrochemicals, other minerals and engineering supplies for Network Rail are likely to remain relatively static, it is clear that there are other sectors with real potential for growth.

There is a noticeable shift in the centre of geography for rail freight. With the reduction in coal traffic a greater proportion is now concentrated into the already busy southern half of the country, presenting additional challenges for the industry and its funders.

The increased use of rail freight brings much wider benefits off the railway balance sheet not just a reduction in carbon:

- road congestion relief
- improvements to road safety
- reduces the need for trunk road investment, and
- wider economic benefits through cheaper logistics for customers.

However, the sectors with potential for expansion are diverse; deep-sea and domestic intermodal, construction, international, express parcels and automotive (and possibly biomass), all have different needs and so there is no 'one size fits all' solution, although some of the requirements are the same (improved network capacity, more efficient pathing and better flexibility, for example). Each market needs to be understood and targeted

effectively to promote modal shift and enable an increase in rail freight and as a result a reduced carbon footprint. A total of fourteen commodities have been identified as being significant flows on the network, and these are summarised in Table 2.1. These fourteen commodities are then taken forward to Chapter 4 for forecasting of future flows.

Of these, the following have been identified as being of particular importance due to their suitability for modal shift from road, natural growth in rail-based haulage, or both:

- Construction
- Intermodal (Ports)
- Intermodal (Domestic)
- Channel Tunnel
- Automotive

Constraints identified in Chapters 3 and 5 which apply to these commodities are therefore of high importance.

Table 2.1: Commodities taken forward for forecasting

Commodity	Summary Forecast
2.1.1 ESI Coal, Biomass Nuclear Energy	Long-term decline Static Long-term decline
2.1.2 Construction Materials	Long-term growth
2.1.3 Intermodal (Ports)	Steady growth
2.1.4 Intermodal (Domestic)	Steady growth
2.1.5 Channel Tunnel	Limited growth
2.1.6 Metals	Static
2.1.7 Petroleum/Oil	Static
2.1.8 Chemicals	Static
2.1.9 Automotive	Slow growth
2.1.10 Non-ESI Coal	Long-term decline
2.1.11 Industrial Minerals	Static
2.1.12 Domestic Waste	Static
2.1.13 Ore	Static
2.1.14 NR Engineering	Static



3) Review of Rail Network Capacity

The rail network is under increasing capacity pressure due to continuing growth in passenger and freight usage.

According to Office of Rail and Road (ORR) data¹⁰, in the last 10 years passenger ridership on the UK rail network (measured by passenger kilometres) has risen by 48%, and freight traffic (measured by net tonne kilometres) has increased by 10%. The freight figure masks a significant change in the mix of commodities carried, with intermodal traffic growing in significance and coal and metals declining dramatically.

However in terms of network capacity utilisation the picture is very different. There has been an increase in passenger train kilometres of 15% in the last 10 years, generated largely by increased service frequencies on many routes, largely in London and other major cities but also on long distance corridors. Freight operators have also become more efficient in the same period, and the number of freight train kilometres has reduced by 18% in the last 10 years, even though the volume moved has increased. However, if the potential for growth and modal shift identified in Chapter 2 is to be realised, it is necessary to assess the constraints upon this growth in terms of rail capacity, and then take these constraints into account when undertaking the detailed forecasts in Chapter 4.

Network Rail recently published a Rail Freight Network Study for consultation in August 2016, which has considered a range of options to address a number of the proposals and issues contained in this freight strategy, and a suggested timescale for implementation.

The role of this section is therefore to set out the capacity constraints that have been

taken into account to constrain the growth forecasts where appropriate. It does not make proposals for specific network upgrades, which are being addressed by Network Rail, but does highlight how some of the themes might influence future market growth.

3.1 Infrastructure Capacity

A number of operating issues currently act as constraints to efficient rail freight operations on the national rail network.

3.1.1 Permitted Train Lengths

Considerable progress has been made by Network Rail and FOCs in recent years in increasing freight train lengths. This has delivered the more efficient use of paths highlighted in the introduction to this section, and has been crucial in delivering sector growth.

The maximum length of trains is affected by network issues such as the length of freight loops, spacing between signals and junctions and the location of critical items of infrastructure such as level crossings. Freight operators have already taken steps to maximise the loads within the specific timing constraints for train paths, which often limit the maximum load that can be run because of performance factors. Network Rail permits a maximum train length of 775 metres (on certain routes). This is also the maximum permitted length of trains to and from Europe via the Channel Tunnel¹¹.

The main intermodal routes from the Channel Tunnel and Felixstowe to Crewe via London are currently cleared for this length (length enhancements from Southampton are in hand but not yet complete). Other routes can be more constrained, with some routes limited to no longer than 440 metres. Even bulk trains

¹⁰ Source: ORR Data Portal

¹¹ Network Rail Freight Trains Loads Book

(which are constrained by weight rather than length) increasingly need longer train lengths of up to 500 metres or more.

3.1.2 Electrification

Although 40% of the UK rail network is electrified, only 7% of freight is electrically hauled¹², and most freight on electrified routes is diesel hauled. Often yards and local branch lines are not electrified, while freight operators have preferred the 'go anywhere' capability of diesel locomotives. Initiatives to fill in electrification gaps are a Network Rail priority, and Freight Operating Companies (FOCs) are showing interest in hybrid electric locomotives with 'last mile' diesel engines. Because of the investment needed in infrastructure and traction equipment this is a long-term initiative but electric locomotives, which offer better performance, would allow more freight trains to run on congested routes and particularly effective on graded routes such as Preston – Carlisle.

Current energy market conditions tend to favour the status quo, but pressures such as a rise in oil prices back towards 2010 levels would change this rapidly. Electrification of passenger routes continues and it will become increasingly important that freight uses electric traction to maintain its share of the overall route capacity. It is important that the sector has plans in place to anticipate this, as well as delivering substantial environmental benefits.

It is important to recognise that increasing electric freight haulage requires both infrastructure investment and acquisition of new locomotives, and therefore depends on partnership between DfT and FOCs to deliver a collective long-term investment strategy.

Clarity and consistency on the electrification policy is therefore essential to give freight operators the confidence to invest in electric traction. Such investment is likely to occur when the current Class 66 loco fleets become due for renewal, which may start in 10 years' time. Until then it is likely that new locos will only be procured for specific traffic

requirements that cannot be satisfied by the current fleets.

3.1.3 Heavier Axle Loads

Most of the UK rail network can already accept trains loaded to the maximum 25.4 tonne axle weight (RA10), though on some routes individual structures have speed limits for RA10 traffic which impact on the viability of heavy axle load paths¹³.

3.1.4 Diversionary Routes

Customers want a consistent and reliable offering that they can depend on, so it is important that even when there is engineering work FOCs are able to continue to offer services. Night time closures avoid disruption to passenger traffic but can severely disrupt freight, often because suitable diversionary routes are either not available or impose greater operational constraints. Network Rail has a long-term policy to upgrade key diversionary routes, but there is a long way to go until FOCs can be offered guaranteed 24-hour access across the whole of the strategic freight network.

Most freight traffic is time sensitive, and freight resource efficiency is key to ensuring competitiveness with road.

3.1.5 Change in the Traffic Mix

Traditionally the rail freight market was dominated by bulk flows generated by core UK industries, such as mining, power generation and steel making. Freight infrastructure, in areas such as Teesside, Humberside and South Wales, is comprehensive, with dedicated freight lines to allow freight and passenger trains to operate largely independently. However over the last 30 years the mix of freight traffic has moved away from these core industries and towards new markets such as intermodal. This traffic uses largely double track routes that are dominated by passenger operations and which lack suitable freight specific infrastructure such as loops or goods lines. The result is that these routes offer much less capacity for

¹² ORR Data Portal

¹³ Network Rail Sectional Appendices (Section D)

freight trains, and constrain growth in these emerging markets.

3.1.6 Gauge Clearance

Network Rail has made substantial progress in clearing core intermodal routes on the strategic freight network to W10 gauge to allow the passage of 9' 6" ISO containers on standard deck height wagons. It is now looking to enhance this in the long term to W12, which permits the passage of a greater range of wagon and swap body combinations. If Channel Tunnel traffic were to grow W12 gauge clearance would become more important, as it provides the capability to move a wider range of swap bodies used in mainland Europe.

While most core intermodal routes are now cleared for W10 gauge, some (including any of the Trans Pennine lines) remain to be cleared. There are many routes still to be cleared to W12, including linking routes such as Trans Pennine, which would provide direct access to terminals from a number of East Coast short sea shipping ports.

The current gauge clearance on the network is shown for W10 (Figure 3.1) and W12 (Figure 3.2) overleaf.

3.1.7 Specific Freight Infrastructure

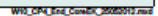
Often, while overall route capacity issues can be solved, specific freight assets still restrict capacity. A case in point is the looping of freight trains. While FOCs naturally dislike freight trains being looped, often it is an efficient way of maximising capacity with faster passenger services. However, when the specific infrastructure is constrained by slow speed turnouts and reduced loop lengths, it means that entry and exit is very slow. These low-speed loops are often under utilised and limit the availability of daytime freight train paths.¹⁴ The same is often true of access to terminals and private sidings.

3.1.8 Route speeds

Freight trains can travel at either 60 mph (most bulk freight services) or 75 mph (most intermodal and automotive services), but their acceleration capacity is more restricted than for passenger trains and therefore they operate most efficiently when running at constant speed. This is often compatible with stopping or semi fast passenger services, where the freight train's performance matches the end-to-end passenger journey times.

However many freight train paths are sub-optimal, involving much stopping and starting, which reduces average speeds considerably, impacts on asset utilisation and increases fuel consumption.

¹⁴ See, for example, Network Rail *Western Route Study* (2013) or Network Rail, *West Coast Main Line Route Utilisation Study*: "Entry and exit speeds affect the usefulness of the loop".



AECOM

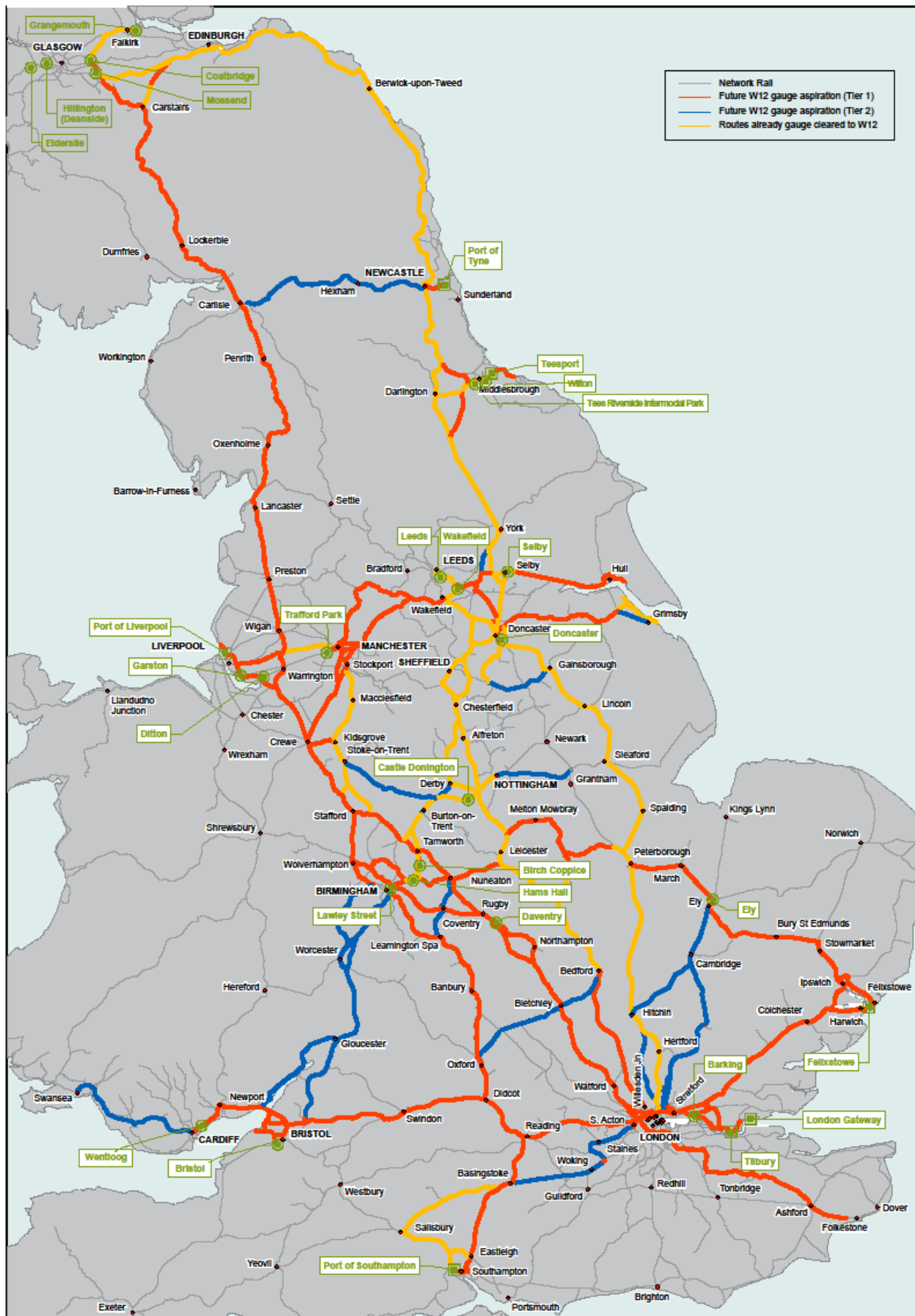


Figure 3.2. W12 network extent (end CP5 and post CP5 aspiration)
 Network Rail W10 / W12 High Gauge Network CP4 Period End (June 2014)

3.2 Route Capacity

Specific capacity constraints apply in many parts of the freight network (the most notable being the single line and non-electrified branch to Felixstowe which currently handles 33 freight trains per day as well as passenger services).

All of the core strategic freight network routes have significant daytime capacity constraints because they are also core passenger routes, which have seen dramatic passenger train service growth over the last 20 years. This is an increasing problem – passenger operators continue to seek to increase service frequencies, often using relatively short formation services at frequent intervals. Although this undoubtedly has a benefit for passenger growth this is a very inefficient use of network capacity, and has a disproportionate impact on rail freight, constraining paths especially to and from intermediate terminals. Better use of the existing network capacity through use of longer trains for both passenger and freight services would make more efficient use of the overall network.

Once spare infrastructure capacity has been used for franchised passenger services, it can be difficult to regain that capacity without reducing the passenger service or introducing additional infrastructure. This demonstrates the need to make best use of existing infrastructure, by balancing the requirements of passenger and freight (in line with DfT rail strategy).

This is now the most immediate issue impacting on the growth of rail freight. Key examples of how these capacity pressures have constrained some of the growth forecasts are described below.

Most of the issues identified will be addressed by Network Rail in its forthcoming Freight Network Study, and this strategy does not seek to identify specific network enhancements or capacity schemes that would alleviate these constraints. It is also important to recognise that the rail freight sector is already responding to these pressures through adoption of initiatives such as increasing train lengths, acquisition

of new more powerful locomotives and eliminating inefficient train paths.

3.2.1 West Coast Main Line (WCML)

The WCML is the core freight route to the north west of England and Scotland, and 43% of all UK rail freight traffic and 90% of all intermodal traffic travels over it at some point¹⁵. The route modernisation completed in 2008 led to an increase in passenger services, and the route is now at full capacity in peak periods. There are at least three freight paths per hour south of Crewe, but this is already constraining growth at times.

HS2 may provide some additional freight capacity between London and Crewe by diverting long distance passenger trains and running others at slower overall speeds. It will be important to ensure that sufficient additional freight capacity is provided as a dividend from the project, and that passenger operators do not take all of the paths that are released.

North of Preston the slower performance diesel hauled freight on the heavily graded sections to Scotland is a challenge. Increased use of electric traction will be away of providing additional capacity, especially as the consequence of HS2 is that there will be more passenger services operating over this part of the route. Providing both freight and passenger services over this section in future will be essential to maximise route capacity.

The difference in performance is quite substantial. A diesel-hauled freight train climbing the six miles to Shap summit from the south can take half an hour, whilst an electric-hauled freight train takes fifteen minutes or less (compared to six minutes for electric passenger trains).

3.2.2 East Coast Main Line (ECML)

The ECML is not heavily used by freight at the southern end, and north of Peterborough benefits from the existence of parallel routes

¹⁵ Network Rail West Coast Route Plan 2010

that provide additional freight capacity, though some further planned enhancements to provide grade separated access to the route are still required.

However there are increasing demands for new passenger services (ORR has just approved additional open access passenger paths), and together with the introduction of new Thameslink services this is putting pressure on key route sections such as London to Peterborough and around Newcastle. Additional infrastructure or reopened freight routes are likely to be the only solutions to these challenges in the long term.

3.2.3 Great Western Main Line (GWML)

The GWML is currently being electrified and upgraded in advance of the introduction of new Super Express Trains from 2018. Freight route capacity has been enhanced through investment at Reading in grade-separated access to and from Southampton. Key sections of route, such as Didcot to Oxford and Didcot to Severn Tunnel Junction, are very heavily used double track sections. There are some long freight loops at key locations which provide freight capacity but it is already difficult to identify additional daytime freight paths on these sections.

A key element of the forecast freight growth will require intermodal access to terminals in South Wales and the South West, and this will require sufficient GWML daytime freight capacity.

3.2.4 Midland Main Line (MML)

The MML primarily carries aggregate traffic to London, but is shortly to be electrified and cleared to W12 gauge¹⁶ north of Bedford, after which freight demand is expected to grow. When they are opened for business, new traffic will serve the strategic intermodal freight terminals currently being developed in the East Midlands, and the new SRFI approved at St Albans.

Currently there are two paths per hour south of Bedford, where Thameslink services

constrain capacity. Thameslink services increase in 2018, and this will add further constraints to capacity between Bedford and London, which Network Rail is addressing by the addition of a dynamic freight loop north of Luton. Efficient scheduling will be required to ensure that the use of this facility is maximised.

3.2.5 Channel Tunnel

Because of service reliability issues, exacerbated by security problems, at present only 8 paths per day (out of a possible 35 each way) are currently used. Channel Tunnel traffic is a major potential growth area for the industry, but recreating one or two daytime paths per hour to London could prove problematic in view of passenger service growth in Kent and the Greater London area over the last ten years.

3.2.6 Trans Pennine Route

Port traffic to both east and west coast ports (such as Immingham and Liverpool) is growing, and major investment in facilities is under way. A number of terminal developments are currently under consideration, and Transport for the North (TfN) indicates that this will be essential to deal with the anticipated increasing demand for intermodal traffic over longer term.



Capacity is the real issue. If shippers wanted to get their goods on rail across the Pennines we would probably have to say 'sorry, no' at the moment.

A Northern Port Operator



Trans Pennine route capacity is constrained on each of the three alternative routes (via Hope, Standedge or Sowerby Bridge), partly by routes needing investment to improve signalling headways to increase the number

¹⁶ Network Rail East Midlands Route Study

of trains per hour they can handle, and partly because all the routes have severe gradients which impact on freight train performance. This is exacerbated by the continuing growth in passenger service frequencies. Currently no Trans Pennine routes are electrified and there is no W10 gauge capability.

3.2.7 Routes around London

Cross London routes are vital for intermodal traffic, much of which is landed at Southeast ports, and virtually all other types of freight traffic (particularly construction, automotive and domestic intermodal flows). Route capacity on core freight routes (North, West, South London Line and Gospel Oak to Barking) is under considerable pressure because of increasing passenger train frequency (London Overground is moving all its key routes towards six trains per hour in both directions). Freight capacity is becoming constrained as a result.

Preservation of cross London freight capacity is vital for the future growth of rail freight, as London route capacity will always be key to transferring between core corridors. Network Rail's Nodal Yard strategy is creating a new facility at Ripple Lane to match the yard already in operation at Wembley. Freight trains operating in the London area usually perform as well as local services and both must be able to co-exist with the flexibility that the rail freight industry requires.

3.2.8 Cross Country

The Felixstowe to Nuneaton (F2N) project, which aims to create a new route from the port to the WCML (north of Nuneaton) as an alternative to travelling via London, is so far only of limited value. Specific enhancements (W10 clearance throughout, Bacon Factory Curve at Ipswich and the Nuneaton North Chord) have been implemented, but at the moment there have been no capacity enhancements between Soham and Ely, Peterborough to Leicester and through Leicester itself. The single line Felixstowe Branch is being improved with capacity works at Derby Road and Trimley to provide an additional 10 train paths per day. Given

continuing intermodal traffic growth the route may continue to constrain growth in rail traffic from the expanding port in the future.

3.2.9 High Speed Routes

HS1 is of specific relevance to freight because it uniquely offers European gauge freight access direct to London.

The rail freight industry is already exploiting overnight capacity on HS1 (Channel Tunnel to London), though more work is needed to improve the available capacity, which is limited by HS1's overnight maintenance activities and the route infrastructure.

There are also institutional issues over performance compensation and access charging that may be restricting market entry - reference to the ORR to resolve this may be required.

3.3 Terminal Capacity

Forecast growth will require the creation of additional terminal capacity. Government policy now highlights the need for SRFIs, especially for intermodal traffic, across key areas of the country. Terminals are private sector funded developments, and the distribution sector responds directly to government policy and infrastructure investment. FOC involvement and support is also important in ensuring successful delivery of new terminals, which will be essential in delivering the growth opportunities identified in the forecasts.

New terminals need to be located on routes with good freight capacity, and W10/12 gauge capability to make them attractive to the market.

At the moment domestic flows between terminals are principally limited to traffic from Daventry to Scotland, with some additional traffic to and from Barking, and a growing volume to South Wales and potentially the South West.

3.4 Resource Availability

The recent downturn in coal traffic has created a surplus of Class 66 diesel locos, along with much of the coal wagon fleet. Some equipment will be deployed in Europe, but this does indicate that there is sufficient haulage capacity available to facilitate growth in the short to medium term. However as noted above there is a need for FOCs to be encouraged to invest in electric locomotives to provide the better freight performance needed to maintain freight capacity, as well as reduce emissions.

There is also a need for additional investment in wagons; both for growing bulk haul sectors such as aggregates, and also to provide more intermodal container flats. This will be essential to support the projected growth. Fortunately the wagon supply market is healthy, supported by specialist leasing companies willing to invest in fleet expansion given sufficient commercial confidence.

There is, additionally, a long term need to ensure an adequate skills mix to support the rail freight industry. Not only is the work force of the industry aging, but the skills required are changing as ITS solutions continue to change the nature of working in the sector, resulting in a need for regular up-skilling amongst the existing workforce.

However, generally speaking the rail freight market has the capability to support freight growth, provided sufficiently clear evidence of new market opportunities and policy support in terms of route and capacity investment is evident, in order to overcome the constraints identified in this Chapter.

3.5 Summary

This section outlined the capacity constraints that had been taken into account to constrain the growth forecasts where appropriate under the main categories of Infrastructure Capacity, Route Capacity, Terminal Capacity, and Resource Availability. Under Infrastructure Capacity, a number of operating issues which act as constraints to efficient rail freight operations were covered, including train lengths, electrification, axle loads, diversionary

routes, traffic mix, gauge clearance and route speeds. A summary of the issues for each of the main corridors were covered. A high level section on Terminal Capacity along with resource availability was also included. The Network Rail Freight Network Study which was issued for consultation on the 11th August 2016 has considered a range of options to address a number of proposals and issues contained in this freight strategy, and suggested timescale for implementation.

4) Rail Freight Forecast

This study looks to understand the potential growth markets in rail whilst considering the constraints which impact this, it also seeks to estimate the potential for mode shift and the carbon abatement that could be achieved. In making this assessment it is necessary to develop a freight forecast for 2030 which is the carbon reporting year. This chapter outlines the process and the forecast.

4.1 Introduction

So far this report has outlined a brief high level review of the growth potential of fourteen key commodities on the rail network, and identified the key physical capacity constraints on the network which may inhibit this growth. A model has been developed which provides rail freight forecasts to 2030 split by commodities and routes as laid out in Chapters 2 and 3. These results are discussed in this Chapter. This model is separate to, and does not replace, the 2013 Network Rail Freight Market Study, and should instead be viewed as a complementary forecast to the FMS' approach.

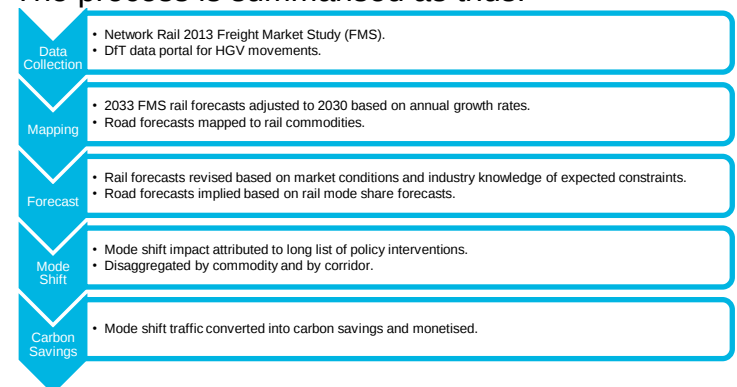
Table 4.1: Rail Freight Forecasts (2030)

Commodity	2030 million tonnes lifted – FMS Forecast unconstrained	2030 million tonnes lifted - LOW constrained forecast	2030 million tonnes lifted- MEDIUM constrained forecast	2030 million tonnes lifted – HIGH constrained forecast	Additional Comments
Ports Intermodal	41.76	22.00	31.81	45.69	Steady growth expected, but high growth only achievable through significant investment
Domestic Intermodal	24.26	2.78	4.03	5.81	Lower than expected growth in terminal building since

The commission has asked and aimed to answer a different question to the NR FMS study – In that the study looks to understand the potential growth markets in rail considering the constraints (network and otherwise) which impact this. It also sought to understand the potential for mode shift and the carbon abatement that could be achieved – whereas the NR FMS looked at what could be achieved in an unconstrained world.

Accordingly the forecast numbers therefore may not necessarily always correspond with the FMS.

The process is summarised as thus:



4.2 Freight Forecasts

The Network Rail forecasts for 2033 and information contained in Chapters 2 and 3 were fed into the model and adjusted to 2030 figures. The reason for the choice of 2030 was to enable calculations to be made for carbon reporting purposes. High, medium and low forecasts were developed, and are presented in the table below.

					FMS forecasts were issued.
					Transferability of goods from highway to rail is a significant issue.
Channel Tunnel Intermodal	1.95	<i>Channel Tunnel Volumes are discussed in Chapter 7 by corridor and commodity.</i>			
ESI Coal	5.44	0.00	0.00	0.00	Expected to disappear due to decommissioning of coal-fired power stations.
-					
Biomass	14.10	2.51	7.13	18.64	Expected to replace some of the Non ESI Coal traffic. Growth dependent upon government policy on subsidies post 2027.
Construction	21.99	21.99	26.51	31.91	Long-term growth expected potential for even greater growth if rail freight is used for large infrastructure projects.
Metals	8.83	8.83	8.83	8.83	
Petroleum	5.28	3.60	4.80	5.28	
Chemicals	0.77	0.77	0.77	0.77	
Industrial Minerals	2.73	2.73	2.73	2.73	
Automotive	0.41	0.42	0.51	0.61	Growth since FMS forecasts higher than expected. Further growth could be seen if rail is connected to manufacturing plants.
Ore	4.13	0.00	2.07	4.13	Heavily dependent upon UK steel market, therefore expected to remain static at best, but could disappear completely.
Non-ESI Coal	2.95	0.00	1.48	2.95	Decline expected due to market demand.
Domestic Waste	1.44	0.48	1.44	1.44	
NR Engineering	6.36	6.36	6.36	9.21	
Total	142.39	72.47	98.47	138.00	

The low, medium and high forecasts are based upon varying assumptions on government policy, market conditions and network constraints through to 2030. The latest available rail volumes (2015-16), both lifted and moved, were used to inform the project team on current trends. These trends in addition to industry consultation, recent trade reports and industry knowledge helped the project team with their review of a number of variables considered, which included GDP growth forecasts. One of the factors has been the much lower oil price since 2014 which has had an effect on transport costs. Lower oil prices tend to

favour road freight operators over the rail sector as fuel is a larger percentage of total road costs, and a reduction in oil price of 25% allows hauliers to reduce freight rates by around 8% if they wish to pass the saving on to their customers. The net effect of this is that there has been reducing pressure on road costs and hence less inclination for shippers to consider modal switch.

The central / medium forecasts reflect coal's more rapid than anticipated decline as discussed in earlier chapters. In addition a number of commodities are experiencing lower than previously estimated growth, particularly biomass and domestic intermodal, given energy policy choices and

network constraints respectively. It is in these figures that the importance of further investment in the network becomes clear, in order to remove some of the constraints as presented in Chapter 3.

In contrast however, construction has seen better growth than expected in recent years performance reflecting the upturn in construction of housing as well as increased use of rail to supply the many major construction projects and the increasing rationalisation of cement and aggregate production.

Some commodity sectors that are not expected to change much were not the subject of detailed examination and hence there is little or no variance in the high, medium or low columns.

It is important to note that there is the potential for some duplication when potential policy interventions are considered in the modal shift calculations described later in the report. The reason for this is that one or more interventions may have the effect of changing the cost competitiveness of rail over road and this in turn has a bearing on rates of modal switch.

Base year data for road movements were obtained from the DfT data portal. 2030 figures were implied using mode share forecasts from the FMS where available and these figures formed the basis of the mode shift calculations described in more detail in Chapter 7.

These barriers are assessed in the next chapter.

4.3 Conclusion

In conclusion, the model shows there is clear potential for growth across several commodity groups. However, much of this is currently forecast to occur on the road network rather than on the rail network. Therefore there is an opportunity to initiate modal shift away from road and towards rail to accommodate this growth, as well as move existing traffic from road to rail. However these opportunities may not be realised due to barriers which currently inhibit this modal shift. So it is important to address these barriers to facilitate rail freight growth and achieve carbon savings as a result.

5) Identified Barriers to Modal Shift

Shifting freight from road to rail is an ambition of national, regional and European government. Whilst rail freight volumes have doubled since privatisation, road remains by far the dominant mode. Further growth in rail freight may be desirable from a carbon perspective.

In order to promote rail freight growth and modal shift to rail from road, it is necessary to understand what currently limits such movements. The most common barriers to modal shift are related to infrastructure capacity, the cost of moving goods by rail as opposed to road, the lack of flexibility of rail haulage compared to road and a lack of awareness of how best to move goods on to rail. These are further worsened through the wider skills and training shortage facing the logistics industry generally. This section considers each of these barriers in turn below, and leads to consideration of policy interventions in Chapter 6.

5.1 Infrastructure Capacity

A number of issues related to the physical infrastructure of the UK rail network act as constraining factors on the ability of rail freight to compete against road.

5.1.1 Network Limitations

The modernisation and rationalisation process which took place on the network between the 1960s and 1980s has resulted in a network which has a significantly impaired capability compared to many developed European countries. For example the town of Washington in County Durham, despite having a population in excess of 50,000 and a major automotive

manufacturing location, is now without direct rail access.

There has been a structural change to rail freight in the UK and Europe away from traditional wagonload trains operating from private sidings directly linking the factory with the rail network. Furthermore, in the ensuing years, as rail freight declined, many sidings, branch lines and related freight routes were cut back or disconnected. The network is now focused mostly on moving passengers directly between city centres and other significant destinations.

Whilst some firms may be located near railway lines, it is not always suitable for them to be directly connected to the network. Instead it is necessary to move goods, by road, to a nearby network access point.

This extra step immediately puts rail at a disadvantage based on the availability of suitable terminals (see 5.1.2 and 5.2.1 below).

In addition, not all of the existing railway network is suitably gauge cleared for large, modern freight wagons, a legacy of the construction of Britain's railways in the nineteenth century. This means that in terms of height and length of wagons, there are limitations, with high-cube containers (for example) requiring specialist vehicles to travel on much of the network or limits on the size and resultant capacity of automotive wagons (see Figures 3.1 and 3.2 for a map of gauge clearance).

5.1.2 Terminal Limitations

The required terminals for network access may not be conveniently located for the sender or receiver of the goods consignment. As is shown in Figure 5.1, the number of high capacity domestic intermodal rail freight interchanges which can act as an easy node for collection/dispatch of goods is sparse, with significant gaps in geographical coverage.

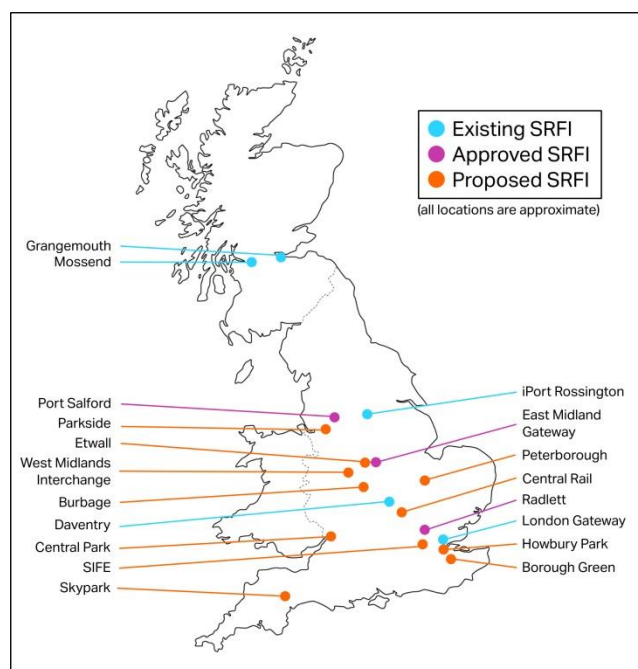


Figure 5.1: Proposed & Existing SRFIs in Great Britain

Whilst there are smaller terminals available, often these terminals do not have the size or facilities to handle trains without arrangements being made by the shipper to arrange offloading of goods. Where some trials have taken place, such as the “Lifting the Spirit” trial in Scotland, the need to re-open moribund facilities and hire equipment is only possible due to sustained and substantial government support; beyond the sum many private companies would be willing to pay (especially smaller firms).

This means that even where there is capacity for future growth at key entry nodes (such as the deep sea ports) there may be capacity or availability constraints at the destination which prohibit the movement of goods by rail. This applies not only to deep sea intermodal movements, but also the import of other commodities such as automotive traffic. In terms of aggregate and other construction material, often there are limited suitable sites for off-loading the material near the required destination, especially in urban areas.

5.1.3 Wagon Availability

Consultation with the intermodal industry found that the low numbers of available flats resulted in unaffordable pricing for setting up new flows. This is especially the case given gauge restrictions requiring specialist rakes of wagons and also the increasing number

of European size 45ft boxes which do not fit on a standard container wagon. However there are some examples of wagon lessors, 3PLs, FOCs and customers successfully working together to overcome this barrier. However, the number of wagons available is further limited by the long periods of time rolling stock can be tied up due to lengthy scheduling (see 5.3.1). Overcoming this will prove crucial in supporting modal shift and market growth aspirations, and it is understood that whilst some other sectors are also experiencing limitations in the current availability of suitable wagons (such as biomass) others have somewhat of a surfeit awaiting utilisation should other barriers be overcome (in particular this applies to the automotive sector).

“

Good train paths would allow the stock to be much better utilised, boosting productivity and lowering prices – rather than paying for it to sit in loops all day awaiting its path.

A Rail Freight User

”

5.1.4 Journey Time

Due to the congested nature of much of the railway network, and the priority placed on passenger services, rail freight services are often given sub-optimal routes or paths through the network, when judged against more direct paths. An example is the shipment of biomass from where it is imported at Liverpool through to Drax power station in Yorkshire. Some of its runs include a 3.5 hour wait in Tuebrook Sidings, followed by waits of half an hour at signals in Edgeley, Ashton Moss and Castleton. All told the journey time is approximately 11 hours whereas a passenger train from Liverpool to Snaith (a similar if slightly shorter journey) is less than 3 hours including station stops. This makes it less

flexible, less competitive, more expensive and less green than a more direct route.



Slowing trains to stop them in loops and then restarting them adds significant time to journeys, making the journey an inefficient use of scarce capacity, uncompetitive with road and increases the environmental footprint.

An Energy Sector Freight User



5.2 Cost Barriers

Cost barriers were identified by the then Office of Rail Regulation (ORR) in 2012 as being the main constraint holding firms back from utilising rail freight. Rail freight is perceived as being considerably more expensive to use than road by non-rail users¹⁷. Rail can be competitive for certain flows, but this is not always widely understood by the logistics industry¹⁸.

5.2.1 Transshipment Costs

Moving goods by rail may include additional transfers from/to road at either end of the route, complete with attendant lift costs, time requirements and the extra management involved in co-ordinating potentially three separate movement legs. This adds

¹⁷ Interestingly this perception is the case across Europe. See European Parliament, *Freight on Road: Why EU Shippers Prefer Truck to Train*, (2015). In terms of intermodal transport (for example) transshipment costs are a significant component of the cost of rail transport (with the cost of transferring a container varying between £50 and £150); however the actual cost per TEU-km is £0.31 for rail and £0.99 for road. See Rodrigues, et al., *UK Supply Chain Carbon Mitigation Strategies*, (2015).

¹⁸ For a detailed look at the comparison of costs by mode for certain key sectors where rail freight is the traditional choice see ORR, *Periodic Review of Rail Freight: Conclusion on the Average Variable Usage Charge and a Freight Specific Charge*, (2013) for a useful overview. For example the coal figures in the report (based on MDS Transmodal, *Estimating Road and Rail Costs between Coal Mines and Power Stations*, (2012) were that Rail cost £0.90 + £0.0135 (per km) and Road haulage cost £1.40 + 0.0729 (per km). Sadly other commodities do not share this ratio of costs.

significant cost to using rail as a mode opposed to a single, direct door-to-door road haulage service with a single contractor. However if one end of the journey is direct to a rail connected terminal site then it can make a much more attractive economic case. A specific constraint is that container handling equipment is expensive and needs to handle a significant minimum volume to be cost effective.



Rail-connected distribution centres could be a game changer as they'd dramatically reduce the costs of using rail freight by removing the road leg from the terminal; bringing distances where rail is competitive with road down to about 150 miles rather than 300.

An Experienced Rail Freight Expert



5.2.2 Facilities & Equipment

A significant cost for rail freight is the high capital cost for any new facilities, which is difficult for companies to justify in the short to medium term. This is particularly notable in comparison with the road network, which has very low access costs, if any.

Similarly, the cost of purchasing new road vehicles is significantly lower than the cost of investing in rolling stock, either independently or in partnership with a FOC.

Current facilities are also geared around current practices, and to adjust to rail freight as a major mode of haulage could require extensive investment in new facilities, equipment, vehicles and modes of working. For example:

- The dimensions and load capacity of a road trailer differs from that of an ISO maritime container, meaning that movements from nearby Europe are

more competitive by road than by a combination of short sea shipping and rail freight. Containers are especially badly designed for pallets or roll-cage dimensions, as commonly used on the road network, although swapbodies can offer a rail-compatible solution for domestic movements, however these have been inhibited by other constraints (see 5.1.1, 5.1.2, 5.2.1 and 5.2.2 for example).

- Similarly, moving containers around a customer or shipper's site and loading and unloading them may be more difficult than simply providing a normal road-hauled trailer.
- Unlike curtain sided lorries, rented containers are usually end-loading – which is slower than curtain-sided vehicles, although curtain-sided swapbodies are available.
- Temperature-sensitive goods can prove problematic in transit on the railway through difficulties in ensuring continuity of temperature, as refrigerated containers (unless specially designed) are not easy to transport on the railway due to their extra width.

Swapbodies overcome many of these disadvantages (including the temperature-control issue), however their greater weight means that fewer pallets can be transported per unit whilst remaining within the road weight limit of 44 tonnes gross vehicle weight, pushing up the costs of the road haul to/from the terminal (see 5.2.1) as more trips need to be made to transport the same number of pallets.

These issues are further exacerbated through the changes made in the past decade to overcome high fuel prices by haulage operators. Double-deck trailers, alternatively fueled vehicles and improved engine efficiency have all lowered road's operating costs in comparison to rail, and with fuel costs now lower than they have been, road's cost advantage has only increased, to the extent that even over long distances a double-deck trailer and a rail-borne swapbody are roughly equal in terms

of cost per pallet per mile, rather than rail offering a cost advantage as an incentive to switch mode¹⁹.

5.3 Flexibility Concerns

With the continuing use of “Just in Time” logistics throughout much of Britain's manufacturing and distribution sectors, it is important that shippers are able to send goods as and when they are required, with a high degree of reliability. This has tended to reduce consignment sizes, which affects rail freight's ability to compete effectively.

5.3.1 Train Path Suitability

Whilst freight trains are generally reliable (94% arrive within fifteen minutes of the scheduled arrival time - and this is the result of a concerted effort by rail freight stakeholders) they are often scheduled for night-time or evening working (see 5.1.4), which may not suit the schedules of either shippers or receivers of goods, especially those which are not currently moved by rail and where schedules are not built around this. Furthermore, with road haulage it is possible to re-arrange routes in response to new information instantaneously, whilst rail haulage is considerably less flexible.

5.3.2 The 7 Day Railway

Despite the ongoing improvement works (and, indeed, partly as a result of them) it is not possible to offer a reliable, 24/7²⁰ service to customers, as routes are often constrained at night for engineering purposes, and alternative routes lack suitable capabilities. Instead often road freight may be required for one or more days or journey times lengthen considerably – in order to simplify processes, it is easier to use the stable medium of road haulage as opposed to dealing with different modes on different days. However it should be noted

¹⁹ Companies moving to incorporate rail into their supply chains are forced to significantly restructure their supply chains, such as increasing inventory, extended delivery windows and better planning due to intermodal transport's increased inflexibility. See, for example Woodburn *Potential for Modal Shift of Freight from Road to Rail in Great Britain*, (2003) and Larsson & Kohn, *Modal Shift for Greener Logistics*, (2012).

²⁰ In practice freight tends to move on 6 days per week rather than 7, but the term 24/7 is used as its meaning is more widely understood.

that Network Rail are making significant strides toward improving the consistency of their service offer over route corridors across the 7 day period.

5.3.3 Diversionary Routes

The rationalisation to a more skeletal network since the 1960s has not only reduced the number of locations served by the railway but has also reduced its resilience for disruption (for example the relatively fragile Dawlish Sea Wall section is now the only route linking Plymouth and all of Cornwall to the wider UK Network). Diversionary routes are liable to incur additional distance than would otherwise be the case, a problem exacerbated by gauge clearance issues on existing diversionary routes off the main rail freight network, which limit Network Rail's ability to assist FOCs in finding alternative routes. When this lack of suitable diversionary routes is combined with the need for maintenance occupations at night time and weekends, the result is a relatively 'brittle' rail freight network which has little scope to cope with unplanned disruption.

5.3.4 Variance in Volume

Many consignments are informed by 'last minute' stock adjustments and updates, requiring a suitable shipment to be compiled and sent to the manufacturer or retailer. With road haulage, it is easy to accept flexible load sizes, with additional vehicles being relatively easy to hire as and when required.

Rail, by contrast, has demonstrated a requirement for large, steady shipments which provide 'critical mass' to underwrite the sending of the entire train. This minimum size requirement limits the number of firms which can use the railway to large distributors, and even these firms find the inability to flex the load size means that road haulage is often the fallback for adjustable capacity. This is particularly the case with regard to domestic movements (exacerbated by the lack of domestic terminals – see 5.1.2), however there are a number of services providing links from deep-sea terminals (which provide a suitable

volume of potential tonnage) where it is possible to book smaller consignments. Smaller firms, requiring the flexibility without the critical mass for a train, and with limited aggregation in the rail market (as opposed to the road market where it is commonplace) are excluded from the domestic rail market. Whilst 3PLs in the industry offer an entry point for occasional or sporadic flows, in terms of domestic movements these are mainly based around Anglo-Scottish traffic where several services with a regular 'baseload' from a larger client underwrite the service.

5.4 Awareness & Attitude

Discovering information about the rail network's freight capabilities in an easy and useful form for shippers and forwarders is difficult; especially outside of established deep sea intermodal movements, assuming that they wish to do so in the first place.

5.4.1 Ease of Access

For current non-rail users, access to the rail network is not obvious. Whilst road haulage is relatively easy to arrange, the understanding required to engineer a rail shipment is significantly deeper, and requires services of specialist freight forwarders. This is particularly relevant in terms of markets outside of deep-sea intermodal. There is not, currently, a "marketplace" where spaces or slots on trains are traded or readily available to the wider market. Whilst Network Rail has produced a guide to Rail freight, and some access contacts, a much better interactive and real time site providing information on terminal locations or methods of planning a shipment by rail would undoubtedly be of assistance.

A logistics planner eager to explore rail freight as an opportunity has no starting point and little reference material, although the Freight Transport Association does offer some assistance to members in this area.

5.4.2 Demand Side Inertia

Of course, the above assumes that transport planners are willing to use rail freight. However, behaviour is notoriously difficult to change once habits have been formed. After many years where rail has struggled to compete with road freight, consultation has shown that many shippers do not consider rail freight as an alternative that could be suitable for their business²¹. There is a need to overcome this cultural aversion if significant modal shift is to be seen. Furthermore, operating practices and equipment (see 5.2.2) have been based around road transport for a long time, and as such a shift to embracing rail freight will require a paradigm shift in both perceptions and practices.

5.4.3 Startup Risk

Many of the UK FOCs have had little incentive to actively seek out new flows where this involves excessive development cost and are understandably averse to taking on financial risk, given the low margins in the transport industry, especially when considering the high capital cost and long asset life of equipment²². This aversion limits new flows to 'tried and tested' solutions which have thus far not proven able to attract significant new flows outside of established, existing routes and sectors²³.

Similarly, entry into the industry is limited by these same high costs, the long timelines of service generation and the low margins on offer. Only Colas, Devon and Cornwall Railways and Victra Rail have successfully entered the industry as operators in recent years, and these operators occupy niche positions in the market.

²¹ Runhaar & Heijden, *Public Policy Intervention in Freight Transport Cost* (2005) found that even a 50% increase in transport costs over 10 years wouldn't result in substantive change in transport methods.

²² Schijndel & Dinwiddie, *Congestion and Multimodal Transport* (2000) demonstrate that transport planners are unlikely to use services which are not suitably well-developed and established.

²³ See also the RHA, *Inhibitors to the Growth of Rail Freight*, (2007)

5.5 Skills & Training

The UK transport sector underperforms with regard to education and training, meaning that the workforce may not be best able to adapt to changing technologies. Given the need to boost innovation across the rail freight sector, this needs to be corrected by boosting the attractiveness of the rail freight industry to those with the correct skills and enthusiasm, as well as ensuring that existing staff are suitably skilled and flexible to adopt new working practices and boost productivity.

5.5.1 Missed Opportunities

There is a need to make sure that rail freight companies take full advantage from engaging with the skills agenda. An example of this is that FOCs (who pay the Apprenticeship Levy) may not currently be taking up opportunities that result from the scheme, denying access to some of the UK's most promising young people.

5.5.2 Complex Skills Landscape

The freight industry includes a wide range of skills and needs a diverse intake of people to ensure efficient movement around the system, especially in rail freight which often involves consideration of multi-modal journeys. As such there are currently a large number of organisations, strategies and initiatives seeking to engage with some of these existing workers and potential employees. There is also a need to upskill the current workforce in the use of new technology and systems to ensure that innovative and flexible solutions can be implemented quickly and efficiently.

5.6 Summary

These 15 barriers represent a range of different issues affecting rail freight. Some can be overcome through targeted infrastructure investment, whilst others will require operational changes and a shift in mindset both of the railway industry and those seeking to move freight. When looking at how these barriers affect the sectors identified as being most suitable for rail

freight growth and modal shift, some of this differentiation becomes clearer.

Table 5.1 shows the relationship between the identified barriers and the potential key growth sectors for the rail freight market (as laid out in Chapter 2), as understood through the consultation process.

Table 5.1: Identified Barriers and their interaction with identified potential growth sectors

	Construction	Intermodal (Ports)	Intermodal (Domestic)	Channel Tunnel	Automotive
5.1.1 Network Limitations	✓	✓	✓	✓	✓
5.1.2 Terminal Limitations	✓	✓	✓	✓	✓
5.1.3 Wagon Availability				✓	✓
5.1.4 Journey Time			✓		
5.2.1 Transshipment Costs		✓	✓		
5.2.2 Facilities & Equipment	✓	✓	✓	✓	✓
5.3.1 Train Path Suitability		✓	✓	✓	✓
5.3.2 The 7 Day Railway		✓	✓	✓	✓
5.3.3 Diversionary Routes	✓	✓	✓	✓	✓
5.3.4 Variance in Volume		✓	✓	✓	✓
5.4.1 Ease of Access		✓	✓	✓	✓
5.4.2 Demand Side Inertia	✓	✓	✓	✓	✓
5.4.3 Start Up Risk		✓	✓	✓	✓
5.5.1 Missed Opportunities	✓	✓	✓	✓	✓
5.5.2 Complex Skills Landscape	✓	✓	✓	✓	✓

6) Policy Options

In order to encourage modal shift and lower carbon emissions for the future, there are a number of interventions (see table 6.1, 6.2, and 6.3) which could be made to overcome the identified barriers.

In response to the overall constraints identified in Chapter 5, a series of policy options have been developed which could help to overcome some of the barriers identified. Some are recommendations for further study or more close and collaborative working between industry players – which whilst not having a direct impact necessarily on rail's modal share, may lead to more effective solutions as part of a wider programme of improvements to the ability to meet market requirements and deliver efficiency gains.

This builds on the substantial progress that has been made by the industry since privatisation, and which is referred to in this section where appropriate.

Each section concludes with a table setting out identified potential actions. No detailed review has been carried out, and the scoring is therefore subjective, but the categories used are as follows:

- **Priorities** – a subjective assessment of the importance of each option and its likely achievement of the overall strategic objectives (High, Medium and Low)
- **Deliverability** – the assessed complexity of achieving a successful outcome (Difficult, Medium, Easy and Variable)
- **Cost** – a general estimate of the likely scale of investment necessary (Up to £5m - Low, Up to £50m - Medium and over £50m - High)

- **Timescale** – approximate estimates of the time for implementation. Therefore before 2020 is classified as Short-Term, before 2030 as Medium-Term and beyond 2030 is Long-Term.

6.1 Investment and Infrastructure Schemes

Several of the identified barriers cannot be overcome through 'soft' interventions and will require active and focused investment in developing physical infrastructure. Where possible (with terminals, for example) this should be sought in partnership with the private sector, however some policies (such as safeguarding land) can only be undertaken by the public sector (DfT and Network Rail).

6.1.1 New-build Terminals

An SRFI has recently been approved near St Albans, and another recently at East Midlands Airport, but more are required to address growing demand and to influence rail's position in the distribution sector. Existing terminals elsewhere have already been expanded to cater for volume growth and continue to be under similar pressure. Pressure on port terminals also continues to increase, and is driving expansion in handling facilities.

New terminals need suitable brownfield or greenfield sites, and those which have previously been used for rail purposes are more likely to be able to connect effectively into the national network. Protecting suitable sites, as discussed in sub section 6.1.2, can facilitate this.

Government policy, in terms of planning guidance, was revised in 2014, as part of the National Networks National Policy Statement.²⁴ This has set the scene for terminal developments, but it has to be

²⁴ DfT, *National Networks National Policy Statement*, (2014).

recognized that there is a long lead time from project inception to securing planning consent for terminal developments. This is therefore a long-term process.

However the government has stated its belief that as the number of high quality intermodal terminals around the country increases, more internal flows from terminal to terminal will become viable, diverting trunk traffic away from road. This will, however, depend on there being sufficient terminals with coverage across all the major UK regions.

It is also important that new terminals have high quality infrastructure connecting them with the main line network, to ensure that maximum length trains can enter and exit as efficiently as possible. This will ensure that specific terminal capacity constraints are avoided. Developers building terminals could be influenced to locate them where rail is accessible.

Whilst a number of new terminals have opened in the last 10 years, there is still a shortage of rail connected freight terminals and distribution hubs in key locations, especially serving several urban areas in general and London in particular. As such the government needs to support the continued creation of new terminals to improve access to the network and minimise the amount of road mileage run to and from terminals. These terminals need to be purpose built to reflect their intended market – intermodal terminal layouts are very different from bulk terminals, and can also be significantly influenced by the site geography and the nature of the main line rail connections.

Some sectors (notably domestic intermodal) can only grow if there is a sufficient range of terminals available across the country. This sector would make considerable contributions to carbon emissions if it expanded significantly.

The lead time between identifying a site, securing the necessary planning consents for its development and constructing the terminal and main line connections can be as long as 10 years. Developers face considerable risks in developing their proposals. It therefore has to be recognised

that this is a long-term initiative that would need consistent government support.

Part of this initiative could involve streamlining the application processes – developers complain that the current procedures are lengthy and can cost £millions to secure.

Indeed, the planning process is crucial in opening sites elsewhere in the country for rail freight terminal expansion, be it for intermodal or construction. The changes we are seeing in the economy are releasing a number of rail-connected brownfield sites that would be ideal for future rail freight terminal use – former power stations and MOD depots are obvious examples. However, local authorities are under pressure to build more houses, inevitably see these sites as opportunities for residential development. Government could require local authorities to give 'first refusal' to new rail freight use before releasing such sites to alternative uses. To put some names to this as examples, Didcot, Rugeley and Ferrybridge power stations and MOD Bicester all have excellent rail and road links and are ideally suited as rail-based distribution hubs.

Identified Potential Action

In combination with '6.1.2. Safeguard Land', there is a need to ensure that more terminals are built in suitable locations which can serve the identified growth sectors (in particular intermodal terminals and construction sector railheads linked to urban areas). This could be incentivised by the government to create conditions for wider rail freight use and the associated carbon saving that would result from the growth of domestic intermodal and railborne construction traffic.

Terminal costs have not been assessed as the underlying factors (location, area, land value, network connections, road infrastructure etc.) vary significantly in each case.

Priority	Deliverability	Cost	Timescale
High	Difficult	Variable	Medium

6.1.2 Safeguard Land

There are a number of significant unused sites and corridors of land which are owned by councils, Network Rail and the British Rail Residuary Board's successors at London & Continental Railways. Many of these are adjacent to or relate closely to the rail network and could provide locations suitable for rail freight purposes as diverse as linking chords between lines, sidings, passing loops or even terminals for freight reception and/or delivery. This is particularly the case with the current changes in the economy resulting in rail-connected brownfield sites becoming available (such as former power stations and Ministry of Defence sites). It is important that these sites are not transferred to alternative ownership without a full assessment of their practical value to the freight network having been carried out, perhaps even with "first refusal" being offered to new rail freight use before being released to alternative uses (at present this only applies to regulated rail sites owned by Network Rail).

There are regulated provisions covering the safeguarding of some freight sites, but continuing pressures for the development of sites for non-rail purposes must be resisted, both in terms of policy and execution. This should form part of the strategic plan.

Identified Potential Action

Identify and safeguard railway land that may have long term future utility.			
Priority	Deliverability	Cost	Timescale
High	Medium	Variable	Short

6.1.3 Refurbished Terminals

Some existing terminals may have been run-down as their original purpose (such as shipment of a single commodity) has changed or ceased. There is potential for these to be re-developed, where suitable, into rail freight terminals more relevant to the needs and requirements of the modern freight industry. Sites which are losing their core operation (such as power stations) may provide good opportunities for private sector development. Converting an already rail connected site significantly reduces the time

needed to develop new viable rail business, and removes the considerable costs involved to create new network connections.

The scope for a change of sector is limited; it has happened for example at Burton-on-Trent, where wagon storage sidings were converted into a small multi-modal terminal handling both intermodal and conventional traffic. There is also potential to change the nature of bulk terminals, for example by altering and lengthening the track configuration to permit longer trains to run, or revising the loading and unloading facilities to allow improved handling plant to operate. This can deliver significant benefit, in allowing higher capacity trains to run to the terminal making better use of train paths, and reducing unloading times, generating resource efficiencies. This can both improve network efficiency and also make the terminal itself more customer responsive and therefore commercially attractive.

The investment required will be supplied by the private sector (by freight customers, developers or FOCs) working in conjunction with Network Rail and needing the policy encouragement which can be supplied by DfT.

Identified Potential Action

Identify currently dormant or defunct terminals which may be suitable for re-purposing to serve the identified growth sectors, and encourage this conversion to be undertaken by the private sector. Brownfield sites should be quicker.			
Priority	Deliverability	Cost	Timescale
Medium	Easy - Medium	Low - Medium	Short-Medium-

6.1.4 Capacity & Gauge Enhancements

Specific capacity and gauge enhancements are being developed by Network Rail, and will be outlined in their forthcoming Freight Network Study. This report only looks therefore at the themes that will underlie these interventions.

In addition to continuing the process of gauge clearance and capacity improvements already achieved by Network

Rail, it is important to look further ahead. Gauge clearance has delivered W10 access between all the principal deep-sea ports and the Midlands, North West and Scotland. Further expansion of the network is required to support future business growth.

This could include large schemes such as the electrification of the core network and missing links for freight services to encourage the uptake of cleaner, more efficient and more powerful electric locomotives and smaller schemes such as renewing turnouts so that freight trains can be looped and stabled more quickly without excessive, long periods of 20mph operation. Another option is to develop the Strategic Freight Network of electrified gauge cleared routes at geographic points across the country that mirror key road routes, helping to improve currently poor east-west links in the country. There is certainly a clear case that on certain routes freight trains hauled by electric locomotives, offer significant performance advantages which in turn may ease pressure on capacity as more trains seek to use the route overall.

The proportion of throughput by rail from Felixstowe could be further enhanced by providing additional capacity on the Felixstowe branch line and on the routes to the East and West Coast Mail Lines. Several consultees highlighted that this is the single most important investment that would lead to an increase in the volume of rail freight in the UK. Indeed, radial diversionary routes (Felixstowe – Nuneaton, East West Rail from Oxford to Bedford, and the North Downs Line from Redhill to Reading) all have to be considered to relieve pressures on capacity on routes around London. However, all of these projects would require significant investment, and can only be implemented over a long period.

However, these constraints mean that prioritisation of completion of the F2N project to improve access to Felixstowe is a key priority and further interventions such as electrification and doubling of the Felixstowe branch will be required after that.

In addition to the F2N project, other cross country routes (such as Nottingham to Grantham and Syston (near Leicester) to

Stoke-on-Trent) are incremental additions to this core strategy, but are vital to provide the 24/7 gauge cleared network coverage that the freight industry demands.

The East West Rail initiative to create a new electrified freight route from Oxford to Bedford also has relevance for intermodal traffic from Southampton. However this needs to be reviewed to determine that it provides the correct network response to freight growth.

This, along with heavier and longer trains (amongst other interventions), will enable better utilisation of existing assets and more efficient movement of goods. Some of these are detailed below:

Longer Trains

Infrastructure works to increase the permitted train lengths to 775m on all core freight routes is a priority for Network Rail, though this is a long-term strategy requiring major investment. It would allow operators to make more efficient use of train paths, potentially delivering up to 50% greater productivity. However in turn longer trains are likely to need more powerful freight locos to maintain or improve performance and stronger wagon couplings. Electric locos usually provide improved performance compared to their diesel equivalents, and may offer the solution to longer trains.

For certain low-density traffics (such as automotive, where rail struggles to compete with high capacity road vehicles), and where the performance of longer trains is not so much of an issue, there could be a case to further increase these length limits towards 1,000 – 1,500 metres to maximise rail's competitiveness. However there may be barriers to implementing this on the mixed traffic railway, including the need for longer loops, higher entry speeds and capacity constraints caused by slower trains.

Heavier Trains

On some routes individual structures have speed limits for RA10 traffic which impact on the viability of heavy axle load paths. Existing restrictions could be targeted to remove existing constraints for heavy axle load traffic on core routes to enable these

trains to operate at maximum train speed for the category of line.

However on certain core bulk routes there has long been a case for increasing this towards the US standard of 30 tonnes, and the standard CEN 60 rail and many of the wagons already in use would permit this (though may require their coupling equipment to be updated). There may be an opportunity for some core bulk routes to be upgraded to 30 tonne axle loads, though the decline in UK industrial activity may be reducing the network value of this. Further work is required to understand the impact of these heavier trains on braking distances and their suitability (as a result) for inclusion on the mixed traffic railway – it is likely they would only be suitable on routes utilising electric traction.

In addition to these interventions, the achievement of sensible overnight reliability is an essential part of making rail commercially attractive, and improving the core reliability of the network. Provision of alternative routes with suitable capability (predominantly gauge and capacity) between routes remains a top priority for the industry. This has particular relevance to high value traffic such as some container traffic (which is gauge dependent) and parcel flows (which are highly time sensitive).

More work is required to ensure that in all cases diversionary routes are also cleared to these gauges, and that potential new freight terminals can be exploited on routes that are currently gauge constrained. This will be crucial to provide support to the continuing intermodal growth.

Freight Loops

When route investment takes place a priority should be to improve the access and egress from freight facilities to the network with switches that can be used at speeds of at least 40 mph, longer 'run off' tracks that allow trains to enter and exit the running lines at speed, and signalling that facilitates crossing moves on the flat (noting that it is usually impossible to build grade separated facilities). Network Rail is developing 'Nodal Yards' at key locations to provide increased

freight capacity and provision of fast routes into and out of these facilities is a crucial requirement.

This increases the number of timetabled paths available to FOCs (which are often restricted purely by the time taken to negotiate these slow speed points) and also provides significant operating cost and emissions benefits by reducing the acceleration and deceleration times.

There are some further points of improvement for consideration based around certain routes which are outlined below:

East Coast Mainline

Access to the less frequently used 'freight friendly' Joint Line between Peterborough and Doncaster is a problem, which needs a grade separated junction north of Peterborough to resolve. Loops north of Northallerton are considered essential in the future, and reinstatement of the Leamside Line may be essential, again if HS2 increases passenger traffic on the main line via Durham.

Great Western Mainline

Forecast freight growth on this corridor will require intermodal access to terminals in South Wales and the South West, and this will require sufficient GWML daytime freight capacity. This may require that freight operators make full use of the electrification currently being implemented, which in turn means that it is essential that the project provides adequate electrified freight facilities. Indeed, it is important that the slow/relief lines and access lines to and from freight terminals are electrified.

Network Rail already forecasts that infrastructure works such as quadrupling and more dynamic freight loops will be needed to increase route capacity for freight trains in line with its Route Study demand forecasts.

Midland Mainline

Electrification of the MML to Nottingham and Sheffield will deliver an increased passenger service frequency north of Bedford, which is likely to further restrict freight paths on the

capacity constrained (largely two track) route section between Bedford and Leicester. Network Rail is forecasting a need for further capacity enhancement works and restoration of disused freight infrastructure between Bedford and Leicester, especially if DfT's East West Rail initiative to divert some freight to the MML from the WCML via East West Rail is implemented.

Trans Pennine Routes

Currently no Trans Pennine routes are electrified and there is no W10 gauge capability. Significant freight investment in one or more of the three main corridors will be required to avoid growth being constrained during the next Control Period, while new traffic may require the provision of more powerful diesel (or electric) locomotives.

Finally, it is suggested that a study is conducted, looking into facilitating "mega-cube" container trailers on the GC gauge high speed rail network or innovative options for the classic network (such as S75 swapbodies on low deck wagons via W12 gauge cleared routes).

The continued availability of ring-fenced capital funding to finance freight specific network developments is seen as critical to the success of this initiative.

Identified Potential Actions

- a) Identify bottlenecks and capacity constraints likely to affect future growth of rail freight (such as those outlined in this report) and then direct and ensure delivery of targeted, prioritised improvements, both in terms of physical infrastructure and operating practices.
- b) Target investment to address problems faced by the growing rail freight sectors
- c) Need for additional capacity for high cube boxes on parts of the network.
- d) Improved network reliability and resilience to boost on-time arrivals.
- e) Work closely with ports to ensure that barriers to increasing rail freight capacity are overcome by the implementation of capacity improvements where required.

- f) Examine the opportunities for moving "mega-cube" trailers (P400)²⁵ in the UK High Speed Rail network (HS1 and HS2).
- g) Continue developing longer & heavier train capability across SRN and on selected other routes.
- h) Continue improving the railway network to deliver a "24/7 Railway" to enable more reliable planning and resilience and meet customer expectations.
- i) Need to improve east-west links - creating a network ladder of electrified gauge cleared routes mirroring key road routes: A69, M62, A50, A14, A43 + M25.

	Priority	Deliverability	Cost	Timescale
a)	High	Medium	High	Medium - Long
b)	Medium	Medium	Variable	Short-Medium
c)	High	Medium	Variable	Short-Medium
d)	Medium	Medium	Variable	Medium
e)	High	Medium	Medium	Medium
f)	Low	Medium	Low	Long
g)	Medium	Medium	Variable	Medium
h)	Medium	Variable	Medium	Medium
i)	High	Variable	High	Long

6.2 Innovation and New Systems

New technology and dynamic processes enable better use of existing assets and may provide potential benefits for rail freight in terms of competing with road. These can range from adjusting practices to better accommodate existing technologies to positive interventions such as adoption of new fuel technologies.

6.2.1 Alternative Technology for Rail Locomotives

While rail freight emissions per tonne km are very substantially below those for road, the technology used to move freight on the road has improved dramatically over the past 25 years, while rail has not seen similar development in terms of efficiency and emissions. Substantial progress has been made in using train space more efficiently,

²⁵ Size of HGV trailer using the international coding methodology applicable to road trailers suitable for rail transport.

which reduces emissions per payload tonne, but a step change in traction emissions may depend on a greater take up of electric traction.

In the short term (next 10 years) there may be a case for establishing handover locations on electrified main lines where a local operator can diesel haul the train onto its final destination. In addition, electrified arterial routes and nodal yards could act as convenient staging and changeover points. Higher speeds for freight traffic also enable trains to better operate alongside passenger traffic.

Network Rail and DfT have developed a strategic concept which seeks to establish a core electrified network from ports to key terminals to provide encouragement to the freight sector to invest in electric traction. However implementation has been delayed by the Hendy Review and the strategy may now be refocused into a more general electrification strategy. To be effective freight electrification would need to be largely completed by the time the Class 66 loco fleet needs renewal.

Class 66s were introduced into the UK between 1998 and 2016. As such some of the older locomotives will soon be reaching half-life assuming a forty year operational life. FOCs have already invested in enhancements to restrict emissions (such as the adoption of 'start-stop' technology to reduce idling time), and a rolling programme of refurbishment could involve further measures to reduce carbon emissions. This might be particularly useful in older members of the class, as more recent examples had additional fuel efficiency equipment fitted from new.

Progress has already been made with the use of Driver Advisory Systems (DAS) to provide drivers with the information they need to drive in a more efficient manner. Further assistance for FOCs in trialing low carbon locomotives could help to lower the emissions of rail locomotives and improve the sector's environmental advantage. Similarly research into potential disruptive interventions such as driverless freight locomotives and hydrogen/Liquid Natural Gas (LNG/battery fuelled locomotives (or

retro-fitting existing locomotives) could provide a significant investment opportunity and world-leading advantages to British rail freight.

Work to address the specific emissions and fuel efficiency issues of the Class 66, the UK prime freight mover, would have particular effectiveness for all FOC locomotive fleets.

Options which would secure other locomotives and refurbish and convert them for further freight use (for example reuse of class 90 locos freed up from London to Norwich passenger traffic) might also be addressed under this strategic option.

Identified Potential Actions

- | | |
|----|--|
| a) | Fund research into alternative fuel locomotives such as LNG or hydrogen or battery packs. Also assist retro-fitting Class 66's with "lean burn" engines. |
| b) | Research into using technology to reduce freight train operating costs is required to keep pace with the development of driverless trucks. |
| c) | Facilitate the trial of low carbon locomotives for any or all FOCs to try (including bi-mode 'last mile' diesel locomotives). |

	Priority:	Deliverability	Cost:	Timescale
a)	High	Easy	Medium	Medium
b)	Low	Medium	Medium	Medium
c)	High	Medium	Medium	Short

6.2.2 ITS Solutions for Rail freight

Tracking of individual loads on the railway is currently harder than on road due to the widespread application of telematics on lorries. FOCs have sought to counter this by using GPS on locomotives, equipping drivers with iPads, and making train operations data open source and available on the internet.

Solutions, including making Network Rail's TRUST system more widely available on a user friendly basis, and making wagon consignment data (currently using the TOPS system) more readily available to customers could provide better safe and secure information availability to rail freight

customers, boosting its competitive potential as opposed to road. There are also potential improvements to the end user experience as shown by the European iCargo project.

The adoption of the European Technical Specification for Interoperability for Freight Telematics (*TAF-TSI*) will provide opportunities to improve customer interfaces with the railway systems.

Identified Potential Action

Assist FOCs in equipping their locomotives with the latest communication and telemetry which is being developed by Network Rail and support wider digitisation of rail freight, including wagon technology and terminal technology.			
Priority:	Deliverability	Cost:	Timescale
Medium	Medium	Medium	Short

6.2.3 Studies into Supply Chain Solutions

Current logistics systems are not always compatible with rail freight (be this roll-cages for supermarkets or standard pallets from road haulage) without lengthy transshipment processes or the use of specialised equipment such as swapbodies. New solutions which can better match these requirements could be researched. For example if supply chains move to using a model where consolidation centres are built on the outskirts of our major towns and cities, could these be developed near the railway thereby offering a multi-modal choice. Similarly a study could investigate the conversion of 125mph passenger trains into express parcel carriers. These trains would operate at over twice the maximum speed of road transport, providing an attractive service that would also be easier to run amongst passenger trains than traditional, slower freight services.

Longer term, there are opportunities for urban deliveries which could incorporate purpose-built city centre modal transfer facilities, where small containers (20/30') could be offloaded for delivery within the Central Business District (CBD). If these could be devised to be easily joined or separated, so that they operated either as a

large unit (for trunk haulage) or smaller, discreet units (for the last mile) then this could go a long way to solving several problems relating to HGVs operating in urban areas and so the feasibility of these should be assessed. Similarly, a deep dive study to specifically assess the issues with moving imports/exports from/to ports via rail, including intermodal and bulk (e.g. steel) could provide increased tonnages on the classic network. This study would examine remaining barriers and seek to make recommendations to overcome them. By their very nature ports act as a natural agglomeration centre and hence there may be opportunities for accumulating sufficient critical mass to operate additional rail services.

Other study options could include assessing the feasibility of options as “rolling motorway” routes on congested corridors to enable significant HGV miles to be taken off the road network and transferred to rail, as in some European countries. This assumes compatible infrastructure is available and will assess the benefits forgone due to the restricted nature of the UK rail network. Rolling motorways potentially offer the biggest benefit by enabling significant HGV miles to be taken off the most congested corridors of the road network and transferred to rail. This is more likely to be appropriate in conjunction with the wider gauge available on HS1, and potentially investigated for application at night on HS2. Solutions could include European standards such as Modalohr (approved for the Channel Tunnel), CargoBeamer, ContainerMover and Megaswing, or a bespoke British solution. It is recognised that this is unlikely to be applicable to the classic Network Rail network but could be used on HS1/HS2. The study could also investigate the benefits of revisiting the need for a direct HS1 to HS2 link which is likely to benefit passenger and freight customers in the Midlands and North.

Identified Potential Actions

- Study the scope for a specialist, classic-compatible solution regarding domestic intermodal traffic in the guise of urban logistics (including modular containers). The study would investigate the barriers preventing further take-up of domestic intermodal movements.
- Study technology ideas for making modal switch easier and encourage their development. As part of this there would be a need to develop a methodology to provide financial and technical support to update certain current rail freight methods and adapt solutions developed for road haulage into solutions compatible with rail haulage. In this way rail can be technology led and keep pace with developments in road logistics.
- Study the benefits of introducing a “rolling motorway” system for long-distance & heavily trafficked routes such as London – North; Dover – Manchester including mandated use (as in Switzerland). This assumes compatible infrastructure is available and will assess the benefits forgone due to the restricted nature of the UK rail network.
- Commission a deep dive study to specifically assess the issues with moving imports from ports via rail, including intermodal and bulk (e.g. steel).

	Priority	Deliverability	Cost	Timescale
a)	High	Easy	Low	Short-Medium
b)	High	Easy	Low	Short
c)	Low	Easy	Low	Short
d)	Medium	Easy	Low	Short

6.3 Promotion, Marketing and Engagement

The ubiquity of road haulage has resulted in rail freight struggling to be considered as a viable mode of moving loads, especially for those without specialist needs. It is proposed to overcome this barrier through raising the profile of rail freight and also

making the initial steps in using rail for logistics simpler.

6.3.1 Web-Based Portal

Awareness of rail freight and the ease of accessing it needs to be improved in order to enable modal shift. As such making available the following could help inform potential users; an improved interactive map based database of existing rail freight terminals (and the commodities handled) along with case studies of previous successful modal shifts and guides as to the next steps, estimating costs, how to best utilise rail freight for different types of business and, crucially, a list of who to contact to progress developing a rail freight solution. It will of course be important to ensure that this is done in a way that provides equal access to all operators and participants, and does not discriminate in favour of certain organisations.

Identified Potential Actions

- Feature an improved interactive map of available terminals whilst developing a web-based booking portal.
- Produce a white paper to show the benefits of using rail freight services and how to access them so that SMEs and developers can better understand rail freight's offer.
- Showcase good examples of rail freight in operation to demonstrate its feasibility

	Priority	Deliverability	Cost	Timescale
a)	High	Easy	Low	Short
b)	Medium	Easy	Low	Short
c)	High	Easy	Low	Short

6.3.2 Financial Assistance

Enhanced support for those applying for freight grants could be provided. To do this it is would be necessary to better explain the process and provide assistance – this could be done through a Web-Based Portal (6.3.1) and could include advice and active support in applying for alternative funding streams.

One option that could be explored is to provide government funding, reclaimed on a usage charge basis, for upfront capital

investment in rail specific infrastructure, as a commercial arrangement rather than predicated on environmental benefits (as was the justification for Freight Facilities Grants). Another option could be shared funding of terminals with a risk and reward premium, much in the way that shared home ownership works to the benefit of the government and the developer.

“

The main barrier is speed; both getting Network Rail moving and also the grants system, they're both too slow. It only really works if the customer is willing to provide finance.

A Leading UK Ports Operator

”

Identified Potential Actions

- a) Provide advice and support to potential freight mode shift grant applicants.
- b) Ensure DfT website contains supporting information for prospective grant applicants and publicise the availability of these to make it easier for customers to apply.
- c) Support applicants making applications for other government grants.
- d) Need for long-term certainty of both capital and revenue grant funds.
- e) Terminal Connection Differential Subsidy to cover cost of rail connection to network.
- f) Capital Support Grant to be restarted for England to match devolved regions.

	Priority	Deliverability	Cost	Timescale
a)	High	Easy	Low	Short
b)	High	Easy	Low	Short
c)	High	Easy	Low	Short
d)	High	Easy	Medium	Short-Medium
e)	High	Easy	Medium	Medium
f)	Medium	Easy	Medium	Short

6.3.3 Develop Rail freight Conference Programme

There is a widespread lack of understanding about how rail freight operates and what it could offer many businesses. One such solution to overcome this lack of awareness could be a series of Rail freight Conferences around the country including the key stakeholders in the system and inviting non-users along to learn about the benefits and advantages of moving goods by rail. This promotional activity would build on previous engagements with the market such as The Haven Gateway (AECOM), CILT and FTA.

Identified Potential Actions

- a) Work with public sector partners and the rail freight industry to arrange a series of rail freight conferences targeted at key growth sectors.
- b) As part of the Conference programme there could be a funded, independent and impartial post (paid for by the industry) to actively seek out new flows and to work with end users to promote wider use of rail freight.

	Priority	Deliverability	Cost	Timescale
a)	Medium	Easy	Low	Short
b)	High	Easy	Low	Short

6.3.4 Rail freight Data Repository

Currently, despite the wealth of data collected by various stakeholders on freight movements on the rail network, this is disaggregated and not always compatible to enable analysis and network-wide assessment. An agreement with operators, Network Rail and others (including road haulage operators where appropriate) could develop a wealth of data for further study and to better pinpoint bottlenecks and inefficiencies in the system compared to road freight, including in terminal movements and the 'last mile' section of rail freight delivery on the road network.

Identified Potential Action

Current knowledge and analysis of the freight sector is too general, and commercial sensitivity prevents sharing of knowledge - an anonymised central hub for data would assist in benchmarking as well as offering a source of "average" and "usual" data across metrics.

Priority	Deliverability	Cost	Timescale
Medium	Medium	Low	Short

6.3.5 Barriers to Shared Loads

Groupage is a key part of road freight's success in providing flexible haulage for firms and manufacturers of all sizes by combining consignments into a unit lorry

load. In rail terms this would not extend to sharing individual container or wagon loads, but would certainly involve single trains conveying part loads for different FOCs, operators or customers between fixed locations. We see this as a crucial component, which could support the development of the domestic intermodal sector where individual consignment volumes can be relatively low. We do not advocate returning to a wagonload network (like the former BR Speedlink system).

Therefore as the network of SRFIs develop, it is imperative to develop a work programme with the freight operating companies and other key stakeholders to understand the technical, commercial and contractual barriers to moving shared loads. Whilst this has and can happen, it needs to become more widespread to consolidate traffic flows into viable rail volumes. A new load sharing "cloud" based service is being developed to allow the matching of available transport capacity to consignments. This system allows use by road and potentially rail applications.

Identified Potential Action

Work with freight providers to understand the technical, commercial and contractual barriers to moving shared loads specifically and how these can be overcome (links to 6.2.3. Studies into Supply Chain Solutions).

Priority	Deliverability	Cost	Timescale
High	Easy	Low	Short

6.3.6 Rail Freight Customer Forum

In order to provide a clear and ongoing location for dialogue and understanding of the requirements of freight users, a forum for discussion could be created with representative bodies from the market sectors identified as being suitable for future growth. This will enable a clear understanding of their requirements to be developed, as well as providing a body to facilitate other interventions, share best practice while preserving commercial confidentiality, and to work with FOCs to ensure successful modal shift. For example,

this body could inform the requirements of the web-based portal (6.3.1). In this respect the rail freight industry could more closely emulate the technical information sharing that takes place within the aerospace industry. The Rail Freight Group already facilitate this where possible but there is much more that could be done.

Identified Potential Actions

a) Engage with specific transport users to understand barriers and develop case studies of these being overcome.				
b) The voice of the end user/market sector needs to be brought in to enable a better understanding of the issues with using rail freight.				
c) DfT to seek further information engaging existing and potential users in the development plan process and how it could be further improved to identify key opportunities and optimise investment potential.				
	Priority	Deliverability	Cost	Timescale
a)	High	Easy	Low	Short
b)	High	Easy	Low	Short
c)	Medium	Easy	Low	Short

6.3.7 Freight Path Improvement

Considerable progress has been made by FOCs and Network Rail in eliminating unused paths and developing more efficient through paths that more closely match the performance of passenger trains using the route. Work has already been carried out (and is reported in Route Studies) to identify specific route freight capacity requirements.

However, more work is required to generate efficient freight paths that mix better with passenger trains and which may produce reduced journey times. This may give the opportunity to improve the efficiency of freight operations, and would also provide better and more robust passenger paths.

However there is a need to further ring fence freight capacity on the network in the face of stiff competition for paths from increased passenger services. As such it is important to ensure that high quality, fast and direct freight paths (with minimal waiting times) are

available across the Strategic Freight Network. This need for “clean” direct paths allows FOCs to use their rolling stock and staff assets in a more efficient way, thus helping to contain costs and be more competitive with road freight. This work should be undertaken in the context of the potential for allocation of significant increases in capacity after the completion of HS2, and may require some more fundamental reviews of capacity allocation between passenger and freight flows.

The solution is more likely to require the performance of freight trains to be improved to more closely match that of passenger trains on the same route. Greater use of electric traction may provide the most practical solution, however an alternative would be to limit the size of freight trains on some routes to ensure performance more comparable to passenger trains. Infrastructure enhancements such as faster entry and exit speeds on loops would also improve capacity.

Indeed, differentiation of an electrified or heavy haul diesel core main line network and secondary tripping to and from terminals might be consistent with this approach. It also might assist prospective site developers to know that there were potential network services that might serve it.

Identified Potential Actions

a) Actively target to improve the average speed of existing freight train paths across the network.				
b) Continue the rational approach to freight paths (which has already released 40% of freight paths) to continue to ensure operators better use existing capacity.				
c) Continue to secure fast, "clean" train paths for certain types of freight traffic through the Strategic capacity planning process – in the longer term requirements can be identified through the Network Rail Route Studies process.				
d) The DfT needs to ensure that the need to provide freight capacity on routes is recognised in Franchise agreements with passenger operators.				
	Priority	Deliverability	Cost	Timescale
a)	High	Medium	Medium	Short

b)	High	Medium	Low	Short
c)	High	Medium	Low – Medium	Short - Medium
d)	High	Easy	Low	Medium

lead to better internalisation of HGV external costs would be also part of this workstream. HGVs currently receive a £5 billion subsidy each year by not fully covering its external costs²⁶. Furthermore, it would allow rail and water to compete with HGVs on a level playing field.

6.4 Facilitation & Funding

By working to encourage rail freight (including where suitable assessing the potential for providing financial support either directly or indirectly for particular interventions) the DfT can provide an environment which supports its wider adoption.

6.4.1 Cost Stability Development

Long-term stability of operating costs and an understanding of how these are liable to shift over time enables more effective planning and keener pricing, and encourages long term investments by FOCs and other participants. There are a number of options that could be assessed to provide a better framework for developing a stable cost basis for track access charges and also costs applicable to rail and road transport – low oil prices and the freezing of fuel duty have recently affected rail freight's price competitiveness. Therefore in looking at the cost of rail freight in the long term, the strategy should consider elements such as track access charges (and the potential integration of a carbon element into their composition) and potentially lowering excise levels on locomotive gas oil.

Assessment should also be made of how road freight's costs are built up, including elements such as the fuel duty escalator and potential road user charging to see how the relative balance of costs is set to develop over the coming years, and whether this can be adjusted to encourage modal shift in the long term. It has been estimated by several sources (including Freight on Rail) that HGVs currently cover only 30% of their total costs when externalities such as congestion, environmental and road damage, are taken into account. Therefore there may prove a case for 'levelling the playing field' to enable fairer competition between road and rail.

Measures to address these inequalities between road and rail hauliers, which could

Identified Potential Actions

- Work with the ORR to explore options for how the charges and the incentives framework can provide a stable platform to enable and encourage growth in the sector.
- Better understand the financial and technical risks involved in setting up a rail freight service/business/flow (e.g. Fastline) and how this compares with road haulage, including the opportunity for funding support.
- Include a factor taking account of carbon saving benefits in the assessment of the freight track access charges.

	Priority	Deliverability	Cost	Timescale
a)	High	Easy	Low / Medium	Short
b)	Medium	Easy	Low	Short
c)	Medium	Easy	Low	Short

6.4.2 Wider Policy Framework

Support for rail freight needs to be considered across the wider policy spectrum of government. This has already happened with the planning system explicitly recognising the value of SRFIs. As a further example local authorities could aim to promote industrial development across the country especially in areas suitable for rail connection or as part of rail-linked hubs. Similarly when considering other government policy areas that could mutually benefit rail freight (such as power generation through biomass or the use of rail for major construction projects) considerations could be included at an early stage.

²⁶ Campaign for Better Transport, *Heavy Goods Vehicles – do they pay for the damage they cause?*, (2014)

Identified Potential Actions

- a) Encourage local authorities to link industrial developments and urban centres to rail freight facilities through grant funding, and encourage use of rail when considering minerals planning, major infrastructure (see 6.5.1 Large Project Procurement), air quality schemes, etc.
- b) Understand better the future for biomass (including the long term viability in UK energy generation) and how this can travel better by rail including better paths from import terminals to power stations

	Priority	Deliverability	Cost	Timescale
a)	High	Medium	Low	Short-Medium
b)	Low	Medium	Low	Short - Medium

6.4.3 Channel Freight Review

The Channel Tunnel has significant spare capacity for through rail freight, in a market where rail should be most competitive because of long distance hauls across mainland Europe. Furthermore, the larger gauge of HS1 (and HS2 if a purpose-built link is constructed in the long term) offers access to European wagons including a range of “rolling motorway” solutions, which could reduce HGVs in Kent and the M25 and produce carbon savings. However, this has not happened to date. Indeed, network limitations such as the lack of clearance for Class 92s and gauge restrictions also affect the diversionary routes freight trains can take.

The classic network cannot accommodate European gauge traffic (which has to use HS1 at night to access London). Future network enhancement towards European gauge would provide additional access options, which would address the current frustrated demand for this traffic.

Setting aside the temporary factors affecting the tunnel recently, an understanding of the barriers to long-distance rail freight needs to be gathered. This could include developing the role of the Channel Tunnel in European Rail Freight Corridor (RFC) North Sea –

Mediterranean, and exploiting the routes through northern France and on into Germany and the Baltics. If it seems that the private sector is unwilling to develop the market without government support, the possibility of a concession model could be explored similar to the French Autoroute Ferroviaire, where action by the French Government has facilitated the establishment of new routes to exploit new technology, by directing financial assistance to the projects.

The freight strategy should consider developing the ability to use HS1. Although high speed routes are heavily graded, and will only be suitable for lighter weight freight trains.

The implementation of the HS2 project from 2026 onwards offers greater possibilities for freight growth, if some of the released route capacity on the WCML, ECML and MML is allocated to freight use. Removing the fastest trains from the classic network could make freight and stopping passenger services much more compatible, optimising network capacity. It will be very important to ensure that sufficient daytime freight capacity to deal with the projected growth is reserved for the rail freight industry and is protected for future use.

Identified Potential Action

Stimulate market growth in Channel Tunnel rail freight. Apart from reviewing access and pricing, could also consider the development of a ‘freight concession’ operator.

Priority	Deliverability	Cost	Timescale
High	Medium	Medium	Short-Medium

6.4.4 Rail freight Innovation Fund

The creation of a ring-fenced fund to promote modal shift could be considered, providing long-term certainty behind continuing the Mode Shift Revenue Support (MSRS), which currently delivers a cost benefit ratio of over 4:1²⁷. It could also initiate the introduction of an infrastructure support grant as well as supporting innovative new ideas in partnership with

²⁷ Department for Transport, *Review of Revenue Support Freight Grant Schemes*, (2014).

industry. Ideally the fund should act as a gateway to wider funding opportunities.

Identified Potential Actions

a) Public sector funding has supported innovation in the road sector and there could be an equivalent considering barriers to innovation and attracting freight and helping overcome these. b) The DfT could establish a ring-fenced rail freight innovation fund including access to RSSB and Transport Catapult funding.				
	Priority	Deliverability	Cost	Timescale
a)	Medium	Easy	Low	Short
b)	High	Easy	Medium	Short

However, more opportunities surrounding large construction and development projects could be levered in using planning policy/requirements to mandate the use of rail transport for the bulk movement of material.

However, as mentioned elsewhere there is a need for suitable terminal sites for unloading and distribution. It is possible that some of these terminals could be built and used for construction materials during the building stage and then be refurbished and used for alternative uses such as an intermodal terminal once construction is complete.

6.5 Regulatory Intervention

In addition to incentivising new or expanded rail freight flows, an alternative approach is to encourage its uptake and modal shift through regulatory approaches. These can include procurement requirements for large construction contracts or developments, actively intervening to encourage new market entrants to boost innovation in the sector and even using legislative approaches to re-balance the playing field and increase effective competition between road and rail freight.

6.5.1 Large Project Procurement

A large number of big construction projects are in the pipeline for the United Kingdom, partly or wholly government funded, many of which have requirements for deliveries which could be supplied by rail freight. Examples include HS2, the Road Building Programme, airport expansion, rail network developments including Crossrail 2, and power generation projects. There is potential to incentivise or even stipulate the use of rail freight for some deliveries as a planning requirement, or as part of the overall procurement contracts. Insistence of the use of rail at the project outset would have significant advantage. The benefits of this strategy were demonstrated for both the Olympics and Crossrail.

Identified Potential Actions

- a) Positively discriminate in favour of rail transport for key government contracts and use these to showcase rail benefits (perhaps through issuance of guidance from National Infrastructure Commission on how infrastructure planning and procurement can support sustainable modes).
- b) Re-plan construction works and ensure that all contracts let by HS2, large housing schemes, New Towns, road building, etc. positively encourage contractors to use rail. Agree planning constraints where necessary.

	Priority	Deliverability	Cost	Timescale
a)	High	Medium	Low	Short - Medium
b)	High	Medium	Low	Short

6.5.2 Market Entry Review

Entry into the rail freight sector by new operators has been limited. Increased competition amongst rail freight operators helps drive innovation and lowers costs throughout the sector. As such, a detailed assessment of the barriers to entry to the sector could be undertaken to identify how they impact on new entrants and how they could be overcome. This could also consider the barriers involved in setting up new rail freight flows (particularly speculative intermodal routes which, whilst having long term viability, may not have sufficient initial traffic). Solutions to this may require some funding support to overcome the higher costs of entry to the market compared to those for road haulage.

Identified Potential Actions

- a) Conduct a review of whether the commercial leasing arrangements and requirements inhibit the start-up of new routes due to long-term commitments required in wagon leasing.
- b) Review with ORR (and invite input from FOCs etc.) to determine barriers to market entry and how to overcome them to make it easier for new rail freight operators to join the market.

	Priority	Deliverability	Cost	Timescale
a)	Low	Easy	Low	Short
b)	High	Easy	Low	Short

6.5.3 Cross Government Policy Intervention

Freight on Rail and others have produced compelling evidence that road freight does not pay for all its external costs. Government policy already recognises this and is providing grants to encourage mode shift to rail and water, based on the environmental benefits this produces. In certain cases, there may be further scope for using wider government policy to support the interventions listed above, aimed at boosting the wider adoption of rail freight in particular circumstances. This should be seen as a set of targeted, controlled steps for specific objectives rather than a blanket intervention. The aim of this is not to restrict road's competitiveness – rather it should be aimed at supporting areas where rail faces specific difficulties or there are opportunities where specific government policies can encourage mode shift. A good example of this is the government's support for converting thermal power stations from burning coal to biomass. When coordinated with investment in route infrastructure this has helped open up a new market sector for rail. In other areas key policy initiatives, such as reintroduction of the fuel duty escalator for road traffic, might be effective though would bring undoubted political challenges. This review should be wide ranging enough to be able to review legislative options such as

weight derogations for HGVs used for multimodal trips to boost rail's competitiveness

Identified Potential Actions

- a) Convene a joint industry group to identify valid and economically beneficial legislative measures which would encourage industry and retailers to increase their use of rail.
- b) Study the implementation of a range of legislative and policy options to increase the cost of road freight to take into account its externalities and level the playing field with rail (links with 6.4.1 Cost Stability Development).

	Priority	Deliverability	Cost	Timescale
a)	Medium	Easy	Low	Short
b)	Medium	Difficult	Low	Medium

6.6 Further Studies

In addition to the measures outlined above, a number of further studies could have effects on the reliability and attractiveness of rail freight. Whilst some of these relate to current operations, some reflect the potential that rail has to play a more significant role in the future.

6.6.1 Freight Corridor Resilience

Bridge strikes, flooding and other major infrastructure incidents have significant impacts on both road and rail freight; attempting to understand what causes these and how best to mitigate them will provide improvements to network reliability and lower costs.

Identified Potential Action

Study what causes disruption to key freight routes (e.g. bridge strikes, flooding, landslides etc.) and what interventions can be undertaken to lessen the number and impact, including how assessment of damage and return to normal service can be sped up if appropriate. Consideration could also be given to review the penalties for road vehicle users colliding with overbridge structures

Priority	Deliverability	Cost	Timescale
Medium	Medium	Medium	Short

6.6.2 Express Freight Solutions

There are some examples of niche products travelling by passenger train, such as parcels or fish from Cornwall. Understanding what steps were taken to enable this cross-sector working and its success may enable its emulation (where suitable) on a wider scale. This will bring rail freight to greater prominence as well as broadening the scope of commodities for which rail freight can provide a solution. This ties in with DfT's existing research programme, which is looking at the overall market for carriage of goods on passenger trains, and also is considering the potential offered by the existing Royal Mail train fleet. This strategy does not examine these areas in the interests of avoiding duplication.

Identified Potential Action

Investigate the conditions for the success of the current operational trials of freight by passenger train and develop recommendations how this can best be expanded and adopted more widely.

Priority	Deliverability	Cost	Timescale
Medium	Easy	Low	Short

6.6.3 Strategic Freight Network

Long-term guidance demonstrating commitment to the improvement of freight facilities will help to encourage wider use of rail freight, as using rail usually requires a long-term commitment. Therefore, it is recommended that DfT, working closely with Network Rail, reviews the Strategic Freight Network in light of the changing traffic

patterns identified in this report to ensure it is suited for the requirements of tomorrow's railway. This will include recommendations for Control Period 6 (2019-2024) and beyond, to improve resilience and flexibility. Therefore such a document should consider and recommend (where suitable) measures to improve the ability of the network to handle tomorrow's rail freight needs, including considering potential diversionary routes and the potential for re-opening short sections of track that have either been lifted or mothballed (e.g. Skipton – Colne, Shotton Curve and the Leamside Line).

Identified Potential Actions

- a) Develop a strategy for the electrification of the core freight network and ensure missing links are completed
- b) Review and identify the English and Welsh strategic freight network in light of changes in traffic patterns.
- c) Provide guidance on future plans to ensure that freight targets in HLOS for CP6 are met and that progress against these is monitored.
- d) Create suitable gauge cleared diversionary routes to enable freight trains to operate robustly during engineering works - including potential re-opening of closed lines (e.g. Leamside)
- e) Provide a vision of the SFN including the number of freight paths to be guaranteed during peak and off peak passenger hours
- f) As part of the freight strategic plan DfT needs to allocate sufficient freight paths post 2026/33 (HS2) on WCML, ECML and MML to provide freight capacity

	Priority	Deliverability	Cost	Timescale
a)	High	Medium	Variable	Medium
b)	High	Medium	Medium	Medium
c)	High	Easy	Low	Short
d)	High	Variable	High	Medium
e)	High	Medium	Low	Short
f)	High	Variable	Low	Short

6.6.4 Consolidation Centres

The pressures on both road space and air quality in urban centres has brought about renewed interest in the possibility of 'consolidation centres' on the peripheries of urban areas. London is leading the way in this initiative with the new Mayor intending to ban all but Ultra Low Emission Goods Vehicles from Central London. Often these centres act as warehousing hubs and sorting depots before the final 'last mile'. As such they are well-suited to be supplied by bulk rail freight trains, with the storage sorting and disaggregation of goods to supply small-scale road deliveries. Further work could be undertaken assessing the potential for these centres, their possible location, the feasibility of serving them by rail freight and also how these connections could then be further utilised to provide urban freight terminals for other traffics.

The conditions are not yet appropriate for such a strategy, but potential environmental restrictions are likely to make it more relevant in the future.

Identified Potential Action

Study the feasibility of a network of rail connected consolidation centres and their potential impact on air quality, congestion and carbon emissions.

Priority	Deliverability	Cost	Timescale
Medium	Difficult	Medium	Medium

6.6.5 European Rail freight

The UK now enjoys a direct rail connection to the continent, and this offers long distance journeys on the scale that makes rail freight very competitive. However market share through the Channel Tunnel is currently very low. Engaging closely with the TEN-T corridor network and seeing how the main UK freight corridors could be integrated into the wider European system, together with increasing commercialisation and liberalisation of the routes through to Europe, will enable better use of this unique asset, helping to significantly reduce congestion and improve air quality in the south east and around London through reduced HGV mileage. This applies both to the conventional classic rail route to London and the European gauge HS1 route, both of which have distinct advantages and disadvantages.

Assuming the UK continues to belong to Rail Freight Corridor North Sea - Mediterranean, potentially there could be European Union funding to part finance some schemes on this network. These interventions are aimed at achieving the stretching targets set out in the 2011 European Roadmap which anticipated that 30% of long distance road freight movements should use more sustainable transport (rail or water) by 2030.

Identified Potential Action

Fully engage with the European projects looking to enhance the TEN-T network. The UK has two routes where work should be ongoing.

Priority	Deliverability	Cost	Timescale
Medium	Easy	Medium	Short



6.7.1 Skills Access & Promotion

Improving the quality of both new and existing staff in the rail freight sector is a priority given the increasing rate of technological change in the sector. Furthermore, given the wider shortages of suitable staff in the logistics sector and the need to boost the image of a career in the sector to school leavers, graduates and other suitable potential workers, it is important that a clear and attractive career pathway is developed to attract talent.

Identified Potential Actions

- | | | | | |
|----|--|--|--|--|
| a) | Raise Awareness of careers in Rail freight using existing channels and promotional opportunities. | | | |
| b) | Develop a coordinated industry approach to developing clear career pathways and attracting apprentices, graduates and others onto the relevant pathways to meet industry demand as well as ensuring that transport managers across the logistics sector understand rail freight, either as a stand-alone initiative or as better engagement with existing schemes. | | | |

	Priority	Deliverability	Cost	Timescale
a)	Medium	Easy	Low	Short
b)	Medium	Easy	Low	Short

consideration of which interventions to progress should be taken with this information in mind.

Table 6.3 then ties the solutions, given the barriers they overcome, to the commodity movements most likely to be assisted by their implementation.

6.8 Summary

All of the interventions listed above are summarised in Table 6.1, along with their estimated priority, deliverability, cost and timescale. The interventions suggested would have an impact on the modal balance of movements to differing effects (and thus the resultant potential carbon saving) and so a high level assessment of these is also shown for each intervention.

Table 6.2, summarises how the identified interventions would together overcome the barriers outlined in Chapter 5, to enable increased modal shift to rail freight and lower carbon emissions. Several of the interventions were viewed either by consultees or the project team (or both) to have an impact on multiple barriers, whilst others were more targeted. Therefore any

	Priority	Deliverability	Cost	Timescale	Carbon Impact
Table 6.1: Summary Impact of Interventions					
6.1.1 New-build Terminals					
a) Encourage construction of new-build terminals for growth commodities	H	D	V	M	H
6.1.2 Safeguard Land					
a) Identify and safeguard railway and brownfield land with potential freight utility	H	M	V	S	M
6.1.3 Refurbished Terminals					
a) Encourage conversion of existing terminals for growth commodities	M	E-M	L-M	S-M	L
6.1.4 Capacity & Gauge Enhancements					
a) Identify key bottlenecks in infrastructure and operating practice	H	M-D	H	M-L	L
b) Target investment towards barriers limiting growth in commodities identified to have potential	M	M	V	S-M	L
c) Additional W12 gauge clearance for high-cube boxes on parts of the Strategic Freight Network	H	M	V	M	M
d) Improved network resilience and reliability	M	M	V	M	M
e) Work with ports to overcome barriers	H	M	M	M	L
f) Study the potential movement of mega-cube trailers on HS1 & HS2	L	M	L	L	L
g) Longer and heavier trains across the Strategic Rail Network	M	M	V	M	H
h) Delivery of the "24/7 Railway"	M	V	M	M	L
i) Improvement of east-west links to mirror road network	H	V	H	L	M
6.2.1 Alternative Locomotive Technology					
a) Research into alternative fueled locomotives and retro-fitting Class 66s	H	E	M	M	L
b) Research into use of enhanced locomotive technology	L	M	L-M	M	L
c) Facilitate trial of low-carbon locomotives	H	M	M	S	L
6.2.2 ITS Solutions for Rail freight					
a) Improve access to railway information systems for shippers and rail freight users. Also aid the development of productivity from a digital railway	M	M	M	S	M
6.2.3 Studies into Supply Chain Solutions					
a) Conversion of road haulage solutions into rail compatible solutions	H	E	L	M	M
b) Technological solutions for easing modal switch	H	M	M	S-M	M
c) Feasibility of introducing "rolling motorway" type solutions (especially for HS1 & HS2)	L	D	H	M	L
d) Assessment of barriers to intermodal movements and potential solutions	M	E	L	S	L
6.3.1 Web-Based Portal					
a) Map of current terminals	H	E	L	S	L
b) White paper showing benefits of rail freight including to SMEs	M	E	L	S	L
c) Showcase of current rail freight examples to demonstrate feasibility	H	E	L	S	L
6.3.2 Financial Assistance					
a) Advice and support for mode shift grant applicants	H	E	L	S	L
b) Ensure website contains supporting information for applications	H	E	L	S	L
c) Support applicants applying for other relevant government/European grants	H	E	L	S	L
d) Provide long-term certainty of capital and revenue grant funds	H	E	M	S	M
e) Terminal connection subsidy to cover the cost of railway connection	H	E	M	M	M
f) Capital support grant to be started for England.	M	E	M	S	M
6.3.3 Rail Freight Conference Programme					
a) Organise targeted series of conferences to promote modal shift	M	E	L	S	L
b) Independent rail freight facilitator for industry conferences	H	E	L	S	L
6.3.4 Rail Freight Data Repository					
a) Creation of anonymised central data hub	M	M	L	S	L
6.3.5 Barriers to Shared Loads (Groupage)					
a) Understand barriers to groupage and shared loads as part of building up critical mass for multi-user domestic rail flows	H	E	L	S	L
6.3.6 Rail Freight Customer Forum					
a) Engage with transport users to understand barriers in key sectors	H	E	L	S	L
b) Provide pathway for voice of end user	H	E	L	S	L
c) Better communicate with potential end users of rail freight to inform development process	M	E	L	S	L

	Priority	Deliverability	Cost	Timescale	Carbon Impact
Table 6.1: Summary Impact of Interventions					
6.3.7 Freight Path Improvement					
a) Actively target improved average freight train speeds	H	M	M	S	M
b) Mandate rational approach for better freight path utilisation to ensure available capacity is used to the full	H	M	L	S	L
c) Secure fast "clean" paths for certain freight traffic	H	M	L-M	S-M	M
d) Ensure the requirements for current and future freight capacity provision is included in franchise agreements in line with the Freight Market Study	H	E	L	S-M	M
6.4.1 Cost Stability Development					
a) Work with ORR to ensure stable cost platform in terms of regulated charges	H	E	L-M	S	L
b) Better understand financial and technical risks of new services and flows	M	E	L	S	L
c) Incorporate carbon saving into freight track access charges	M	E	L	S	M
6.4.2 Wider Policy Framework					
a) Encourage local authorities to link new industrial/warehouse facilities to rail	H	M	L	S-M	M
b) Understand future biomass movement requirements	L	M	L	S-M	L
6.4.3 Channel Freight Review					
a) Stimulate growth in cross-channel rail freight including the creation of a potential freight operating concession to reduce the commercial risk of introducing and operating new and existing services	H	M	M	S-M	L
6.4.4 Rail freight Innovation Fund					
a) Develop funding stream equivalent to government support for road innovation	M	E	L	S	L
b) Ring-fence fund and encourage access to other funding streams	H	E	M	S	L
6.5.1 Large Project Procurement					
a) Key government contracts could encourage the use of rail for the movement of construction materials and waste	H	M	L	S-M	M
b) Re-plan construction of large schemes to enable rail freight	H	M	L	S	M
6.5.2 Market Entry Review					
a) Review of leasing arrangements	L	E	L	S	L
b) Review with ORR the barriers to market entry	H	E	L	S	L
6.5.3 Cross Government Policy Intervention					
a) Convene joint industry group to assess legislative measures	M	E	L	S	L
b) Assess better incorporation of externalities into road freight charges	M	D	L	M	H
6.6.1 Freight Corridor Resilience					
a) Study key causes of disruption to freight routes and develop proposals for interventions during CP6	M	M	M	S	L
6.6.2 Express Freight Solutions					
a) Investigate wider use of passenger trains to convey light/small freight consignments	M	E	L	S	L
6.6.3 Strategic Freight Network inc. Electrification					
a) Develop a strategy for electrification	H	M	V	M	H
b) Review size and shape of the Strategic Freight Network in light of emerging traffic patterns	H	M	M	M	L
c) Provide clear guidance on future plans to ensure that freight targets for modal switch are met	H	E	L	S	L
d) Create suitable gauge cleared diversionary routes	H	V	H	M	M
e) Provide guarantees on freight paths for both peak and off-peak	H	M	L	S	L
f) Allocate sufficient freight paths post 2026/2033 (HS2)	H	V	L	S	M
6.6.4 Consolidation Centres					
a) Investigate potential for rail-connected consolidation centres	M	D	M	M	M
6.6.5 European Rail freight					
a) Engage with European projects to enhance UK's TEN-T routes	M	E	M	S	L
6.7.1 Skills Access and Promotion					
a) Raise awareness of rail freight careers	M	E	L	S	L
b) Develop coordinated industry approach to encourage clear career pathways	M	E	L	S	L

Table 6.2: Potential Solutions and Identified Barriers Potentially Affected by their Implementation

	5.1.1 Network Limitations	5.1.2 Terminal Limitations	5.1.3 Wagon Availability	5.1.4 Train Pathing (1)	5.2.1 Transshipment Costs	5.2.2 Facilities & Equipment	5.3.1 Train Pathing (2)	5.3.2 The 7 Day Railway	5.3.3 Diversionary Routes	5.3.4 Load Variance	5.4.1 Ease of Access	5.4.2 Demand Side Inertia	5.4.3 Supply Side Inertia	5.5.1 Missed Opportunities	5.5.2 Complex Skill Needs
6.1.1 New-build Terminals		✓				✓					✓	✓	✓		
6.1.2 Safeguard Land	✓	✓									✓				
6.1.3 Refurbished Terminals		✓				✓					✓	✓	✓		
6.1.4 Capacity & Gauge Enhancements	✓		✓	✓			✓	✓	✓						
6.2.1 Alternative Locomotive Technology	✓			✓											
6.2.2 ITS Solutions for Rail freight			✓	✓		✓	✓				✓				
6.2.3 Studies into Supply Chain Solutions			✓		✓	✓					✓				
6.3.1 Web-Based Portal										✓	✓	✓			
6.3.2 Financial Assistance											✓	✓			
6.3.3 Rail freight Conference Programme											✓	✓	✓		
6.3.4 Rail freight Data Repository	✓	✓				✓						✓	✓		
6.3.5 Barriers to Shared Loads (Groupage)							✓				✓	✓			
6.3.6 Rail freight Customer Forum								✓			✓	✓	✓		
6.3.7 Freight Path Improvement			✓	✓			✓								
6.4.1 Cost Stability Development											✓				
6.4.2 Wider Policy Framework												✓			
6.4.3 Channel Freight Review	✓			✓			✓	✓	✓			✓	✓		
6.4.4 Rail freight Innovation Fund			✓			✓						✓	✓		
6.5.1 Large Project Procurement	✓											✓			
6.5.2 Market Entry Review											✓		✓		
6.5.3 Cross Government Policy Intervention											✓	✓			
6.6.1 Freight Corridor Resilience	✓								✓						
6.6.2 Express Freight Solutions										✓		✓	✓		
6.6.3 Strategic Freight Network	✓	✓		✓			✓								
6.6.4 Consolidation Centres					✓					✓		✓			
6.6.5 European Rail freight	✓							✓				✓	✓		
6.7.1 Skills Access and Promotion														✓	✓

Table 6.3: Potential Solutions and relevance to identified rail freight growth sectors

	Domestic Intermodal	Port Intermodal	International	Construction	Automotive	Biomass
6.1.1 New-build Terminals	✓	✓	✓	✓	✓	✓
6.1.2 Safeguard Land	✓	✓	✓	✓		
6.1.3 Refurbished Terminals	✓	✓	✓	✓	✓	
6.1.4 Capacity & Gauge Enhancements	✓	✓	✓	✓	✓	✓
6.2.1 Alternative Locomotive Technology	✓	✓	✓	✓	✓	✓
6.2.2 ITS Solutions for Rail freight	✓	✓	✓	✓	✓	✓
6.2.3 Studies into Supply Chain Solutions	✓	✓	✓		✓	✓
6.3.1 Web-Based Portal	✓	✓	✓			
6.3.2 Financial Assistance	✓	✓	✓			
6.3.3 Rail freight Conference Programme	✓	✓	✓	✓	✓	✓
6.3.4 Rail freight Data Repository	✓	✓	✓	✓	✓	
6.3.5 Barriers to Shared Loads (Groupage)	✓	✓	✓			
6.3.6 Rail freight Customer Forum	✓	✓	✓	✓	✓	✓
6.3.7 Freight Path Improvement	✓	✓	✓	✓	✓	✓
6.4.1 Cost Stability Development	✓	✓	✓	✓	✓	✓
6.4.2 Wider Policy Framework	✓	✓	✓	✓	✓	✓
6.4.3 Channel Freight Review			✓		✓	
6.4.4 Rail freight Innovation Fund	✓	✓	✓	✓	✓	✓
6.5.1 Large Project Procurement				✓		
6.5.2 Market Entry Review	✓	✓	✓		✓	✓
6.5.3 Cross Government Policy Intervention	✓	✓	✓	✓	✓	✓
6.6.1 Freight Corridor Resilience	✓	✓	✓	✓	✓	✓
6.6.2 Express Freight Solutions	✓		✓			
6.6.3 Strategic Freight Network	✓	✓	✓	✓	✓	✓
6.6.4 Consolidation Centres	✓	✓	✓			
6.6.5 European Rail freight			✓		✓	
6.7.1 Skills Access and Promotion	✓	✓	✓	✓	✓	✓

7) Carbon & Intervention Modelling

One of rail freight's key advantages is its environmental performance when compared with road. Figures provided by DfT, Freight on Rail and others show that rail freight's emissions are about 10% of those for road, measured on a tonne kilometre basis.

Demonstrating these benefits has become key in convincing both public and private investors of the potential value of rail freight.

It also has a value to the UK economy in terms of the monetised environmental savings that sending traffic by rail rather than road generates.

In recent years, this demonstration has centred around savings in CO₂ and other greenhouse gas (GHG) emissions. As such, we have looked to demonstrate potential savings in GHG across rail freight forecasting scenarios as well as including a monetary value on the carbon saved. The following section details the methodology and planned scenarios to be modelled.

7.1 Methodology

The forecast estimates growth in rail freight volumes between now and 2030 by commodity from a baseline of current freight volumes transported. This forecast is turned into equivalent road journeys as shown in Chapter 4.

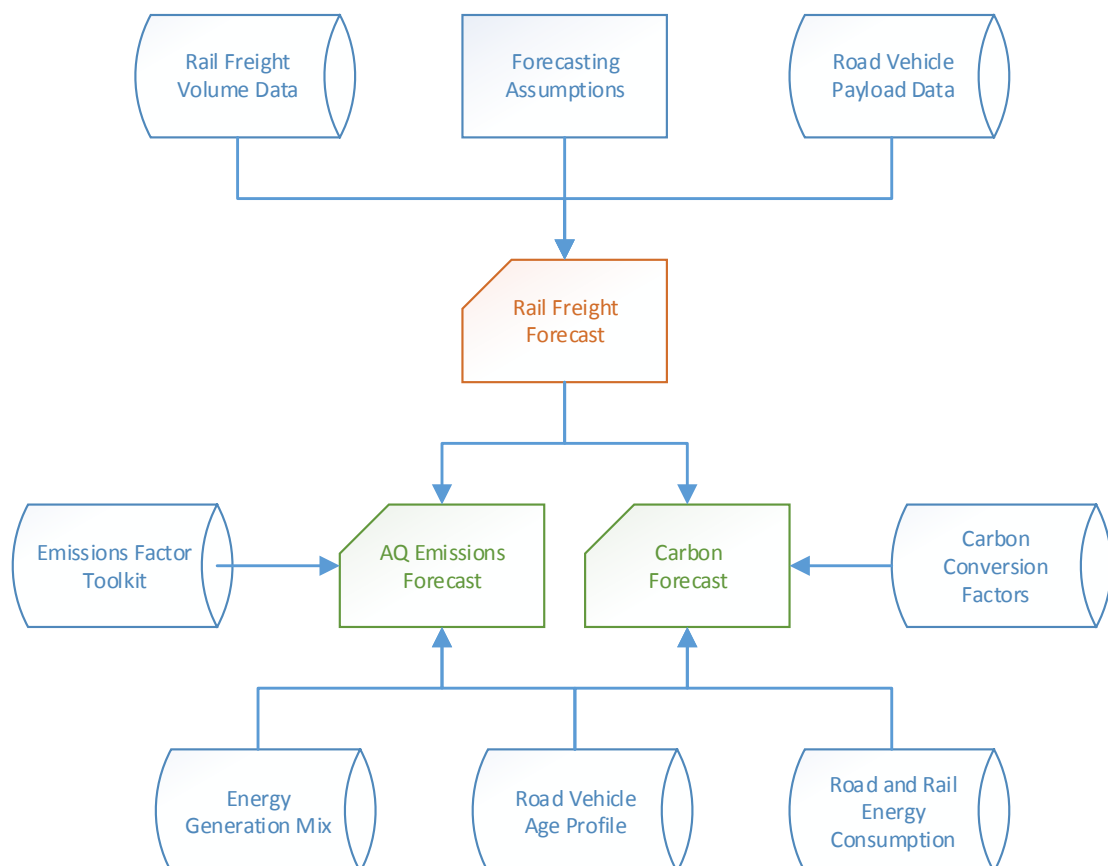


Figure 7.1 The Carbon Model

By comparing equivalent expected road emissions (based on vehicle age) with rail emissions for diesel and electric traction; the carbon saved by moving freight via rail both now and in the future as well as the potential savings from additional modal shift can be understood. Figure 7.1 shows the structure of the carbon model.

7.1.1 Rail Freight Volume Data

Base rail data is supplied by Network Rail and the ORR. The data is supplied as billion tonne KM by commodity and corridor. The data has provided the basis of our rail freight forecasts, as set out in Chapter 4.

7.1.2 Road Freight Vehicle Payload Data

In order to convert train volumes into HGV volumes an understanding of legal weight limits and unladen weights of vehicles is necessary in order to understand vehicle payloads for each commodity, depending on the type of vehicle used. Table 7.1 shows the assumptions.

7.1.3 Forecasting Assumptions

Within the scope and time of this project, a number of assumptions have been made in order to produce high level forecasts of potential carbon and air quality resulting from interventions.

Before any actions are undertaken on the basis of this estimate, forecasting in addition to that carried out on this project, using more detailed data will be necessary in order to obtain more robust figures.

Rail Freight Forecast

As set out in Chapter 4 rail freight forecasts to 2030 have been developed, based on the identified fourteen key sectors of rail freight currently moved on the network and the existing capacity constraints of the network. This forecast has been further expanded in order to understand the carbon impact such growth in rail would have. It also assesses what the changes in CO₂e emissions would be as a result as well as changed in the number of vehicles (trucks and trains) that would occur. Table 7.1 shows the payloads

for both trains and HGVs by commodity in order to ascertain such changes

Carbon Forecast

The carbon and air quality forecasts will quantify the potential CO₂e and emissions savings that can be made through modal shift from road to rail.²⁸ Inputs are brought in via the emissions factor toolkit for the road sector and academic research/DEFRA factors for rail traction based on average levels of energy consumption for electric and diesel locomotives.

The carbon costs of construction/implementation are not included within the calculations.

Carbon Conversion Factors

DEFRA's GHG database is a comprehensive analysis of carbon produced across a range of business activities including rail freight diesel locomotives and HGVs of varying size and weight on a tonne km basis. This has been fed into the carbon model to provide net savings from shifting mode from road to rail.

²⁸ A multitude of greenhouse gases are emitted via the combustion of diesel including carbon dioxide, methane and nitrogen dioxide. For reporting purposes all greenhouse gases are converted to their equivalent quantity of CO₂ using their global warming potential; e.g. 1kg of methane has four times the potential to warm the planet; therefore is equivalent to 4kg of CO₂. This is noted as CO₂e.

Table 7.1: Vehicle Payload Assumptions

Commodity	Rail Payload	Truck Type	Weight Limit (kg)	Unladen Weight (kg)	Payload (kg)
Coal	1,440	6x2 Artic Tipper	44,000	15,300	28,700
Coal	1,440	8x4 Rigid Tipper	32,000	9,345	22,655
Steel	1,220	6x2 Artic Flatbed	44,000	15,000	29,000
Aggregates/Const	1,500	6x2 Artic Tipper	44,000	15,300	28,700
Aggregates/Const	1,500	8x4 Rigid Tipper	32,000	9,345	22,655
Biomass	1,700	6x2 Artic Tipper	44,000	15,300	28,700
International	670	6x2 Artic Skeletal	44,000	14,000	24,030*
Domestic Intermodal	670	6x2 Artic Skeletal	44,000	14,000	24,030 *
Other	1,050	Average Artic	38,750	12,691	26,059

* Assumes actual payload for gross-weight, not including container weight

Road and Rail Energy Consumption

In order to forecast emissions for electric traction, data on locomotive energy consumption is required. Similarly, fuel consumption of road vehicles and diesel locomotives can be used to more accurately estimate the level of carbon dioxide being produced. Some data has been provided from Network Rail and the FOCs, and data from academic sources as well as previous government research has been used in support where appropriate.

Ideally, detailed, operational data would be used to ascertain the energy consumption and in turn emissions from the two freight modes including include CO₂, NO_x and particulates *PM10* and *PM 2.5*. As such it is recommended that a detailed study be undertaken with both road and rail operating companies, providing real data on an anonymous basis

This would mean testing a range of locomotives and HGVs carrying a variety of commodities and along a selection of key routes. This would provide detailed benchmarks across a range of parameters based on real world data. Considerable efforts in engagement would be required including a working group in order to ensure the provision of data as well as oversight regarding methodology and results as the deliverables have the potential to be quite sensitive commercially.

A recommendation of the study is to work with FOCs in order to gain more accurate data for future model revisions.

Energy Generation Mix

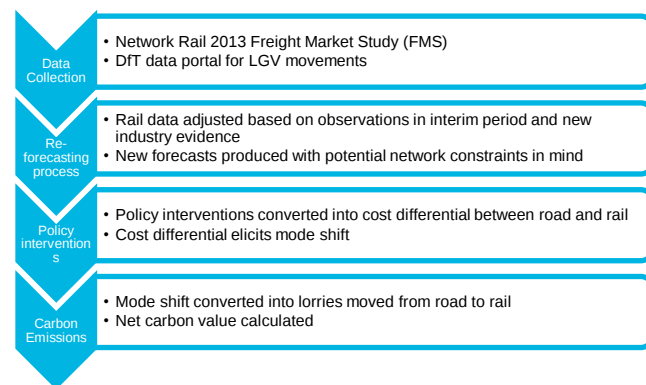
Electric locomotives are assumed to produce zero emissions at the point of use; however emissions are produced in the generation of the electricity used to power the locomotive. The level of emissions depends on the mix of methods used to generate the electricity. However, power generation is included under the EU emissions trading scheme and therefore already internalized and accounted for at the point of generation. As such, the use of electric traction is assumed to produce no carbon emissions. This is supported by WebTAG A3 4.1.5.

7.2 Modelling Interventions

This therefore creates a “base” scenario of the expected flows on both road and rail, including the carbon output.

The interventions set out in Chapter 6 were entered into the model in order to provide forecasts of their impact on rail freight volumes and on modal shift from road to rail through overcoming the constraints demonstrated in Chapter 5. It is assumed that all tonnage that moves off road will be put on rail rather than onto other alternative modes such as coastal ship or aircraft.

This is summarised thus:



Tonnages

For each intervention, an assessment as to the percentage of modal shift taking place for each commodity and on each corridor was provided along with an estimated likelihood of modal shift occurring as a result of each intervention. The factor is variable but is designed to provide a level of conservatism, acknowledging the fact that some interventions will be more effective than others in that they can directly influence the level of modal shift, whereas others may require further action. This probability was weighted according to table 7.3 below, the less likely the impact was considered, the smaller the level of change.

Table 7.3 Probability weightings

Likelihood	Weight
Possible	0.5
Likely	0.9
Very likely	1

Tonne KM

Having ascertained the tonnage estimates of modal shift, this was multiplied by the number of km associated with a particular corridor. As it is difficult to predict the road lengths of particular routes taken, an assumption was made that road km travelled equated to the rail distance plus 10% to account for the tranship leg between the rail heads and the ultimate origin and destination. This was based on a sample of 30 equivalent road and rail journeys tested through the Haven Gateway's Carbon calculator, which maps rail and road routes in order to ascertain carbon emissions.

Emissions Calculations

With the tonne km moved from road to rail established, the CO₂e saved as a result of modal shift as well as those emissions generated by additional train movements were calculated using the methodology described above. The two figures were then subtracted to provide a net saving in terms of both emissions and damage costs.



7.3 Carbon Savings

The analysis shows that substantial savings can be brought about via modal shift from road to rail. However further savings can be brought about through electrification without having to provide additional volumes through modal shift and this is illustrated in table 7.4

Currently around 7% of rail freight is electrified, the other 93% going by diesel traction. However, per tonne KM, electric traction, based on the 2015 generation mix produces 100% fewer emissions (see energy generation mix). Table 7.4 shows what the saving might look like for both 25% and 50% level of electrification predicated on a nominal 23 billion tonne KM figure²⁹.

Table 7.4 Electrification Scenarios

	'000 tonnes CO ₂ e	'000 tonnes CO ₂ e	'000 tonnes CO ₂ e
Level of Electrification	7%	25%	50%
Current Generation Mix	48.88	174.57	349.14

Table 7.5 shows that the maximum amount possible through implementing all interventions is around **10.5 million tonnes** of CO₂e though this would require all interventions to take place by 2030. This is up to 40% of total CO₂ emitted by HGVs (24.4 million tonnes) as of 2013³⁰. However; real savings are likely to be lower as there is likely to be some overlap/duplication of predicted savings. Additionally, it is inconceivable that all elements will be implemented.

Tables 7.6 and 7.7 show results summarised by corridor and by commodity respectively.

These show the CO₂e savings possible for each intervention in isolation and a maximum theoretical total saving. Carbon values are nominal and have not been discounted.

To provide a more realistic estimate, a package of measures therefore has been put together and this is set out in table 7.5. The package is formed from the leading interventions thought most valuable in the views of the expert team.

Table 7.6 and 7.7 shows that implementation of the interventions across the different commodities and corridors, has the potential to save over 4.6 million tonnes of CO₂e, a reduction of around 19% of total 2013 HGV emissions, with a value based on untraded prices of around £269 million and these savings could be further extended with greater levels of electrification.

²⁹ 23 billion tonne kilometres is the total freight currently moved on the network according to the 2013 Freight Market Study.

³⁰ ENV0201 DfT TSG 0306 Greenhouse gas emissions by transport mode: United Kingdom, 1999-2013

Table 7.5: Carbon Savings by Intervention

	ROAD						RAIL					NET SAVING				SCORE				
	Tonnes (million)	Tonne KM (billion)	Trucks	Carbon (tonnes)	Carbon Value (£)		Tonne KM (billion)	Trains	Carbon (tonnes)	Carbon Value (£)		Tonne KM (billion)	Carbon (tonnes)	Carbon Value (£)		Priority	Deliverability	Cost	Timescale	Carbon Impact
6.1.1 New-build Terminals	8.74	2.82	310,414	294,431	£17,127,058		2.70	12,714	77,901	£4,531,509		0.12	216,530	£12,595,548		H	D	V	M	H
6.1.2 Safeguard Land	3.67	0.96	137,889	99,929	£5,812,882		0.92	4,365	26,613	£1,548,085		0.03	73,316	£4,264,796		H	M	V	S	M
6.1.3 Refurbished Terminals	2.25	0.52	90,039	54,509	£3,170,763		0.54	2,321	15,468	£899,796		0.01	39,040	£2,270,967		M	E-M	L-M	S-M	L
6.1.4 Capacity & Gauge Enhancements	30.39	8.70	1,112,155	907,878	£52,811,284		8.53	40,793	246,092	£14,315,164		0.17	661,786	£38,496,120		H	M	H	M	H
6.2.1 Alternative Locomotive Technology	2.57	0.67	96,523	69,950	£4,069,017		0.65	3,056	18,629	£1,083,660		0.02	51,321	£2,985,358		H	M	M	M	M
6.2.2 ITS Solutions for Rail Freight	3.67	0.96	137,889	99,929	£5,812,882		0.92	4,365	26,613	£1,548,085		0.03	73,316	£4,264,796		M	M	M	S	M
6.2.3 Studies into Supply Chain Solutions	8.40	2.55	301,842	266,040	£15,475,535		2.43	11,854	70,122	£4,078,991		0.12	195,918	£11,396,543		H	E	L	M	H
6.3.1 Web-Based Portal	-	-	-	-	£0		-	-	-	£0		-	-	£0		H	E	L	S	L
6.3.2 Financial Assistance	14.78	4.91	515,190	512,516	£29,813,076		4.64	21,215	133,892	£7,788,491		0.27	378,624	£22,024,585		H	E	M	S	H
6.3.3 Rail Freight Conference Programme	2.29	0.60	86,182	62,456	£3,633,051		0.58	2,728	16,633	£967,553		0.02	45,823	£2,665,498		M	E	L	S	M
6.3.4 Rail Freight Data Repository	0.92	0.24	34,473	24,982	£1,453,220		0.23	1,091	6,653	£387,021		0.01	18,329	£1,066,199		M	M	L	S	L
6.3.5 Barriers to Shared Loads (Groupage)	1.37	0.48	47,334	50,454	£2,934,911		0.45	2,049	13,030	£757,962		0.03	37,424	£2,176,949		H	E	L	S	L
6.3.6 Rail Freight Customer Forum	-	-	-	-	£0		-	-	-	£0		-	-	£0		M	E	L	S	L
6.3.7 Freight Path Improvement	7.81	2.04	293,243	212,516	£12,362,031		1.96	9,283	56,597	£3,292,253		0.07	155,918	£9,069,778		H	M	L	S-M	M
6.4.1 Cost Stability Development	7.34	1.91	275,779	199,858	£11,625,763		1.84	8,730	53,226	£3,096,171		0.07	146,632	£8,529,593		M	E	L	S	M
6.4.2 Wider Policy Framework	2.96	1.01	102,798	105,928	£6,161,814		0.95	4,302	27,271	£1,586,330		0.07	78,657	£4,575,484		M	M	L	S-M	M
6.4.3 Channel Freight Review*	-	-	-	-	£0		-	-	-	£0		-	-	£0		H	M	M	S	L
6.4.4 Rail Freight Innovation Fund	3.67	0.96	137,890	99,929	£5,812,882		0.92	4,365	26,613	£1,548,085		0.03	73,316	£4,264,796		M	E	M	S	M
6.5.1 Large Project Procurement	8.61	2.04	331,291	213,132	£12,397,917		1.97	9,048	56,878	£3,308,590		0.07	156,255	£9,089,327		H	M	L	S	M
6.5.2 Market Entry Review	2.75	0.72	103,418	74,947	£4,359,661		0.69	3,274	19,960	£1,161,064		0.03	54,987	£3,198,597		M	E	L	S	M
6.5.3 Cross Government Policy Intervention	15.79	4.12	592,920	429,696	£24,995,391		3.97	18,770	114,436	£6,656,767		0.15	315,259	£18,338,625		M	M	M	M	H
6.6.1 Freight Corridor Resilience	1.84	0.48	68,945	49,965	£2,906,441		0.46	2,183	13,307	£774,043		0.02	36,658	£2,132,398		M	E	L	S	L
6.6.2 Express Parcel Solutions	0.25	0.06	9,419	5,815	£338,236		0.05	237	1,402	£81,557		0.01	4,413	£256,679		M	M-D	L	M	L
6.6.3 Strategic Freight Network	23.16	6.31	858,799	658,651	£38,313,739		6.06	28,619	174,944	£10,176,485		0.24	483,707	£28,137,254		H	M	H	S	H
6.6.4 Consolidation Centres	3.25	1.09	111,985	114,121	£6,638,446		1.04	4,847	29,968	£1,743,210		0.05	84,154	£4,895,236		M	D	M	M	M
6.6.5 European Rail Freight	0.26	0.05	8,818	5,560	£323,438		0.05	382	1,537	£89,379		-	4,024	£234,059		M	E	M	S	L
6.7.1 Skills Access and Promotion	0.46	0.12	17,237	12,491	£726,610		0.12	546	3,327	£193,511		0.00	9,165	£533,100		M	E	L	S	L

*Intervention in isolation will not trigger carbon savings but must be undertaken in combination with other interventions to realise Channel Tunnel carbon savings

Table 7.6: Carbon Savings by Corridor**Summary by Corridor**

	ROAD					RAIL				NET SAVING			
	Tonnes (million)	Tonne KM (billion)	Trucks	Carbon (tonnes)	Carbon Value (£)	Tonne KM (billion)	Trains	Carbon (tonnes)	Carbon Value (£)	Tonne KM (billion)	Carbon (tonnes)	Carbon Value (£)	
Channel Tunnel	6.65	1.39	229,353	144,629	£8,413,089	1.39	9,927	39,967	£2,324,885	-	104,662	£6,088,204	
Gatwick	-	-	-	-	-	-	-	-	-	-	-	-	
Southampton	16.37	4.40	601,150	494,991	£21,347,185	4.56	21,162	131,548	£7,652,166	-	0.16	363,442	£13,695,019
M4 Corridor	2.74	0.71	101,318	80,473	£4,818,381	0.74	3,418	21,382	£1,243,793	-	0.03	59,091	£3,574,588
M5 Corridor	14.34	3.84	527,132	432,375	£25,787,856	3.98	18,419	114,769	£6,676,119	-	0.14	317,606	£19,111,736
West Coast Main Line	28.43	7.34	1,052,479	835,746	£50,416,287	7.70	35,625	222,212	£12,926,091	-	0.36	613,533	£37,490,195
Trans Pennine	11.51	3.08	422,629	346,035	£20,731,932	3.18	14,753	91,876	£5,344,436	-	0.10	254,159	£15,387,495
East Coast Main Line	41.84	11.11	1,540,480	1,253,830	£75,539,063	11.55	53,512	333,190	£19,381,683	-	0.43	920,640	£56,157,380
A14 Corridor	17.40	4.43	645,707	506,171	£30,201,287	4.67	21,577	134,724	£7,836,891	-	0.24	371,447	£22,364,395
Felixstowe - London	12.75	3.33	471,068	378,096	£22,640,578	3.49	16,183	100,640	£5,854,247	-	0.16	277,456	£16,786,331
M11 Corridor	0.26	0.07	9,445	7,746	£462,863	0.07	329	2,048	£119,140	-	0.00	5,698	£343,723
Thames-side	4.91	1.28	181,677	145,591	£8,717,528	1.34	6,232	38,754	£2,254,310	-	0.06	106,838	£6,463,218

Table 7.7 Carbon Savings by Commodity**Summary by Commodity**

	ROAD					RAIL				NET SAVING			
	Tonnes (million)	Tonne KM (billion)	Trucks	Carbon (tonnes)	Carbon Value (£)	Tonne KM (billion)	Trains	Carbon (tonnes)	Carbon Value (£)	Tonne KM (billion)	Carbon (tonnes)	Carbon Value (£)	
Domestic Intermodal	79.84	28.11	2,753,150	2,934,671	£170,709,796	26.27	119,166	757,900	£44,087,022	-	1.84	2,176,771	£126,622,774
Ports Intermodal	8.56	2.46	295,152	256,775	£14,936,610	2.73	12,775	78,842	£4,586,227	-	0.27	177,933	£10,350,383
Construction	30.73	1.87	1,336,300	541,245	£31,484,214	5.76	20,490	166,187	£9,667,103	-	3.89	375,058	£21,817,111
Automotive	3.83	1.13	147,155	117,821	£6,853,646	1.25	13,103	36,176	£2,104,385	-	0.13	81,645	£4,749,261
Channel Tunnel	6.65	1.39	229,353	144,629	£8,413,089	1.39	9,927	39,967	£2,324,885	-	-	104,662	£6,088,204
Other	27.58	6.04	1,021,327	630,543	£36,678,692	5.27	25,676	152,040	£8,844,140	-	0.77	478,504	£27,834,552

The interventions identified in the following chapter as being of particular merit were chosen based on both their overall scores as well as the professional view of the project team including rail engineers and logisticians. The interventions were scored on a scale of Low (L) Medium (M) or High (H) against cost, deliverability and timeliness. The carbon benefits were calculated and then converted into L, M and H for ease of reference according to table 7.8 below. This information is shown in table 6.1.

Table 7.8: Intervention Scoring

Value of Carbon Saving	<£2.5m	L (Low)
	£2.5 - £10m	M (Medium)
	>£10m	H (High)

A clear strategy on reducing carbon emissions, through rail freight expansion will be required if these savings are to be realised by 2030 in order to provide stakeholders with the confidence they need in order to invest. By acting decisively in the short term to overcome the barriers identified in Chapter 5 through some of the solutions in Chapter 6, the Department for Transport can unlock large carbon savings in the long term through development and better use of the rail freight network.

7.4 Conclusion

The environmental efficiency of rail freight has long been identified as a potential way to reduce the climate impact of freight transport and the modelling exercise undertaken further supports this idea, with theoretical savings of up to 19% of current GHG emissions from HGVs. That said, to achieve this a large amount of investment would be required in projects that would transform the railway by 2030, which may be an ambition but is probably not likely given other investment priorities.

However, it's clear that by identifying prioritised, high impact interventions such as those laid out in Chapter 8, significant savings could be made over the base scenario.

Outside of these interventions, electrification could be the key to unlocking further savings, with modal shift often being difficult to achieve, electrification of up to half of the network could offer carbon savings of **over 54%** over current rail freight emissions; based on today's electricity generation mix without any additional tonnage being transferred. However, it will require clear direction and firm commitment from government enabling freight operating companies to take firm purchase decisions regarding their next generation of locomotives.

8) Identified Key Interventions

This report has identified 10 key options for implementation. These options vary in their difficulty to implement, their timescale and their cost. However, they offer the greatest chance of successfully influencing the market to achieve the overall goal of rail freight growth and reduction in carbon impact.

Together these 10 options form the backbone of the strategic plan to increase modal shift towards rail and away from less sustainable modes.



Given that rail lowers emissions per tonne by 76% over road, there is no more effective way to de-carbonise a supply chain.”

The CILT Rail Freight Forum



The following interventions should be viewed in conjunction with table 7.5 that show the carbon impact of each intervention.

1 New Build Terminals (6.1.1)

There is a clear need for new terminals to support the forecast strong growth in intermodal traffics. Several SRFIs are already in the planning process, but more of them (and also smaller terminals) are needed across the country to meet the challenge of providing national coverage.

The strategic plan should incorporate ways to encourage their development, through

streamlining of the planning process, attraction of new players to the market and ensuring that site tenants are incentivised to use the rail facilities. There is scope for potential public sector intervention in subsidising the cost of the rail connection, potentially through the retention of business rates, helping to lower the perceived risk and the cash profile requirements and thus bringing forward development.

There is the prospect that once a critical mass and national spread of terminals is achieved domestic intermodal traffic may start to grow as inter-terminal trains start to run, and more FMCG customers and retailers start to exploit the potential for secondary rail distribution.

Development of terminals, especially in the construction and automotive sectors, are also a priority if the strong market forecasts are to be achieved.

In terms of supporting freight growth and generating strong carbon reductions this is probably the most positive strategic action that can be taken.

2 Capacity & Gauge Enhancements (6.1.3)

It is important that the existing network capacity is optimised – both by more efficient use of freight paths and by ensuring that passenger and freight operators make best use of the route capacity.

The need for further freight capacity enhancements to meet growth is well understood, and progress is being made to deliver this. However, this is a long term process that needs a clear and consistent approach based on an overall strategy. Felixstowe to Nuneaton is a good example of a strategic plan that is not currently achieving potential because key parts of the overall route have yet to be upgraded.

There are clear roles for both DfT (as specifier and funder) and Network Rail (as implementer) to play in developing the

network. There is also a need to resist the demands of the passenger business to use up additional capacity, especially where this is used by relatively short trains, which may be poor users of the remaining paths.

Plans declared in the HLOS and Initial Industry Plan process before each regulatory control period have to be implemented in full and to budget, if industry confidence is to be secured. FOC investment plans depend on successful delivery of the strategy.

W12 gauge capability, 750m+ permitted train lengths and the provision of alternative routes are all part of the plan, and need to be delivered in a way and on routes that meet the growth forecasts.

This is a very important component to the strategy, and delivery is vital if the market demands are to be met - failure to do so will severely impact industry confidence.

3 Alternative Locomotive Technology (6.2.1)

The freight business is largely reliant on Class 66 locomotives. While reliable and capable these engines, incorporating 2-stroke engine technology that is decades old, fail to meet modern emissions standards and have relatively poor fuel consumption.

Given that over 400 Class 66s operate in the UK the application of new technology to reduce fuel consumption and limit emissions will have a significant impact on rail's overall emissions profile. However, it is accepted that the new technology should not increase costs above those saved from lower fuel consumption, as this would discourage uptake without further subsidy. This intervention is to provide support for trials regarding the uptake of new technology.

At the same time it is worth considering whether incentives can be applied to encourage manufacturers, leasing company owners and operators to invest in fuel efficient designs, or electric traction.

4 Financial Assistance (6.3.2)

Traditionally the freight market has operated without direct government support, though it is heavily reliant on understanding the level of access charges that are raised from it. Financial certainty is a core component in industry investment decisions, and doubts over major cost items forms a barrier to long term planning.

Grant aid (such as MSRS) is very important, especially in supporting development of new traffics, and also has very high benefits to cost ratio, typically of well over 4:1.

Continued availability of grant assistance, and commitment that revenue grants will continue over the longer term, is important to build this confidence and encourage entry into new markets. This will require direct prioritisation of assistance to the freight industry.

In parallel, certainty over future access charging is an important factor for the FOCs and their customers, as it can have a significant impact on low margin traffic. Certainty of the access charging regime is therefore a core strategic option.

5 Rail Freight Conference Programme (6.3.3)

Promotion of rail freight by DfT forms a very important part of the strategy. The rail freight industry needs clear signals that government endorses the growth of rail freight and is prepared to support it because of its environmental benefits. Knowledge and confidence also inspires interest from the customer base, and is likely to be a key influence on decision makers within potential customers considering whether rail is the right mode.

DfT could therefore both encourage the growth of databases and other information systems and also actively promote and support the industry in establishing rail freight as an environmentally sound transport mode with clear advantages in terms of network reliability and freedom from congestion factors. The recommendation is to establish a conference programme, supported by a dedicated staff member to promote rail freight and the underwriting of

venue costs (provided the conferences were run as not-for-profit) to ensure a wide reach to potential customers.

6 Freight Path Improvement (6.3.7)

While infrastructure enhancements (Strategy 2) will deliver greater network capacity, there is a limit to what can be achieved within reasonable timescales. Freight growth is likely to outstrip this. Therefore it is important that the industry, with DfT at the centre, seeks to optimise the freight paths that it can achieve.

This involves ensuring that paths are used efficiently and the specification of faster paths that work more closely with passenger TOC requirements.

This may result in freight services being hauled by electric traction as a practical solution to meet these requirements. Alternatively some freight trains may have to be reduced in weight to meet comparable performance standards.

However faster and more reliable paths will stimulate the market, and can form the basis of agreed freight capacity on all core routes, protected from use by passenger operators. This could be incorporated into the franchise renewal process.

This strategic option is likely to be the fastest way of securing additional capacity to support and stimulate freight growth, although the findings from these studies into freight pathing may result in identified improvements which will require infrastructural change.

7 Channel Tunnel Freight Review (6.4.3)

The Channel Tunnel has underperformed significantly since its opening in freight terms. There are many reasons for this, some well outside industry control. However an overall lack of competition, structural problems within the rail freight industry on both sides of the Channel, and the strength of the Ro-Ro industry have all been powerful factors affecting performance. Rail freight has the ability to capture much more traffic, which is inherently profitable due to the distances involved, and for which capacity exists through the tunnel.

The strategy to promote and encourage traffic growth therefore has to be a key one for DfT. Encouragement of competition and support for new traffics therefore is a core strategic option. The benefits of this can be seen in Table 7.7. However, the freight review is unlikely to produce these benefits in isolation, but must be undertaken in combination with other interventions. Such a review should also consider the option of a concession operator (let by tender) to lower risk and 'pump prime' services, reducing traffic on the M20 and M25 with resultant improvements in congestion and decarbonisation.

8 Large project procurement (6.5.1)

There are many major capital investment projects in the pipeline, including HS2, Crossrail 2, runway capacity expansion, and new nuclear power plants, as well as major private sector developments. All of these have government involvement, but lack any commitment for the use of rail freight to support construction, even where there is a clear case for doing so.

Incorporation of requirements to use rail (as happened with the Olympics and Crossrail) is a quick easy win which does not hinder the success of the project (and indeed is likely to enhance its delivery).

Each of these projects has a major impact on rail freight, and more importantly will trigger investment in terminals, rolling stock, locomotives and staff, all of which can be used to win further traffics.

For this reason this is a core strategic option.

9. Studies into Supply Chain Solutions (6.2.3)

Modern logistics systems need to be flexible and adapt to changing market forces and customer expectations. "Just-in-time" deliveries which was an emerging business model over a decade ago, in terms of stripping out the internal cost of working capital, is now not always the preferred solution. The growth of internet shopping, smaller consignment size and service offering of next day or even same day delivery is not necessarily compatible with

the traditional model of rail freight. Rail is most suited to moving large volumes between fixed points quickly and efficiently, hence why it is good for long distance trunking. The standard transport model used in road transport is for the movement of roll-cages for supermarkets or standard pallets for general road haulage, without lengthy transshipment processes or the use of specialised equipment such as swapbodies.

With the rapid change in logistics and the fact that a large proportion of domestic goods movements are by road, it is recommended that a series of studies is embarked upon, investigating how new rail based solutions can better match with modern logistics requirements. Several different research studies have been suggested in Chapter 6 and they would have at least one common aim and that is to assess the likely impact on modal switch levels from road to rail.

10. Strategic Freight Network (6.6.3)

Development of a vision for the future network (in the same way that HS2 has delivered a vision for the future passenger network) is a key strategic requirement. The vision will undoubtedly include electrification of core routes, capacity enhancements, longer permitted lengths and heavier trains. It will anticipate and respond to identified growth forecasts.

Network Rail already has a strategic network vision and this is being revisited and enhanced so that freight growth can be achieved. The vision has to incorporate key targets for implementation of route upgrades, in order to encourage the rail freight sector to invest in new traction, probably electric, and new terminals on core routes.

Updating the Strategic Freight Network to better reflect the identified growth commodities (such as domestic intermodal between cities) should be undertaken as part of a broad based engagement with not only FOCs but also sub-national transport bodies, devolved administrations and 3PLs, to ensure that the ambitions and requirements of all are taken into account.

The strategic network also provides the logic for securing the right number of high quality through freight paths envisaged in Strategic Option 6.

Summary

These ten options are laid out in summary in Table 8.1, alongside some approximate cost estimates and the resultant modelled carbon savings. It should be understood that the costing is indicative and that real costs may be either above or below those stated. Given the high level nature of the estimate cost ranges, it must be understood that further work on any one of these interventions would need to be undertaken to assess its cost benefit ratio.

In outlining the ten policy options in this section, it is important to note that this Report has been commissioned to inform the Government's Rail Freight Strategy and Freight Carbon Review to identify potential means for enabling modal shift from road to rail for freight movements within and to / from the UK. It is important to note that in delivery of modal shift from road to rail will require continued cross industry and public and private collaboration between Government Departments, Devolved Administrations, Local Authorities / Sub National Transport Bodies, Infrastructure Owners, Freight Operators, Regulators, Developers, and Supply Chain customers and suppliers.

In delivering freight modal shift from road, there is an important relationship to a number of other key plans and strategies including (but not exclusively), the DfT Rail Freight Strategy, Network Rail's LTPP – Freight Network Study, the National Planning Statement for National Networks, the relevant Freight and Planning strategy documents for Scotland and Wales and the relevant transport strategy documents from English Sub National Transport Bodies.

The development of these 10 interventions taken as a whole would represent an innovative yet realistic response for freight modal shift with regards to the current context of the rail freight sector in the UK. They would build on the established track record of the rail freight sector and its

partners in their contribution to the UK economy since privatisation in developing the market and responding to customers' requirements in a constantly changing operating environment.

Further these interventions taken together would assist in the removal and reduction in the barriers of freight modal shift between a market which is continually changing and the longer lead in times for the planning, delivery and longevity of much of the fixed and mobile infrastructure assets which are required for the effective and efficient transportation of freight on the railway.

In conclusion, the ten interventions listed are those which in the study team's opinion offer the greatest chance of successfully influencing the market to achieve the overall goals of rail freight growth and reduction in carbon impact. As well as informing the Department for Transport's Rail Freight Strategy they will be considered as part of freight's contribution to the reduction in future UK carbon budgets



Table 8.1: Identified Ten Strategic Options

Intervention	Estimated Costs		Estimated CO ₂ Saving (tons)	Commentary
	Low	High		
6.1.1 New-build Terminals	£20m	£50m	216,530	Note: This is an estimate of the total costs to the developer per Strategic Rail Freight Interchange, with costs for smaller terminals being lower and the cost for a full network of terminals being multiples of this figure. However, given that much (if not all) of this cost is borne by the private sector, the cost to the public sector is limited to the degree of subsidy given (such as paying for rail connection through business rate retention) if any is given at all.
6.1.3 Capacity & Gauge Enhancements	£100m	£500m	661,786	Note: This is the estimated cost per five year control period, as money to enhance and bring forward improvements such as clearance to W12, additional dynamic looping capacity and the ability to operate 775m trains.
6.2.1 Alternative Locomotive Technology	£20m	£50m	51,321	Note: This cost is based on the assumption of piloting and assisting in the improvement of existing locomotives, in particular software adjustments and 'bolt-on' fuel saving devices to ensure that full value can be gained from the existing fleet's lifecycle.
6.3.2 Financial Assistance	£25m	£50m	378,624	Note: This is the estimated range of costs per annum, rather than a complete programme cost.
6.3.3 Rail Freight Conference Programme	£0.2m	£1m	45,823	Note: This is the estimated cost for a specific post and some underwriting of venue and administration costs for a not-for-profit series of conferences.
6.3.7 Freight Path Improvement	£1m	£5m	155,918	Note: This is assumed to be additional work to the everyday work undertaken by FOCs, the DfT and ORR – providing support for GRIP1 studies on key routes to provide interventions for 6.1.3 (above). It also covers the cost of additional consideration of freight paths during the franchise tender competition process during renewals.
6.4.3 Channel Freight Review	£1m	£10m	See Corridor Saving and Chapter 7.	Note: Estimating the range of cost involved in this intervention is complicated by the range of potential outcomes. Costs incurred could be revenue support 'pump priming' payment for new services (if repeated over several years) or the one-off capital cost of acquiring plant to operate a concession with regular services. In addition this intervention could include studies regarding diversionary or alternative routes through Kent; better freight use of HS1; and interventions to encourage more rail freight through the Channel Tunnel.
6.5.1 Large Project Procurement	£0.2m	£1m	156,255	Note: This cost is related to the enforcement of planning guidance and changes in policy. A root and branch review may incur higher costs. These costs may be borne by bodies such as the National Infrastructure Commission.
6.2.3 Studies into Supply Chain Solutions	£0.2m	£1m	195,918	Note: This estimate covers a range of studies which should seek to engage a large number of research institutions and potential equipment suppliers. 4 topics have been suggested in Chapter 6.
6.6.3 Strategic Freight Network	£100m	£500m	483,707	Note: This is the estimated range of costs per five year control period, to reflect the improvements required in adjusting the SFN to reflect changing modern flows (such as domestic intermodal flows between cities). Such an improvement programme would need to be developed with sub-national transport bodies, devolved administrations and 3PLs as well as FOCs.

A1) List of Consultees

In the process of developing this report, extensive consultation has been undertaken and the report authors would like to thank the following for their valuable contributions:

- Campaign for Better Transport
- CILT Rail Freight Forum
- Colas Rail
- DB Cargo UK
- Drax Group
- Europorte
- Forth Ports
- Freightliner
- Freight on Rail
- GB Railfreight
- Hadley Associates
- Hutchinson Ports
- Kilbride Group
- Lafarge Tarmac
- Network Rail
- Office of Rail and Road
- PD Ports
- Peel Ports Group
- Rail Freight Group
- Savills
- Transport for London
- Transport Scotland
- Transworth Rail
- Victa Railfreight
- Welsh Government

A2) Related and Further Reading

As part of the development of this report, a range of different literature has been consulted and played an important role in shaping the strategic recommendations of the report. Some of the key texts are referenced below.

Key Publications

AECOM, *Strategic Distribution Site Assessment*, (2010)

AECOM, *Freight Modal Choice* (for DfT - 2010)

Campaign for Better Transport, *Heavy Goods Vehicles – do they pay for the damage they cause?*, (2014)

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European Parliament, *Freight on Road: Why Shippers Prefer Truck to Train*, (2015)

ORR Statistical Release, *Freight Rail Usage*, (2011 – 2015)

ORR, *Periodic Review of Rail Freight: Conclusion on the Average Variable Usage Charge and a Freight Specific Charge*, (2013)

ORR, *Freight Customer Survey*, (2012)

MDS Transmodal, *Estimating Road and Rail Costs between Coal Mines and Power Stations*, (2012)

Mineral Products Association, *Railfreight In Construction*, (2015)

Network Rail, *The Value of Rail Freight*, (2016)

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Network Rail, *East Midlands Route Study* (2016)

Network Rail, *West Coast Route Plan* (2013)

NewRail, *Barriers to and Enablers for European Rail Freight Transport*, (2014)

Rail Delivery Group, *Freight Britain*, (2015)

Rail Delivery Group, *Keeping the lights on and traffic moving*, (2014)

University of Westminster, *Freight Modal Choice Study: Addressable Markets*, (2010)

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Rodrigues, et al., *UK Supply Chain Carbon Mitigation Strategies*, (2015).

Woodburn *Potential for Modal Shift of Freight from Road to Rail in Great Britain*, (2003)

Schijndel & Dinwiddle, *Congestion and Multimodal Transport* (2000)

Woodburn, A., *The Role for Rail in Port-Based Container Freight Flows in Britain*, (2007)

Woodburn, A., *Intermodal Rail Freight in Britain: A Terminal Problem?* (2008)

Woodburn, A., *Intermodal Rail Freight Activity in Britain*, (2012),

Woodburn, A., *Empirical Study of Variability in the Composition of British Freight Trains*, (2015)

Woxenius, J. & Bergqvist, R., *Comparing Maritime Containers and Semi-Trailers in Hinterland Transport*, (2011)

A3) Glossary and Acronyms

To aid understanding, a brief glossary of terms in this report which may not be familiar to all readers is provided below.

3PL - Third-party logistics. Provide outsourced logistics solutions.

CP5 - Control Period 5 is Network Rail's delivery plan between April 2014 and March 2019.

DfT – Department for Transport

ECML/WCML/MML/GWML - Major sections of the British rail network: East Coast Main Line, West Coast Main Line, Midlands Main Line and the Great Western Main Line.

ESI Coal & Biomass – Fuel which is moved for the purposes of the Electricity Supply Industry

F2N – The Felixstowe to Nuneaton Rail freight Corridor

FOC – Freight Operating Company

FMS – Freight Market Study. A document produced by Network Rail in 2013 (see A2).

Intermodal – The movement of goods in containers. In this report it is important to note that deep sea intermodal refers to containers that arrive at Britain's various ports whilst domestic could be the movement of goods between urban centres either in these same containers or in other transferable forms such as swapbodies,

although this latter traffic is also termed “combined transport”.

HLOS - High Level Output Specific sets out information for the Office of Rail Regulation (ORR) and for the rail industry about what the Secretary of State for Transport wants to be achieved by railway activities during railway control period 5 (CP5) (April 2014 to March 2019).

HS1 - High Speed 1. A high-speed rail line running from London St Pancras to Dover, connecting the UK to mainland Europe.

HS2 - High Speed 2. A proposed expansion of the British high-speed rail network. HS2 will connect London to Birmingham and eventually to other English cities, including Manchester, Sheffield and Leeds.

IIP - Initial Industry Plans inform funders of the range of possible outputs that could be delivered in Control Periods.

SRFI – Strategic Rail freight Interchange

TEN-T – The Trans-European Transport Networks are a planned set of road, rail, air and water transport networks in the European Union.

TEU – The Twenty-Foot Equivalent Unit is universally used as a guide to the intermodal capacity of ships, trains and terminals, with containers usually being either 1 (if it is 20 foot long) or 2 (if it is a modern, larger container).

W Gauge: Rail gauge system in the UK.

W10: Allows 2.9 m (9 ft 6 in) high Hi-Cube shipping containers to be carried on standard wagons and also allows 2.5 m (8 ft 2 in) wide Euro shipping containers.

W12 is slightly wider than W10 at 2.6 m (8 ft 6 in) to accommodate refrigerated containers. Recommended clearance for new structures, such as bridges and tunnels.