TRANSPORT FOR THE NORTH

Enhanced Freight and Logistics Analysis Report

STRATEGIC TRANSPORT PLAN EVIDENCE BASE

JANUARY 2018

This report has been commissioned by Transport for the North to inform development of its Strategic Transport Plan. Proposals and recommendations in the report are those of Arup. Publication of the report does not imply TfN endorsement of any material in the report.

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Transport for the North Summary

Transport for the North (TfN) is progressing to become England's first Sub-National Transport Body. There is a partnership of Transport Authorities, Delivery Partners and Local Enterprise Partnerships all working together to agree a Strategic Transport Plan for the North of England.

The plan will cover passengers on road and rail, freight on road and rail, inland waterways, coastal shipping, ports and airports for passengers and freight. A truly multimodal approach.

To enable the plan to be delivered, TfN needed to understand the needs of the freight and logistics industry and the infrastructure required for it to grow. Concisely put – why would TfN need to invest in the networks for the freight and logistics industry?

This Report

This report provides the baseline for understanding the North's markets and travel patterns for road, rail, air, coastal shipping and inland waterway for freight. The data is mapped with no assumptions of schemes being delivered in the future, the growth is simply overlaid on the current network.

The need for investment in the infrastructure to accommodate growth in the freight industry can be seen. The maps show clear growth in tonnages for freight movements. This is based on the analysis from the Northern Powerhouse Independent Economic Review completed by TfN in June 2016 which showed significant economic growth is possible in the North if the transport systems are right. Therefore, there is tangible evidence that the freight and logistics industry need the investment in infrastructure just as much as passengers do. When the networks break down, the freight industry pauses in just the same way as the passenger network. The growth that has been applied to the network has implications for sustainability and air quality.

TfN are working on corridor studies across the North to understand the programmes of investment required to make the networks more efficient within the study areas. The first three studies are Connecting the Energy Coasts, Central Pennines and West and Wales. The work completed within this report will feed directly into the studies and will be made available to the consultancy teams.

Finally, the content of the report has been presented to TfN and written by a team at Arup. TfN and its partners will decide which recommendations to take forward in the coming months and which to include in the corridor studies currently underway.

Aims and Objectives

The Northern Powerhouse Independent Economic Review (NPIER) was published in June 2016 and set out that by 2050, a transformed economy in the North would feature the following:

- Gross Value Added (GVA) projected to be 15% (£100 billion) higher than business as usual projections;
- Productivity would be 4% higher; and
- 850,000 additional jobs would be created.

Transport for the North, seeking to become the Government's statutory body tasked with improving transport in the North of England, are therefore integral to achieving the outcomes of NPIER.

Freight and Logistics as a key enabling capability to achieving transformational economic growth is a prime focus and therefore there is an important requirement to set out how investment should be made in the transport network to ensure it meets the demands that will be placed upon it by passengers and freight.

Strategic Transport Plan (STP)

TfN are developing a Strategic Transport Plan (STP) alongside a long term investment programme to support the people and businesses across the North and to create a stronger, more diverse and resilient place for people to live, commute and conduct business.

TfN has published a variety of other reports which make up the evidence base for the STP. For each of these reports, an element of this enhanced freight and logistics analysis has been used although since these reports were published, the freight analysis has been further developed and enhanced, the outcome of this work is contained within this report.

In addition to the freight and logistics reports (this report and the initial freight study), the STP evidence base is also made up of:

- Major Roads Report;
- Integrated Rail Report;
- Independent International Connectivity Report; and
- Economic Appraisal.

This evidence base will be used within the Strategic Development Corridor studies which will be undertaken by TfN to produce a prioritised programme of investment.

The North's Transport Network

The North boasts a wealth of freight assets that grant the North a strong multimodal freight capability. These include:

- Eleven major ports in addition to other smaller ports located on the Tyne, Tees, Humber and Mersey as well as in Lancashire, Cumbria and Northumberland;
- Seven international airports including Liverpool John Lennon, Leeds-Bradford, Doncaster-Sheffield, Humberside, Durham Tees Valley and Newcastle in addition to the major international airport at Manchester;
- Three Strategic Rail Freight Interchanges (SRFIs – distribution centres with intermodal terminals) at Ditton, Wakefield and Selby with more emerging;
- Five further Intermodal Terminals at Trafford Park, Leeds, Garston, Doncaster and Widnes;
- A Strategic Road Network focused on the M62/M60/M56 and A66/69 East-West corridors and the M6 and M1/A1 North-South corridors;
- A strategic rail network principally comprising of the West Coast Main Line, East Coast Main Line and Midland Main Lines that connect the North of England to the South and the Transpennine routes; and
- A significant amount of distribution centre capacity.

Despite these assets being available, many are not being fully utilised due to a number of reasons such as lack of joined up infrastructure or attractive alternative logistics solutions. Gaps in connectivity prevail that urgently require investment; 80% of road freight in the North is domestic traffic, most of which is short haul (making it difficult to justify the use of rail on commercial or efficiency grounds), which places a heavy burden on the strategic road network.

Mode Share and Growth Forecasts

Through use of the Great Britain Freight Model (GBFM) which has been adapted to include NPIER growth forecasts for 2050, it is possible to identify the current and future mode share of freight being moved in the North and to identify the growth predicted.

The metrics used for this include tonnes lifted (the overall tonnage of freight moved) and tonne km (the total freight moved multiplied by the distance it is moved).

The mode share of freight moved in the North and based on tonnes lifted is:

- Road 91.0% (2016), 91.0% (2050)
- Rail 7.0% (2016), 7.3% (2050)
- Waterway 2.0% (2016), 1.7% (2050)

However, by using the tonne kms metric, the mode share is as follows:

- Road 87.2% (2016), 88.0% (2050)
- Rail 12.1% (2016), 11.6% (2050)
- Waterway 0.6% (2016), 0.4% (2050)

As freight is generally moved over longer distances by rail it is more accurately reflected using the tonne km metric. Rail mode share is shown to decrease slightly between 2016 and 2050 which reflects longer haulage distances by road, generally driven by the growth in e-commerce and increased consumer spending which require more and larger National Distribution Centres (NDCs) and Regional Distribution Centres (RDCs), often only connected by road. This trunking of goods between NDCs and RDCs drives up the distances that road freight vehicles travel.

The growth of the various modes for the movement of freight is also reflected in the GBFM outputs and suggests that based on tonnes lifted, there will be a 33.1% increase in goods moved between 2016 and 2050. This is broken down as follows:

- Road 33.1%
- Rail 39.0%
- Waterway 11.6%

Using tonne km as a metric, the growth is more substantial reflecting freight moving over longer distances. GBFM predicts the growth in tonne km as 60.4% overall, broken down as follows:

- Road 61.8%
- Rail 52.9%
- Waterway 11.6%

Key Flows

Taking into account the growth in the economy forecast between 2016 and 2050, it is clear that as consumer spending increases, so will the demands for goods. This has an enormous effect on the logistics and freight sector with more demands for the movement of goods both into and out of the North of England.

The majority of commodity groups show strong growth across the horizon to 2050 with the exception of bulk traffic, which is affected by the reduction in demand for coal as the UK moves away from coal fuelled power stations towards other sources such as nuclear and renewable energy from wind for example.

The outputs from GBFM forecast the growth in a number of commodity groups between 2016 and 2050. These are:

- Intermodal 41.8%
- Construction and Metals 34.6%

- Petrol and Petroleum Products 49.2%
- Other Bulks -1.8%

Clearly through the growth predicted, the demands placed upon the North's transport network will be greater and the challenges faced now and predicted in the future will be exacerbated.

Challenges

Road

Some of the challenges facing the road freight sector are highlighted below and include:

- Vehicle emissions;
- Congestion;
- Workforce / skills shortage;
- Lack of safe and secure overnight parking for freight vehicles; and
- Regional and city distribution.

Rail

Lack of capacity on the rail network in the North is a key challenge and can generally be expressed in a number of ways in addition to availability of freight paths covered above:

- Train Average Speeds;
- Train Length Limits;
- Train Weights;
- Gauge Clearance;
- Headways and Network Access; and
- Utilisation of Freight Paths.

Waterborne

As with the other transport modes, water-based transport and, in particular for this report, the Northern Ports face a number of challenges which include:

- Consolidation of shipping lines and focus on southern ports;
- Port location and access and infrastructure;
- Land availability and planning restrictions; and

- Unbalanced flows.

Air

Much of the air freight which arrives or departs the North of England is currently moved by road. The scope of either influencing modal shift or redirecting this freight to Northern airports is limited until a greater number of long haul passenger or dedicated cargo services are introduced.

Drivers for Change

The analysis set out in this report highlights the forecast significant increase in freight movements into, out of and throughout the North in the future and the impact this has on existing infrastructure. This change will have a significant impact on three key areas listed below and these form the key Drivers for Change upon which the rationale for investment should be based:

- The increase in forecast freight movement is going to have a significant impact on **congestion**, the **environment** and **quality of life** in the North;
- The **shortage of skilled drivers and labour** is going to place considerable pressure on the logistics and freight industry to service businesses and consumers in the North; and
- As a result of the above there will also be an impact on the **cost of logistics** and the **service levels** the sector can deliver to businesses and consumers in the North.

The North’s Freight Vision

In order to achieve the desired economic growth, action needs to be taken to address the challenges outlined in the previous section which can generally be achieved through two overarching methods:

- Reduce the Demand for infrastructure; and / or
- Increase the Capacity of the transport infrastructure.

Under both of these methods there are two main areas that TfN can affect in order to drive change and which are covered within the subsequent sections of this report. These are through:

- Policy based solutions, which can influence how the private sector operates and invests; and
- Physical solutions, such as new infrastructure.

This report focuses on how the freight and logistics sector in the North could be enhanced and supported by TfN building on the key drivers identified above. This will be achieved through key focus points:

- The need to maximise the use of existing assets and prioritise their use for the greatest value they bring to the North;
- The need to ensure that the North has a modal mix that delivers the most effective investment in infrastructure, technology and policy, whilst supporting economic growth in the North through an efficient logistics industry; and
- The need to ensure that the North has the skills and can utilise available data to plan for the future.

Maximise the use of existing assets

The first priority should be for TfN to contribute towards maximising the use of the current suite of transport assets within the North of England. The report sets out what needs to be done to achieve this.

Ports are generally privately owned and rely upon private sector investment however, ensuring that infrastructure connecting the ports to their markets within the UK is important. Equally, the pressures on southern ports are increasing, with Brexit likely to have a significant effect. Regional Ports in the North could have an increased role in alleviating this pressure and this opportunity should be explored.

The rail industry are working towards delivering a Digital Railway and as such are looking to maximise the available capacity on the network through interventions such as improved signalling systems and more efficient timetabling. The use of under-utilised routes is also paramount and there could be other measures such as pop-up rail terminals that could be a viable short term measure for increasing the freight transported by rail.

On the road network, work is ongoing to examine how more capacity could be achieved through Smart Motorways, autonomous vehicles, alternative fuels including electric vehicles and increased vehicle efficiencies.

Delivering effective investment through the correct modal mix

In order to maximise the efficiency of the network and address the three key drivers for change, it is essential that the correct modal mix is achieved where flows (which could travel by rail or water), are transferred from an already congested road network.

This can be achieved through TfN having an influence over policy and where that is not solely effective, through investment in the North’s transport infrastructure.

Some areas where TfN could implement some policy measures to promote modal shift are by providing funding support in the form of specialist freight grants to support rail and coastal shipping or by setting up a rail freight franchise for the North. Other areas should include work to improve the perception of alternative modes of transport and increasing collaboration between freight operators. In this regard, TfN could act in a facilitator role.

Other proposals include working with the public sector to ensure alternative modes of transport are included in public sector procurement and to ease planning conditions on freight infrastructure. Finally there could be a merit in creating more road space for freight vehicles by reducing other users of the road network.

On the infrastructure front, the report identifies four main principles as rational for investing in and enhancing infrastructure. These principles are to improve:

- East-west connectivity;
- North-south connectivity;
- General capacity enhancements; and
- Intermodal connectivity.

Providing skills and utilising data to plan for the future

In order to ensure that the North has the skills required to meet the future needs of the freight and logistics sector, TfN should work towards a number of key strategic aims to promote the industry and make it more attractive as a career. This works across all modes where increase the skills base and the pool of resources is imperative to meet future demand. Working with the industry to improve the standards for HGV drivers in particular will help to address the driver shortage currently being felt in the UK.

The evidence base used in the development of this report is a mixture of model outputs from the GBFM and information gleaned through engagement with a number of freight and logistics operators and industry experts.

There remains however an important requirement to increase the robustness of the evidence base through the collection of more information and ensuring TfN have a long term strategy for gathering the required data to assess KPI's and how the North's freight industry operates. This could be through embracing the move to the use of Big Data and developing systems that will aid the enhancement of the freight and logistics story within TfN.

Freight and Logistics Action Plan

The report contains a Freight and Logistics Action Plan which sets aside areas where TfN can provide influence in order to deliver on the Freight Vision. These areas encompass maximising the use of the North's existing assets, delivering effective investment through the correct modal mix and providing the skills and utilising data to plan for the future.

The Action Plan forms a basis for future Freight and Logistics work should TfN choose to take it forward.

1 Introduction

In September 2016, Transport for the North (TfN) published its *Northern Freight and Logistics Report* which set out how a combination of public and private sector investment in new transport infrastructure could achieve £34.7 billion of user and non-user benefits to the UK economy and £13-£20 billion of wider economic benefits (GVA benefits).

The report also contained some initial modelling of the North's freight network using the Great Britain Freight Model (GBFM) developed and maintained by MDS Transmodal (MDST).

In June 2016, the Northern Powerhouse Independent Economic Review (NPIER) was published, which set out the transformational economic growth opportunity for the region. The review clearly set out the markets that offered the greatest potential growth and highlighted that the logistics and freight industry was a key enabling capability in supporting this growth. Whilst the 2016 Freight and Logistics report focused on what interventions should be prioritised in a freight and logistics strategy to optimise logistics flows and grow the sector, it did not set out the justification for these investments within the context of the NPIER.

Subsequently, Arup were commissioned by TfN to advance the strategic thinking around Freight and Logistics on a regional, national and global level, visualise "The Freight Story" and examine why investment in the transport network in the North is required (from a freight and logistics perspective) to achieve Transformational economic growth.

In addition, utilising the evidence that indicates why investments should be made, the final part of the commission looks at what interventions are required and how these can be achieved.

This report will be used as part of the evidence base within the Strategic Development Corridor studies that will be undertaken by TfN.

1.1 Structure of the Report

This report is structured in such a way so that a rational argument for the investment in freight transport infrastructure can be presented. This includes breaking down the argument into the following categories:

- **Why**: the current and future forecast for freight movements in the North of England and why investment will be required to achieve transformational economic growth.
- **What**: the overarching objectives of what needs to be achieved to deliver the transformational economic growth. This will include examining a number of scenarios under which strategies can be tested.
- **How**: the means by which the objectives will be meet and how the freight and logistics strategy for the North of England will be implemented.

2 Context

2.1 Aims and Objectives

The North of England plays a major part in the success of the UK in the global marketplace. Despite this, the economy of the North of England lags behind that of other areas of the UK. The premise of the Northern Powerhouse was therefore introduced by the 2010-15 UK Coalition Government and has been maintained by subsequent governments.

The aims and objectives of the Northern Powerhouse is to boost economic growth in the North of England and is based around the North's four distinctive prime capabilities, encompassing:

- Digital technology: including software and content;
- Advanced manufacturing: especially materials and processes;
- Energy: including nuclear and offshore wind; and
- Health innovation: including life sciences, medical technology and service delivery.

In order to support these prime capabilities and drive job numbers there are three key enabling capabilities of which logistics is one. The other two are financial and professional services and higher education.

The Northern Powerhouse Independent Economic Review (NPIER) was published in June 2016 and set out that by 2050, a transformed economy in the North would feature the following:

- Gross Value Added (GVA) projected to be 15% (£100 billion) higher than business as usual projections;
- Productivity would be 4% higher; and
- 850,000 additional jobs would be created.

Transport for the North, seeking to become the Government's statutory body tasked with improving transport in the North of England, are therefore integral to achieving the outcomes of NPIER.

Freight and Logistics as a key enabling capability to achieving transformational economic growth is a prime focus and therefore there is an important requirement to set out how investment should be made in the transport network to ensure it meets the demands that will be placed upon it by passengers and freight.

2.2 Strategic Transport Plan (STP)

One of the key issues identified by the NPIER in the North's ability to deliver transformational economic growth by improving connectivity. Transport services across the North do not encourage economies of agglomeration and transformational changes to the services provided would ensure that the North of England becomes a more attractive and buoyant marketplace. TfN, with a focus on Pan-Northern connectivity and presenting a single voice for the North, has a responsibility to deliver the case for strategic transport investment across the North of England. To this end, TfN are developing a Strategic Transport Plan (STP) alongside a long term investment programme to support the people and businesses across the North and to create a stronger, more diverse and resilient place for people to live, commute and conduct business.

TfN's vision is of a:

"*thriving North of England, where modern transport connections drive economic growth and support an excellent quality of life.*"

The vision will be the guiding principle for the STP which will cover all aspects of TfN's activities. Freight and Logistics will be a key theme running through the STP and as such has been fed into some of the parallel work streams.

In essence the STP will:

- Be a long term, multi-modal plan;
- Identify a sequenced investment and delivery programme;
- Ensure that value is added to the Northern economy;
- Pursue transformational economic growth;
- Be a public facing, publicly supported plan; and
- Be a living, evolving document.

TfN are delivering a number of evidence streams to support the development of the STP as shown in Figure 1.

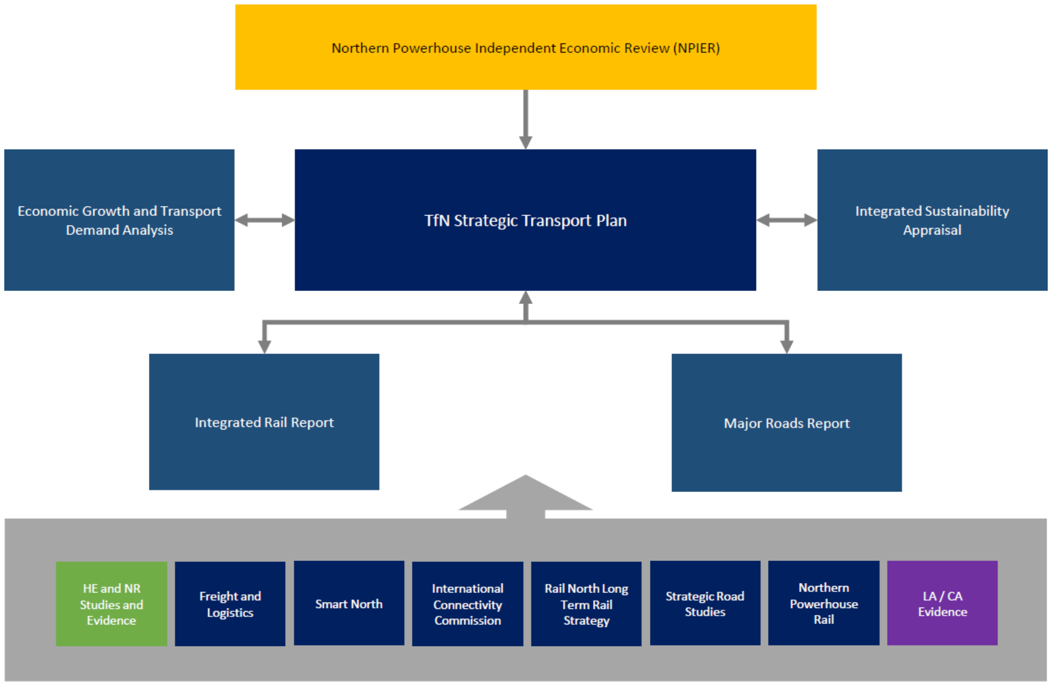

Figure 1 TfN STP Evidence Base and Parallel Work streams

Freight and Logistics is one of the parallel work streams and has fed into the Integrated Rail Report (IRR) and the Major Roads Report (MRR) as well as directly into the STP.

2.3 Previous Freight Report

TfN published a Freight and Logistics Report in September 2016 following a piece of work which examined the opportunities to reduce the cost of freight transport to both users and non-users, create new facilities, expand market share in the logistics sector and attract inward private sector investment to the Northern Powerhouse.

As part of the work, consultation sessions were held with a wide range of stakeholders. The outcomes of these consultations fed into the work.

The report concentrated on developing a preferred strategy alongside a list of interventions to feed into TfN's strategic investment plan. This strategy and suggested interventions have fed into the proposals set out in this report.

2.4 STP Evidence Base

TfN has published a variety of other reports which make up the evidence base for the STP. For each of these reports, an element of this enhanced freight and logistics analysis has been used although since these reports were published, the freight analysis has been further developed and enhanced, the outcome of this work is contained within this report.

In addition to the freight and logistics reports (this report and the initial freight study), the STP evidence base is also made up of:

- Major Roads Report;
- Integrated Rail Report;
- Independent International Connectivity Report; and
- Economic Appraisal.

This evidence base will be used within the Strategic Development Corridor studies which will be undertaken by TfN to produce a prioritised programme of investment.

2.5 Scope of Work

The second phase of the Freight and Logistics work stream (which this report covers) was commissioned in December 2016. It builds upon the first report by developing a clear case for investment through expansion of the "Why" case.

2.6 The North's Transport Network

The North of England's transport network is extensive and encompasses rail, road, see and air infrastructure in addition to a significant volume of warehousing, particularly around Liverpool, Manchester and Leeds.

The transport infrastructure supports a Northern population in the region of 16 million people, 7.9 million jobs and over 14,400 square miles of land. It also ensures that the North of England contributes over £290 billion GVA towards the UK economy.

Freight accounts for 9% of the country's GDP and supports every industry with access to goods and services. In the UK, a total of 1.65 billion tonnes of freight are lifted by all modes per annum. A little over a third of freight activity takes place in the North of England.

The North boasts a wealth of freight assets that grant the North a strong multimodal freight capability. These include:

- Eleven major ports in addition to other smaller ports located on the Tyne, Tees, Humber and Mersey as well as in Lancashire, Cumbria and Northumberland;
- Seven international airports including Liverpool John Lennon, Leeds-Bradford, Doncaster-Sheffield, Humberside, Durham Tees Valley and Newcastle in addition to the major international airport at Manchester;
- Three Strategic Rail Freight Interchanges (SRFIs – distribution centres with intermodal terminals) at Ditton, Wakefield and Selby with more emerging;

- Five further Intermodal Terminals at Trafford Park, Leeds, Garston, Doncaster and Widnes;
- A Strategic Road Network focused on the M62/M60/M56 and A66/69 East-West corridors and the M6 and M1/A1 North-South corridors;
- A strategic rail network principally comprising of the West Coast Main Line, East Coast Main Line and Midland Main Lines that connect the North of England to the South and the Transpennine routes; and
- A significant amount of distribution centre capacity.

Despite these assets being available, many are not being fully utilised due to a number of reasons such as lack of joined up infrastructure or attractive alternative logistics solutions. Gaps in connectivity prevail that urgently require investment; 80% of road freight in the North is domestic traffic, most of which is short haul (making it difficult to justify the use of rail on commercial or efficiency grounds), which places a heavy burden on the strategic road network.

Figure 2 shows the key transport infrastructure within the North of England.

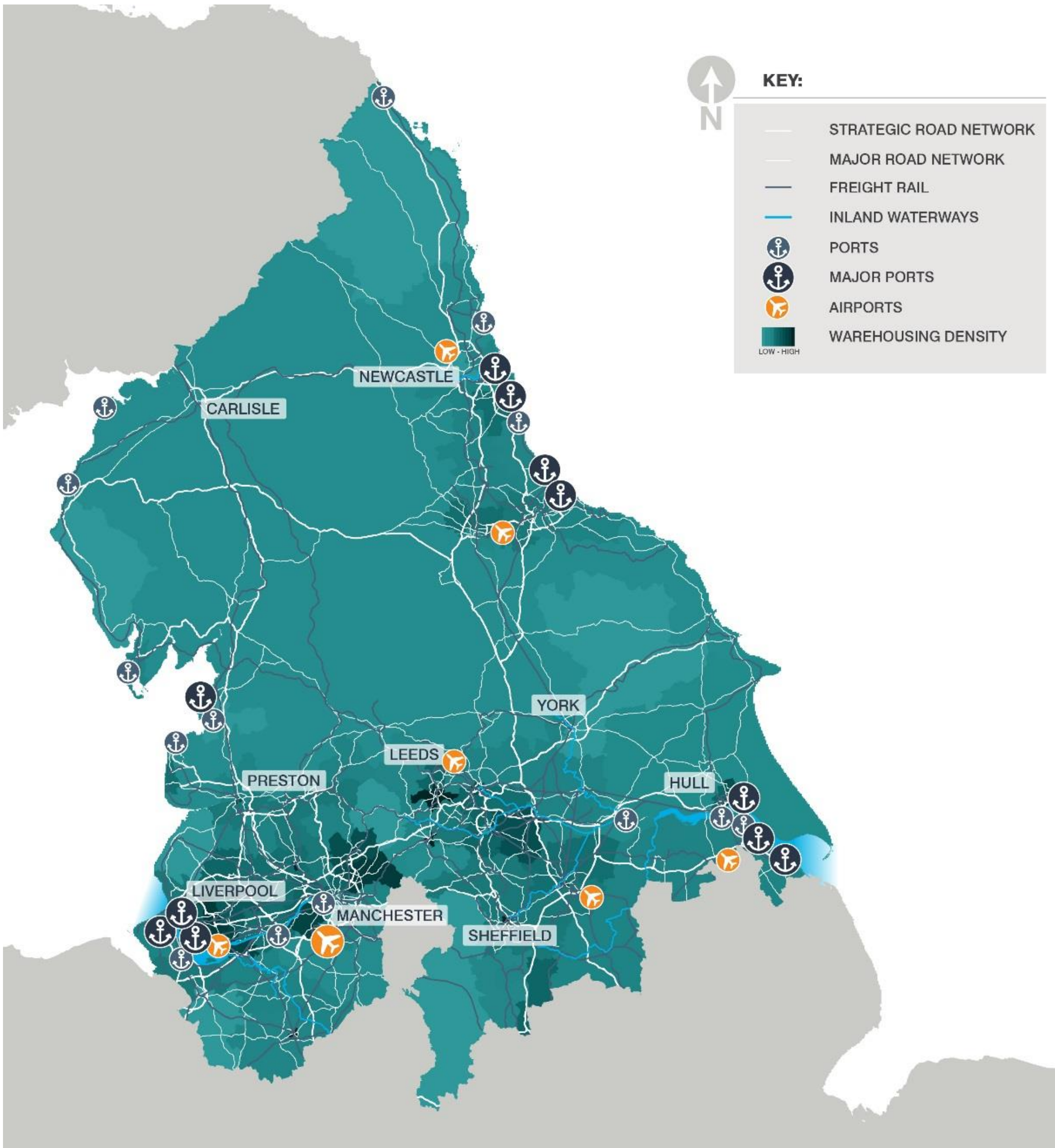

Figure 2 Key Transport Infrastructure - North of England

2.6.1 Road Network

The Strategic Road Network (SRN) in the North of England cover many of the regions large economic centres. North-South routes are provided through the M6 between Carlisle and Rugby, providing a vital link through the west of the region, and the A1 (M) between Newcastle close to Doncaster through the east of the region. The M1 links Leeds to London and provides a key route into and out of the North.

East-West routes are provided primarily through the M62 as the central corridor between Liverpool in the west and close to Hull in the east. Additional routes include:

- M56 between Manchester and the Welsh Border near Chester
- M58 between the M6 at Wigan to the north of Liverpool close to the Port;

- M57 links the M58 and M62 and provides an eastern bypass to Liverpool;
- M53 links Liverpool to the M56 via the Wirral;
- M60 forming the Manchester Ring Road;
- M65 between Preston and Colne;
- M18 links the M1 near Rotherham to the M62 to the west of Goole;
- M180 connects the M18 north of Doncaster to the A180 west of Grimsby and Immingham;
- A628/A616 is the main strategic freight route between South Yorkshire and Greater Manchester;
- A69 links Carlisle and Newcastle; and
- A66 provides a strategic route between Penrith (M6) to Scotch Corner on the A1 (M).

Many of the economic centres in the region are linked by routes from the SRN. The TfN Major Roads Report sets out the principle of a Major Roads Network (MRN), which includes the links mentioned above. The MRN encompasses the SRN plus all other routes that provide a road connection between economic centres.

The MRN is shown graphically on Figure 3.

The vision and objectives for the MRN in the North are characterised by conditional output statements based around the following areas for freight and logistics and should be considered in an economic; rather than transport context:

- **Journey Reliability**: measured by percentage of acceptable journeys in the North by LGV / HGV;
- **Network Efficiency**: including measure of average delay in minutes per hour by LGV / HGV and the percentage of the network that is adaptive;
- **Network Resilience**: measured by analysing the number of road closure events per annum on defined MRN corridors; and
- **Journey Quality**: collation of business perceptions of journey information provision and road condition.

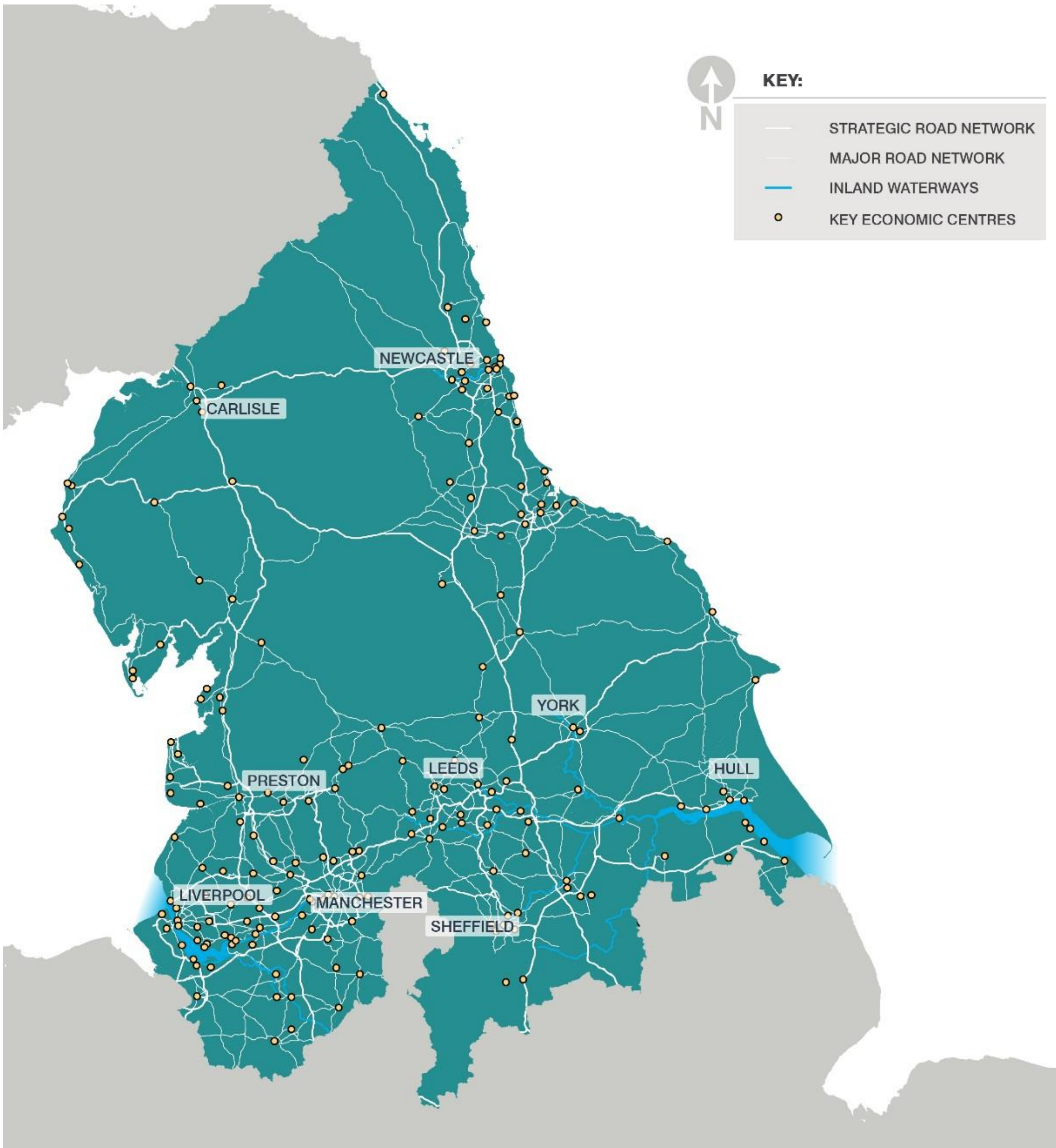

Figure 3 TfN Major Road Network

2.6.2 Rail Network

The North of England has an extensive rail network ranging from faster main lines to rural branch lines and freight-only lines into and out of ports for example.

The main north-south rail routes include:

- West Coast Main Line (WCML) from Scotland / Liverpool and Manchester to London Euston through the North of England via Crewe;
- East Coast Main Line (ECML) from Scotland / Newcastle / Leeds / Middlesbrough / Hull / York / Darlington to London Kings Cross through the North of England via Doncaster; and
- Midland Main Line (MML) from Sheffield to London St Pancras.

There are also a number of other routes throughout the North of England which are used for the movement of freight which include:

- Diggle Route from Manchester to Leeds via Stalybridge and Huddersfield;
- Calder Valley Route from Manchester to Leeds via Rochdale, Halifax and Bradford;
- Hope Valley Route from Manchester to Sheffield via Marple and Chinley
- Leeds to Carnforth via Wennington;
- Leeds to Carlisle via Settle and Appleby;
- Blackburn, Hellifield, to Carlisle via Settle and Appleby;
- Chat Moss Route from Liverpool to Manchester via St Helens and Newton-le-Willows;
- CLC route from Liverpool to Manchester via Warrington;
- Cumbrian Coast Line from Carlisle to Barrow-In-Furness and Lancaster via Workington and Whitehaven;
- Durham Coast Line from Newcastle to Middlesbrough via Sunderland and Hartlepool;
- Tees Valley Line from Saltburn via Darlington to Middlesbrough and Redcar; and
- Cleethorpes line from Cleethorpes to the Doncaster via Grimsby, Immingham and Scunthorpe.

The vision and objectives for rail freight in the North are characterised by conditional output statements based around connectivity, capacity, cohesion and cost efficiency. In this regard the outputs have been identified as:

- **Connectivity**: Develop a rail freight network that efficiently links industry to markets in terms of reduced journey times and transfer arrangements within the TfN region and to corridors to other regions of the UK and to international ports
- **Capacity**: Provide the rail freight capacity in advance of forecast demand such that rail supports the economic growth of relevant markets both in terms of the volumes and physical size of goods capable of being conveyed along corridors within the TfN region and on links to the wider UK and international markets
- **Cohesion**: Develop a rail freight network and service capacity and capability within the TfN region that complements the characteristics of the road network and provides a consistent unified system that is easy to understand and access
- **Cost Efficiency**: Create a freight rail network that focuses on the traffic requirements that are most closely aligned to rail's commercial strengths

such that the transportation of goods is undertaken efficiently in terms of lower unit rates and reduced transit times both within the region and across its boundary connections

Beyond the linkage to the above conditional outputs, the vision for rail freight is that it will act as a complementary mode of transport to road. Rail freight will have aims in this regard to reduce the environmental impact of the movement of freight, and also play a significant role in relieving road congestion. Such vision will by necessity need to be tempered with an appreciation of the commercial impact of such a modal shift taking due account of rail’s advantages (bulk movements along defined corridors) and limitations (not suitable for low volumes to diverse destinations).

A large proportion of the Northern rail freight has historically been related to movements of coal between ports and inland power stations. It was also linked with heavy industry such as the making of steel. These volumes are now falling as the UK switches to a lower carbon economy and with the loss of significant portions of the country’s heavy industry. However this provides an opportunity to utilise the released capacity to the benefit of other commodities where it is in the right place to do so.

The North’s rail network is shown in Figure 4.

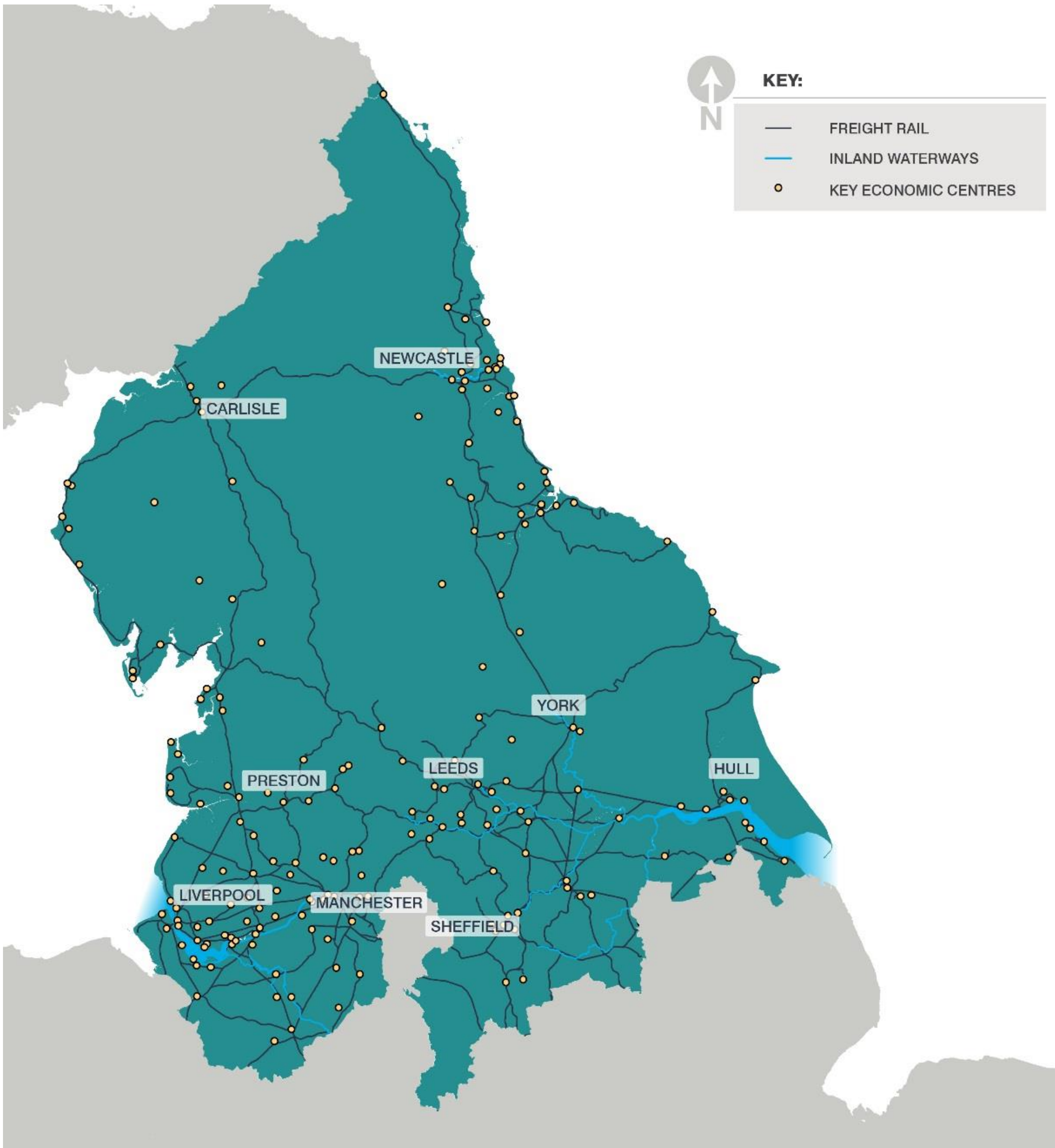

Figure 4 North of England Rail Network

2.7 Key Freight Operators

The North of England is home to a number of freight and logistics organisations of varying sizes and complexities. Generally these can be split into four areas:

- Distribution – Logistics companies that use a wide range of solutions to transport goods throughout the North of England. This could include road, rail, water or air transport;
- Ports – Organisations that own and operate the North's various ports;
- Rail Freight Operating Companies (FOCS) – Organisations that operate rail freight trains on the UK rail network; and
- Shipping Lines – Organisations that provide short or deep sea shipping services into or out of ports in the North of England.

Examples of these organisations are included in Figure 5.

Distribution and Haulage

- Royal Mail
- DHL
- Wincanton
- DPD Group
- UPS
- Kuehne + Nagel
- Whistl UK
- Yodel Distribution
- Eddie Stobart Logistics
- Gist
- Clipper Logistics Group
- Turners (Soham)
- FedEx UK
- WH Malcolm
- CM Downton
- JG Russell
- Harry Yearsley
- Canute Haulage
- Prestons of Potto
- Reed Boardall
- Bowker Haulage

Rail Freight Operating Companies (FOCs)

- DB Cargo
- Freightliner
- GB Railfreight
- Direct Rail Services (DRS)
- Colas Rail
- Devon & Cornwall Railways (DCR)

Shipping Lines and Freight Forwarders

- DFDS Seaways
- Stena Line
- P&O Ferries
- Isle of Man Steam Packet
- Maersk
- Grimaldi Lines
- Bibby Line Group
- Seatruck
- Mediterranean Shipping Company (MSC)
- Atlantic Container Line UK Ltd (ACL)
- Independent Container Line (ICL)
- BG Freight Line
- Express Cargo UK
- UK Freight Forwarding
- Tuscor Lloyds
- Interspan

Ports and Terminal Operators

- Peel Ports
- Associated British Ports (ABP)
- PD Ports
- Port of Tyne
- Cumbria County Council
- Swissport
- Kerry Logistics
- Evergreen Shipping
- Stobart Group

Figure 5 Key Freight Operators

In addition, freight is also carried by air, however in the North of England this is more likely to be moved by long-haul passenger aircraft operating into and out of Manchester Airport such as Emirates Airlines, Qatar Airways, Etihad Airways, Cathay Pacific Airways and Singapore Airlines. Other Northern airports are looking to grow their air freight activity and are lobbying hard to ensure that the last mile of route of the major road network doesn't impede the speed and efficiency of delivery of airfreight to the airports.

3 Methodology

3.1 Introduction

The data used to inform the current and future freight forecasts analysis within this report is based upon model outputs from the Great Britain Freight Model (GBFM) which is developed and maintained by MDS Transmodal .

This section highlights how the model has been used to provide the data for the scenarios examined within this report.

3.2 The Great Britain Freight Model (GBFM)

GBFM is a four stage freight transport model. Over the last ten years GBFM has been used by a wide variety of ports and warehouse developers, as well as public sector bodies at a regional and national level, including for road freight forecasts as part of the DfT's National Transport Model (NTM).

3.3 Methodology

GBFM uses the available official freight transport statistics to develop a multi-modal base year matrix for 2016 for this study. It then explains the observed freight transport movements in terms of generalised costs, reflecting how the freight transport industry determines the choice of mode and allowing future market and policy-based scenarios to be developed for any future year where these scenarios affect generalised cost of freight transport.

GBFM was used in the initial freight and logistics report published by TfN and included a demand forecasting module allowing demand to be forecast up to 2043 including origins and destinations for both domestic and short sea international movements so that both domestic and international movements by ferry can be modelled.

For this subsequent enhanced analysis, the economic output from the Northern Powerhouse Independent Economic Review (NPIER) was included in the future year scenario whereby the future year was 2050.

To produce the outputs for the future year scenario which is referred to in the report as the 2050 Do Nothing with NPIER Growth scenario the following process was followed:

- MDS Transmodal built on the previous major work undertaken for the TfN Freight & Logistics Strategy (September 2016) for which there were 2033 and 2043 "Do minimum" outputs (without NPIER growth) (see below)
- To generate 2050 outputs a continued trend through 2033 & 2043 to extrapolate to 2050 (without NPIER growth) was assumed;
- For each TfN zone the 2050 Business-As-Usual (BAU) forecast of GVA & population was used. These were compared to the equivalent (higher) 2050 forecasts in the NPIER transformational scenario.

- For each zone, two scale-up factors for 2050 were calculated:
    - GVA in the NPIER transformational scenario) / (GVA in BAU); and
    - Population in the NPIER transformational scenario) / (Population in BAU).
- An average of the above two figures was taken to give a scale-up factor for freight tonnes to/from each TfN zone; and
- For any freight journey this scale-up factor was calculated for the origin and the destination zone and the traffic was scaled up by the average for the origin and destination to give results for the 2050 NPIER transformational scenario.

The full assumptions for the modelling work carried out by MDST are contained within the documents prepared as part of the initial Freight and Logistics Study whereby the Phase 1 Baseline Report sets out the assumptions and methodology for calculating the baseline freight volumes.

The TfN Freight and Logistics Study Technical Appendices document sets out how the future year forecasts were created in more detail aside from the process outlined above.

3.4 Representation of the Data

The GBFM model outputs have been analysed using ArcMap GIS software, to handle geographic data and create visual representations of current and future forecast freight flows to, from and within the north of England. For each mode of transport, these outputs take the form of a route based network with two-directional freight flows, as modelled for different scenarios, connected to each section of route.

GBFM model outputs distinguish by mode of transport, and this is reflected in the representation of the data:

1. **Road Freight**: two data types – annual volume in cargo tonnes and number of HGVs;

2. **Rail Freight**: two data types – annual volume in cargo tonnes and number of rail paths used; and

3. **Waterborne freight**: one data type – annual volume in cargo tonnes.

Volume in cargo tonnes has been used as the main basis for representation of the data, as this data type is available for each mode thereby making direct comparison possible.

Two primary visualisation methods have been used to represent the data:

1. Flow volumes indicated through **line thickness.**
   The data has been grouped in bandwidths, created as appropriate based on

the range and distribution pattern for flow values within each individual data set, with line thicknesses scaled to the mid-point of each bandwidth.

Where possible, line thickness representation scales have been created to match within each group of figures, so that they are instantly visually comparable.

A minimum significance threshold has been created for each data set in order to visually represent it, with the base transport network shown where freight flows remain below this threshold.

2. Flow volumes indicated through a **heat map colour scale**.

   This is used only in the Key Corridors figures, with methodology is applied as above.

3.4.1 Road and Rail Freight data

The road and rail freight data for each scenario has been used to calculate and ‘difference’ figures, comparing between:

- 2050 Do Nothing (without NPIER) to 2050 Do Nothing (with NPIER); and
- 2016 Base to 2050 Do Nothing (with NPIER).

The differences in freight flows are represented graphically through line colour, with yellow lines used to represent growth and dark blue lines used to represent decline.

The GBFM model outputs for road and rail freight also distinguish between movement types as follows:

- Domestic: freight movement to/from/within TfN and South England/Wales/Scotland
- Through: domestic freight movement through TfN (i.e. between South England/ Wales and Scotland)
- UK Import freight movement
- UK Export freight movement

In addition, the road and rail freight model outputs have been analysed by commodity group, although there are no 2050 forecasts for road split by commodity group due to the limitations of inputs available for this type of modelling.

3.4.2 Waterborne Freight data

The GBFM outputs for waterborne freight were in the form of an OD matrix, which was analysed using spreadsheet software to calculate annual cargo tonnes values for representation. Analysis focuses on six ‘Port Groups’ within TfN, as follows: Humber Ports, Tees Ports, Tyne & Wear Ports, Mersey Ports, Lancashire

Ports, and Cumbrian Ports. The import and export freight movements which travel through these are represented on separate figures.

The origin/destination regions in the UK (3 within TfN) were grouped into six areas as follows: North East, North West, Yorkshire & Humber, Other England, Wales and Scotland.

Outside the UK, the origin/destination country groups have been analysed and represented in eight areas as follows, broadly in relation to their location relative to the UK: Irish Republic, Northern Europe, Central Europe, Southern Europe, Far East & the Gulf, Africa, North America and Latin America.

3.4.3 Key Corridors

The GBFM outputs used in the key corridors analysis were in the form of an OD matrix, which was analysed using spreadsheet software to calculate annual cargo tonnes values for representation. This combines the road and rail modes, so represents all land surface based freight movement. The flows are represented on the basis of the 2050 Do Nothing (with NPIER) growth scenario. Flow volumes are indicated through a heat map colour scale, with darker shades for larger freight volumes.

4 The Case for Investment

4.1 Growth Forecast

The Great Britain Freight Model (GBFM) has been used to model freight transport flows to, from and within the North under Base (2016) conditions as well as future conditions with and without the Northern Powerhouse Independent Economic Review (NPIER) growth forecasts.

The 2050 Do Nothing scenarios assume that only committed schemes are applied to the North's transport network i.e. future interventions that are not committed are excluded.

Utilising the scenarios outlined in Section 3, the GBFM has been interrogated to produce summary statistics for all freight movements within the North of England. These statistics are presented in two differing ways:

- Tonnes Lifted; and
- Tonne Kilometres.

The Tonnes Lifted metric take into account all freight moved within the North. It does not take account of distance travelled therefore is more biased to road transport given the significant number of short trips that take place.

Table 1 shows the mode share of freight movements in the North expressed in Tonnes Lifted. The Table shows that road freight is the dominant method with the mode share remaining stable from the 2016 to the two 2050 Do Nothing scenarios. The rail freight mode share increases slightly whilst the share of freight travelling by water reduces.

Table 1 North of England Mode Share (Tonnes Lifted)

Mode	2016 Base		2050 Do Nothing (without NPIER)		2050 Do Nothing (with NPIER)	
	Tonnes Lifted	**Mode Share**	**Tonnes Lifted**	**Mode Share**	**Tonnes Lifted**	**Mode Share**
Road	574,040,614	91.0%	703,313,674	91.0%	763,909,612	91.0%
Rail	44,078,262	7.0%	56,805,387	7.3%	61,633,147	7.3%
Waterway	12,820,832	2.0%	12,820,832	1.7%	14,307,050	1.7%
Total	**630,939,709**		**772,939,894**		**839,849,809**	

Table 2 shows the growth in terms of tonnes of freight lifted between the various scenarios. For the purposes of the modelling, it was assumed that the volumes of goods moved by inland waterway remains stable between 2016 and the 2050 Do Nothing (without NPIER) scenario. Applying the NPIER growth results in an increase in freight by inland waterway. In addition, the heaviest growth occurs on the rail network.

Table 2 North of England Growth (Tonnes Lifted)

Mode	Growth from: 2016 Base > 2050 Do Nothing (without NPIER)		Growth from: 2016 Base > 2050 Do Nothing (with NPIER)		Growth from: 2050 Do Nothing (without NPIER) > 2050 Do Nothing (with NPIER)	
	Tonnes Lifted	**Growth**	**Tonnes Lifted**	**Growth**	**Tonnes Lifted**	**Growth**
Road	129,273,060	22.5%	189,868,998	33.1%	60,595,938	8.6%
Rail	12,727,125	28.9%	17,554,885	39.8%	4,827,760	8.5%
Waterway	-	0.0%	1,486,217	11.6%	1,486,217	11.6%
Total	**142,000,185**	**22.5%**	**208,910,100**	**33.1%**	**66,909,916**	**8.7%**

A more accurate metric for measuring mode share is through analysing tonnes kilometres. As freight is generally moved over longer distances by rail it is more accurately reflected using this metric where the total freight is multiplied by the distance it travels.

Table 3 outlines the mode share based on tonne kilometres and shows that the rail mode share has increased. Using this metric however does show the rail mode share decreasing throughout the three scenarios reflecting longer haulage distances by road which is generally driven by the growth in e-commerce and increased consumer spending which require more and larger National Distribution Centres (NDCs) and Regional Distribution Centres (RDCs), often only connected by road. This trunking of goods between NDCs and RDCs is driving the increasing distances that road freight vehicles travel.

Table 3 North of England Mode Share (Tonne Km)

Mode	2016 Base		2050 Do Nothing (without NPIER)		2050 Do Nothing (with NPIER)	
	Tonnes Km	**Mode Share**	**Tonnes Km**	**Mode Share**	**Tonnes Km**	**Mode Share**
Road	71,841,903,276	87.2%	107,035,877,428	88.0%	116,257,849,963	88.0%
Rail	9,994,744,474	12.1%	14,087,404,401	11.6%	15,284,660,792	11.6%
Waterway	526,873,283	0.6%	526,873,283	0.4%	587,949,522	0.4%
Total	**82,363,521,033**	100.0%	**121,650,155,112**	100.0%	**132,130,460,277**	100.0%

Table 4 illustrates the growth in each mode using the tonne kilometres metric and shows that road has the most significant growth.

Table 4 North of England Growth (Tonnes Km)

Mode	**Growth from: 2016 Base > 2050 Do Nothing (without NPIER)**		**Growth from: 2016 Base > 2050 Do Nothing (with NPIER)**		**Growth from: 2050 Do Nothing (without NPIER) > 2050 Do Nothing (with NPIER)**	
	Tonnes Km	**Growth**	**Tonnes Km**	**Growth**	**Tonnes Km**	**Growth**
Road	35,193,974,152	49.0%	44,415,946,687	61.8%	9,221,972,535	8.6%
Rail	4,092,659,928	40.9%	5,289,916,318	52.9%	1,197,256,391	8.5%
Waterway	-	0.0%	61,076,239	11.6%	61,076,239	11.6%
Total	**39,286,634,080**	**47.70%**	**49,766,939,245**	**60.4%**	**10,480,305,165**	**8.6%**

There is a significant growth on both the road and rail networks between 2016 and 2050. Road is by far the dominant mode for the movement of freight and in 2050 will represent 91% of all cargo tonnes lifted or 88% of all cargo tonne km in the North of England (a growth of 33.1% cargo tonnes lifted or 61.8% cargo tonne km). This will put significant pressure on the existing road infrastructure as the consumer demand for freight increases and will have a negative impact on congestion, regional air quality and costs.

In addition, while the rail freight share is smaller, growth is expected and is driven primarily by the movement of intermodal freight between the Southern ports and the North of England. In 2050, rail is expected to make up 7.3% of all cargo tonnes lifted and 11.6% of all cargo tonne km. This reflects a growth (between 2016 and 2050) of 39.8% and 52.9% respectively. Capacity on the rail network for freight is a key issue, which the projected growth will only exacerbate.

The construction of large infrastructure schemes such as HS2 may also create temporary growth in rail freight; particularly bulk materials.

The subsequent sections set out the trends in both movement types and commodities as well as the challenges faced for freight moved by road, rail and water in more detail.

4.1.1 Demands outside the modelled periods

The case for investment outlined in this section of the report is based around examining the current freight and logistics demand and comparing those with future demand in 2050 to match the timeframe set out in the TfN STP.

It should be noted however that there may be more pressing demands placed on the transport network in the years leading up to 2050 particularly around the construction of major developments throughout the North of England where large quantities of construction materials will be required to be moved. An example of such developments are those which occur along the Energy Coast in West Cumbria between 2020 and 2030. It is understood that the freight demand to support the new and existing developments on the Cumbrian Coast Line could include the following services, many of which are additional to the existing demands placed on the line:

- Nugen/Moorside – 4 Trains per day
- National Grid – 3 trains per day
- Low Level Waste Repository – 3 trains per day;
- West Cumbria Mining – 6 trains per day;
- Sellafield – 2 trains per day;
- Port of Workington – 1 train per day; and
- Port of Barrow – 2 trains per day.

The Cumbrian Coast Line needs to support these major developments and the capacity of line is significant constraint.

Whilst the mapping of future freight flows does not reflect the demands created by developments such as those listed above (the construction period will have been completed by 2050), they should be considered within each of the respective Strategic Corridor Studies where any required interventions should be identified.

4.2 Road Freight

4.2.1 Operation

The road haulage sector is the UK's fifth largest employer. It is a highly competitive, low-margin business and is service-driven responding to customer demand which fluctuates depending on a number of factors including seasonality and the economic outlook.

Most operators within the road haulage sector work within a licensing system that is highly regulated. There are exceptions for smaller vehicles under 3.5 tonnes.

4.2.2 Commodities

A wide variety of commodities are moved around to, from, within and through the North of England by road. The modelling exercise has grouped these into six main categories, namely:

- Temperature Controlled Foodstuffs;
- Other Foodstuffs;
- Construction and Metals;

- Crude Materials and Manufactured Items;
- Petrol and Petroleum Products; and
- Other Bulks.

Examples of types of freight under each category are shown in Table 5.

The road commodities are only provided for the 2016 year scenario due to limitations with the model however later in the report, total freight flows by commodity irrespective of mode have been analysed and assumptions have been made to calculate the likely forecast volumes for road.

Of the six commodity categories for road, no indication has been made on which are categorised as intermodal (unlike the rail commodity groups). For the purposes of the analysis in this report, it is assumed that Temperature Controlled Foodstuffs, Other Foodstuffs and Crude Materials and Manufactured Items could all be transported in intermodal containers.

Table 5 GBFM Road Freight Commodity Groups

1. Temperature Controlled Foodstuffs	**2. Other Foodstuffs**	**3. Construction and Metals**
• Fresh / Fruit and Veg • Perishable Foodstuffs	• Cereal • Potatoes • Sugar Beet • Live Animals • Sugars • Beverages exc. Tea & coffee • Stimulants and spices • Other non-perishable foodstuffs • Animal Fodder & Foodstuff & Waste • Oil, seeds & oleaginous fruit & fat	• Wood and cork • Pig iron, ferro-alloys • Semi-finished rolled steel product • Iron & steel bars, rods, rail & tramways • Steel sheets, plates, hoop & strip • Tubes, pipes, iron & steel castings • Non-ferrous metals • Sand, gravel, clay & slag • Sal, iron pyrites, sulphur • Other stone earths & minerals • Cement and lime • Plasters • Other manufactured building materials • Manufacturers of metal • Glass, glassware and ceramic products

4. Crude Materials and Manufactured Items	5. Petrol and Petroleum Products	6. Other Bulks
• Textiles • Raw animal & veg material • Paper pulp & waste paper • Transport equipment • Tractors, agricultural machinery • Other machinery apparatus / appliance • Leather, textiles and clothing • Automotive • Miscellaneous manufactures • Misc. articles	• Crude petroleum • Fuel derivatives • Gaseous hydrocarbons, liquid • Non fuel derivatives • Coal chemicals	• Coal • Lignite and peat • Coke • Iron ore • Non-ferrous ores and waste • Iron and steel waste and blast furnace dust • Natural fertilisers • Chemical fertilisers • Basic chemicals • Aluminium oxide and hydroxide • Other chemical products

Appendix A1 presents the mapped commodity flows by road across the North of England for 2016.

All of these commodities can be moved by road, rail and water with infrastructure and capacity often a key limiting factor (in addition to cost). Containerised freight is an example whereby utilising rail and water for longer distance movements may be more attractive. Bulk goods is also another commodity group which is particularly suited to high volume, longer distance movements by modes other that road and rail and water are often a more attractive proposition for bulks.

4.2.3 Total Cargo Movements

4.2.3.1 2016 Base

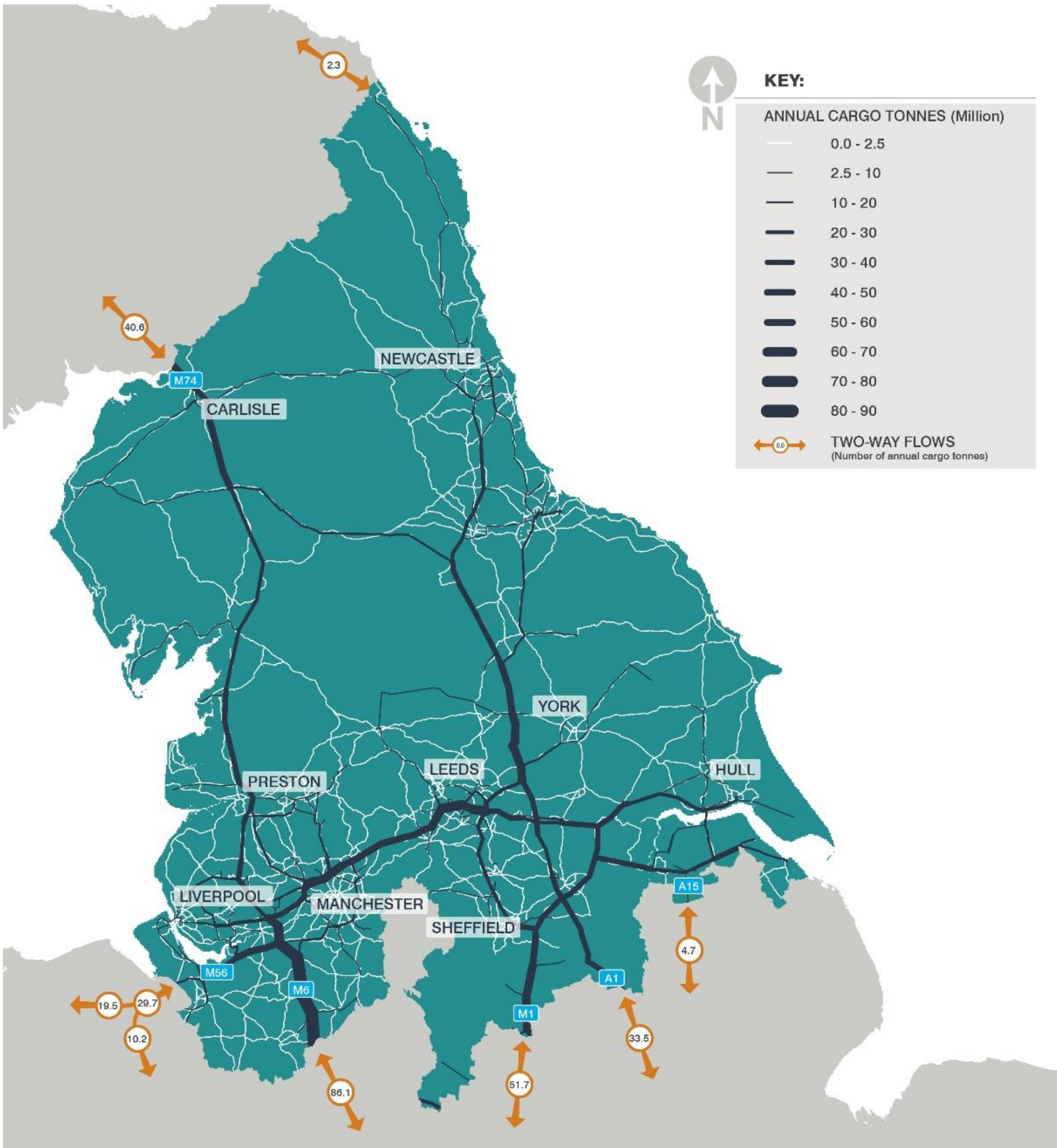

Figure 6 shows the 2016 Base freight flows in cargo tonnes that travels via the Major Road Network (MRN)

The figure shows that in 2016, the heaviest freight flows in the North of England occur on the M6 south of Warrington and on the M62 between Manchester and Leeds. Heavy flows are also shown on the M56 towards North Wales, the A1(M) in North Yorkshire as well as on the M1 to the south of Sheffield. The section of the M6 between Penrith and the Scottish Border to the north of Carlisle also shows significant movements of freight.

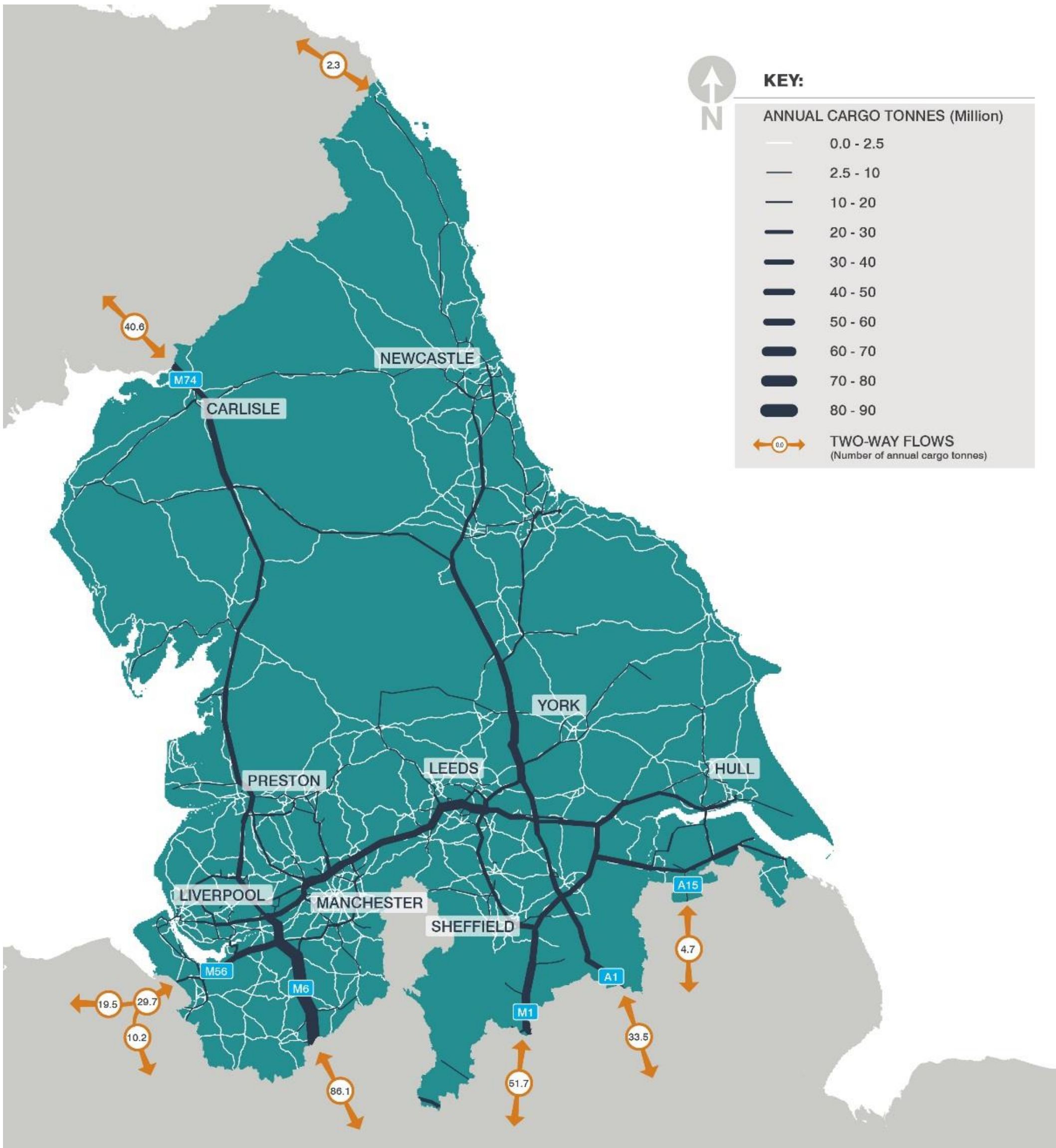

Figure 6 Road Freight (cargo tonnes) - 2016 Base

4.2.3.2 2050 Do Nothing (without NPIER)

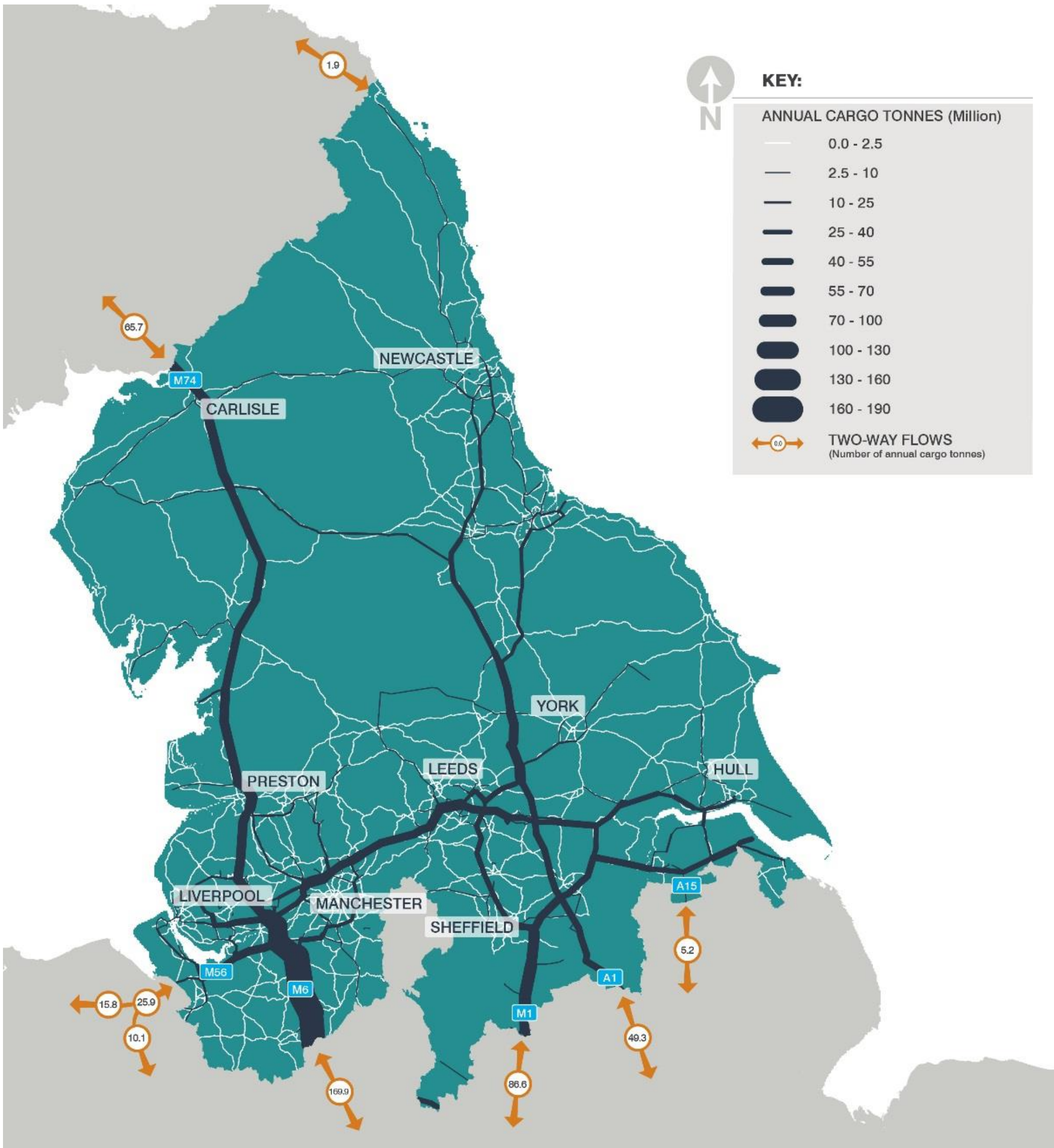

Figure 7 illustrates the forecast freight moved on the MRN in 2050 under the No NPIER growth scenario. Significant flows are forecast particularly on the M6 over its full length but specifically south of the M62 corridor.

The volume of freight moved via the M6 south of the M62 is 160 Million tonnes annually compared with 86 Million tonnes in the 2016 Base scenario.

Significant flows are also shown on the major freight routes including the M62, A1(M), M1 and M180.

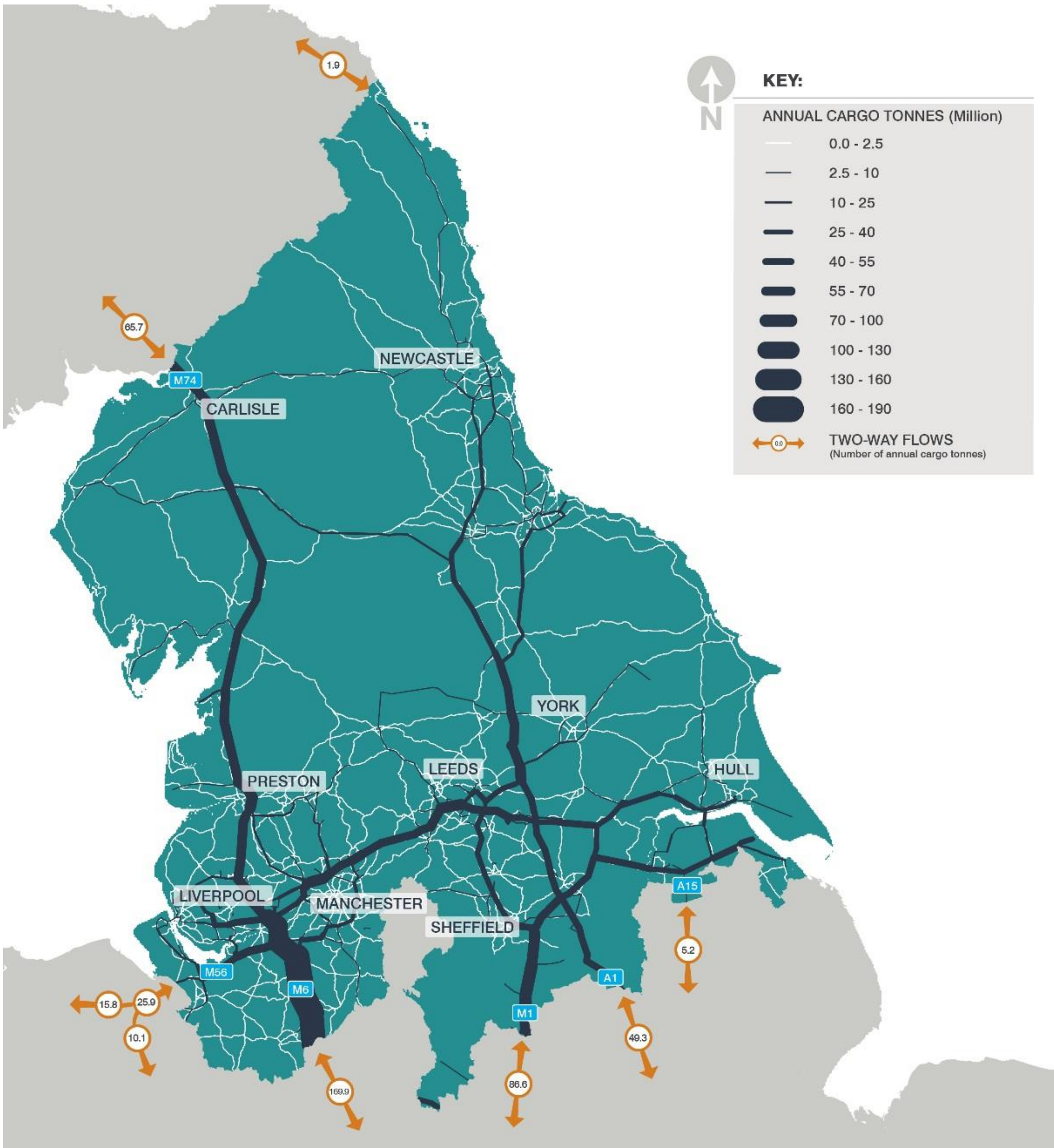

Figure 7 Road Freight (cargo tonnes) - 2050 Do Nothing (without NPIER)

4.2.3.3 2050 Do Nothing (with NPIER)

Figure 8 shows the cargo volumes on the MRN in 2050 under the Do Nothing with NPIER growth scenario whereas Figure 9 shows the difference between the 2016 Base and the 2050 Do Nothing (with NPIER) scenarios.

The figures show that on the existing road network the heaviest road freight flows occur on the M6, particularly south of Warrington and on the east –west axis between Liverpool / North Wales, Manchester, Leeds and the Humber. The A1(M) in North Yorkshire and M1 South of Sheffield also experiencing significant growth in volumes of freight traffic.

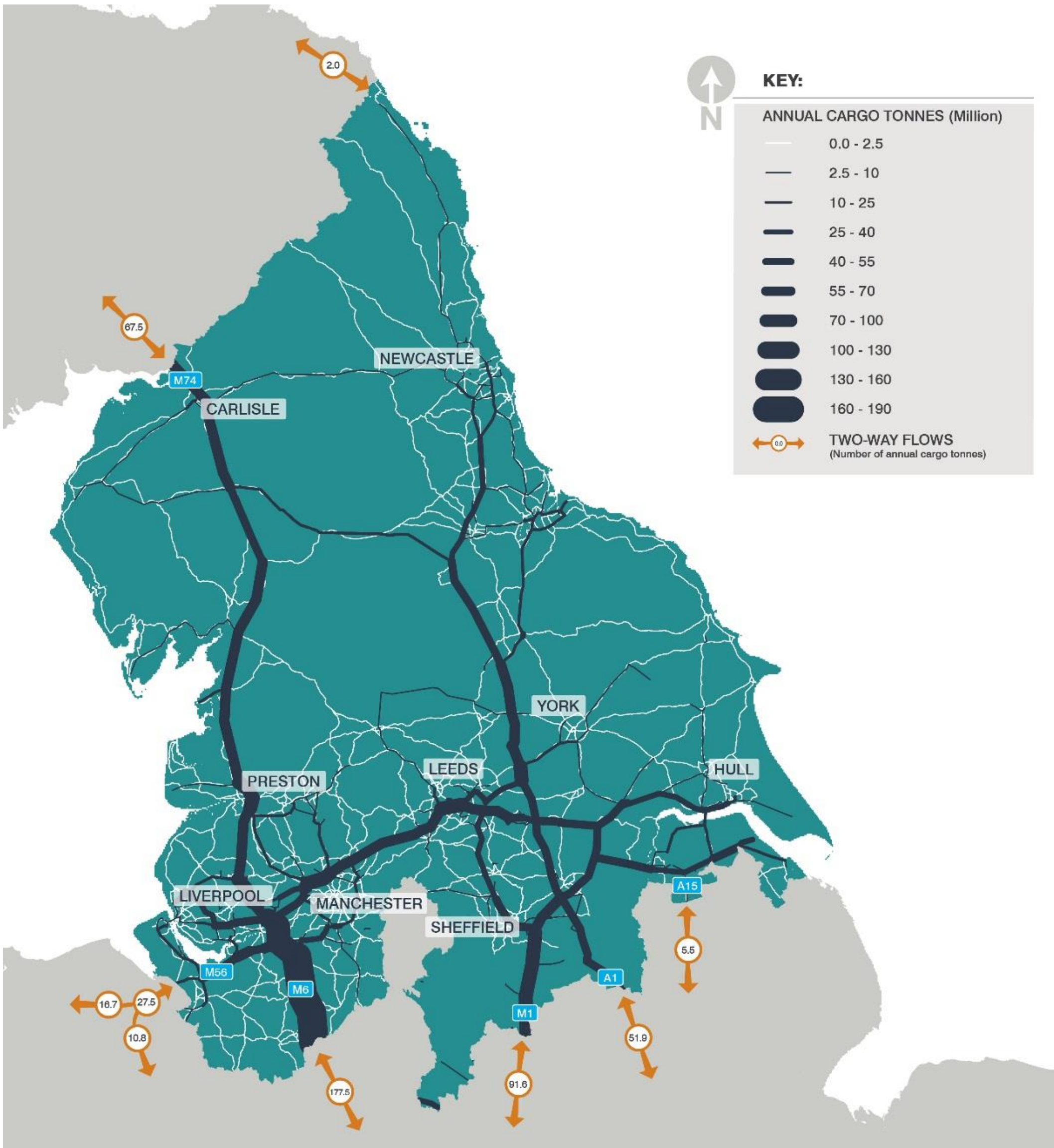

Figure 8 Road Freight (cargo tonnes) - 2050 Do Nothing (with NPIER)

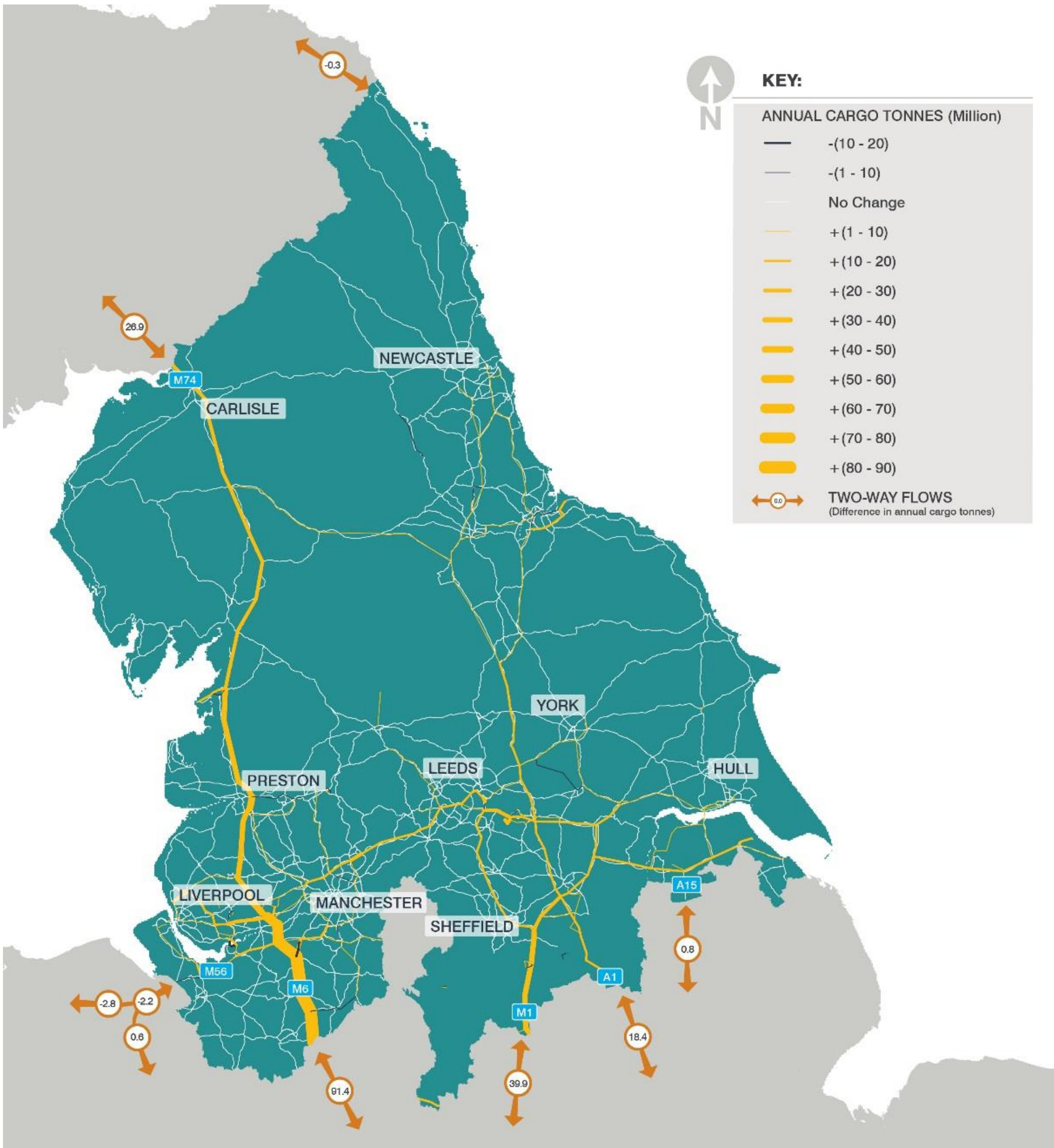

Figure 9 Road Freight (cargo tonnes) - Difference between 2016 Base and 2050 Do Nothing (with NPIER) scenarios

4.2.4 Movement Types

GBFM has been interrogated to analyse the types of road freight moves in the North of England. Movement types are grouped as shown in Table 6.

Table 6 Movement Types

Movement Type	Description
Domestic: To, from and within the North	Domestic freight movements where goods are loaded or unloaded in the North of England at one end of the journey at least.
Domestic: Through the North	Domestic freight movements that are not loaded or unloaded in the North of England but travel through the North to on journeys between other regions e.g. Scotland to Midlands.

International: Imports	Any international freight movements that are imported to UK and that travel within the North of England – this could be via Ports or Airports but within and out with the North of England.
International: Exports	Any international freight movements that are exported from the UK and travel within the North of England – this could be via Ports or Airports but within and out with the North of England.

Each of these has been analysed in the following sections.

4.2.4.1 Domestic: To, from and within the North

The domestic flows are the dominant movement type across the North with the major flows in 2016 shown on Figure 10 and the forecast flows in 2050 (Do Nothing with NPIER scenario) shown on Figure 11.

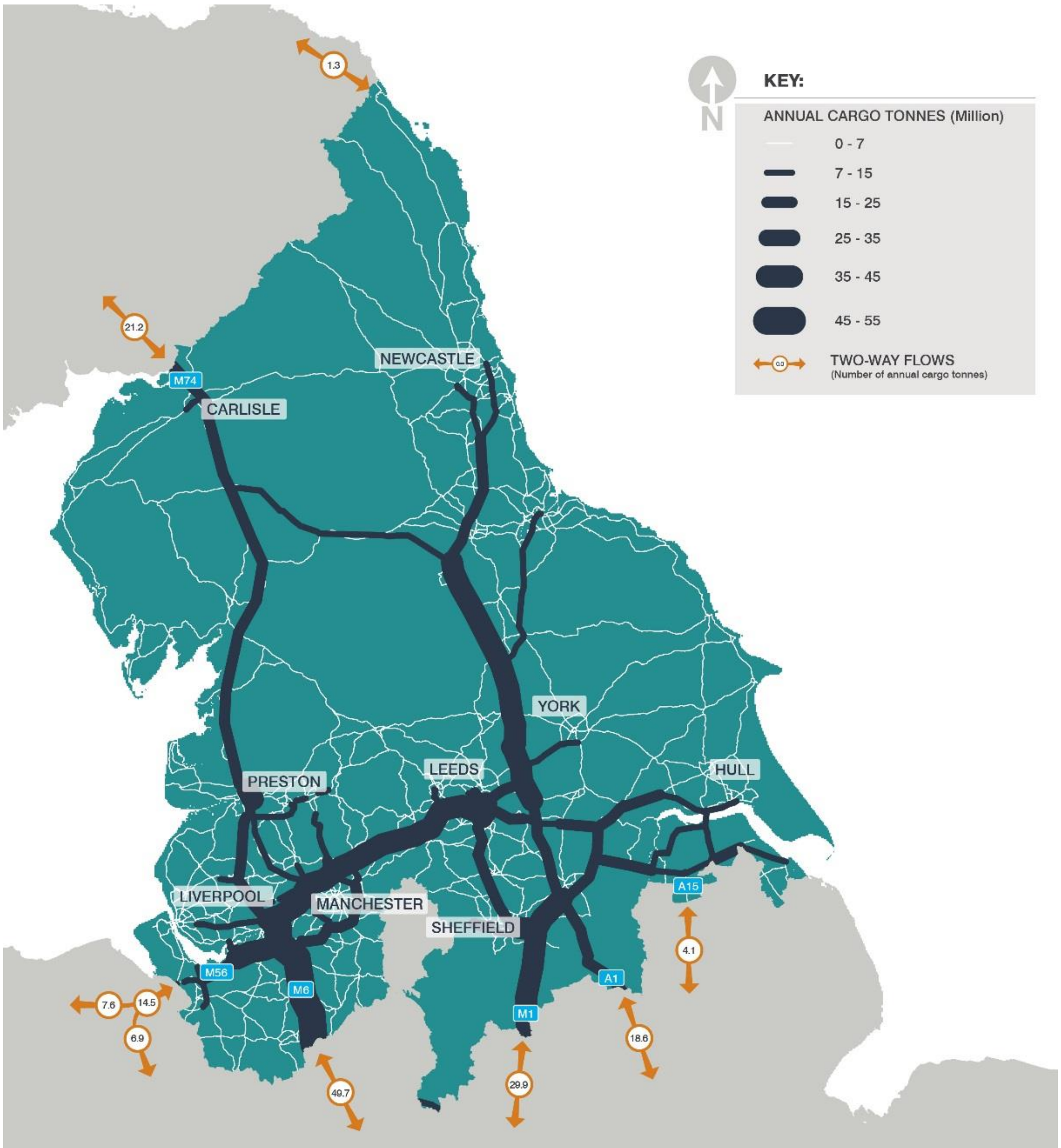

Figure 10 Road Freight Movement Types: 2016 Domestic: To, from and within the North

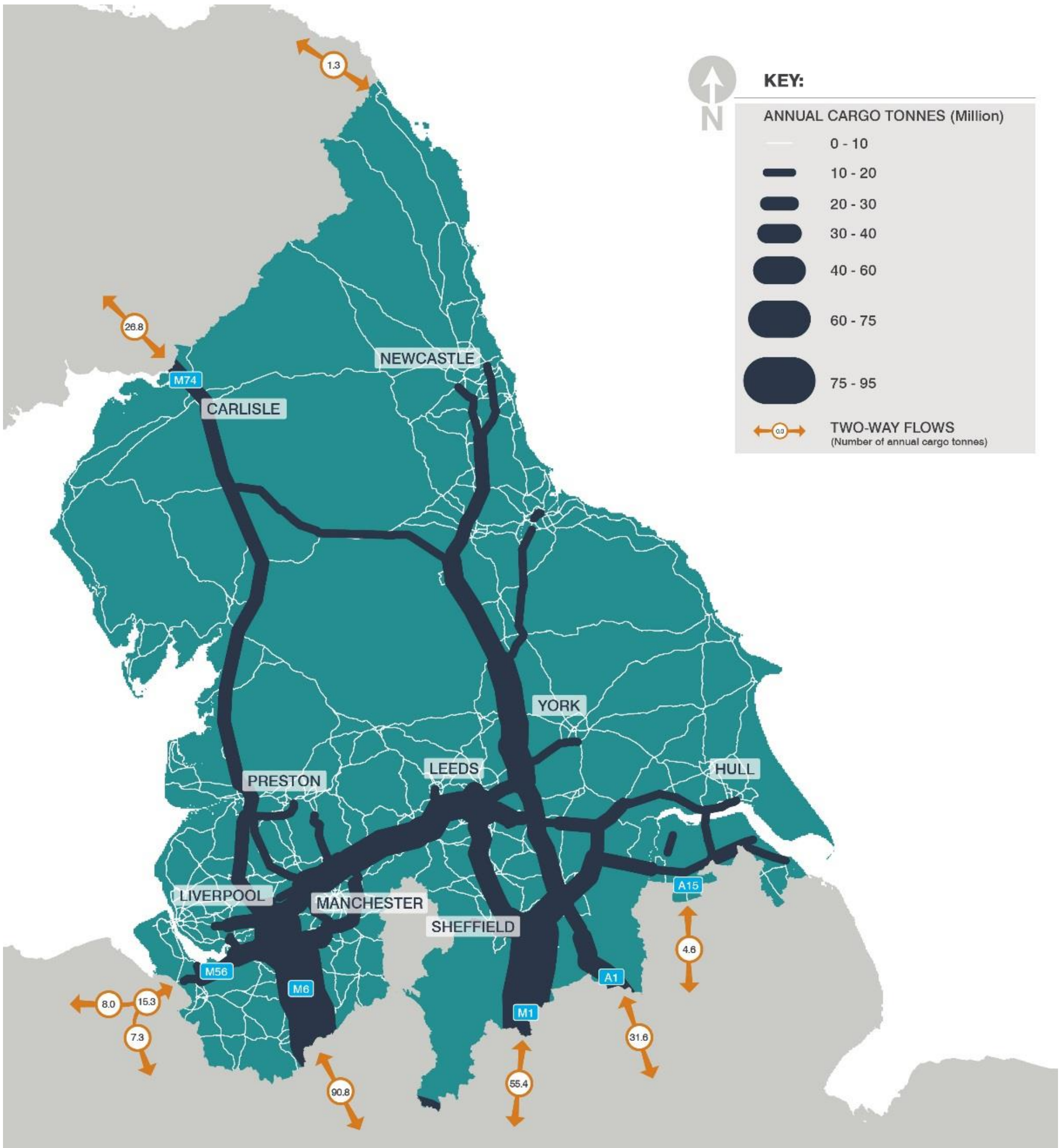

Figure 11 Road Freight Movement Types: 2050 (Do Nothing with NPIER) Domestic: To, from and within the North

A large proportion of domestic freight flows are made up of National Distribution Centre (NDC) to Regional Distribution Centre (RDC) movements on the key trunk routes. These flows increase in line with the growth in consumer spending and as the popularity of online “e-tailers” grows for example.

The growth in cargo tonnes on a selection of the North’s strategic routes between 2016 and 2050 is shown in

Table 7. The most significant growth occurs on the M1 and M6 providing links to the Midlands and southern England.

Table 7 Road Freight - Key Strategic Routes Flows - Domestic: To, from and within the North

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	22.1	28.8	30%
M6 - near Lancaster	18.7	23.2	24%
M6 - southern TfN border	53.7	96.0	79%
M62 - between Leeds & Bradford	44.2	54.5	23%
M1 - southern TfN border	40.1	72.7	82%
A1 - southern TfN border	18.6	31.6	70%
M180 - near Scunthorpe	11.3	18.3	61%
M62/A63 - near Hull	14.6	17.1	17%
A1(M) - near Thirsk	33.4	47.1	41%
A66 - between Darlington & Penrith	8.6	11.9	39%

4.2.4.2 Domestic: Through Traffic

The remainder of the domestic flows are made up of movements between regions out with the North of England. These movements include road vehicles transporting goods from the likes of Scotland to the Midlands for example.

The significant domestic through movements in 2016 are shown on Figure 12 with the corresponding forecast for 2050 (Do Nothing with NPIER) shown on Figure 13.

Table 8 illustrates the growth on some of the North's key routes and illustrates that the traffic on the M6 along its length will grow considerably. This growth is attributed to the trend to a model with more NDC and RDC model caused by the move towards next-day-delivery of a wide variety of goods. This move is likely to lead to distribution chains with a very large NDC able to hold a wide variety of goods, which are then trunked overnight to local depots for local delivery. In 2050, more NDCs are forecast within Central England, which are predicted to supply RDCs in both the North of England and in Scotland.

Through the introduction of more and larger NDCs and RDCs to support the growth in consumer spending and the changing ways in which people purchase goods, the average length of haul by road freight increases. For the sorts of cargoes that typically go through warehouses (e.g. Fast Moving Consumer Goods (FMCGs)), the domestic average length of haul increases from 93km in 2016 to 130km in the 2050 Do Minimum scenarios (approximately 1 km per year). This reflects the longer route that road vehicles are travelling.

The figures illustrate however, that the main route for through movements is via the M6 between southern England and Scotland with a smaller proportion of traffic utilising the A1(M) and A66 before joining the M6 (or vice versa) on journeys to and from Scotland. This route is significantly more popular than the A68 or A1 north of Newcastle as it provides a quicker route to Central Scotland, the majority of which is motorway standard rather than single lane A-roads via other routes.

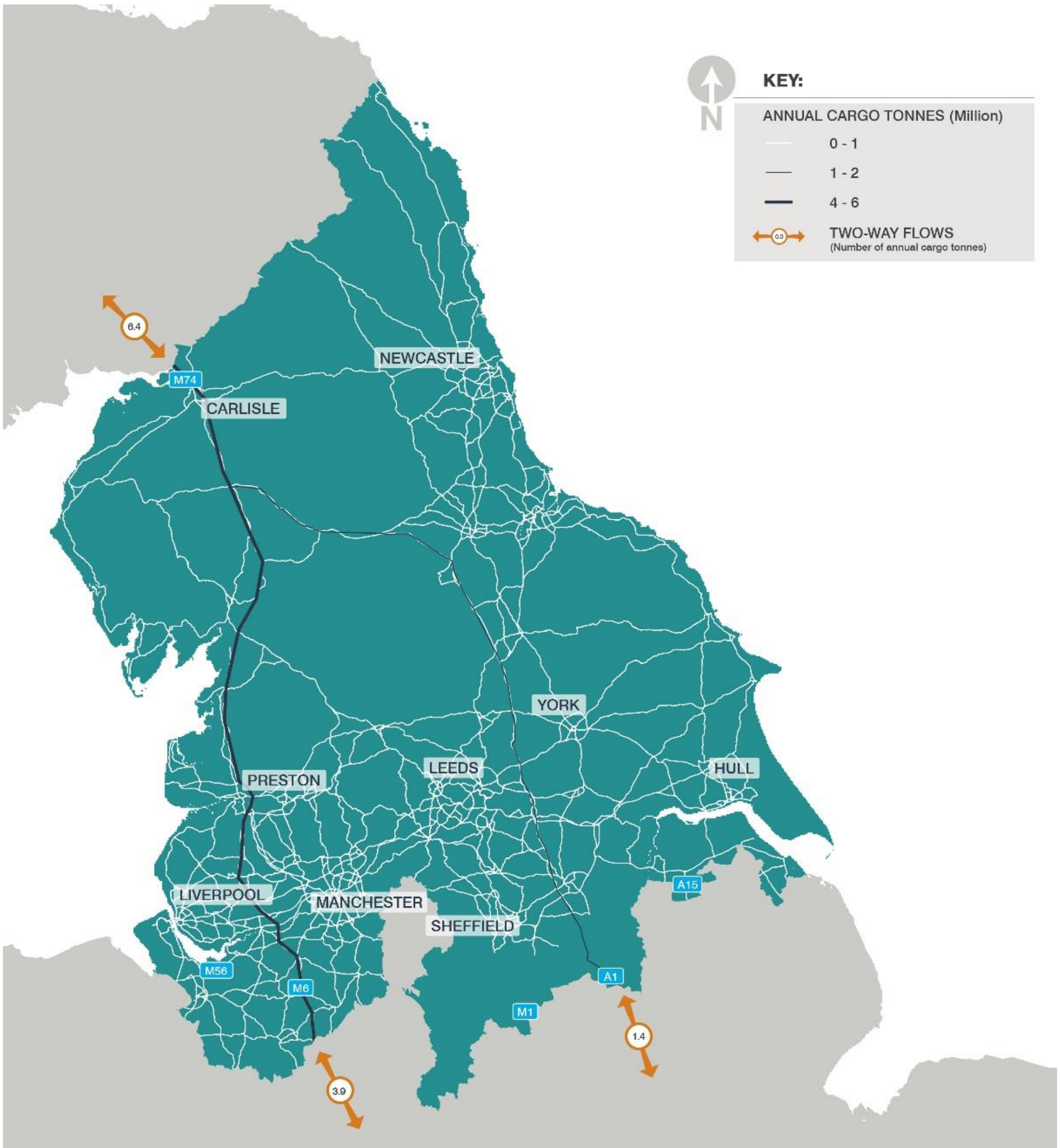

Figure 12 Road Freight Movement Types: 2016 Domestic: Through traffic

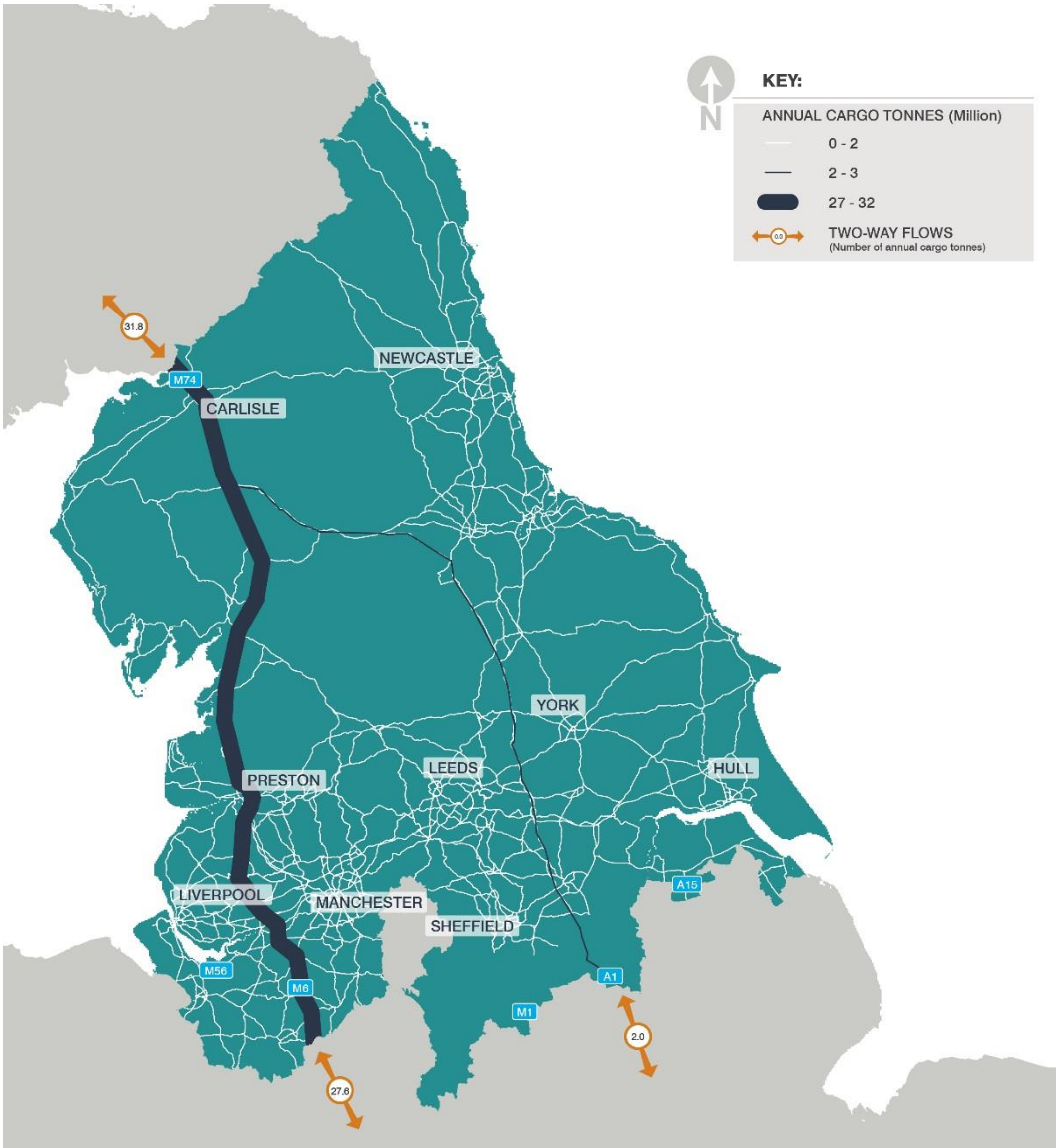

Figure 13 Road Freight Movement Types: 2050 (Do Nothing with NPIER) Domestic: Through traffic

Table 8 Road Freight - Key Strategic Routes Flows - Domestic: Through Traffic

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	6.4	31.9	396%
M6 - near Lancaster	4.8	28.9	507%
M6 - southern TfN border	4.2	28.3	576%
M62 - between Leeds & Bradford	-	-	n/a
M1 - southern TfN border	0.3	0.9	242%
A1 - southern TfN border	1.4	2.0	45%
M180 - near Scunthorpe	0.02	0.02	22%
M62/A63 - near Hull	-	-	n/a

A1(M) - near Thirsk	1.7	3.0	78%
A66 - between Darlington & Penrith	1.7	2.9	77%

4.2.4.3 International: Imports

Of the international freight moved within the North, imports are most dominant. All freight that has been imported to the North of England in 2016 is shown on Figure 14 with the forecast 2050 (Do Nothing with NPIER) flows shown on Figure 15.

The imported freight moved by road is focussed on the Ports, particularly on the Mersey, Humber and Tees as well as existing freight terminals such as Trafford Park in Manchester.

Table 9 illustrates the growth in imported freight on some of the North's key routes. The figures show a decrease in imports between Scotland and the North with negative growth on both the M6 (north of Penrith and the A66 between Penrith and Darlington. Significant increases in import traffic is experienced on the M1 and M180 as well as on the M6 south of the M62 corridor.

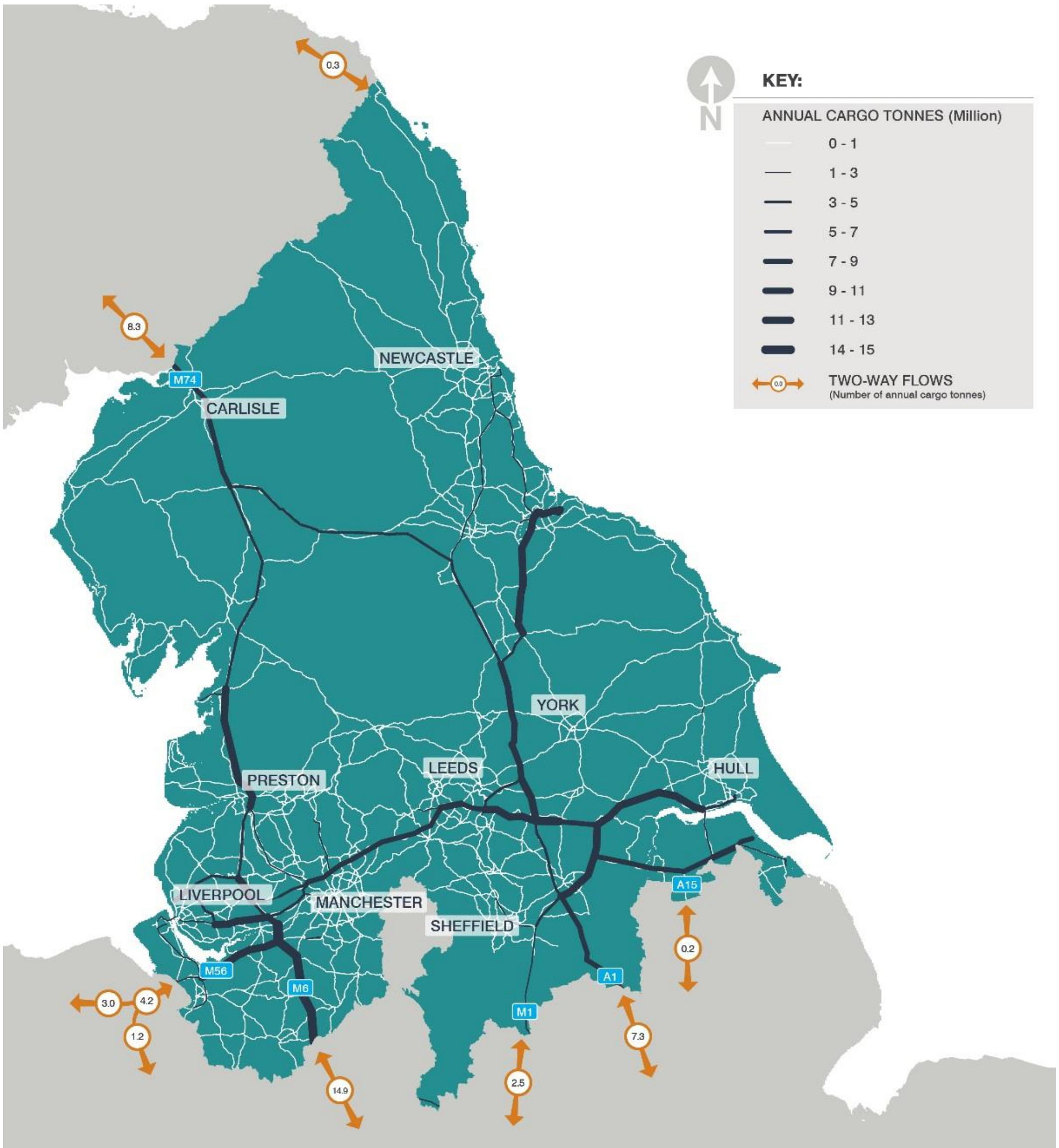

Figure 14 Road Freight Movement Types: 2016 International – Imports

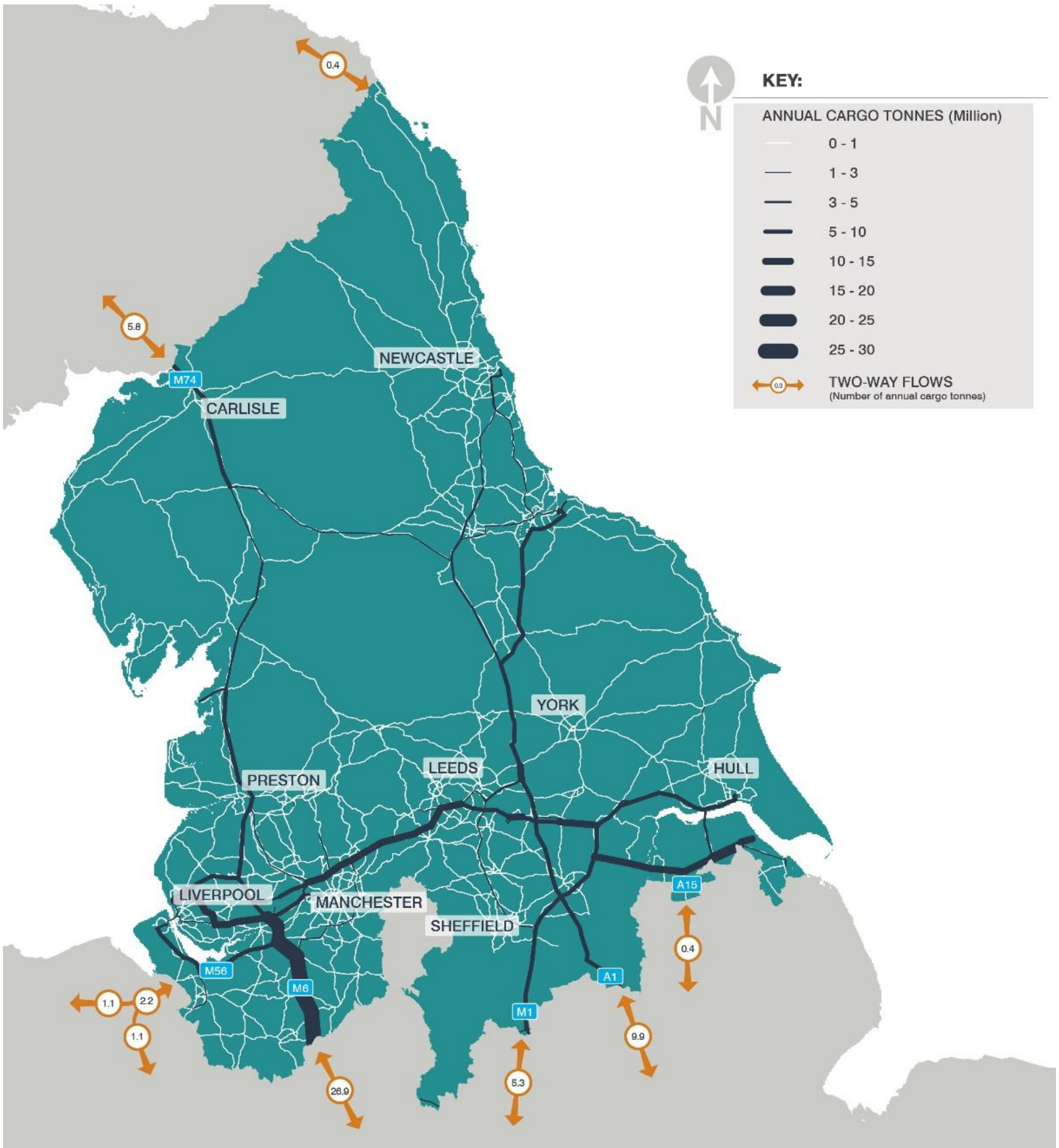

Figure 15 Road Freight Movement Types: 2050 Do Nothing (with NPIER): International – Imports

Table 9 Road Freight - Key Strategic Routes Flows - International: Imports

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	7.8	5.2	-33%
M6 - near Lancaster	5.2	7.2	38%
M6 - southern TfN border	15.0	27.3	82%
M62 - between Leeds & Bradford	9.0	11.9	31%
M1 - southern TfN border	2.9	6.1	114%
A1 - southern TfN border	7.3	9.9	35%
M180 - near Scunthorpe	7.4	12.9	76%
M62/A63 - near Hull	5.4	7.5	41%

A1(M) - near Thirsk	9.3	9.9	7%
A66 - between Darlington & Penrith	4.7	2.9	-38%

4.2.4.4 International: Exports

Exports account for less of the international freight moved by road in the North of England due to the nature of the UK's manufacturing capabilities. Figure 16 illustrates the export freight moved by road in 2016 with the forecast 2050 (Do Nothing with NPIER) flows shown on Figure 17.

The figures show that in 2016 the main exports routes are to and from the Ports, particularly on the Humber and the Mersey. There are also significant export flows from the east coast ports towards Scotland utilising the A66.

In 2050, the flows change to become more focused on the Mersey and Humber ports however, a significant flow is also shown as using the Port of Heysham in Lancashire. There is a reduction in export traffic to and from Scotland, however the flows increase heading to Southern England on the M6 and A1(M) in particular.

The major growth in exports is focused on the east-west corridor between Liverpool and Hull as well as the north-south corridors to the south of the M62. In addition, there is a decline of export traffic into and out of Scotland on the northern section of the M6 and across on the A66 as shown in Table 10.

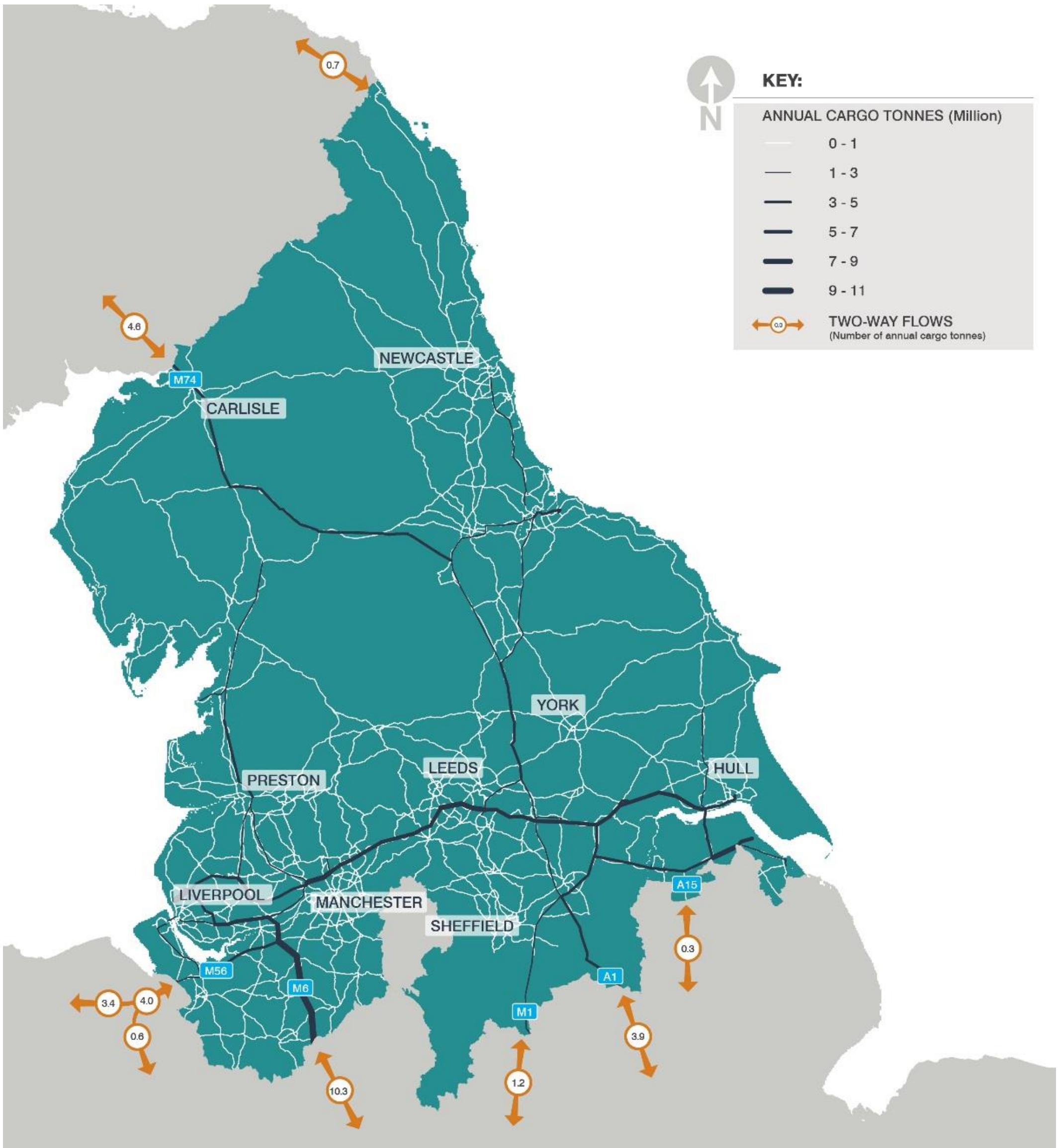

Figure 16 Road Freight Movement Types: 2016 International – Exports

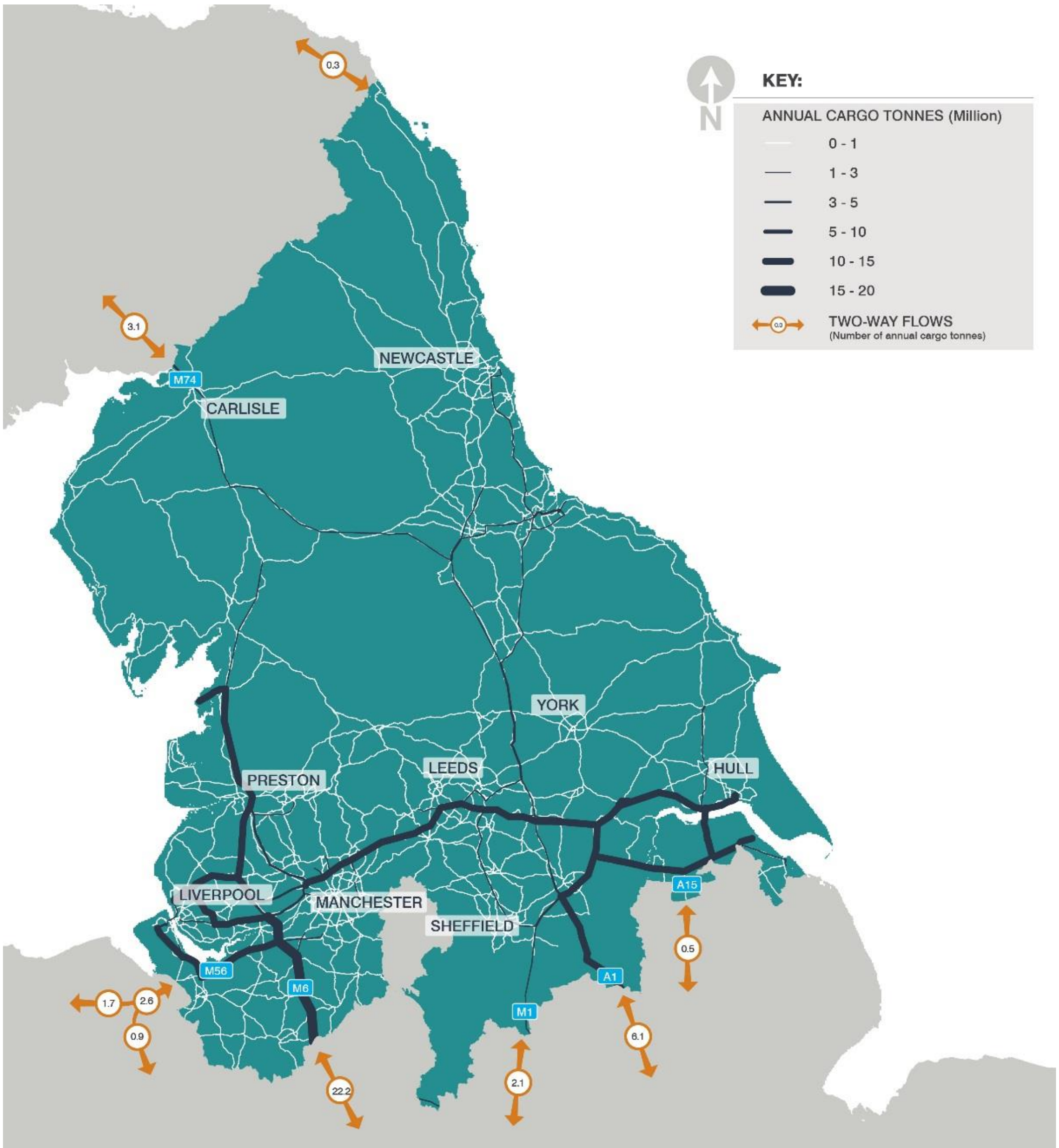

Figure 17 Road Freight Movement Types: 2050 Do Nothing (with NPIER): International – Exports

Table 10 Road Freight - Key Strategic Routes Flows - International: Exports

Highway	Annual Cargo Tonnes (millions)		2016-2050 Growth
	2016 Base	2050 Do Nothing (with NPIER)	
M6 - northern TfN border	4.3	2.5	-41%
M6 - near Lancaster	3.0	9.8	227%
M6 - southern TfN border	10.3	22.3	116%
M62 - between Leeds & Bradford	7.2	11.9	65%
M1 - southern TfN border	1.5	2.6	74%
A1 - southern TfN border	3.9	6.0	56%
M180 - near Scunthorpe	3.9	6.8	73%
M62/A63 - near Hull	5.4	8.1	49%

A1(M) - near Thirsk	4.1	3.3	-20%
A66 - between Darlington & Penrith	3.7	2.8	-24%

4.2.5 Network Pinch Points

TfN's Major Roads Report highlights the major pinch points on the Major Road Network (MRN). It is helpful to conceptualise the MRN as a ladder that only provides the requisite strength for transformational growth with a series of strong north-south routes and multiple rungs for east-west connectivity.

4.2.5.1 North-South Connectivity

Throughout the evidence base for TfN's Major Roads Report, north-south movement is generally seen as better than east-west connectivity at present with the core components of the SRN, such as the M6, M1, M18, A1 and A168/A19 providing vital links between the North, Scotland and the Midlands. These have helped to define the economic geography in terms of journey to work, industry clusters and supply chain patterns of the North. Specific examples include:

- The links via the A19 between Nissan and the Port of Tyne which is the second largest exporter of cars in the UK;
- The continued strength of the logistics and food industry in the A1(M) corridor through North Yorkshire;
- The contribution and ongoing importance of the M1 (including its links to the M62) in terms of supporting the diversity of the polycentric and multiple NPIER sector West Yorkshire, Leeds City Region and Sheffield City Region economies alongside a wider pan-Northern and national connectivity role between London, the East Midlands, North East and Scotland; and
- Major distribution centres for growing retailers as part of a major transformation of the Dearne Valley area including ASOS and Aldi benefitting from links to the M1 and A1(M).

This over-reliance on the SRN for these north-south movements results in congestion and sections of the network prone to incident related resilience issues however, with particular problems including:

- The M1 around Sheffield and the A1(M) around Doncaster;
- The A1(M) including the A1 Newcastle - Gateshead Western Bypass, which links the whole area to Newcastle Airport, is one of the most congested roads in England;
- The A19 in the Tees Valley and North East, with the approaches to and the interchange with the A66 link to the A1 and Teesport being a key constraint for the area's network;
- The M6 in Cheshire and Warrington, albeit now benefiting from RIS1 smart motorway enhancements.

Estuary / river crossings and urban areas also provide north-south connectivity issues at a LEP level, with the following constraints to growth noted amongst others:

- River Tyne crossing points and their approaches are often subject to congestion. Further issues in the short to medium term are expected with planned major maintenance schemes on some of the Tyne Crossings providing fewer options and resilience for these journeys;
- A19 Tees Crossing - a pinch point at the Tees flyover, where delays regularly occur because there are too few high quality roads crossing the Tees;
- The Ribble Crossing proposal to unlock new development in Preston, South Ribble and Fylde; and
- Radial links to and through many of the Independent Economic Centres (IECs); and
- The Manchester Ship Canal, through Greater Manchester, Warrington and Cheshire West, where limited and often low capacity bridging points create resilience and capacity issues.

4.2.5.2 East-West Connectivity

TfN's Major Roads Report states that consistently across its evidence base the number, capacity, reliability and resilience of east-west road connections are seen as a constraint on the Northern economy. This is pertinent to links across the Pennines as well as the connections to and from key north-south axes described above.

The M62 and the A63 to the port of Hull are the only continuous east-west dual-carriageway roads linking the M6/M74 and A1/M1 north of the A50 corridor in the Midlands and south of the M8-A8 in Central Scotland. It carries half of all trans-Pennine road traffic, and two thirds of all freight, while performing a vital function in respect of the diversity and growth of the Liverpool City Region, Greater Manchester, West Yorkshire / Leeds City Region and Humber economies. Yet this role also leads to certain stretches experiencing a 70%-80% likelihood of serious congestion during peak periods.

It is also a key issue for network resilience, being the North's highest altitude motorway and more susceptible to snow and adverse weather. Various Partner documents reference the need for a long term strategy for improving resilience and reliability on this section of the M62 and A63, the neighbouring M60 and other trans-Pennine highway links.

Other east-west routes exist that also play an important role for east-west traffic and the resilience and reliability of these routes must be maintained. These routes include the A69 linking Tyne and Wear, Northumberland and Cumbria, the A66 which links Teesside and North Yorkshire to Cumbria, the A59 which links Merseyside and Lancashire to North Yorkshire and the A57 which links Merseyside and Cheshire to South Yorkshire. The majority of these routes are single carriageway highways and therefore are impacted heavily by incidents or adverse weather across the Pennines.

4.2.6 Challenges

Some of the challenges facing the road freight sector are highlighted below and include:

- Vehicle emissions;
- Congestion;
- Workforce / skills shortage;
- Lack of safe and secure overnight parking for freight vehicles; and
- Regional and city distribution.

It should be noted however that more detailed analysis on the some of these challenges are contained at the end of this section in Section 4.7.

4.2.6.1 Vehicle Emissions

As traffic begins to increase on the already busy road network, congestion is an inevitable consequence that will impact all road and rail users; not just freight movements. With this increase in traffic and the assumption that fossil fuels will still be in use by most of freight industry vehicles, this will likely lead to the increases in vehicle emissions being concentrated around the cities and ports, where most of the congestion is likely to occur. Significant inroads are already being made in built up areas to reducing the impact of freight through consolidation.

Congestion, particularly stop/start traffic where acceleration and deceleration occurs, can significantly increase emissions from vehicles including Heavy Goods Vehicles (HGV) compared to free flowing traffic. Corridors such as the M62, M6 and A1(M) which are already constrained, or showing signs of congestion currently will produce greater emissions of GHG unless some interventions are undertaken.

It is likely that interventions to increase the capacity as well as increase vehicle efficiency will be required to help mitigate the effects of the increase in freight within TfN. Whilst it is acknowledged that providing improvements will result in the creation of GHG in the form of building infrastructure etc., it should be noted that this will be a short to medium term effect that will be mitigated against in the long term by providing for alternative fuelled vehicles and electric trains.

This issue needs to be considered separately as two potential impacts:

1. The release of emissions to atmosphere that will contribute to climate change which could present a risk to the environment/human health through extreme weather events; and

2. The release of emissions at a local level which will affect pollutant concentrations contributing to the damage of human and ecological health when exposed over certain time periods.

The issue of regional air quality related to emissions is explored in more detail in Section 4.7.2 where the impact of the increase in vehicles on the road network is examined.

4.2.6.2 Congestion

As the demand for freight increases in line with increased consumer spending and the growth in e-commerce, more and more vehicles are predicted to use the road network in the North of England.

The pinch points on the network have been set out in Section 4.2.5 and as such any increase in the volume of traffic will only result in increased congestion which has an impact on logistics operator's operational costs. Additionally, increased congestion leads to an increase in vehicle emissions as more and more traffic is stationary in queues or travelling at slower speeds.

Section 4.7.1 outlines the impacts of congestion on time and how this affects costs to the logistics sector in more detail.

4.2.6.3 Workforce / Skills Shortages

A major challenge currently being felt in the haulage industry is related to the shortage of HGV drivers. There are a number of reasons for this which are outlined in more detail in Section 4.7.3 as this forms a key driver for change.

As demand for freight increases and in particular in the road haulage sector, the current driver shortage will be exacerbated to the extent to where the demand for road transport far exceeds supply. There are a number of methods for addressing this which include moving freight to other modes as well as improving the attractiveness of a career in freight distribution.

4.2.6.4 Lack of safe and secure overnight parking for freight vehicles

Road freight in particular faces specific issues including a lack of overnight parking facilities for HGVs adjacent to the MRN. A study conducted for the DfT in 2011[1] examined the usage and supply of overnight parking spaces for goods vehicles across the UK including the North. The DfT recently commissioned a new survey into the HGV parking shortage, building on the 2011 study. The DfT expects to publish the findings of this research later in 2017.

A summary of Northern regions is shown in Table 11.

[1] Lorry Parking Study Demand Analysis, Department for Transport 2011

Table 11 HGV Parking Statistics

Region	Official Secure Parking			Unofficial unsecure parking		Total number of road freight crimes (2010)
	Total Truck stop capacity (spaces)	Average Truck Stop occupancy (spaces)	Truck Stop Utilisation	Industrial Estates (spaces)	Lay-bys (spaces)	
North East	310	156	50%	127	119	38
North West	2,213	1,228	55%	480	276	278
Yorkshire and the Humber	1,628	728	45%	145	374	520
Total North	4,151	2,112	51%	752	769	836

Reference 1 - Table 3.8 National Overview (DfT Lorry Parking Study 2011)

Feedback from the industry shows that even though official truck stop occupancy appears to show them as underutilised, the official parking is often not in the correct place and the facilities on offer to drivers are overpriced deterring them from being used. As a result, drivers are opting to park in unsecured locations in laybys or industrial estates. The table shows that in 2010 (the last time the data was collected) the number of crimes associated with road freight was almost 850 per year.

There is a requirement to provide further parking sites for HGVs to ensure that more vehicles park in secure areas away from laybys and industrial estates to reduce road freight related crimes to a minimum. This would also minimise the movement of vehicles around built up areas when searching for a suitable overnight parking space.

4.2.6.5 Regional and City Distribution

As more and more cities face up to their responsibilities around regional air quality and bringing it under control, many are focusing on methods on reducing traffic in urban centres. One method for reducing traffic (and in particular freight vehicles) within urban centres is through consolidation of goods.

There are different types of consolidation techniques, such as:

- Process solutions:
  - Procurement-led;
  - Upstream supply chain; and
  - Click and collect.
- Physical solutions:

- Urban consolidation centres;
- Micro consolidation centres;
- Locker boxes / locker banks; and
- Pick-up / Drop-off Parcel shops.

With the drive towards consolidation, this will have an effect on regional distribution and could result in a reduction of RDCs in areas where physical consolidation centres are introduced.

4.3 Rail Freight

4.3.1 Operation

Freight traffic on rail generally falls into three broad categories:

- Movement of inter-modal containers, this is normally between dedicated intermodal terminals or port facilities;
- Movement of bulk commodities, for example construction aggregates, heavy oil or steel billets – this is generally between client owned terminals; and
- Moving material around the country necessary for the maintenance of the railway -such movements are generally determined by Network Rail, are operated by the freight companies and use either privately owned loading facilities or dedicated Network Rail facilities.

Freight trains tend to have a fixed formation meaning that they are geared to convey significant quantities of material between terminals. With the exception of containers the railway no longer caters for individual wagon load consignments.

Most freight traffic is won after a competitive process, which is often not only between rail freight operators, but also includes other mode options (e.g. road, maritime or air).

A grant scheme is operated by the Department for Transport, Transport Scotland and the Welsh Government which, for eligible flows, neutralise the higher cost of rail versus road through revenue support. The grant scheme is designed to reduce carbon emissions through modal shift whilst not financially penalising operators from using rail. The grant money is claimed retrospectively after the freight has been moved.

All freight trains are timetabled and have paths on routes taking account of their likely slower speed (due to weight, length, height and commodity) although some freight services such as intermodal can often operate at relatively high speeds. These paths can be used on various days of the week but may not run if there is no traffic to convey. Where a flow has ceased freight paths may still exist in the timetable in the expectation that new traffic will be found to utilise it. This often prevents other paths being awarded to other operators and restricts capacity where it otherwise might have been available. It is often the case that freight trains do not run as per the working train timetable.

The planning and operation of freight services is fundamentally different to the processes applied for passenger services although the two regimes must mesh when it comes to the overall network timetable. Whereas passenger trains run independent of demand, freight services will generally run only if the traffic demands it. The exception to this are intermodal services which will generally be timetabled and planned to run even with low levels of loading. Freight services are also at the mercy of economic change and the closure of production sites or changes to the point of entry of imports to the UK, meaning that the requirements for a freight path can change midway through timetable periods. Equally the presence of extra tonnage may require the running of additional services at relatively short notice. In this regard freight planning tends to be far more volatile than passenger, which is more geared to long-term planned changes in service pattern.

The result of this volatility is that freight paths may be held in the Working Timetable for freight services which never run. Such paths are treated by FOCs as assets which they can capitalise on either through trading with other FOCs or have in store for future traffic. Network Rail has recently undertaken an exercise to try to remove redundant paths from the timetable in order to provide a clearer understanding of the capacity that is available for new traffic. Nevertheless the recent substantial reduction in coal movements has thrown up a further legacy of redundant freight paths.

With passengers demanding improved journey times and the TOCs responding to this through the introduction of new rolling stock the differential between the point-to-point journey times for passenger and freight is likely to grow. This potentially puts freight at a disadvantage in that those services will have to give way at junctions to passenger services or will be put into loops to allow passenger services to pass. One constant criticism raised by FOCs is the length of time, or average speed of their services which is poor compared to passenger trains and equivalent road movements. Table 12 provides some examples of transit times.

Table 12 Rail Freight Journey Time Examples

Origin	Destination	Journey Time*	Average Speed
Liverpool	Drax Power Station	7.50 hours	16mph
Immingham	Drax Power	2.75 hours	19mph
Crewe	Trafford Park	1.25 hours	36mph
London Gateway	Trafford Park	7.50 hours	31mph
Immingham	Eggborough Power Station	3.50 hours	17mph
Tunstead	Eggborough Power Station	3.25 hours	53mph
Cardiff	Doncaster	8.75 hours	25mph
Wellingborough	Doncaster	3.50 hours	40mph

* Decimal fraction of hours used

Source: Network Rail Working Timetables

4.3.2 Commodities

The GBFM analyses rail freight commodities in a slightly different way to the road commodities. The following outlines the rail freight commodity categories where intermodal is treated as its own commodity group:

- Intermodal;
- Biomass;
- Iron Ore;
- Petroleum;
- Network Rail Engineering;
- Construction and Metals;
- Coal; and
- Other:
    - Industrial Minerals;
    - Chemicals;
    - Domestic Waste;
    - Automotive;
    - General Merchandise; and
    - Other.

Appendix A2 outlines the commodity flows transported by rail in 2016 and those forecast for 2050.

Intermodal freight is shown as growing between 2016 and 2050 whereas bulk traffic such as coal shows a decrease. This is similar across all modes of transport, not simply rail.

In some cases, rail is the only viable option for the transportation of certain commodities. The transport of nuclear flasks to and from Sellafield in Cumbria is an example where rail access must be maintained to ensure safe and secure transport of this hazardous material as shown in Figure 18.

Figure 18: Specialist commodities such as Nuclear Waste as shown in the image are included in the "Other" commodity category (Source: DRS)

4.3.3 Total Cargo Movements

4.3.3.1 2016 Base

The total cargo movements for rail are expressed in Cargo Tonnes across the rail network in the North of England.

Figure 19 shows the volume of freight moved annually by rail in 2016. The largest volumes of freight are moved by rail between the Humber Ports at Grimsby and Immingham and the East Coast Main Line (ECML). The majority of this freight is made up of bulk materials. Additionally, large volumes of freight are moved on the West Coast Main Line (WCML) particularly south of Warrington (also includes east-west flows due to network capacity issues on more direct routes) and on the ECML north of Doncaster towards Middlesbrough and Newcastle.

Other major flows are shown towards Manchester and particularly Trafford Park which includes intermodal freight from the southern ports.

The major east-west freight movements occur on the Hope Valley Line with minimal flows on other east-west routes between Manchester and Leeds.

There is a perception that the significant reduction in coal movements in the UK (down 64% year on year) has had a major impact on freight movements. In fact freight by rail has only dropped around 4% over the last year as the volumes have been made up by significant increases in intermodal traffic, which now account for 40% of UK freight movements, and construction, which is 26%.

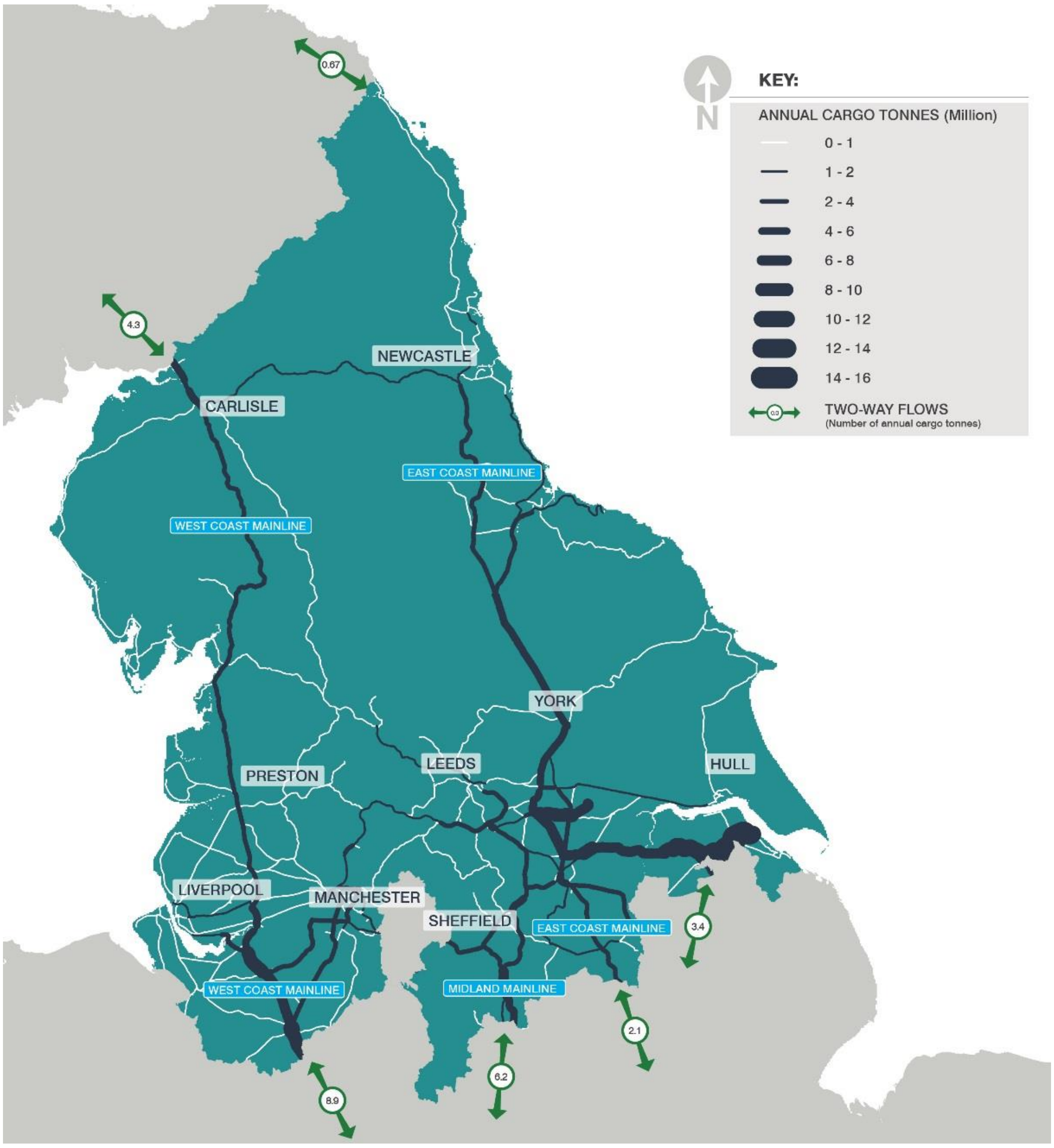

Figure 19 Rail Freight - 2016 Annual Total Cargo Movements (Cargo Tonnes)

4.3.3.2 2050 Do Nothing (without NPIER)

Figure 20 illustrates the cargo tonnes moved by rail throughout the North of England in the 2050 Do Nothing (without NPIER) scenario.

The Figure shows that the heaviest flows are located on the WCML south of Warrington. In addition, significant flows are shown on routes into Liverpool (to Garston and Widnes / Ditton) and the Port of Liverpool from the WCML, as well as towards Manchester and Trafford Park. Significant freight flows are also shown around the Humber Ports and towards the ECML as well as on the ECML towards the Port of Tees.

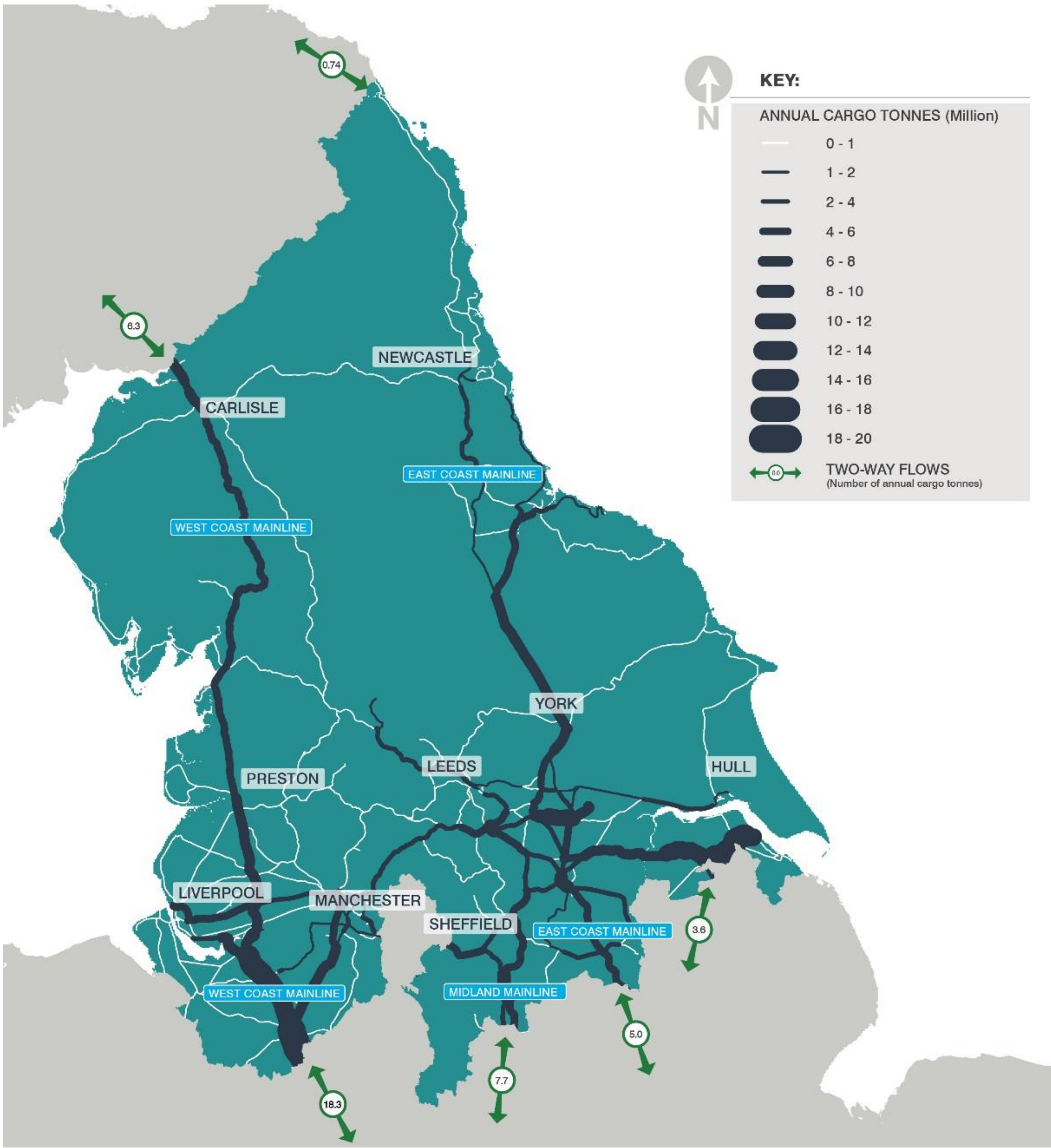

Figure 20 Rail Freight - 2050 Do Nothing (without NPIER) Annual Total Cargo Movements (Cargo Tonnes)

4.3.3.3 2050 Do Nothing (with NPIER)

Figure 21 and Figure 22 illustrate how the cargo movements by rail change between 2016 and 2050 under the NPIER growth scenario. Figure 22 in particular shows that strong growth occurs on the WCML along its length but particularly south of Warrington. There is also growth on the ECML south of Doncaster and on sections of the line leading to Leeds.

The Chat Moss route between Liverpool and Manchester shows a growth in freight movements as well as the line from Wavertree to the Port of Liverpool and from the WCML to Garston and Widnes / Ditton. Increased freight movements are also shown on the Manchester to Leeds route via Diggle against a reduction in traffic on the Calder Valley route.

The primary drivers for growth on the rail network is increased intermodal freight volumes with reductions particularly driven by less bulk materials (aside from construction bulks) requiring transport.

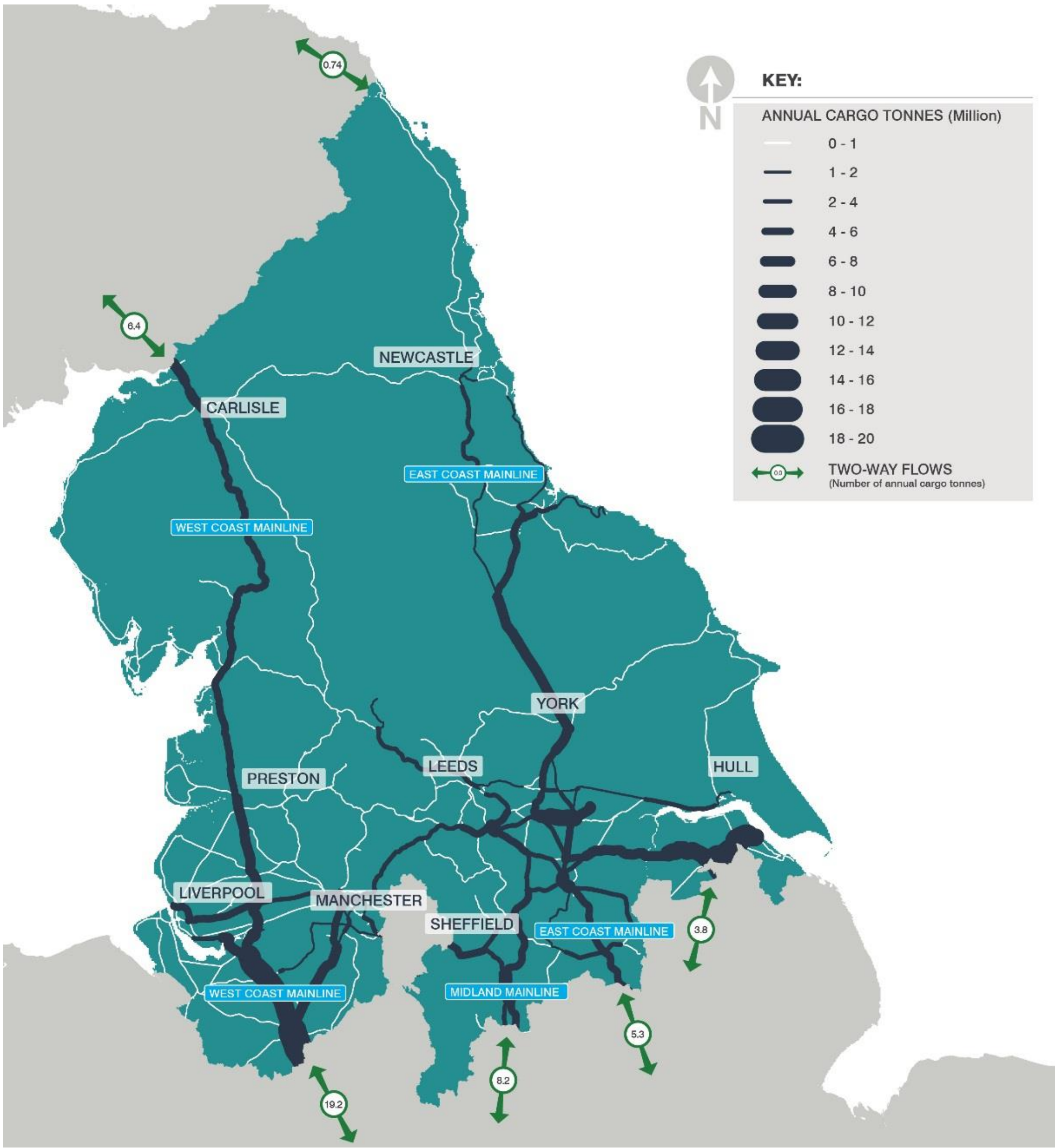

Figure 21 Rail Freight - 2050 Do Nothing (with NPIER) Annual Total Cargo Movements (Cargo Tonnes)

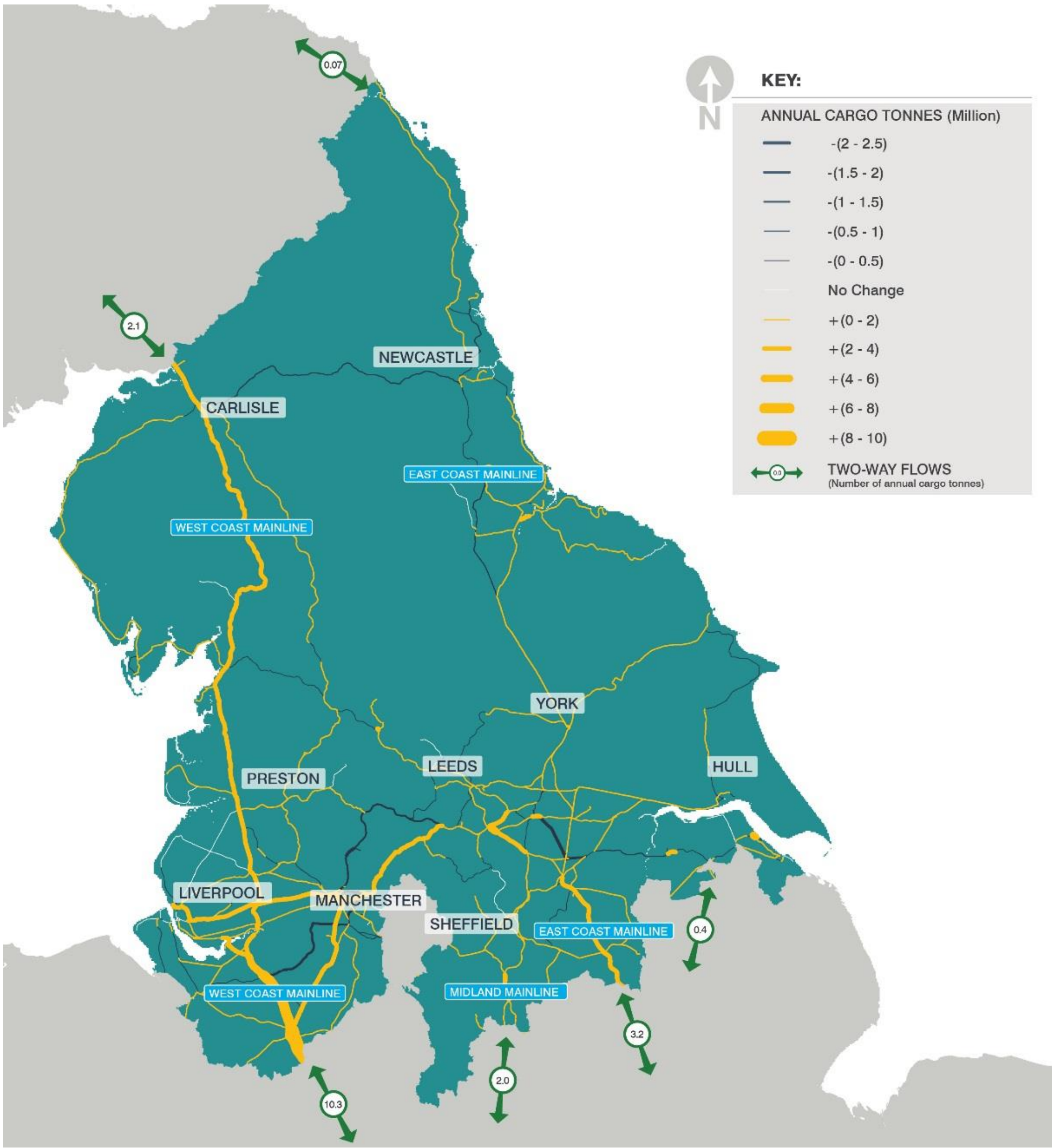

Figure 22 Rail Freight - Difference between 2016 and 2050 Do Nothing (with NPIER) Annual Cargo Tonnes Movements

This figure assumes an unconstrained rail network and in reality the east-west movements could use any east-west route taking into account infrastructure limitations such as gauge, speed, trailing weight and traction in addition to the ensuring a commercially viable solution for the FOC.

4.3.4 Movement Types

Utilising the same process for road outlined in Section 4.2.4, the movement types on the rail network have been analysed. These movement types are split into:

- Domestic flows – to, from and within the North;
- Domestic flows – through the North;
- International flows – imports; and

- International flows – exports.

4.3.4.1 Domestic: To, from and within the North

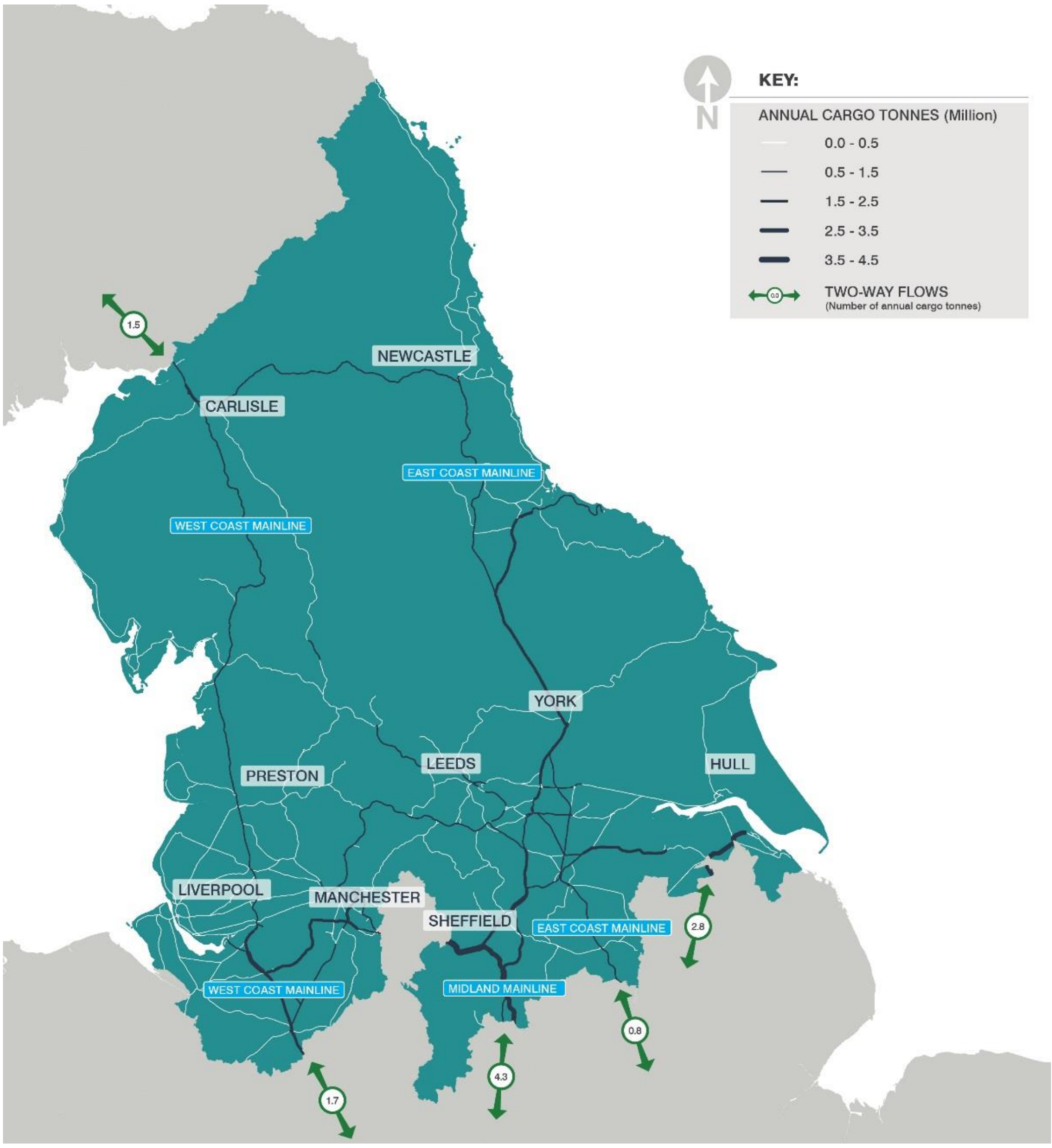

Figure 23 Rail Freight Movement Types: 2016 Domestic: To, from and within the North

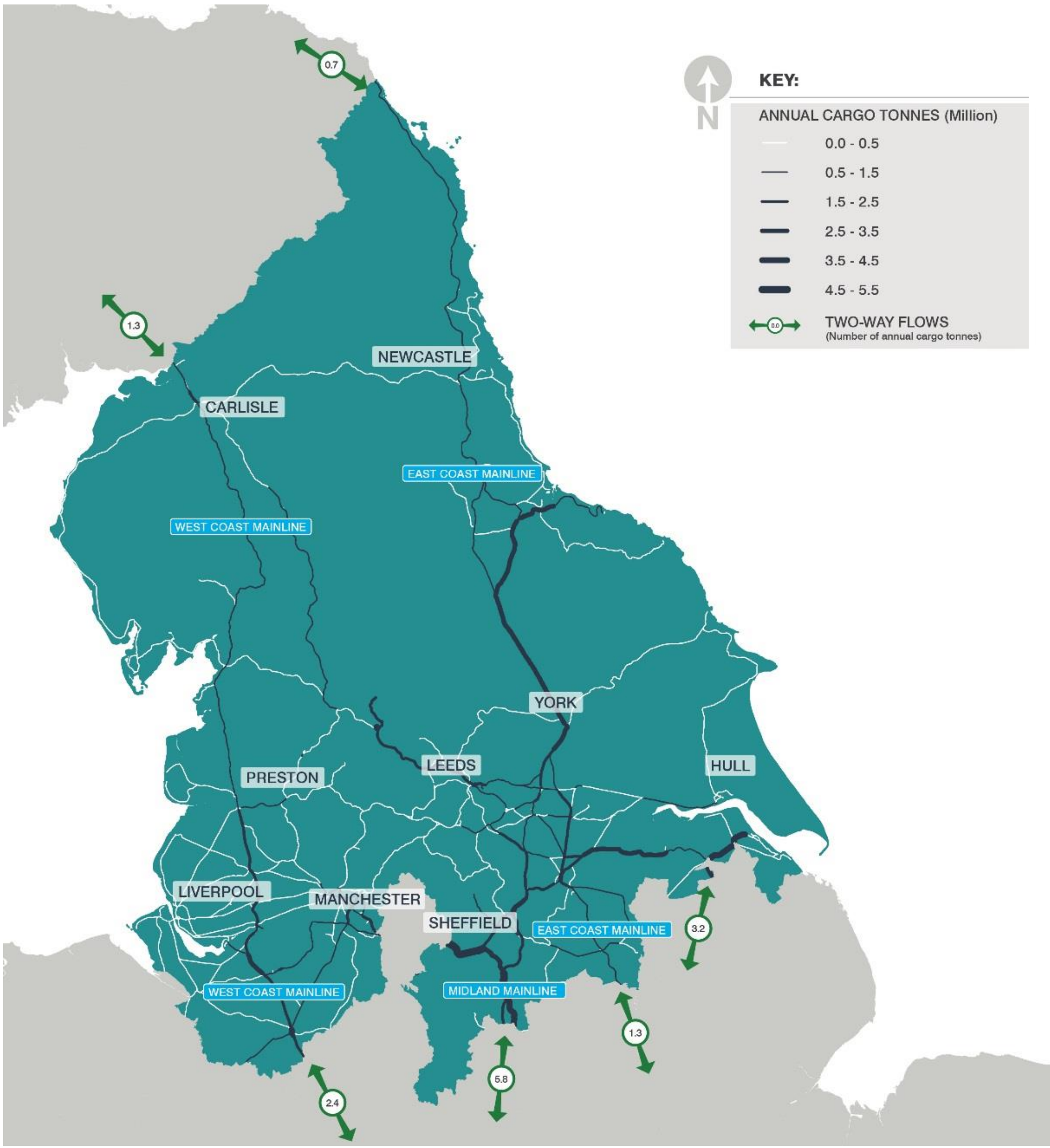

Figure 24 Rail Freight Movement Types: 2050 Domestic: To, from and within the North

4.3.4.2 Domestic: Through traffic

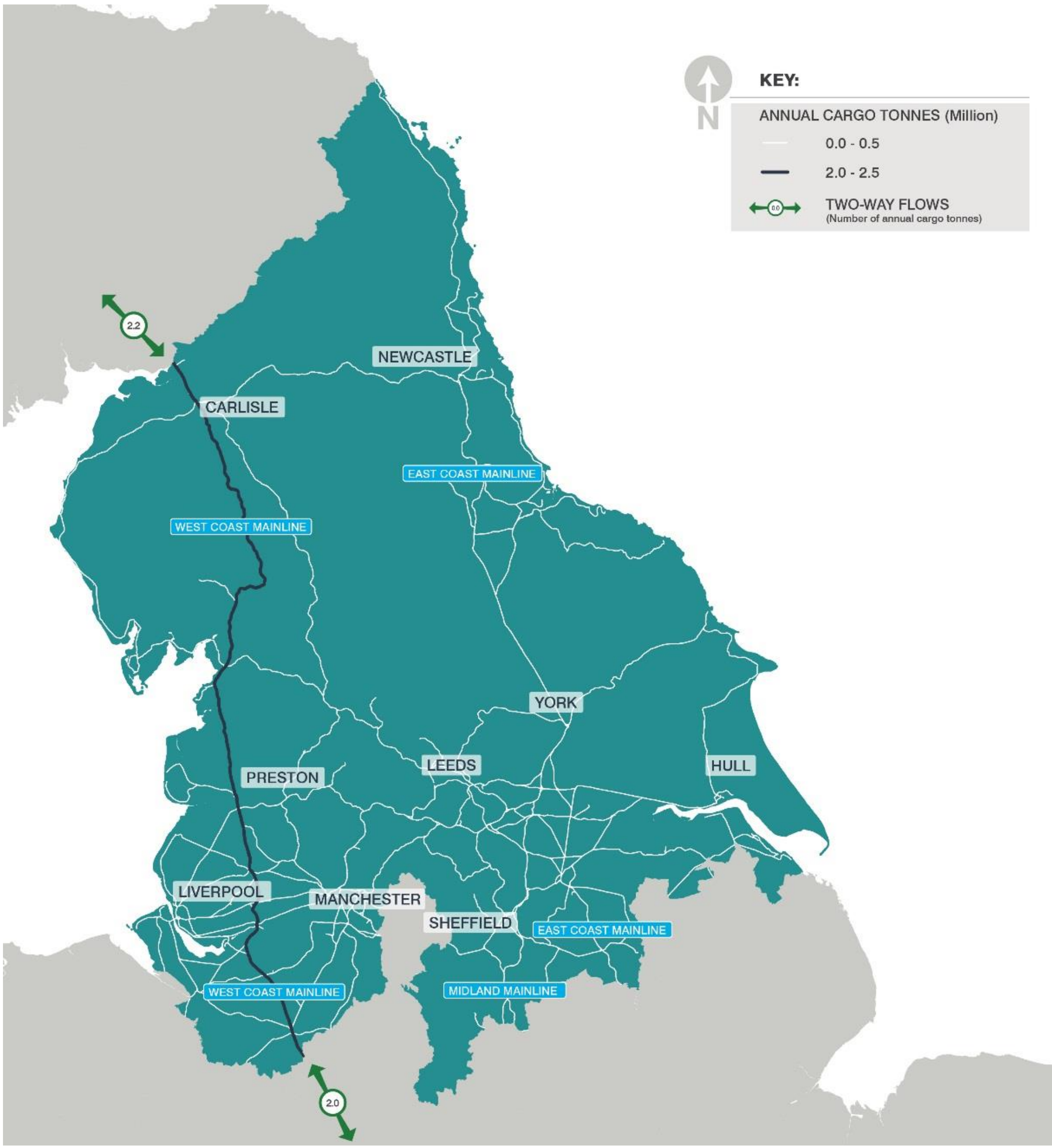

Figure 25 Rail Freight Movement Types: 2016 Domestic: Through traffic

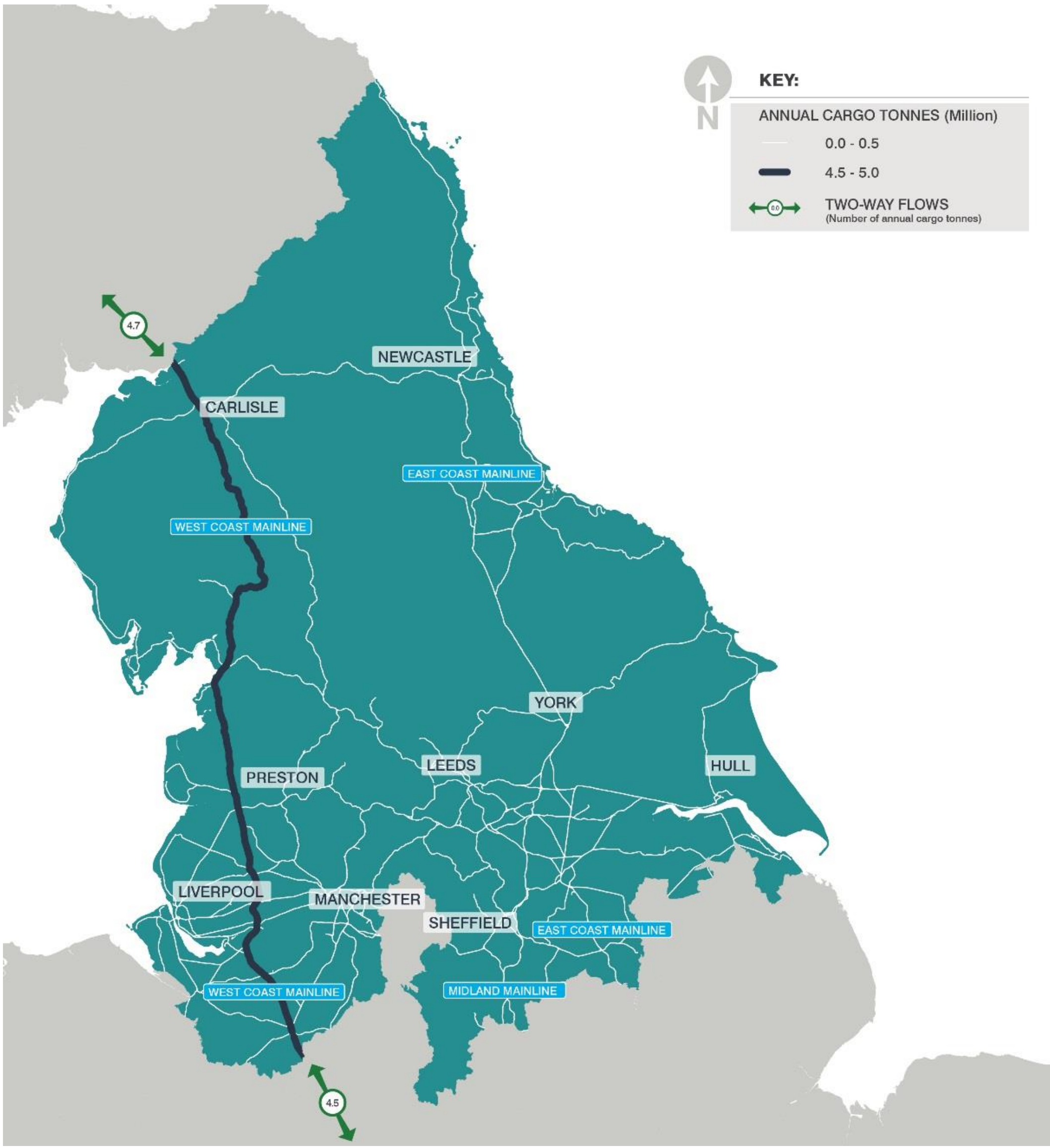

Figure 26 Rail Freight Movement Types: 2050 Domestic: Through traffic

4.3.4.3 International: Imports

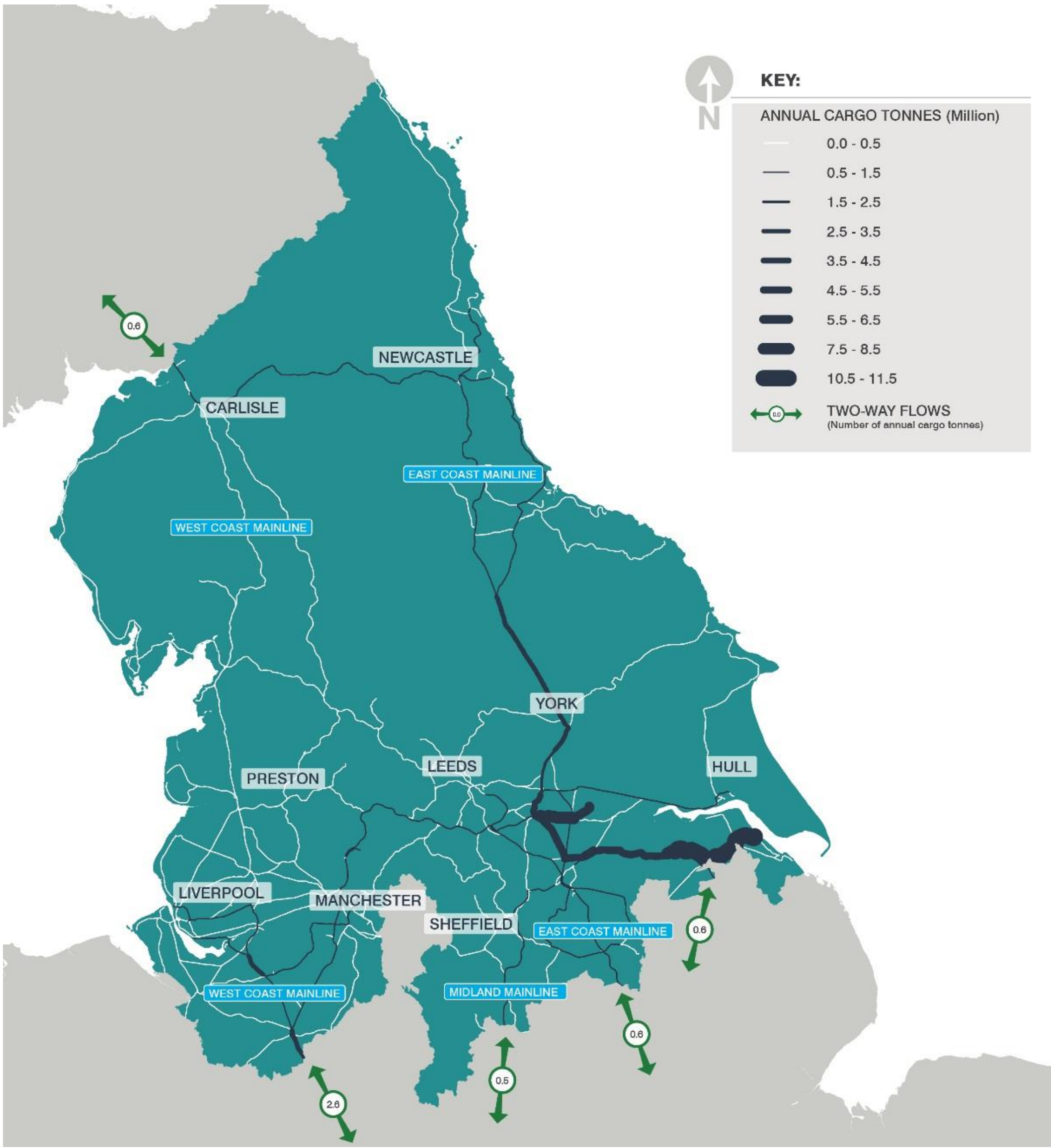

Figure 27 Rail Freight Movement Types: 2016 International: Imports

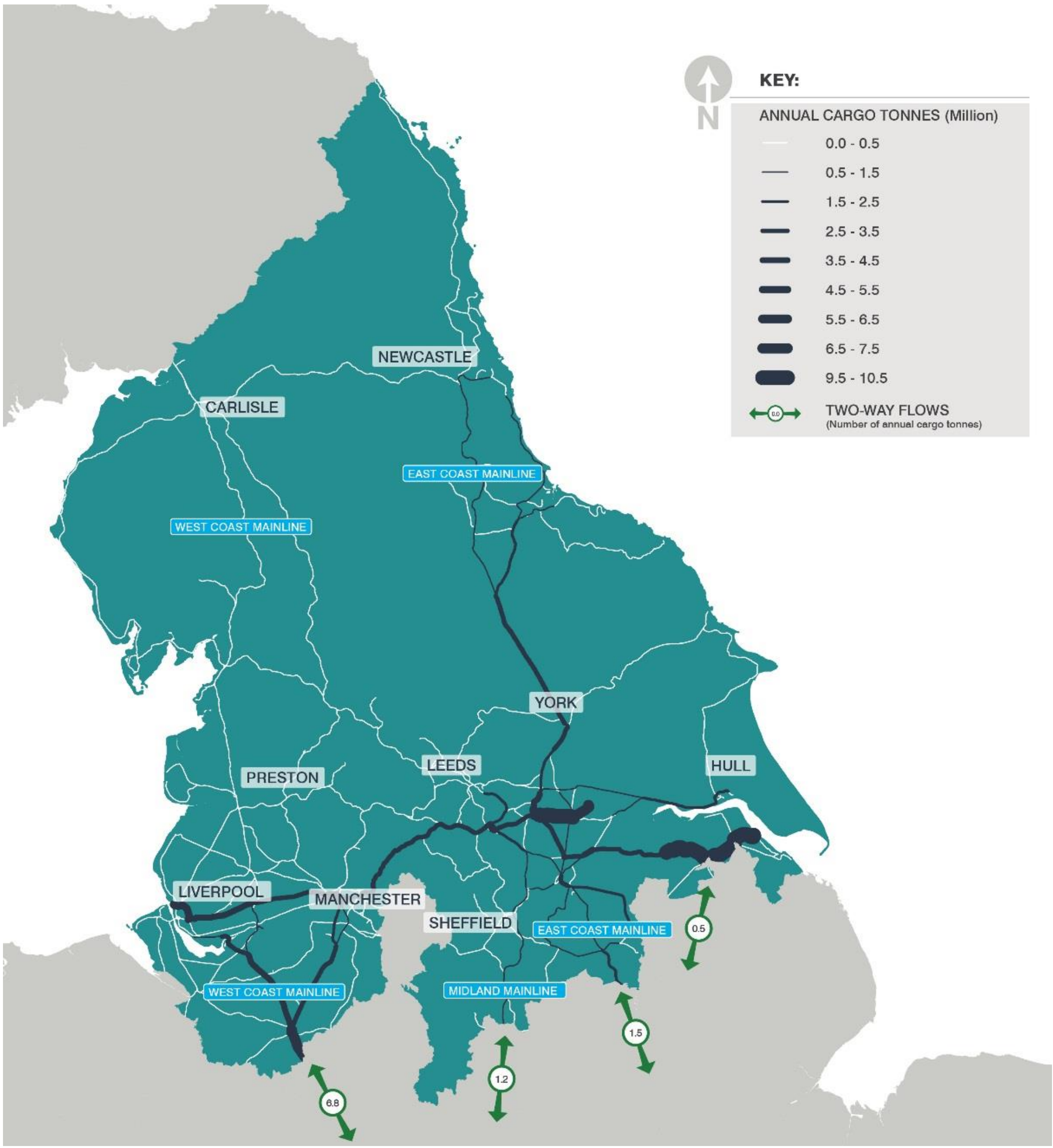

Figure 28 Rail Freight Movement Types: 2050 International: Imports

4.3.4.4 International: Exports

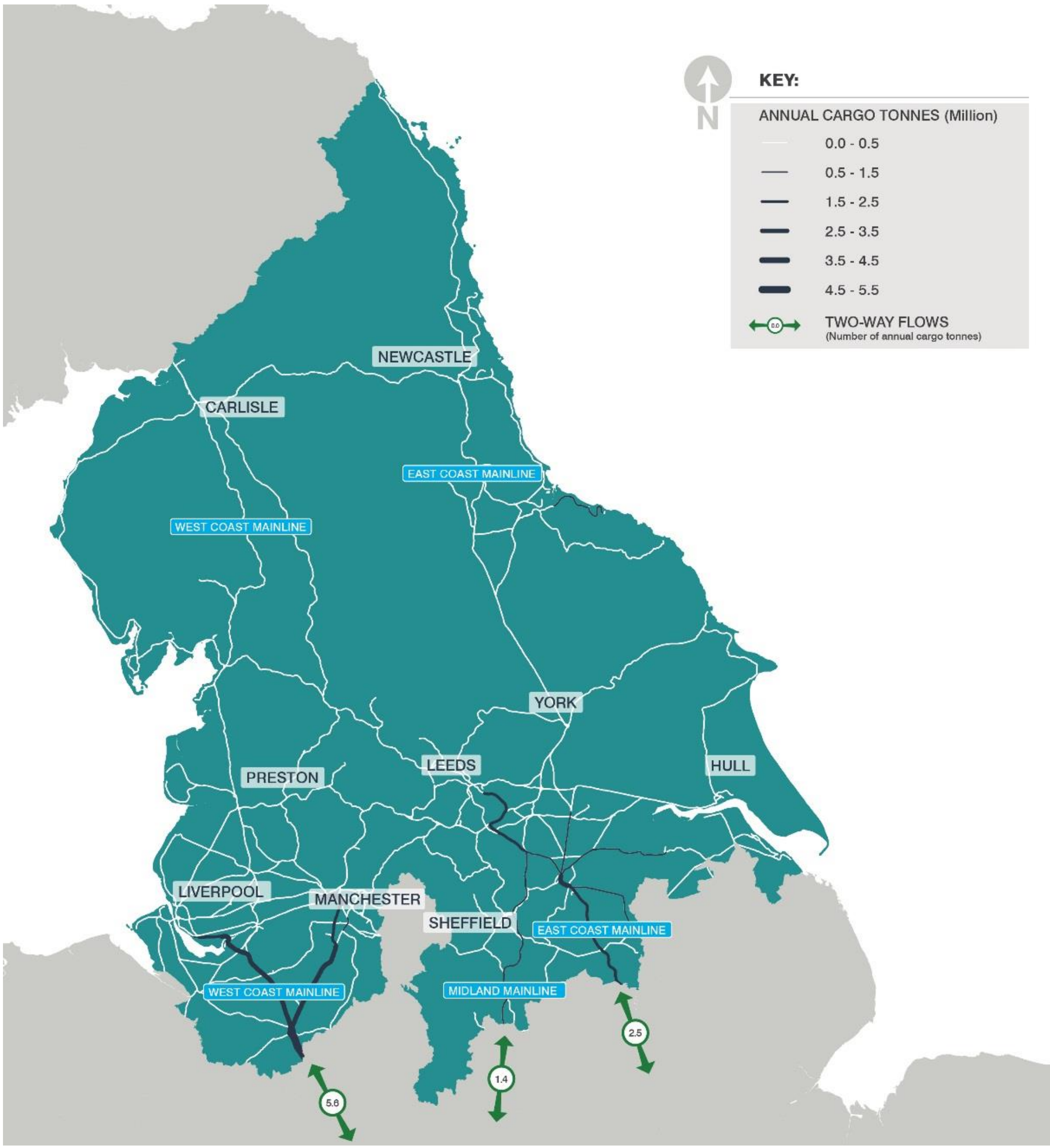

Figure 29 Rail Freight Movement Types: 2016 International: Exports

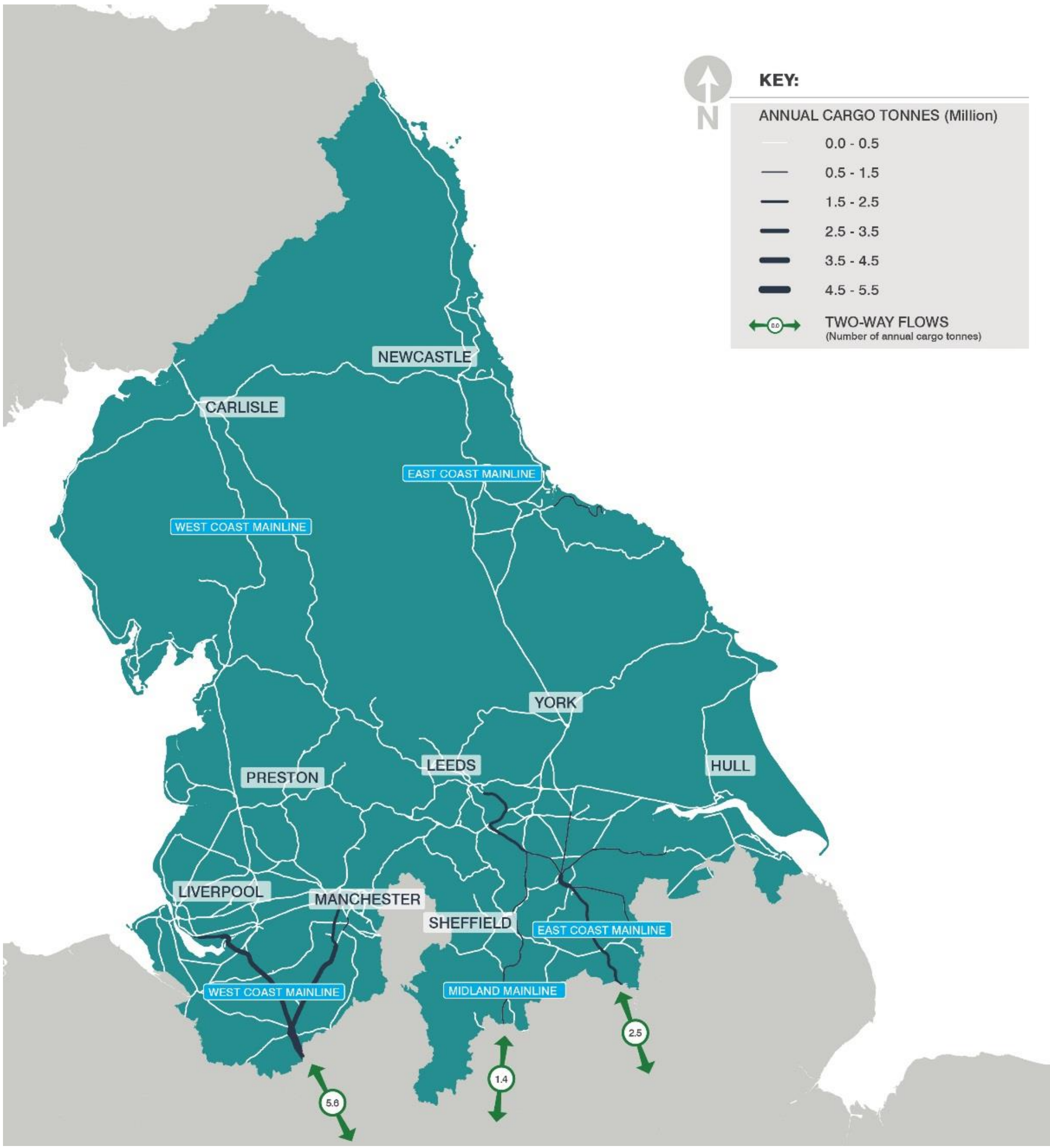

Figure 30 Rail Freight Movement Types: 2050 International: Exports

4.3.5 Network Pinch Points

4.3.5.1 Rail Freight Paths

An exercise was undertaken, examining the network pinch points in respect of the freight path requirements generated by running the GBFM. It should be noted that this exercise provides a quantitative assessment of the impact of variations in rail freight demand between 2016 and 2050.

For the purposes of this exercise, it is assumed that no infrastructure enhancements have taken place during this period.[2]

[2] Whilst there are infrastructure enhancements currently under way which may improve the performance of rail freight, including gauge clearance schemes such as South Humberside, the

The review has been prompted by the need to establish compatible freight and passenger tonnage / pathing forecasts. It is therefore considered that the 'common currency' of rail paths (as required by both passenger and freight trains) is suitable for use as a means of identification of network capacity 'pinch points'. The analysis is based on the working assumption that current freight paths are 'protected' and will be available for future use, and will not be converted to passenger paths, or to flex a passenger path to accommodate higher line speeds.

The methodology adopted in this assessment is based on an examination of trunk routes. It allows for a consideration of the consequences of any increases in demand for paths, and the locations on the Network in which this demand will be.

The analysis presents the outputs of the Great Britain Freight Model (GBFM) which shows the routing of freight services on the Network in 2016 and 2050 measured in paths per hour, as a total for both directions. The mapping only highlights links where the freight demand is modelled to be greater than two paths per hour as a total for both directions.

The initial mapping shows demand for rail freight paths is strongest from the main port areas of Liverpool, Humber and the Tees. This is net of the decline in coal traffic, demonstrating the growth of various forms of freight including intermodal, dry bulk, ore and petroleum.

The following figures illustrate the hourly freight paths required over the three scenarios modelled:

- 2016 (Base) – Figure 31;
- 2050 Do Nothing (with NPIER) – Figure 33.

The difference in hourly freight paths required between the 2016 base scenario and the 2050 Do Nothing (with NPIER) scenario is shown in Figure 34.

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analysis presented here has avoided making assumptions about the outputs of such schemes. This does not materially affect the conclusions of the analysis.

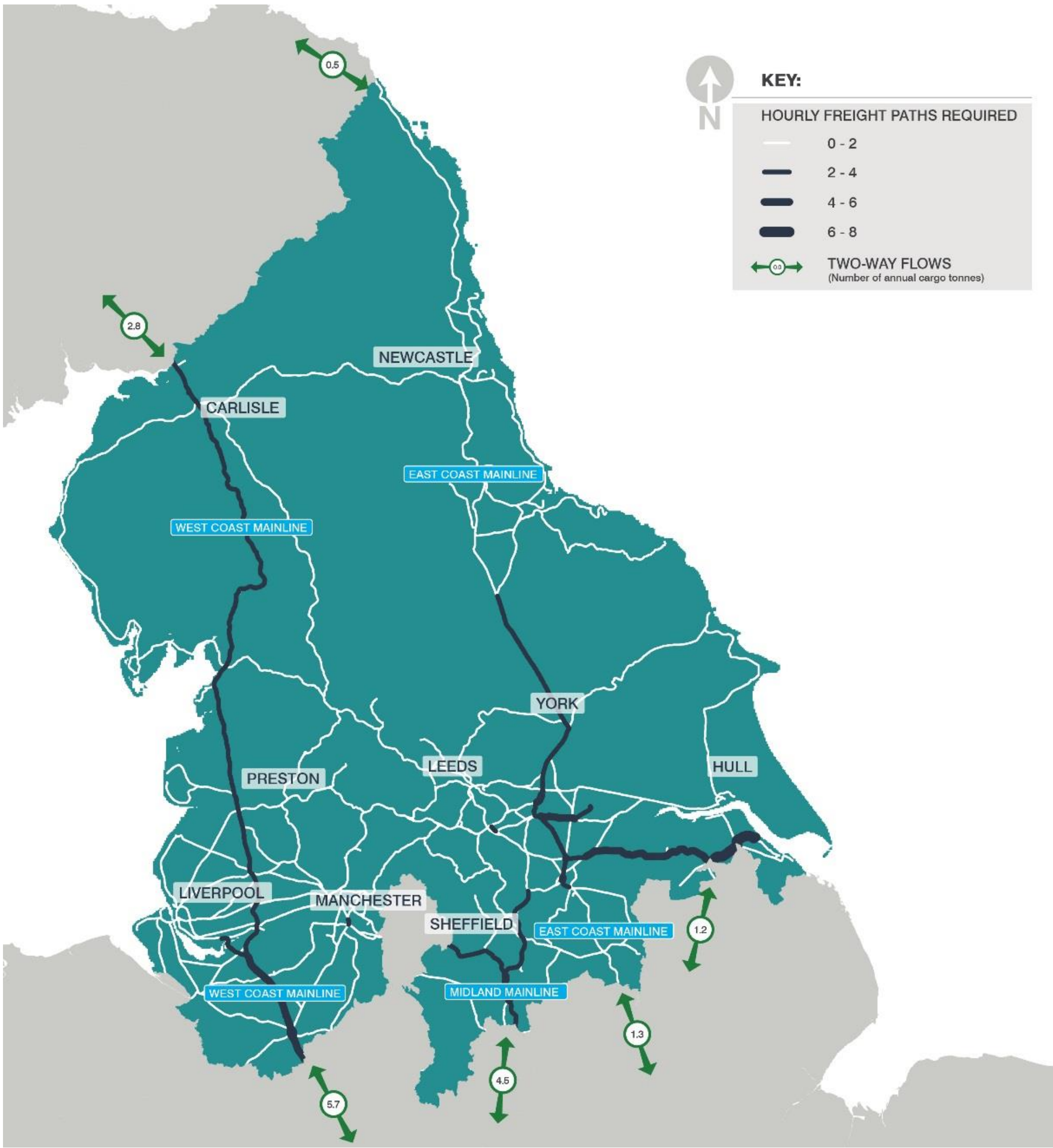


Figure 31 Rail Freight - 2016 Hourly Freight Paths Required

Figure 31 shows the strongest demand for freight (expressed in hourly paths required) on the South Humberside Main Line, and North-South flows from Scotland, particularly on the West Coast Main Line (WCML). The impact of the investment at Liverpool2[3] is not shown, as the terminal opened in early 2017. There is also significant freight demand on the Hope Valley line, and the East Coast Main Line (ECML), with modest demand to Teesport (not shown, as it represents the equivalent of less than 2 paths per hour in 2016) branching from that route.

Figure 32 shows the demand for rail freight paths in 2050 without the application of an NPIER growth scenario. This shows modest growth (compared to 2016) within the Liverpool City Region, Teesport, and Humberside. This reflects the fact that these areas have the largest ports in the North.

[3] 'Liverpool2' is a new, £400m deep water container terminal, capable of handling 13,500 TEU post-panamax vessels.

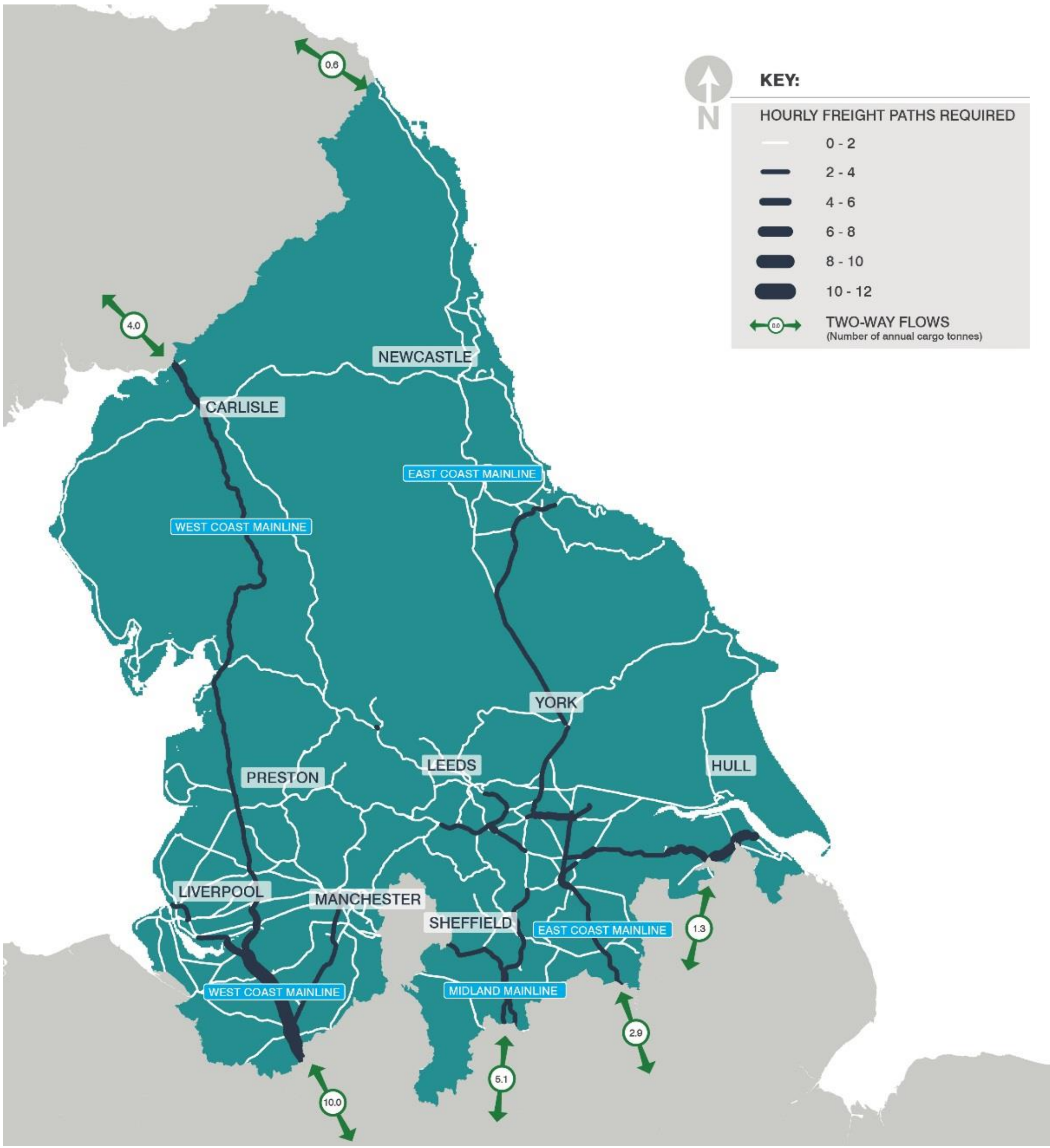


Figure 32 Rail Freight - 2050 Do Nothing (without NPIER) Hourly Freight Paths Required

Figure 33 shows, with the application of ‘NPIER growth’, demand for paths with a similar distribution to Figure 31. The largest demand is on the South Humberside Main Line, and the WCML south of Warrington. In this scenario, the full trans-Pennine route between Leeds and Manchester sees freight demand in excess of 2 paths per hour, which is not the case in Figure 33. The impact of investment in Liverpool can also be observed with the intermodal terminal at Widnes/Ditton driving demand. With additional pathing requirements to meet the growth in demand for flows from Scotland, the WCML is likely to form a pinch point.

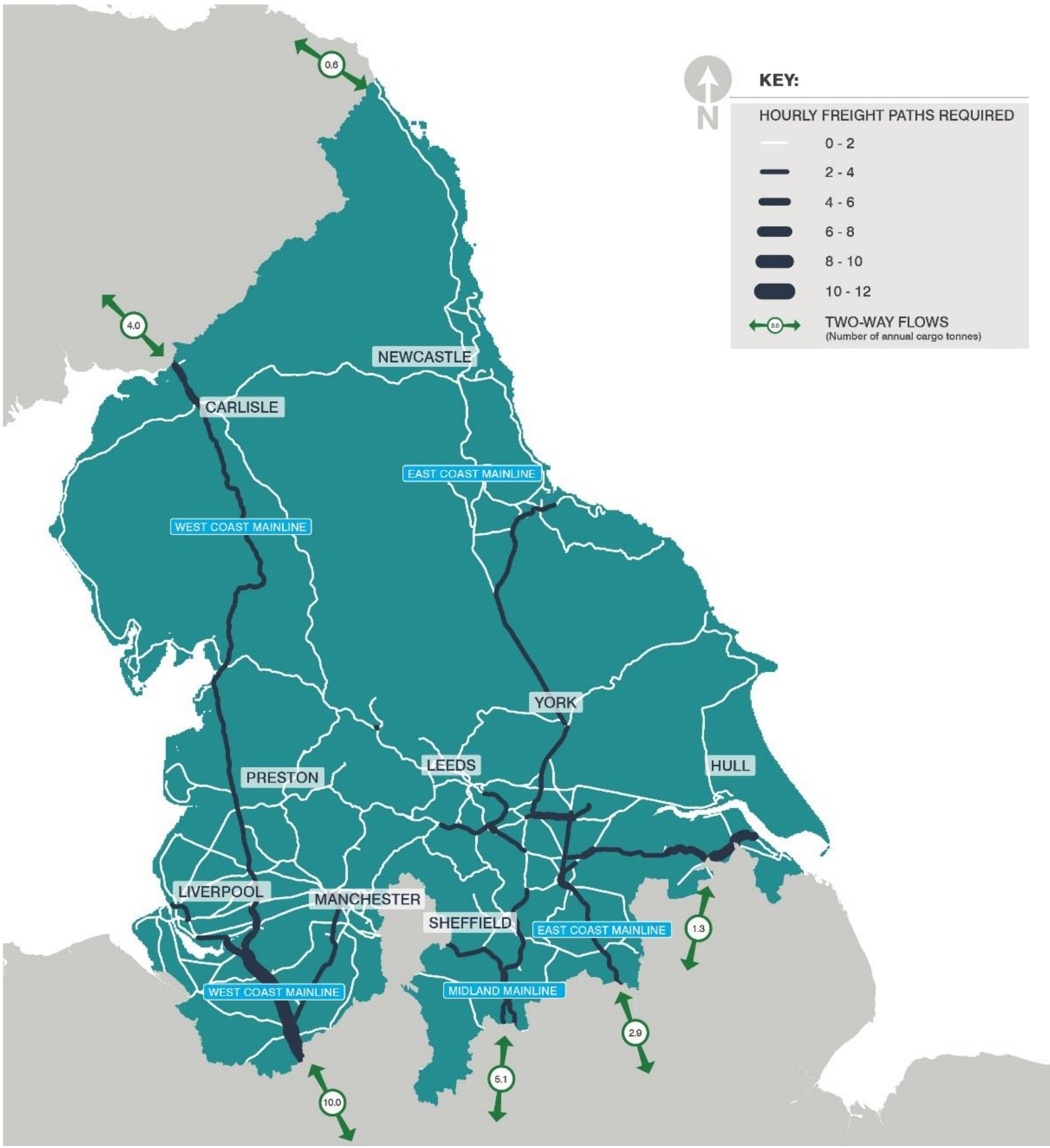


Figure 33 Rail Freight - 2050 Do Nothing (with NPIER) Hourly Freight Paths Required

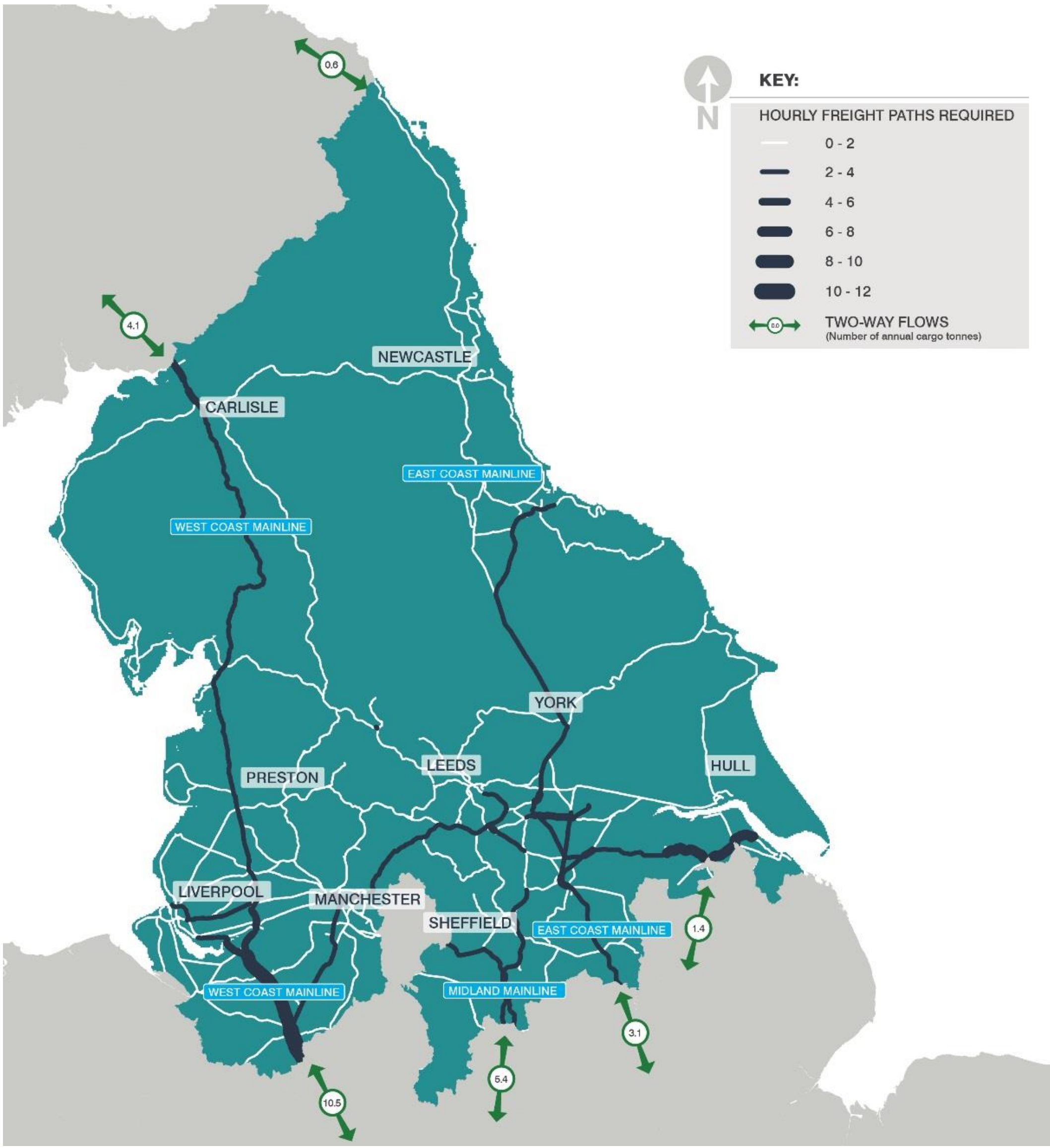


Figure 34 Rail Freight - Difference between 2016 and 2050 Do Nothing (with NPIER) freight paths required

4.3.5.2 Qualitative Analysis of Potential Pinch Points

A qualitative analysis has been undertaken, based on a comparison between 2016 and 2050 demand for freight paths on individual route sections. This initial exercise to identify pinch points has aggregated track sections in order to allow for commentary at a level appropriate for this analysis.

The analysis is based on current network capacity and the nature of the traffic (e.g. freight only / mixed use / high speed long distance passenger) on the various route sections. The impact of changes in demand for paths is then considered in this context.

The outcome of the qualitative analysis is categorised by a RAG assessment as shown in Table 13.

Table 13 RAG assessment for Freight Path Requirement Assessment

Not considered to be an issue	(green)
May be an issue – will require more analysis	(amber)
Based on current knowledge considered to be a pinch point	(red)

In each case, freight traffic is considered in isolation. Passenger traffic is assumed to remain constant (i.e. the current passenger timetable), with the exception to the potential impact of HS2 Phase 2 (north of Birmingham) on WCML passenger service movements.

The values in Table 14 are the total path forecasts per hour for both directions – it is assumed that there is a balanced flow with half the traffic in each direction. The table highlights the impact of the growth of freight services in relation to the routes. A threshold of two trains per hour has been set as the point where it is likely that capacity constraints may occur. The assumption being that below this level the risk of exacerbating or creating a capacity constraint will be low.

It is also worth noting that assumptions made in relation to the focus of intermodal growth in Manchester being at Trafford Park are different to that of the network Rail Freight Market Study which assumed a distribution of growth across other facilities including Parkside and Port Salford. This has led to variations in the assumed growth on routes in this area.

Table 14 Rail Freight - Pathing Assessment

	Tracks	Freight Paths Required			Comment / Status
		2016	2050	Delta	
West Coast Main Line - Crewe to Carlisle					
Southern Border to Crewe	4	5.7	10.4	4.7	This is a four tracked section but is likely to benefit from the transfer of passenger services to HS2.
Crewe to Winsford South Jn.	4	4.9	8.5	3.6	
Winsford South Jn. to Hartford	2	4.9	8.5	3.6	This two tracked section is a pinch point both now and in the future with HS2
Hartford to Weaver Jn.	2	5.9	9.2	3.3	This is a significant increase on a double tracked mixed traffic section and so could be problematic.
Weaver Jn. to Warrington	2	3.5	4.8	1.3	This is an increase of less than one freight path per hour which could be an issue.
Warrington to Winwick Jn.	4	2.9	4.6	1.7	
Winwick Jn. to Wigan	2	2.5	4.0	1.5	
Wigan to Preston	2	2.5	4.0	1.5	
Preston to Carlisle	2	2.4	3.8	1.4	
Newton le Willows to Seaforth					
Newton le Willows to Edge Hill	2	<2	2.2	1.2	This is not considered to be an issue given the current passenger train services.

Edge Hill to Seaforth	2	<2	2.4	1.4	This is a double track freight only branch therefore not an issue.
Weaver Junction to Garston					
Weaver Jn. to Garston	2	2.7	4.4	1.7	This is a mixed traffic railway with LDHS services sharing the tracks with the freight services the impact of the increased freight could be an issue.
Crewe to Trafford Park					
Crewe to Wilmslow	2	<2	3.1	2.1	This section is likely to be a pinch point
Wilmslow to Adswood Road Jn.	2	<2	2.2	1.2	This is not considered to be an issue given the current passenger train services.
Adswood Road Jn. to Slade Lane	4	<2	2.2	1.2	This four-tracked section although near the throat of Piccadilly is not considered to be an issue
Slade Lane to Ardwick	4	<2	2.9	1.9	
Ardwick to Trafford Park	2	<2	4.9	3.9	This section is likely to be a pinch point
Redcar to Newark via Knottingley					
Redcar to Eaglescliffe	2	<2	3.0	2.0	These routes have previously experienced high levels of freight traffic with similar passenger services thus these sections are not thought to be a risk.
Eaglescliffe to Northallerton	2	<2	2.8	1.8	
Northallerton to York	4	3.1	3.8	0.7	These increases on the four track section are not considered an issue. However, the track layout around Northallerton could cause some capacity issues, particularly for traffic heading towards Middlesbrough and the Tees.
York to Colton Jn.	4	3.2	3.9	0.7	
Colton Jn. to Church Fenton	2	2.3	2.9	0.6	These are minimal increases on routes which are not congested.
Church Fenton to Milford	2	2.1	2.7	0.6	
Milford to Knottingley	2	3.4	3.2	-0.2	There are forecast reductions in the level of traffic and are therefore, by definition, not considered an issue
Knottingley to Shaftholme Jn.	2	3.3	2.1	-1.2	
Shaftholme Jn. to Doncaster	2	4.4	3.4	-1.0	
Doncaster to Retford	2	<2	4.6	3.6	This is a high speed two track section of the ECML and is likely to present a pinch point in terms of the volume of additional freight paths required
Retford to Newark	2	<2	3.1	2.1	
Templehurst Junction to Shaftholme Junction					
Templehurst Jn. to Shaftholme Jn.	2	<2	2.4	1.4	This is freight only and within the capabilities of the line
Knottingley to Drax Power Station					

Knottingley to Drax	2	4.4	5.5	1.1	Given the historical level of services into Drax this is not considered to be problematic
Applehurst Junction to Immingham					
Applehurst Jn. to Stainforth Jn.	2	3.3	2.6	-0.7	The dominance of freight services on this route and the relatively slow speed and limited frequency passenger services means that there are not issues anticipated with these variations
Stainforth Jn. to Thorne Jn.	2	4.6	4.6	0.0	
Thorne Jn. to Scunthorpe	2	4.2	4.0	-0.2	
Scunthorpe to Wrawby Jn.	2	5.9	6.1	0.2	
Wrawby Jn. to Brocklesby Jn.	2	7.2	7.7	0.5	
Brocklesby Jn. to Immingham	2	6.9	7.5	0.6	
Swinton to Peak Forest					
Swinton to Aldwarke	2	2.6	2.8	0.2	The variations in path numbers are all relatively modest meaning that there should be little difficulty in accommodating them. In general these are not high speed passenger routes.
Aldwarke to Masborough	2	3.1	3.4	0.3	
Masborough to Tapton Jn.	2	2.4	2.7	0.3	
Tapton Jn. to Dore	2	2.2	2.7	0.5	
Dore to Earles	2	3.0	3.7	0.7	
Earles to Peak Forest	2	2.2	2.5	0.3	
Tapton Junction to Alfreton					
Tapton Jn. to Claycross South Jn.	2	4.5	5.4	0.9	The increase of freight traffic on these routes are likely to require intervention.
Claycross South Jn. to Alfreton	2	2.9	3.1	0.2	This is a minor upgrade and not considered significant
Ardwick to Leeds					
Ardwick to Guide Bridge	2	<2	2.4	1.4	This is a congested stretch of track and likely to be a pinch-point
Guide Bridge to Mirfield	2	<2	2.0	1.0	
Mirfield to Healey Mills	2	<2	2.3	1.3	These are largely freight only sections with the increase in pathing demand likely to be within the route capability
Healey Mills to Wakefield	2	<2	2.5	1.5	
Wakefield to Altofts Jn	2	<2	2.9	1.9	This is a likely to be a congested stretch of track and likely to be a pinch-point
Altofts Jtn to Leeds	2	<2	2.6	1.6	
Wakefield to Moorthorpe					
Wakefield to Moorthorpe	2	2.5	3.2	0.7	This is mixed traffic route with LDHS passenger services although the forecast increase in freight traffic is small it could be an issue
Skipton to Rylstone					

Skipton to Rylstone	1	<2	2.7	1.7	This is a freight-only branch capable of handling this level of traffic

In addition to the above, there is a potential / existing conflict between freight and passenger trains on the Hope Valley line which is constraining capacity and journey time improvements on this main passenger line between Sheffield and Manchester. There is a Transport and Works Act Order (TWAO) awaiting ministerial approval for a scheme to address this.

Determination of the capability of individual track sections to handle the forecast volumes of freight and passenger traffic is a function of the signalling capability of the line, the mix of traffic (types and speed), and the number of tracks / loops.

Whilst this initial analysis provides an indication of potential pinch points based on the available information, more detailed analysis, on a corridor by corridor basis, will need to be undertaken alongside analysis of passenger service demand. This will allow for the development of interventions to alleviate constraints. It is also important to note that any significant increase in passenger trains will have a considerable impact on these findings.

There is a need to make more use of under-utilised routes such as Settle and Carlisle and routes to and from the Humber Ports.

Nevertheless, as a result of this initial analysis it has been possible to identify the most likely areas of conflict between demand for freight paths and passenger paths, which are:

- Hartford to Weaver Junction;
- Crewe to Trafford Park;
- Doncaster to Newark; and,
- Ardwick to Mirfield.

4.3.6 Challenges

Lack of capacity on the rail network in the North is a key challenge and can generally be expressed in a number of ways in addition to availability of freight paths covered above:

- Train Average Speeds;
- Train Length Limits;
- Train Weights;
- Gauge Clearance;
- Headways and Network Access; and
- Utilisation of Freight Paths.

4.3.6.1 Train Average Speeds

In order to ensure rail is an attractive mode of transport for the movement of freight, it needs to be able to compete effectively with road transport with suitable end-to-end journey times. Presently, across the UK rail network and focussing particularly on the North, the average speeds of freight trains and resulting journey times is not conducive to encouraging a greater shift of freight to rail.

Table 15 shows some typical freight train average speeds and resulting journey times on a number of services throughout the North taken from Network Rail's Working Timetables. Average speeds range from 16mph – 53mph.

Table 15 Typical Rail Freight Journey Times

Origin	Destination	Journey Time*	Average Speed
Liverpool	Drax Power Station	7.50 hours	16mph
Immingham	Drax Power Station	2.75 hours	19mph
Crewe	Trafford Park	1.25 hours	36mph
London Gateway	Trafford Park	7.50 hours	31mph
Immingham	Eggborough Power Station	3.50 hours	17mph
Tunstead	Eggborough Power Station	3.25 hours	53mph
Cardiff	Doncaster	8.75 hours	25mph
Wellingborough	Doncaster	3.50 hours	40mph

Source: Network Rail Working Timetables

Source: GBRf

Case Study: Drax Power

Drax Power import Biomass wood pellets from a number of Northern Ports including Liverpool, Immingham and Hull. These are moved by rail from the Port to the power station near Selby.

The import of wood pellets through Liverpool has experienced considerable difficulty in getting efficient rail paths, taking over 3 years to establish before contracts to build the terminal were placed. The average time for a loaded train on what is essentially a 100 mile journey has been over 7 hours, an average speed of just 16 miles per hour.

4.3.6.2 Train Length Limits

Rail's ability to carry significantly higher volumes of freight per journey in many cases allows it to compete effectively with road transport. The length of trains permitted on the rail network is pertinent especially when transporting non-heavy items such as intermodal freight as opposed to bulk goods.

Intermodal freight is a commodity experiencing considerable growth and due to its relatively light nature could be transported in longer trains will relatively little impact on the locomotive traction. Currently, 775m trains (including the locomotive) are considered to be the maximum length permitted for intermodal trains. It remains an aspiration in the UK to allow the running of trains of a greater length.

Longer trains have an impact in various areas but primarily in track signalling and resulting pathing requirements in addition to the availability of suitable loading and unloading facilities at freight terminals. There may also be a consideration in regard to length of existing loops across the rail network that allow faster trains to overtake.

Currently, 775m trains are permitted on the WCML from the South-east up to Crewe. The line north of Crewe (as of the end of Network Rail’s Control Period 5 (CP5) is not cleared for 775m trains – this is the section of the route passing through the North of England.

4.3.6.3 Train Weights

Train weights are defined by the maximum axle weight of services that can travel over a given rail route and is known as the Route Availability (RA). The core rail network is generally able to meet the demands put on it by freight services however there may be specific areas where heavier trains result in re-routing of services and restricted operating speeds. This is generally associated with the transport of bulk cargo.

4.3.6.4 Gauge Clearance

In order to transport ISO containers on the rail network, sections of track are required to have the appropriate gauge clearance. ISO containers (9ft 6in in height) are commonly used for moving freight by sea shipping routes into and out of the North of England. To permit FOCs to transport this type of container on a standard wagon W10 gauge clearance is required.

A significant proportion of the rail network in the North of England does not have W10 clearance as shown in Figure 35, therefore limiting the scope for transporting intermodal containers by rail. Of the three Transpennine rail routes, W10 clearance is not in place at all. There are examples of routes where W10 does exist but only by way of complex manoeuvres such as between the ECML and Teesport where a deviation through Darlington and a reversing manoeuvre is required. The direct route has capacity issues such as the clearance of the Yarm Tunnel.

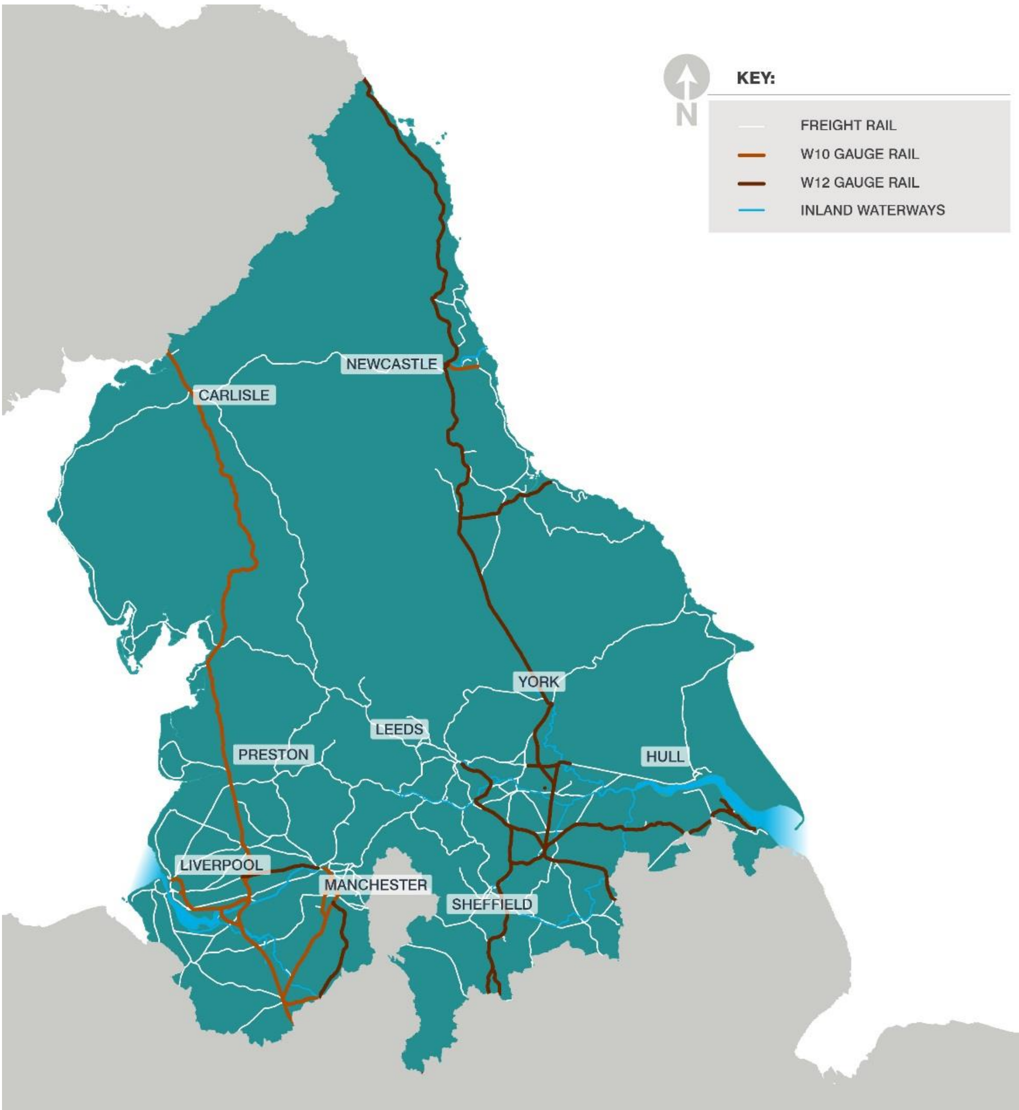


Figure 35 Rail Gauge Clearance

In addition, W12 clearance maintains the height of W10 clearance but features an increased width of 2600mm which accommodates the wider intermodal unit sizes and in particular those units used to transport refrigerated goods. As W12 clearance requires greater width, it is often significantly more expensive to implement as it can involve structure rebuilds and alterations to line side equipment.

Within the North of England, W12 gauge clearance is in place on the entire ECML as well as lines from it to Leeds and Sheffield. The MML is also W12, as is the line from Manchester to the WCML just south of Wigan. The route from Manchester to the WCML via Stoke-on-Trent is also W12 cleared. The majority of the WCML itself is only cleared for W10 gauge.

4.3.6.5 Headways and Network Access

The available headways on existing rail infrastructure are a significant problem often borne out by older signalling systems which can cause issues around network access and days of operation. There are cases such as the Cumbrian Coast Line where the older signalling system inhibits expansion. On parts of the Cumbrian Coast Line, signal boxes are staffed only on Mondays – Saturdays with no operation on a Sunday. This will change soon when the boxes will be staffed seven days a week however the older signalling system and single line sections will remain.

4.3.6.6 Rail Freight Path Utilisation

It is well known in the Rail industry that freight paths are historically underutilised. Rail paths are often secured with good intentions but the loads never materialise. This has resulted in a reduction in the available paths on the rail network.

In order to assess the scale of unused paths, a high level utilisation exercise was undertaken to understand where freight paths are underutilised and where there is scope for improving the rail usage on certain routes.

A number of locations were identified in the TfN area: Colton Junction, Crewe Junction, Castlefield Junction and Knottingley. These four locations sit on different main routes and provide a picture of the current use of the rail freight industry in the area.

Utilising the Working Timetable (WTT) and information from Network Rail data feeds, we looked at the number of scheduled and actual train movements in weekdays from 08/03/2017 and 14/03/2017. The information from Network Rail also shows the variations to the WTT, Cancellations and Short Term Planned Routes. The results of the analysis are outlined in Table 16.

Table 16 - Rail Freight Utilisation Analysis

Type of Service	Castlefield Jn	Crewe Jn	Colton Jn	Knottingley
Working Timetable	210	693	182	81
Cancelled	63	152	345	278
Short Term Planned Routes	11	80	91	71
Variations to WTT	84	155	70	19
Total	368	1080	688	450
Utilisation (WTT Only)	82%	85%	42%	26%
Utilisation (Overall)	83%	86%	50%	38%

Two values of Utilisation have been analysed; number of trains running in comparison to the WTT and number of trains running in terms of number of scheduled trains (i.e. including Short Term Planned Routes). This is because although the Short Term Planned routes are not on the WTT, they still utilise the network and therefore it gives a more accurate reflection of the usage on rail freight.

Table 16 shows that the Castlefield Junction and Crewe Junctions are the most utilised in terms of keeping to the WTT and accommodating new movements.

Colton Junction and Knottingley have high proportions of cancellations, resulting in a much lower utilisation. On further inspection, many of these cancelled movements appear to be a result of the reduction in coal traffic with more than half of the cancelled routes in the top 10 cancelled routes being related to coal, as shown in Table 17.

Table 17 - Top 10 Cancelled Freight Paths

Loc.	Origin - Destination	Cancelled	Total	% run
Colton Jn	Drax Aes (Gbrf) - Tyne Coal Terminal Gbrf	32	55	42%
	Tyne Coal Terminal Gbrf - Drax Aes (Gbrf)	20	35	43%
	Doncaster Down Decoy Gbrf - Tyne Coal Terminal Gbrf	17	24	29%
	Doncaster Down Decoy Flhh - Redcar Bulk Terminal (Flhh)	17	20	15%
	Redcar Bulk Terminal (Flhh) - Doncaster Down Decoy Flhh	14	14	0%
	Drax Aes (Gbrf) - Hunterston (Gbrf)	10	10	0%
	Doncaster Up Decoy - York Engineers Yard	10	10	0%
	York Engineers Yard - Doncaster Up Decoy	10	10	0%
	Doncaster Down Decoy Gbrf - Hunterston (Gbrf)	10	10	0%
Knottingley	Drax Aes (Gbrf) - Tyne Coal Terminal Gbrf	31	49	37%
	Drax Aes (Gbrf) - Liverpool Biomass Tml Gbf	26	38	32%
	Drax Aes (Gbrf) - Tuebrook Sdgs Gbrf	23	26	12%
	Tuebrook Sdgs Gbrf - Drax Aes (Gbrf)	22	25	12%
	Tyne Coal Terminal Gbrf - Drax Aes (Gbrf)	20	35	43%
	Drax Aes (Gbrf) - Hunterston (Gbrf)	20	20	0%
	Hunterston (Gbrf) - Drax Aes (Gbrf)	12	12	0%
	Drax Power Station - Milford West Sidings	11	26	58%
	Hull Biomass Lp (Dbc) - Drax Power Station	10	11	9%
	Sudforth Lane Up Rs (Flhh) - Hunterston High Level Fhh	10	10	0%

4.3.7 Recent Rail Success Stories

Despite the challenges listed above, there have been some notable recent success stories for rail freight in the North of England. A selection of these are summarised below.

4.3.7.1 Sand Trains

In 2016 freight trains carrying sand to Pilkington in St Helens restarted and they operate once a week operated by DB Cargo UK.

Most silica sand in the UK is transported by lorry and bulk tanker vessels and the only silica sand operation in the UK today with a dedicated rail link is Middleton Towers, Kings Lynn in Norfolk. This quarry is operated by Sibelco UK Ltd who have a number of sites across the UK.

From the Middleton Towers site in Kings Lynn, freight trains are used to transport the sand to glass manufacturers in Northern England such as Pilkington in St Helens.

In addition to the sand trains to St Helens, trains also operate regularly taking sand for glass making from Kings Lynn to Encirc (formerly known as Quinn Glass) in Ellesmere Port operated by Freightliner Heavy Haul.

There may also be opportunities in the future for transporting additional raw materials deliveries (40,000 tonnes Limestone) as well as bulk consumer liquids imported from abroad to Encirc for their filling hall as well as transport of finished glass products by rail on container trains if loading gauge issues on the line to Ellesmere Port can be resolved.

4.3.7.2 Waste Trains

In April 2013 it was announced by the Merseyside Recycling & Waste Authority that SITA UK was the successful party for their 30 year resource recovery contract.

On 28 June 2016 a new train service commenced which operates two times a day and five days per week (once on Saturdays). The service is operated by DB Cargo UK on behalf of SITA UK from the rail terminal in Kirkby carrying Solid Recovered Fuel (i.e. waste) from Merseyside to their new Wilton 11 “Energy from Waste” plant in Teeside which is being developed by Sembcorp Utilities UK in partnership with SITA UK.

4.3.7.3 Aluminium Trains

The 3MG Viking Park site is located at the Ditton Foundry Lane rail terminal which is served by a regular freight train from Neuss near Dusseldorf in Germany via the Channel Tunnel following a contract awarded in Feb 2014 to DB Cargo UK by Novelis.

Novelis is the global market leader in rolled aluminium products. It manufactures products such as beverage cans, sheet aluminium for the automotive industry, roofing and exterior components for the construction industry, and lithographic plates.

This is a two-way flow carrying aluminium slab from Warrington to Germany in one direction and aluminium coil from Germany in the other direction and was previously transported by ship.

These trains travel from Neuss, Germany, to 3MG Viking Park Ditton Foundry Lane transporting aluminium coils weighing up to ten metric tons each. The aluminium coils are then distributed onwards by road to customers.

On the reverse journey back to Germany, the trains carry aluminium bars weighing up to 27 metric tons each from Novelis' Warrington recycling plants, back to Neuss. The aluminium bars are transported by road from Warrington recycling plants to 3MG Ditton Foundry Lane rail terminal where they are loaded on to the trains. DB Cargo UK makes three round trips with trains 22 wagons long every week. Each one-way journey takes 25 hours.

4.4 Waterborne Freight

4.4.1 Ports

The UK, as an island nation, relies heavily on water-based freight to deliver imports and ship exports to and from a wide range of global destinations. In order to achieve this a number of major ports are located throughout the North of England alongside a greater number of smaller ports serving local areas as shown on Figure 36. The Major Ports are indicated in Table 18.

Table 18 Major Ports

Port Group	Major Ports
Mersey	Liverpool, Birkenhead, Garston, Manchester Ship Canal
Humber	Hull, Immingham, Grimsby
Tees	Tees, Hartlepool
Tyne and Wear	Tyne, Sunderland
Lancashire	Heysham
Cumbria	-

In addition to the Northern ports, freight flows to and from the North of England also travel via a number of other ports, particularly the southern ports such as Felixstowe and Southampton. Through the modelling of freight flows using GBFM the port throughput across the UK has been assessed.

Appendix B contains a graphical representation of the import and export volumes via each port group for 2016 and the forecast for 2050. It also provides the global origin and destination data for freight moving through these ports as well where in the UK the goods will be moved from and/or to. The total import and export volumes via these port groups are summarised in Table 19.

Table 19 Port Throughput

Port Group	Annual Cargo Volumes (million tonnes)					
	Imports			Exports		
	2016	2050	Growth	2016	2050	Growth
Tyne and Wear	3.4	4.6	35.3%	1.6	2.2	37.5%
Tees	21.1	26.1	23.7%	8.5	11.3	32.9%
Humber	50.4	65.8	30.6%	26.2	35.0	33.6%
Mersey	23.3	29.6	27.0%	7.9	17.3	119.0%
Lancashire	0.8	1.7	112.5%	1.2	2.5	108.3%
Cumbria	0.1	0.1	0.0%	0	0	0.0%

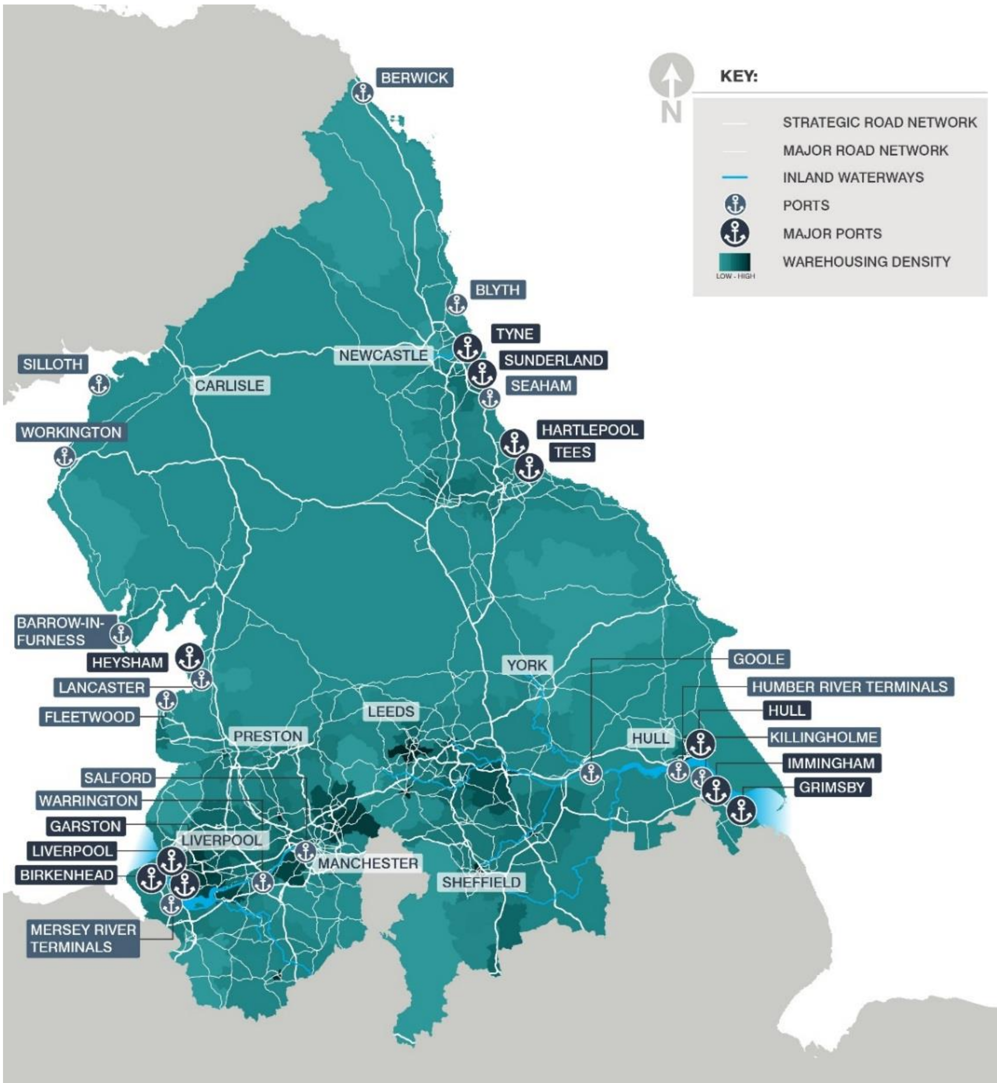


Figure 36 North of England - Port Infrastructure

Figure 37 and Figure 38 illustrate that Northern port's share of cargo throughput decreases between 2016 and 2050, although there is overall growth in total volumes as illustrated in Figure 39, which shows cargo imports and exports through the UK ports in 2016 and 2050. Whilst the throughput of the Northern ports is predicted to increase, the growth at the UK's major southern ports is expected to be higher mainly driven by intermodal freight units.

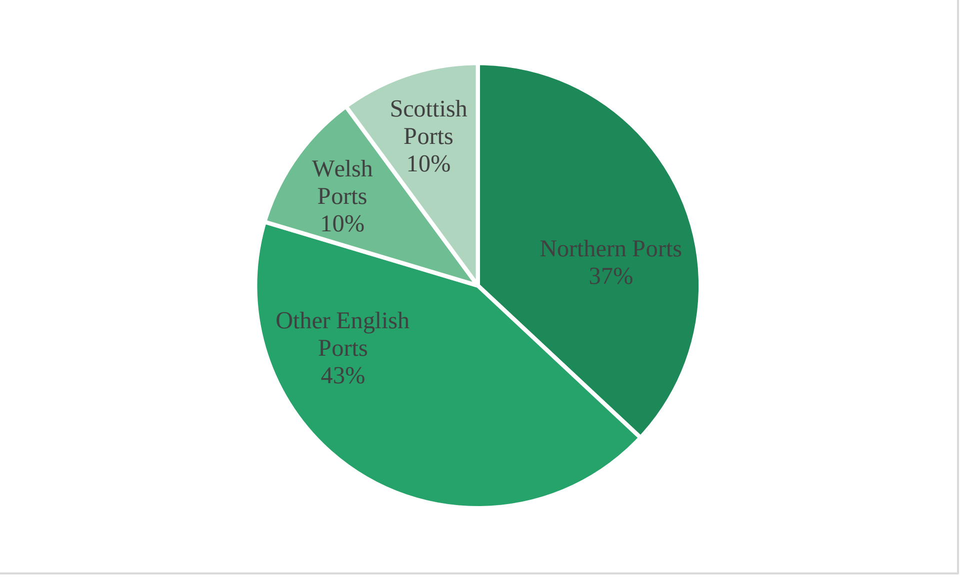


Figure 37 UK Ports Total Cargo Throughput – 2016

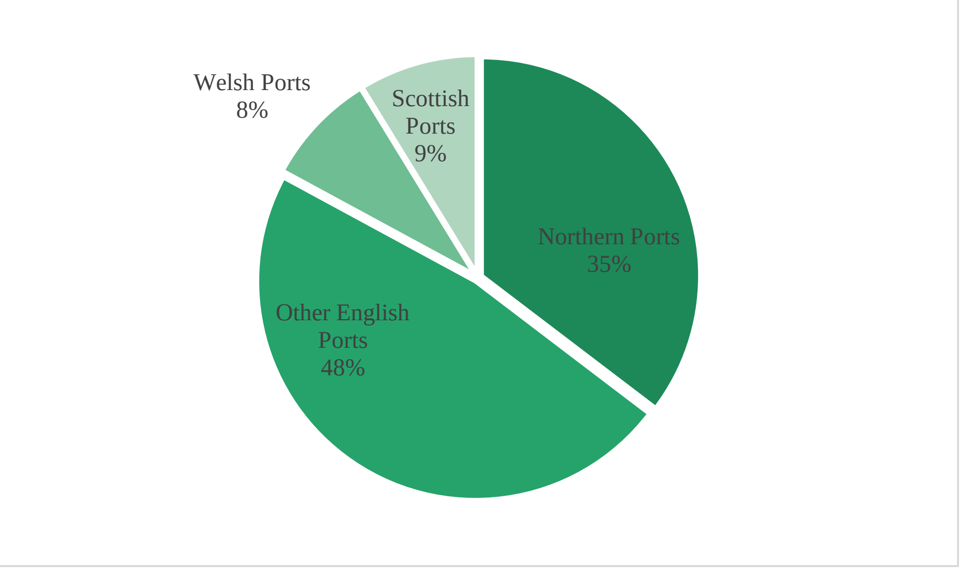
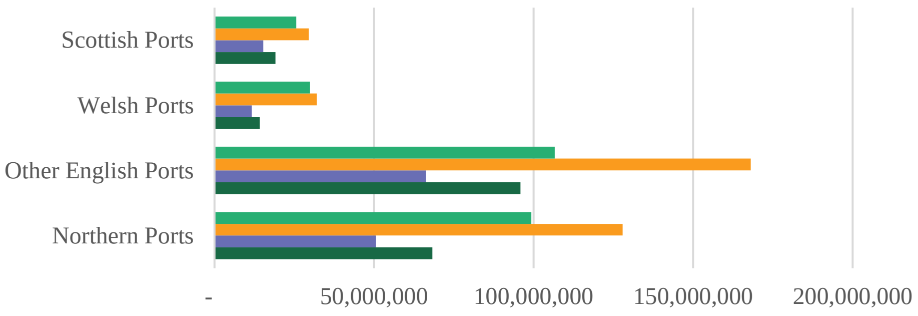


Figure 38 UK Ports Total Cargo Throughput – 2050



	Northern Ports	Other English Ports	Welsh Ports	Scottish Ports
Imports: 2016	99,258,775	106,628,746	29,949,106	25,618,311
Imports: 2050	127,867,494	168,060,676	32,058,208	29,553,382
Exports: 2016	50,582,309	66,274,595	11,701,116	15,280,254
Exports: 2050	68,333,282	95,891,517	14,224,732	19,103,891

Figure 39 UK Ports Imports and Exports by Port Groups (Annual Cargo Tonnes)

Ports play an intrinsic role in actively contributing to the success of the key areas of energy, advanced manufacturing, health sciences and digital and other sectors that are growth points in the Northern economy e.g. food and agriculture. Ports can be more than supply chain gateways for these sectors but can be the location for such activities e.g. Siemens in the Port Hull and BAE Systems in the Port of Barrow.

4.4.2 Shipping Types

Shipping movements are generally split into:

- Short Sea Shipping; and
- Deep Sea Shipping.

Short Sea Shipping (SSS) is the maritime transport of goods over relatively short distances on routes, such as Liverpool to Dublin and Immingham to Rotterdam, whereas Deep Sea Shipping (DSS) refers to the maritime transport of goods on intercontinental routes, crossing oceans.

The primary driver for growth in terms of shipping is intermodal container freight on both SSS and DSS routes. This is reflected in the 2050 forecast although the more predominant intermodal flows are focused on the southern ports, such as London Gateway, Southampton and Felixstowe, where extensive facilities for handling large container vessels have been created.

The Port of Liverpool has however invested over £400 million in the creation of a new deep-water container terminal that will enable two 13,500 TEU vessels to call at one time and hopes to attract regular container ship calls to boost the port's intermodal throughput.

Figure 40 illustrates the mixture of SSS and DSS routes into and out of the various Northern port groups in 2016 and the forecast for 2050. SSS transports the larger volume of cargo into the Northern ports with imports exceeding exports. DSS tend to be focused on large vessels making one call in the UK on global loop routes. Currently some of intermodal freight brought into Europe by DSS services is fed into ports such as Rotterdam with smaller feeder vessels and SSS services transporting it as both accompanied and un-accompanied freight to the Northern ports. The intermodal freight that is transported via the southern UK ports generally travels to and from the North of England by rail into and out of intermodal terminals such as Trafford Park in Manchester for onward “last mile” distribution by road.

The Humber ports dominate the shipping volumes mainly because there are three significant ports (Hull, Immingham and Grimsby) located on the Humber Estuary. The majority of the freight handled by the Humber ports arrives via SSS routes. There is however also significant DSS services into and out of the Humber.

The Mersey ports are evenly balanced between SSS and DSS with aspirations of future growth in DSS services via the new container berth known as “Liverpool 2”. Liverpool has developed a strong network of short sea shipping routes and is a major short sea shipping hub for the Irish Sea area with ro-ro ferry services to the Isle of Man, Dublin and Belfast (key operators including Stena Line, Seatruck Ferries, P&O Ferries and Isle of Man Steam Packet) and lo-lo container feeder services to Dublin, Belfast, Cork and Glasgow and from English Channel Ports (including Southampton, Rotterdam, Antwerp and Le Havre) for example. These feeder services to the English Channel Ports connect Liverpool to deep sea container services to the Far East, India, Africa and South America. Peel Ports also operate the innovative container ship service from the Port of Liverpool along the Manchester Ship Canal.

The Tees ports handle mainly SSS services and primarily import freight with Tyne & Wear ports handling smaller mixed volumes. Lancashire ports handle only SSS services and the ports in Cumbria handle a small amount of SSS services.

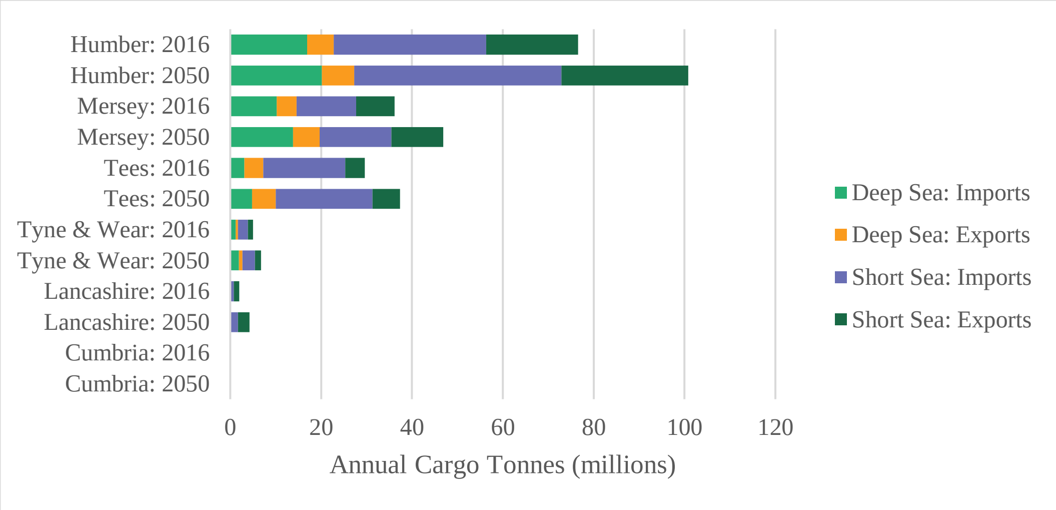


Figure 40 Northern Ports Annual Throughput by Shipping Type

4.4.3 Inland Waterways

There is a network of inland waterways within the North of England. The major waterways concerned with the movement of freight are the Manchester Ship Canal and the Aire Calder Canal which also includes the River Humber and River Ouse.

The Manchester Ship Canal stretches from the Mersey at Liverpool up towards Salford in Manchester. Ships and barges regularly use the Manchester Ship Canal to transport goods to and from ports at Runcorn, Warrington, Irlam and Salford.

There are proposals for new and enhanced port terminals along the Manchester Ship Canal such as Port Wirral (Eastham / Ellesmere Port Docks), Port Cheshire (Bridgewater Paper Mills), Port Ince (Protos Energy Park), Port Weston, Port Runcorn, Port Warrington, Port Irlam and Port Salford.

There are challenges in terms of infrastructure on the route with key crossings being closed to vehicles as ships pass through the canal. This can often lead to localised congestion.

The Aire and Calder Canal is accessed from the Humber Estuary and River Ouse at Goole and runs west towards Leeds. There are numerous barges in use on the canal that transfer bulk goods from the Ports on the Humber such as Immingham and Grimsby.

Development is underway on the Aire and Calder, focused around providing more space for the deliveries of bulk materials related to construction, however there are infrastructure constraints on the canal in terms on bridge heights for example, which limit the size of vessels that can use it. The opportunities this presents the owners and managers of the waterways are being explored. ABP and the Canals and Rivers Trust (CRT) are continuing to investigate the potential to increase traffic on the Aire and Calder Canal to generate more freight to and from the Humber.

In terms of volumes along each route, the DfT Ports Statistics and Barge Survey data gives annual volumes along each route. This is presented in Table 20.

Table 20 Inland Waterways Annual Cargo Volumes

Route	Traffic Type	Annual Cargo moved (million tonnes)										
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Manchester Ship Canal / River Mersey	Internal	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.5	0.8	0.6	0.4
	Seagoing	6.1	6.6	6.4	5.8	4.8	5.3	5.1	4.9	5.5	4.9	4.9
	Total	**6.4**	**6.9**	**6.7**	**6.1**	**5.0**	**5.6**	**5.4**	**5.4**	**6.2**	**5.5**	**5.3**
River Humber	Internal	0.6	0.4	0.3	0.3	0.3	0.2	0.5	0.3	0.5	0.6	0.3
	Seagoing	5.8	5.3	5.7	5.5	3.9	4.5	4.1	3.7	3.7	3.7	3.4
	Total	**6.4**	**5.8**	**6.0**	**5.8**	**4.2**	**4.8**	**4.6**	**4.0**	**4.2**	**4.3**	**3.7**
River Ouse	Internal	0.5	0.4	0.3	0.3	0.2	0.2	0.3	0.2	0.3	~	~
	Seagoing	2.8	2.4	2.6	2.4	1.8	2.2	2.0	1.4	1.5	1.5	1.5
	Total	**3.4**	**2.9**	**2.9**	**2.7**	**2.0**	**2.4**	**2.4**	**1.6**	**1.8**	**1.5**	**1.5**
Aire and Calder	Internal	0.4	0.4	0.3	0.3	0.2	0.4	0.3	0.2	0.1	0.0	~
	Seagoing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	**0.4**	**0.4**	**0.3**	**0.3**	**0.2**	**0.4**	**0.3**	**0.2**	**0.1**	**0.0**	**~**

The table shows that in terms of freight being moved by Inland Waterway, there has actually been on overall decline since 2005 however current investment in infrastructure is likely to arrest this decline.

4.4.4 Challenges

As with the other transport modes, water-based transport and, in particular for this report, the Northern Ports face a number of challenges which include:

- Consolidation of shipping lines and focus on southern ports;
- Port location and access and infrastructure;
- Land availability and planning restrictions; and
- Unbalanced flows.

4.4.4.1 Consolidation of shipping lines and focus on southern ports

As shipping lines seek greater efficiencies to reduce costs, the formation of shipping alliances to achieve consolidation is occurring across the industry. This can achieve a number of advantages, including:

- Cost savings, through delivering synergies and a longer term strategic advantage;
- Generates higher yields where the geographical footprint of the shipping lines is complementary; and

- Improved network utilisation and the ability to deploy larger vessels achieving economies of scale, operating through key terminals within individual regions.

The liner industry is a good example of how consolidation has occurred. There are now three main liner shipping alliances made up of a number of shipping lines that represent over 75% of global container capacity and over 95% of all east-west trades as shown in * forming new operator to be known as Ocean Network Express

Figure 41 (correct at time of issue).

The formation of these alliances has a major effect on ports globally as each alliance consolidates around a small number of regional hubs where their major loop services are focussed. Typically in Europe, the major flows are into Rotterdam and Antwerp and in the UK, most calls are focussed upon the major intermodal terminals at Felixstowe and Southampton with London Gateway also beginning to attract some large ship calls.

* forming new operator to be known as Ocean Network Express

Figure 41 Current Main Liner Shipping Alliances

For the North's Ports, attracting calls by larger ships from these alliances is a challenge against the backdrop of shipping line consolidation but also due to the geographical position of the North. As most major shipping loops are focused on calls in Continental Europe, such as at Antwerp or Rotterdam, the ports in the south of England are well placed for containers headed to the UK. A large proportion of the container traffic imported to or exported from the UK will remain focused through the Southern ports with onward travel provided by road and rail as currently takes place.

External factors such as a widened Panama Canal may work in the favour of ports such as Liverpool where being closer to the North American trade routes could attract increased liner calls.

Port of Liverpool – Cargo 200

The Port of Liverpool has developed the Cargo 200 initiative with an aim of removing 200 million miles off of the UK's road and rail infrastructure by the end of 2020.

The Port has signed up 200 advocates for the campaign to encourage shipping lines to introduce direct deep-sea services to Liverpool2.

The advocates signed up include organisations such as Warburtons, Bentley and Matalan.

There are however significant existing feeder services from the major hub ports in Continental Europe and the major southern UK ports into the Northern ports including Tyne, Hull, Immingham, Teesport and Liverpool. The ports on the east coast also feature a significant throughput of accompanied freight via short sea services from Europe whereas the ports based on the Mersey handle significant volumes to and from the Republic of Ireland and Northern Ireland.

It should be noted however that the trend towards larger ships is not limited to the container trade and is also pertinent in the movement of bulk commodities for example. This will influence how cargoes are directed in the future.

As the UK focuses on its withdrawal from the EU, the type of Brexit deal agreed by the UK Government may have a significant effect on Port traffic. It is difficult to predict the exact effects, however should significant additional pressure be put upon the Port of Dover through increased customs checks for example, the Northern Ports may be relied upon to relieve some of this pressure.

4.4.4.2 Port location and access and infrastructure

The landside facilities for the distribution of goods to and from the Northern Ports is imperative to increasing their attractiveness and ensuring freight is moved efficiently across the network.

Many of the Northern Ports are located in urban areas such as Liverpool within the city itself and therefore any increase in vehicle flows in particular on the local road network will have a negative impact on air quality with resulting congestion impacting on the operational cost of transport.

Many of the ports feature both road and rail access, however often routes to join the major transport networks are slow and unreliable. Again this reduces the competitiveness of the Northern ports.

Providing infrastructure to allow freight to be transported to and from the ports effectively is imperative. A good example of where the North falls short in this regard currently is the Biomass traffic that is brought into the UK through the Port of Liverpool for onward transport by rail to the Drax site at Selby. The route that trains take between the two points is not direct and often takes a considerable amount of time at low speeds due to capacity concerns (related to train weight and pathing constraints) on the east-west routes between Liverpool and Yorkshire (see section 4.3.6.4).

The Port of Hull's rail connection as recently been upgraded to W10 gauge clearance to enable the movement of containers by rail to and from the port. Immingham, Teesport and Liverpool (restricted train lengths) also have the ability to handle containers by rail.

4.4.4.3 Land availability / planning restrictions

Ports are facing a number of challenges around finding suitable land for the expansion of their infrastructure and in turn are generally being frustrated in their attempts to expand by planning restrictions forced upon them.

Typically these planning restrictions are related to port access and road and rail connections.

4.4.4.4 Unbalanced flows

Another challenge is the unbalanced flows through the Northern ports where greater volumes of freight are being imported compared to the volumes of freight being exported. This often results in wagons, trailers or containers being transported around empty and a number of operators have commented that they often transport more waste from the UK than manufactured goods. Returning empty containers back into the system is also a key issue as it is a cost that creates very little benefit, however this is necessary to ensure container terminals in the North do not end up being a storage facility for empty containers.

4.5 Air Freight

4.5.1 Airports

The airport infrastructure in the North of England is illustrated in Figure 42. There are 7 airports across the North offering passenger and/or freight services. Most of the freight travelling by air into and out of the North does so in the belly hold of passenger aircraft, particularly long haul wide body aircraft. As a result of this the major freight flows by air into and out of the North are focused on Manchester Airport where there are a greater variety of air services as shown in Table 21. There are however some long haul wide-body air services into Newcastle International Airport which offer significant cargo space.

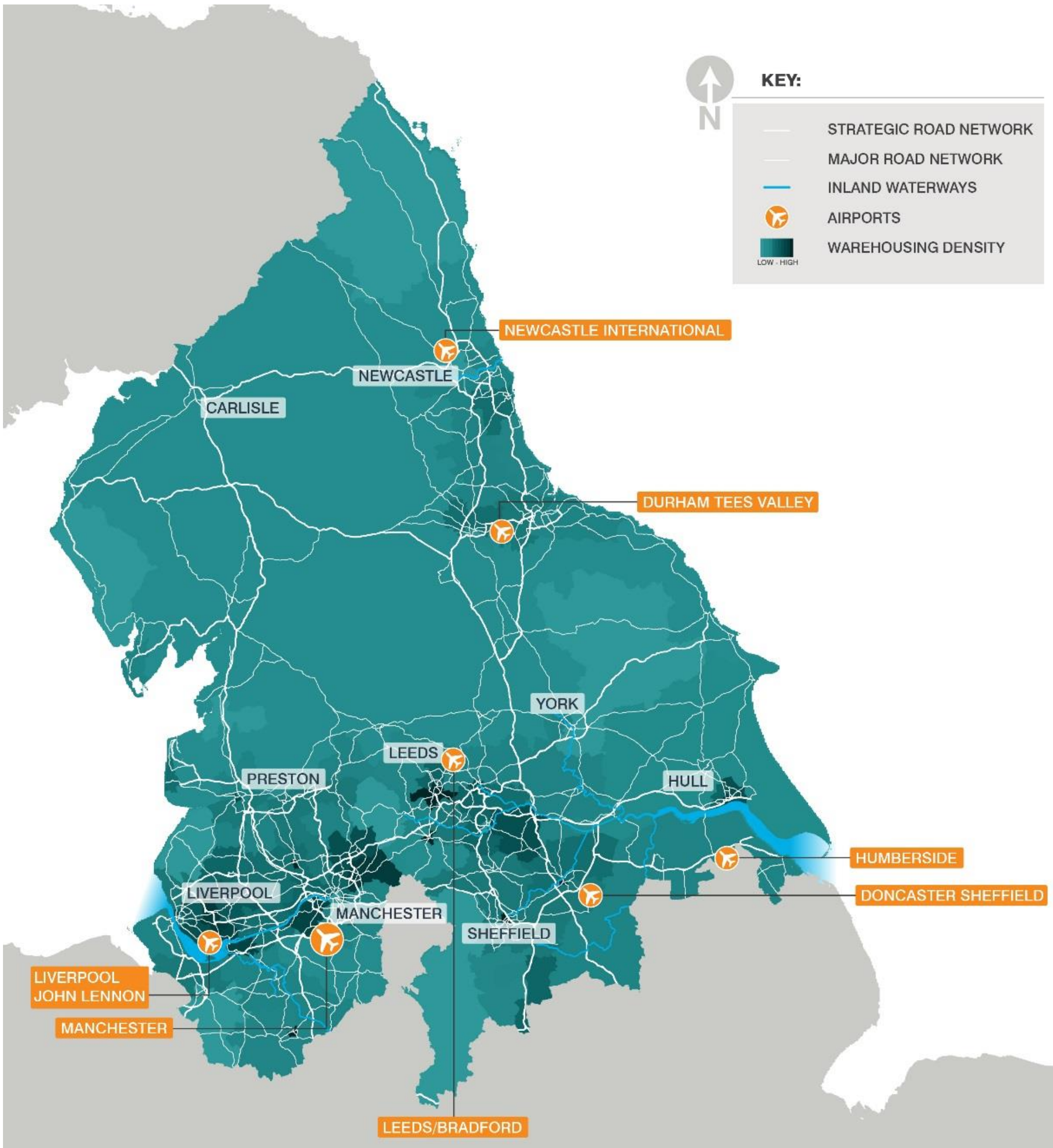


Figure 42 North of England - Airport Infrastructure

In addition to the major airports shown in Figure 42, Chester Hawarden Airport is the location of Airbus Broughton and plays a significant air freight role in the Airbus supply chain transporting finished wings made at Airbus Broughton on specially adapted Beluga aircraft to the final assembly plants in Toulouse and Hamburg. After assembly at Broughton, the aircraft wings are transported by A300-600ST (Super Transporter) Beluga freight aircraft to Toulouse in France.

Carlisle Lake District Airport will also open for scheduled air services from 2018 where there is a potential role for the transportation of freight such as mail.

4.5.2 Total Cargo Movements

At Manchester Airport, long haul airlines operate to an increasing number of destinations using wide-body aircraft such as Singapore, New York, Los Angeles, Hong Kong, Dubai and Abu Dhabi. As these long haul destinations grow, the cargo capacity at the airport also increases.

The annual air freight volumes shown in Table 21 which illustrates that even though Manchester is the dominant airport in terms of freight moved, it carries minimal volumes when compared to two of the UK's strongest freight handling airports; namely London Heathrow and East Midlands Airport.

Table 21 2015 Air Freight carried (tonnes)

Airport	EU		Other International		Domestic	
	Pax AC	Cargo AC	Pax AC	Cargo AC	Pax AC	Cargo AC
Manchester	173	346	6,191	136	8	55
Newcastle	1	41	218	-	0	27
Liverpool	9	-	-	-	10	-
Humberside	-	-	6	2	2	-
Leeds Bradford	-	-	-	-	-	-
Doncaster Sheffield	9	301	-	85	-	-
Durham Tees Valley	-	-	-	-	-	-
London Heathrow	4,950	3,045	107,807	3,217	150	-
East Midlands	-	15,447	-	4,197	-	3,360

4.5.3 Challenges

Much of the air freight which arrives or departs the North of England is currently moved by road. The scope of either influencing modal shift or redirecting this freight to Northern airports is limited until a greater number of long haul passenger or dedicated cargo services are introduced.

4.5.4 Other TfN Work

TfN has undertaken an International Connectivity study and has published a report which provides recommendations on how the North can build upon its connectivity to international markets primarily by air.

4.6 Key Freight Flows

4.6.1 Trends and Growth

Taking into account the growth in the economy forecast between 2016 and 2050, it is clear that as consumer spending increases, so will the demands for goods. This has an enormous effect on the logistics and freight sector with more demands for the movement of goods both into and out of the North of England.

The majority of commodity groups show strong growth across the horizon to 2050 with the exception of bulk traffic, which is affected by the reduction in demand for coal as the UK moves away from coal fuelled power stations towards other sources such as nuclear and renewable energy from wind for example.

As such, the GBFM allows a growth forecast on each major commodity group to be made and this is shown in Table 22.

Table 22 North of England Forecast Commodity Group Trends 2016-2050 (all modes - annual tonnes lifted)

Commodity Group	2016 Total	2050 Total	Difference	Growth
Intermodal	429,047,339	608,223,570	179,176,231	41.8%
Construction and Metals	145,432,706	195,780,275	50,347,569	34.6%
Petrol and Petroleum Products	23,582,068	35,173,303	11,591,235	49.2%
Other Bulks	58,040,217	56,995,074	-1,045,143	-1.8%
Automotive	218,109	262,330	44,221	20.3%

NPIER focuses on four key growth capabilities, namely digital technology, advanced manufacturing, energy and health innovation. Logistics as an enabling capability and as such there are several areas that offer potential growth. Construction logistics is an area experiencing growth and as further infrastructure schemes are developed, the need to transport construction materials will increase. This will be particularly pertinent with HS2 and the developments on the Energy Coast in Cumbria for example.

Another focus is around waste to energy schemes as demonstrated by Drax where there is a need to move bulk fuel (e.g. biomass pellets) from ports or source locations to the power plant. Rail is an attractive method of moving these bulk volumes and therefore there is scope for further movements in the future.

The results for (rail based only) automotive freight movements (another growth area) are presented here alongside the major commodity groups as it has been identified as a major growth sector.

Automobiles moved by road are included in the Intermodal commodity group. This is an unfortunate limitation of GBFM. Automotive rail terminals are located in the North such as in Speke (Ford) and Halewood (Jaguar Land Rover). Automotive Trains operate from Halewood to the Port of Southampton and from Dagenham and the Port of Southampton to Speke for example. Recently, General Motors (Vauxhall) at Ellesmere Port have also commenced automotive rail services to the London EuroHub at Barking.

Automobiles are also imported through a number of Ports within the North of England such as the Port of Grimsby which is the largest car import port in the UK following an investment of £26m by ABP into berths for larger automotive carrier ships.

The decline in coal traffic within the “Other Bulks” sector has been partially offset by an increase in demand for other types of bulk and therefore the reduction in real times is less stark.

The intermodal commodity group represents those freight flows which are currently intermodal or could be deemed as viable for intermodal transport. The vast increase between 2016 and 2050 reflects the growth of online retailers such as Amazon and increased consumer spending leading to increased freight movements.

4.6.2 Key Flows

The key movements within each of the commodity groups listed in Table 22 have been analysed in more detail to provide some key route pairs between defined high level zones which includes the North of England. The zones have been defined to represent similar sized areas and allow the key freight corridors to be defined and fed into the STP for further consideration within the Strategic Corridor Studies.

The zones are broken down as shown in Table 23 and on Figure 43.

Table 23 Key Flows High Level Zone List

Zone	Details
TfN: Central	Leeds, Sheffield, Doncaster, Intermodal Freight Terminals at Leeds Stourton, Wakefield and Doncaster and Drax Power etc
TfN: East	Scunthorpe, Hull, Grimsby, Humber Ports (Port of Hull, Immingham, Grimsby, Killingholme etc) and Tata Steel at Scunthorpe etc
TfN: North East	Newcastle, Sunderland, Middlesbrough and Ports on the Tees (Hartlepool, Port of Tees) and Tyne and Wear Ports (Port of Tyne, Port of Sunderland).
TfN: West	Manchester, Liverpool, Warrington, Mersey Ports (Port of Liverpool etc) and Intermodal Freight Terminals at Trafford Park, Garston and Widnes / Ditton etc
TfN: North West	Preston, Blackpool, Carlisle and Lancashire and Cumbria Ports (Port of Heysham, Port of Barrow, Port of Workington etc), Cumbrian Energy Coast etc.
Other England: East Anglia	Ipswich, Colchester, Norwich and major ports (Port of Felixstowe, London Gateway etc)
Other England: East Midlands	Leicester, Nottingham etc
Other England: London	London
Other England: South East	Major Channel Ports such as Port of Dover, Portsmouth, Port of Southampton and the Eurotunnel terminal at Folkestone.
Other England: South West	Bristol, Swindon, Exeter and south coast ports such as Plymouth.
Other England: West Midlands	Birmingham, Coventry, Stoke-on-Trent, Daventry International Distribution Centre
Scotland	Edinburgh, Glasgow, Scottish Ports such as Grangemouth, Leith, Greenock etc and Intermodal Rail Terminals at Mossend and Coatbridge
Wales	Cardiff, Swansea and Ports such as Holyhead and Fishguard.

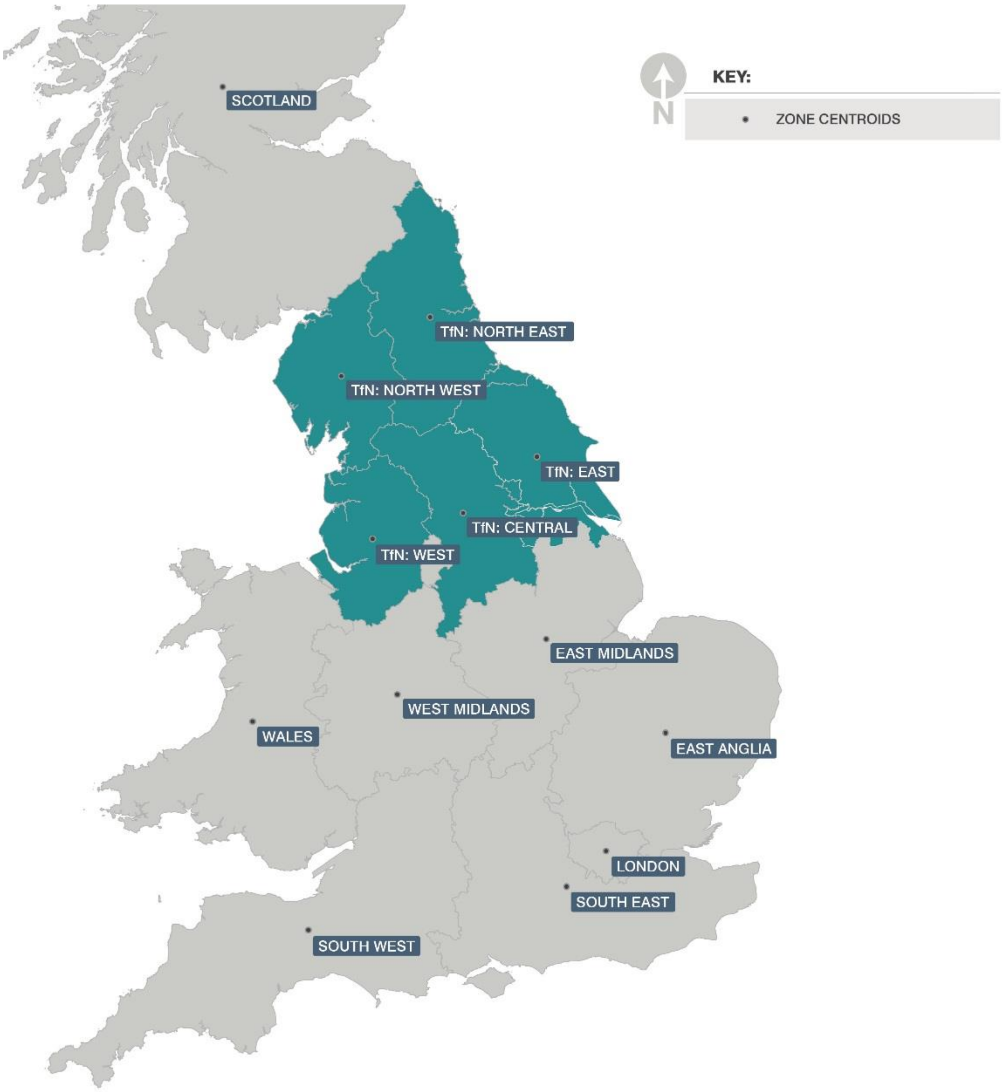


Figure 43 Key Flows Analysis Zone Configuration

The top 10 overall flows in to/from or through the North of England are listed in Table 24. The table shows that the major flows occur between the East Midlands and TfN Central zone with around 42.5 million tonnes of cargo moved in 2050.

There are also some substantial movements within the TfN zones; particularly between TfN Central and TfN East (with 40.7 million tonnes moved in 2050) and between TfN Central and TfN West (with 35.6 million tonnes moved in 2050).

Table 24 Top 10 Freight Flows in the North (all commodities) in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	East Midlands	TfN Central	30.9	42.5	11.6
2	TfN Central	TfN East	34.4	40.7	6.3
3	West Midlands	TfN West	29.9	38.7	8.8
4	TfN Central	TfN West	28.7	35.6	7.0
5	East Midlands	TfN West	14.2	33.8	19.5
6	East Anglia	TfN West	11.8	30.9	19.1

7	South East	TfN West	12.7	28.5	15.7
8	East Anglia	TfN Central	9.9	21.6	11.7
9	TfN East	TfN West	15.3	20.0	4.7
10	East Midlands	TfN East	13.9	19.1	5.2

The top flows weighted by cargo tonnes lifted for all cargo commodities are shown on Figure 44. The movements are shown between zone centroids and not to/from exact locations based on the data supplied from GBFM.

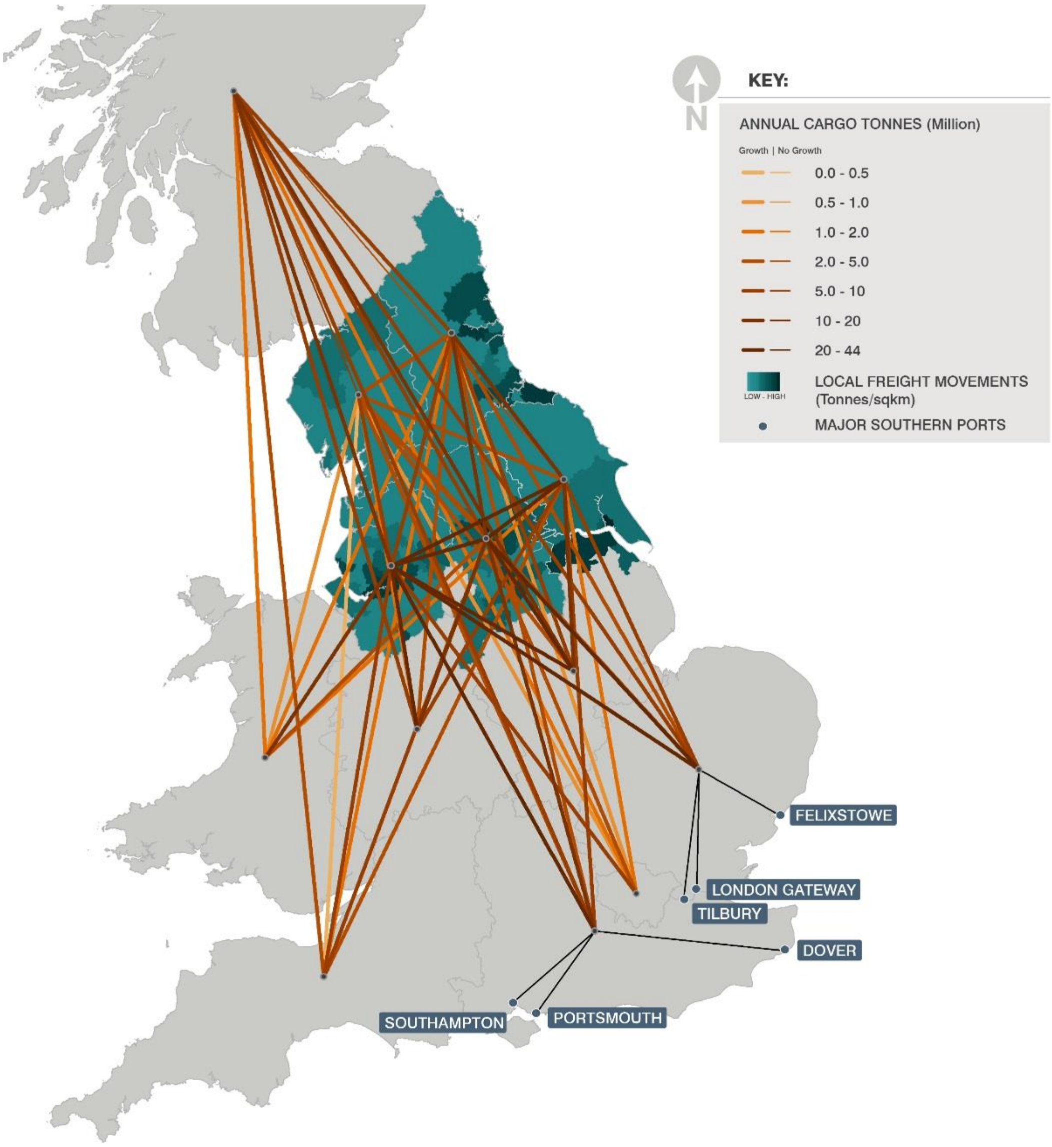


Figure 44 Top Freight Flows in the North (all freight flows) in 2050

4.6.2.1 Intermodal

Intermodal freight is a major growth area not only within the North of England but also nationally and globally. As consumer spending increases due to the popularity of online retailers for example, the demand for goods also increases. Many of these manufactured items or foodstuffs are transported in standard ISO intermodal containers which can be moved relatively easily between varieties of transport modes.

Ports

In the UK, the vast majority of intermodal containers are imported and exported through the major ports in the south of England, namely the established ports at Felixstowe and Southampton. A new container port has been constructed and has commenced operations on the Thames and is known as London Gateway. Containers are however also imported and exported via the Northern Ports albeit in smaller numbers. Ports such as Liverpool, Hull, Immingham, Tyne and Teesport have regular intermodal services, which are generally made up of feeder vessels from the larger hub ports within Central Europe.

The Port of Liverpool has recently invested in its container handling facilities by building a new deep sea container berth capable of handling two 13,500 TEU vessels simultaneously with the aim of securing regular calls by larger liner vessels utilising Liverpool as a hub port therefore decreasing the proportion of containers moved by road and rail from the southern ports.

Challenges remain for all ports around multimodal access (road and rail) and through the limitations in the current supporting infrastructure in the North of England.

Multimodal Terminals

In addition to the North of England's ports, Multimodal freight terminals have been set up by some of the major freight operators in order to minimise the movement of containers by road and increase the proportion of those moved by rail on the trunk routes to and from the southern ports.

Figure 45 Intermodal Train (Source: DRS)

Rail services are currently operated between the three major container ports at Felixstowe, Southampton and London Gateway to the Multimodal terminals shown in

Table 25. Road haulage provides the means for transporting containers from across the North to the Multimodal terminals.

Table 25 Rail Served Multimodal Distribution Terminals - North of England

Name	**Operator**	**Rail Services to / from (> daily)**		
		Felixstowe	**Southampton**	**London Gateway**
Doncaster	Freightliner	✓	×	×
Leeds Stourton	Freightliner	✓	✓	✓
Liverpool Garston	Freightliner	✓	✓	✓
Trafford Park	Freightliner / DB Schenker	✓	✓	✓
Rotherham	DB Schenker	✓	✓	×
Wakefield	DB Schenker	✓	✓	✓
Ditton / Widnes	Stobart Ports	✓	✓	×
Teesport	PD Ports	✓	✓	×

In addition to the Multimodal Terminals in the North of England, there are additional sites in Scotland (Grangemouth, Coatbridge and Mossend) that are also connected to the southern ports by way of daily rail services (and too Teesport). Domestic intermodal rail services also run between Daventry and Scotland carrying high street goods and products. These services pass through the North of England (typically on the WCML) and therefore also have an impact on its infrastructure.

Distribution Model

The rise of online "E-tailers" such as Amazon is changing the way goods are moved across the North of England. Investment in technology and increasingly time-specific delivery demands are challenging traditional logistics providers.

Essentially the distribution model employed by many retailers focuses on goods being imported via the UK ports before being transported to that retailer's National Distribution Centre (NDC). Traditionally these are generally located across the Midlands and as far north as the M62 corridor between Liverpool and Leeds. Goods are often moved between NDCs and Regional Distribution Centres (RDC) which are strategically located across the country. From the RDCs the goods are delivered to their final destinations.

Other distribution models exist however that focus on direct deliveries between manufacturing plants, ports, storage facilities and the consumer.

The growth of the online retail sector is putting enormous pressure on the transport infrastructure as the volume of goods being delivered increases and the expected service level requires same or next day deliveries. The majority of these goods are moved by road due to the absence of viable rail connections between the NDCs and RDCs and fundamentally due to the lower cost of moving goods by road, particularly on shorter journeys and where transferring to containerised based transport may be counter-productive.

The North's MRN is impacted by goods travelling on the trunk routes between NDCs in the Midlands / M62 corridor and RDCs across the North of England and in Scotland. Section 4.2.4 of the report illustrates the growth on the Major trunk routes, particularly as a result of this.

Key Intermodal Flows

The key intermodal flows forecast by GBFM reflect the forecast trends and economic growth to be achieved as part of the NPIER. The flow pairs are shown weighted by cargo tonnes moved on a zone to zone O-D diagram contained within Figure 46. In summary however, the top 10 flows shown in Table 26:

Table 26 Top 10 Intermodal Freight Flows in the North in 2050

Rank	**From / To**		**Cargo Tonnes Lifted (million tonnes)**		
			2016	**2050**	**Diff**
1	East Midlands	TfN Central	17.6	26.2	8.6
2	East Anglia	TfN West	10.6	25.7	15.1
3	West Midlands	TfN West	21.5	25.0	3.5
4	TfN Central	TfN East	16.9	24.8	7.9
5	South East	TfN West	11.8	24.4	12.6
6	East Midlands	TfN West	11.6	23.5	11.9
7	TfN Central	TfN West	17.7	21.8	4.1
8	TfN East	TfN West	12.0	16.5	4.5
9	East Anglia	TfN Central	8.3	16.5	8.3
10	East Midlands	TfN East	8.6	12.9	4.4

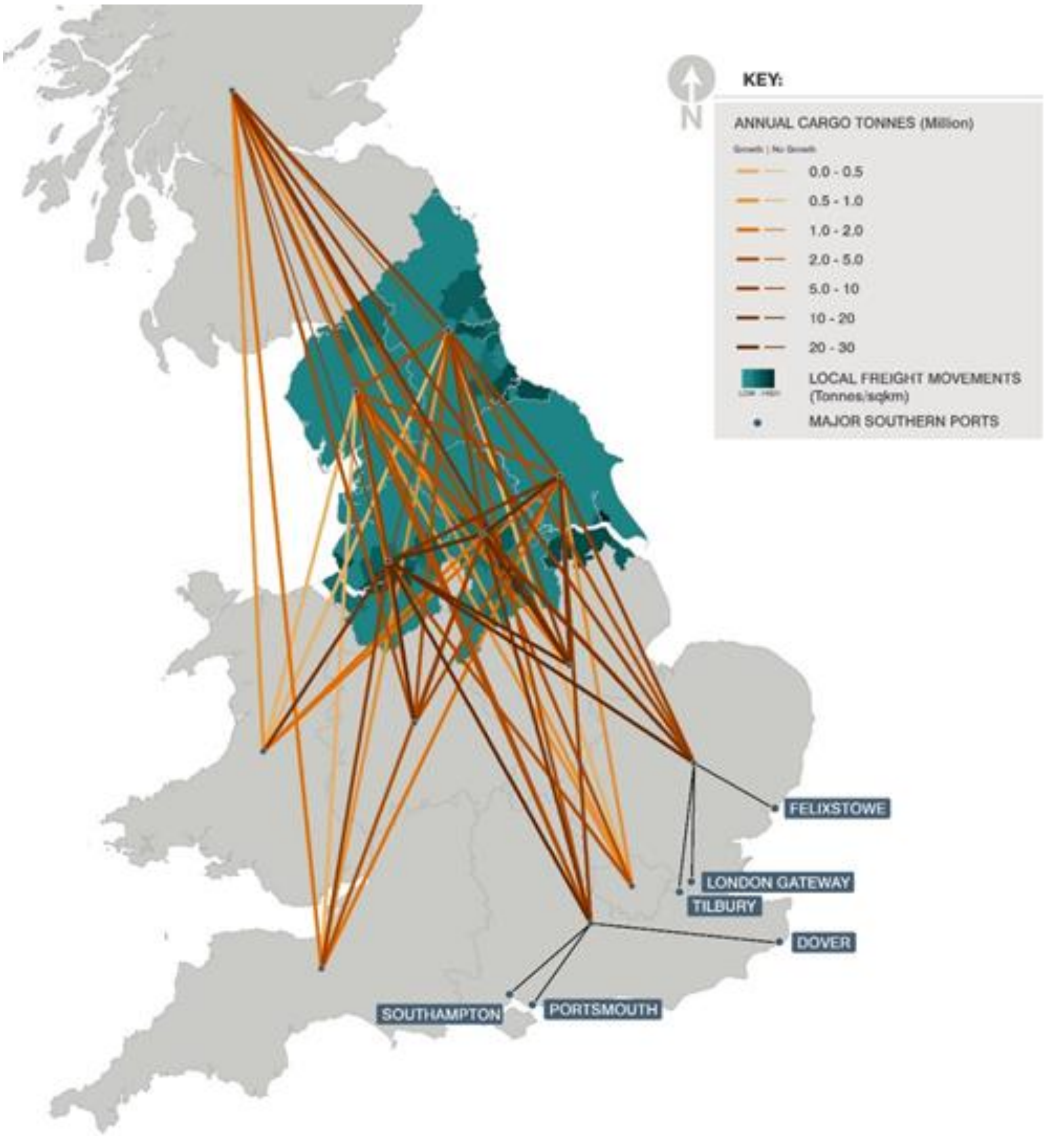


Figure 46 Top Intermodal Freight Flows in the North (all freight flows)

4.6.2.2 Construction and Metals

Materials relating to construction and metals are often imported into the North via the region's ports. There are however manufacturing plants such as British Steel in Scunthorpe (included in the TfN East zone) which generate a significant volume of cargo tonnes which are moved within and out of the North.

The top 10 O-D pairs for the movement of construction and metals materials, into, out of and within the North are shown in Table 27.

The table clearly shows that the top movements occur between the East Midlands and TfN Central and is related to construction materials such as crushed stone and cements from quarries being transported south. There is also a heavy movements between the West Midlands and TfN West and is related to (amongst other things), the movement of scrap metal to the Port of Liverpool for example.

Table 27 Top 10 Construction and Metals Freight Flows in the North in 2050

Rank	From / To		Cargo Tonnes Lifted (million tonnes)		
			2016	2050	Diff
1	East Midlands	TfN Central	10.9	11.7	0.8
2	West Midlands	TfN West	5.7	10.2	4.5
3	TfN Central	TfN East	7.4	8.1	0.7
4	TfN Central	TfN West	6.5	7.8	1.3
5	East Midlands	TfN West	1.4	7.4	6.0
6	West Midlands	TfN Central	4.9	6.1	1.2
7	TfN Central	TfN North East	3.1	4.2	1.1
8	East Midlands	TfN East	2.8	4.1	1.3
9	East Anglia	TfN West	0.6	3.9	3.3
10	East Anglia	TfN Central	1.1	3.9	2.8

Figure 47 shows the top flows of construction and metals materials weighted by annual volume moved between the high level zones set out.

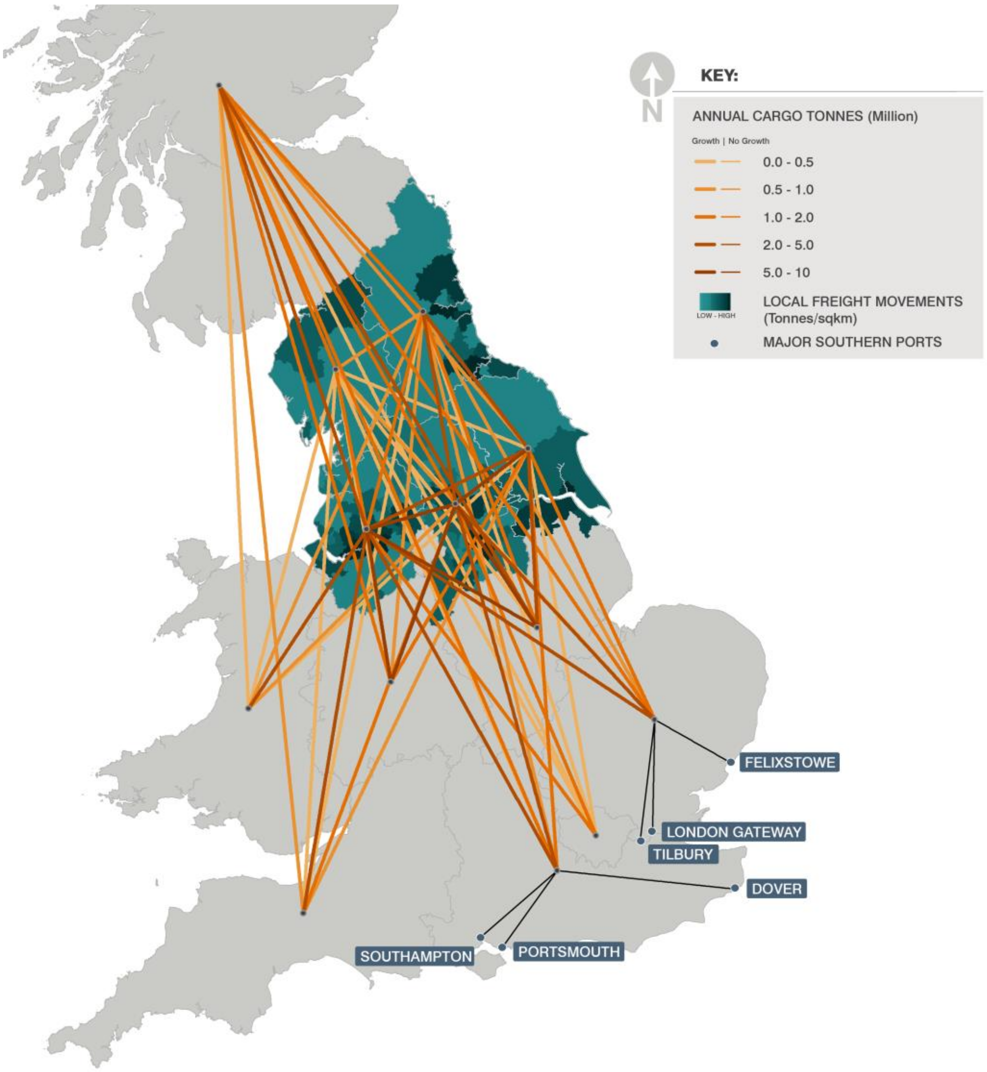


Figure 47 Top Construction and Metals Freight Flows in the North (all freight flows)

Figure 48 Bulk Material related to construction is moved in significant quantities by rail (Source: DRS)

4.6.2.3 Petrol and Petroleum Products

In comparison to the other commodities, the volumes of petrol and petroleum products moved is relatively low, however three large oil refineries are located within the North of England; one at Stanlow on the Mersey (within the TfN West zone) and the other two on the Humber (Total and Philips 66) (within the TfN East zone). There is also a large oil terminal and storage facility on the River Tees including a rail-connected terminal operated by Navigator as well as on the Tyne at Jarrow (also rail-connected).

Petrochemical plants are located on Teesside as well as on the Humber and Mersey.

In addition to the movement of these products by road and rail, substantial pipelines also exist with some stretching over long distances between the fuel terminals in the North and major airports in the south such as Heathrow and Gatwick.

Table 28 shows the top 10 O-D zone pairs for the movement of petrol and petroleum products into, out of and within the North of England.

Table 28 Top 10 Petrol and Petroleum Freight Flows in the North in 2050

Rank	**From / To**		**Cargo Tonnes Lifted (million tonnes)**		
			2016	**2050**	**Diff**
1	West Midlands	TfN East	2.6	2.6	0.0
2	East Midlands	TfN Central	0.3	1.9	1.6
3	West Midlands	TfN West	0.7	1.4	0.7

4	TfN Central	TfN East	1.7	1.4	-0.3
5	TfN Central	TfN West	0.9	1.3	0.4
6	East Midlands	TfN West	0.2	1.3	1.1
7	East Midlands	TfN East	1.3	1.1	-0.2
8	West Midlands	TfN Central	0.4	0.7	0.4
9	South West	TfN East	0.1	0.7	0.6
10	TfN West	Wales	0.7	0.6	0.0

The top O-D movements of Petrol and Petroleum products are shown, weighted by volume on Figure 49.

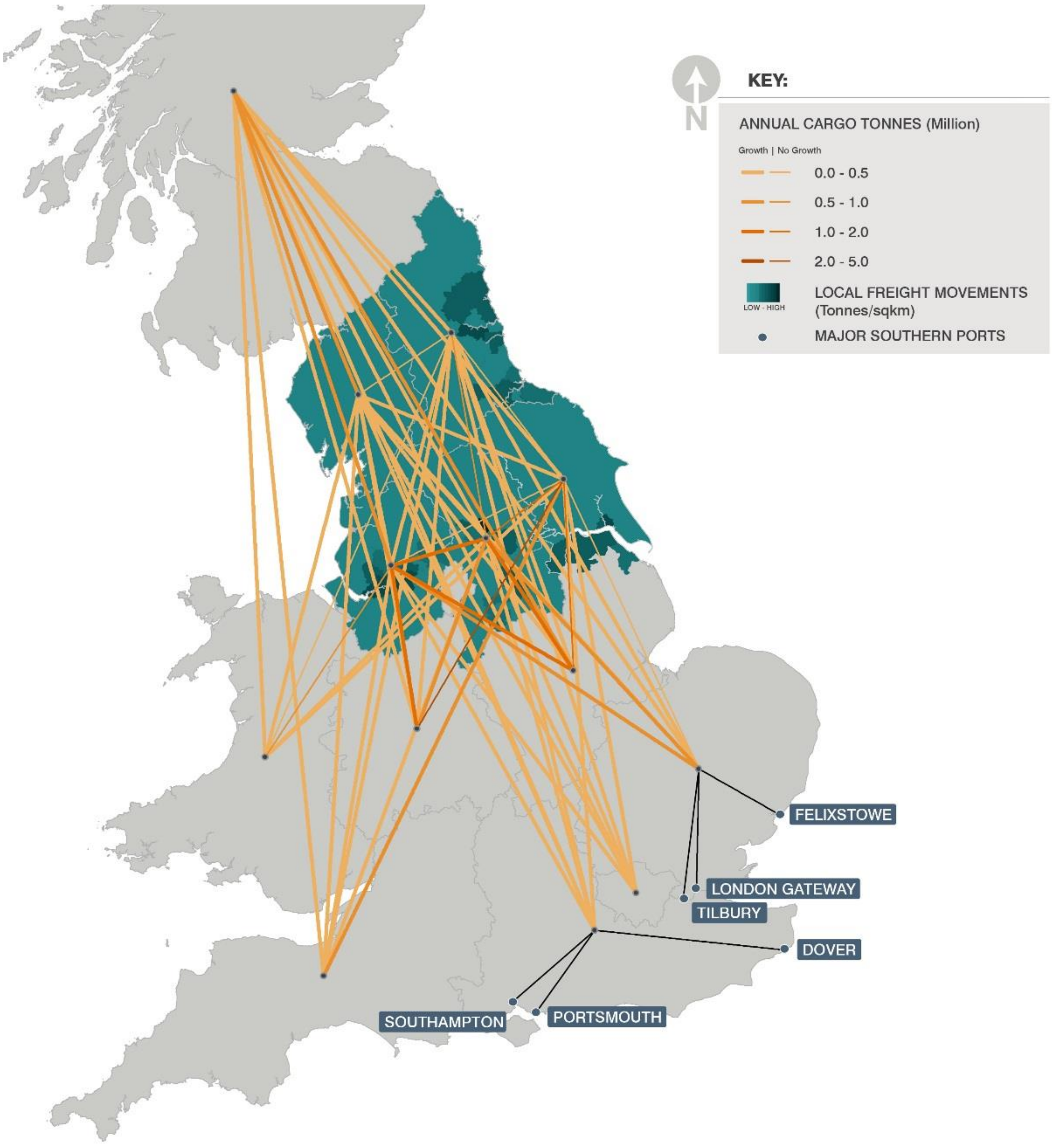


Figure 49 Top Petrol and Petroleum Movements in the North

4.6.2.4 Other Bulks

The Other Bulks commodity category shows a decline between 2016 and 2050 and is mainly related to the decrease in demand for coal. There are however other bulk materials moved in significant quantities within the North of England. One of these is the movement of Biomass pellets to the Drax Power Station near Selby in the TfN Central zone. This is reflected in the top three OD movements shown in Table 29 as the biomass pellets are imported through ports on the Mersey, Tyne, Tees and Humber.

Table 29 Top 10 Other Bulks Freight Flows in the North in 2050

Rank	**From / To**		**Cargo Tonnes Lifted (million tonnes)**		
			2016	**2050**	**Diff**
1	TfN Central	TfN East	8.2	6.3	-1.9
2	TfN Central	TfN West	3.5	4.7	1.1
3	TfN Central	TfN North East	2.9	3.0	0.1
4	East Midlands	TfN Central	1.9	2.3	0.4
5	West Midlands	TfN West	1.9	2.0	0.2
6	East Midlands	TfN West	0.9	1.4	0.5
7	East Midlands	TfN East	1.3	1.0	-0.2
8	Scotland	TfN West	0.6	0.8	0.2
9	West Midlands	TfN Central	0.6	0.8	0.2
10	TfN West	Wales	0.8	0.7	-0.1

The top movements of Other Bulks materials within the North of England are shown weighted by volume moved in 2050 on Figure 50.

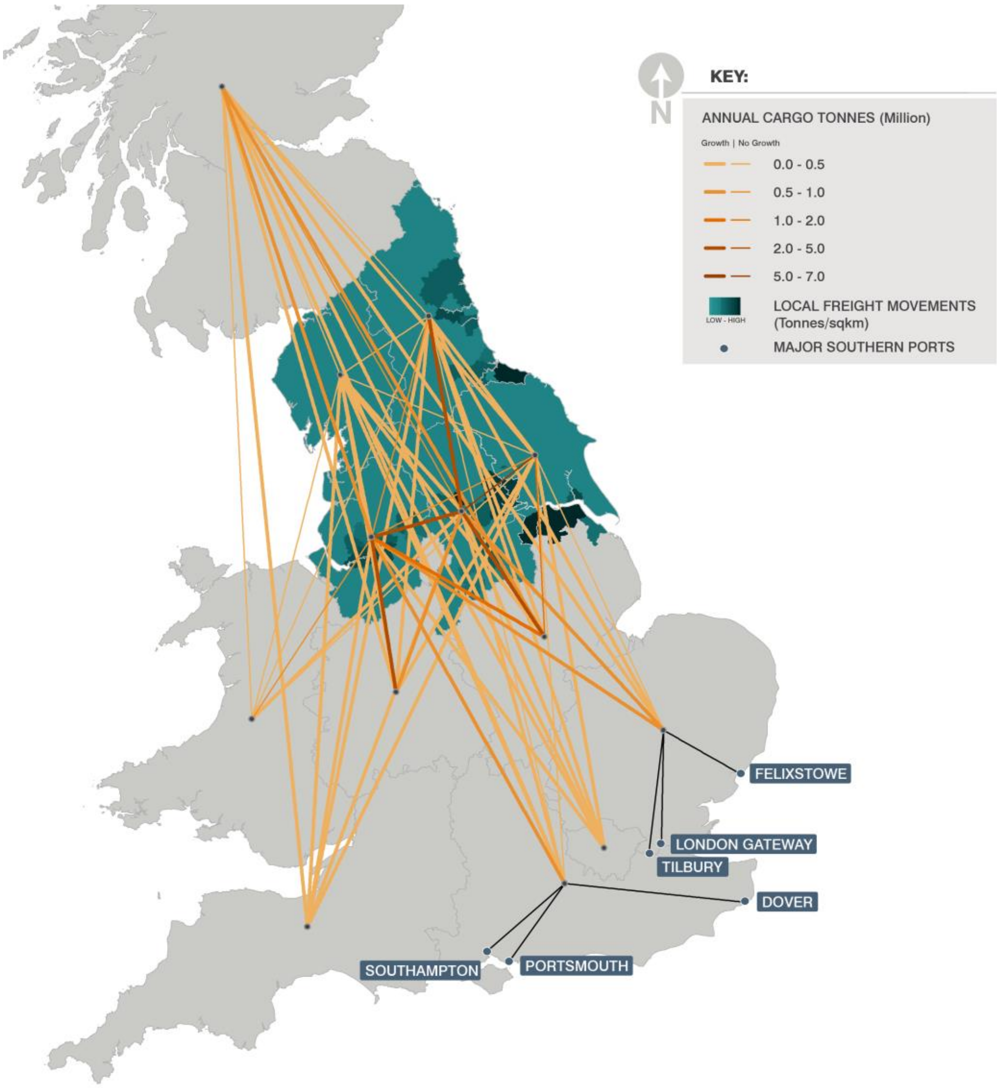


Figure 50 Top Other Bulks Movements in the North

Coal

The decline in the demand for coal has been significant for the rail freight sector and as such, capacity has been released on the rail network where coal movements no longer take place.

Table 30 shows the top 5 coal movements that show a decline between 2016 and 2050 whereas Table 31 shows the top 5 movements that have been discontinued completely. Many of these movements are related to the closing down of coal power stations such as at Drax near Selby for example.

Table 30 Top 5 Declining Coal Flows (without being discontinued)

Top 5 for 2016-2050 Difference (without being discontinued)	2016	2050	Difference
North Lincolnshire : Selby	1,500,967	123,710	-1,377,257
Central West Scotland : Selby	737,116	123,220	-613,896
Bassetlaw : Northumberland	541,159	98,942	-442,217
North Lincolnshire : South Nottinghamshire	449,616	107,069	-342,547
Central West Scotland : South Nottinghamshire	97,246	20,945	-76,301

Table 31 Top 5 Discontinued Coal Flows

Top 5 for 2016-2050 Difference (without being discontinued)	2016	2050	Difference
North East Lincolnshire : North Lincolnshire	689,256	0	-689,256
Wakefield : Warrington	287,846	0	-287,846
Selby : Wakefield	152,155	0	-152,155
Northumberland : Wakefield	66,241	0	-66,241
Central West Scotland : Leicestershire	35,017	0	-35,017

4.7 Drivers for Change

The analysis set out in this report highlights the forecast significant increase in freight movements into, out of and throughout the North in the future and the impact this has on existing infrastructure. This change will have a significant impact on three key areas listed below and as shown in Figure 51 and these form the key Drivers for Change:

- Congestion (Time);
- Emissions; and
- Workforce / Skills shortage.

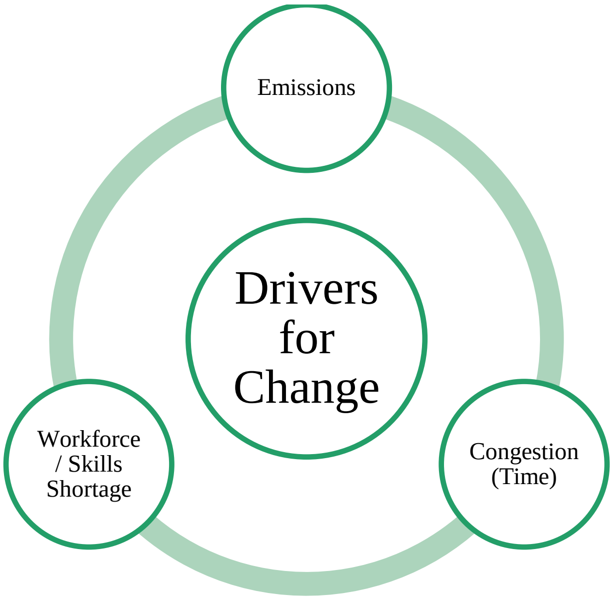


Figure 51 Drivers for Change

4.7.1 Congestion (Time)

As the demand for the transport of freight increases, alongside the general demand for transport as the economy grows, congestion is inevitable. Many of the key routes within the North already reach their design capacity at some point during the working day and this issue will be exacerbated in the future.

The Road Haulage Association (RHA) provides costs for different vehicle types in 2014 (see Table 32). These costs consider everything from drivers' wages to the depreciation of the vehicle. The cost data allows conclusions to be drawn on the monetary effect of time lost to congestion over a year to business.

Table 32 - RHA Goods Transport Costs (per average day)[4]

Vehicle Type	**2014 Cost (£ per day)**	**2014 Cost (£ per 15 mins)**
Rigid		
3.5 tonne	161	1.68
7.5 tonne	183	1.91
13 tonne	206	2.15
18 tonne	225	2.34
26 tonne	265	2.76
32 tonne	285	2.97
Articulated		
32/33 tonne	273	2.84

[4] http://www.andersonstransport.com/documents/terms/Cost-Tables-2014-EDITION.pdf

38 tonne	303	3.16
44 tonne	325	3.39

The modelling from GBFM forecasts the freight moved in cargo tonnes annually on the road network in the North. Utilising the assumptions in Table 33, an approximate number of annual HGV movements across the North can be calculated. It should be noted that this is a simple test that assumes one vehicle type and a theoretical overall equipment effectiveness (OEE) value. The OEE assumes that 80% of vehicles are fully loaded and that those vehicles operate at 80% efficiency (i.e. 80% of their maximum load capacity).

The assumption has been made that road movements consist of 60% HGV and 40% LGV movements. This therefore leaves the total capacities for the two modes at 19.2T and 4.8T, respectively.

Table 33 HGV Movements Assumptions

Assumptions	
Vehicle size (tonnes)	44
Max Load Capacity (tonnes)	30
Load Factor	80%
OEE	80%
OEE + Load Factor	64%
Average Vehicle Load (tonnes)	19.2
2050 Cargo Tonnes Moved by Road (tonnes)	763,909,612
2050 HGV Movements	39,786,958

The data presented in Table 33 shows that in 2050, based on the assumptions set out, there is forecast to be circa 40 million HGV movements on the Major Road Network within the North of England.

Table 34 illustrates the costs to the haulage industry of effects of congestion on the annual HGV movements within the North of England. Varying levels of congestion on similarly varying proportions of the total annual HGV movements generate different costs. If 50% of the HGV movements were caught in 15 minutes congestion every day during the working year, this would equate to an extra cost to the industry (purely time driven as a result of congestion) of £67,347,715. Similarly if 100% of HGV movements experienced 45 minutes congestion every day, the extra cost as a result of that congestion to the industry would be £404,086,292.

Table 34 - Cost of Congestion at varying levels

Time in Congested Conditions (mins)	**Cost of varying proportions of HGV Flows in Congestion (£ million)**			
	25%	**50%**	**75%**	**100%**
15	33.6	67.3	101.0	134.7
30	67.3	134.7	202.0	269.4
45	101.0	202.0	303.1	404.1
60	134.7	269.4	404.1	538.8

This creates a number of issues however in the context of time and cost that could have repercussions on the cost of goods to the consumer. Manufactures will simply absorb these costs in the price of the goods to the detriment of the consumer.

Alleviating congestion will not only have a significant impact on the costs of the road haulage industry in the North, it may also attract additional investment from hauliers, which in turn will drive economic growth.

4.7.2 Emissions

With the proposed rise in freight traffic from 2016 to the forecast year of 2050 with NPIER Growth, there are significant concerns without taking any action around the regional air quality and contribution of emissions to the atmosphere in the North. This needs to be evaluated to understand the effects of this increase in freight traffic in terms of emissions and air quality.

CO^2e, or carbon dioxide equivalent, is a standard unit for measuring carbon footprints. It encompasses other greenhouse gases such as methane, nitrous oxide and ozone and allows them to be expressed in terms of CO^2e based on their relative global warming potential. This will be used as a measure to highlight the impacts of greenhouse gases (GHG) as a result of increasing freight volumes.

Outlined in Table 35 are the CO^2 $_{(equivalent)}$ volumes for each of the different freight modes. Air freight has been omitted from this analysis as the volumes and projected growth are minimal.

Table 35 - CO^2e values at 2016 and 2050[5]

	Road	Rail	Waterway	Total
2016	5.9 billion	294.8 million	8.5 million	6.2 billion
2050 without NPIER	8.7 billion	415.6 million	8.5 million	9.1 billion
2050 with NPIER	9.5 billion	450.9 million	9.4 million	9.9 billion
2016 to 2050 with NPIER difference	+3.6 billion	+156.1 million	+1.0 million	+3.8 billion
2016 to 2050 with NPIER difference (Percentage)	38.20%	34.61%	10.39%	38.02%

From the information provided in the Table, it can be seen that the two modes that will have the greatest impact on emissions in the TfN region are Road and Rail with increases projected upwards of 50%. This is a significant increase, which will occur mainly on the strategic road network where pollution hotspots are known to exist and on a number of already polluted cities and towns in the North of England.

Ships accessing the Northern ports also contribute to air quality issues. MARPOL SECA regulations restricting ship emissions to 0.10% m/m (mass/mass) have been operating on English Channel, the Baltic and North Seas. A global sulphur cap of 0.50% m/m will be implemented by 2020. A switch to cold-ironing and the

[5] It should be noted that this table does not include for any improvement in emissions associated with cleaner vehicles entering the UK fleet or the development of alternative fuel technologies.

use of lower sulphur fuels such as LNG may help but will require shore side infrastructure investment. Alternatively, some ships are being fitted with "scrubbers" which "clean" the emissions or rotor sails to harness wind energy.

Figure 52 shows the CO^2 emissions associated solely with Road Transport. As is expected, emissions are worse around the Strategic Road networks, most notably around the city centres. As the current levels appear to be severe in some of these areas, it can only be assumed that without any intervention and increased growth, these concentrations of CO^2 are likely to increase in the future. If these increases are realised and the introduction of cleaner vehicles/ rolling stock is not implemented successfully, it could have devastating effects on the general health of the population, have a detrimental effect on local wildlife and the environment as well as a number of other factors that could have detrimental impact to the wider global environment.

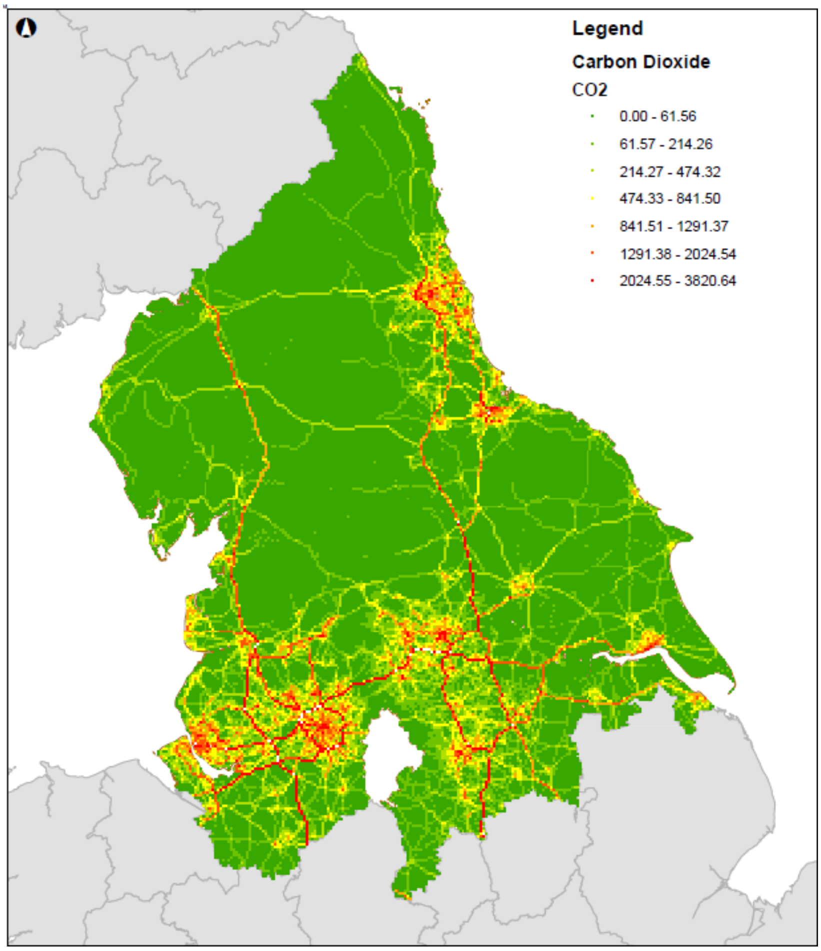


Figure 52 CO^2 emissions within TfN Boundary from Road Transport

4.7.2.1 Human health

Air quality limit values and objectives for certain pollutants, which are considered to be harmful to human health, are set out in legislation by the European Union (EU) and UK Government. The main pollutants of concern with regard to the harmful health in the UK is nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

Particulate Matter less than 10µm (PM_{10}) and 2.5µm ($PM_{2.5}$) in aerodynamic diameter, respectively, are usually used to discuss air quality with relation to health, as the evidence base is robust. However, there is also emerging evidence in relation to the health impacts from NO_2. Outlined in Figure 53 and Figure 54 are the concentration of $PM_{2.5}$, PM_{10}, N_2O NO_2 levels across the TfN region.

The main human-made source of particulate matter and NO_2 is from stationary fuel combustion and transport. Road transport increases the primary particles from engine emissions, tyre and brake wear and other non-exhaust emissions. It has been documented that short and long-term exposure to ambient levels of PM are associated with respiratory and cardiovascular illness as well as increasing mortality rates. PM_{10} and $PM_{2.5}$ are used to measure the mass of particles less than 10 and 2.5 micrometres in diameter that are likely to be inhaled into the thoracic region of the respiratory tract. $PM_{2.5}$ are suggested to have a stronger association with ill health and therefore both of these indicators can be used to gain a better understanding of the particles in the atmosphere.

Although no thorough assessment has been undertaken on air quality at this stage, it is fair to say that increasing the number of vehicles on the roads with TfN will potentially have an adverse effect on the population where congestion and high volumes of freight movements are prominent.

4.7.2.2 The Environment

The environment can be affected by oxides of nitrogen (NO_x) emitted directly from combustion engines. There is an EU limit value and air quality objective for NO_x for the protection of vegetation set out in EU and UK legislation.

Elevated levels of NO_x can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from NO_x emissions can contribute to acidification and/or eutrophication of sensitive habitats leading to loss of biodiversity. The APIS website (Centre for Ecology and Hydrology, 2014) contains critical loads for nitrogen deposition for those habitats considered sensitive to nitrogen and average nitrogen deposition rates for all designated sites in the UK.

As the number of vehicles is likely to increase and the use of alternative fuels is still largely unknown and untested for road freight, it can be assumed that there will be a large increase in the amount of NO_x that will be present around the major road network.

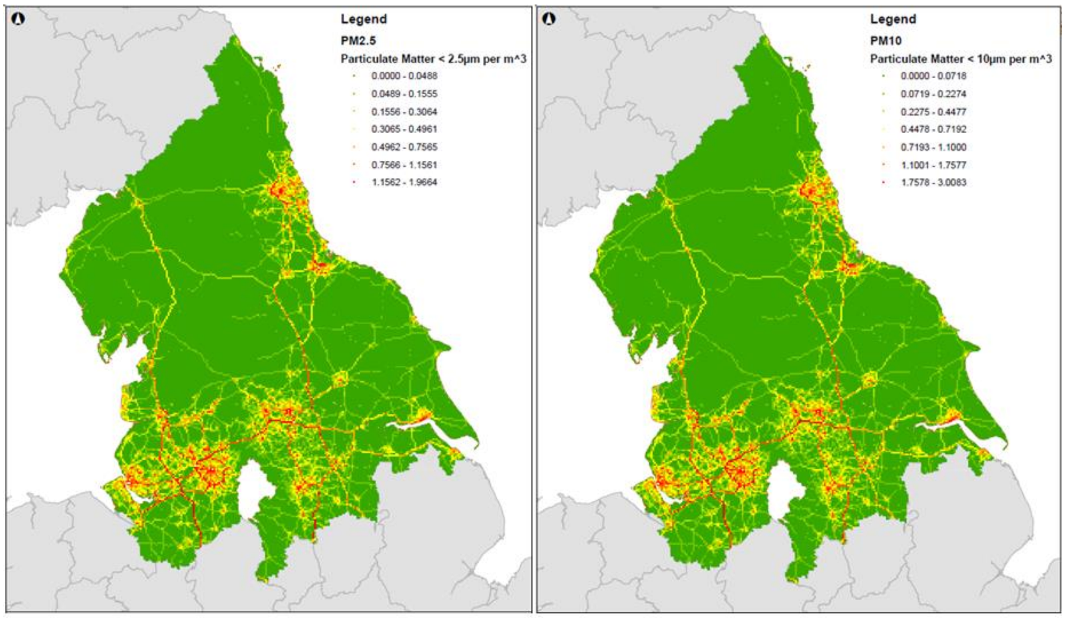


Figure 53 Particulate Matter in TfN Boundary from Road Transport (µg per m3)

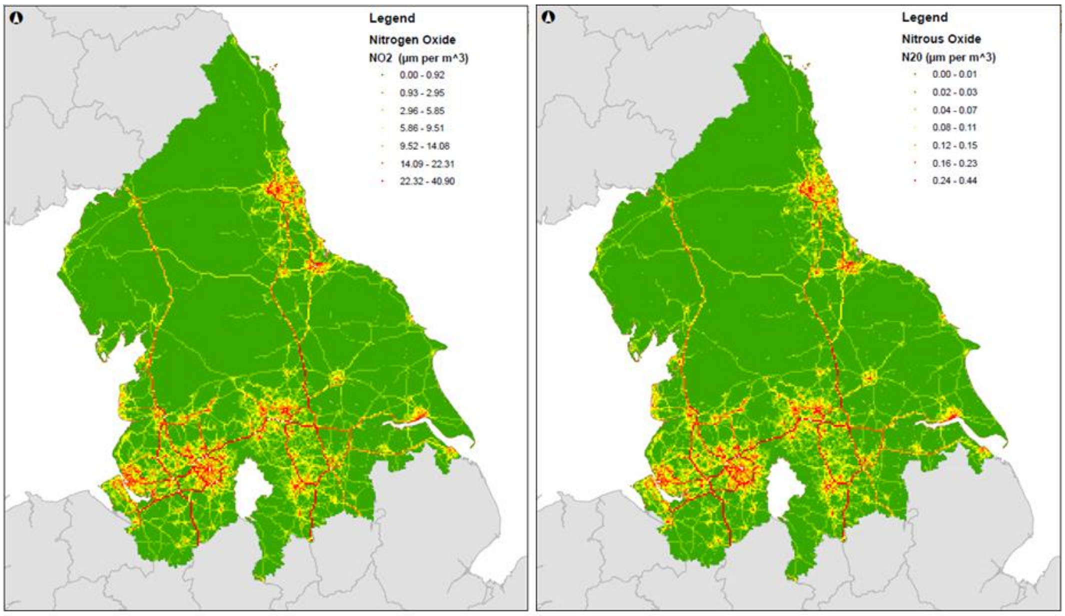


Figure 54 Nitrous Level in TfN Boundary from Road Transport (µg per m3)

4.7.2.3 Evaluation

The "INTERIM ADVICE NOTE 174/13" from Highways England, which focusses on the strategic road network outlines a series of questions that should be answered when assessing the significance of a scheme on local air quality, which can be viewed in

Table 36. These have been answered in a very high level manner to highlight the implications associated with the "Do Nothing" scenario.

Table 36 - Overall Evaluation of Local Air Quality Significance

Key Criteria Questions	Answer
Is there a risk that environmental standards will be breached?	Yes
Will there be a large change in environmental conditions?	Yes
Will the effect continue for a long time?	Likely
Will many people be affected?	Likely
Is there a risk that designated sites, areas, or features will be affected?	Likely
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	Likely
On balance is the overall effect significant?	Likely

As this assessment is looking at the TfN region as a whole, these issues are likely to be location dependant, but will most definitely be an issue in and around areas of high population on the strategic road network where the concentration of jobs is high and therefore more freight is likely to move.

As a next step, once a range of measures are proposed to mitigate the substantial rise in road freight, an accurate air quality model assessment can be undertaken to assess the extent of the effect of each measure and to ensure that the correct and appropriate measures are being implemented.

4.7.3 Workforce and Skills

As the demand for transport of freight increases, the requirement for more qualified drivers for both road and rail transport. Road transport forms 91% of freight movements in the North of England currently and the tonnage of freight moved in the North is forecast to grow by 33% to 2050 (equates to circa 190million cargo tonnes lifted annually by road).

This sharp increase in demand will require significantly more qualified drivers however there is currently a shortage, which is impacting the haulage industry as well as the UK economy.

The Freight Transport Association (FTA)[6] estimates that there is currently a shortage of 35,000 LGV drivers (which includes traditional HGV drivers) in the UK which is beginning to impact on the logistics sector. With current live vacancies so high, the existing workforce is having to work overtime (both paid and unpaid) in order to fulfil deliveries and there is an over-reliance on contract drivers with generally a high turnover of staff within most haulage companies. Within the North of England, HGV drivers account for 27% of all HGV drivers in the UK; 14% in the North-West, 4% in the North East and 9% in Yorkshire and Humber. The driver shortage figure quoted above is however considered to be conservative due to the rise in e-commerce and home delivery in recent years.

[6] Freight Transport Association, *The Driver Shortage: Issues and Trends*, 2016

Despite the shortage, there are many qualified HGV drivers who are not driving HGVs suggesting retention is also an issue. Some of the major factors causing the driver shortage in the UK are:

- An aging workforce – in the UK the average driver age is 47.9 years old, 64% of HGV drivers are 45 years or older with only 2% under 25 (compared to 10% of the total employed population being under 25);
- Economic growth – demand to move goods has increased;
- EU Directives – extra training requirements as cited by the EU have been put in place although how Brexit affects this remains to be seen;
- Perception of the industry – perception of haulage and logistics amongst those looking for a career can be poor;
- Driver Safety – particularly for those drivers working abroad i.e. through Europe. Negative press coverage of incidents involving HGV drivers outside of the UK such as Calais for example;
- Financial costs of becoming an HGV Driver – often drivers have to self-fund driving tests, medical tests, initial Drivers CPC and a digital tacograph card;
- Lack of apprenticeship schemes – limited funding available for HGV driver apprenticeship schemes;
- Lack of acceptable facilities – concerns exist over the conditions that drivers are expected to work in. This includes lack of secure HGV parking with clean usable amenities such as toilets. Road side service stations charge premium prices for trucks to park, which often have to be funded by the driver in the first instance;
- Salaries – Salaries remain low despite the demand for HGV drivers with cheaper labour resourced from other parts of Europe (currently 89% of HGV drivers in the UK are from the UK with 10% from the EU - majority come from Eastern Europe and in particular Poland, Romania and Hungary, and 1% from elsewhere);
- Insurance – generally haulage companies require drivers to be over the age of 25 as the insurance premiums are too high for anyone younger. This prevents young people from becoming HGV drivers; and
- Work / Life Balance – long hours and time away from home can have an impact on the attractiveness of the job.

While there is a shortage in HGV drivers, the need for skills in other areas of the logistics sector is also important. In order to accommodate mode shift there needs to be sufficient staff working within the FOCs and in shipping to cope with the increased demand.

4.8 Summary

This section of the report has outlined trends in the freight and logistics sector in the North of England and the challenges that will be faced in the future based on an assumption that NPIER growth is applied to forecast unconstrained 2050 freight volumes. The major findings which make up the case for investment are summarised below:

4.8.1 Overall Freight Growth and Demands

- Based on tonnes lifted, the current mode share of freight moved in the North is broken down into:
    - 91% road;
    - 7% rail; and
    - 2% waterway.
- Based on tonne km the current mode share of freight moved in the North is broken down into:
    - 87% road;
    - 12% rail; and
    - 1% waterway.

  This reflects the increased distances that rail freight typically covers hence the higher mode share;
- Overall growth of freight moved in the North of England (including through movements) between 2016 and 2050 is predicted to be 33% based on tonnes lifted or 60% based on tonne km driven by growth in consumer spending and ecommerce. More goods will be required to be moved quickly and efficiently;
- Road freight in the North is expected to grow by 33% based on tonnes lifted between 2016 and 2050. Utilising the tonne km metric, the growth is forecast to be 62%;
- Freight moved by rail in the North is expected to grow by 40% between 2016 and 2050 based on tonnes lifted. In terms of tonne km, the growth is predicted to be 61.8% representing more trains travelling longer distances. It should be noted however that this is based upon an unconstrained forecast and to achieve this sufficient extra capacity will need to be provided on the rail network;
- The growth in freight moved by inland waterway is expected to be in the region of 12% irrespective of the metric used. Again this is an unconstrained forecast and capacity enhancements may be required.
- There are significant developments which will drive the need for freight movements such as construction materials that will occur in the

intermediate period between 2016 and 2050 that will need to be taken account of within individual strategic corridor studies;

- In commodity terms, based on unconstrained forecasts, growth is generally expected between 2016 and 2050 with the exception of bulk traffic:
    - Intermodal freight moved will increase by 41.8%;
    - Construction and metals freight moved will increase by 34.6%;
    - Petrol and Petroleum products moved will increase by 49.2%;
    - Other bulks moved will decrease by 1.8%;
    - Automotive freight moved (by rail only) will increase by 20.3%.

4.8.2 Road Freight

- Significant growth in freight volumes on the road network is predicted on the M6 and M1 between the Midlands and the North as well as on the A1(M) in North Yorkshire. On an east-west basis, the significant growth is predicted on the Liverpool / North Wales – Manchester – Leeds – Humber (north and south) corridor;
- The largest proportion of freight movements on the North's road network is made up of domestic traffic with major growth being driven by increased trunk movements between NDCs and RDCs mostly all by road;
- Freight vehicles travelling through the North by road are concentrated mainly on the M6 which provides the quickest north-south route, however there are also significant flows on the A1(M), crossing over the A66 to get to and from the M6. Significant growth is predicted on through movements on the M6 as more trunk movements take place between NDCs in the Midlands and other parts of England and RDCs in Scotland;
- Traffic related to imports and exports is focused on the North's largest ports on the Tees, Humber and Mersey but also on the major north-south routes such as the M6 and M1 linking to the UK's major ports in the South of England such as Felixstowe, London Gateway, Dover, Portsmouth and Southampton;
- A significant number of sites have been identified within the Greater Manchester Spatial Framework for warehousing and distribution which will increase the pressure on the highway network around Greater Manchester;
- Generally, the north-south road infrastructure in the North is more substantial and offers more alternatives than the east-west road infrastructure however there are significant capacity issues at the following locations:
    - M1 around Sheffield;
    - A1(M) around Doncaster and Newcastle;

  - A19 in Tees Valley and the North-east;
  - The junction between the A1(M) and A66;
  - The M6 in Cheshire and Warrington; and
  - Various key river crossings.

- East-west road connectivity is a constraint with the M62 being the only major motorway route across the Pennines. As a result the reliability of east-west movements often reduces during periods of adverse weather or when incidents occur;
- The key challenges for road other than congestion (as highlighted above) are:
  - Vehicle emissions;
  - Workforce / skills shortage;
  - Lack of safe and secure HGV parking; and
  - Changes to regional and city distribution networks where there is a drive towards consolidation.

The strategic corridor studies should consider how these can be tackled through the proposed interventions.

4.8.3 Rail Freight

- Commodities moved on the rail network have increased with the exception of coal traffic, which is currently down 64% year on year. However total rail volumes are only down 4% over the last year as the volumes have been made up by significant increases in the movement of consumer goods, which now account for around 40% of UK rail freight movements, and the movement of construction materials (bulk), which accounts for 26% of the UK rail freight movements;
- Unconstrained, strong growth in rail freight is forecast up to 2050. The major growth occurs on the WCML and is driven by an increase in intermodal rail services such as those moving containers from the major ports in the south of England to the various intermodal rail terminals in the North and Scotland, but also by the North's ports increasing their throughput of intermodal traffic, particularly the Port of Liverpool and its new container berth on the Mersey;
- An increase in the east-west rail flows across the North is also forecast and will be made up of increased Biomass movements and potentially also new intermodal services. This will require increased freight capacity in the form of additional paths and suitable routes cleared for freight services;
- Particular rail capacity concerns exist at the following locations:

   - WCML south of Warrington;
   - WCML between Weaver Junction and Liverpool (particularly towards the Port of Liverpool and the intermodal freight terminals at Garston and Widnes/Ditton;
   - WCML between Crewe and Manchester (particularly towards Trafford Park and through the congested Platforms 13 and 14 at Manchester Piccadilly);
   - The ECML between Doncaster and Newark;
   - The ECML south of Leeds and through Wakefield;
   - The ECML around Northallerton;
   - The MML south of Sheffield and through Chesterfield;
   - The Cumbrian Coast Line between Carlisle and Sellafield in the interim period to 2050 in particular; and
   - The Transpennine Rail Routes particularly between Manchester and Huddersfield however alternative east-west routes may be more appropriate.
- The key challenges facing the rail industry in the North are:
   - The current low average speeds of freight trains;
   - Train length limits – not enough loops capable of handling 775m trains;
   - Train weight limits;
   - Lack of appropriate gauge clearance for freight and in particular the larger intermodal units; and
   - Low utilisation of allocated freight paths in many cases limiting the available capacity of the network.

   The corridor studies should consider how these can be tackled through the proposed interventions.

4.8.4 Waterborne Freight

- The throughput of the Northern Ports is set to increase between now and 2050 driven largely by container based freight (91% of the UK container flows are currently through the UK's Southern ports). Despite the throughput of Northern Ports increasing, their share of the UK freight market is set to drop as the UK's southern ports are forecast to grow at a faster rate;
- Access by all modes of transport to the Northern ports remains a key issue where many are in built up areas and the existing road and rail networks have capacity issues;

- The region's two main inland waterways (Manchester Ship Canal and the Aire and Calder Canal) are utilised for freight however there are infrastructure constraints in the form of conflicts with existing infrastructure, such as low bridges on the Aire and Calder and swing bridges on the Manchester Ship Canal, which cause traffic congestion every time a ship passes through;
- Other challenges facing the water-based freight sector are:
    - Land availability and planning restrictions;
    - Consolidation of major shipping lines; and
    - Unbalanced flows of goods into and out of the UK – there is generally more import traffic than export traffic therefore there is the need to move empty containers back to hub locations.

4.8.5 Air Freight

- The North's major freight handling airport is at Manchester with the other airports in the region handling little or no air freight. Freight volumes at Manchester Airport are driven by increased long haul passenger air services where belly hold capacity is available. As more long haul connections are established, the air freight moved will increase;
- In comparison with the UK's major air freight hubs at London Heathrow and close by at East Midlands Airport, Manchester's flows are relatively low.

4.8.6 Drivers for Change

The Drivers for change deduced from the enhanced freight analysis undertaken in this section of the report can effectively be summarised into three key points:

- The increase in forecast freight movement is going to have a significant impact on **congestion**, the **environment** and **quality of life** in the North;
- The **shortage of skilled drivers and labour** is going to place considerable pressure on the logistics and freight industry to service businesses and consumers in the North; and
- As a result of the above there will also be an impact on the **cost of logistics** and the **service levels** the sector can deliver to businesses and consumers in the North.

5 The North’s Freight and Logistics Vision

5.1 Introduction

With prime capabilities in advanced manufacturing, energy and health innovation (as identified in the NPIER), the North is one of the UK’s regions that is most dependent on a reliable and efficient logistics industry and infrastructure, and the government’s national industrial strategy plans may make this more so.

As a crucial enabling capability in supporting growth and development, there is significant potential to deliver a more resilient and efficient logistics network. However, despite the significant benefits that freight transport infrastructure can bring, there is always a difficult balance between investing for the movement of people and movement of freight.

In order to achieve the desired economic growth, action needs to be taken to address the challenges outlined in the previous section which can generally be achieved through two overarching methods:

- Reduce the Demand for infrastructure; and / or
- Increase the Capacity of the transport infrastructure.

Under both of these methods there are two main areas that TfN can affect in order to drive change and which are covered within the subsequent sections of this report. These are through:

- Policy based solutions, which can influence how the private sector operates and invests; and
- Physical solutions, such as new infrastructure.

A number of the recommendations in this section of the report are already being undertaken to a degree by organisations within the transport and logistics sector in the UK. TfN can add value by prioritising investment to be made across the various Strategic Development Corridors in the North of England whilst being mindful and taking cognisance of the work being undertaken by others.

5.2 The Vision

TfN’s Pan-Northern transport vision is to:

> “Improve the frequency, capacity, reliability, speed and resilience of the North’s transport system to make it easier for people and goods to move throughout the North. In doing so, we want to create a globally competitive environment that can sustain economic growth for decades to come.”

The freight and logistics sector will play an important role in achieving the vision and as such its ability to operate efficiently, reliably and resiliently must be enhanced. This report focuses on how the freight and logistics sector in the North could be enhanced and supported by TfN building on the key drivers identified in the previous section. This will be achieved through three key focus points as outlined in Figure 55.

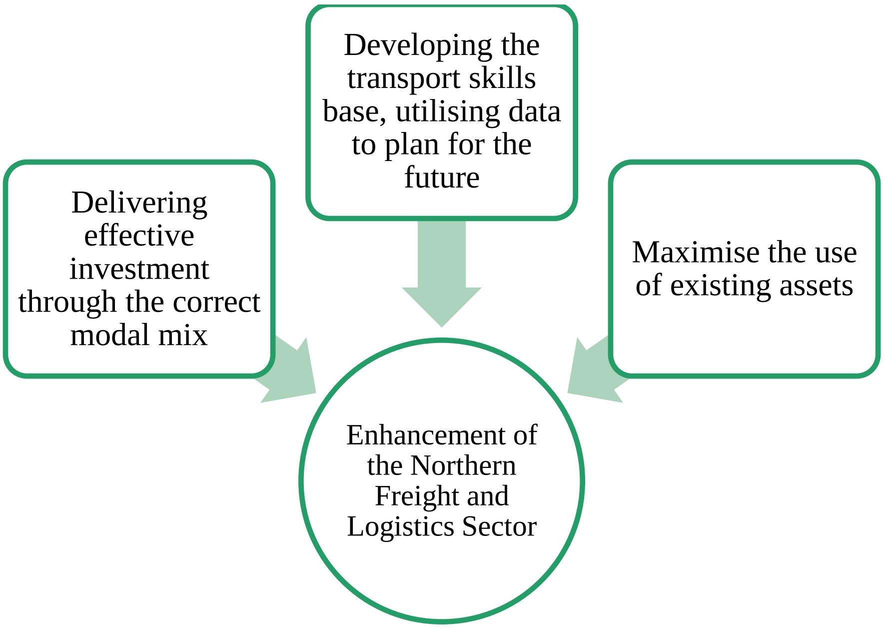


Figure 55 Enhancing the Northern Freight and Logistics Sector - Key Focus Points

The three key focus points are covered in the following sections of this report and consist of:

- The need to maximise the use of existing assets and prioritise their use for the greatest value they bring to the North;
- The need to ensure that the North has a modal mix that delivers the most effective investment in infrastructure, technology and policy, whilst supporting economic growth in the North through an efficient logistics industry; and
- The need to ensure that the North has the skills and can utilise available data to plan for the future.

5.3 The Future of Freight

The freight industry is vital in ensuring that the economy continues to grow and remain sustainable for the future. In the past 30 years, the freight industry has changed dramatically. A number of technological advances have resulted in more efficient processes, shifts to more sustainable modes and practises, managing emissions and providing faster and more efficient services. Inventions such as mobile phones, satellite navigation and the internet have revolutionised the way that people and companies make decisions and how they procure products and services.

In the past, it would have been unimaginable that the world, including freight, would advance in such a way and at such a speed. This therefore makes it difficult to understand how the freight industry will progress into the future. Research undertaken by the CILT looked at the future vision by 2035 and outlined the main forces that would influence the transport and logistic operations within the UK (see Table 37).

Table 37 - CILT Vision 2035 Forces Summary[7]

Forces	Effect	Future Logistic Issues
Demographic	Rising Population; Aging Population	People are living longer and there are more of them. This in turn has increased the demand for goods which generally have to be delivered quickly.
Transport	Increase in demand	Larger volumes of freight are being moved more efficiently leading to stabilisation of HGVs, however there is a notable increase in the number of LGVs being used. Rail freight has also risen in the last decade.
	Varying prospects for domestic and international air transport	Declined due to the rise in rail freight and rising costs making it uncompetitive. With rise in low cost airlines etc. there is a likelihood that blocs like Russia and China will start to utilise these channels more frequently.
Economic	Environmental costs not reflected in cost of goods and service	Current market price of commodities does not reflect true cost to environment. Likely to be a factor in the future and therefore will drive up prices.
	More demand for 24-hour services	Forecast increase in people active between 9pm and 6am is estimated to be around 13 million by 2020. This can be for shopping, cinema etc. and will increase demand. Currently only forecasts could be found for London study, but the general findings are likely to apply to northern cities.
	Cost of energy	Due to increased activity throughout the day, and higher consumption, energy prices are likely to rise by 20%-30%. This could affect fuel prices and therefore impact the freight industry.
	Road congestion costs are high and will increase	Currently costs the UK £7-8 billion/year. If left unchecked, this could rise to around £22 billion/year by 2025.
Environmental	High probability of climate change	Likely increase in global temperature of 2°C by 2035, which could result in more frequent extreme weather events causing disruption to the logistics industry.
	Transport emissions will come under scrutiny	Domestic transport accounts for 22% of all GHGs in the UK. The reduction of this should be highly prioritised.
	Emission reduction targets under pressure	The UK Government is predicted to miss its 2018-22 target by a wide margin. This figure is for the whole economy, but transport will obviously have an effect.
	Ambitious aim for car fleet replacement	Reducing emissions by replacing the existing car and van fleet with electric and hybrid is the government's central policy to achieve reductions. In order to reduce emissions by 80% compared to 1990 levels, 31-37% of vehicles will need to be utilising alternative fuels by 2035. It is likely that fleet replacement will need to be accelerated in order to achieve this target.
Political	Changing role of government could	With the success of the devolved London administration, it is likely that other regional administrations will be created to deal with regional

[7] https://www.ciltuk.org.uk/Portals/0/Documents/About%20Us/Vision2035.pdf

Forces	Effect	Future Logistic Issues
	lead to new regional bodies	and local transport issues being addressed at a lower level.
	Balance of power is changing	Private sector now has more power in influencing policy due to lack of public funding.
	'User pays' becoming enshrined in government thinking	Shift away from public sector burden to charging the user at the point of consumption. This can drive up costs but offset them elsewhere meaning that logistics could potentially become more profitable with reduced taxes etc. whilst passing the cost on to the consumer.
	International context	Potential impacts of developing countries as consumption and increased freight markets emerge, impacting on global emissions. It is forecast that by 2050, 70% of people will live in an urban environment, changing the way that we currently operate as a society.
Technology	Price and range of electric cars	Limitation in distance and charging restrict the attractiveness of changing to electric vehicles. It is also considerably more difficult for HGV's as the batteries required would have to be substantial in size, based on current technology. This could change in the future, but it is unclear.
	Viable case for alternative fuels not proven	The move to LPG would be expensive and gas reserves are mainly owned by one country (Russia), which would allow them to dictate what the consumer pays. Still a lot of obstacles for other biofuels and hydrogen that will need to be addressed before becoming a viable replacement to electric, diesel and petrol vehicles.
	Communicating with vehicles	"Smart Infrastructure" is increasing and could be used to reduce congestion in the future by using cloud based services to analyse the entire transport network at once, basing decisions on real-time information.

Some of these forces have already been realised as highlighted above. There are now plans to devolve transport related matters to different regional administrations, electric vehicles are becoming more and more efficient and alternative fuels are still being heavily researched and look more viable than they did when this report was originally published.

With these forces likely to sculpt the future of the transport industry, the report then outlines the implications that this could have on the freight industry:

- **Industry Organisation**;
    - Likely to focus on minimising the impact of road congestion on supply chain, reduce costs, minimise CO_2 emissions and improve customer services. Automated warehouses are an example of changes to the industry that is making these aims a reality.
- **Making use of new technology to supply consumers**;
    - Social networking platforms are driving more efficient and effective supply chains. Online orders could allow for greater product price and product suitability with end-to-end carbon footprint being accounted for when making purchases.

Consignment track and trace likely to be more open to the public to allow them to track their orders, more than is currently available.

- **Partnership with Government**
  - All parties need to act in order to form a more productive relationship between the public and private sectors. Change is needed in the freight industry and this has been acknowledged by the Government. Clarification on competition laws and revisiting restrictive planning conditions will need to be addressed to aid the freight industry in remaining competitive and economically successful. Potential need for PFI type models in future freight developments.

As mentioned previously, forecasting the future can be difficult as the exact technological advances and behavioural changes the industry will go through are impossible to accurately predict. DHL have undertaken research using different scenarios to highlight the potential implications for freight operations in the future. Although some of these scenarios are extreme conditions and seem rather bleak in their outcomes, the progression to these scenarios is interesting and could be partially correct – after all, mobile phones were thought to be advanced in the 1980s and now they are just as powerful as a high end laptop.

Table 38 - DHL Future Scenarios Summary[8]

Scenario	**Description**	**Freight Issues**
Untamed Economy – Impending Collapse	Unchecked Materialism and consumption coupled with rejection of sustainable development creates flourishing global trade with no trade barriers. Untamed economy exacerbated by unsustainable lifestyles incur massive climate change, frequent natural disaster and constantly disrupted supply chains.	Massive increase in demand for transport and logistical services. Whilst climate change opens up new trade routes through the artic resulting in shorter trips etc. extreme weather events interrupt trade routes frequently and raises capital costs for logistic companies.

8 http://www.dhl.com/content/dam/Local_Images/g0/aboutus/SpecialInterest/Logistics2050/szenario_study_logistics_2050.pdf

Scenario	Description	Freight Issues
Mega-Efficiency in Megacities	Megacities are the main driver towards green growth. Overcoming challenges such as congestion and emissions results in megacities becoming collaborative champions. Open trade and Global governance models are partnered with supranational institutions with rural regions being left behind. Robotics revolutionise the production and services industry; Ownership is traded for "rent and use"; highly efficient transport concepts have been realised; zero-emission automated plants have cut carbon emissions; global "super-grid" with mega transporters including trucks, ships and aircraft as well as space transporters.	Logistics companies are trusted to run cities rather than provide one solution; airports, hospitals, shopping malls and construction sites. Logistics will also manage the complex planning and operating for advanced manufacturing plants. As a result of "dematerialisation", logistic companies now offer a range of renting and sharing services.
Customized Lifestyles	Individualism and personalised consumption becomes prevalent. Consumers are empowered to build/create/design/innovate their own products. This changes the function in which goods are moved, with raw materials being transport in bulk and products created regionally with the use of 3d printers and automation being accelerated in their usage. Extensive production of customised "things" results in increased energy use and raw material consumption leading to increase global temperatures.	Logistics will notice a vastly reduced need for long distance haulage of semi-finished and finished goods. Conversely, logistics also organise and provide the physical value of the supply chain via the handling of raw materials. Logistic services will also hand the encrypted data streams for construction and design blueprints for 3D computers. Decentralisation moves emphasis onto high-quality "last mile" services being the main focus of the logistics sector.
Paralysing Protectionism	Triggered by economic hardship, excessive nationalism and protectionist barriers, globalisation has been reversed with resources becoming scarce technological advances stalling and economies declining. High energy prices lead to international conflicts over resource deposits.	Decline in world trade leads to regionalisation of supply chain. Logistics becomes the strategic industry – as strained relations between blocs become apparent, bloc free countries act as intermediaries in international trade brokerage.

Scenario	Description	Freight Issues
Global Resilience – Local Adaptation	High consumption due to cheap, automated production results in accelerated climate change which frequently disrupts the supply chain and leads to supply failures for all kinds of goods. This forces a move away from redundant systems of production and moves towards regionalised supplies allowing the global economy to better weather troubling times.	Logistics is entrusted with the security of commodities and back-up infrastructure to guarantee reliable transport. To ensure backup systems are readily available contradicts the aim of reducing carbon. To balance this, high capacity utilisation is established using sophisticated logistical planning. Complex "Just in time" delivery processes will be located close to manufacturer's sites and will be seen as indispensable buffers.

In reality the future for freight and logistics could be summarised, thus:

a. The most likely outcome is a combination of these, but the logistics industry will go through change;

b. There is a role for the public sector to channel this change to ensure it delivers the economic and environmental objectives of the region. Policy is a key aspect in being able to achieve this; and

c. Technology, skills and the private and public sector working together are key aspects in delivering a successful strategy.

5.4 Maximise the use of existing assets

The first priority should be for TfN to contribute towards maximising the use of the current suite of transport assets within the North of England. Essentially this includes the road and rail networks but also the Ports and Airports.

5.4.1 Ports

The major ports within the North of England are privately owned and therefore rely on private sector investment to be able to grow and ensure supply meets demand. This has certainly been the case in the North where there is evidence that the port operators are willing to invest.

Ports will generally be responsible for maximising the value of their assets within the port boundaries and are actively engaged in examining where future technologies such as automation and infrastructure for ships utilising alternative fuels such as LPG can be implemented.

Any interventions that can improve the infrastructure connecting ports with their markets i.e. the road and rail networks is therefore vitally important.

There is a role for regional ports within the North to play in terms of supporting the wider Northern economy and helping to alleviate capacity issues at southern ports, particularly in light of Brexit. TfN should look to support the North's regional ports in this regard.

5.4.2 Rail

5.4.2.1 The Digital Railway

The railway signalling system in the UK is currently undergoing a major upgrade over the next 30 years to standardise the system to be in line with the European Rail Traffic Management System (ERTMS)

European Train Control System (ETCS) is the core signalling and train control component of ERTMS. ETCS continuously calculates a safe maximum speed for each train, with cab signalling for the driver and on-board systems that take control if the permissible speed is exceeded.[9] This has clear benefits to the freight industry that include:

- Increases capacity on existing lines due to reduced headways and constant interaction with other trains on the network;
- Higher speeds and reliability; and
- Reduced maintenance costs.

The premise of this system is desirable to the freight industry, however, on sections of line where traffic is mixed i.e. with passenger and freight services travelling at different speeds with different stopping patterns, the benefits will be diluted and not as effective.

Another system that could be installed that will assist with rail movements by both passenger and freight is the ‘Connected’ Driver Advisory System (C-DAS). Driver Advisory Systems are already in use by some operators, however, these are stored on timetables which are pre-loaded at the start of each journey. The C-DAS system connects in real time to the railway around it, providing information on what is actually happening on the network. This system has been introduced to South West Trains who say that:

“The system collects real-time data from a huge range of sources to calculate the ideal speed of the train to help ensure it arrives exactly on time. It also has the potential to reduce the impact on the environment by lowering energy consumption as well as allowing more frequent trains to be run on the network.”[10]

This system is clearly desirable for the freight industry as it would make journeys more reliable, provide greater visibility of journey reliability and help to achieve a number of targets, both within the sector and within the environmental impacts.

5.4.2.2 Pop-up rail terminals

Rail freight terminals typically are expensive to set up, operate and maintain which can restrict the freight commodities moved by rail and supress certain

[9] https://www.thalesgroup.com/en/european-train-control-system-etcs
[10] http://www.railtechnologymagazine.com/Rail-News/south-west-first-operator-to-introduce-new-connected-driver-advisory-system

demands. One solution that has been piloted by DB Cargo has been the use of "Pop-up" terminals for the construction industry in the North West.

The idea of a "pop up" terminal is that a temporary site is utilised line side to move freight off of the rail network. The construction of such a terminal can take weeks rather than months and it can be easily removed when it is no longer needed.

In the context of the North-West, the "pop up" terminal was used to move aggregates from Dove Holes Quarry in Derbyshire to Warrington, resulting in 125,000 tonnes being moved from road to rail. Each of the trains carried around 1,540 tonnes which is the equivalent of 150 HGVs and produced around 76% less CO^2 per journey[11].

5.4.2.3 Timetabling

The surge in passenger rail in the past decade has placed considerable restrictions on freight whereby it is now more difficult to find paths on certain rail routes. This is unlikely to change without investment in the network to accommodate more freight traffic.

There is also an issue associated with procuring new paths faster. The current process for gaining these new paths is drawn out and therefore is usually a barrier to flexibility within the industry. Linked to this is the difficulty of identifying and removing unused paths from the timetable. This is principally driven by the Track Access Regime, which currently does not penalise unused paths.

Nevertheless the holding of such paths can be used as a tool to block other operators due to the competitive nature of freight and logistics. The pathing of freight trains is often such that there are long periods of freight trains standing waiting in order to progress in a timetabled path. This can be a result of being over-run by faster passenger services causing the freight train to be looped. It also means there are more freight trains waiting at junctions for late running passenger services which will get priority.

In conversation with FOCs as part of the Transport Scotland Freight Study, it was stated that they estimate 20% of a train's running time was spent standing waiting to progress. This clearly leads to inefficiency in the use of resources and lengthy delays in sidings also pose security risks associated with valuable cargos.

Enhancements and greater emphasis on the Freight Timetabling could result in more efficient freight services being provided and give them a similar prominence to passenger rail services.

DfT's Rail freight strategy also identified that ensuring sufficient capacity on the network does not only mean identifying future infrastructure investment, but also always making best use of the existing network. This could include making more flexible and innovative use of existing infrastructure, more efficient timetabling,

[11] http://uk.dbcargo.com/rail-uk-en/News_Media/news/11547848/UK_and_CEMEX_introduce_pop-up_rail_depot.html

and improving capability (for example, through reviewing and lifting speed and weight restrictions).

As part of the Rail Freight Strategy, DfT has commissioned work from Transport Systems Catapult to explore the implication and potential benefits of reducing freight dwell times.

5.4.3 Roads

5.4.3.1 Smart Motorways

Smart-motorways refers to a technology-driven approach to managing the use of key strategic roads. The technology used allows an increase in capacity and reduces congestion while maintaining safety. This results in journeys on these roads becoming more reliable.

Highways England[12] estimates that congestion on the motorway and major road network in England costs an estimated £2billion every year with 25% of this the result of incidents on the network. Section 4.7.1 examines the effects of increasing congestion on the Major Road Network in the North of England and shows why cutting congestion creates economic benefits for the region.

Smart motorways allow hard shoulders to be used for traffic either permanently or during peak times to help aid the flow of traffic and reduce congestion by creating an additional lane. The motorway is monitored for incidents and the hard shoulder closed immediately should any occur.

Technology is used to monitor congestion levels and change the speed limit on a particular stretch of road when required to smooth the flow of traffic and reduce stop-start movements which creates additional emissions and reduces journey reliability. The technology also allows warning signs to display information about journey times, incidents or heavy traffic ahead whilst also allowing for quick closure of lanes to let emergency vehicles through.

The major benefit to providing smart motorways is the ability to create more capacity from the existing asset at a lower cost than traditional widening schemes.

The first Smart Motorway scheme in the UK opened on the M42 motorway in 2006 and has provided the following statistics:

- Journey reliability improved by 22%;
- Personal injury accidents reduced by more than 50%; and
- Where accidents did occur, severity was much lower overall with zero fatalities and fewer seriously injured.

TfN should examine the case of Smart Motorways where major congestion is occurring on the MRN and where appropriate provide the required infrastructure to reduce costs of road widening that may not be required.

[12] http://www.highways.gov.uk/smart-motorways-programme/

Specifically for freight and logistics, an assessment of whether HGV only lanes on specific motorways could be introduced would be a worthwhile exercise within the strategic corridor studies.

5.4.3.2 Autonomous Trucks

Self-driving Trucks

As with the conventional motor vehicles, there is also significant research evaluating the use of self-driving trucks. Uber purchased a self-driving truck start up called "Otto" in August 2016 for $680 million, which reflects the significance of this potential industry revolution.

Autonomous technology has been developed to reduce accidents, increase efficiency and potentially ease congestion on road networks. This technology is still currently being developed, however it has been tested in Colorado to transport beer 120 miles across the state[13]. Similar tests have also been undertaken by Daimler in Germany although these are more advanced, with the Ministry of Transport and Infrastructure in Stuttgart looking to introduce these trucks into real traffic before 2025[14].

Current research is primarily focussed on highway/motorway driving to remove the monotonous driving and increase safety and efficiencies. TfN could play a coordinating role in supporting tests in the North.

Truck Platooning

Another feature of automation is "Truck Platooning". This forces trucks to travel close together on motorways rather than wastefully passing each other, and taking up valuable road capacity. Autonomous trucks like the Highway Pilot-enabled "Inspiration" can use vehicle-to-vehicle communication technology to virtually lock-onto the truck ahead, reducing the gap between them. This close formation allows for better aerodynamics and can increase operational efficiencies by 5-6% over trucks travelling in singular form. The use of GPS can also enable fuel savings by monitoring traffic situations and adjusting speeds within the cab.

In 2016, Iveco ran a cross border test of two trucks between Rotterdam and Belgium to demonstrate the viability of automated freight transport. This test was only semi-automated with the rear truck taking the lead from the truck in front[15]. These pilots however demonstrate that it will be possible to send multiple vehicles at once between origin and destination, resulting in faster deliveries with fewer drivers needed, which may partially mitigate the HGV driver shortage in the UK.

Truck platooning is not as advanced in the UK compared to mainland Europe and America, however the technology is available and is being enhanced indicating

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[13] http://www.techrepublic.com/article/otto-self-driving-truck-company-the-smart-persons-guide/
[14] http://www.zdnet.com/article/daimlers-self-driving-18-wheelers-ready-to-take-to-the-autobahn/
[15] https://eandt.theiet.org/content/articles/2016/04/first-driverless-truck-platoon-heading-to-rotterdam-from-belgium/

that this is a viable alternative to normal operations and could be utilised in the future to support the growth of freight movement in the TfN region.

5.4.3.3 Electric Vehicles

With the focus on emissions now at the forefront of UK government policy, there has been a marked rise in the number of electric and hybrid vehicles on the road network, primarily within bus and private car fleets. As such, many vehicle manufacturers are working on producing the next generation of motor vehicles that will have lower emissions and be more efficient than traditional diesel and petrol ones.

Recent research and development by Damiler and Tesla has been looking into the construction and implementation of full electric LGV/HGVs. These are expected to be in full production within the next decade and look to reduce the penalty associated with the vehicle weight and the distance travelled[16]. This will deliver significant reductions in CO_2 emissions associated with HGV movements, but will not necessarily reduce the number of vehicles on the network. It will however mean that the Particulate Matter from braking and tyre-wear will still need to be tackled to ensure that public health is not being compromised.

Although mass production of electric HGVs is still under development, BMW has already deployed a fully electric 40T HGV. It is initially being used to transport automotive parts between its facilities in Munich and has a range of 100km on a full battery. The truck runs with no direct CO^2 generation and is quieter than conventional diesel trucks[17]. This results in a saving of around 11.8 tonnes of CO2 per year.

Although these vehicles are being produced to fulfil EU directives, there is a large upfront capital cost associated with these vehicles and it may take some time for these vehicles to be implemented into mainstream freight usage. For now, the industry is concentrating on implementing vehicles that meet Euro 6 engine standards.

5.4.3.4 Alternative Fuels

Aside from Electric and Hybrid Electric vehicles, there are a number of alternative fuels that are also being researched and could potentially be implemented within the Road Freight sector. Two of those are the use of hydrogen fuel cells and BioLPG.

Toyota are currently undertaking a feasibility study into the usage of fuel cell technology that could be used in HGVs. The hydrogen-fuelled vehicle will travel between ports in Los Angeles and Long beach from summer 2017 resulting in reduced emissions and noise pollution around and between the port areas[18]. This will result in the vehicle emitting water vapour instead of harmful pollutants. The

[16] http://www.commercialmotor.com/news/damiler-and-tesla-bring-fully-electric-hgvs-step-closer
[17] http://www.wired.co.uk/article/bmw-40-tonne-electric-truck
[18] http://freightinthecity.com/2017/04/toyota-put-hydrogen-fuel-cell-hgv-action-californian-port/

weight capacity of the semi-trailer will be 36.2T and have a driving range of around 320km; three times the distance of current electric vehicle technology.

Although hydrogen seems to be the most progressive in terms of distance and emissions, there are inherent risks associated with hydrogen fuel cells that could detract from its potential success. It is more easily combustible than fossil fuels and can create invisible flames and potential asphyxiation if the cell is broken.

Another tried and tested fuel type is Liquid Petroleum Gas (LPG) that produces significantly reduced emissions when used in motor vehicle operations. However, Calor Gas have now introduced a new BioLPG that will offer further reductions of between 15% and 32% in GHG emissions[19]. This new BioLPG will be created using a proportion of conventional LPG and a proportion of BioLPG, which will come from waste material such as organic plant material, vegetable oil and animal fat. This method of working could be used effectively by the food retail industry such as McDonalds which currently uses its used vegetable oil to power its diesel trucks through biodiesel[20]. This could in turn reduce HGV movements from the road as some waste will be recycled

5.4.3.5 Vehicle Efficiencies

Although there will be significant reductions in GHGs with the introduction of Electric and alternatively fuelled vehicles, this alone will not tackle the volume of freight vehicles on the road as it will be a “like for like” swap.

A number of Retail businesses have looked at the capacities that are achievable by increasing the size, configuration and weight of their trailers to reduce the number of trips required. In 2009, Boots looked at the use of a Multideck Urban Delivery trailer to increase efficiencies within the supply chain. The final solution resulted in a 10m long vehicle with 2 floors and a 50% increase in comparison to traditional 10m urban trailers. An overall capacity increase of 83% over a standard store delivery was also identified. The use of this trailer resulted in a reduction of 212km of HGV trips per day and by the end of 2010, a fleet of 10 vehicles saves around 358 tonnes of CO2 per year[21].

Boots have also introduced double decked wedge trailers for longer distance transport which has resulted in a reduction in their fleet from 340 to 280 trailers. These trailers allow for a 30% increase in cage capacity and save on average 348,000km from their routes[22]. Other companies have also realised that increasing the trailer capacity can be good for business in terms of reduced storage, handling, fuel and maintenance costs such as Kimberly Clark (Bespoke Trailer

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[19] http://freightinthecity.com/2017/04/calor-supply-biolpg-european-road-freight-sector/
[20] http://www.mcdonalds.co.uk/ukhome/whatmakesmcdonalds/questions/running-the-business/environment/do-mcdonalds-use-recycled-cooking-oil-to-fuel-your-own-delivery-vehicles.html
[21] http://www.fta.co.uk/policy_and_compliance/environment/logistics_carbon_reduction_scheme/case_studies/boots_case_study.html
[22] https://www.apex-insight.com/boots-brings-in-double-decker-trailers/

specifications for pallets), Nestle (Bespoke Deck Beam Trailer) and Asda (Semi Deck Trailer Configuration).

Large operators with significant volume tend to be run efficiently, the issue often comes from smaller operators or routes that have less volume and therefore lower vehicle utilisation. TfN should be prepared to work with the industry to develop new and enhance existing solutions for vehicle efficiencies to maximise the use of the road network within the North of England. TfN's role could be as a facilitator of collaboration and set up regular workshops where innovative solutions could be discussed between organisations who may not ordinarily communicate with each other but where in doing so, mutual benefits could be realised.

5.5 Delivering effective investment through the correct modal mix

The Drivers for Change outlined in Section 4.7 which include congestion, emissions and workforce and skills are primarily based on a logistics and freight network dominated by road transport. In order to maximise the efficiency of the network and address the three drivers listed above, it is essential that the correct modal mix is achieved where flows (which could travel by rail or water) are transferred from an already congested road network.

This can be achieved through TfN having an influence over policy (such as through the administration of a specialist Northern grant scheme) and where that is not solely effective, through investment in the North's transport infrastructure.

5.5.1 Policy

Whilst it is inevitable that new infrastructure will be required, it may be possible to temper this against increased initiatives through the implementation of new policies designed to produce a modal shift or cause a reduction in the number of vehicles on the region's congested road network or the development and use of new technology.

Some new policy ideas are included in this section, such as:

- Establishing a franchised rail freight operator for routes that are considered not commercially viable at the present time and to encourage movement of freight by rail;
- Funding of more rail freight services through the use of grants such as MSRS and Waterborne Freight Grant (WFG) schemes;
- A drive to improve the perception of alternative modes of transport for freight led by TfN and the encouragement of collaboration between transport operators and shippers;
- Increased use of alternative modes of transport for freight in public sector procurement; and

- More road network capacity made available for freight through initiatives to reduce the number of private cars on the region's congested road network.

5.5.1.1 Encouraging modal shift through funding support

Freight Support Grants

The costs of starting up new freight routes can be high with no guarantee of a return on investment. For example, on the rail network the procurement of additional stock, track access charges and various other operational and terminal charges can make rail freight undesirable for some hauliers. With the introduction of additional rail freight grants, this could alleviate the pressure felt by FOCs and share the burden with the Government. It is in the interest of all parties to ensure that this is a success and as a result, the DfT, Transport Scotland and the Welsh Government have set up a "Mode Shift Revenue Support" Grant[23] to support the transfer for road freight to rail. This is done by demonstrating the amount of freight that can be transferred and awarded on the basis of removing large quantities of lorries from UK roads.

This appears to be the only current Grant option available to rail freight and is rather restrictive in terms of how it can be accessed as entails retrospective funding i.e. grants are paid after the freight has been moved.

As part of DfT's Rail Freight Strategy, the DfT commissioned a report from Arup, to look at innovative models of delivery. These new models could include parcels carried directly between and into city centres using the spare capacity on off-peak passenger services, or old rolling stock fully converted to carry freight into cities.

Franchised Rail Operator

The financial aspect of rail freight acts as a barrier to growth as there are alternative modes that appear much more affordable to some users. One issue that rail has when compared to road are the discrepancies with the licensing regime. HGVs are effectively subsidised by other road users, even though they put more strain on the road. Rail freight has however been effectively subsidised through the marginal costs for their use. This arrangement masks the levels of subsidy whereas direct subsidy for specific flows would be more transparent. Nevertheless the charges are levied based on tonnage and mileage, which is not replicated in the road freight model. This additional cost is effectively passed onto the user which is why rail is often priced out of the market when compared with road.

Another aspect of the financial issues associated with the rail freight sector is the lack of funding to allow trials of different commodities to be undertaken. Funding has been secured in the past to allow experimental movements to be undertaken, but this is not easily available and the process is complex. This would need to be simplified and embraced by both Network Rail and Government.

With this in mind, the idea of Freight Franchising could be considered as a progressive change within the North of England as well as the rest of the UK. The

[23] https://www.gov.uk/government/collections/freight-grants

premise of this option is simple; Freight Operating Companies (FOC) would bid to run services on specified routes which have been determined as not commercially viable to a timetable for a set period of time, similar to Passenger Rail Franchises. TfN would be able to support these services financially which would effectively reduce the risk for shippers given that the service would run to a regular timetable. The shippers would pay for a slot on a particular service. The benefits of using this structure include:

- Ensuring that freight services are always being run and therefore increases availability and reliability;
- Reduces costs by making rail a more attractive option (Economies of Scale) and allows better competition with road;
- More accountability and greater prominence in terms of ranking on the rail network i.e. it is no longer second class to passenger transport; and
- Provide upfront funds to Network Rail to deliver freight enhancements

If this could be realised in the TfN region, it would set a good precedent to other routes out with the region.

As this has never been done before, there are issues with deliverability and setup costs as well as commercial aspects with existing freight services. A more detailed analysis of this option should be undertaken in the future to highlight the viability of such a scheme and outline the different opportunities and risks such a structure might contain.

Coastal Shipping

TfN could support the Mode Split Revenue Support (MSRS) Scheme and the Waterborne Freight Grant (WFG) initiative through either managing the fund regionally or / and providing more funding to move freight onto Coastal shipping routes particularly from the southern ports directly into Northern Ports.

MSRS freight grants provide revenue support to encourage mode shift from road to rail or inland waterway, where the costs are higher than road, and where there are environmental benefits to be gained. MSRS assists companies with the operating costs associated with running rail and waterborne freight transport instead of road (where rail/water are more expensive than road).

WFG can assist a company with operating costs associated with running waterborne freight transport instead of road, where transport by water is more expensive. The grant applies to coastal and short sea shipping and can assist a company for up to 3 years. (Coastal shipping services take place entirely within the waters of the UK; Short-Sea shipping involves the transport of goods between the UK and destinations in Mainland Europe).

Any grant offered will be limited to the lower of (i) the value of environmental benefits (ii) the financial need for grant (iii) 30% of the total operating costs of the water movement or (iv) € 2 million.

The combined budget for MSRS and the Waterbourne Freight Grant (WFG) was £18.6 million in 2013-2014 and a similar amount was envisaged for 2014-2015.

Following the Spending Review the total sum available will be reduced to £15-16 million by 2020. Competition for awards is intense with successful Benefit: Cost ratios in excess of 3:1, which means the scheme needs to offer significant benefits to achieve funding.

Total (provisional maxima) awards in 2016 were £20.3 million saving 1,036,000 HGV journeys however only £0.7 million worth of awards related to the movement of bulk traffics with all the remainder for intermodal traffic. This is mainly due to the fact that it can be significantly cheaper to move bulk materials by rail over road. There were no WFG awards made in 2016.

It is proposed that TfN work with DfT to examine how these schemes could be made easier to apply for, reduce the financial risk for operators and become accepted, for example by removing the retrospective nature of the funding where the goods must be transported before the money is received. The general issues around the way grants for shipping lines are made available are outlined below:

- There has been limited interest from shipping operators in the Waterborne Freight Grant. TfN should examine why this is and what would make WFG more attractive; and
- A ship costing model, based on operator interviews, could be developed. The best way to illustrate relative financial costs would be to select some example movements and work up total cost estimates, using each mode, for the same annual volume.

The benefits a move to increase coastal shipping would achieve would include a significant reduction in HGVs on the road network and associated reduction in emissions. There may be an increase in road vehicle demand closer to ports however for the last-mile delivery of goods and this should be explored further.

5.5.1.2 Perception and Collaboration of Freight by Rail and Water

Improving Perception

The Freight on Rail You Gov survey showed that of the members of the public surveyed the majority would prefer freight to be moved by rail rather than road. Although rail and water-based freight is an obvious choice for many long distance deliveries, there are various negative perceptions of the rail freight industry. Based on information obtained from the Transport Scotland Rail Freight study, there were a large number of producers whom did not consider rail freight when planning their operations as it was perceived as being less reliable than road. This was based on the fact of single line sections and having no resilience built into the network on certain sections. This perception of inflexibility on rail is contrary to the data provided by the ORR which shows that the Freight Delivery Metric (measures the percentage of freight trains arriving at their destination within 15 minutes of scheduled time) was sitting at 94% as of Q1 2016-2017[24].

[24] http://www.orr.gov.uk/__data/assets/pdf_file/0004/23278/network-rail-monitor-2016-17-q1-2.pdf

Another aspect that supports this perception was the lack of engagement by the ORR with potential customers. In a freight customer survey commissioned by ORR[25], 64% reported a need for the ORR to be more customer-facing and directly engage with a panel of end users of rail freight to make sure freight was getting a fair access opportunity on the network. This could be because the interests of the end user are not always the same as the FOCs who tend to be considered as the voice of the industry.

TfN should seek to increase the promotion of the industry more widely through a raising of the profile of rail freight (as an alternative to road) and providing easy to access guidance on how to get goods on rail.

Increasing Collaboration

Through some of the stakeholder engagement carried out by TfN with various organisations within the freight and logistics sector, it is apparent that there often is a lack of cooperation both within the rail industry and between road and rail modes. There is clear competition between the various FOCs however closer co-operation could be achieved through relinquishing unused pathing rights, and sharing terminal facilities where appropriate. Any such co-operation would need to be compliant with UK and EEC Competition Law and TfN may need to act as a facilitator in this regard.

In addition there is also significant competition and perceptions across the various modes of transport within the freight industry. In some cases there exists some serious resentment by road hauliers of rail and vice versa. Again, if the freight industry is to remain a competitive market, the wider industries need to work together.

Road freight is historically more competitive than rail on shorter routes and rail starts to become more competitive where the journey is circa 100 miles or more. The increased collaboration and better integration of paths could help in making rail freight more competitive against road on shorter journeys.

The current rail freight industry is driven by the commercial imperative. Where road hauliers have engaged with rail it has been possible to attract and retain new traffics to rail which works for both the road hauler and the freight operator; and ultimately benefits the customer in terms of more efficient delivery. There is a clear opportunity to aid freight operators share services to insure efficiency gains in many supply chains.

Linked to this, the creation of some form of ‘brokerage’ arrangement to provide an independent entry to the market and promote smaller flows coming onto rail to fill up capacity could be an area that TfN could influence. This is particularly aimed at the intermodal markets which are heavily biased in favour of unidirectional flows from the large container ports in the south of England.

The DfT Rail Freight Strategy refers to the work that has been undertaken to relinquish unused freight paths in collaboration with FOCs. Over the last two years more than 3,700 paths that are no longer required for existing traffic have been relinquished by freight operators and have either been removed completely from the

[25] ORR Freight Customer Survey : ORR 2012

timetable or have become available as strategic capacity and TfN should support this continued process.

Intermodal (Tesco) – DRS / Stobart Group

DRS and Stobart Group have combined their road and rail capabilities to create a tailor made and highly efficient distribution network for Tesco across the UK from their depot at Daventry.

Switching to an intermodal delivery solution where long distance trunk routes to and from Scotland saves an estimated 26million HGV miles every year. Each rail journey removes up to 77 HGVs off the road network and results in a reduction of CO2 emissions by up to 80% depending on the route.

Source: Direct Rail Services

5.5.1.3 Increased use of Alternative modes of transport in Public Sector Procurement

The major infrastructure projects that are taking place throughout the UK are typically driven by the public sector. There was evidence, for example, that the construction of the Aberdeen city by-pass had a direct impact of the tonnage of construction material being moved by rail as Tarmac utilised their rail connected facility on the outskirts of Edinburgh to move aggregates to Aberdeen. There is no doubt that the collective public sector has potentially, a very significant degree of influence over the movement of bulk materials for major construction projects, and also to support other sectors such as health.

In the case of the construction industry the requirements for a particular project will be transient and the need will have moved elsewhere once the project is completed. There is thus potentially a need to create innovative terminal solutions, such as “pop up” terminals (see Section 5.4.2.2). This in turn could benefit other traffic and lead to the development of new approaches driven by the requirements on such projects.

Away from the construction industry there are regular deliveries of products to hospitals and local authority facilities for example which could be specified to be transported by rail or even barge on one of the region’s waterways where appropriate. In this way the public sector has the potential to support the desire to grow freight by alternative modes to road in the North.

5.5.1.4 More road network capacity for freight through the reduction in other road users

In order to reduce road congestion and provide a more efficient road freight sector, it could be argued that action needs to be taken to decrease the number of private cars on the road, without placing any restriction on haulage organisations.

This could include significant improvements to public transport encouraging general road users to switch from their private cars. This would create more space on the road network for larger freight vehicles and reduce the significant emissions generated by non-freight road transport.

A multi-modal approach to improving conditions on the road network should be taken within the strategic corridor studies and TfN should seek to aim to improve conditions for road freight through the promotion of improved public transport schemes. This is not to say that freight infrastructure should be ignored, as it along with relevant policy is key to achieving economic growth through ensuring that logistics maintains is status as an enabling capability.

5.5.1.5 Work with local authorities to ease planning conditions

A review of planning applications involving freight interchanges which have been determined in the past 5 years has been undertaken. The time between the submission of an application and a decision being issued averaged around 2 years. Most decisions were delayed due to a failure to provide sufficient information or plans to the relevant bodies, regarding the impacts of the development on the surrounding infrastructure. These include, but are not limited to; National Grid overhead lines, ecology, water regulation and drainage systems, and implications on traffic flows in the area.

Of the ten applications reviewed, half were granted permission while half were refused. Different types of application process were used. Three applications were submitted via the Development Consent Order process to the Secretary of State given the development were classed as Nationally Significant Infrastructure Projects. Seven applications were submitted to local authorities as outline planning applications. One of the DCOs has yet to be determined whilst the other two were permitted. Two of the outline planning applications were permitted whilst five of them were refused. Of these five, two of the developers appealed the local authority’s decisions to refuse the applications and both appeals were dismissed by the Planning Inspector.

For those applications that were refused, the Green Belt was consistently a contentious issue. Local authorities were concerned that such a significant development was a major intrusion, the benefits of which failed to outweigh harm done to the Green Belt however one previously refused application was overturned on appeal on the basis that the need for strategic rail freight interchanges serving London and the South East was capable of representing a very special circumstance which outweighed harm to the Green Belt. Other contentious issues resulting in refusal includes the increase in traffic to the local area, and reduced air quality and noise impacts to local residents. Public opinion was consistently unfavourable towards the developments.

Successful applicants had consulted the relevant bodies to assess potential impacts, including the Environmental Agency and Highway Agency. Developments located in industrial areas that already had adequate transport links and experienced a high level of background noise were also more likely to be permitted.

As statutory transport body, TfN could assist in helping developers through the planning process via a number of methods:

- Bottom up approach – Preparing a Planning Advisory Note to local authorities explaining the powers that TfN have and that fact that there may be some revenue earning opportunities (ties in with the 2020 loss of local government funding)
- Top-down approach – Following on from the National Policy Statement for National Networks (DfT, 2014) which highlights a 'compelling need for an expanded network of SRFIs', TfN could prepare its own version of this as a National Policy Statement- light version covering the region.

5.5.2 Infrastructure

It is very likely that the implementation of new policies will require support to be successful through the provision of enhanced infrastructure to ensure that supply can meet the demand generated by a growing economy.

The exact nature of the infrastructure required to support the growth of the transport network will be derived through the individual Strategic Corridor Studies being commissioned by TfN. This report seeks to identify where new infrastructure is required on a high level basis.

The premise behind the requirement for new infrastructure is based around four key themes outlined in Figure 56.

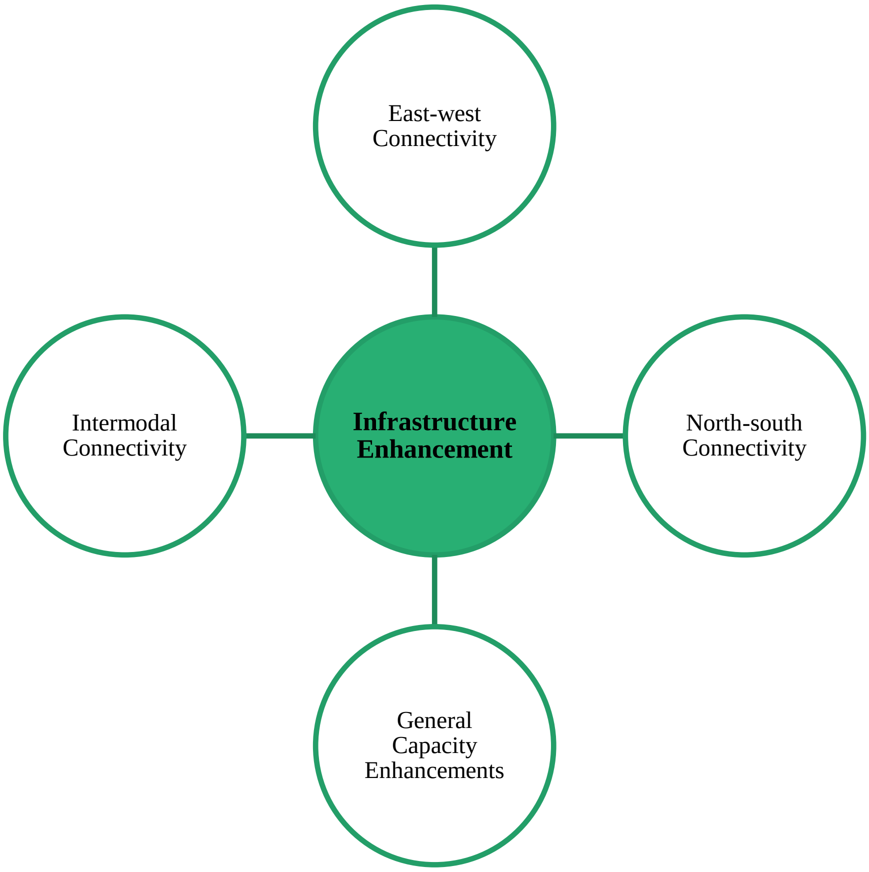


Figure 56 Infrastructure Enhancement Themes

5.5.2.1 Road freight

In terms of improvements to infrastructure to increase the efficiency of road freight transport, the following are some examples of where enhancements could be made. These should be considered in each of the relevant strategic corridor studies.

East-west connectivity:

- Northern Transpennine Improvements (A66/A69)
- TfN Manchester North West Quadrant Improvements (M60)
- Additional south Transpennine routes (Transpennine Tunnel)
- Road widening and key junction enhancements on east-west SRN routes (M62, M60, M56)
- Existing A Road capacity upgrades, interchange improvement schemes and link / relief road schemes

North-south connectivity:

- Road widening and key junction enhancements on north-south SRN routes (M6, M1, A1(M))

General capacity enhancements:

- Removal of road toll to improve flows across congested river crossings
- Dedicated lanes for HGVs on motorways

- Permissions sought for road trains
- Enhancement of secure HGV parking sites across the North

Intermodal connectivity:

- Enhanced port connectivity i.e. A5036 Liverpool, A63 Hull and A19 to the Port of Tees

5.5.2.2 Rail freight

In order to increase the volumes of freight moved by rail and to improve the attractiveness of rail as a mode for moving freight, the following are some examples of where enhancements to infrastructure could be made. These should be considered in each of the relevant strategic corridor studies.

East-west connectivity:

- Establishment of a key east-west freight route allowing access from west coast ports such as Liverpool and east coast ports on the Humber, Tees and Tyne. The route would need to be appropriately gauge cleared (W12 is desirable) and able to accommodate 750m long trains that would encourage retailers like Wilkos and Argos to transfer deliveries to rail
    - Up to 3 paths an hour (bi-directional) will be required on the Transpennine route (could be any route) assuming the unconstrained scenario developed in GBFM;
    - Between the WCML at Newton-le-Willows and Liverpool, 2 paths an hour will be required for freight;
    - On the line between Doncaster and Scunthorpe, up to 4 freight paths an hour will be required;
    - Between Scunthorpe and Immingham/Grimsby up to 8 paths an hour for freight will be required.
    - Safeguarding of freight paths on east-west routes when and if Northern Powerhouse Rail (NPR) is constructed and in operation.

North-south connectivity:

- Additional capacity will be required on both the ECML, MML and WCML in order to accommodate future demand under a Do-Nothing scenario.
    - On the WCML south of Crewe, up to 10 paths an hour will be required with 3 paths an hour allocated on the Crewe to Manchester line and 4 paths an hour on the Weaver Junction to Liverpool Line. North of Preston, 4 paths an hour will be required for freight.
    - On the ECML, up to 5 paths an hour will be required south of Doncaster, with up to 4 per hour north of York.
    - On the MML 5 paths per hour will be required south of Sheffield.
    - Safeguarding of freight paths on WCML once HS2 is constructed and in operation.

General capacity enhancements:

- Additional capacity will need to be explored on lines where demand in the interim period up to 2050 may be high. This includes for example, the Cumbrian Coast Line and the demand created by the construction of various large scale developments in the near future along its length in the period between now and 2030;
- Increased use of in-cab signalling to increase capacity for freight trains;
- Capacity enhancement for longer (750m) and heavier freight trains with enhanced gauge clearance for the largest intermodal units (W10/W12).

Intermodal connectivity:

- Methods for improving the establishment of increased intermodal terminals across the North and their connection to the rail network. This may be through working in partnership with local authorities.
- Enhanced rail connections and available capacity for freight trains to the UK's ports, specifically those located in the North.

5.5.2.3 Water-based freight

Improving the case for water-based freight transport where appropriate will require enhancements to infrastructure within the North. Some examples of the type of enhancements required are provided below.

East-west connectivity:

- n/a

North-south connectivity:

- Coastal feeder services from southern UK and central European ports is increasing. Ensuring Northern ports are able to handle the increase in throughput and in some cases offer additional capacity.

General capacity enhancements:

- Ensure ports are capable of handling future demand and are able to accommodate larger ships using alternative fuels such as LNG for example.
- Improved capacity on Manchester Ship Canal and Aire and Calder Canal through removing constraints such as low bridges where possible.

Intermodal connectivity:

- Enhanced port access by all modes and greater ability to offer quick and efficient intermodal transfer.
- Examine innovative solutions such as automated inland freight terminals to take pressures away from the port and surrounding area.

5.5.3 TfN High Level Intermodal Freight Tool (HiLIFT)

5.5.3.1 Purpose of the Model

HiLIFT was created as a way of evaluating the effects of different interventions on the major road and rail networks in Northern England in 2050 if the NPIER Growth scenario is realised. The tool provides high level details of the areas that are likely to be affected on the Road and Rail Network independently using Base information provided from MDST's GBFM Output for the TfN region.

Intermodal freight flows are then separated from Non-intermodal flows to allow various scenarios to be applied and to view the effects these scenarios have. The tool illustrates all freight tonnage movements on each road and rail network but only allows adjustments to be made to the Intermodal Flows.

It is a certainty that there is strong encouragement towards the decarbonisation of freight transport and move towards low / zero emissions. This will open up many opportunities around modal shift and how it can be achieved. The model examines the impacts of modal shift and of reduced emissions.

5.5.3.2 Modal Mix Scenarios

HiLIFT tests a range of scenarios developed from some key themes and includes:

- 2016 Scenario Year:
    - Current Conditions
- 2050 with NPIER Growth Scenario Year:
    - Future Base Conditions
    - Coastal Shipping
    - Inland Freight Terminals – Increased Rail
    - Automation and Alternative Fuels
    - User Specific

Under each of the scenario themes, three levels of testing have been carried out which reflect low, medium and high impacts; the current conditions, future base conditions and user specific scenarios are the exception to this where one level of testing has been conducted.

The key testing scenarios have been set out as described in Table 39

Table 39 HiLIFT Scenario Theme Details

Scenario	Testing Level	Description
Coastal Shipping	Low	Assumes 5% shift from road moves between Southern Ports and Northern England to Coastal Shipping

	Medium	Assumes 10% shift from road moves between Southern Ports and Northern England to Coastal Shipping
	High	Assumes 15% shift from road moves between Southern Ports and Northern England to Coastal Shipping
Inland Freight Terminals – Increased Rail	Low	Assumes a 5% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
	Medium	Assumes a 10% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
	High	Assumes a 15% shift from road to rail moves from the Southern Ports to the existing Intermodal Freight terminals in the North.
Automation and Alternative Fuels	Low	Assumes that operational efficiency of intermodal vehicles goes from 80% to 90% and 10% of intermodal road vehicles use alternative fuels
	Medium	Assumes that operational efficiency of vehicles goes from 80% to 95% and 20% of road vehicles use alternative fuels
	High	Assumes that operational efficiency of vehicles goes from 80% to 100% and 50% of road vehicles use alternative fuels

All details regarding the assumptions, variables and parameters as well as model limitations can be found in Appendix X.

5.5.3.3 Scenario Testing

The following section examines the results of the scenario testing on the four modal shift themes.

In order to represent the findings of each scenario, an evaluation tool has been used as illustrated in Figure 57.

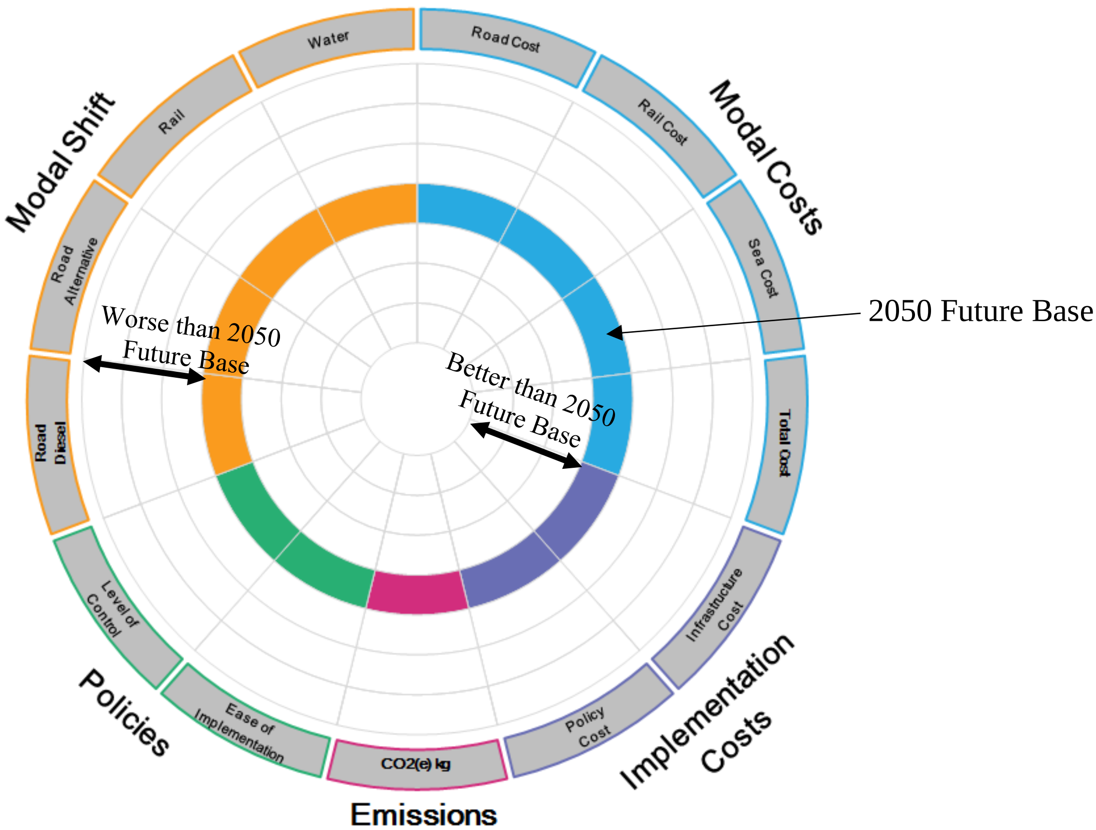


Figure 57 HiLIFT Scenario Evaluation Wheel

The wheel evaluates each of the scenarios based on a number of categories. These categories are outlined in Table 40.

Table 40 HiLIFT Evaluation Wheel KPIs

Category	KPIs	Details
Modal Costs	Road Cost	Total costs based on road vehicle operating costs
	Rail Cost	Total costs based on freight train operating costs
	Sea Cost	Total costs based on coastal shipping container vessel operating costs
	Total Cost	Overall intermodal costs of all modes
Implementation Costs	Policy Cost	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents costs of implementing required policies to support the initiative.
	Infrastructure Cost	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents costs of providing the appropriate infrastructure to support the initiative.

Emissions	CO2(e) kg	Measured in overall CO2 equivalent in kg of all freight vehicles based on distances travelled within the North.
Policies	Ease of Implementation	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents how easy the policies required to support the initiative will be to implement.
	Level of Control	Based an indicative low, medium and high scale – are all shown as worse than the base do nothing scenario. Represents how easy the policies required to support the initiative will be to control.
Modal Shift	Road Diesel	Indicates the increase or decrease in traditional diesel vehicles over the 2050 Future Base Do Nothing scenario. An increase is seen as a negative with decreases seen as a positive.
	Road Alternative	Indicates the increase or decrease in vehicles running on alternative fuels over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive.
	Rail	Indicates the increase or decrease in freight trains over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive with decreases seen as a negative.
	Water	Indicates the increase or decrease in coastal shipping vessels over the 2050 Future Base Do Nothing scenario. An increase is seen as a positive with decreases seen as a negative.

The following sections outline the results from the scenario testing in HiLIFT for the scenarios outlined in Table 39.

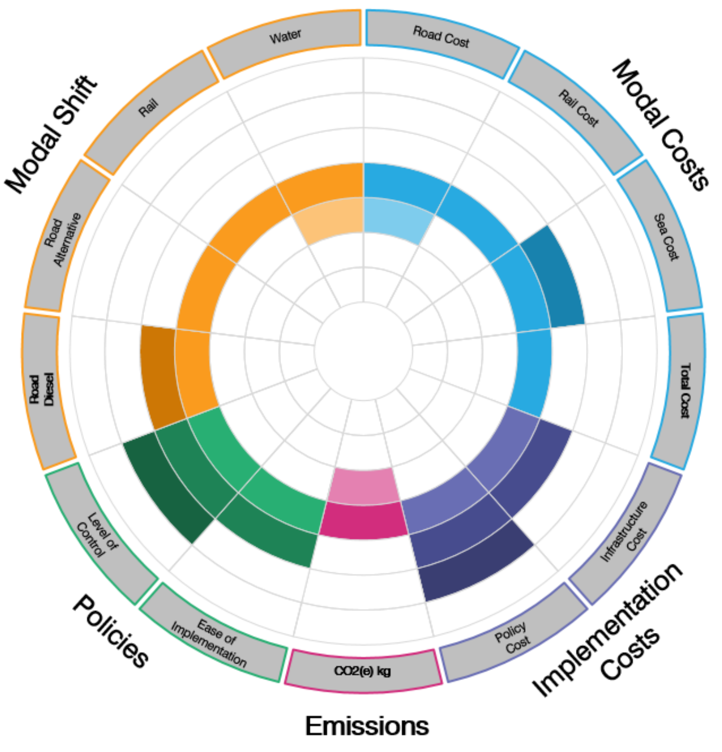
Coastal Shipping Scenario

The Coastal Shipping scenario outlines the effects of displacing some of the road movements to feeder vessels, taking HGV and LGVs off trunk routes between the southern ports and the North where road would be used for the final movement of the cargo from the North's ports to / from the origin / destination location.

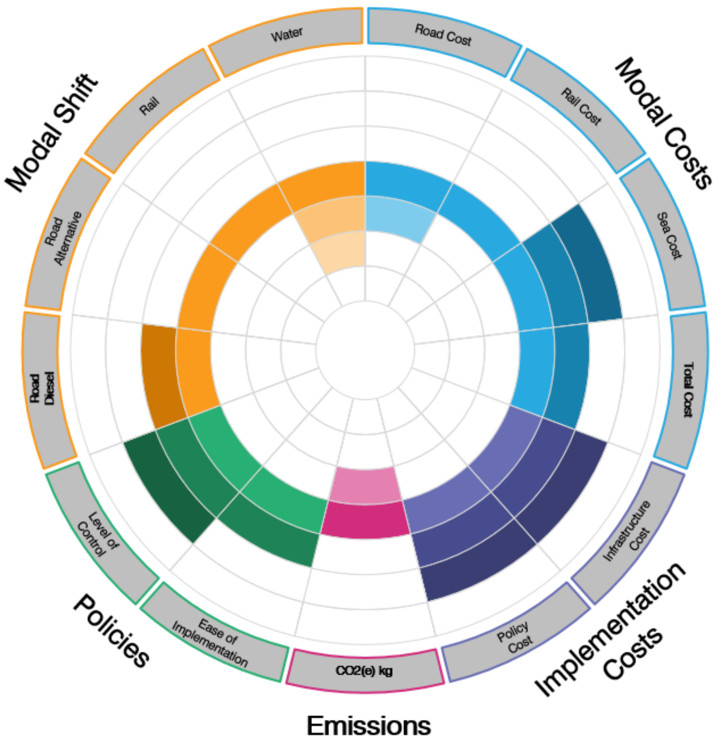
As this scenario considers new additional coastal shipping services over base line, there are costs involved with developing this scenario but these costs can be offset by the saving in CO2e.

This scenario indicates that there would be an increase in the number of vehicles on the road and this may be correct, however, what the model is not showing (due to the high level nature) is that these movements are being taken off the most congested sections i.e. M6 and applied to less congested areas on the network i.e. from the ports. So this is shown as a negative based on the figures, but in reality, this would be a benefit in terms of congestion reduction.

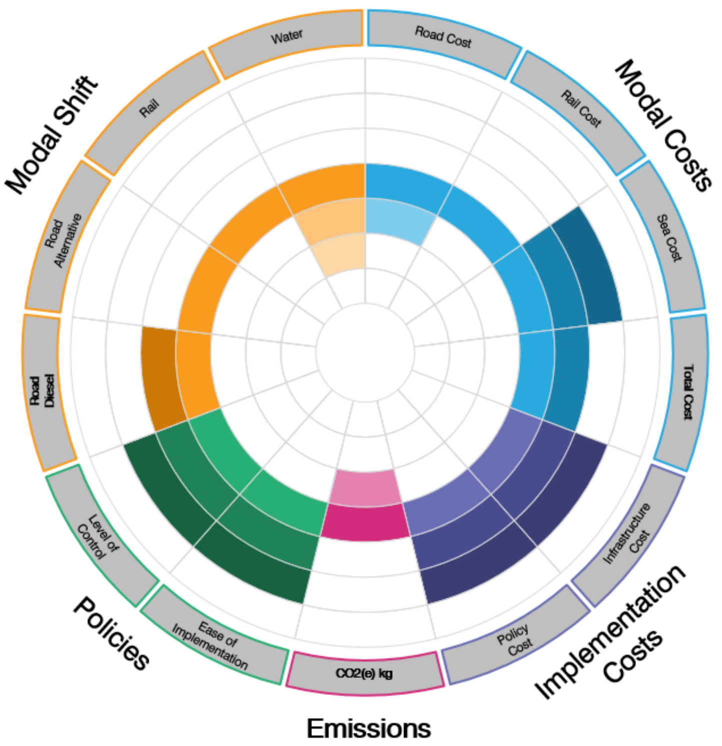
The Coastal Shipping option could be considered viable in promoting freight in the North, building the economic powerhouse and increasing the health benefits in the North however, there are a number of hurdles that need to be addressed such as build or enhance coastal shipping terminals to make them more competitive as well as implementing controls to ensure that this scenario will be a success in practise.



5% Shift to Coastal Shipping



10% Shift to Coastal Shipping



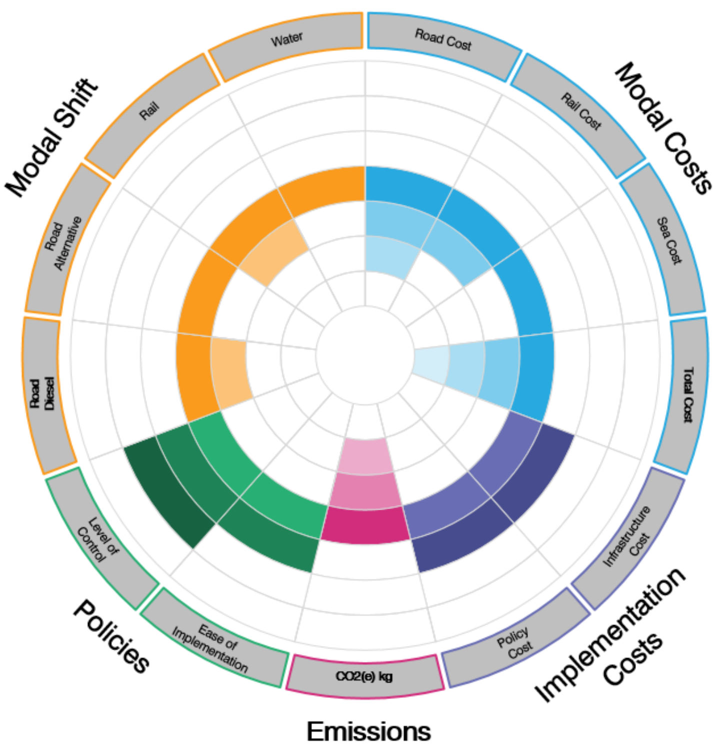
15% Shift to Coastal Shipping

Inland Freight Terminals Scenario

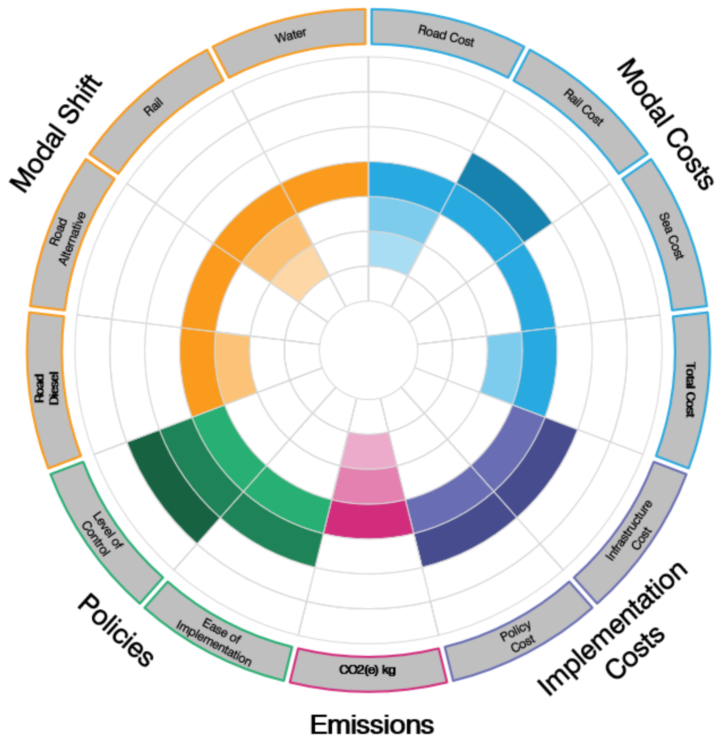
The Inland Freight Terminal scenario outlines the effects of displacing some of the road movements to the rail network, taking HGV and LGVs off the congested sections of the road network in the south and redistribute trips in the North.

It can be seen that the greater the share, the greater the cost however, it should be noted that there are significant decreases in CO2e, road movements and road costs.

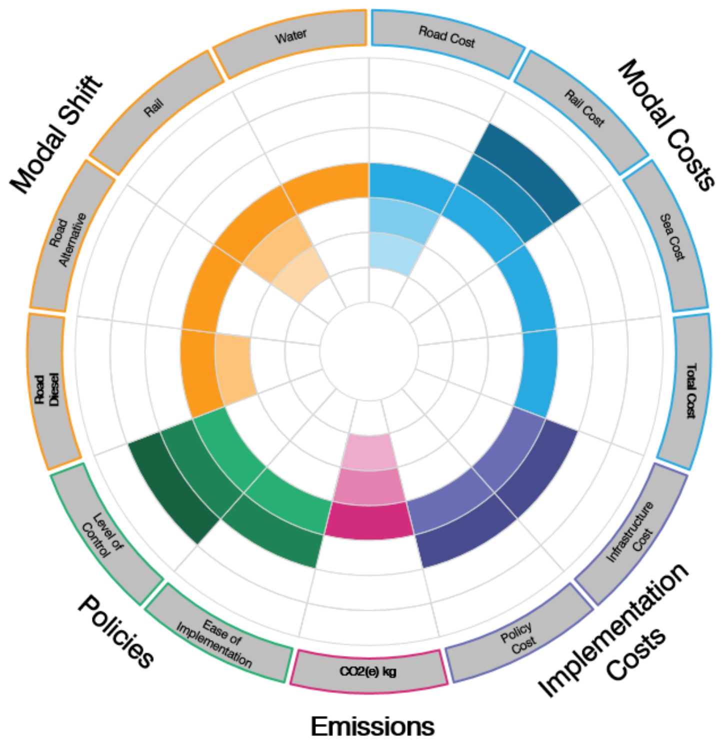
Due the high level nature of the model, it does not highlight that although there would be increases in rail infrastructure, potential difficult policy implementation and low levels of control, it is highly likely that once these routes/services/terminals are developed, costs, reliability and attractiveness of the inland terminals will be realised and be successful in releasing freight capacity in the North.



5% Shift to Inland Freight Terminals



10% Shift to Inland Freight Terminals



15% Shift to Inland Freight Terminals

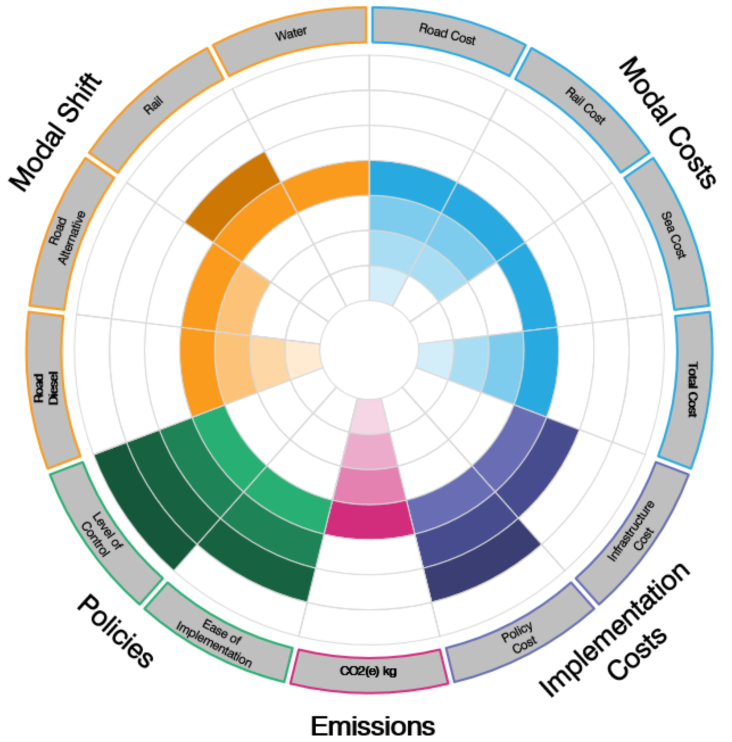
Automation and Alternative Fuels Scenario

The Automation and Alternative Fuels scenario outlines the effects of increasing freight efficiencies as well as improving emissions through the use of alternative fuels. These combined measures can better manage congestion whilst reducing the number of vehicles needed and reduce the emissions that are produced from non-alternative fuelled vehicles.

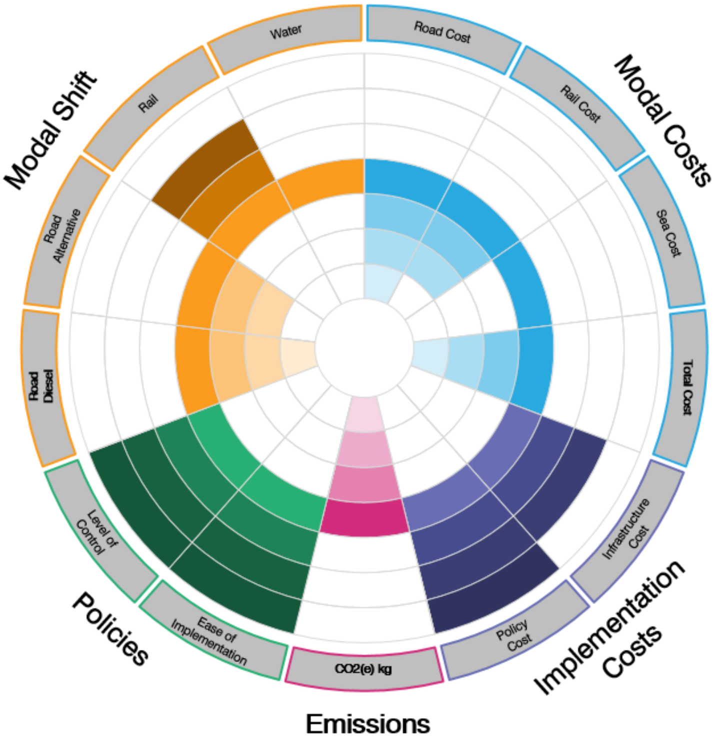
It can be seen from the diagrams that by increasing efficiencies and encouraging alternative fuels, there are cost savings as well as health benefits.

The difficulty in ensuring this scenarios success is the policy measures and the level of control and implementation due to the privatised nature of the freight industry.

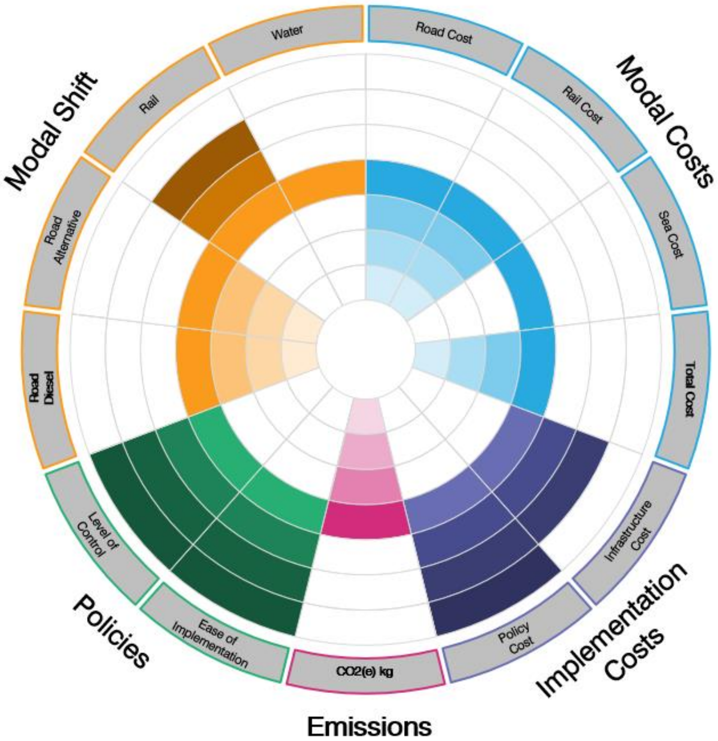
Although, it should be noted that alternative fuels i.e. renewables, are becoming a focus of research in the freight industry. There are also numerous examples of increasing efficiencies to ensure that there are less wasted trips. With this in mind, the future base scenario might actually be vaguely similar to these outputs, but this is unlikely to be realised in the near future.



10% Shift to Alternative Fuels & 90% Efficiency



20% Shift to Alternative Fuels & 95% Efficiency



50% Shift to Alternative Fuels & 100% Efficiency

5.6 Providing Skills, and utilising data to plan for the future

5.6.1 Workforce and skills

In order to ensure that the North has the skills required to meet the future needs of the freight and logistics sector, TfN should work towards a number of key strategic aims. The FTA conducted its annual Transport Manager Survey in June 2016 where respondents were asked a number of questions, one of which focused around what measures are required to address driver recruitment and deployment.

The strategic aims to tackle the workforce and skills shortage are:

- Increase the availability and funding for apprenticeships at the same time reducing qualification costs;
- Guidance on skills, funding and support;
- Staff development;
- Improve industry image;
- Access to student type loans;
- Incentives to recruit long-term unemployed;
- Improve driver roadside facilities;
- Improve driver pay, hours and conditions; and
- Reduce driver regulatory burden.

TfN should aim to work with the haulage industry to achieve the above aims where a role of ensuring the industry promoted adequately is essential.

It is also essential that TfN work with the industry to create a safe environment for staff to work in. This includes physical safety of staff as well as protection of their information. It should also include cognisance to the safety of the freight being transported within the North and how this can be enhanced.

5.6.2 Technology / Data

The importance of data in maintaining an efficient and resilient transport network cannot be overstated. Companies in every sector are making significant efforts to increase their data-driven decision making processes, replacing what the requirement to make decisions based on gut-feelings.

For the freight and logistics industry, online e-tailers are a good example of organisations using big data to anticipate sales volumes, customer product preferences and future requirements.

For TfN, the power of big data will be key to understanding the forecast demands that will be placed on the transport network both in terms of numbers of vehicles on the road, operation of rail services in booked paths and when ships are likely to deliver or pickup goods for the UK’s ports.

Real time data will also be key to managing incidents and linking across all modes to ensure the resilience of the transport networks is maintained.

The availability of data will increase dramatically in the coming years as developments such as the ‘Internet of Things’ grow, providing huge and varied quantities of data in real time. Much of this data will be related to transport and mobility.

Whilst collecting data is valuable, TfN will have a role to play in terms of ensuring this data is safe and secure. Cyber security consists of technologies, processes and measures that are designed to protect systems, networks and data from cyber-crimes. TfN have a duty to ensure that effective measures are in place to reduce cyber risks, identifying threats, vulnerabilities and risks that could be faced.

6 Recommended Next Steps

6.1 Introduction

This section of the report sets out the next steps for TfN and some of the areas where further action is required in order to respond to and plan for the increasing demands that will be placed upon the North's transport network in the coming years.

It is clear that due to rapidly evolving changes in consumer behaviour, the demands for goods will increase requiring a transport network that can respond to these demands efficiently and resiliently.

This report has recommended three key themes for ensuring that the transport network is sufficiently equipped for the future, namely:

- Maximise the use of existing assets;
- Deliver effective investment through the correct modal mix; and
- Providing the skills and utilising data to plan for the future.

The subsequent sections will form a suggested Freight and Logistics Action Plan for TfN to aid the above themes and take forward into the Strategic Development Corridor studies.

6.2 Freight and Logistics Action Plan

6.2.1 Maximise the use of existing assets

6.2.1.1 Use of Digital Technology

TfN should support the rail industry as it explores how digital technology such as ETCS (in-cab signalling) on the rail network (The Digital Railway) and smart motorways on the road network could be deployed to gain more capacity from existing infrastructure and where these may be a more cost-effective solution rather than completely new infrastructure.

6.2.1.2 Automation

Innovative methods for increasing capacity include automation. Automation does not only refer to automated vehicles although these are currently in advanced stages of development and may offer a solution to congestion and emissions issues in urban areas in the near future.

For TfN, however some aspects of automation should be explored where benefits to regional pan-northern movements could be offered. This includes HGV convoys on the motorway network (platooning) and automated systems for moving freight particularly into and out of ports for example. Trials of this nature are already being carried out by the DfT in the UK and TfN should support these and push for further trials in the North of England.

6.2.1.3 Better integration of rail paths

This report has highlighted the issues that exist around the allocation and utilisation of rail paths for freight. TfN should seek to work with Network Rail to address the process by which freight paths are applied for and then subsequently allocated to make it more simple and straightforward and to ensure that capacity on the network is maximised.

The planning, allocation and usage of rail paths needs to be more transparent with live, electronic path planning available.

There is also an exercise to be undertaken with Network Rail to ensure that the requirements for freight are considered during timetable recasts for passenger services. The timetable is developed in accordance with the provisions of the Network Code Part D and in order to support a better integration of train paths a review of these provisions may be required.

6.2.2 Deliver effective investment through the correct modal mix

6.2.2.1 Infrastructure Investment

It is inevitable that investment in existing and new infrastructure will be required. Freight may be able to aid the business case for some infrastructure schemes and TfN should ensure that the requirements for freight are taken into account during the appraisal of any new schemes, particularly within the Strategic Development Corridor studies. The overall premise behind the need for new infrastructure is to:

- Enhance east-west connectivity;
- Enhance north-south connectivity;
- Provide general capacity enhancements; and
- Improve intermodal connectivity.

One of the barriers to modal shift outlined in the report is the lack of multimodal terminals allowing the switch between road and rail / water. The majority of the current intermodal rail terminals are located on the Central Pennines corridor from Liverpool across to Leeds and Wakefield and there are many sites across the North of England where there are opportunities to develop further multimodal terminals. In addition there are opportunities on both the Manchester Ship Canal and the Aire and Calder Canal for inland water-borne intermodal opportunities.

There may be sufficient case to introduce additional multimodal terminals further north, particularly within the North-East and Cumbria where the longer journey to and from the southern ports or the Port of Liverpool for example would be suitable for rail. These opportunities should be explored in the Strategic Development Corridor studies.

6.2.2.2 Funding

Rail

The report recommends a number of actions for encouraging a modal shift to rail. These actions include promotion of rail freight though increased collaboration between transport operators and shippers. TfN should look to set up sessions where industry organisations can collaborate and share ideas. This should be targeted and developed through consultation with private sector stakeholders.

TfN should also explore:

1. How the market can be encouraged to operate more freight paths by reducing the financial risk by restructuring funding streams through to setting up a franchised rail freight operator for particular routes that would otherwise be unviable
2. How freight can be better integrated into the passenger timetable by assessing how they are operated technologies used, etc.

The premise of this action should be developed in consultation with DfT.

Coastal Shipping

TfN should look to develop a case for increasing the movement of intermodal containers on coastal shipping routes between the UK's southern ports and the North of England (and Scotland). This could also include increased services to central European hub ports such as Rotterdam and Antwerp.

Coastal shipping is an increasingly attractive method for the movement of empty containers out of the North due to the heavy import flows. Empty containers do not have the same time pressures as loaded containers and therefore they do not need to travel by road.

TfN should work with port operators, retailers and shipping lines to develop the case for increased coastal shipping services and undertake a review of funding opportunities and risk reduction.

6.2.2.3 Alternative Fuels

As the pressure to reduce emissions from transport continues, there is a stronger case for the development of infrastructure to support alternative fuels.

Future investment should include where appropriate the provision of infrastructure that supports and encourages an increase in the use of alternative fuels. This could include strategically placed refuelling points across the north for alternative fuels such as hydrogen and LPG.

Working with the region's ports to improve infrastructure to support ships using alternative fuels such as LNG will also be imperative, particularly if coastal shipping is to be encouraged.

6.2.2.4 Policy Incentives

TfN should look to work with rail freight operators and local authorities to seek to break down the planning obstacles that are often put in place that hinder the development of freight terminals such as onerous planning conditions. TfN should use the forecast traffic volumes in 2050 to highlight why a modal shift is beneficial to each local authority and the benefits that it could bring.

6.2.3 Providing skills and utilising data to plan for the future

6.2.3.1 Skills Strategy

TfN should build upon the work being done to create its own skills strategy and work with freight groups and bodies such as the Road Haulage Association (RHA), Freight Transport Associated (FTA) and CILT (Chartered Institute of Logistics and Transport (CILT) to ensure that the industry is developing the skills required in the freight and logistics sector to meet future demands.

Priorities for this stream of work should seek to improve the perception of the freight and logistics sector (particularly the haulage industry) and ensure that the industry gets exposure to a younger audience to ensure the longevity and resilience of the workforce.

6.2.3.2 Robust Data

The evidence base used in the development of this report is a mixture of model outputs from the GBFM and information gleaned through engagement with a number of freight and logistics operators and industry experts.

There remains however an important requirement to increase the robustness of the evidence base through the collection of more information and ensuring TfN have a long term strategy for gathering the required data to assess KPI's and how the North's freight industry operates. This could be through embracing the move to the use of Big Data and developing systems that will aid the enhancement of the freight and logistics story within TfN.

TfN should work with partners, many of whom have already started this process to examine whether a Pan Northern approach to data collection and interrogation can be established. This may utilise data collected from a number of sources including GPS systems such as Traffic Master, Tom-Tom, INRIX or mobile phone data.

6.2.3.3 Work with city regions

TfN should work with city regions around the development of strategies affecting freight and logistics in urban areas and the sharing of data. Supply chains are international but Northern Cities are evaluating policy interventions to mitigate and control their environmental impact locally, such as low emission zones. These new schemes will fundamentally change the way road freight is moved throughout the North and the coordination of such interventions and cross learning could be of benefit to the North.

6.2.4 TfN's role in Brexit

Britain's exit from the European Union (EU) has the potential to have a significant impact of the freight and logistics sector. These impacts could be in the form of opportunities and/ or threats.

TfN should work with the sector as the Brexit process is undertaken to understand the significance of any impacts that might arise and how the industry should respond. TfN could act as a voice for the freight and logistics sector in the North of England to ensure that any concerns or views are represented to Government during the process.

6.2.4.1 Free Port Zones

An opportunity presented by Brexit are the establishment of Free Port Zones. Free Ports are areas that, although inside the UK boundary geographically, would be considered outside of the country for customs purposes. This would result in goods entering and exiting the port without incurring typical import procedures or tariffs and incentivising domestic manufacturing.

Currently no free port zones exist in the UK as EU laws prevent them from being established but successful examples can be found in the USA where jobs have been created, manufacturing output stimulated and trade boosted.

Post Brexit, TfN could support the creation of Free Port Zones at major ports and airports in the North to aid the development of economic clusters in maritime, logistics, aviation, aerospace and space sectors along with the continued development of Enterprise Zones in other areas. This could include international rail freight terminals through links to the Channel Tunnel.

6.2.4.2 Impact of Brexit on Southern Ports

On the flip side to the opportunities offered by Free Port Zones, Brexit could have an enormous detrimental impact on ports, particularly in Southern England such as Dover where new border checks procedures could have a significant impact on the surrounding road network which is already strained by the existing throughput of vehicles on the UK's busiest cross-channel ferry routes.

This could offer an opportunity for Northern Ports to increase throughput as the pressure is lifted from constrained ports in the south with existing ferry routes to the North strengthened by larger vessels and increased port capacity, and perhaps new routes created to meet demand.

Appendix A

Freight Movements by Commodity

A1 Road Commodities

A1.1 Temperature Controlled Foodstuffs

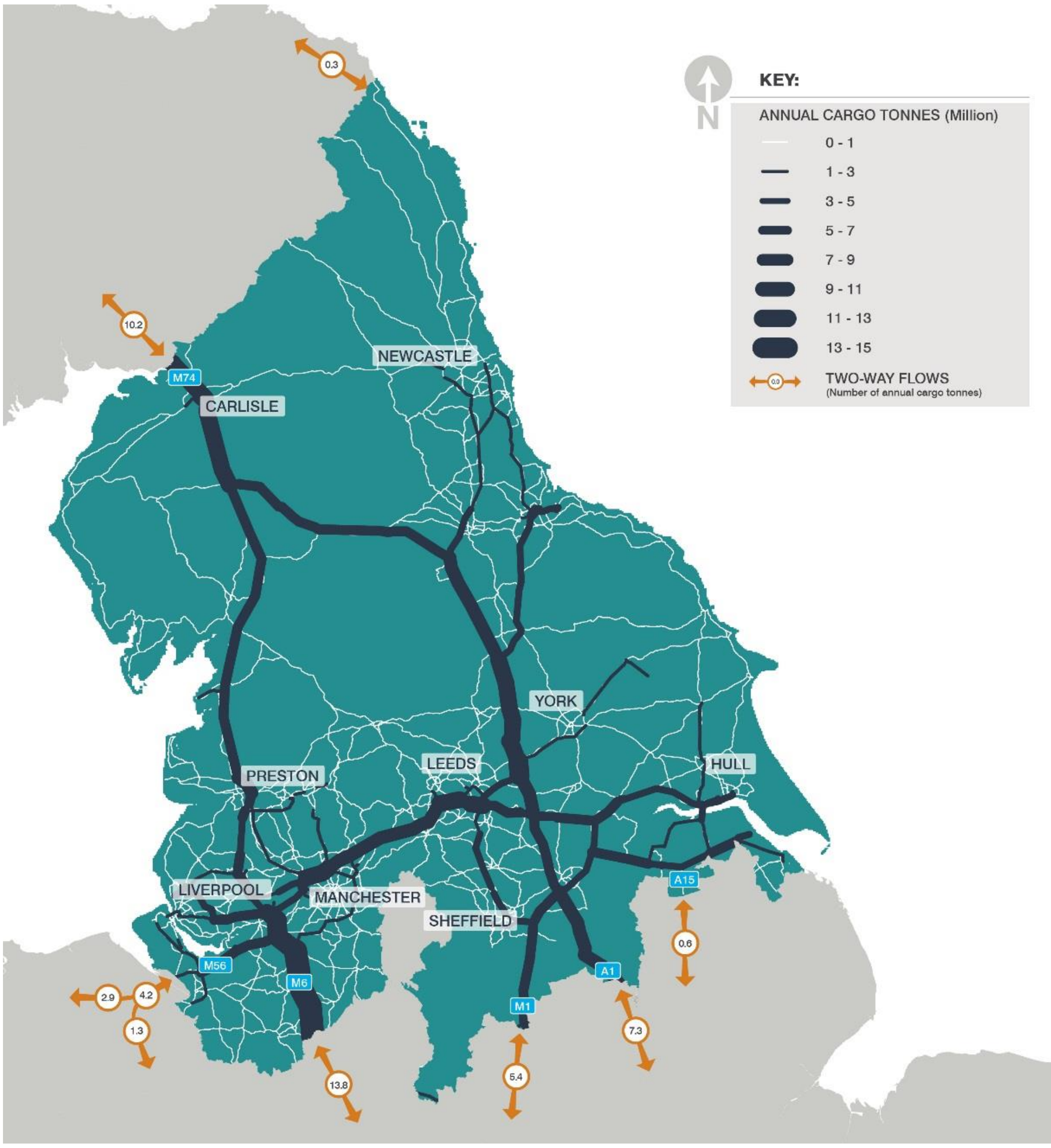


Figure 58 Road Freight by Commodity - 2016 - Temperature Controlled Foodstuffs

A1.2 Other Foodstuffs

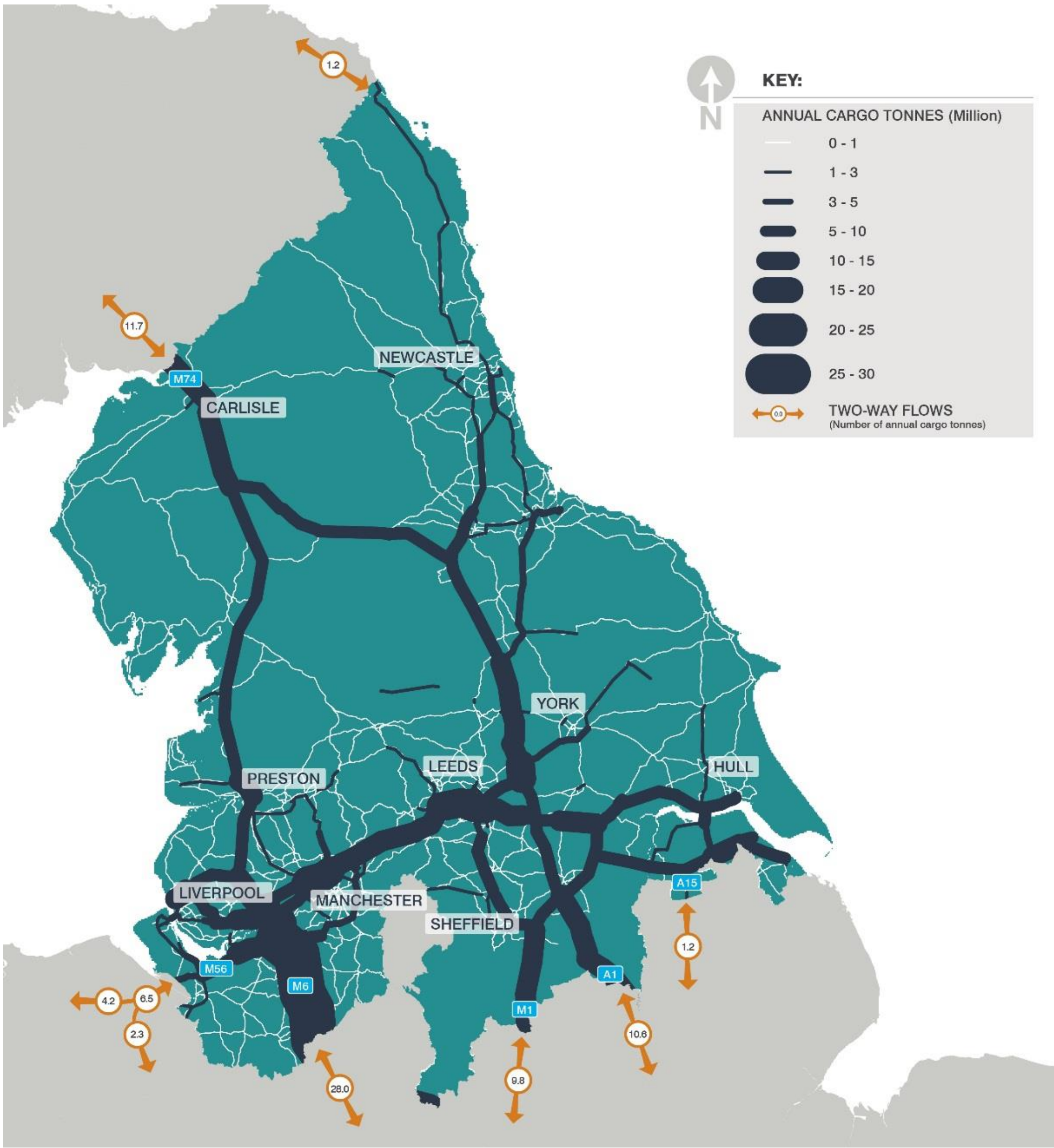


Figure 59 Road Freight by Commodity - 2016 - Other Foodstuffs

A1.3 Construction and Metals

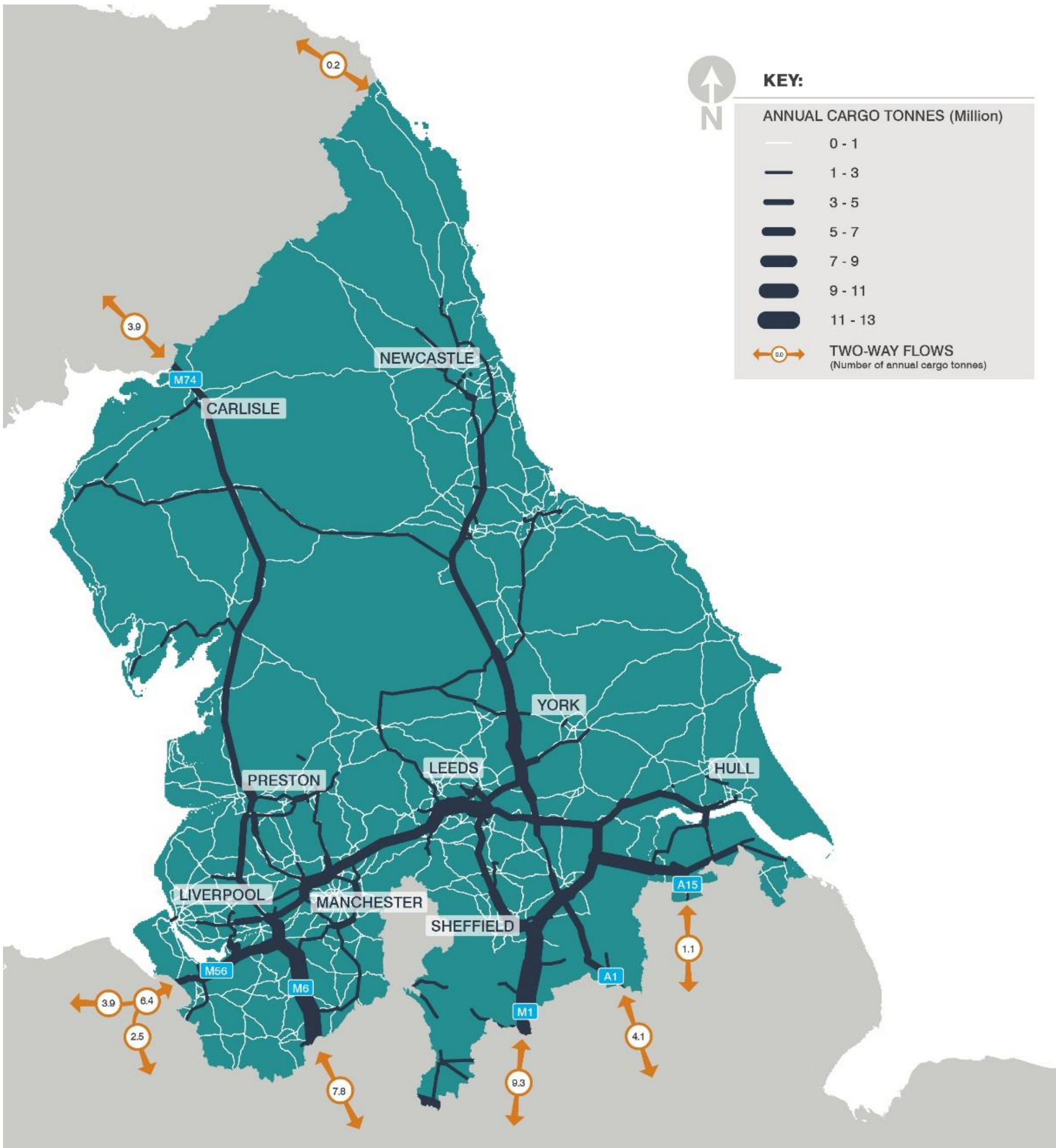


Figure 60 Road Freight by Commodity - 2016 - Construction and Metals

A1.4 Crude Materials and Manufactured Items

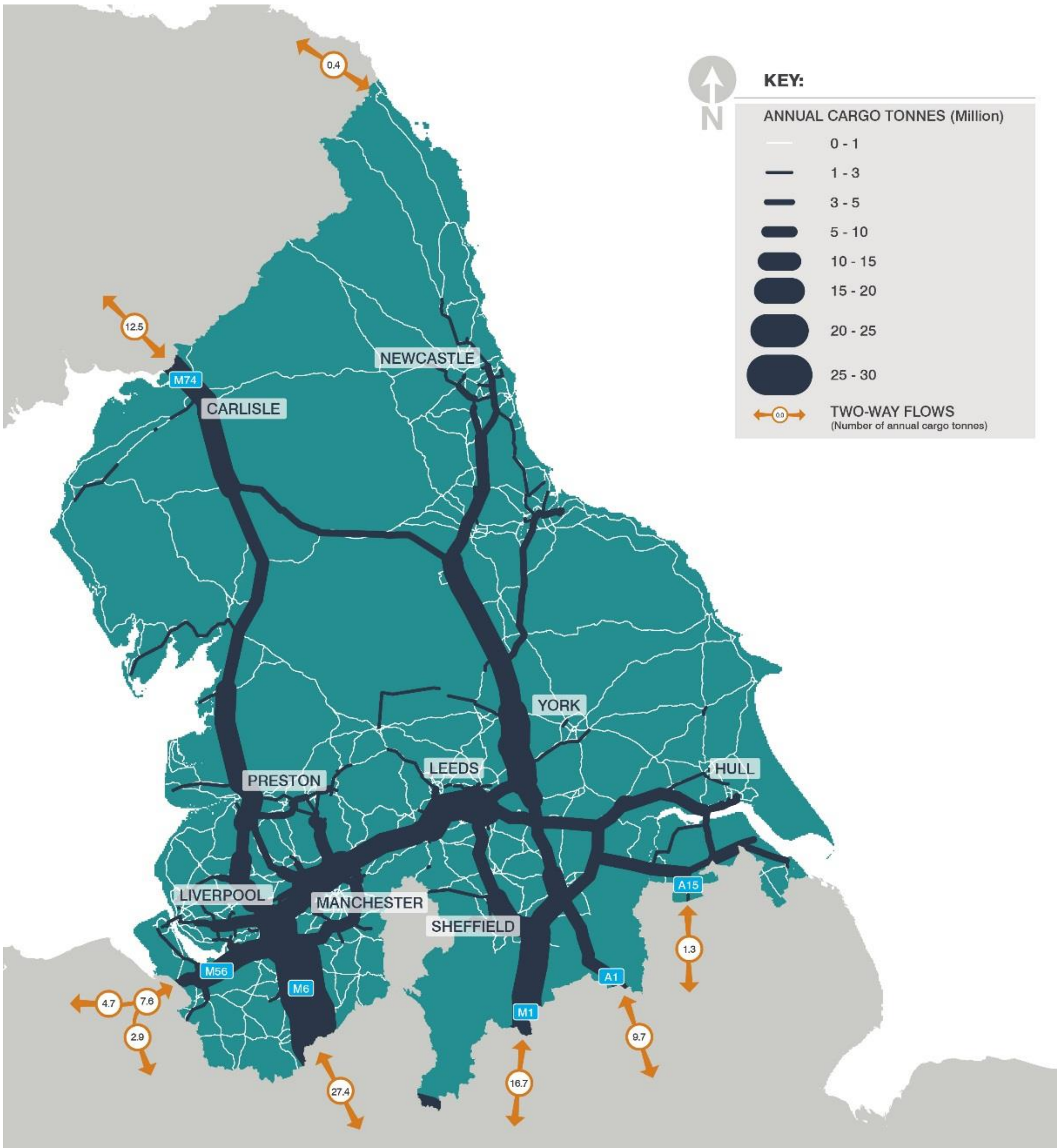


Figure 61 Road Freight by Commodity - 2016 - Crude Materials and Manufactured Items

A1.5 Petroleum and Petrol Products

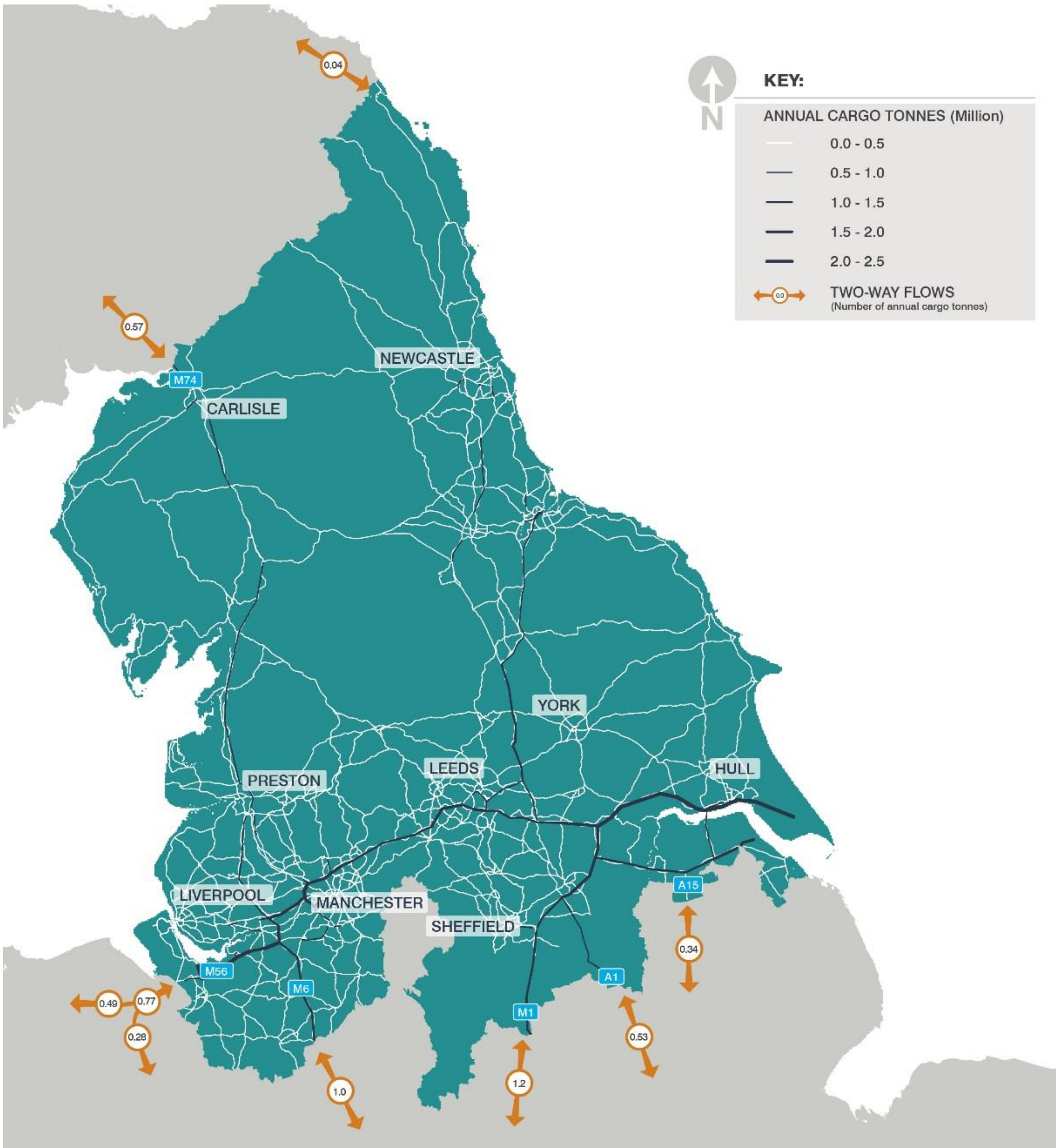


Figure 62 Road Freight by Commodity - 2016 - Petroleum and Petrol Products

A1.6 Other Bulks

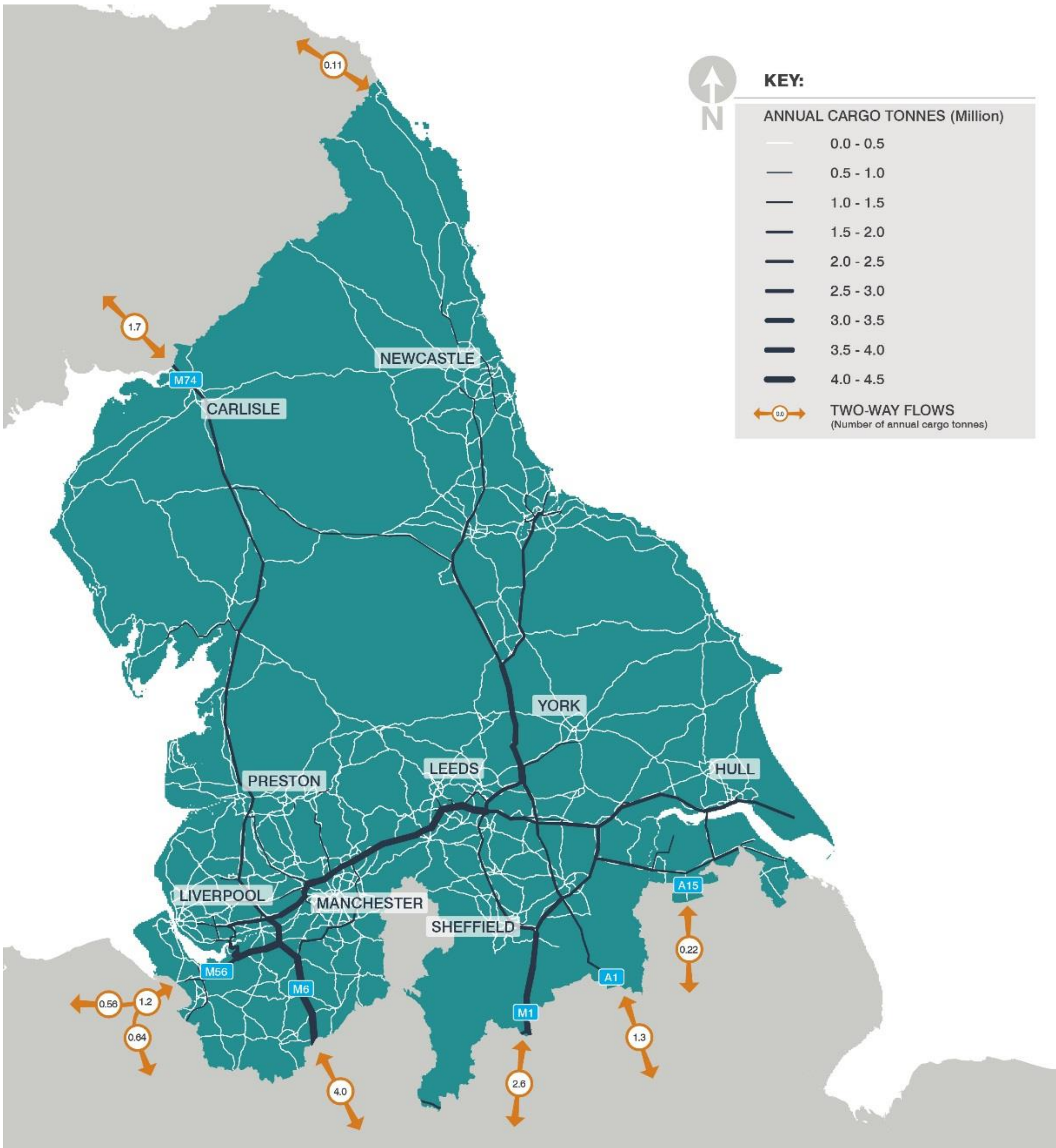


Figure 63 Road Freight by Commodity - 2016 - Other Bulk

A2 Rail Commodities

A2.1 Intermodal

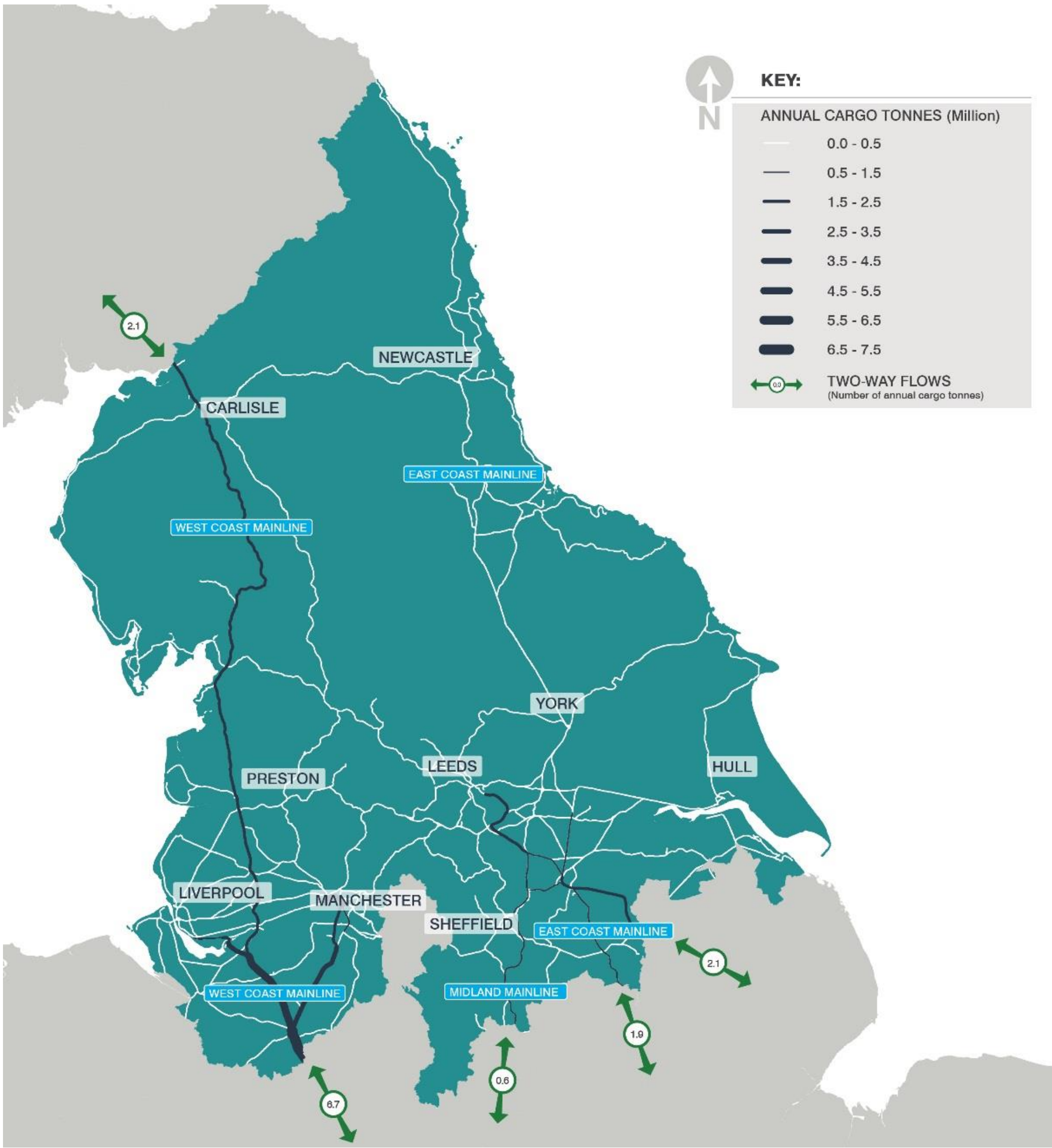


Figure 64 Rail Freight by Commodity - 2016 – Intermodal

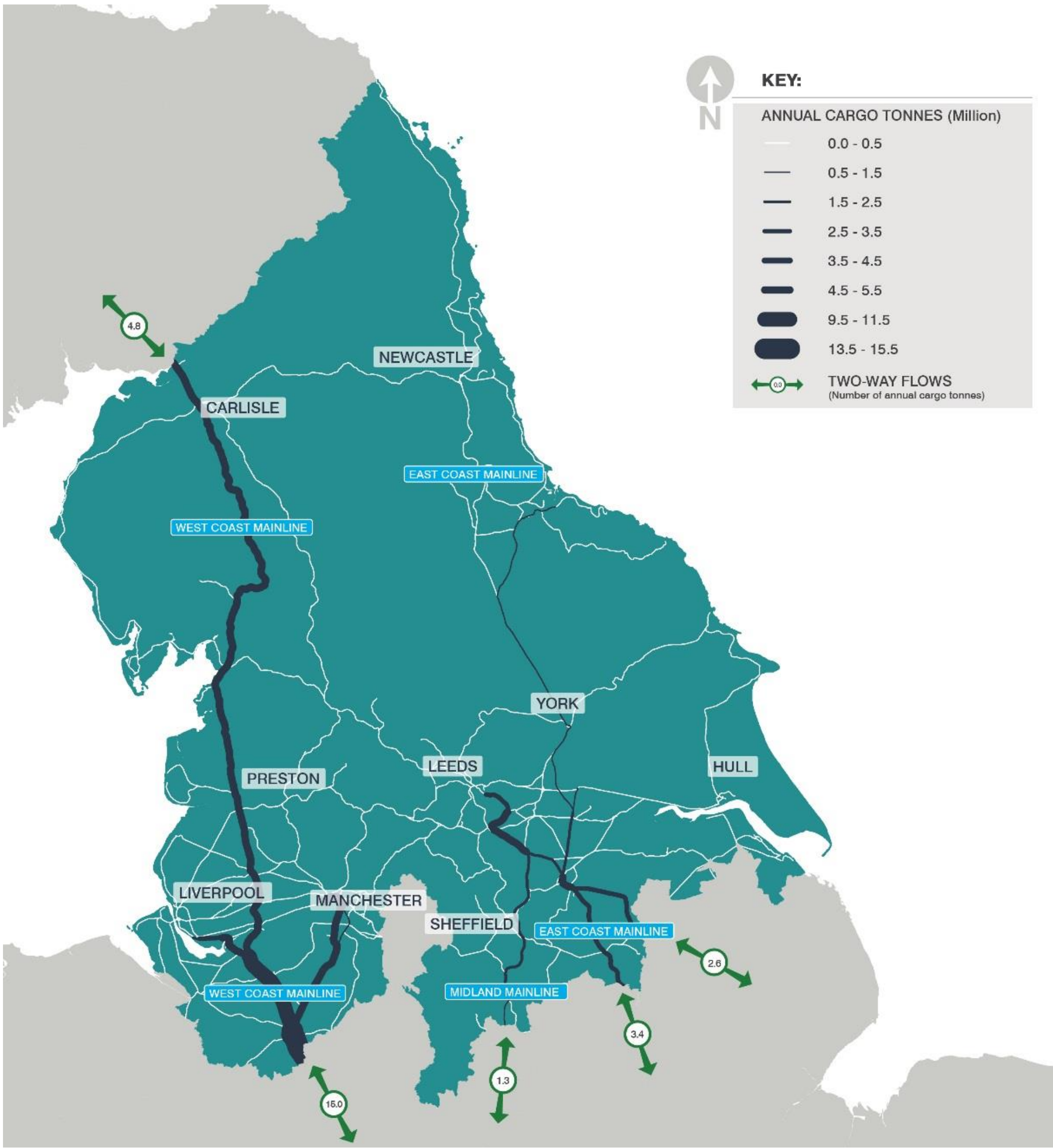


Figure 65 Rail Freight by Commodity - 2050 – Intermodal

** NB The Great Britain Freight Model does not show growth in flows that do not exist within the baseline unless TfN added assumptions into the model where growth was likely. To keep the standard approach, no assumptions were added hence the growth of intermodal traffic West-East is limited. **

A2.2 Biomass

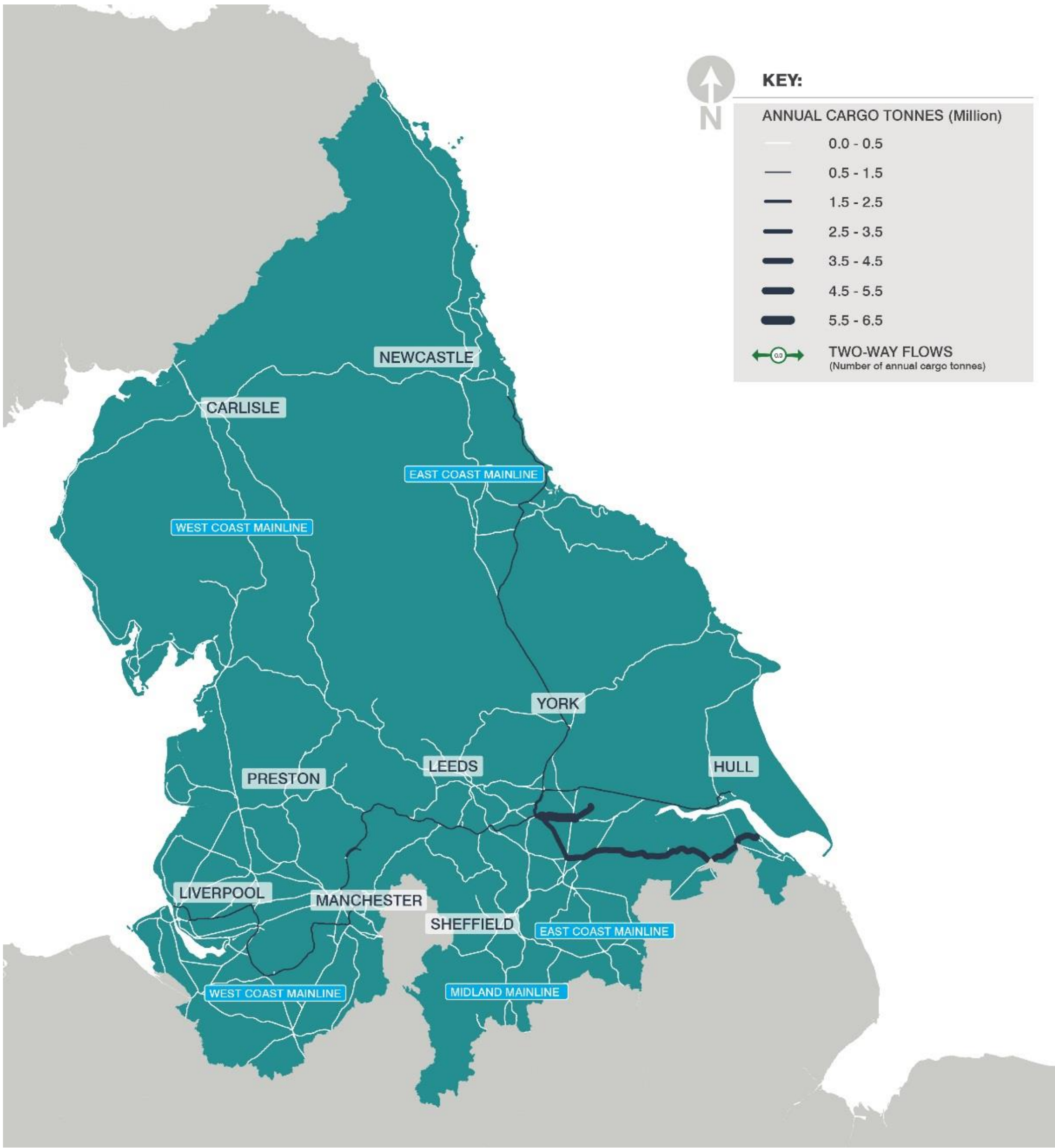


Figure 66 Rail Freight by Commodity - 2016 – Biomass

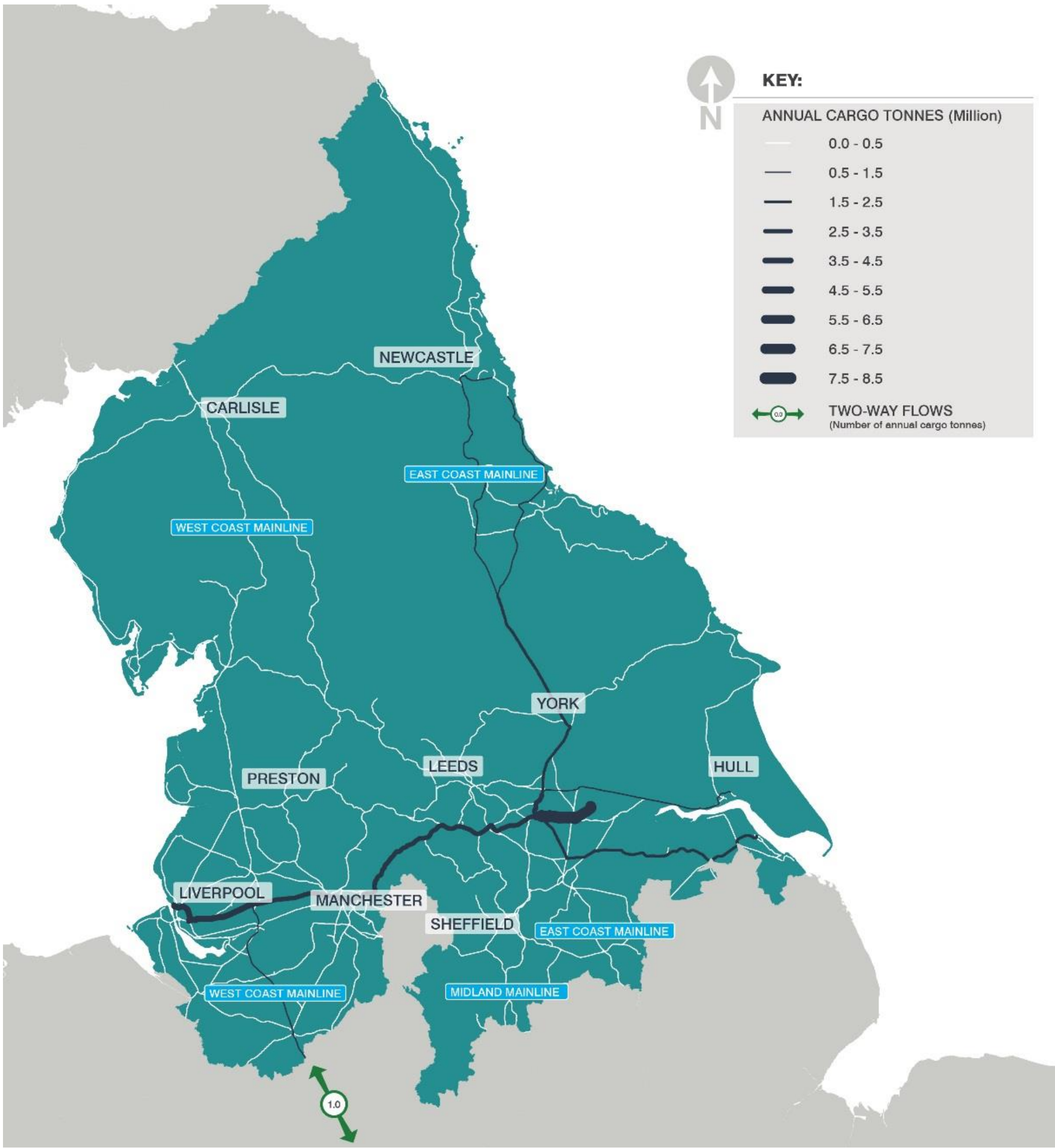


Figure 67 Rail Freight by Commodity - 2050 – Biomass

A2.3 Iron Ore

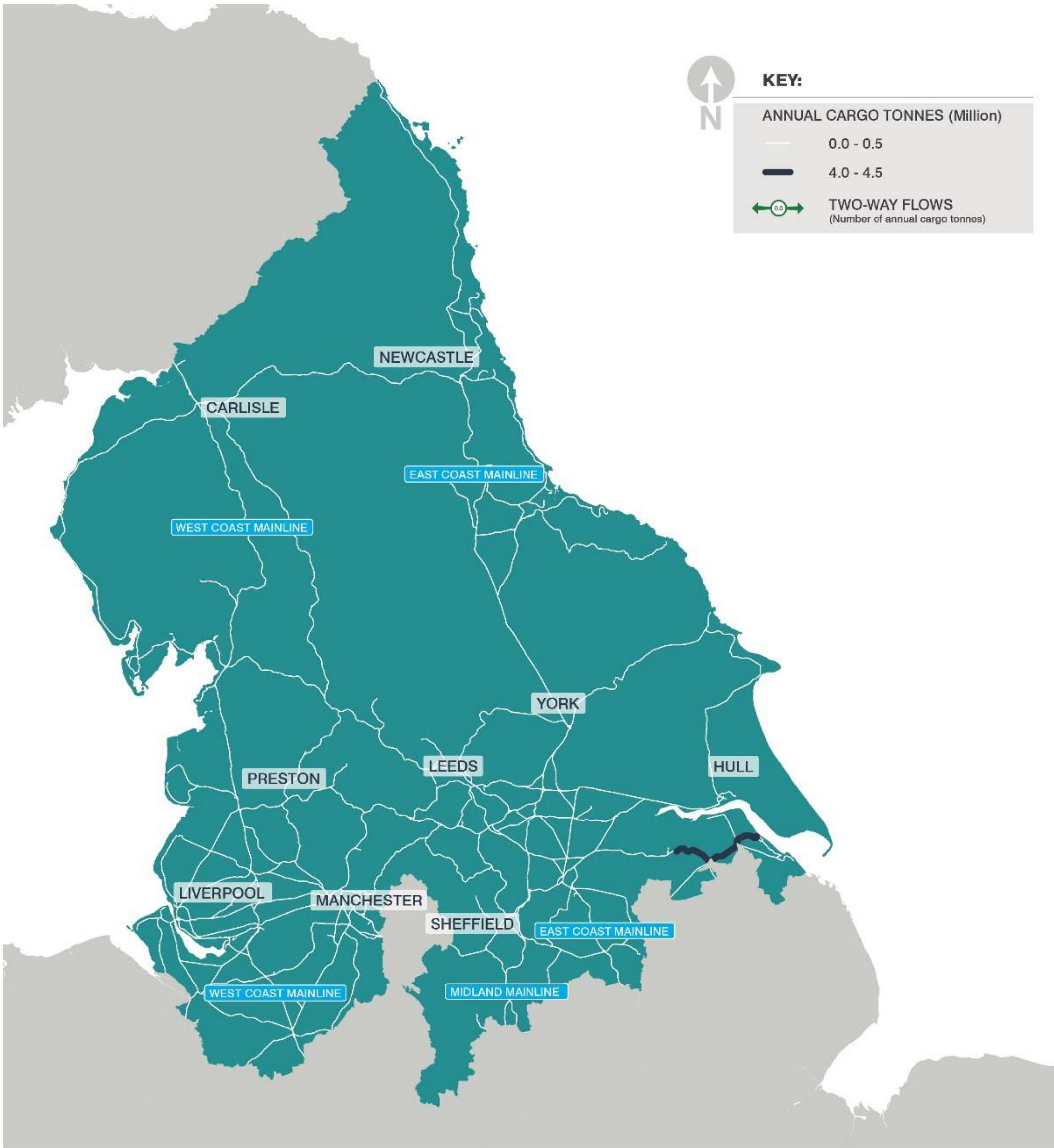


Figure 68 Rail Freight by Commodity - 2016 - Iron Ore

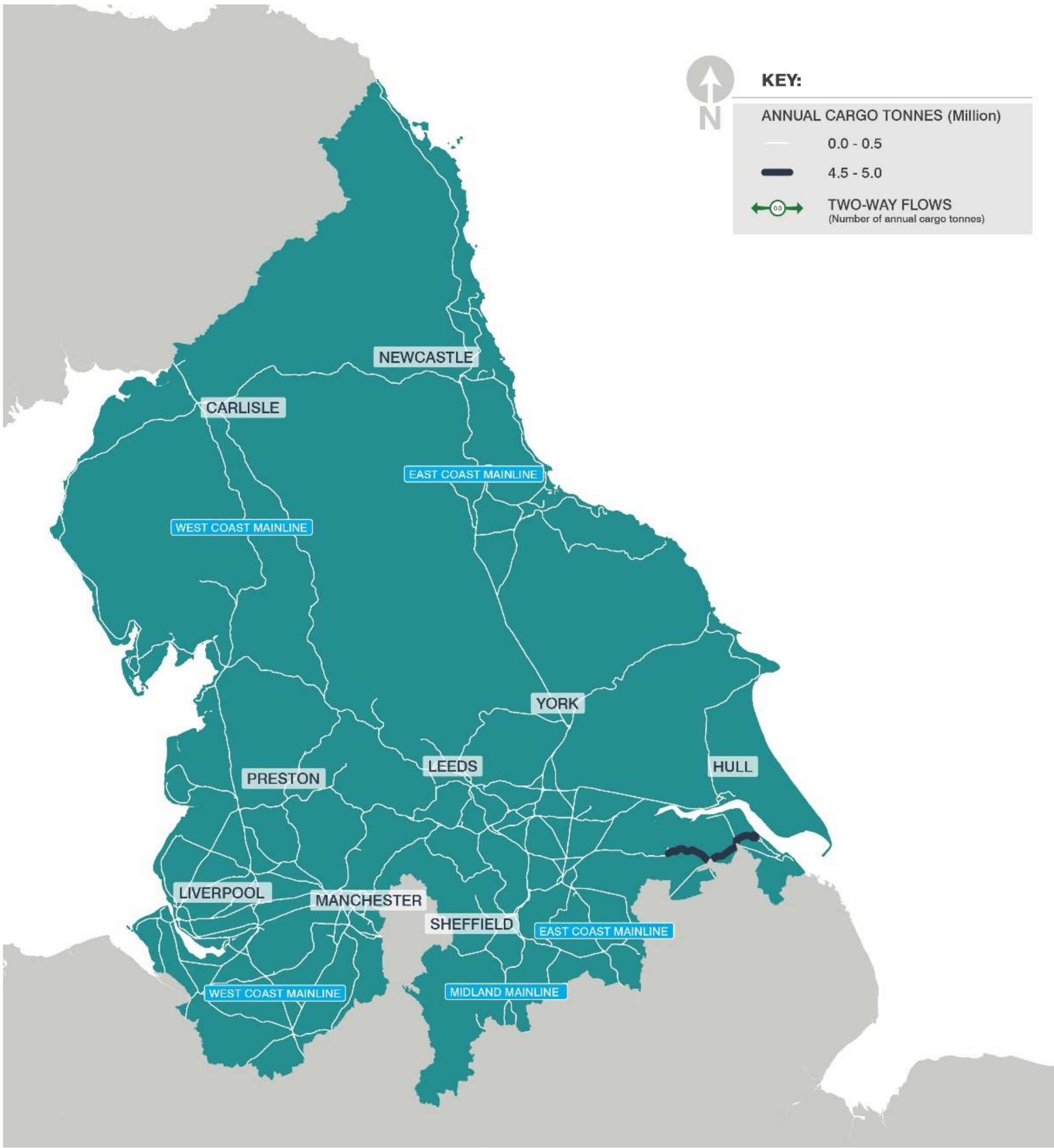


Figure 69 Rail Freight by Commodity - 2050 - Iron Ore

A2.4 Petroleum and Petrol Products

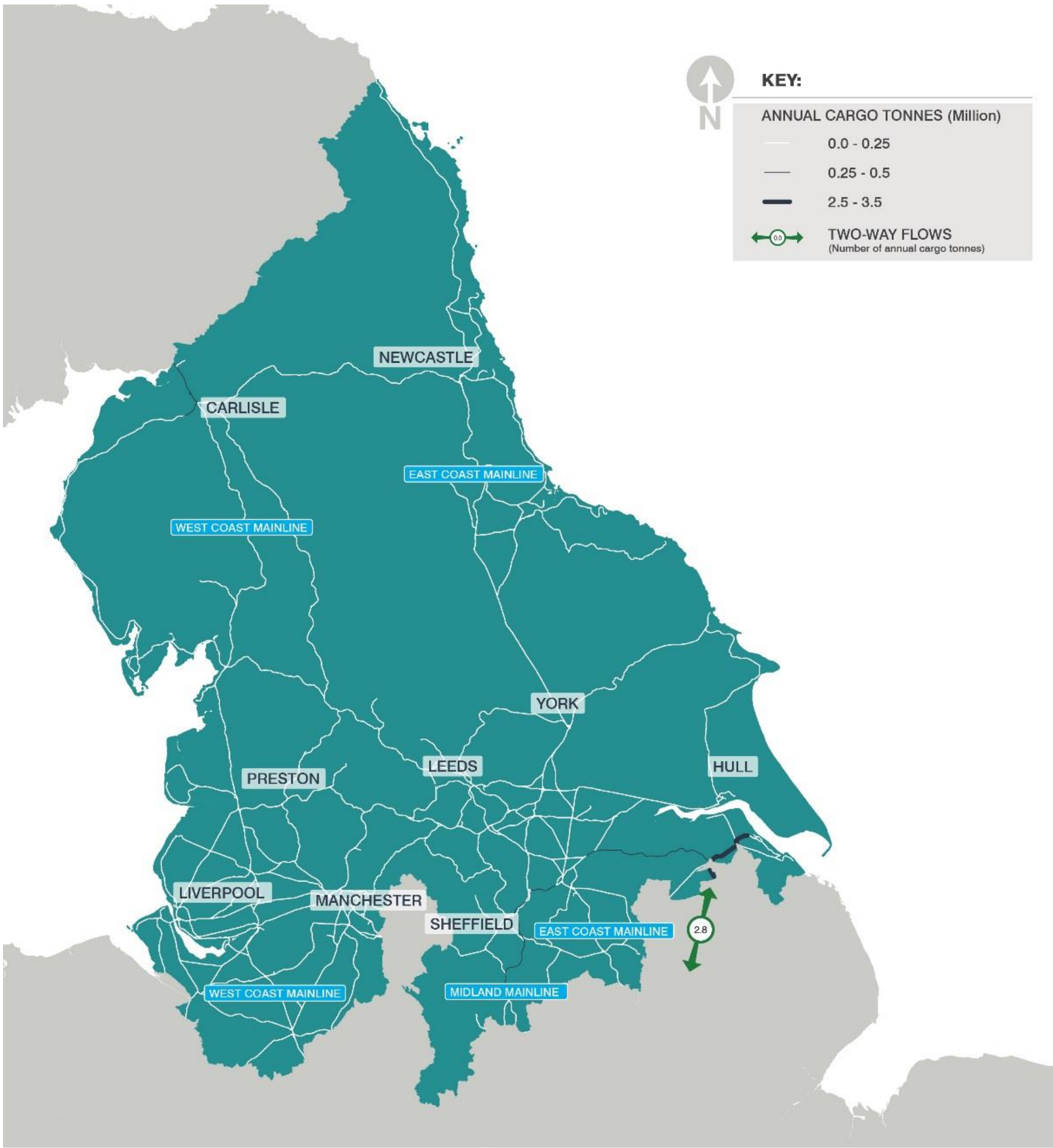


Figure 70 Rail Freight by Commodity - 2016 - Petroleum Products

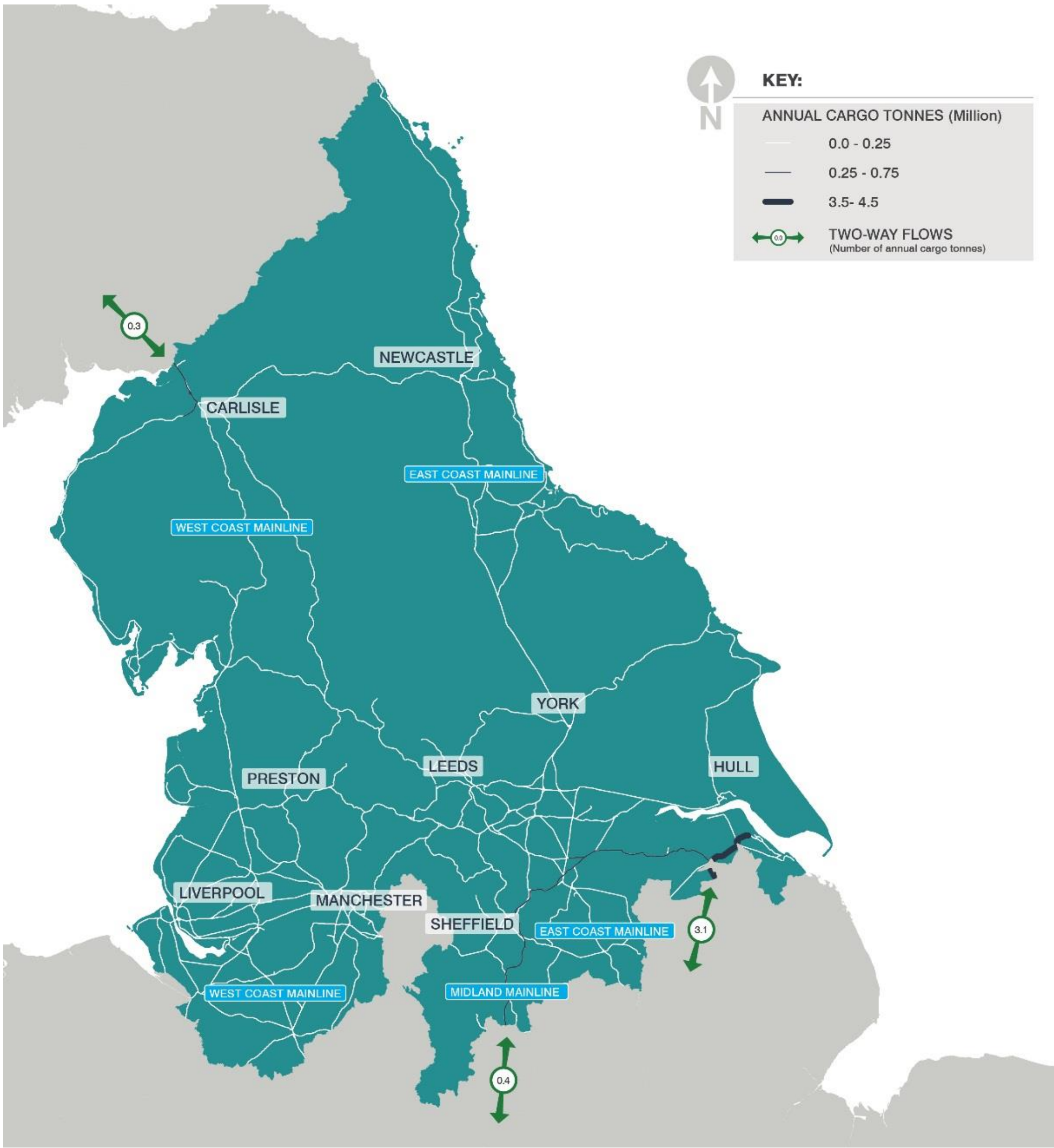


Figure 71 Rail Freight by Commodity - 2050 - Petroleum Products

A2.5 Network Rail Engineering

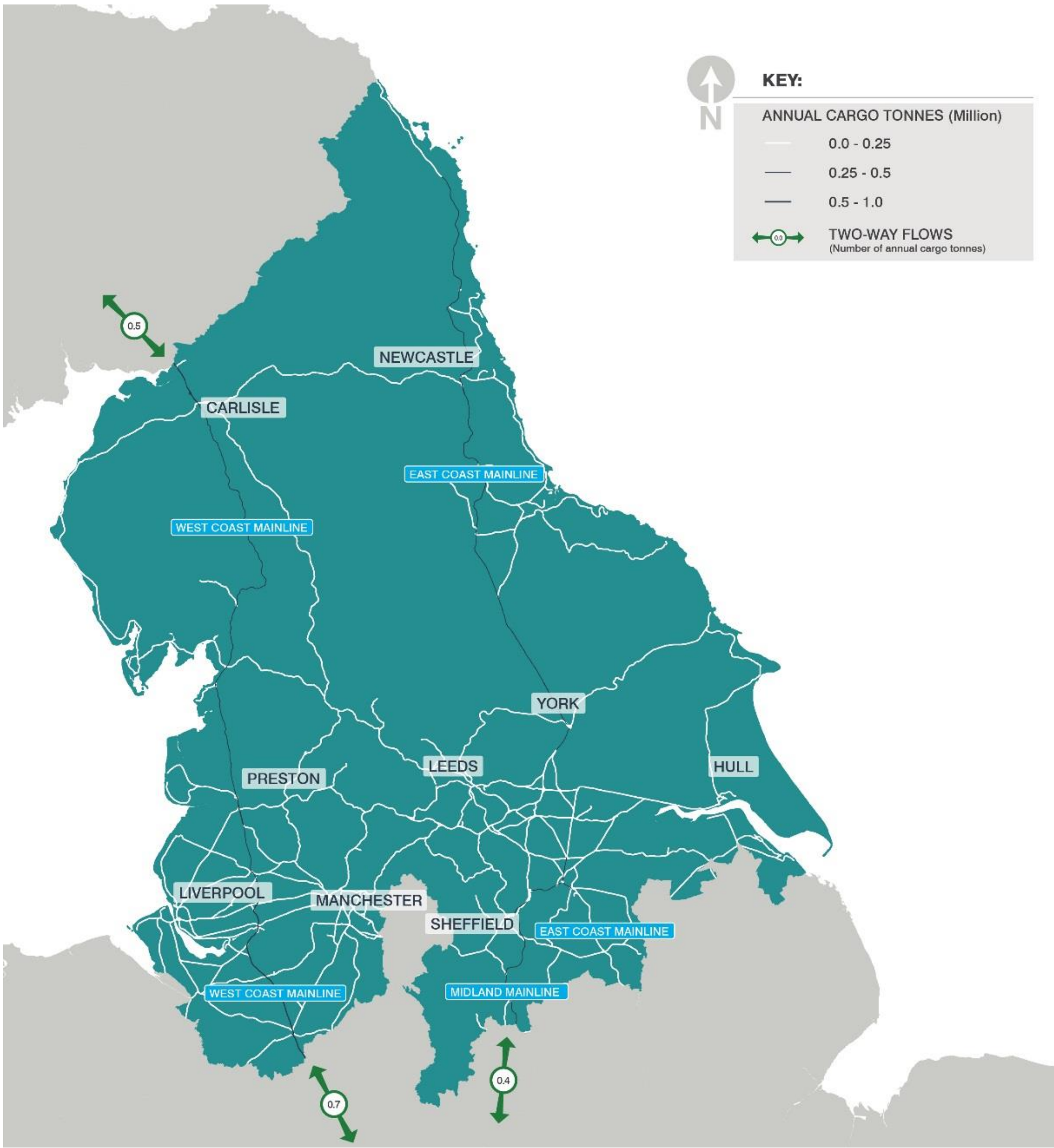


Figure 72 Rail Freight by Commodity - 2016 - Network Rail Engineering

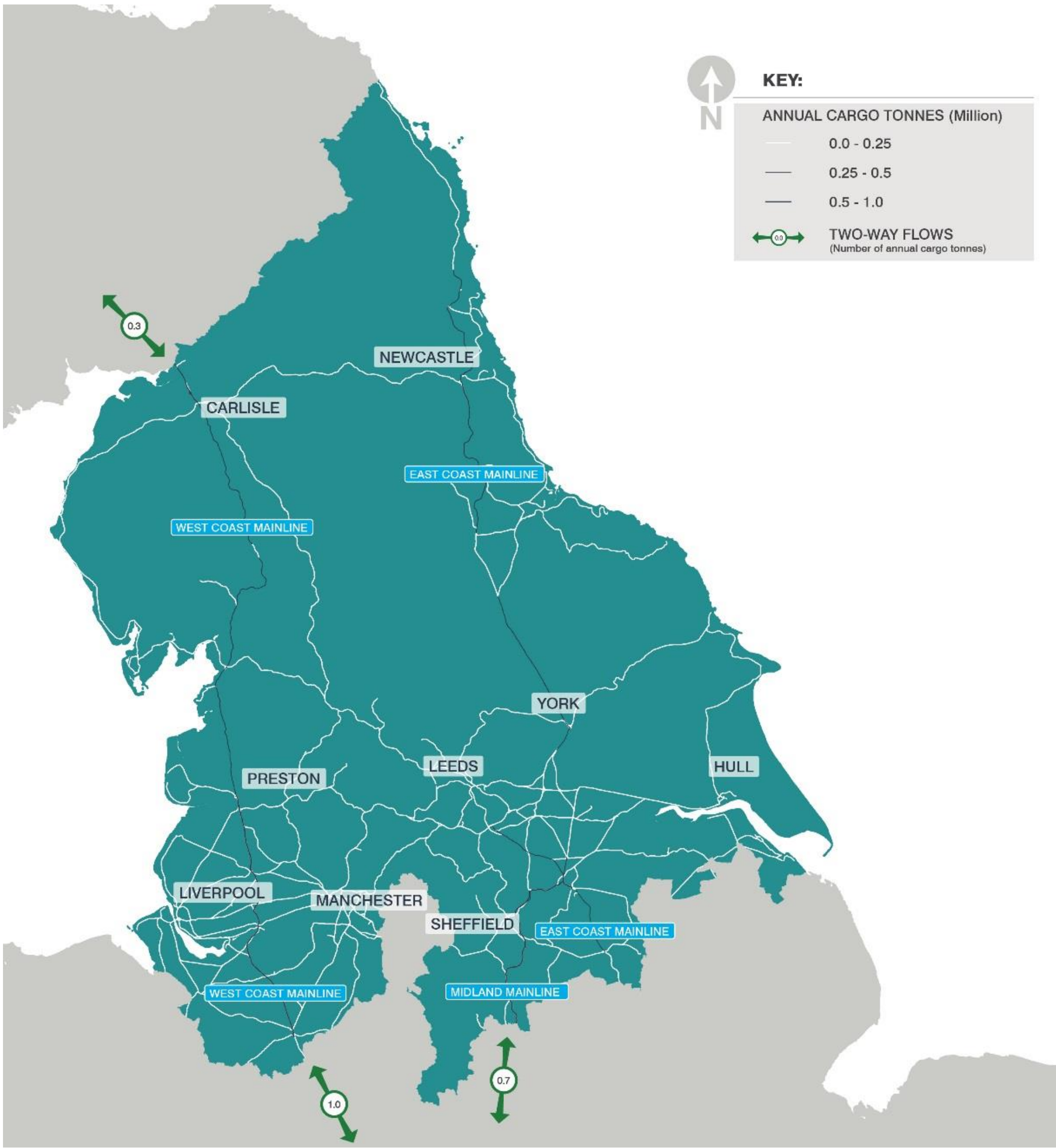


Figure 73 Rail Freight by Commodity - 2050 - Network Rail Engineering

A2.6 Construction and Metals

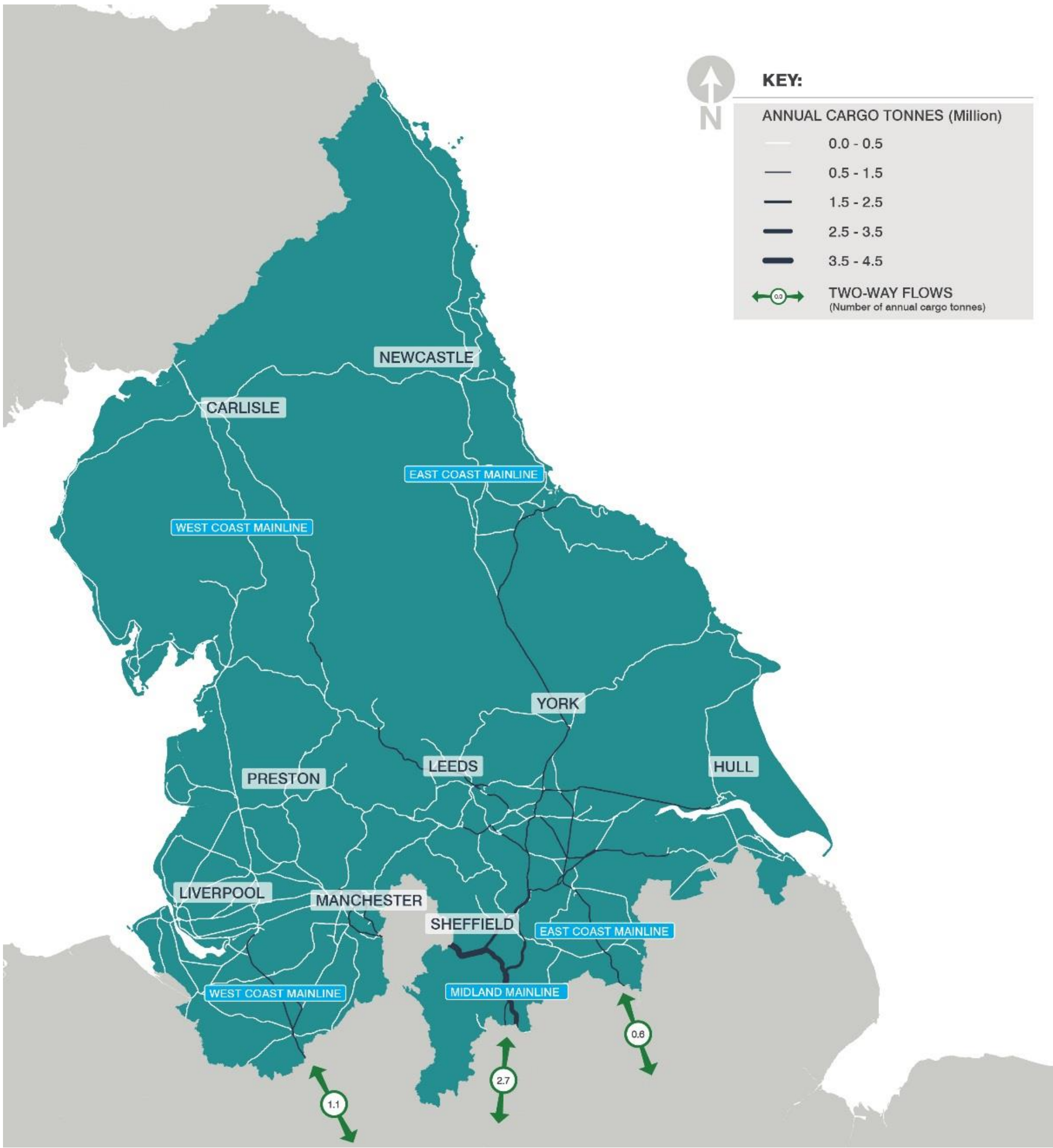


Figure 74 Rail Freight by Commodity - 2016 - Construction and Metals

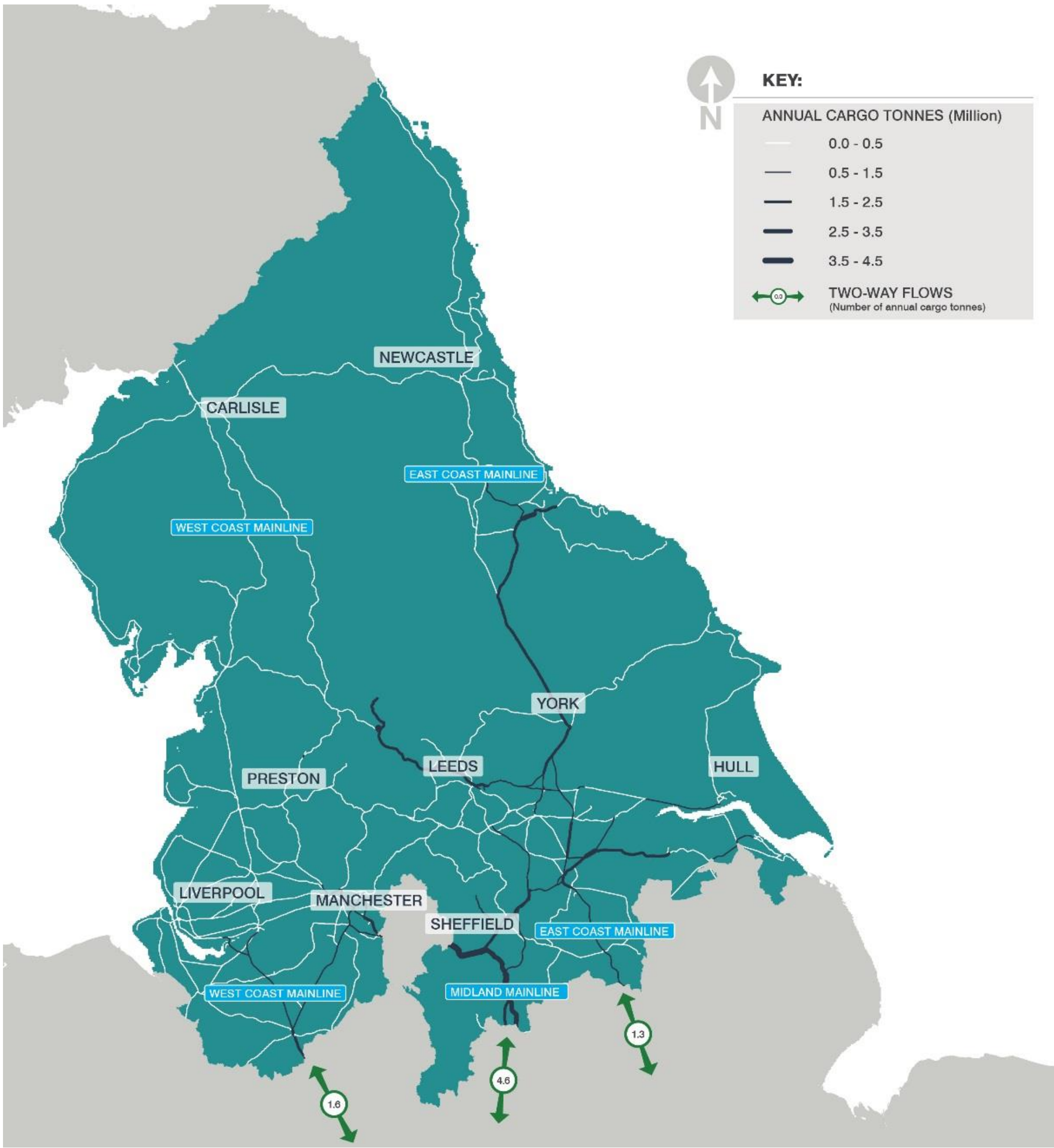


Figure 75 Rail Freight by Commodity - 2050 - Construction and Metals

A2.7 Coal

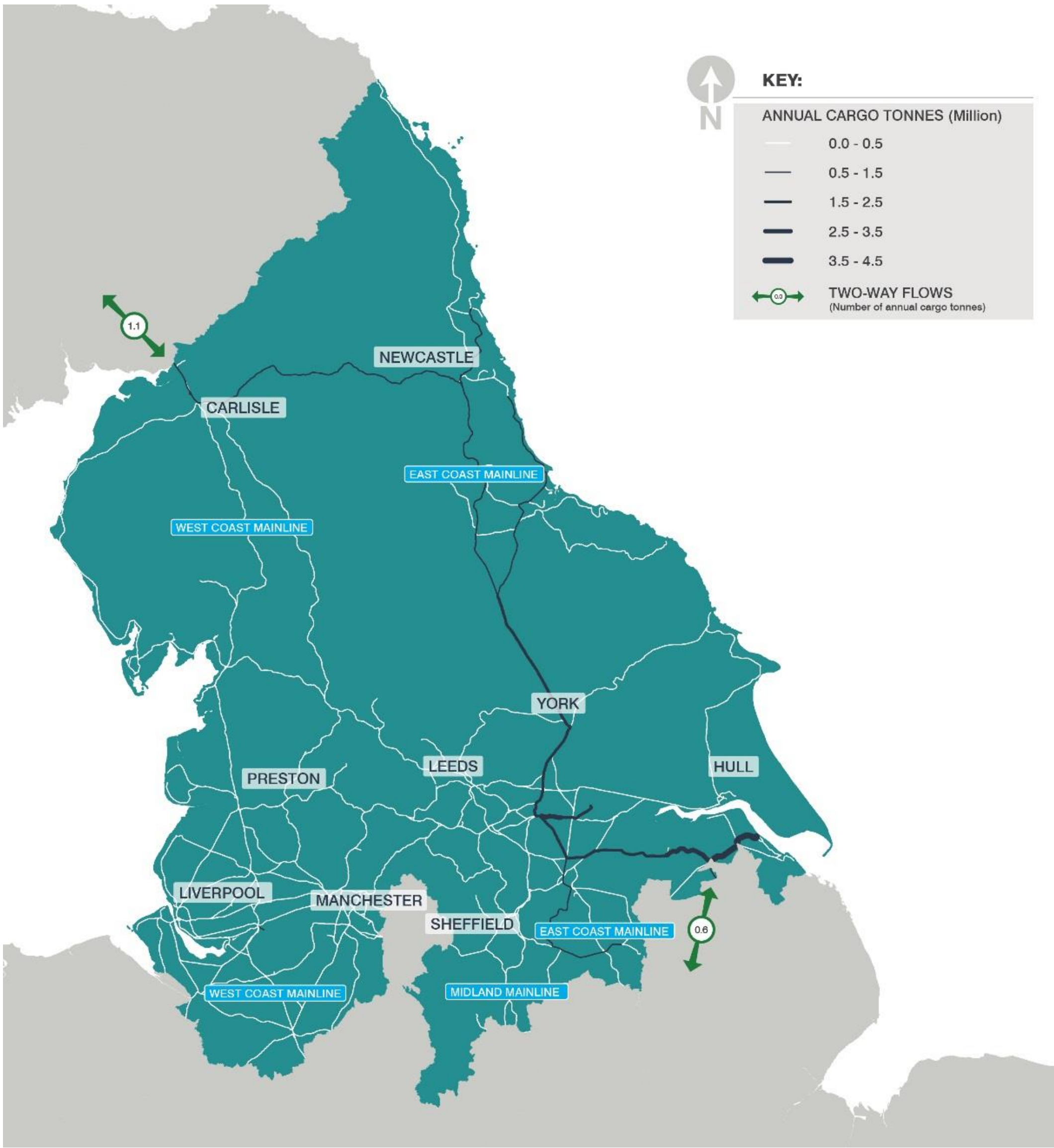


Figure 76 Rail Freight by Commodity - 2016 – Coal

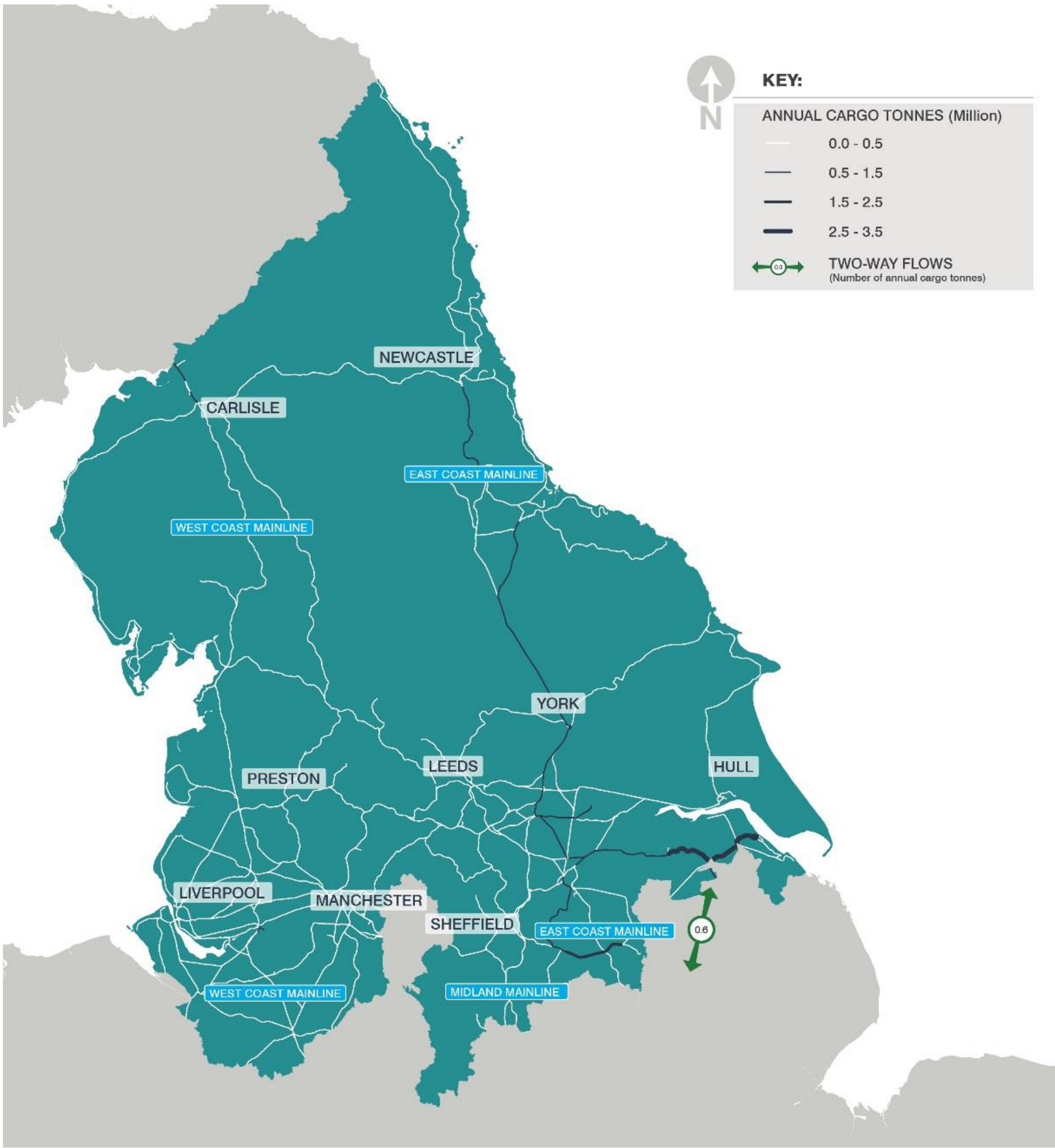


Figure 77 Rail Freight by Commodity - 2050 - Coal

A2.8 Other

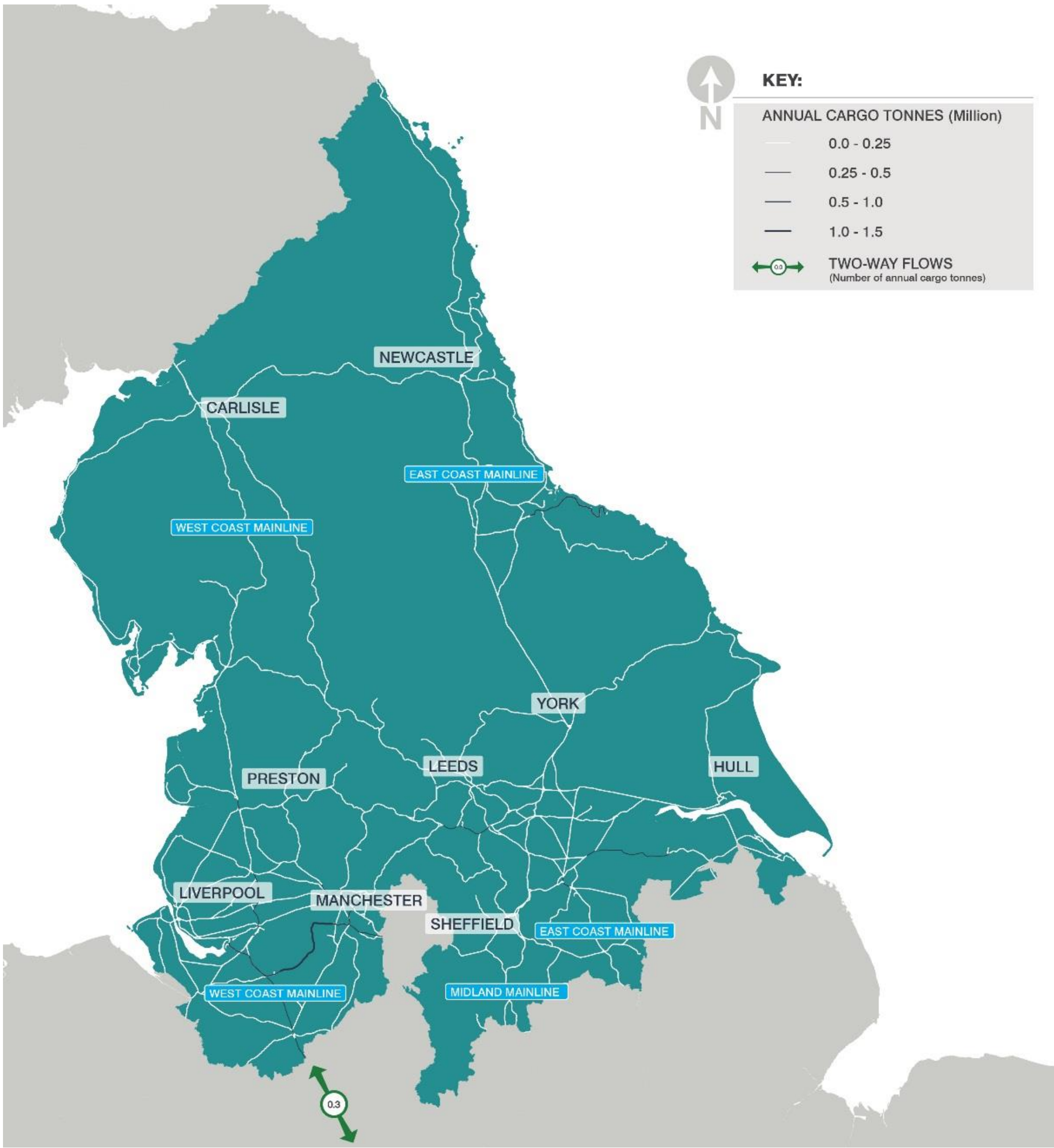


Figure 78 Rail Freight by Commodity - 2016 – Other

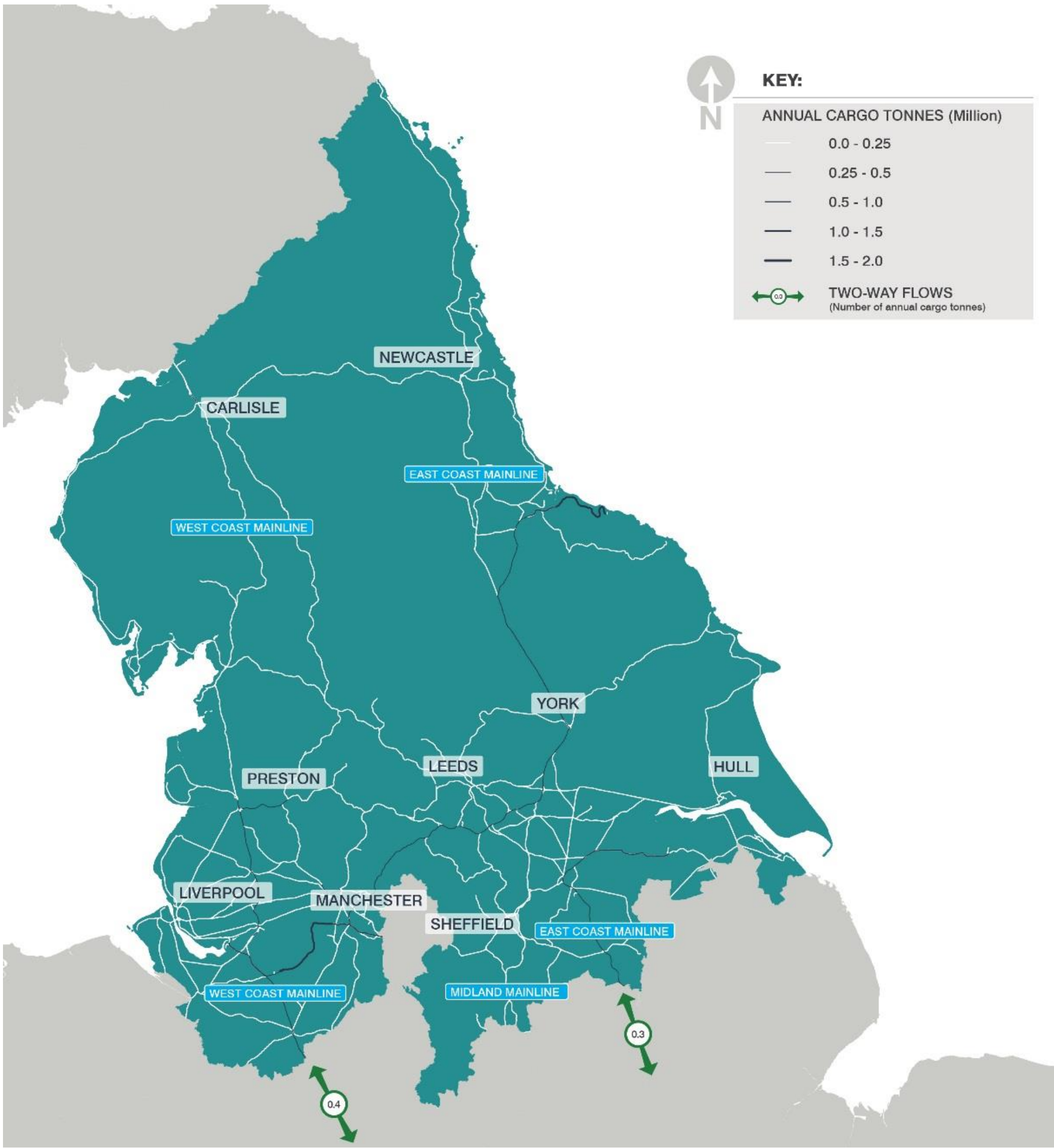


Figure 79 Rail Freight by Commodity - 2050 - Other

Appendix B

Freight Movements by Port Group

B1 Tyne and Wear Ports

The Tyne and Wear Ports group is made up of two major ports, namely the Port of Tyne and the Port of Sunderland. In addition, other ports are located at Berwick, Blyth and Seaham.

The imports via the Tyne and Wear Ports are shown on Figure 80. The majority of the cargo flows imported are from Central and Northern Europe. These are mainly heading for the North-East and Yorkshire and the Humber.

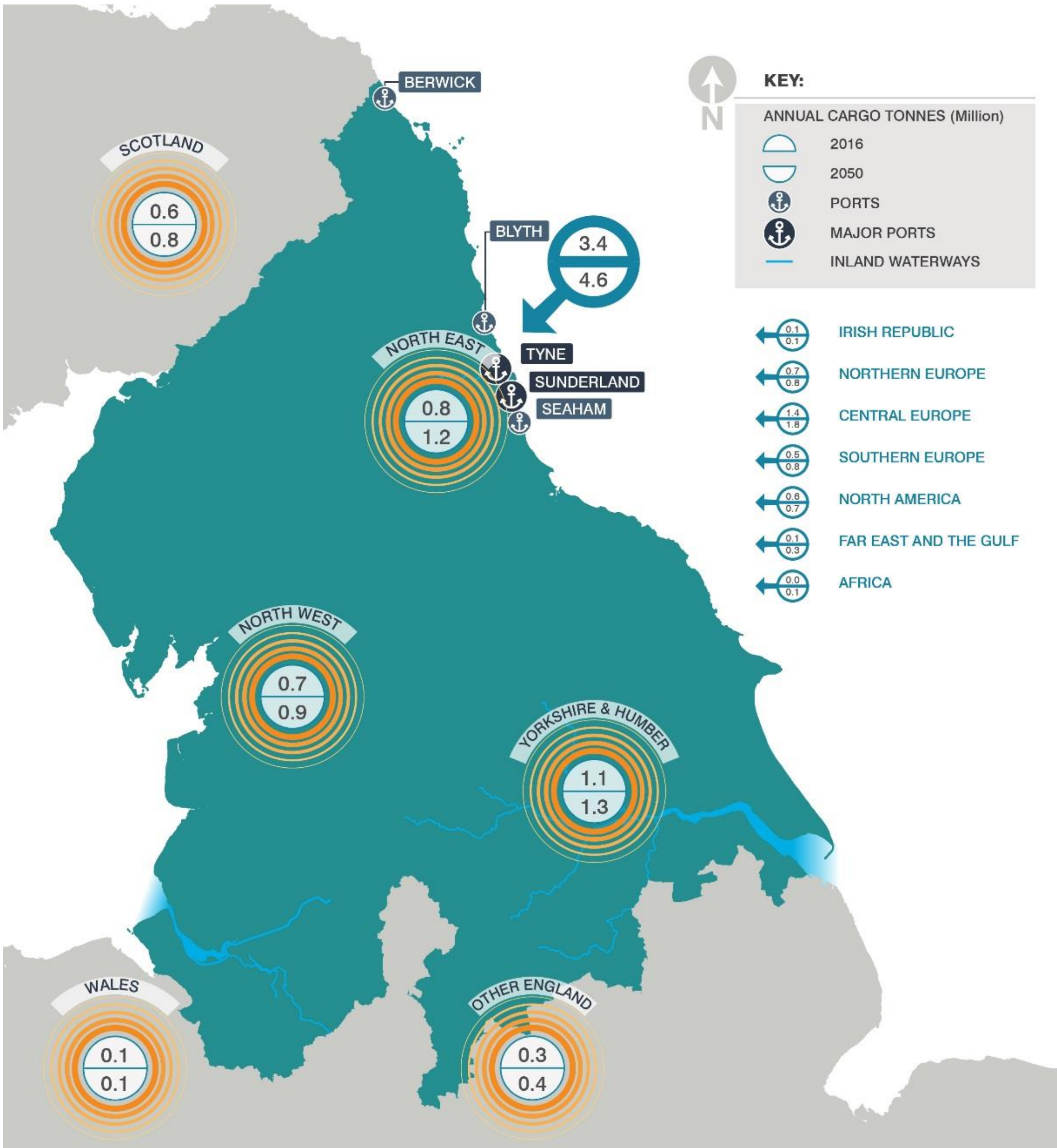


Figure 80 Tyne and Wear Ports – Imports

The freight exported via the Tyne and Wear ports is shown on Figure 81. The vast majority of this freight originates in the North-east and is headed for Central Europe.

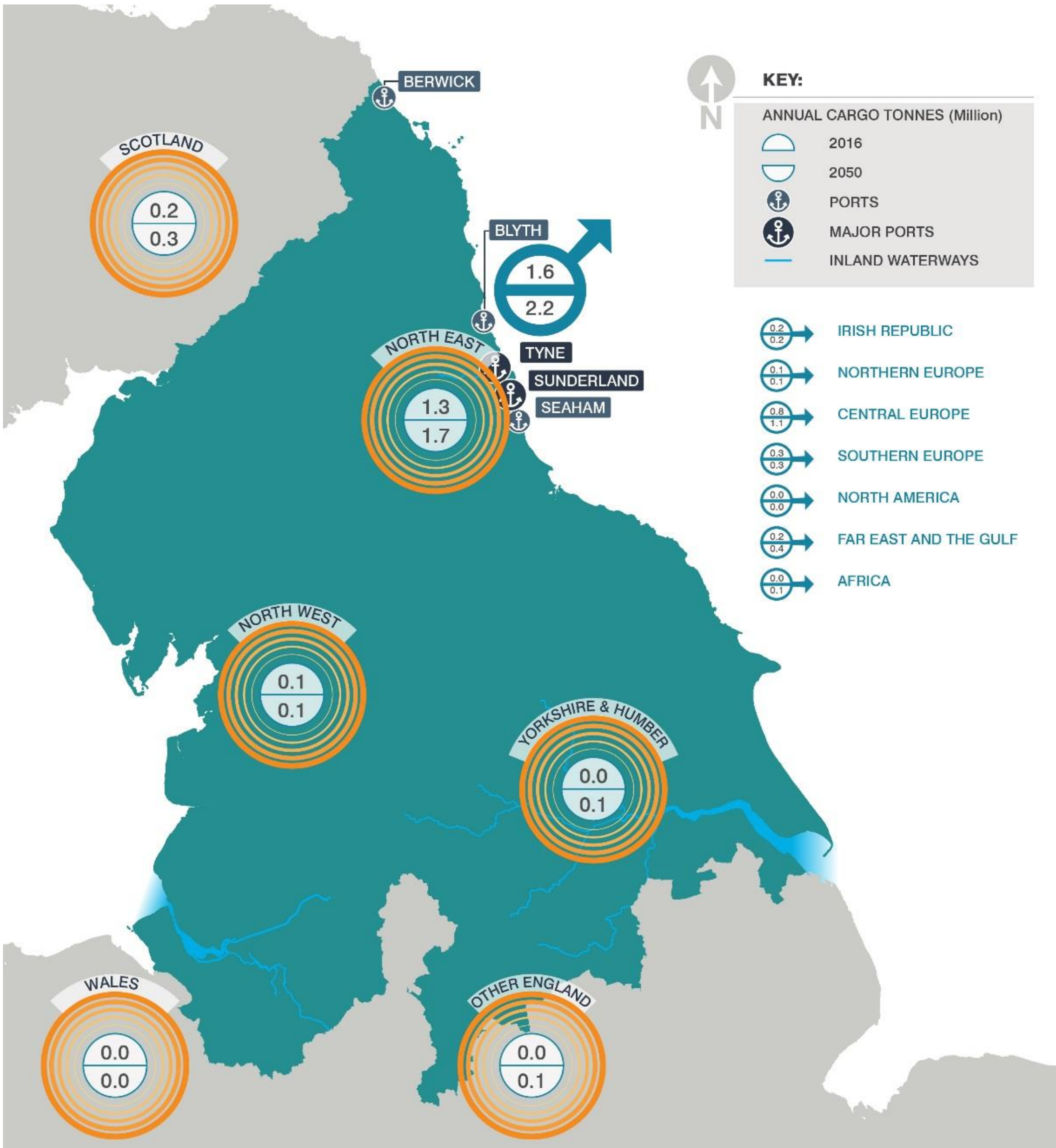


Figure 81 Tyne and Wear Ports - Exports

B2 Tees Ports

The Tees Ports group is made up of two major ports at Hartlepool and the Port of Tees.

The imports via the Tees Ports are shown on Figure 82 and illustrates that the majority of the freight originates in Northern and Central Europe, however there are also significant flows from Southern Europe. The majority of the freight imported through the Tees Ports is headed for Yorkshire and the Humber as well as the North-west. There are also significant flows to the North-east.

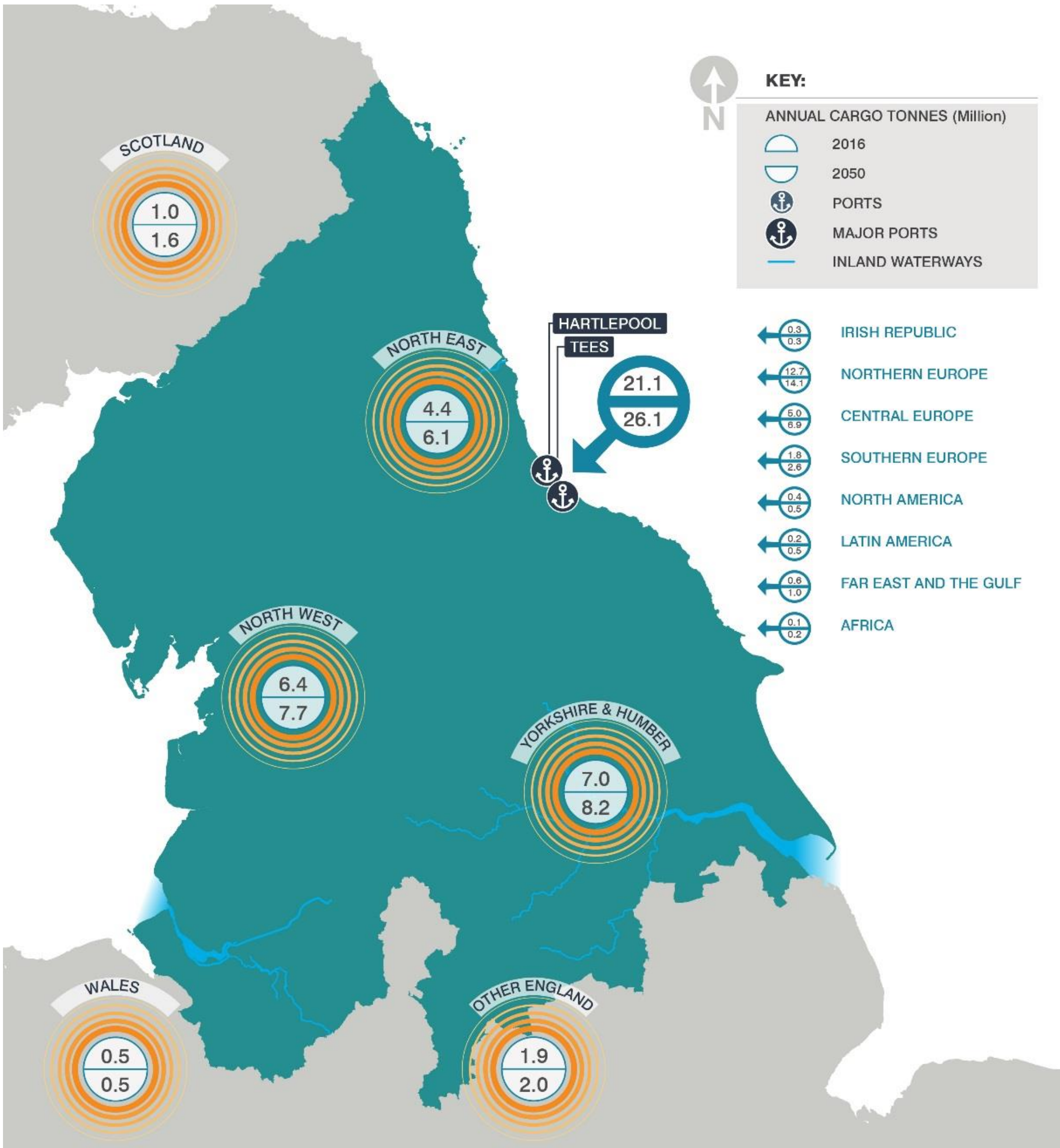


Figure 82 Tees Ports – Imports

Figure 83 illustrates the exports via the Tees Ports, the majority of which are headed for Central Europe within other significant flows to Southern Europe as well as North America and the Far East and the Gulf.

The majority of the exports shipped through the Tees originate in the North-east with other significant flows in Scotland, the North-west and Yorkshire and the Humber.

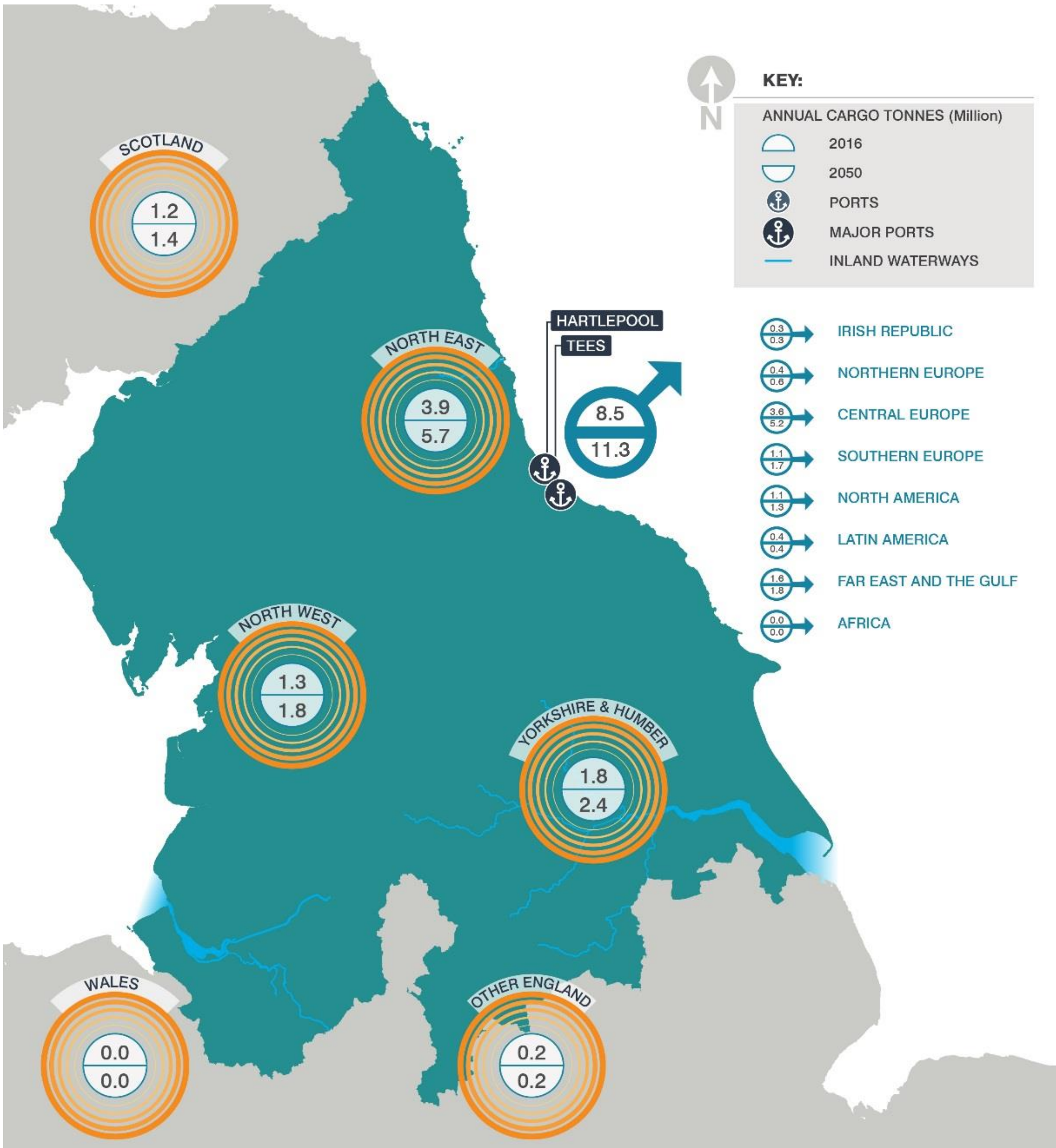


Figure 83 Tees Ports - Exports

B3 Humber Ports

The Humber Ports group is made up of three major ports on the Humber Estuary, namely the Ports of Hull, Port of Grimsby and Port of Immingham. Additional ports are found at the Humber River Wharves and Goole which is located on the Aire and Calder Canal.

Figure 84 illustrates the freight imported via the Humber and shows that the majority of the goods originate in Northern Europe. Significant other flows come from Central and Southern Europe, North America and Latin America.

Of the freight imported via the Humber, the majority is headed for the Yorkshire and Humber region however a significant proportion also heads to Southern England, out with the North completely as well as to the North-west.

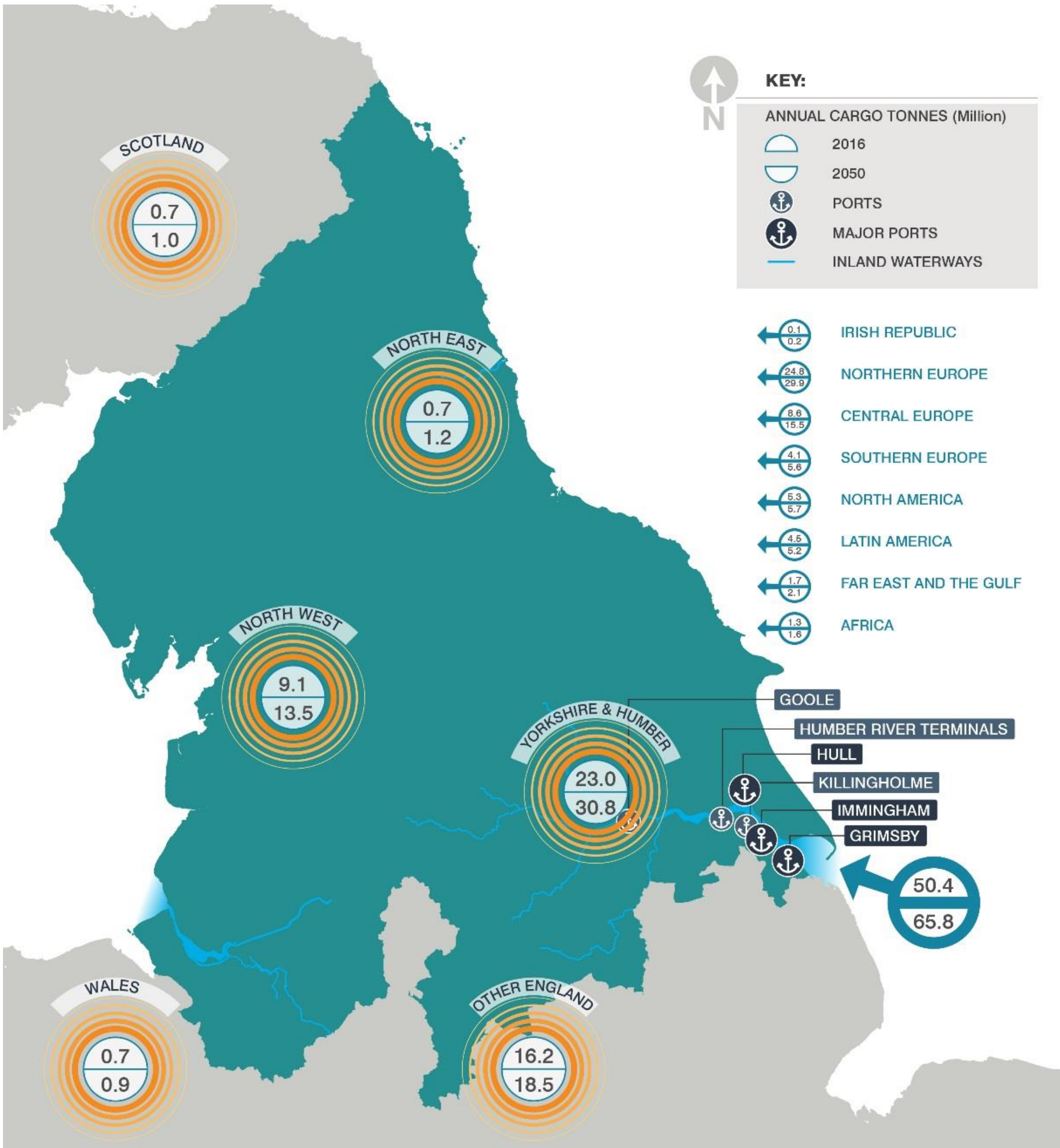


Figure 84 Humber Ports – Imports

The freight exported from the North via the Humber Ports is shown on Figure 85. The majority of the freight is exported to Central Europe with additional significant flows to Northern and Southern Europe as well as North America, the Irish Republic and Africa.

The majority of the export freight originates in the Yorkshire and Humber region however, significant flows also originate in the North-west as well as from Southern England.

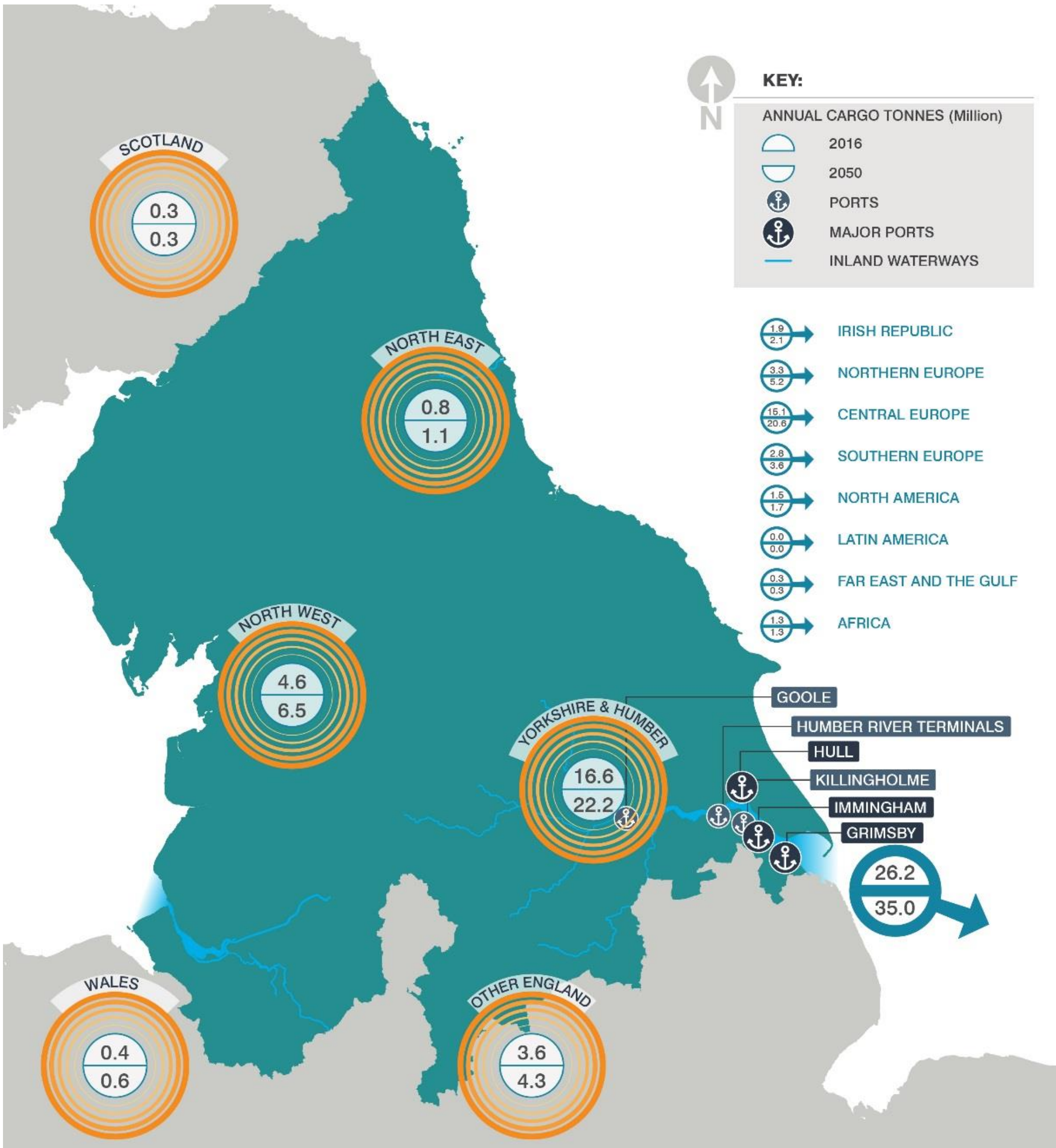


Figure 85 Humber Ports - Exports

B4 Mersey Ports

The Mersey Ports groups consists of three major ports, namely the Port of Liverpool, Port of Birkenhead and Port of Garston. There are also additional ports at Bromborough and on the Manchester Ship Canal accessed via the Mersey at Warrington and Salford.

Figure 86 illustrates the freight imported via the Mersey Ports, the majority of which originates in Northern Europe with significant additional flows from Central and Southern Europe, North America, and Latin America.

Most of the freight is destined for the North-west however there are other significant flows to the Yorkshire and Humber region as well as Southern England and Wales.

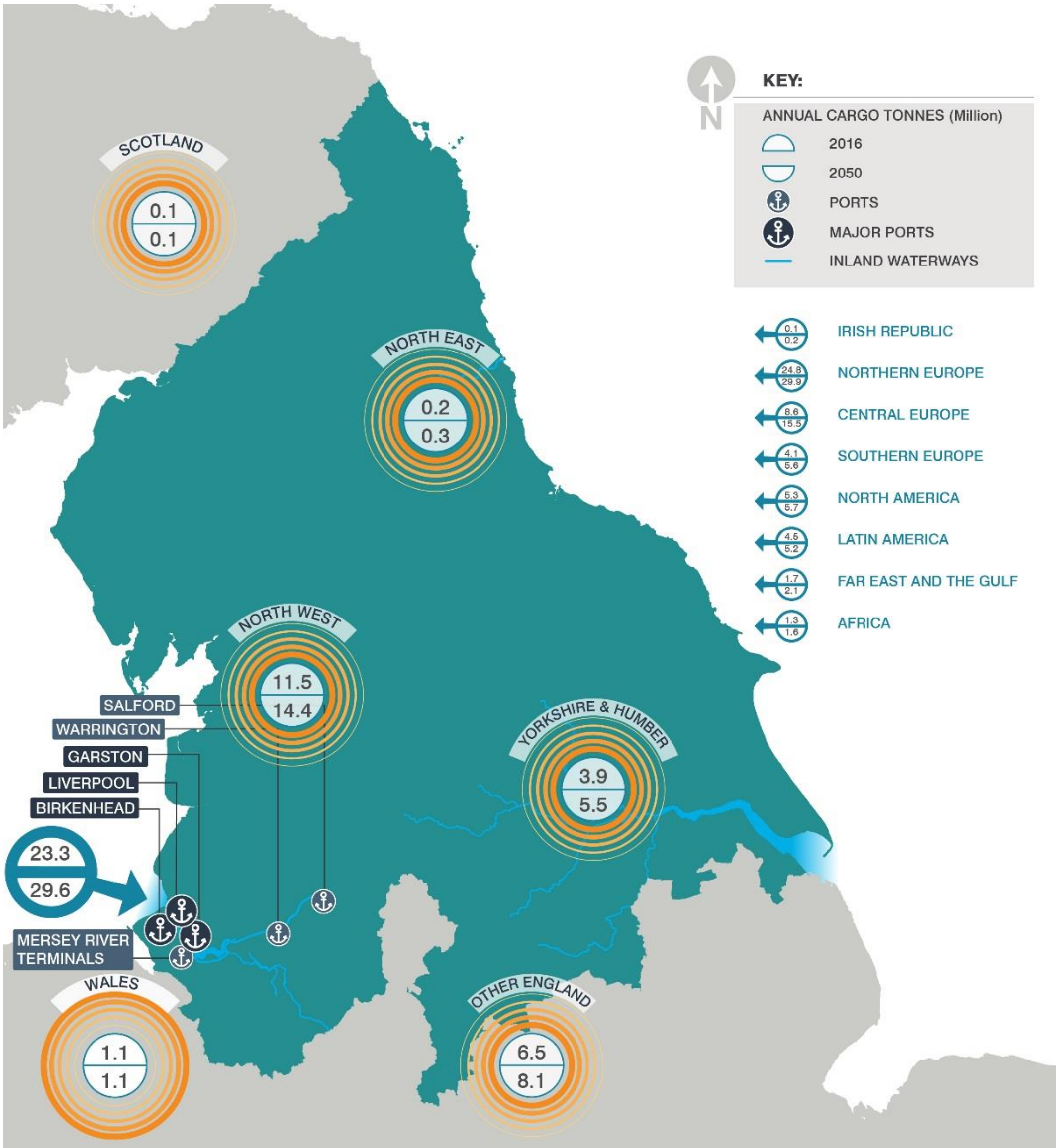


Figure 86 Mersey Ports – Imports

Figure 87 shows the freight exported via the Mersey Ports. This freight is mainly headed for Central Europe and the Irish Republic with significant other flows to Southern Europe.

Most of the freight originates in the North-west and Southern England however there are also significant flows from the Yorkshire and Humber region.

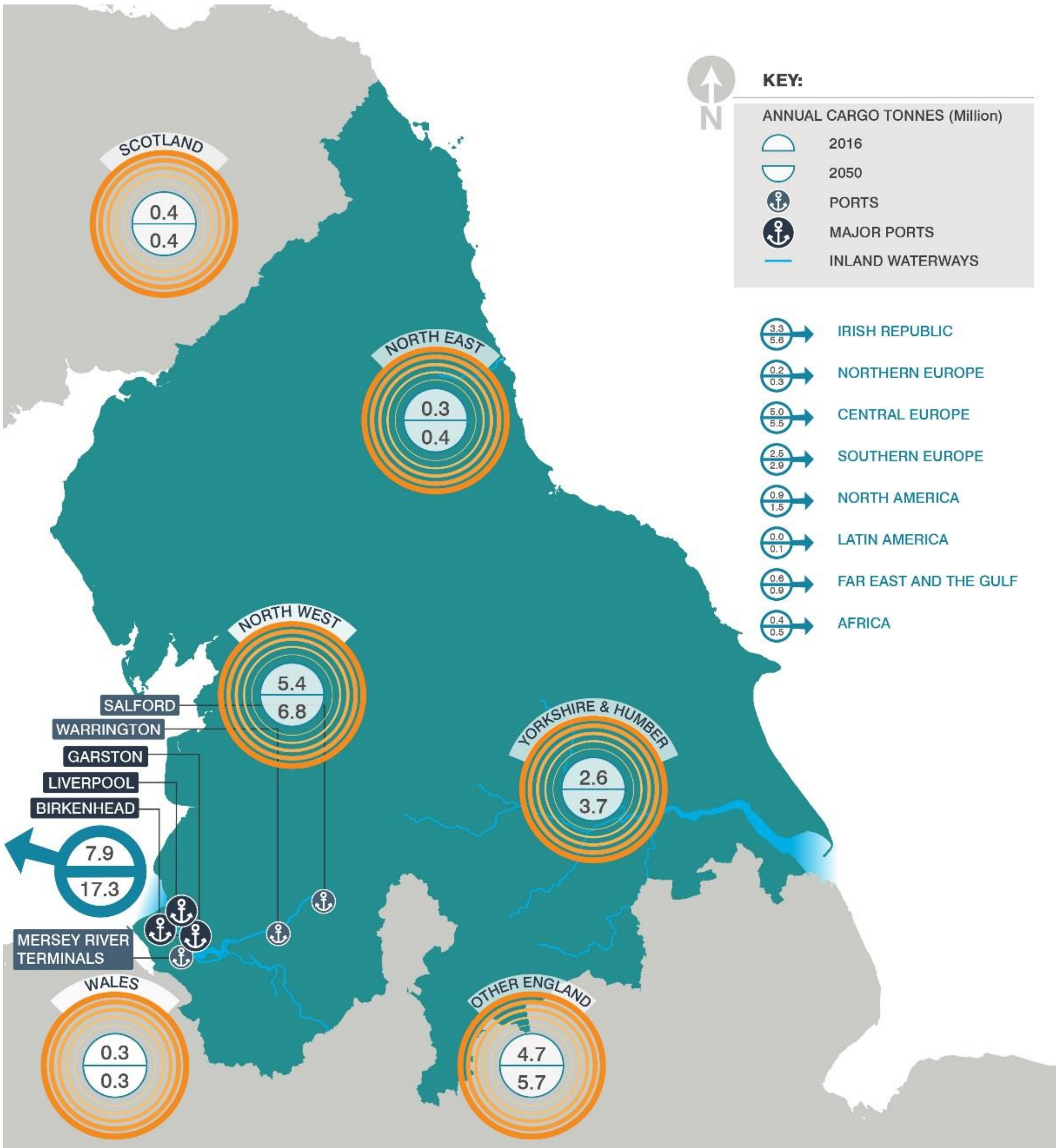


Figure 87 Mersey Ports - Exports

B5 Lancashire Ports

The Port of Heysham is the major port located within the Lancashire Ports group. Additional ports are located at Lancaster and Fleetwood.

Figure 88 illustrates that the volumes of freight imported via the Lancashire ports are less than the other Port groups with the exception of Cumbria. The majority of the freight is imported from the Irish Republic and is headed for the North-west and Scotland.

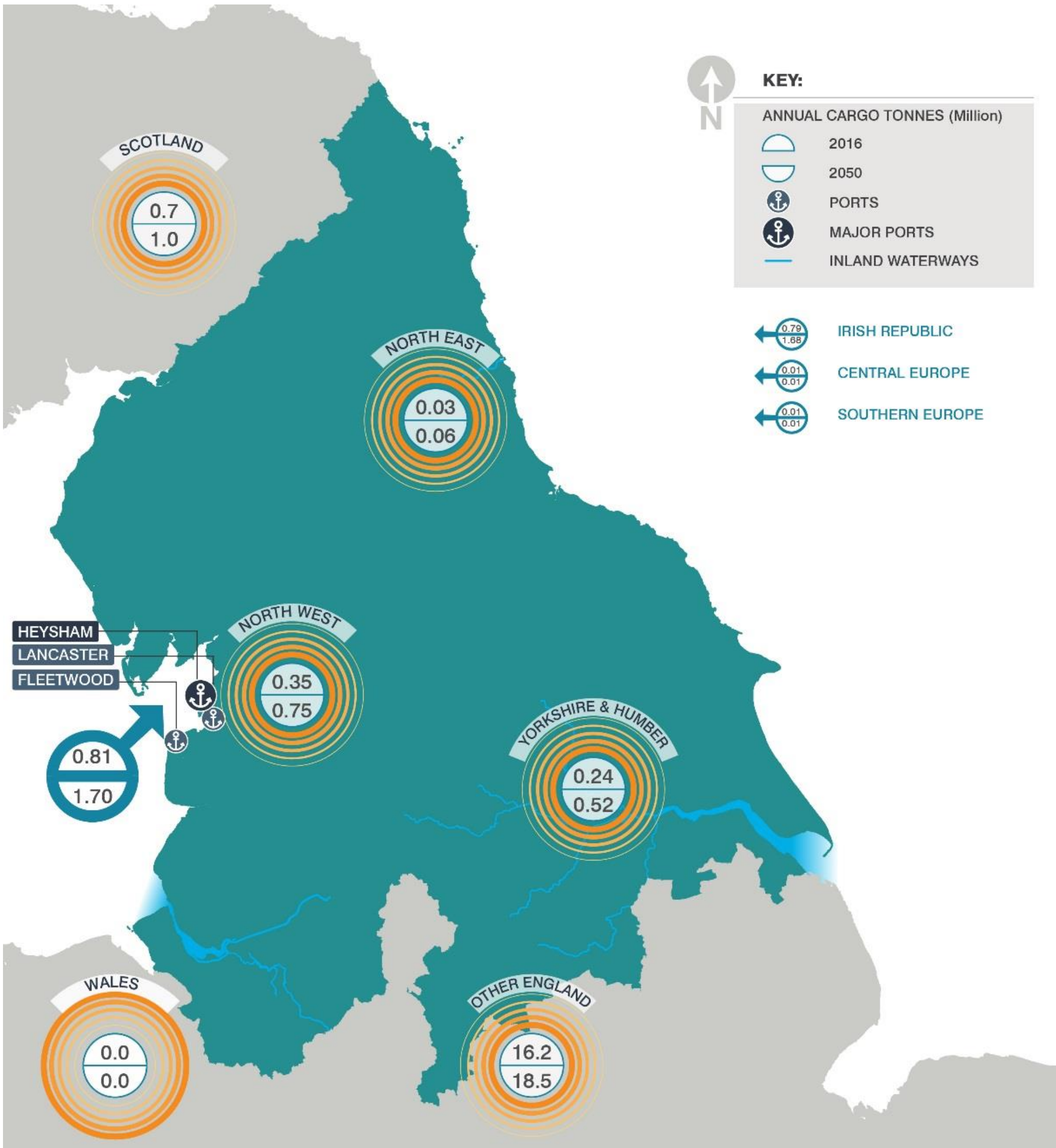


Figure 88 Lancashire Ports – Imports

Figure 89 illustrates the freight exported from the Lancashire ports, the majority of which is headed for the Irish Republic.

The majority of the freight exported originates in the North-west and Yorkshire and Humber region.

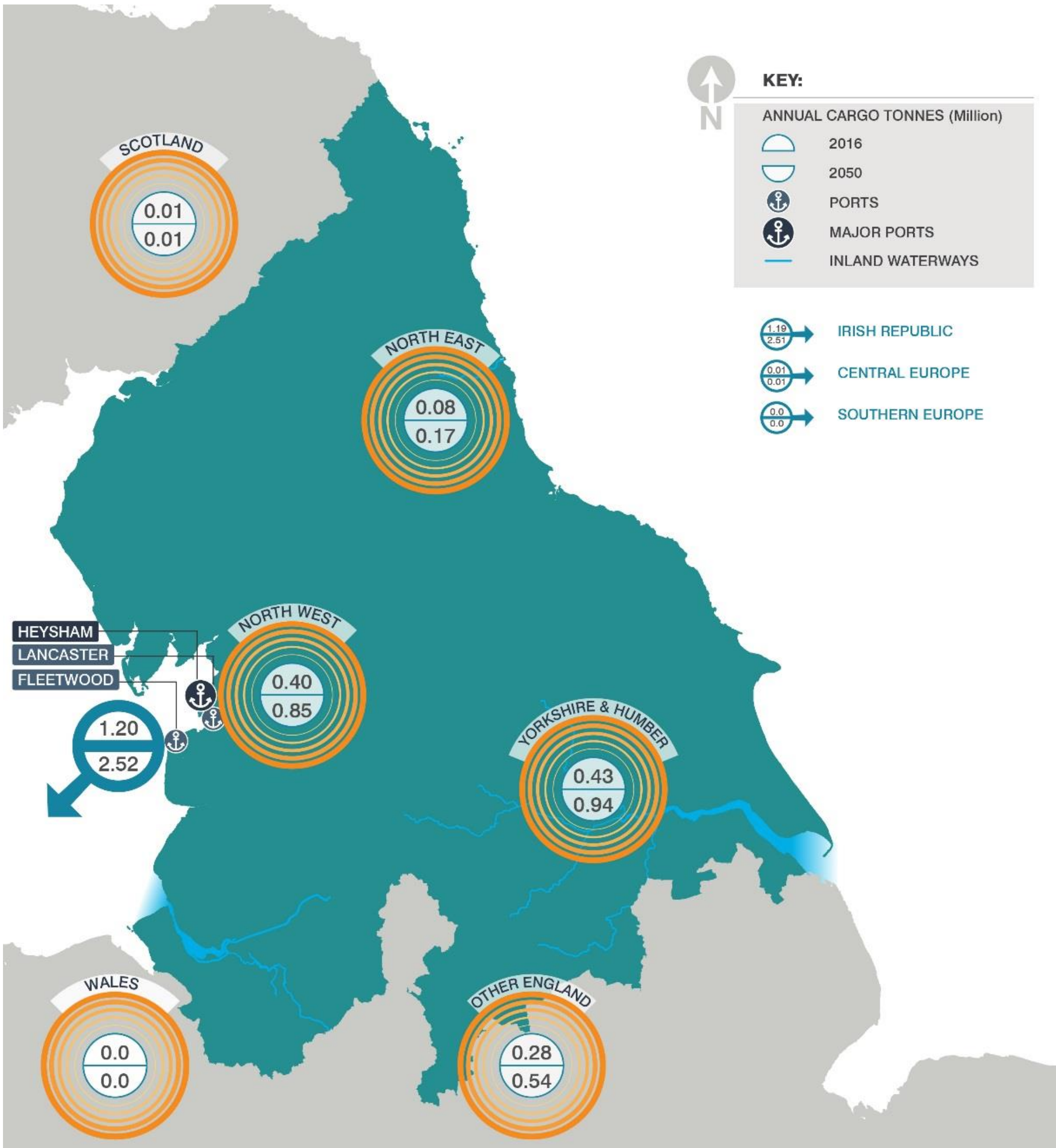


Figure 89 Lancashire Ports - Exports

B6 Cumbrian Ports

There are no major ports in the Cumbrian Ports group however there are three smaller ports located at Barrow-In-Furness, Silloth and Workington.

These ports mainly import from Africa, Southern Europe and Latin America but in small amounts in volume terms as shown on Figure 90.

The majority of the goods imported is destined for the North-west.

The Cumbrian Ports are only involved with the import of freight and as such no freight volumes are exported.

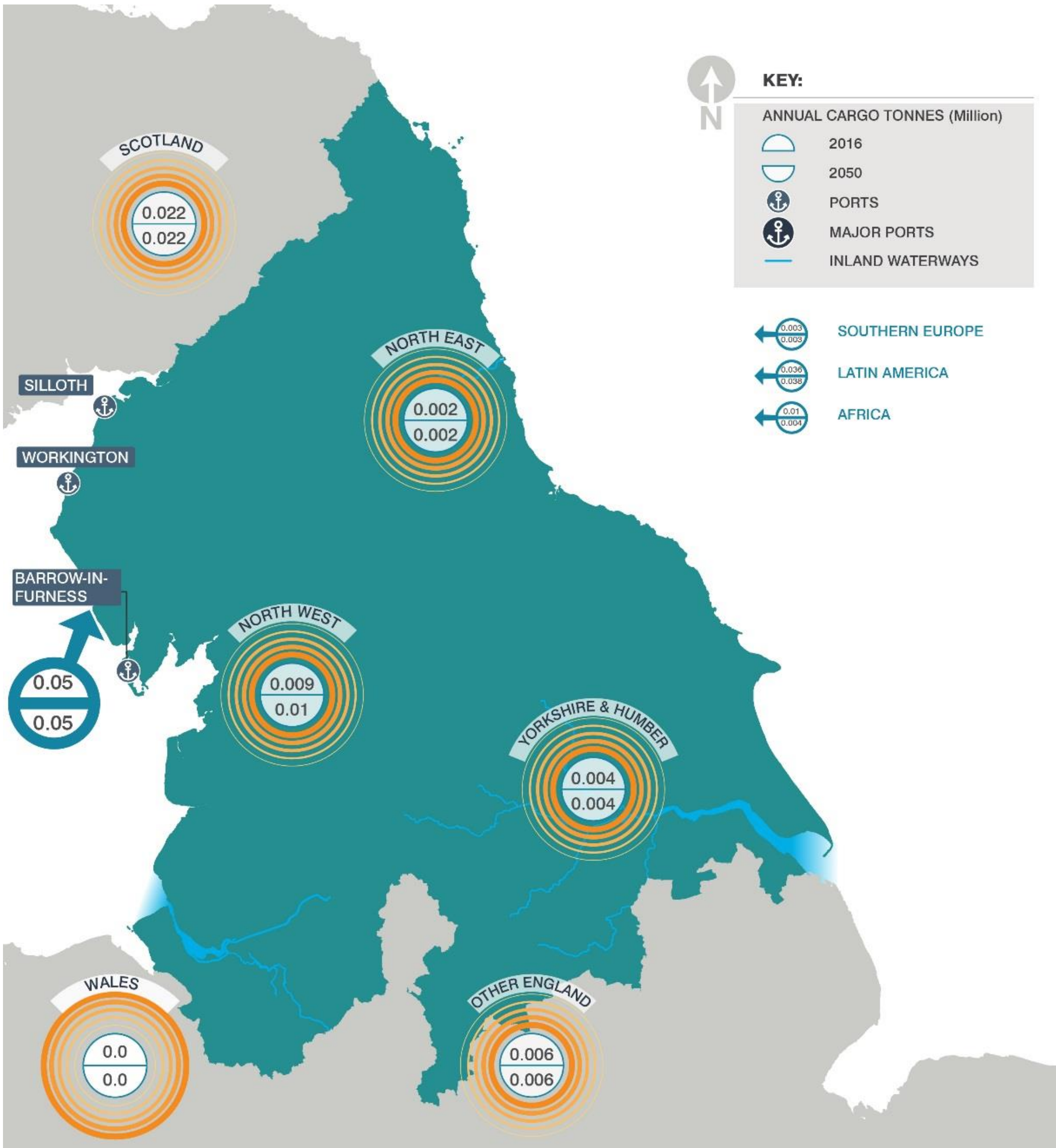


Figure 90 - Cumbrian Ports - Imports

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