KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

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Humber Shortsea Market Study

Ro-Ro & Lo-Lo Market Research in the UK-Europe Shortsea Routes in general and their interaction with the Humber Region

ABEL

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1. Executive Summary

1.1 Introduction

1. Associated British Ports (ABP) – Port of Immingham – is proposing to develop a new Roll-on / Roll-off (Ro-Ro) terminal at the Port of Immingham. This new terminal will be located in the eastern part of the existing port estate and will be known as the Immingham Eastern Ro-Ro Terminal (IERRT). Due to the capacity capability of the new terminal, it constitutes a Nationally Significant Infrastructure Project (NSIP) for which a Development Consent Order (DCO) application is being submitted.
2. The DCO application will be seeking consent for the construction of a new three berth Ro-Ro terminal with appropriate storage space on the landside area within the Port. The new facility will be used to service the commercial Ro-Ro traffic sector, with a limited element of passenger use during quiet periods.
3. For the purposes of the DCO application, ABP instructed Rebel to review and, if appropriate, confirm ABP's considered need for additional Ro-Ro terminal capacity on the Humber. This study, therefore, considers the demand for Ro-Ro capacity specifically in the context of the Humber, but also references the national position.

1.2 The shortsea unitised market

4. Ro-Ro cargo consists of wheeled cargo which can be driven on and off the ship. It is a form of unitised cargo that is used to move goods and products within the shortsea market – which, for the purposes of this report, has been taken to be trade that occurs between the UK and Europe. Ro-Ro unitised cargo can be split into:
   a. Unaccompanied Ro-Ro – where the trailer or wheeled platform containing cargo are moved by vessel without a driver or road vehicle.
   b. Accompanied Ro-Ro – where the trailer is accompanied by a driver and road vehicle between origin and destination, including on the vessel.
5. The other form of unitised cargo is Lift-on / Lift-off (Lo-Lo) – this consists of containers loaded onto and off a vessel by specialised handling equipment with containers deposited or collected from a container yard.
6. Key characteristics of the shortsea unitised sector include the requirement for shorter and more predictable transit times, the requirement for dedicated facilities and equipment and the importance of good and reliable hinterland connections.
7. Recent trends in the Ro-Ro shortsea sector include, amongst other things, the deployment of larger vessels, which in turn generates marine accessibility issues.

1.3 The historic position at the national level

8. From an analysis of historical UK shortsea demand over the period 2010 to 2021 the following trends can be noted:

a. Shortsea cargo (excl to/from Ireland) increased by some 10.8% between 2010 and 2021 to reach a total of 70.1m tonnes. This growth has been influenced by various factors including Brexit and the pandemic.

b. There is a strong bias in favour of imported goods – with these accounting for 73.2% of tonnages handled over the period. This import bias has increased over the period and results in a requirement for significant repositioning of empty equipment to Europe (both containers and trailer units).

c. Within these totals, there has been an increase in the market share of both Lo-Lo containers and unaccompanied Ro-Ro freight. The former has increased its share of total import demand from 22.8% to 28.8%, the latter from 29.2% to 32.3%.

9. The UK's unitised shortsea Ro-Ro traffic is focused on facilities located on the East Coast, the Thames Estuary and Dover. The East Coast ports (ranging from Harwich to the Firth of Forth) have gained shortsea market share – increasing from 34.4% to around 41% of the UK's shortsea unitised port volumes over the last decade.

1.4 The historic position on the Humber

10. Between 2010 and 2021 total shortsea demand at the Humber ports increased by 38.9% to reach 17.0m tonnes.

11. Unaccompanied Ro-Ro freight is by far the most important category and accounts for around 57.7% of Humber shortsea import volumes. In common with the UK as a whole, the strongest growth has been in the unaccompanied Ro-Ro and Lo-Lo sectors, with accompanied Ro-Ro recording only limited growth.

12. The market share of East Coast ports has remained fairly constant over the 2010 to 2021 period, growing from 42.2% to 50.9%. The Humber market share of total UK trade (excluding Ireland) has increased from 19.4% to almost 24.3%.

13. For unaccompanied Ro-Ro, the Humber market share as a proportion of the East Coast UK market is currently 61.4% and some 46.0% of the total UK trade (excluding Ireland).

14. It is apparent that the Humber represents a vital national gateway for the unaccompanied Ro-Ro sector and has more than maintained its national importance in this sector.

1.5 Requirements of a Ro-Ro facility

15. The overarching requirement for a successful Ro-Ro facility is that it is located where the market wants it to be located and that it benefits from reliable and efficient hinterland connections. In addition, in what is a highly competitive industry, key aspects of successful facilities are:

(i) the provision of dedicated infrastructure to provide certainty for Ro-Ro operators;

(ii) the provision of sufficiently large storage areas, particularly for unaccompanied cargo which requires a greater area than other shortsea cargoes;

(iii) the ability to accommodate large deep draught vessels, and

(iv) the provision of infrastructure flexibility to enable various types of Ro-Ro vessels to be handled.

16. The shortsea Ro-Ro facilities on the Humber are located at the ports of Immingham, Killingholme and Hull.

1.6 Shortsea Shipping Structure

17. There has been a continuing trend for shortsea operators to deploy larger Ro-Ro vessels in a search for economies of scale and in order to maintain schedules in a period of expanding demand. Terminals with deeper berths that do not require lock access enjoy an advantage over smaller and marine access constrained terminals. This is an important consideration in defining the competitive position of a particular port in terms of handling Ro-Ro cargo. Specifically:

a. Typical capacity or Ro-Ro vessels deployed on the UK-Europe routes has increased from between 2000 - 3000 lane metres (with 7.5m draught) in the late 1990s to a current level of around 5400 - 7800 lane metres (with 7.1 - 8.2m draught) for vessels delivered in the period since 2018.

b. Increased capacity has been delivered by longer and broader vessels. There have been only limited increases in the design draught of vessels over the same period as a result of the volume-limited nature of Ro-Ro operations.

c. It is considered unlikely that there will be further large increases in Ro-Ro vessel capacity in the coming years as the largest vessels currently deployed present a realistic compromise between economies of scale, flexibility of deployment and frequency of services. It is considered unlikely that Ro-Ro capacity will exceed a maximum of around 8,000 lane metres on the North Sea trade routes.

1.7 Humber Shortsea Services

18. Each of the facilities on the Humber serve a different traffic mix and client profile, namely:

a. The Ro-Ro facilities at the Port of Immingham mainly serve DFDS which operates two Ro-Ro terminals in the port (the berths on the ‘in-dock’ Dockside Terminal and berths on the ‘in River’ Riverside Terminal). Since 2022, Stena Line has also undertaken operations from another temporary terminal with a berth in the ‘in-dock’ area.

b. The Ro-Ro facility at Killingholme is operated by CLdN Ports. Its main client is CLdN (Cobelfret) which is closely tied to CLdN Ports as a company. The facility also supports a Stena Line service.

c. P&O and Finnlines carry out operations from the Port of Hull. Mostly accompanied Ro-Ro traffic is handled by P&O, which requires little storage space as the trucks leave the port shortly after docking and arrive just before departure.

19. The frequency of vessel calls places a strain on berth capacities. From an analysis of shipping schedules it is conclude that, effectively, three berths (increasing to four on occasion) berths are needed at Killingholme for the CLdN and Stena Line services, four berths are needed for the DFDS services and one berth for the Stena Line service at Immingham just to ensure all existing services can maintain their intended current sailing schedules.

1.8 The Competitive Position of Humber ports.

20. The primary driver of a port's competitive position is the overall transportation costs of using the port versus other facilities. 'Overall costs' means the built-up costs of using a port from the origin of the cargo to its final destination – i.e., inland costs + shipping costs + port/stevedoring costs + final delivery charges.

21. Cities such as Manchester, Liverpool, Leeds and Sheffield are located in the direct hinterland of the ports on the Humber. In addition to these markets, the Humber ports are very well located to serve other areas in the North of the UK and the Midlands.

22. The Humber has a clearly defined captive hinterland based on a competitive logistic cost assessment for trades to North West Europe, Scandinavian and the Baltic. The ports on the Humber have transport cost advantages over other UK ports for key markets such as Liverpool, Manchester, Sheffield, Leeds and parts of Yorkshire and the Midlands. From the analysis provided in this report, the Humber ports provide the cheapest route for shortsea cargo for over 35.5% of total national demand based solely on comparative total transportation costs.

23. Parallel analyses have also been undertaken for other major European and Scandinavian regions and this indicates that the facilities on the Humber are highly competitive on a cost basis for unaccompanied Ro-Ro traffic to/from these other major trading regions of continental Europe.

24. Emissions from transportation also have to be taken into account for a broader societal and economic assessment. Once carbon pricing is fully included in transportation costs, the Humber ports would be even cheaper for key markets such as Liverpool, Manchester, Sheffield, Leeds and parts of Yorkshire and the Midlands in comparison to the other ports considered in the analysis undertaken.

1.9 Forecast National and Humber demand

25. A review of macro-economic forecasts for the UK has been undertaken and these have been used to drive an assessment of future demand for the shortsea sector of UK trade. Use of GDP projections provides a well-grounded assessment of the

main forces driving demand and a core consensus view of developments has been used[1].

26. The period since the end of 2019 has been atypical due to the Covid measures adopted by the UK Government but, for the purposes of the analysis, it is assumed that this period is now passed with trade primarily driven by economic expansion and the remodelling of trade with the EU following Brexit. The inclusion of the Humber region in the UK Government's Freeport policy also provides grounds for further potential upside on these core forecasts.

27. Overall, UK shortsea trades are expected to grow in line with GDP developments in the years to come. The Compound Annual Growth Rate (CAGR) for UK's shortsea tonnage in the periods 2022-2027 and 2028-2032 are respectively 2.3% and 1.5%. After a period of readjustment of trade resulting from Covid and new custom arrangements, it is envisaged that the macro-economic relationship with trade will be re-established.

28. The share of accompanied Ro-Ro traffic is set to further decline. The share is expected to decline from 38.9% currently to 34.1% in 2032. With increased capabilities for logistical planning, unaccompanied freight will gain market share. Unaccompanied trades and Lo-Lo traffic will grow in line with each other. In particular, on the import side unaccompanied trailers will increase their dominant position due to competitive delivery times.

29. Unaccompanied Ro-Ro is expected to continue its strong growth with a CAGR for this trade of 3.6% in the period 2022-2027 and 2.0% in 2028-2032. The combination of short time to market and no requirement for a driver during the crossing are drivers behind the continued growth.

30. Lo-Lo is also expected to keep growing for parallel reasons. The trade is expected to have a CAGR of 2.8% in the period 2022-2027 and 1.8% in 2028-2032.

31. The ports in the East of the UK (ranging from Harwich to the Firth of Forth) handle the majority of the UK's shortsea trade with Europe in both the unaccompanied Ro-Ro and Lo-Lo segments. The ports in the East of the UK handle between 70%-80% of the UK's shortsea trades in these categories. Accompanied movements are primarily routed over South UK ports (in particular via Dover).

32. Unaccompanied Ro-Ro traffic is expected to see continued and strong growth as a consequence of the set of drivers detailed in this report, including a general shift toward unaccompanied traffic, a move away from the southern ports to the northern ports and as a consequence lower emissions to key markets in the hinterland of the Humber.

33. The facilities on the Humber are ideal for serving the captive hinterland of the central and northern parts of the UK. Clear growth is, therefore, predicted for the unaccompanied Ro-Ro segment in the Humber region. Ro-Ro units are predicted

[1] April 2022 UK Government summaries of consensus UK GDP forecasts have been used for 2022 and 2023, with longer term trend assessments utilised for the remainder of the forecast period. This is also a Government -accepted approach to demand forecasting.

to have a CAGR of 4.5% in 2022-2027 and a CAGR of 2.3% in 2028-2032 (in comparison to 3.5% in 2012-2021). The CAGR between 2032 and 2050 is expected to be 1.5%. Growth in the short term in terms of tonnage is lower having a CAGR of 4.2% in the period 2022-2027, 2.3% in 2028-2032 and 1.5% in 2032-2050. The market share of unaccompanied Ro-Ro on the Humber is just above 60% and expected to remain stable.

34. Accompanied Ro-Ro traffic in the region will remain the smallest of the shortsea traffic flows. Growth is predicted to be relatively modest (CAGR (in units) for this trade of 2.8% CAGR in terms of units in the period 2022-2027, 1.7% in 2028-2032 and 1.4% for 2032-2050. As a result, this category will continue to lose market share in the future.

35. Albeit in smaller volumes, the Humber facilities will also see increased shortsea Lo-Lo traffic. The Humber is well placed for this sector in relation to key centres of production and consumption.

1.10 Supply/Demand Development in the Humber

36. Unaccompanied Ro-Ro and Lo-Lo trades will take up the growth in shortsea trade for the UK. The East of the UK will accommodate the majority of this growth, with shortsea trade moving to ports closer to their end destinations and origins. The growth in the number of unaccompanied trailers is predicted to be higher than the underlying growth in the UK's shortsea tonnage.

37. Although the position very much depends on the specifics of each situation, in general, volatility in supply chains has increased over the past three years. An increase in dwell time of e.g. one further day requires additional storage space and reduces the capacity of the facility. On the basis of any consideration, there is little spare capacity for unaccompanied Ro-Ro cargo storage within the existing Humber facilities if volatility results in increased dwell times in the future.

38. Ro-Ro facilities on the Humber that handle unaccompanied Ro-Ro freight are, therefore, expected to see sustained demand. On the basis of the analysis detailed in this report, the existing storage capacity for unaccompanied Ro-Ro trailers is, however, expected to be exceeded at somepoint in the period 2024 to 2026 – depending upon the macro-economic scenario being considered.

1.11 Conclusion – the need for additional Ro-Ro capacity on the Humber

39. The port facilities on the Humber are ideally placed to serve the growing demand in unaccompanied trades generated by the location's captive hinterlands and other large parts of the UK. The proximity of the Humber port facilities to these markets and the logistic cost advantage are key drivers for this demand. Use of the Humber will also result in a reduction in the overall emissions generated by the shortsea trades, the Humber is the best option for routing the cargo to/from these regions.

40. A clear growth is expected for the unaccompanied Ro-Ro segment in the Humber. This is driven by overall growth in shortsea trades in the post-Covid period. In

addition, a shift to unaccompanied Ro-Ro trades, and the good position of the Humber facilities will further drive this growth.

41. Capacity in the Humber for unaccompanied Ro-Ro will be exceeded in the next few years under all realistic scenarios that have been considered. Storage capacity and space for additional services will be limiting further growth. Berthing windows for preferred timeslots at preferred facilities are limited. Operators have a strong preference for having a dedicated berth or berths to make sure they can offer the right service levels to remain competitive. The in-dock facilities have limitations in the vessel sizes that they can handle.

42. Without the provision of new capacity, trade will be constrained and/or routed over ports located further away from the key markets in the captive hinterland of the Humber adding to the overall transportation costs and emission levels.

43. There is, therefore, a clear demand for additional appropriate Ro-Ro freight capacity on the Humber Estuary.

2. Introduction

2.1 General Context

44. Associated British Ports (ABP) – Port of Immingham – is proposing to develop a new Roll-on / Roll-off (Ro-Ro) terminal at the Port of Immingham. This new terminal will be located in the eastern part of the existing port estate and will be known as the Immingham Eastern Ro-Ro Terminal (IERRT). Due to the capacity capability of the new terminal, it constitutes a Nationally Significant Infrastructure Project (NSIP) for which a Development Consent Order (DCO) application is being submitted.

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2.2 Immingham Eastern Ro-Ro Terminal

46. The DCO application will be seeking consent for the construction of a new three berth Ro-Ro terminal with appropriate storage space on the landside area within the Port. The new facility will be used to service the commercial Ro-Ro traffic sector, with a limited element of passenger use during quiet periods.

47. The shortsea unitised cargo market (which for the purposes of this report is taken to be the trade in unitised cargo in the form of an HGV trailer or container that occurs between the UK and Europe), of which Ro-Ro trade forms a part, has changed as a result of various factors including a different trade relationship between the UK and Europe, a shift in global trade relations, the pandemic and structural problems in the logistic sectors both in the UK and Europe. A shift from accompanied Ro-Ro (where the driver and tractor unit stays with the cargo as it is transported on the vessel) towards unaccompanied Ro-Ro and Lift on-Lift off (Lo-Lo) (where the trailer or container is transported on its own) has resulted in a different traffic profile. This includes shifts in both trade volumes and growth in trade at facilities in the East of England, changes in modality as well as a geographical shift northward. An analysis of the impact of these trends is provided by this report and which forms the basis for an assessment of the need for additional Ro-Ro capacity.

2.3 Study Structure

48. This report first assesses the broader shortsea unitised cargo market trends at the national level, then focuses on the east coast as a whole before then providing a detailed consideration of the Humber market. The study only considers the shortsea unitised segment and no other cargo segments. Projections have been prepared under different macro-economic scenarios through to 2050 – thereby matching the timeframe over which national port freight forecasts have been prepared by the Department for Transport (DfT). The study clearly confirms the need for additional Ro-Ro terminal capacity in the Humber region. Figure 2-1 provides an overview of the approach.

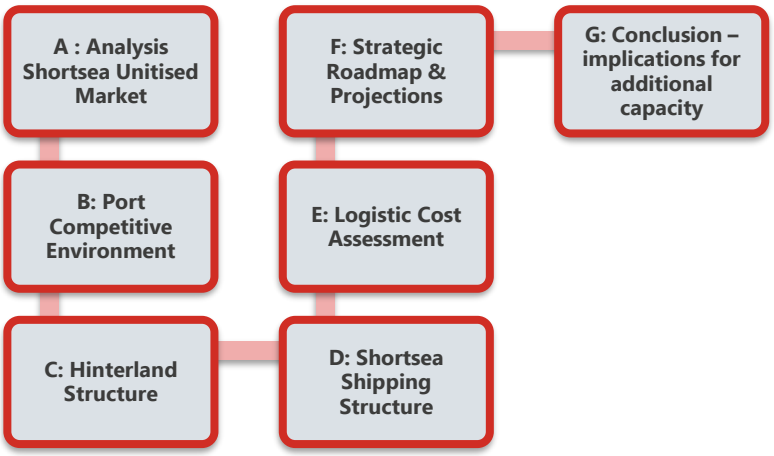

Figure 2-1 Overview of steps in the analysis

49. This basic approach has been modified and refined in the light of a number of different issues which are of relevance, including:

a. Changes in the balance of modalities – i.e., the relationship between accompanied and unaccompanied Ro-Ro traffic and also the role of shortsea Lo-Lo (Load on-Load off) containers in these markets.

b. The development of Ro-Ro vessels – the size and types that can be anticipated on the North Sea routes, and broader regional markets, and the impact of these developments on terminal location and design.

c. The impact of various stimuli such as the Government's Freeports and 'Levelling-Up' agendas on potential demand development on the Humber.

d. Environmental benefits associated with re-routing Ro-Ro traffic from southern ports. These benefits are quantified in general terms within the analysis.

e. Intrinsic factors such as an anticipated reduced availability of HGV drivers and the implications for diversion of trade to a northern hub.

3. Shortsea Unitised Market: Humber & the UK

3.1 Introduction

50. This section considers the shortsea unitised market, and in doing so focuses on the following:

a. Overall market trends and analysis of the UK shortsea unitised shipping market.

b. Historical demand overview for the UK (2010-2021 import and export) for-

i. Accompanied Ro-Ro.

ii. Unaccompanied Ro-Ro.

iii. Shortsea Lo-Lo containers (including analysis on filtering out feeder volumes).

c. Overview of European trading partners.

d. Overview of shortsea unitised trade commodities

e. Historic demand overview for Humber terminals (2010-2021 import and export)

3.1.1 UK shortsea port sector

51. The UK's unitised shortsea market covers the trade that occurs between the UK and Europe. Trade with other parts of the world are considered to be deepsea trades.

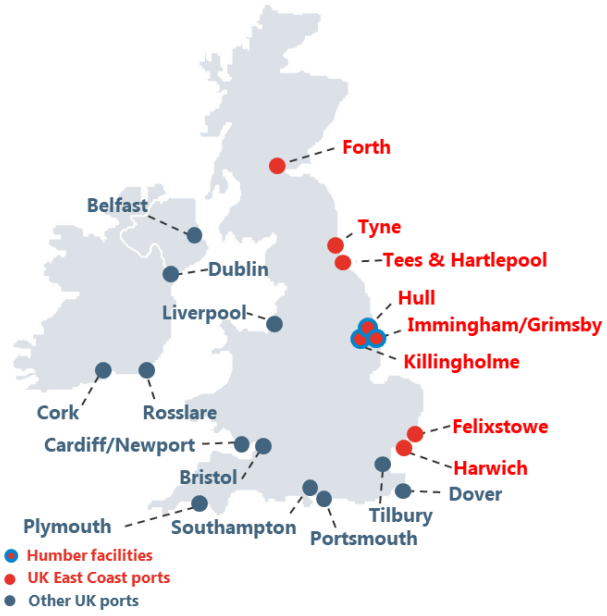

Figure 3-1 Overview of key ports in the UK and Ireland

52. The UK shortsea unitised market is effectively served by three separate clusters of ports:

a. **East Coast ports** – These ports connect mainly the north and central parts of the UK to North-West Europe, Scandinavia and the Baltics primarily. This port cluster includes the ports located between Harwich and the Firth of Forth.

b. **South Coast ports and the Thames estuary ports** – These connect the UK mainly to France with some additional linkages to Southern Europe.

c. **West Coast ports** connecting Britain with both Ireland and Northern Ireland.

53. This study considers the East Coast ports cluster. Shortsea port facilities for unitised cargoes include Ro-Ro facilities and Lo-Lo terminals. Both the Ro-Ro facilities and the Lo-Lo terminals can serve shortsea cargo vessels typically in the range of up to 2,000 TEU capacity.

3.1.2 Shortsea type of transport

54. The shortsea unitised market can be sub-divided into two separate cargo flows:

a. **Roll-on/Roll-off (Ro-Ro):** Consists of wheeled cargo which can be driven on and off the ship. Ro-Ro vessels can also carry some containers on board in addition to the Ro-Ro cargoes. Within the shortsea Ro-Ro market volumes are subsequently split between:

a. **Ro-Ro Accompanied:** A driver accompanies the cargo during the complete journey and drives the cargo on and off the ship. This makes for a relatively fast transit time. However, the transportation costs are higher due to various factors including the additional driver costs.

b. **Ro-Ro Unaccompanied:** The cargo is left at the embarkation port, is driven onto the ship by stevedores and transported by vessel to the port of destination without a driver or road vehicle. Once the cargo has arrived at the port, it waits to be picked up by a driver to then be taken to its hinterland destination. These flows can be further broken down into cargo transported in the trailers the customer places it in and cargo which is placed onto a wheeled platform at the port and then wheeled onto and off the vessel.

b. **Lift-on/Lift-off (Lo-Lo):** Consists of containers which are loaded or unloaded on ships with either on-board cranes or dockside cranes. The European Lo-Lo volumes are split between shortsea and feeder volumes. Feeder volumes comprise deepsea containers which are transported to large European ports (e.g., Rotterdam, Antwerp) on large deepsea vessels before being forwarded via smaller feeder vessels to the end destination. In contrast shortsea volumes represent direct trade between European countries. Lo-Lo vessels are only carrying containers and are not capable of transporting Ro-Ro cargoes.

3.1.3 Key characteristics of the shortsea sector

55. The shortsea unitised sector is different from the deepsea container sector and feeder markets. Intra-Europe distribution of cargoes are frequently focused on

logistics that require frequent and reliable services. Key characteristics of the shortsea unitised sector include:

a. **Shorter transit times:** Shortsea customers expect shorter and more predictable transit times than in the deepsea sector. Shortsea services sail more frequently than, for example, feeder services on the same connection. This requires short turnaround times at each port otherwise delays may occur as a result of missing berthing windows leading to a failure to meet specified timetables. Such unpredictability would result in a more ad-hoc nature of delivery and pick-up of the cargo from the terminals – which would cause significant issues for customers.

b. **Shortsea trades use different types of containers and equipment:** Shortsea traffic often uses HGV and 45' pallet-wide containers. This is in contrast to the 40'or 20' containers which dominate the deepsea sector. This results in a requirement for some different terminal handling equipment in comparison to deepsea or feeder container terminals.

c. **Dedicated facilities needed**: Dedicated facilities are required for Ro-Ro traffic in order to prevent the occurrence of bottlenecks and ensure high service levels. In this regard, a suitable berth has to be available when required – particularly in respect of regular liner service sailings with relatively short turn-around times. In addition, the facility has to be able to ensure that all HGVs can arrive at or leave the terminal in an efficient way, or that they can be temporarily stored.

d. **Low margins and strong competition**: The shortsea sector is characterised by strong competition with multiple lines and ports serving the same routes. With few ways to differentiate from each other this results in lower margins and a strong focus on cost reductions and quality of service.

e. **Strong focus towards cargo owners:** In the shortsea market the direct relationship between cargo owners, trailer operators and the shipping lines is much stronger than in the deepsea shipping market. This influences the dynamics of a terminal and hence logistics costs. The parties work closely together requiring high service levels with flexible operations and short transit times.

f. **Hinterland connectivity:** In the shortsea shipping market the efficiency and ease of moving the cargo to and from the terminal is more important than for deepsea containers. The length, quality and reliability of hinterland connections are vital to the provision of effective operations. Ideally a trailer operator aims to return the trailer after delivery for the next service. Reducing this transit time optimises the utilisation of the equipment.

3.1.4 Trends in the shortsea sector

56. The shortsea sector has experienced the following trends in recent years:

a. **Increasing vessel sizes with larger calls:** There is an ongoing trend for shortsea operators to deploy larger vessels for both Ro-Ro and Lo-Lo trades. This in turn impacts cargo parcel sizes and results in lower shipping costs per

unit of cargo handled. Terminals benefiting from deeper alongside berth depths and lock free access (thereby removing any vessel beam restriction) enjoy an advantage over shallower and access restricted terminals.

To overcome such marine accessibility issues some shortsea operators have increased the frequency of services to handle growth in demand, albeit that this in turn can generate other capacity issues with supporting landside infrastructure and increased pressure on the efficiency and reliability of services.

The increasing size of Ro-Ro vessels is considered likely to result in certain current in-dock marine restricted facilities in the future losing their ability to handle Ro-Ro cargo. In such a scenario new, unrestricted capacity, will be required simply to ensure the status quo.

b. **Popularity of nearshoring drives shortsea segment:** The pandemic highlighted the advantages of more reliable and resilient supply chains, mostly realised via more local production. This trend is combined with an increasing move to “Just-In-Case” sourcing models where larger inventories are kept to ensure the availability of sufficient raw materials and components. This will provide an additional stimulus to growth in the shortsea segment in the short term although in the medium-term considerations relating to cost efficient sourcing may again become important.

c. **Environmental focus:** With an increased focus on environmental issues, ‘green’ initiatives are and will continue to be marketing factors and it is considered that they could well become a requirement for some cargo owners. In general terms, shortsea shipping produces less emissions on a per mile basis for transporting goods in comparison to road transport and will thus benefit from this trend

d. **Competition between Lo-Lo versus Ro-Ro (unaccompanied and accompanied):** In addition to the inter terminal competition in the shortsea market, cargo volumes can also switch between Ro-Ro and Lo-Lo in some circumstances. Containers can choose between being placed on top of a separate trailer at the port and transported as Ro-Ro traffic or being handled via a Lo-Lo container terminal. The former option results in shorter transit times but leads to more expensive transport. Within the Ro-Ro category cargoes can also switch between unaccompanied and accompanied.

   A number of factors can be said to influence an increasing move to unaccompanied Ro-Ro cargo, including cargoes traditionally handled on break bulk vessels now increasingly being handled in unaccompanied Ro-Ro form to enable cargoes to be handled in smaller more frequent shipments. Also, Brexit has influenced the shift to unaccompanied Ro-ro traffic. The influence of Brexit is covered in the next section.

e. **Emergence of niche players in the shortsea Lo-Lo market:** Recently, with the reliability and effectiveness of supply chains worsening, some breakbulk terminals and barge/river terminals have also sought to attract shortsea

services. Although breakbulk operators have higher operational cost structures due to less efficient equipment and lower volumes, handling some shortsea Lo-Lo cargoes may still be attractive in the current market where capacity is limited. These niche players will however not be easily able to offer Ro-Ro services, as these have specific requirements for the terminals they call at and incidental rerouting of services is not easily undertaken.

3.1.5 Impact of Brexit and Covid on Shortsea Ro-Ro

57. The combination of Brexit and the global pandemic has also contributed towards the shift from accompanied to unaccompanied Ro-Ro cargo flows. Significant cargo flows that were previously transported via the Channel Tunnel or in accompanied Ro-Ro form are now shipped directly via shortsea connections. The most important drivers for this shift are:

a. **Risk spreading:** By partially switching to unaccompanied Ro-Ro transportation, logistics service providers have retained the ability to switch quickly if congestion problems arise on a particular route. Additional controls on UK imports are yet to be introduced as the UK government announced at the end of April 2022 that full custom checks have been postponed until the end of 2023, but these controls have potential to increase friction at the border.

b. **Higher labour costs and avoiding waiting times:** Additional border controls and associated uncertainty on transit time as a result of Brexit has increased the cost of using accompanied Ro-Ro transportation. Accompanied transport requires logistics companies to provide more drivers for the same volume of cargoes handled than in comparison to unaccompanied transport.

c. **Shortage of HGV drivers:** A combination of Brexit and Covid has led to a reduction in the number of EU and UK citizens working as HGV drivers. In general, HGV licenses are difficult to obtain and during the pandemic reduced testing capacity limited the inflow of new drivers. With many EU nationals active in the UK haulage industry and these drivers facing uncertainty about working in the UK, Brexit caused a further increase in the already existing shortage.

d. **Limited return-freight:** Brexit has caused a worsening trade imbalance between the UK and the EU, resulting in a reduced number of outbound cargoes returning to the continent. The cost price of accompanied transport increases (due to higher empty movements), resulting in reduced or non-profitable round trips.

e. **COVID-proof:** The human element within the unaccompanied Ro-Ro sector is less than for the accompanied Ro-Ro sector meaning that the pandemic has had less effect on the unaccompanied Ro-Ro sector.

f. **Mental shift**: Shippers have adapted their supply chains to the longer lead times associated with unaccompanied transport. Point-to-point connections are no longer a necessity for some shippers. With volatility increasing in all supply chains, the marginal increase in transit time as a consequence of un-accompanied transport is more easily accepted.

g. **Unaccompanied transport** is seen as a reliable and solid transport model that provides a competitive advantage. The long-term trend is anticipated to further increase the market share of unaccompanied transport. However now that free circulation is possible again, a limited increase in demand is expected for accompanied transport for higher value, time-sensitive, goods. This, however, is likely to be a relatively small component of overall demand.

h. **The Channel Tunnel** remains an alternative to shipping for Ro-Ro traffic . In addition, the Channel Tunnel has recently introduced some measures to attract more cargo by reducing the time for custom clearance.

i. The **Land Bridge**, which is shorthand for the transit of Irish goods across England to Europe, will not disappear but will alter by switching from accompanied to unaccompanied transport with local traction in the UK (from East to West).

3.2 UK Shortsea demand

58. Historical UK shortsea demand has been analysed over the period 2010-2021. Section 3.2.1 describes the methodology that has been applied to reconstruct the historical demand per trading partner and mode of transport. Section 3.2.2 provides an overview of the overall historic UK market. Section 3.3 considers the position from a commodity perspective, whilst section 3.4 consists of an East coast analysis and section 3.5 consists of a Humber estuary analysis.

3.2.1 Methodology

59. Various sources have been used to provide a full overview of the UK shortsea market. The DfT offers detailed trade statistics of UK maritime freight transport. For unitised cargo this source provides a subset which includes the following categories:

a. All container traffic representing both shortsea and feeder Lo-Lo volumes.

b. Road goods vehicles and trailers representing accompanied Ro-Ro traffic.

c. Unaccompanied road goods vehicle trailers representing unaccompanied Ro-Ro traffic.

60. For these cargo types, the number of units as well as the weight of goods is recorded. All cargo weights are gross tonnages. The tare weights of containers, road goods vehicles, trailers, and other items of transport equipment (i.e., the unloaded weight of the vehicle or equipment itself) are excluded.

61. Within the DfT statistics UK port traffic is classified geographically according to where the goods were last loaded or next unloaded at the other end of the sea journey. In other words, cargo moving through a transshipment port such as Rotterdam will not be recorded under the country of origin/destination – for example, cargo coming by feeder from Rotterdam but originally from Asia will be included under Dutch container volumes. As a result, the real origin/destination of

cargo is not properly recorded in the DfT data set and European feeder volumes are aggregated with pure European shortsea volumes.

62. An analysis of the UK's detailed customs data has been undertaken in order to remove feeder volumes from the UK's shortsea statistics. The feeder volumes (light green bar in the right column of Figure 3-2) are calculated by comparing the total European containerisable trade from custom records (see middle column of Figure 3-2) with that of the UK port statistics for shortsea container and Ro-Ro volumes (see left column of Figure 3-2). By subtracting the feeder volumes and Ro-Ro volumes from the UK port statistics, the actual shortsea Lo-Lo volumes are estimated (see turquoise bar in the right column of Figure 3-2). The customs data has also been analysed to identify the European trading partner and trade direction for each commodity (most detailed reporting level available – HS6). Containerised commodity classes are aggregated to get the total potential for shortsea trades. From this subset those commodities with a preference for being moved by truck (including high value goods, perishable goods and semi-finished goods subsequently used in manufacturing processes at the destination) are selected.

63. Other commodities transported in dry bulk, liquid bulk and non-containerisable trades are removed from the data set.

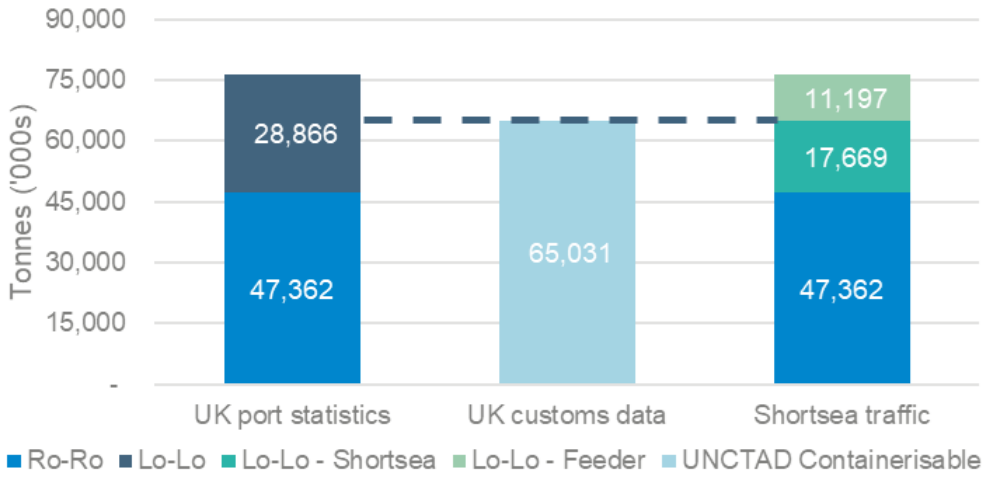

Figure 3-2 Comparison between UK port statistics and UK customs data (2020; excluding Ireland)

3.2.2 UK Shortsea Unitised Maritime Statistics

3.2.2.1 UK containerised and Ro-Ro traffic

64. UK trade in both deepsea and shortsea goods increased in the period leading up to 2018. There was then a decline in tonnages to 2020. This decline was mainly caused by the changing UK-EU trading relationship and the initial reaction to the start of the pandemic in 2020. Based on national 2021 data, total trade in containers and trucks has rebounded in 2021 to roughly 2019 volumes. In addition, historical data shows that the share of cargo being shipped to outside Europe has been relatively stable over the last decade.

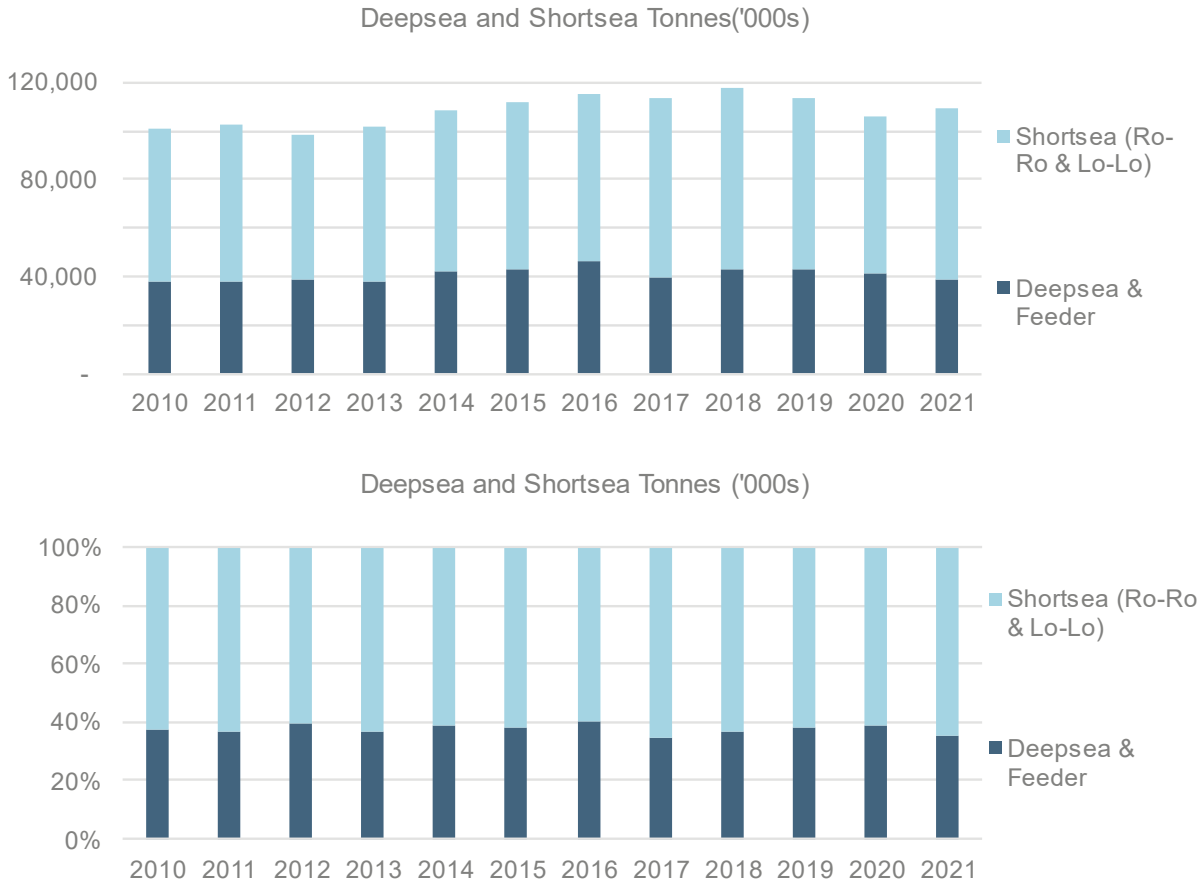

Figure 3-3 Historic UK total containerised and Ro-Ro traffic UK shortsea traffic

65. Focusing on shortsea traffic in the UK (excl to/from Ireland), volumes grew from 2010 to 2018 with a CAGR of around 2.0%. Shortsea volumes were particularly affected in the period between 2018 and 2020, reducing by almost 9 mtpa as a consequence of initial post-Brexit reorientation and the start of the pandemic. Initial traffic statistics over 2021 indicate a sharp rebound, reversing the 2020 declines. Also, for this segment 2021 matched 2019 throughput figures with a total of 70.1m tonnes in 2021. More interesting have been the trends In the type of shortsea traffic. Until 2016 these shares were stable. Since 2016, there has been an increase in

unaccompanied Ro-Ro and Lo-Lo share, with this increase being at the expense of accompanied Ro-Ro volumes.

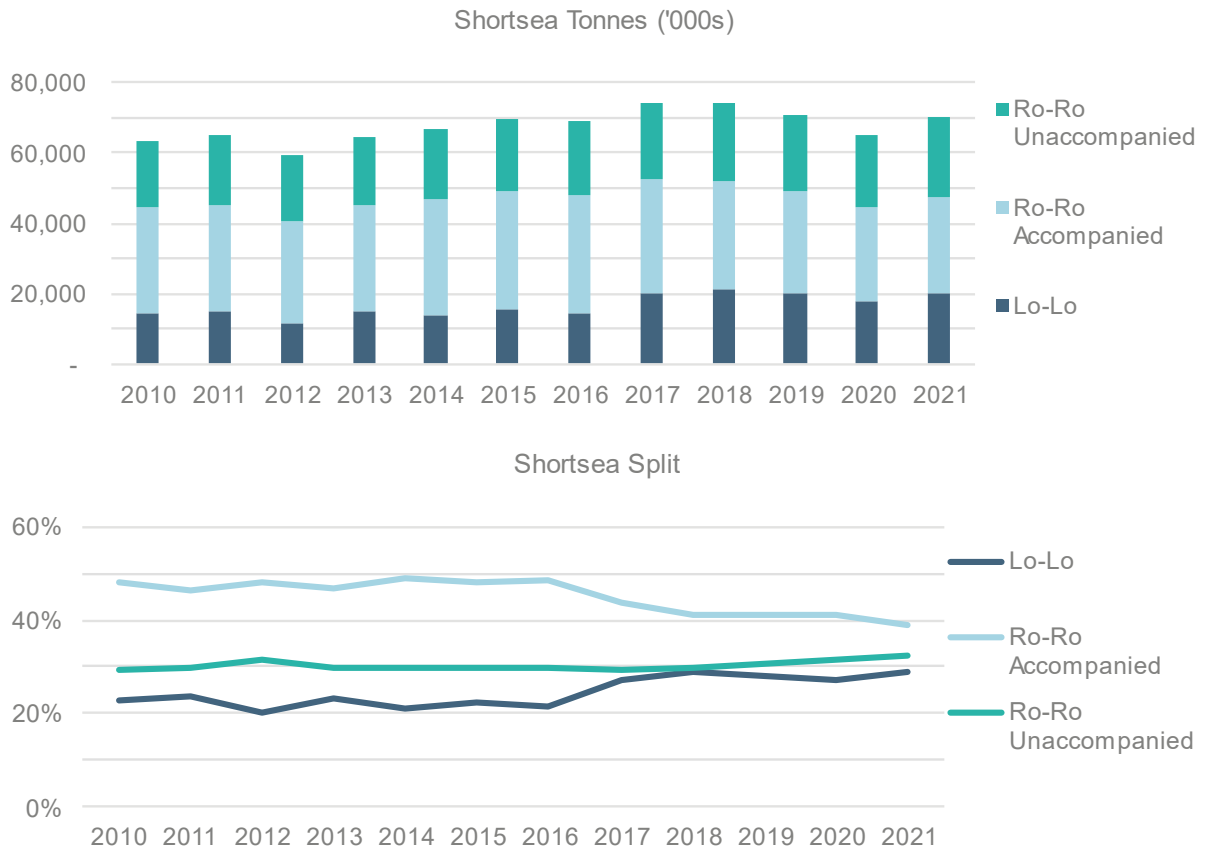

Figure 3-4 Historic UK shortsea traffic

3.2.2.2 UK shortsea unitised traffic by direction of trade

66. In the figures below the total shortsea traffic in both Lo-Lo and Ro-Ro form has been defined by the direction of trade. It is clearly apparent that imports are by far the dominant sector. This results in a return flow of empty containers and empty trailers to European destinations. In terms of overall flow, loaded and discharged units are roughly equal and dominated by full imports in containers and trucks. Managing these imbalances is a significant aspect of the UK freight sector.

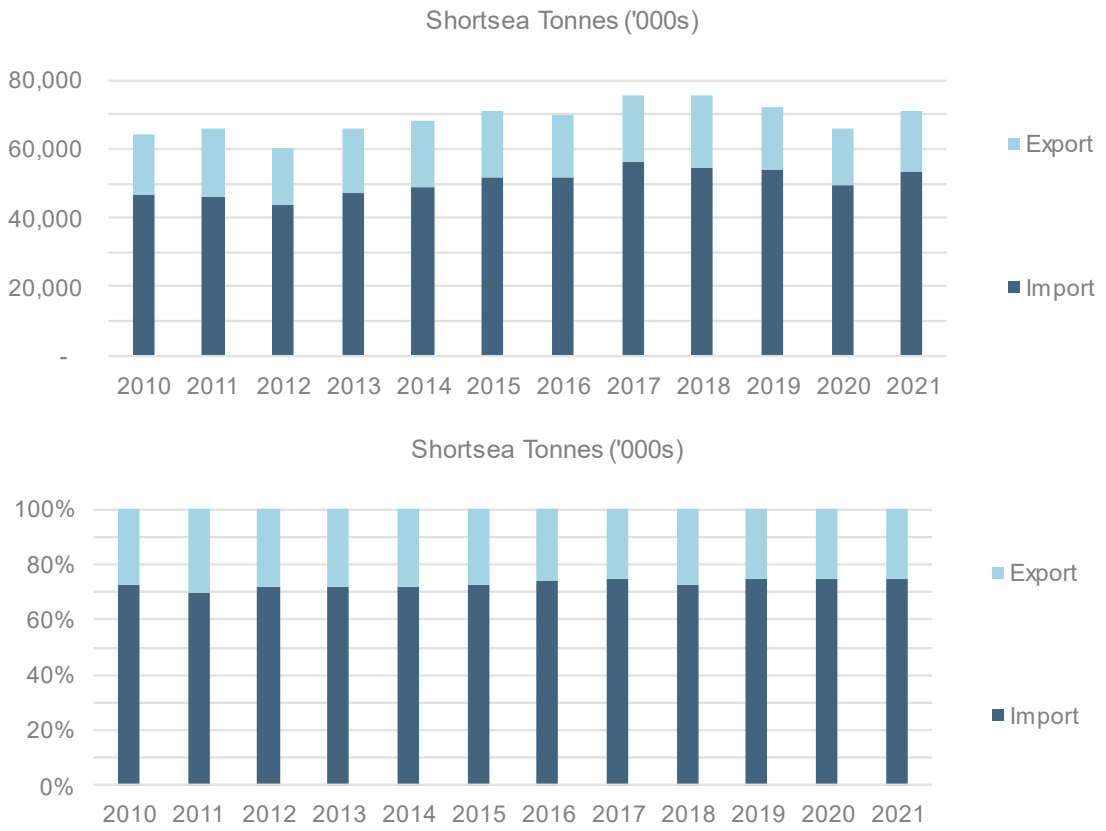

Figure 3-5 UK shortsea traffic by direction UK shortsea traffic by country

67. Splitting the UK's shortsea traffic by geographical region within Europe and by direction enables a more detailed picture to emerge:

a. UK shortsea traffic is focused on trades with the Benelux, Germany and France. These countries make up more trade with the UK than all the other countries in Europe combined.

b. The decline in overall shortsea volumes between 2018 and 2020 was driven by a contraction in shortsea trade with North West European countries. In particular, a decline in output in both Europe and the UK's car manufacturing industry contributed to this contraction.

c. Except for Scandinavia and North West Europe, all other regions recorded stable trade volumes with the UK or even some increase in volumes.

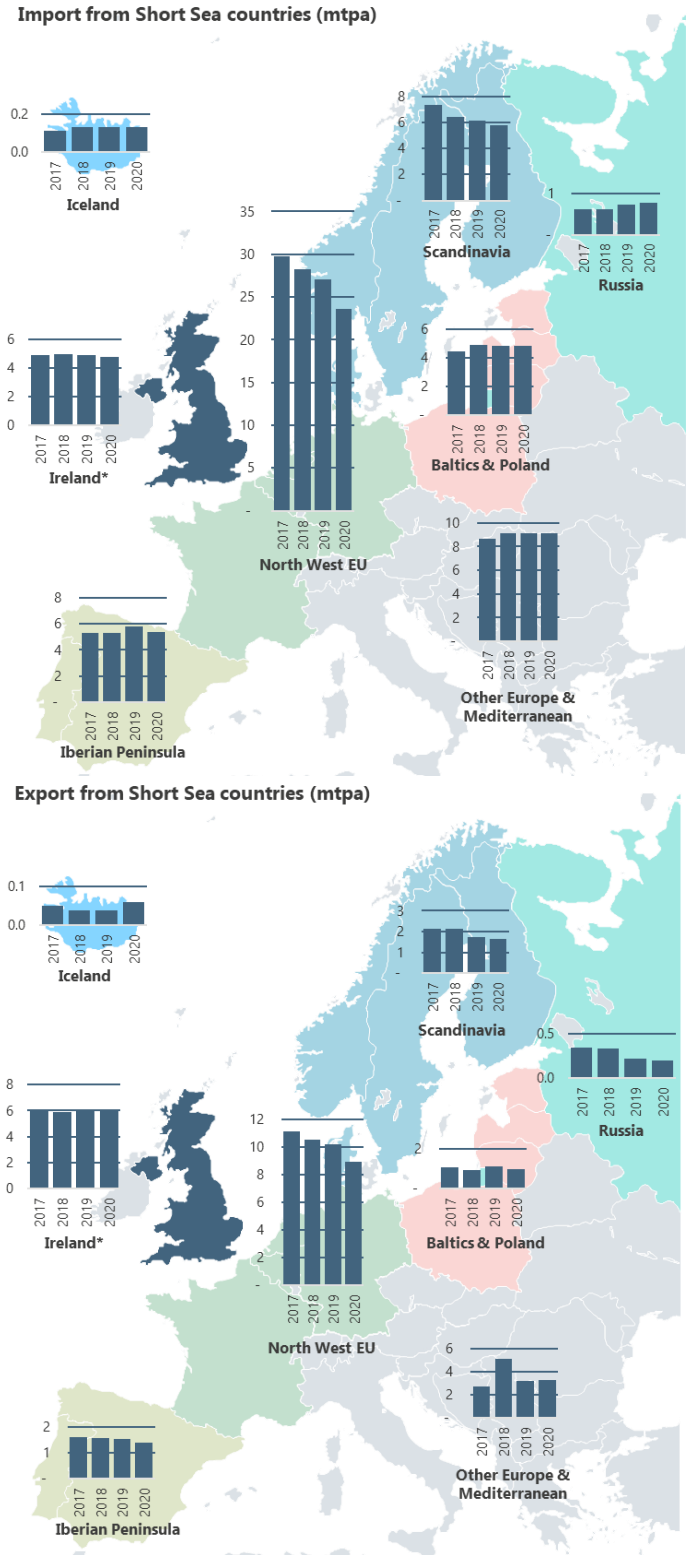

Figure 3-6 Import and Export of unitised goods between the UK and shortsea countries

After a longer period of growth in the UK's unitised shortsea sector, a short term decline in volumes occurred between 2018 and 2020 – for obvious reasons. Statistics for 2021 indicate a strong rebound again to 2019 throughput levels. Shortsea trade for the UK is focused on Northwest Europe, with this area covering more than half of the UK's shortsea volumes. Together with the Baltics and Scandinavia these markets form the majority of UK's shortsea market.

3.3 Commodities

68. The commodity profile of the shortsea trades over the period 2017 to 2020 is shown in the figures below. It can be seen that a wide range of products are being shipped to and from Europe. Food products, wood products, plastics and chemicals being the most important commodity groups. The profile has stayed relatively stable over the last few years. Only stone/glass and chemicals are commodities which saw the volumes increase, when considering the CAGR over the 2017-2020 period. This underlines that the shortsea sector serves a large set of industries in the UK and European economies.

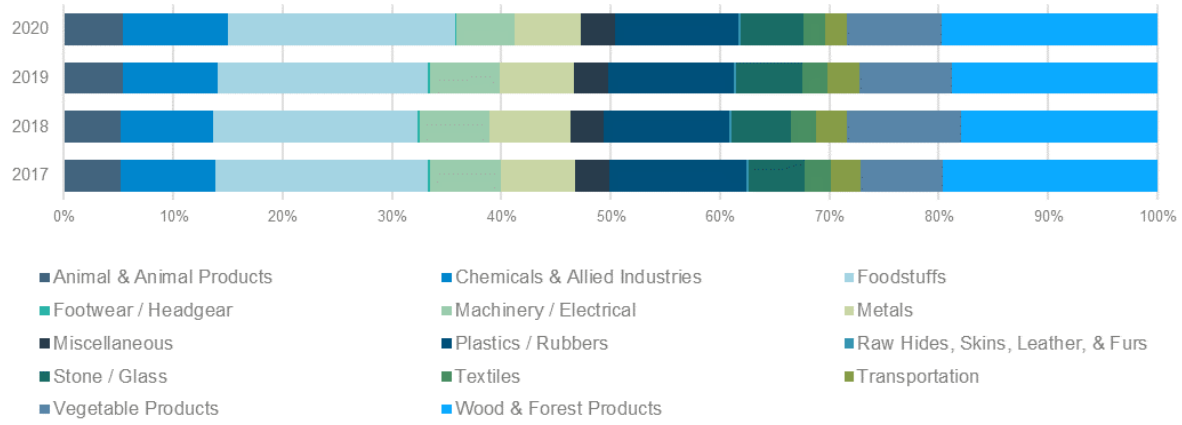

Figure 3-7 Commodity profile UK shortsea trade

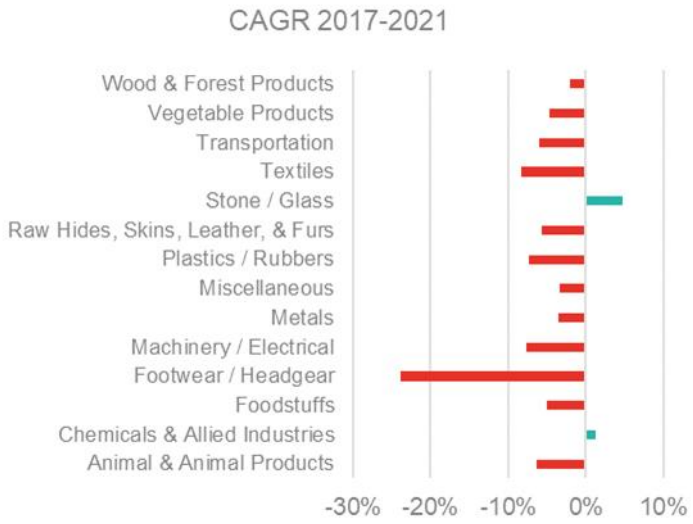

Figure 3-8 Growth by commodity class over 2017-2021 period

3.4 Shortsea Traffic East Coast Ports

3.4.1 UK Shortsea Unitised Traffic

69. The following points can be highlighted:

a. UK's unitised shortsea and feeder traffic is focused on the East Coast and the Thames Estuary and Dover which together handle almost 80% of the UK's shortsea market in terms of tonnage. The combined market share has increased by a couple of percentage points over the last decade.

b. The East Coast ports (ranging from Harwich to the Firth of Forth) have gained market share in the shortsea domain in the UK–- increasing from 34% to around 40% of the UK's shortsea unitised port volumes over the last decade.

c. South Coast shortsea volumes are primarily directed to the Iberian Peninsula and the Mediterranean. However, the volumes in the South English ports are quite small in a national context. In addition, overall volumes actually decreased over the last decade.

d. West Coast shortsea volumes are a result of trade between Britain and Ireland.

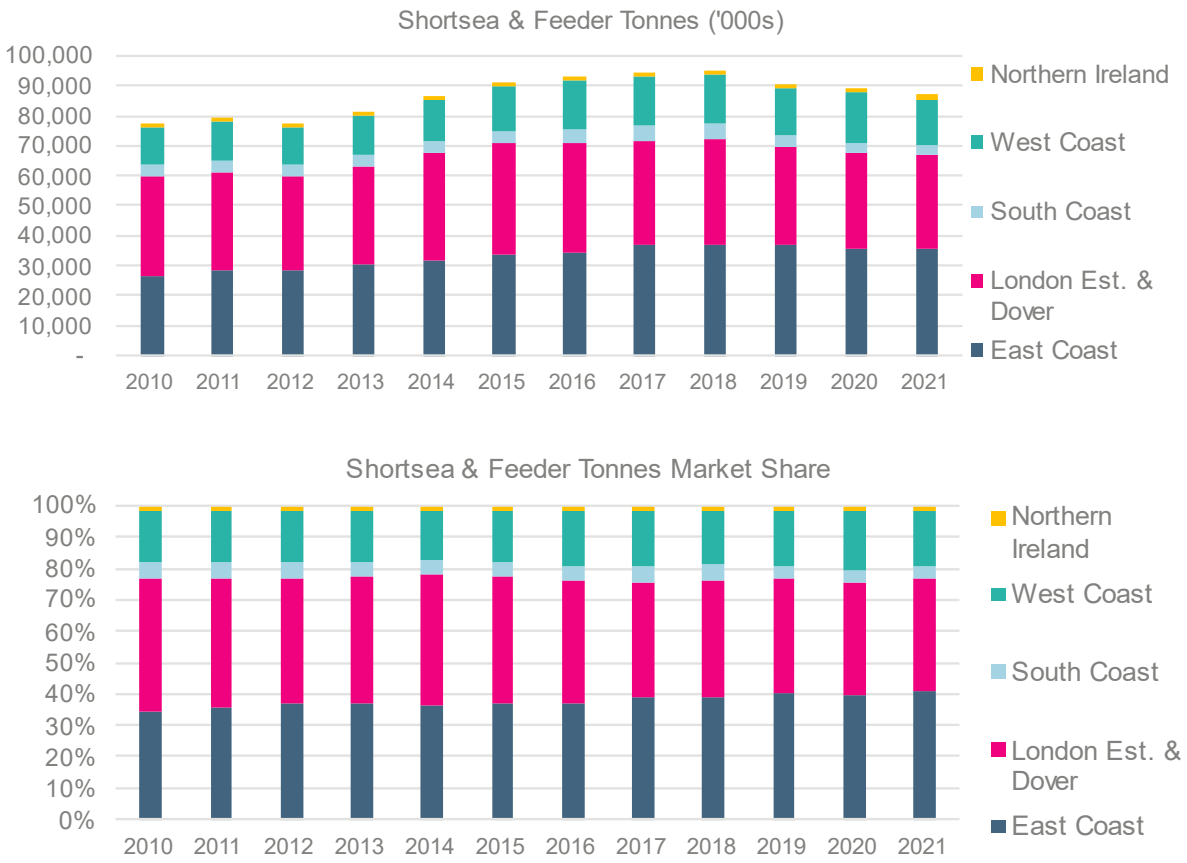

Figure 3-9 UK shortsea and feeder traffic in tonnes

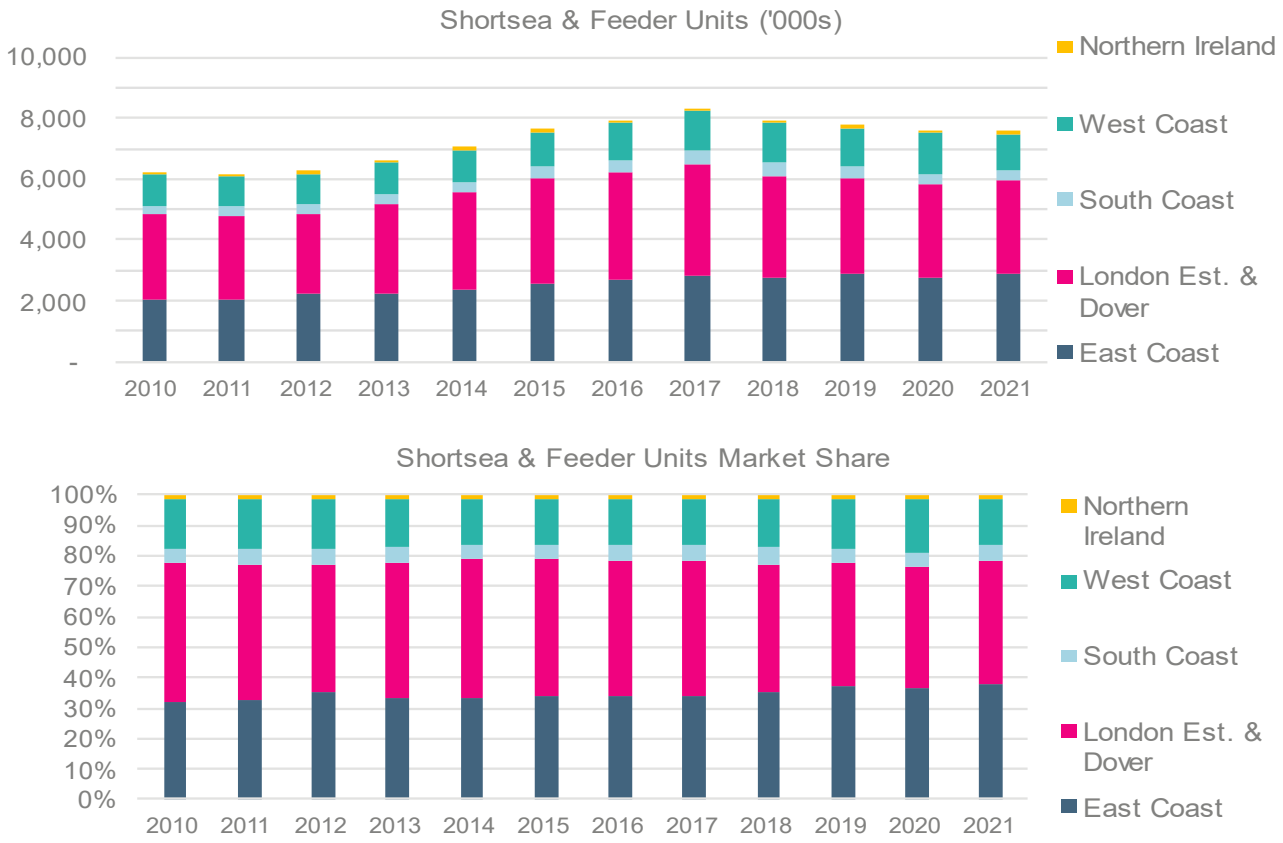

Figure 3-10 UK shortsea and feeder traffic in units

3.4.2 East Coast Shortsea Unitised Traffic

70. East Coast shortsea ports have gained market share over the last decade. This is a consequence of shortsea traffic moving from the South to the North. This increase in market share can be clearly seen from the growth in shortsea volumes in each port as shown in the below figures. Market share of the East Coast ports increased from 32.2% in 2010 to just over 37% in 2019 in terms of units. Between 2010 and 2018 volumes increased by 39.3% to reach 37.2m tonnes.

71. In terms of the Humber, Grimsby, Immingham and Killingholme[2] combined handle more than a third of the East Coast shortsea volumes. The Humber region is responsible for about half of the UK's East coast shortsea volumes.

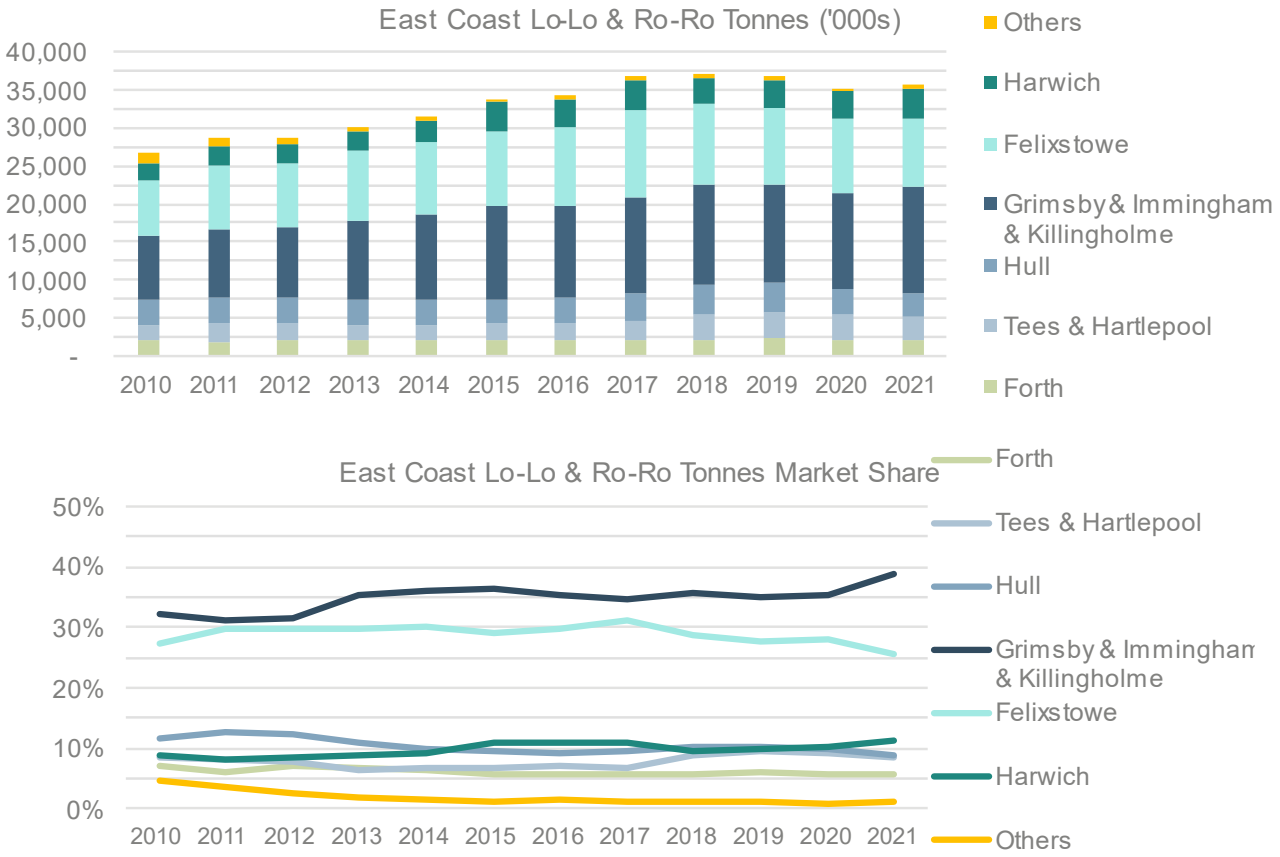

Figure 3-11 East Coast total shortsea traffic in tonnes (Killingholme is included under Immingham & Grimsby in the UK national port statistics)

[2] Within the UK maritime freight statistics of the Department for Transport the statistics for Immingham and Killingholme are combined within the statistical group 'Immingham & Grimsby'.

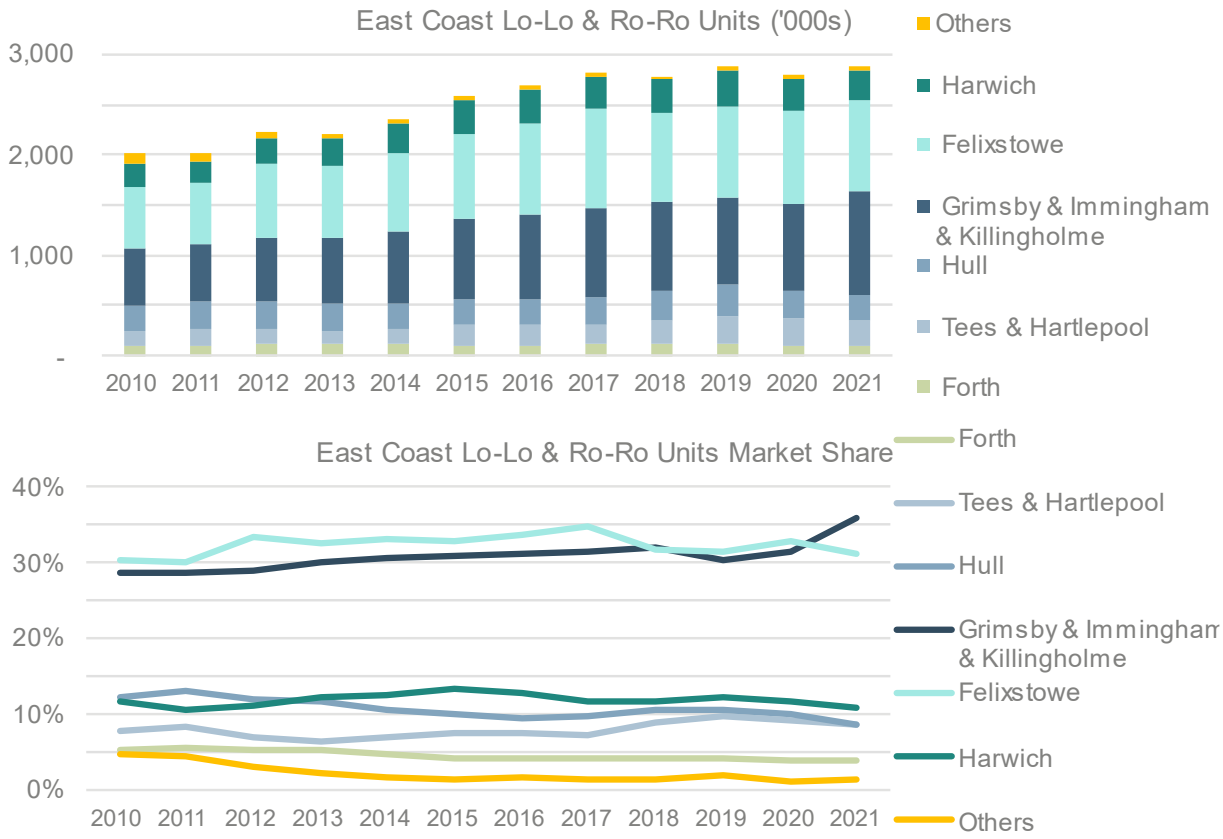

Figure 3-12 East Coast total shortsea traffic in units (Killingholme is included under Immingham & Grimsby in the UK national port statistics)

72. A similar picture emerges when focusing solely on the Ro-Ro traffic on UK's East Coast. Tonnage grew by 35.5% between 2010 and 2018, reaching a total of 21.2m tonnes. The dominant position of Grimsby and Immingham together with Killingholme, can be clearly seen with these ports having a combined market share of well over 50%. Despite declining volumes over the pandemic, the Port of Immingham actually gained market share over this period.

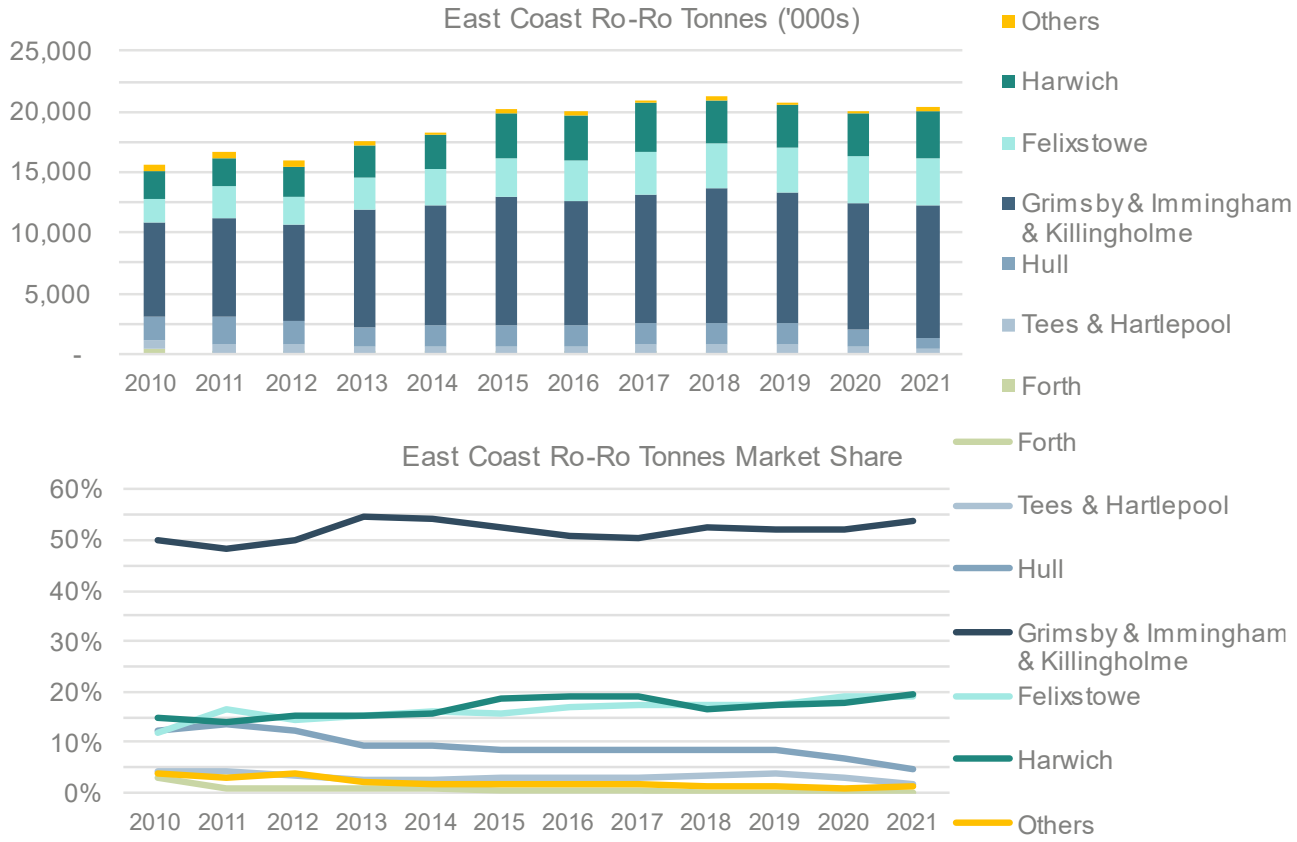

Figure 3-13 East Coast Ro-Ro traffic in tonnes (Killingholme is included under Immingham & Grimsby in the UK national port statistics)

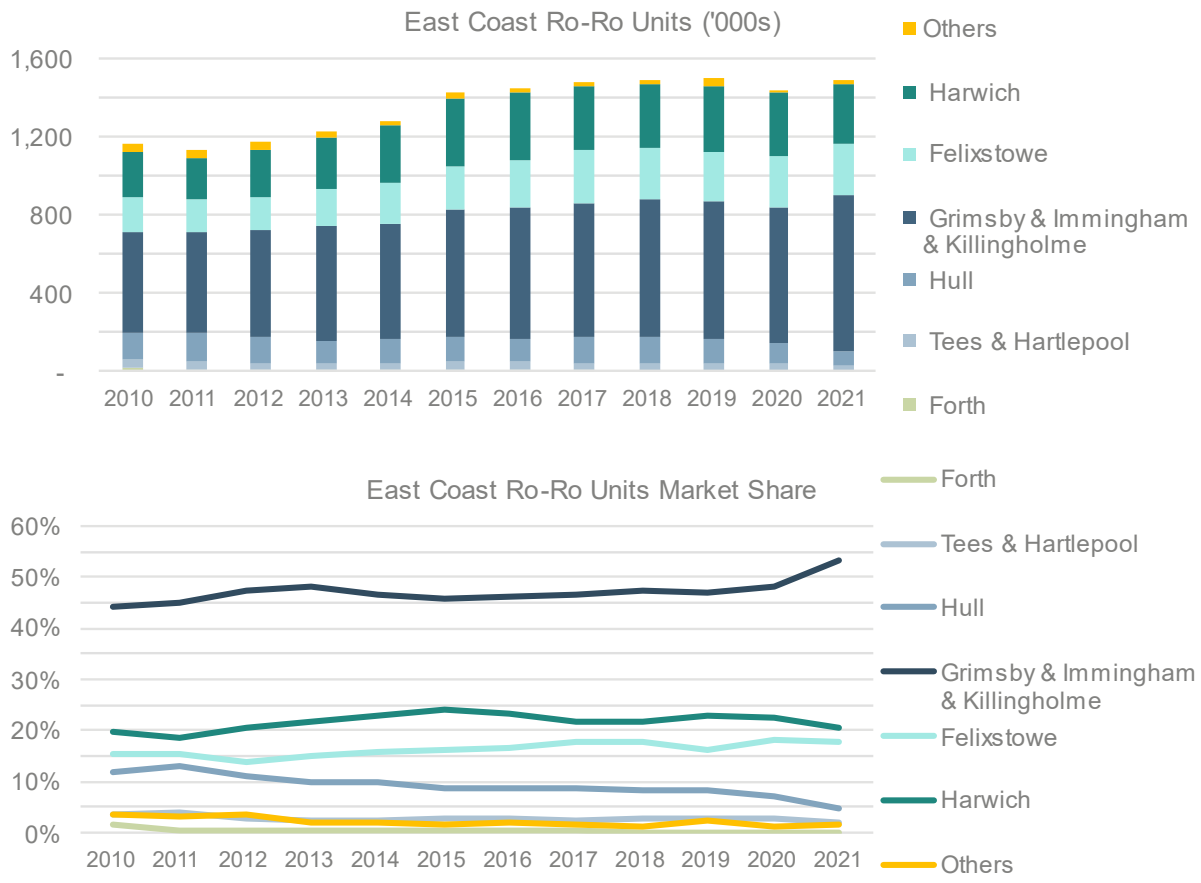

Figure 3-14 East Coast Ro-Ro traffic in units (Killingholme is included under Immingham & Grimsby in the UK national port statistics)

3.5 Humber Shortsea Unitised Traffic

3.5.1 Humber Shortsea Unitised Traffic Overview

73. The Humber estuary is the key port cluster that serves the UK's principal demand centres such as Manchester, Liverpool, Sheffield and Leeds, as well as handling freight flowing to and from the Midlands. The Humber port facilities are the east coast ports located closest to these key markets. Even though national shortsea volumes have declined since 2018, shortsea tonnage in the Humber region has stayed stable. Over the 2010-2018 period shortsea unitised demand in the Humber grew by around 39%, which corresponds to a CAGR of around 4.0%.

74. In terms of the number of units, growth has been larger than when considered in terms of tonnages. Growth in full trailers imported exceeded growth in full trailers being exported. The difference resulted in the export of empty trailer units. As a result, both the import and export flow in terms of units roughly grew by the growth rate of the full imports. This growth rate was larger than that of the overall tonnage.

This also resulted in the total number of empty units crossing the North Sea also increasing.

75. Unaccompanied Ro-Ro has been increasing over time with more volumes being consolidated at the Humber ports. By way of contrast, volumes routed via Tees & Hartlepool have been fluctuating at roughly the same levels. This is considered to be a result of the port facilities in these locations not offering the same access and efficient transport links to key markets in the direct hinterland – as is detailed later in this study. Volumes in Hull also saw a decline as this port serves a high proportion of accompanied trades and there is little available space for unaccompanied trailer storage within the port. There are also vessel size limitations at Hull in respect of the 'in dock' nature of a large proportion of the port.

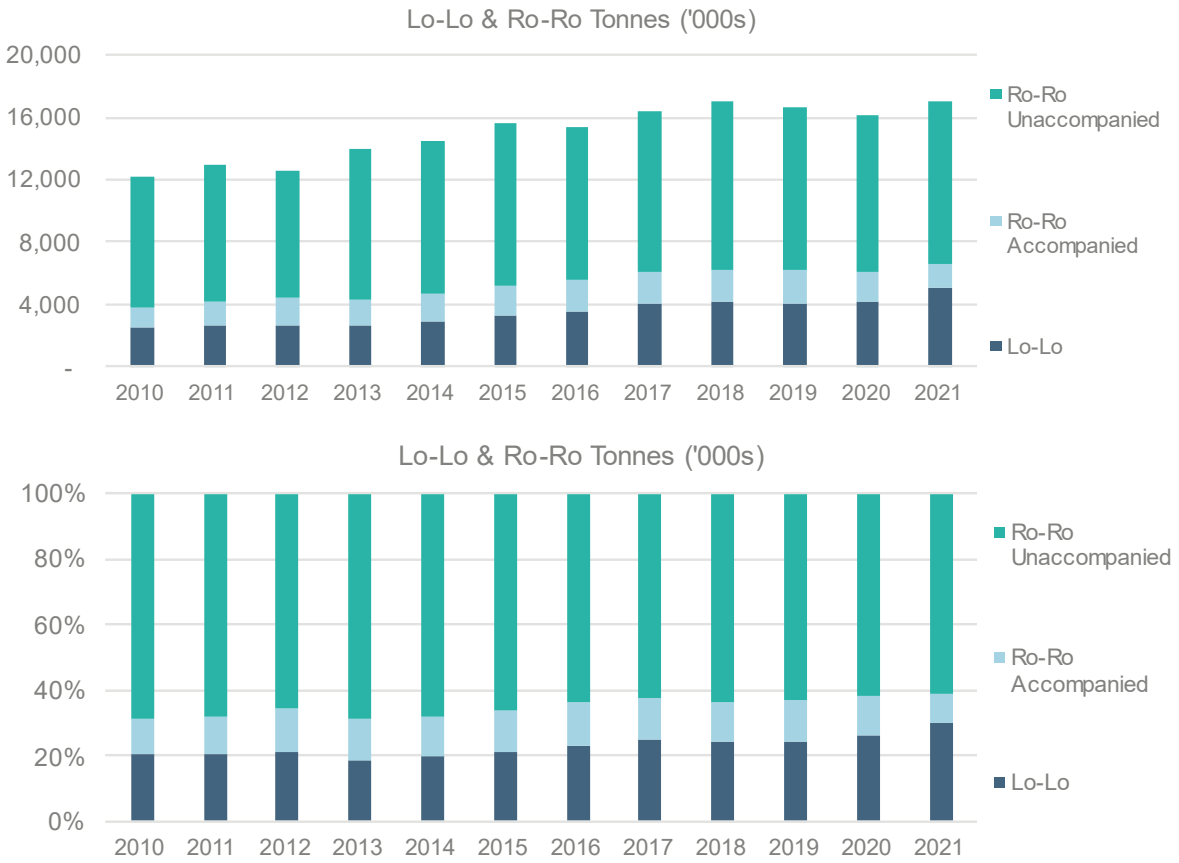

Figure 3-15 Shortsea traffic Humber estuary in tonnes

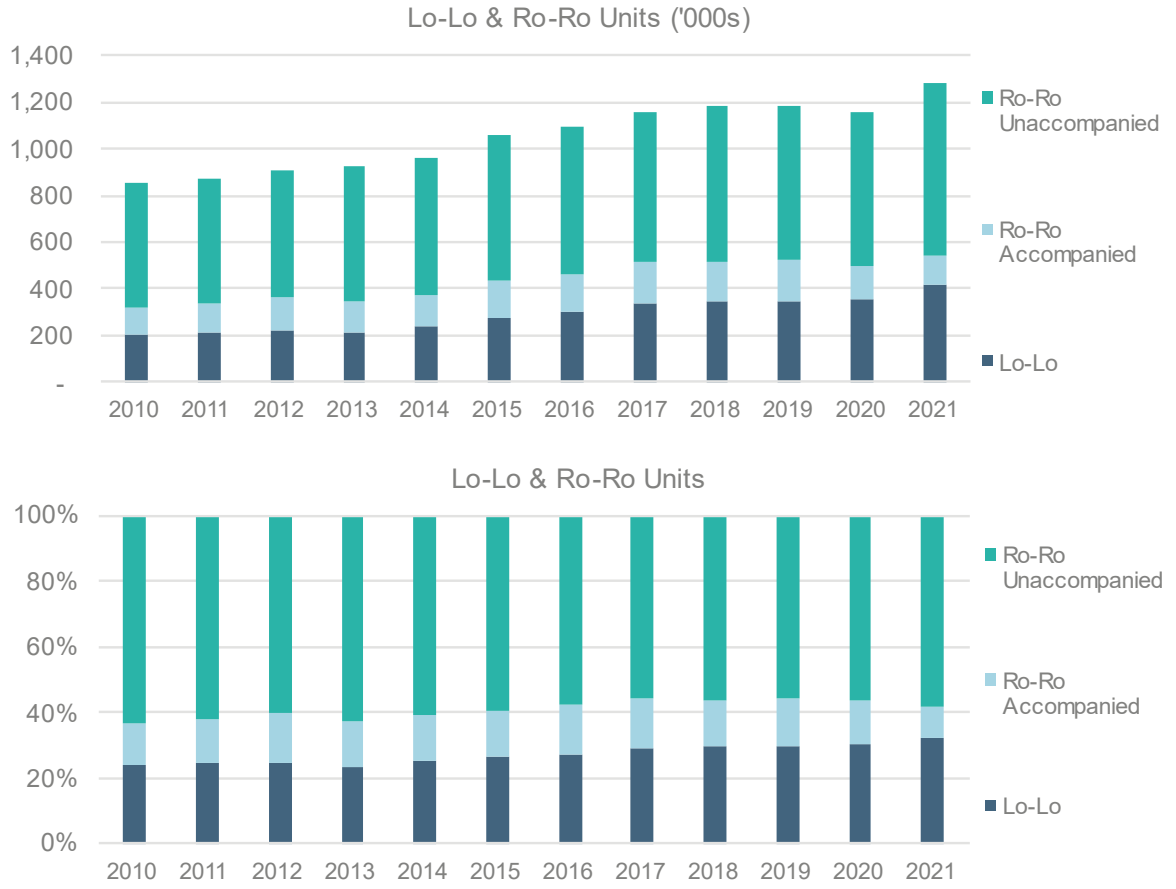

Figure 3-16 Shortsea traffic Humber estuary in units

3.5.2 Humber Unaccompanied Ro-Ro Traffic (tonnage)

76. For unaccompanied Ro-Ro freight the different traffic profile between shortsea tonnages and units is significant. Whilst tonnage on the Humber has seen a decline in recent years, the number of units has increased over the same period. This has been caused by a larger imbalance in trade as well as a lower average loaded weight per unit. Recent volatility and disruptions in the supply chain have contributed to these lower weights per unit. Over the past decade this has resulted in an average growth rate for units of around 2.2% per year, reaching 708,000 units in 2021. However, the greater part of this growth was noted last year (2021), with a renewed focus on shortsea trades and reshoring.

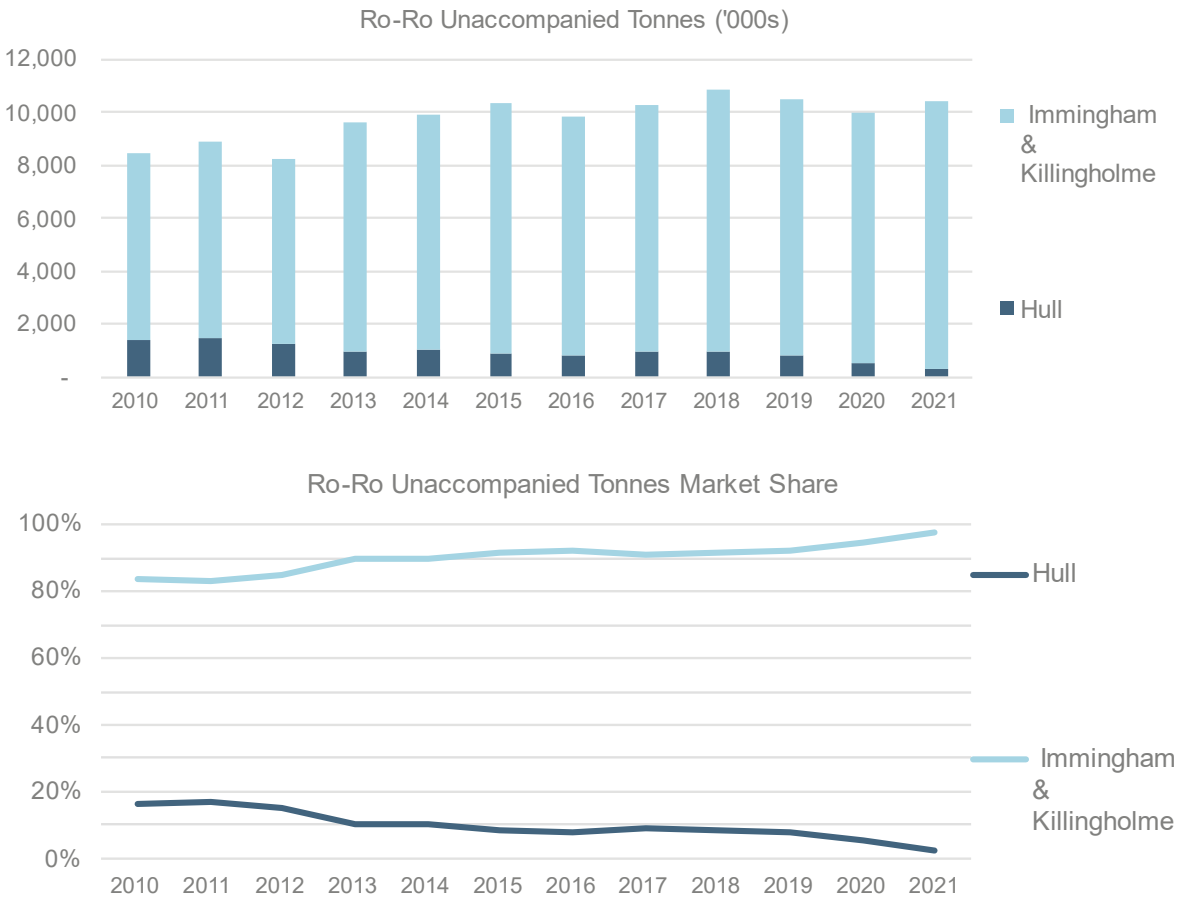

Figure 3-17 Shortsea unaccompanied Ro-Ro traffic Humber estuary in tonnes

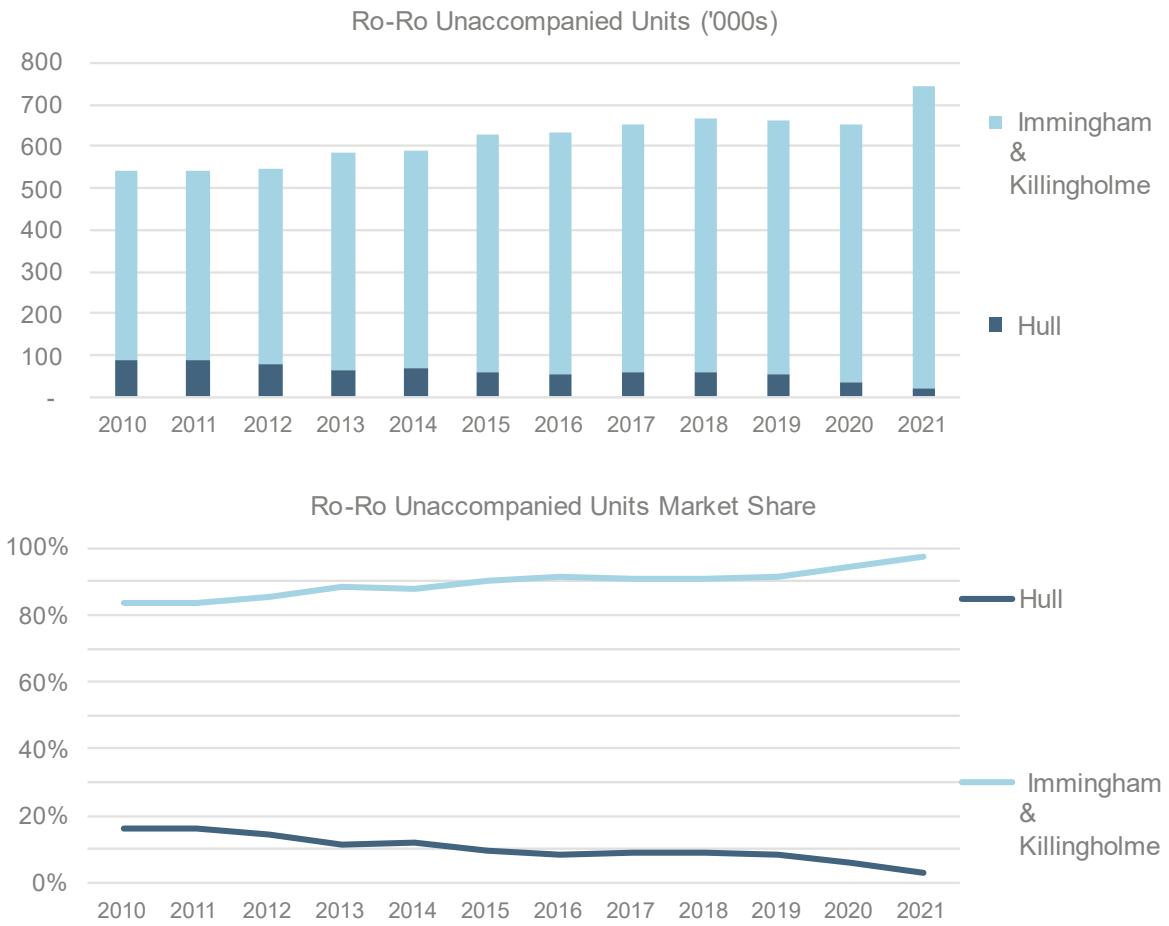

Figure 3-18 Shortsea unaccompanied Ro-Ro traffic Humber estuary in units

3.5.3 Humber Accompanied Ro-Ro Traffic (tonnage)

77. Accompanied Ro-Ro traffic in the Humber was only around 12% of total Ro-Ro volumes in 2020. This was largely a consequence of Covid related travel restrictions and HGV driver shortages. Over the pandemic, accompanied Ro-Ro volumes were most affected and generated most of the decline of the overall Ro-Ro segment in the region.

78. Accompanied Ro-Ro consists of trucks driving away from the port areas shortly after berthing or arriving just before departure. Accompanied Ro-Ro does not therefore, have a need for storage or added-value services. The decline in volumes as a consequence of the pandemic, therefore, resulted in only a marginal decline in activity and indeed the Ports of Killingholme and Immingham actually gained market share in the accompanied segment. Since 2019, accompanied Ro-Ro traffic on the Humber has declined by 23.4% over the two years combined, dropping from 2.2m tonnes in 2019 to 1.6m tonnes in 2021.

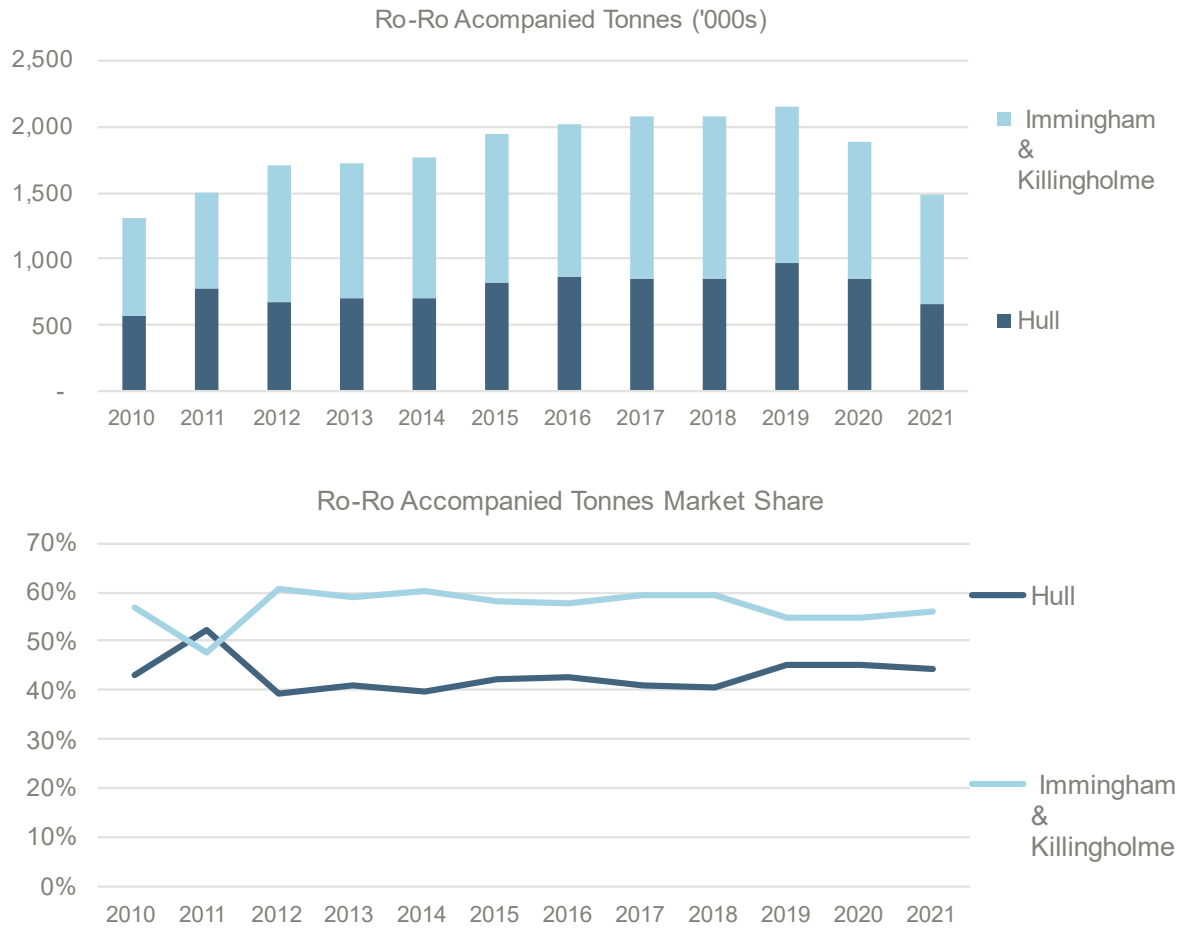

Figure 3-19 Shortsea accompanied Ro-Ro traffic Humber estuary in tonnes

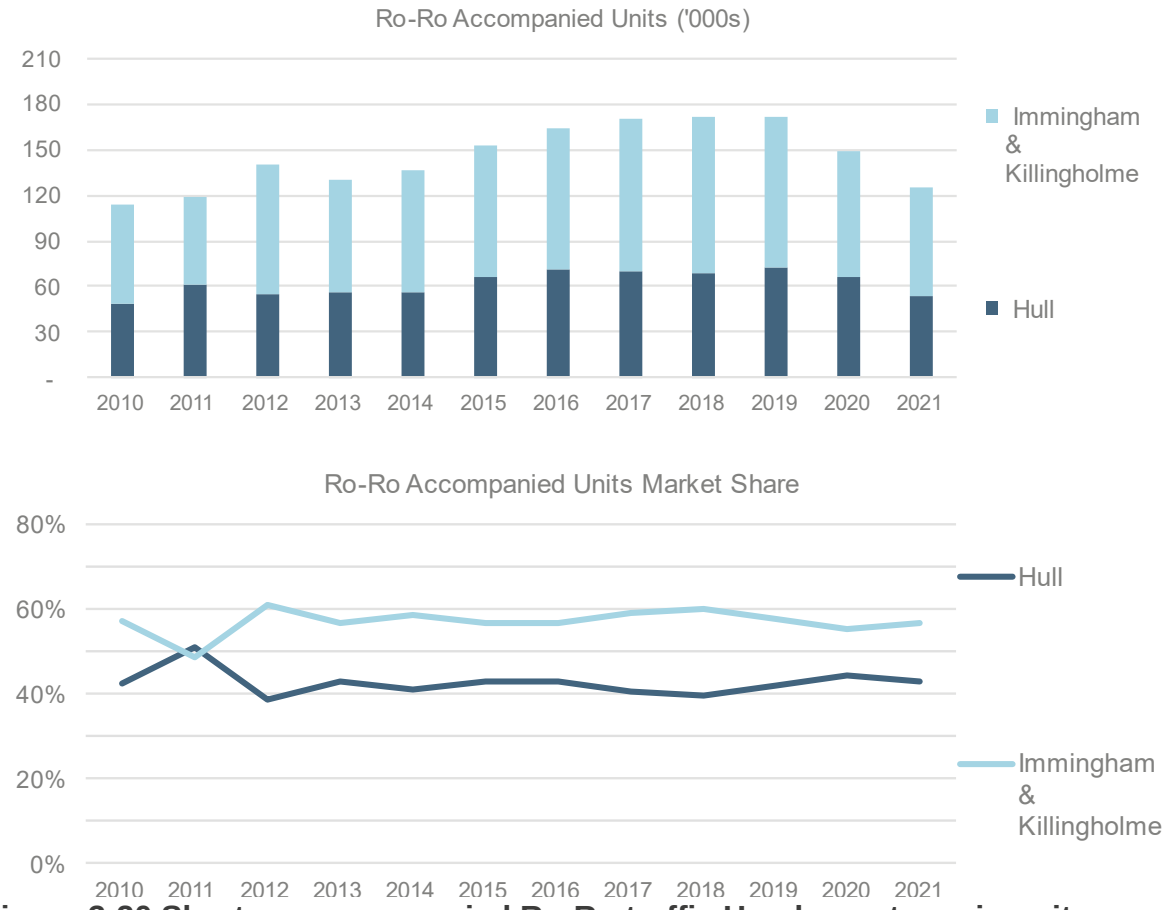

Figure 3-20 Shortsea accompanied Ro-Ro traffic Humber estuary in units

3.6 Humber Unaccompanied Lo-Lo Traffic (tonnage)

79. Container volumes have increased by 80% over the last decade to reach 4.8m tonnes in 2021, equalling a CAGR of around 6.74%. The market shares of the three ports in the Humber handling containers (Immingham, Hull and Goole) have been relatively stable over the last decade. No port has significantly outperformed the others, indicating that the competition for penetrating the hinterland is likely to be in equilibrium. Over a decade ago the Port of Goole handled some container volumes. However, its location at the end of the estuary and limited facilities has seen these container volumes disappear.

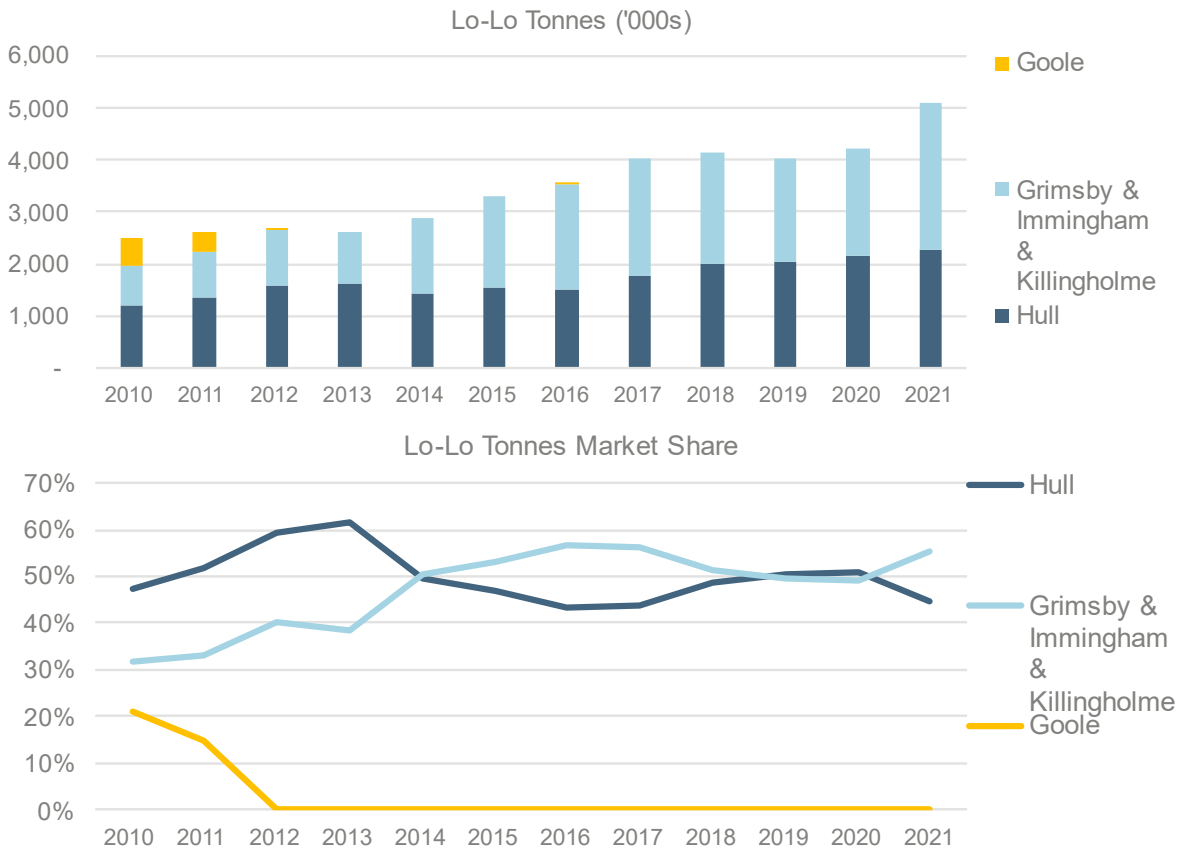

Figure 3-21 Shortsea Lo-Lo traffic Humber estuary in tonnes

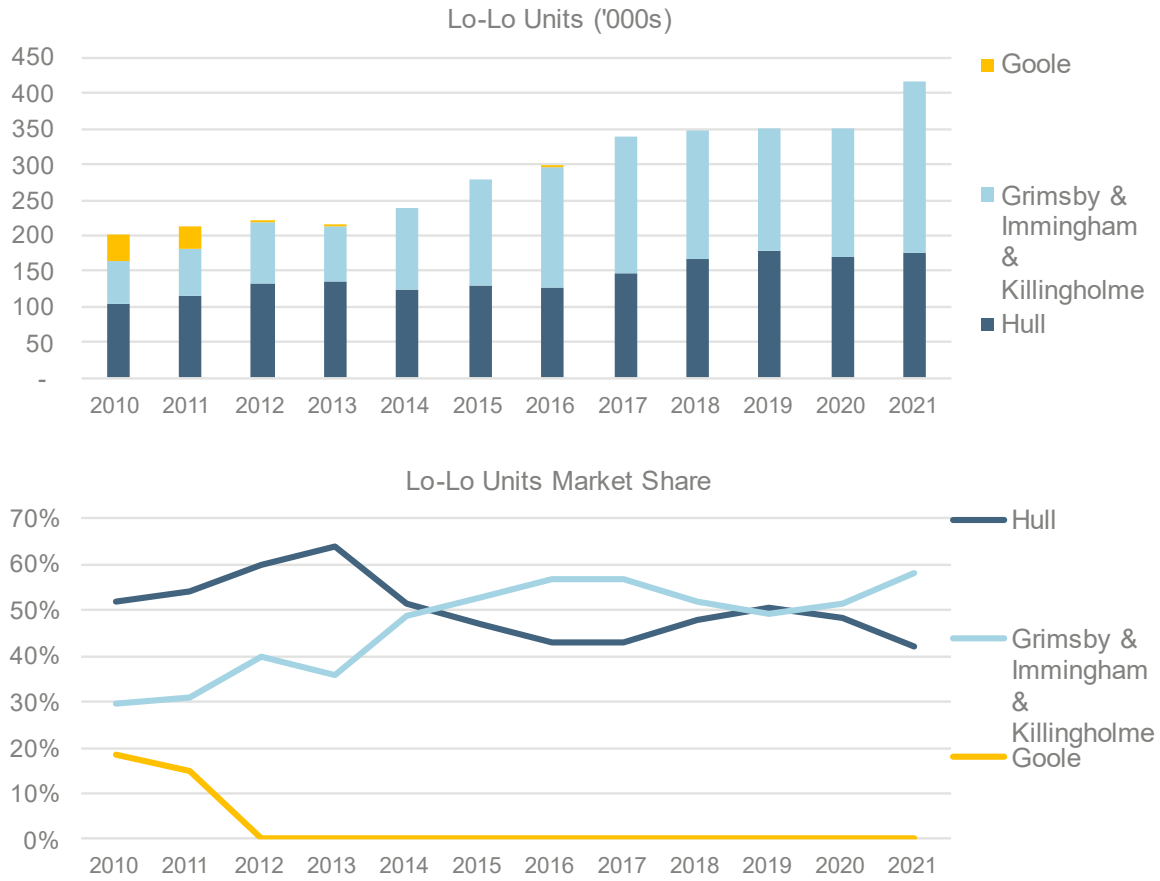

Figure 3-22 Shortsea Lo-Lo traffic Humber estuary in units

The overall trend in the UK shortsea sector in terms of growth profile over the last decade (see Figure 3-9 and Figure 3-10) was not reflected at the English East Coast ports (see Figure 3-13 and Figure 3-14). Unitised shortsea volumes on the East Coast grew for most of last decade and stayed relatively stable over the pandemic and following the UK's exit from the EU. The same holds for the shortsea volumes in the Humber (see Figure 3-15 and Figure 3-16).

The unaccompanied Ro-Ro sector is the most popular mode of transport for the shortsea sector. The Ports of Immingham and Killingholme have a strategic position in this particular market. Unaccompanied tonnage stabilised in the last two years after years of growth. However, in terms of units passing through the facilities on the Humber growth in Ro-Ro traffic actually continued over the pandemic. The exception is the accompanied Ro-Ro traffic in the Humber region, which declined in line with the overall UK market.

3.6.1 The Humber Estuary Ro-Ro Traffic

80. As already indicated, within the UK maritime freight statistics from the DfT, the statistics for Immingham and Killingholme are combined within the statistical group 'Immingham & Grimsby'. Immingham and Killingholme, however, are the only two facilities within this group which provide significant Ro-Ro services. By using the Ro-Ro volumes for Immingham provided by ABP, the Killingholme Ro-Ro volumes were deduced for the period 2018-2021 as shown in Figure 3-23. Although the pervious sections focussed on shortsea trade with European countries, this section considers all Ro-Ro traffic handled in the Humber Estuary, including domestic and non-EU traffic.

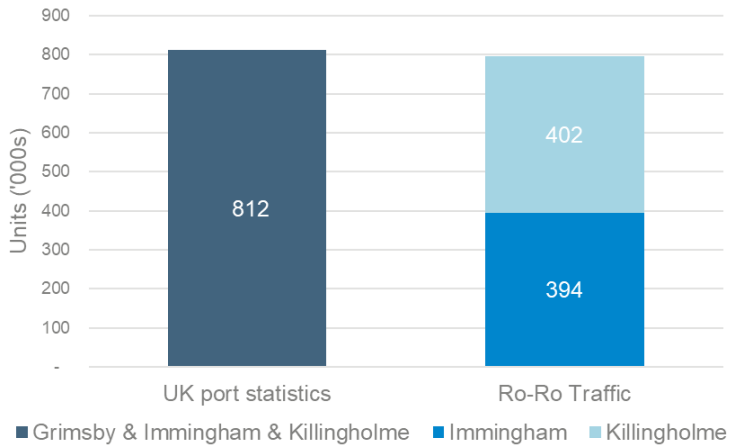

Figure 3-23 Ro-Ro volumes for Immingham and Killingholme (2021)

81. In terms of tonnage, Immingham handles the largest Ro-Ro volume of the Humber estuary facilities with a market share of 49.3% in 2021. Over the period 2018-2021, Hull has seen a significant decline of its Ro-Ro tonnage and units which has resulted in a CAGR of -16.3%. This decline has been compensated by a growth in volumes handled by Killingholme, which has seen a significant increase in volumes handled in 2021, which resulted in CAGR of 7.7% and led to the largest market share in terms of units in 2021.

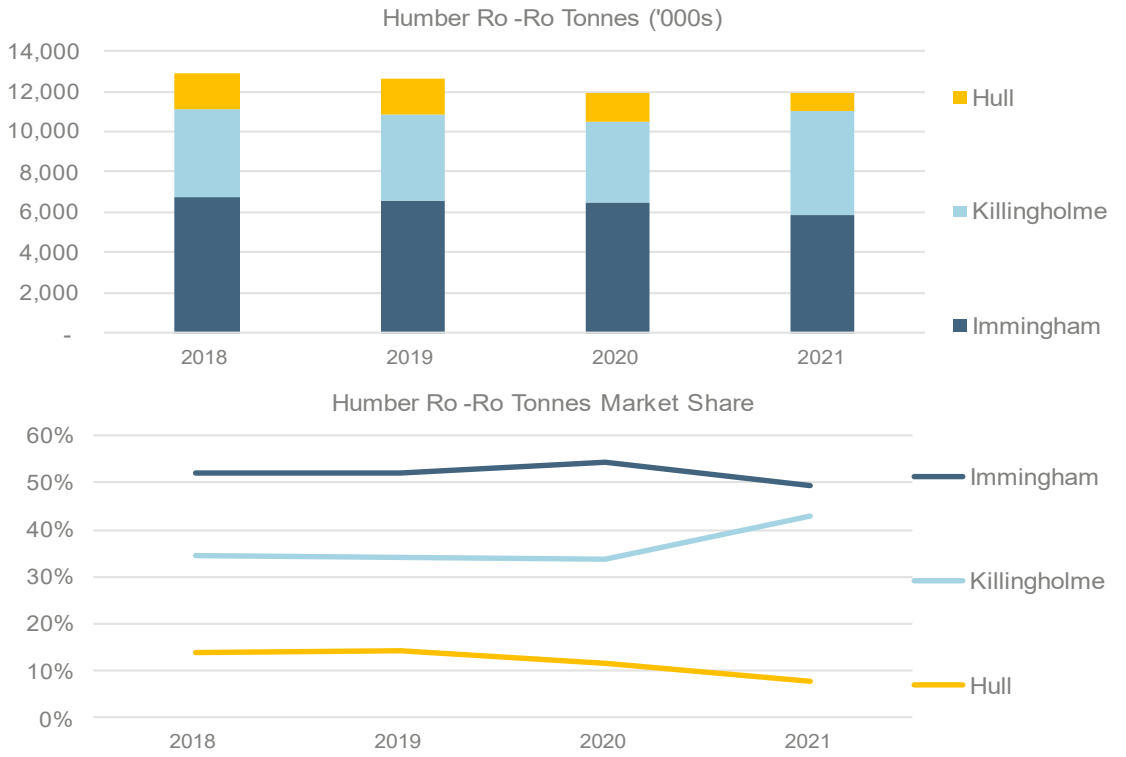

Figure 3-24 Ro-Ro traffic Humber estuary in tonnes

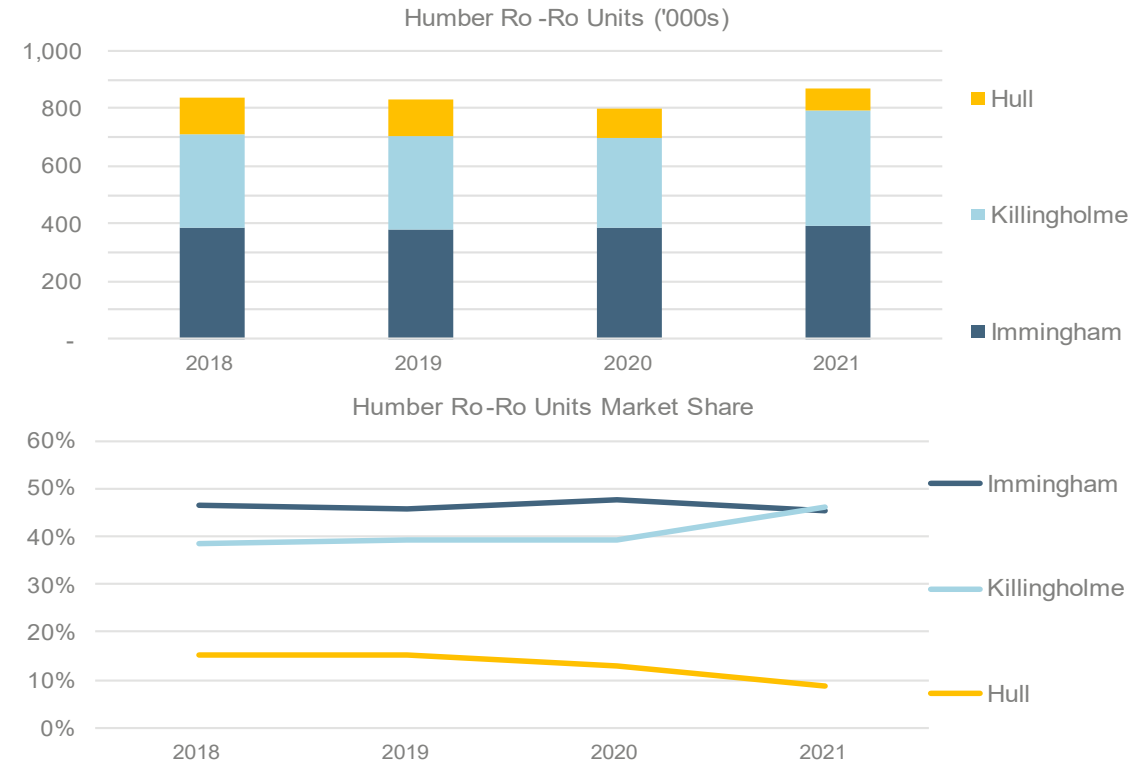

Figure 3-25 Ro-Ro traffic Humber estuary in units

4. Port Competitive Environment

4.1 Introduction

82. This section of the report considers the competitive environment in respect of Ro-Ro facilities. Matters that are looked at comprise:

a. The key requirements for efficient Ro-Ro operations

b. An overview of Ro-Ro facilities on the Humber

c. A summary of other UK East Coast Ro-Ro Facilities including Tees and Tyne that are at the margins of the Humber hinterland

d. Freeport developments and status

e. Capacity projections for the Humber ports

4.2 Key requirements for a Ro-Ro facility

83. Having regard to the key characteristics of the shortsea sector – see Section 3.1.3 – the following section analyses a number of key requirements for a Ro-Ro facility:

a. **Location**: the facility must be located where the market wants it to be located, benefiting from reliable and efficient hinterland connections to key market areas.

b. **High Quality Facilitie**s: High quality facilities are essential in what is a highly competitive market. This includes the following key aspects for a terminal:

I. **Dedicated facilities:** Due to tight Ro-Ro schedules and frequent sailings, preventing delays is vital for competitive services. For this reason, Ro-Ro operators typically seek certainty over a berth or berths, in order to be able to schedule arrival and departure times and eliminate exposure to third party delays. With competition being fierce, coordination between competing lines for priority berthing can be problematic. It follows that having dedicated facilities enables Ro-Ro operators to be in direct control of matters such as scheduling, stevedoring and storage. In addition, certain berthing windows will be preferred over others, i.e., daytime operations are preferred over berthing windows at night.

II. **Large storage areas:** Unaccompanied Ro-Ro cargo trailers are driven on and off the vessel and require land side storage. The space requirement per unit is larger than for example for a Lo-Lo container. The dwell time of trailers (i.e., the time the trailer sits in the storage area waiting to be either loaded onto the vessel or moved off inland to its destination) is shorter in comparison to the Lo-Lo sector. However, dwell times for Ro-Ro cargo have generally been increasing over the past few years, putting pressure on the terminals in terms of the availability of landside storage space. The trailers being taken on board need to be parked in an orderly manner close to the loading point. The

unaccompanied trailers also need parking and manoeuvring space when these are handled by terminal tractors.

III. **Ability to accommodate large deep draught vessels:** On the North Sea trade routes Ro-Ro vessels have increased in size in order to reduce per unit shipping costs and absorb growth in the market whilst maintaining the same frequencies of sailings. Although Ro-Ro vessels have relatively shallower draughts in comparison to other types of vessels, the size of the current largest Ro-Ro vessels requires relatively deep water. In-dock facilities are – for both water depth and vessel beam reasons – much less useful for larger modern Ro-Ro vessels .

IV. **Flexibility of infrastructure for various types of vessels:** Due to the range of potential Ro-Ro vessel characteristics, a terminal must have sufficient flexibility in terms of the vessels it can accommodate. Naturally these requirements have increased in line with the Ro-Ro vessel sizes. Given the lifetime of port investments designs must be sufficiently flexible to accommodate changes in market requirements over an extended period.

4.3 Humber Facilities

84. With these characteristics and requirements in mind, a high level review has been undertaken of the facilities serving the Ro-Ro market in the Humber region. In reviewing the current facilities, estimates have been made of the likely capacity of the facilities. The capacity of a Ro-Ro terminal depends on a range of operational characteristics which vary per route, operator and traffic flow amongst others. In order to make these broad estimates a number of assumptions have therefore had to be made. These assumptions are based on Rebel's experience in the market and have been verified by other market parties. However, it is recognised that if these assumptions on the operational characteristics are altered then the capacity estimate is altered. The resulting position that has been presented, therefore, serves only as an estimate of the order of magnitude of capacity that is available.

85. The methodology that has been used to produce the estimates of capacity is detailed within Appendix 6.

4.3.1 Port of Immingham

86. The Port of Immingham is owned and operated by ABP. It is located in an area not heavily constrained by residential or commercial areas. It is a key international gateway for the UK and handles a variety of different cargoes from both its in dock and in river facilities. The existing Ro-Ro facilities at the Port of Immingham serve the needs of two major Ro-Ro freight shipping lines – DFDS and Stena Line.

87. **DFDS:** The area occupied by DFDS within the Port is shown indicatively on

Figure 4-1. The characteristics of the terminals used by DFDS are summarised in Table 4-1. DFDS' activities are largely split between activities occurring at the Riverside Terminal and the Dockside (Nordic) Terminal. The facilities are used to

handle a variety of unaccompanied and accompanied Ro-Ro cargo along with trade cars. The Ro-Ro freight services operated by DFDS out of the Port of Immingham are detailed within section 6.3.

88. The Riverside Terminal is located within the Immingham Outer Harbour on the western side of the Port estate. The terminal benefits from lock free marine access and has three Ro-Ro berths. The two main berths are located either side of a single finger pier and the third berth uses a fender arrangement which allows for a vessel to be berthed alongside a vessel already moored on the most southerly of the two main berths. These berths are collectively supported by an area of trailer storage and warehousing immediately adjacent to the berths. The Riverside Terminal accommodates Ro-Ro vessels that are approximately 237m length overall (LOA), 33m beam and with a draught of 7m.

89. The Dockside Terminal is located within the enclosed dock area at the Port. The maximum size of vessels that can be accommodated within the inner dock is 198m LOA, 26.2m beam, 10.36m draught and 38,000 dead weight tonnes (DWT). The facility benefits from three berths with a depth of 10.36m and is supported by an area of trailer storage and Ro-Ro container storage in close proximity to the berths. A variety of warehousing and trade car storage is provided in locations further away from the berths. The Dockside Terminal has direct rail access, although this is considered a limited competitive advantage as virtually all Ro-Ro traffic is transported by road.

90. **Stena:** The area occupied by Stena Line is shown indicatively in Figure 4-2. The Stena Line operations within the Port of Immingham currently consist, albeit on a temporary basis, of a single berth terminal within the enclosed inner dock. As with the DFDS Dockside Terminal the size of Ro-Ro vessel that can be accommodated at this terminal is restricted by the inner dock limitations. The Stena berth is supported by trailer storage areas located at three different locations that stretch away from the berth. This facility currently serves Stena Line's Immingham / Rotterdam daily liner service which recently moved to the Port from the neighbouring Killingholme facility.

91. **Immingham Container Terminal**: In the context of the inner dock, reference should also be made to the Immingham Container Terminal which is located adjacent to the Dockside Terminal within the dock (see Figure 4-1) and can accommodate smaller shortsea container vessels. The terminal has recorded increased container volumes over the past decade resulting in high utilisation rates. There is limited potential for significant expansion at this location with the current arrangement of surrounding port uses.

Table 4-1 Port of Immingham terminal characteristics

	DFDS Dockside Terminal	DFDS Riverside Terminal	Stena Terminal	Immingham Container Terminal
Type	**Ro-Ro/Lo-Lo**	**Ro-Ro**	**Ro-Ro**	**Lo-Lo**
Estimated Ro-Ro / Container storage area	15.8 ha	17.9 ha	5.8 ha	19.1 ha
No of Ro-Ro berths	3	3	1	0
Size of Ro-Ro vessel accommodated	198m LOA 26.2m beam 10.36m draught	237m LOA 33m beam 7m draught	198m LOA 26.2m beam 10.36m draught	198m LOA 26.2m beam 10.36m draught
Estimate of efficient capacity*	200.000 unaccompanied units*	310.000 unaccompanied units*	60.000 unaccompanied units*	~400,000 TEU
	*assumed dwell time of 2.25 days, number of parking and ground slots, peak factor 1.25 units, stacking height 3 units, stacking efficiency 0.6 (see also appendix 6)			

Figure 4-1 Port of Immingham – DFDS areas and container terminal (source ABP)

Figure 4-2 Port of Immingham – Stena areas (source ABP)

4.3.2 Killingholme

92. The port facility at Killingholme is owned and operated by CLdN Ports Killinghome. It is a major terminal on the Humber estuary that predominantly handles unaccompanied and accompanied Ro-Ro freight, as well as a significant volume of trade car imports.

93. The facility has six in river berths and currently accommodates the largest Ro-Ro vessels operating out of the Humber estuary.

94. The main Ro-Ro shipping line services handled at the facility are those of the terminal operator's shipping line CLdN (Cobelfret). The Ro-Ro services operating out of Killingholme by CLdN (Cobelfret) are detailed in section 6.3.

95. In addition to the CLdN (Cobelfret) services, Stena Line operates a daily Ro-Ro liner service to and from the Hook of Holland.

96. The extent of the Killingholme facility is indicatively shown in Figure 4-3. Publicly available information indicates that in its entirety this covers in the region of 107 hectares. However, it is estimated that the area utilised for Ro-Ro trailer and Ro-Ro container storage is in the order of 33 ha and is all located in relatively close proximity to the berths. It is understood that some flexibility has been built into the terminal layout such that some parts of the terminal are used for either Ro-Ro storage or trade car storage.

97. From publicly available land ownership information the Killingholme facility is bordered by the site of the proposed Able Logistics and Business Park development to the north and west and the Able Marine Energy Park to the south. The facility is however unconstrained in terms of residential developments surrounding the port.

Table 4-2 Killingholme terminal characteristics

	General
Type	**Ro-Ro**
Estimated Ro-Ro / Container storage area	32.9 ha
No of Ro-Ro berths	6
Size of Ro-Ro vessel accommodated	Up to 262 m LOA Up to 35 m beam Up to ~8.4 m draught (9.35m depth)
Estimate of efficient storage capacity*	290,000 unaccompanied units*

*assumed dwell time of 2.25 days, number of parking and ground slots, peak factor 1.25 units, stacking height 3 units, stacking efficiency 0.6 (see also appendix 6)

Figure 4-3 Killingholme Ro-Ro facility(source ABP)

4.3.3 Hull

98. The Port of Hull is owned and operated by ABP and is a facility which handles a variety of different cargo from its in dock and in river facilities. An indicative overview of the port is shown in Figure 4-4 and in Table 4-3. The main Ro-Ro activity occurring at the Port of Hull is in respect of a daily service operated by P&O to /

from Rotterdam. In addition to freight this service also handles passengers and passenger vehicles. The P&O vessels operating on this service are, therefore, passenger / Ro-Ro vessels (Ro-Pax). The terminal from which this service operates benefits from a single in river berth which has an alongside depth of 6.5m.

99. The available storage area for the terminal is more limited than the Ro-Ro terminals located on the south bank of the Humber, but the larger share of accompanied and passenger use of this service helps in reducing the storage requirements needed by this service. The port itself is located on the eastern periphery of Hull which has the potential to generate issues over traffic congestion in that routes to the major hinterland lie to the west of Hull.

100. In addition to the P&O services the Port of Hull also supports a twice weekly service to Helsinki operated by Finnlines. This service utilises a berth within the locked Queen Elizabeth Dock which accommodates a variety of different cargo types including unaccompanied Ro-Ro trailers, container and break bulk cargoes. The locked entrance into the Queen Elizabeth Dock and King George Dock restricts the maximum size of vessels that can enter to those which are 199m LOA, 25.5m beam, 10.4m draught and 34,000 DWT.

101. Thor Shipping operates from two in-dock areas in the port of Hull with a Lo-Lo/multi-purpose service. The areas are multi-purpose areas.

102. The Queen Elizabeth Dock is also the location of the Hull Container Terminal. This facility serves as a major shortsea Lo-Lo terminal for the North of England and currently handles in the order of 264,000 TEU per annum.

103. The Ro-Ro facilities within the Port of Hull are surrounded by other port uses and activities, which makes potential expansion difficult.

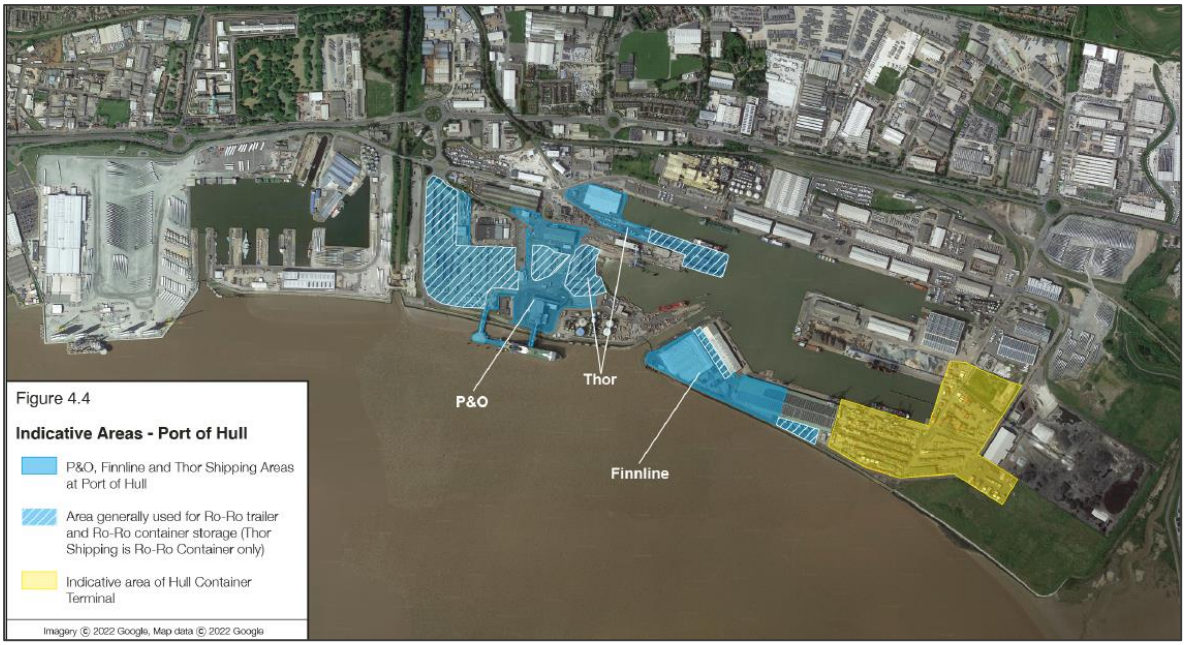

Figure 4-4 Port of Hull

Table 4-3 Port of Hull terminal characteristics

	P&O Terminal	Finn Terminal	Hull Container Terminal	Thor Shipping
Type	**Ro-Ro**	**Ro-Ro**	**Lo-Lo**	**Ro-Ro**
Estimated Ro-Ro / Container storage area	8.6 ha	0.7 ha	13 ha	3.3 ha
No of Ro-Ro berths	1	1	1	1
Size of Ro-Ro vessel accommodated	214m LOA 29m beam 6.5m draught	199 m LOA 25.5 m beam 10.4 m draught	199 m LOA 25.5 m beam 10.4 m draught	199 m LOA 25.5 m beam 10.4 m draught
Estimate of efficient capacity*	80,000 unaccompanied units*	10.0000 unaccompanied units*	~600,000 TEU	50.000 unaccompanied units*
	*assumed dwell time of 2.25 days, number of parking and ground slots, peak factor 1.25 units, stacking height 3 units, stacking efficiency 0.6 (see also appendix 6)			

4.3.4 Other East Coast Facilities

104. Aside from the Humber ports, there are a number of other facilities on the UK's East Coast which also handle Ro-Ro traffic. These facilities, however, are located further from the key markets served by the Humber facilities and are only considered to be potentially competitive at the margins of the main hinterland served by the Humber facilities.

a. **Tees and Hartlepool:** The twin port facilities of Tees and Hartlepool are located just east of Middlesbrough. The ports primarily serve the market further to the north of the Humber with a set of shortsea services. Although the Port of Hartlepool has four Ro-Ro berths, Ro-Ro volumes are low and the facility would appear to be focussed on meeting the needs of the offshore energy industry. Ro-Ro activity in Teesport serves the market in the far north of England. P&O

is the key client in the port of Tees and is responsible for the greater part of Ro-Ro activity in the port, albeit on a much smaller scale than for the Humber.

b. The focus at Teesport is Lo-Lo activity. Container volumes have increased over the past decade. The port has long standing plans to expand into the deepsea container market.

c. **Port of Tyne:** Located near Newcastle, the port of Tyne serves the local market and Scotland. DFDS calls at a small Ro-Ro facility. Storage capacity is limited to handle only relatively small volumes of unaccompanied Ro-Ro. The main service at the facility is the overnight ferry to iJmuiden which includes mainly passengers and passenger vehicles as well as limited Ro-Ro freight traffic. The container facility handles small volumes of containersbut a relatively large proportion of empty containers returning to Europe.

d. **Port of Harwich:** Located in Essex, Harwich has a long established ferry link with the Hook of Holland. Stena operate a passenger and passenger vehicle service from a dedicated Ro-Ro facility at the port. There is also a limited accompanied Ro-Ro freight aspect to this service. The focus of demand is London and the Midlands.

e. **Port of Felixstowe:** Although best known as a container gateway, the Port of Felixstowe is also active in the Ro-Ro sector. It handles predominantly unaccompanied trailer trade with Europe via the Netherlands. DFDS operate three sailings per day to Vlaardingen in Rotterdam using vessels of 190-250 trailer capacity. The focus of the market is London and the Midlands.

4.4 Freeport Developments

4.4.1 English Freeports

105. Eight English Freeports have been announced by the UK Government. Two more Freeports are planned to be developed in the near future: one in Scotland and one in Wales. These last two Freeports still need to be approved by the Devolved Administrations in the two countries. The UK has had Free Zones in the past which were aimed at regeneration or to encourage specific business sectors to become established.

106. The Government is currently working with the selected Freeports in England to develop their detailed business cases. The concept has significant political backing at a UK Government level and is often described as the flagship levelling up policy of the Government. This is because the Freeports also focus on ‘Levelling Up’ and ‘Global Britain’ agendas central to policy following the end of the Transition Period with the EU.

107. One of the core objectives of Freeports is to appeal to business which import goods, process them and then re-export. Tax exemptions at the Freeport may result in lower costs of production for English products and could create a port centric supply chain. This would result in more captive volumes routed over the ports to which the Freeports are attached. Businesses which are located within the Freeports will have

advantages over those located outside the Freeport boundary. The advantages consist of customs and tax benefits.

108. The business cases of the Freeports will focus on attracting direct investments. More important is that for the ports it can actually provide benefits in comparison with inland industrial parks. As these Freeport areas are located in the direct vicinity of certain ports, cargo generated will be captive cargo for those ports. In addition, the system will allow ports to run their port eco system in a more cost-efficient way. Thirdly, the additional business activity will likely result in increased land prices around the port. As a result, those ports with sufficient land available in the vicinity could benefit from the Freeport concept.

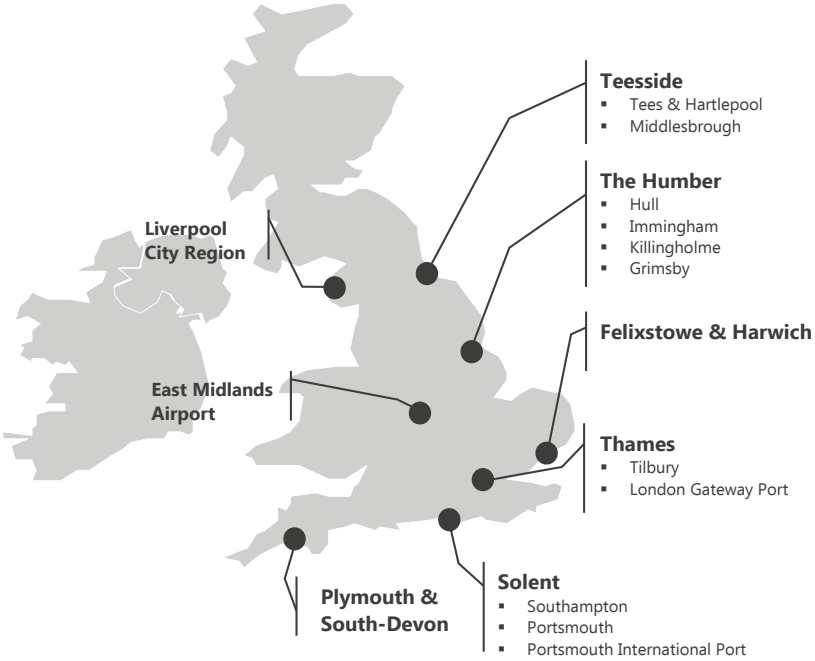

Figure 4-5 Geographical location English Freeports. Source: Rebel, Government UK (GOV.UK)

4.4.2 The Humber Freeport

109. ABP was involved in the bidding process for a Freeport status area in the Humber together with the East Riding of Yorkshire, Hull, North and Northeast Lincolnshire Councils, the two Local Enterprise Partnerships (LEP) and other businesses. The proposal includes:

a. **Customs zones:** the four ports of Immingham, Killingholme, Hull and Grimsby; this therefore maintains a level playing field between the four existing Humber port facilities.

b. **Four tax sites:** the tax sites are focusing on green energy and logistics across the sub-region and include locations on both the north and south banks and inland at Goole consisting of:

a. East of the Port of Hull includes some port land, Saltend Chemicals Park, the Yorkshire Energy Park and part of the new Humber International Enterprise Park; there is a focus on green energy jobs, including a potential new hydrogen de-carbonisation project.

b. Goole: focus on an innovation centre, the rail industry and supply chain employment.

c. Humber South Bank (including Killingholme): focus on green energy jobs, especially in the offshore wind sector.

d. Grimsby & Immingham.

c. **Forecast economic impacts:** additional investment is estimated at £3.5bn and 7,000 additional jobs.

d. **Governance:** A new company will be created to run the Freeport; the board will be drawn from local authorities, LEPs and local business.

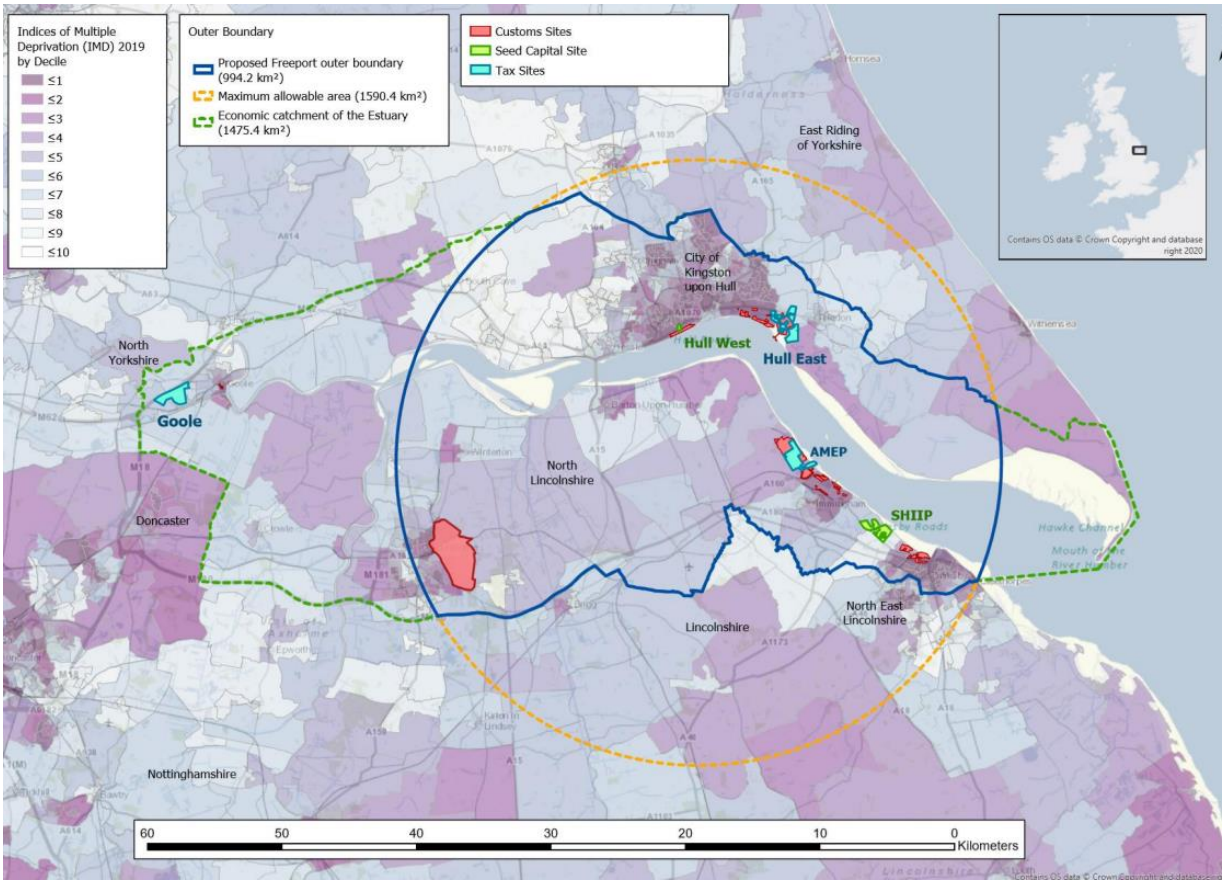

Figure 4-6 Map of Humber freeport: Source Humber freeport

4.4.3 Humber Freeport potential impacts

110. The overall impact of the Humber Freeport is difficult to assess at this early stage although there is significant political support for the concept, and it appears that

customs and tax measures will be put in place to seek to make the concept a success. Expected results will be additional economic activity (in terms of GVA), additional employment created and reduced levels of deprivation, as well additional traffic being handled through the port facilities.

111. The Humber has many advantages as a Freeport location, including deep water facilities, good shortsea Ro-Ro connectivity and sectoral strengths in automotive and offshore wind. It has good road connections to the main motorway and rail networks. It also has land available (principally on the South Bank) with potential for further expansion to serve these sectors. The Freeport clearly has potential for generating additional inward investment in manufacturing and processing facilities.

4.5 Capacity projections

4.5.1 Summary of Ro-Ro Capacity on the Humber

112. The capacity of a Ro-Ro terminal is determined by both berth capacity and storage area capacity. The berth capacity on the Humber (i.e., available berth windows at suitable infrastructure for vessels to dock) is considered further in section 6.3 (see Figure 6-3). Storage area requirements are almost entirely determined by demand for unaccompanied traffic. Accompanied traffic will typically stay in the port for a short time and hence requires only limited space, mostly for gates and access roads, whereas unaccompanied freight builds up over time at the terminal in advance of or after a vessel sailing.

113. Table 4-4 summarises the high-level estimate of unaccompanied Ro-Ro capacity currently considered to be available on the Humber. For the reasons already explained, this serves only as an estimate of the order of magnitude of capacity that is available. The methodology used to reach these estimates, along with the assumptions made, are contained within Appendix 6.

114. The Ro-Ro facilities at Immingham are operating near to their efficient capacity. This means that an increase in traffic through those facilities will reduce the efficiency of those facilities and could possibly lead to congestion.

115. In the assessments below we used 2.25 days as average dwell time based on our experience in the industry as being a typical dwell times across the sector. It is considered highly likely that Killingholme operates with a shorter dwell time, as no facility can operate above its capacity. In the next section we will discuss the sensitivity of the capacity projections to the dwell time assumption.

Table 4-4 Summary of Ro-Ro Capacity in the Humber

	Ro-Ro Accompanied (2021-- units)	Ro-Ro Unaccompanied (2021-- units)	Capacity Ro-Ro Unaccompanied (units)*	Efficient Capacity Utilisation
Immingham	7,621	386,837	570,000	68%
Killingholme	63,291	338,474	290,000	117%
Hull	66,428	37,416	140,000	27%

*assuming dwell times of 2.25 days, relevant to unaccompanied Ro-ro cargo only

4.5.2 Dwell times and capacity

116. Over the past three years supply chains have faced multiple challenges. Anecdotally, dwell times for short sea unitised cargo have fluctuated depending on local challenges. Although the position very much depends on the specifics of each situation, in general, volatility in supply chains has increased. The industry typically operates with an average combined dwell time of around 2 to 2.5 days for unaccompanied Ro-Ro units. An increase in dwell time of one further day requires additional storage space and thus reduces the capacity of the facility. Conversely, if dwell time is shortened then capacity increases. This highlights the difficulty in determining the precise capacity of a Ro-Ro facility. Table 4-5 however, indicates how capacity utilisation changes as dwell times change. It confirms that, on the basis of any consideration, there is little spare capacity for unaccompanied Ro-Ro cargo storage within the existing Humber facilities.

117. Based on anecdotal market intelligence it is understood that due to the recent supply chain issues terminals are seeking alternative parking locations as their capacity is exceeded.

Table 4-5 Sensitivity of the estimated capacity utilisation based on increasing dwell times

	Utilisation 1.75 days	Utilisation - 2 days	Utilisation - 2.25 days	Utilisation - 2.5 days	Utilisation - 3 days
Immingham	53%	60%	68%	74%	90%
Killingholme	91%	106%	117%	130%	154%
Hull	21%	23%	27%	31%	34%

4.5.3 Ro-Ro Traffic Benchmarks

118. The mix of modes and volumes of Ro-Ro traffic for each of the Ro-Ro facilities on the Humber varies. In Table 4-6 some traffic benchmarks are listed. Due to the differences in traffic pattern, there is also a divergence in terminal layout. The share of unaccompanied Ro-Ro traffic is key as this type of traffic requires larger storage areas as dwell time is much greater. Accompanied traffic only requires temporary parking positions sufficient to allow smooth embarkation and adequate space at disembarkation to allow smooth exit from the terminal.

119. The following observations in respect of the Humber facilities can be made based on the information reported in Table 4-6:

- Immingham and Killingholme have a strong focus on unaccompanied traffic. In contrast Hull is more focused towards accompanied traffic and passenger traffic (including passenger vehicles).
- The available storage area relative to the throughput in Killingholme and Immingham are very similar indicating likely similar dwell times of the units handled. The different traffic profile for Hull can also be seen in the table with fewer unaccompanied trailers at the P&O terminal and for Finnlines per hectare.

120. Although the terminals in Immingham and Killingholme are relatively similar in terms of throughput, the amount of throughput over each berth is much higher in Immingham than in Killingholme, as well as there is more storage space available per berth. In contrast the throughput per hectare of storage space in Immingham is lower than in Killingholme. Part of this is considered likely to be due to the fact that a higher amount of trade cars are also imported at Killingholme. This seems to indicate that at Immingham the berths are a limitation whereas in Killingholme the storage space is scarcer. At both locations there appear to be limited berthing windows available to accommodate a new service following our analysis in section 6.3.

Table 4-6 Traffic benchmarks Ro-Ro terminals on the Humber (2021)

Port	Terminal	Capacity Utilisation* [%]	Unaccompanied / Accompanied [-]	Storage / Linkspan [ha / nos]	Unaccompanied / Storage ['000s units / ha]	Ro-Ro / Linkspan ['000s units / nos]
Immingham	DFDS	68%	50.8	11.3***	11.5	131.5***
Killingholme	CLdN Ports	117%	5.3	4.8**	17.5	100**
Hull	P&O	27%	0.4	2.9	2.4	24.8

*assuming dwell times of 2.25 days
**this considers all four berths are available for Ro-Ro. It is understood that one berth is used for berthing deep sea car carriers. In addition it is understood that the usability of a sixth berth is not guaranteed. A higher number of berths, would result in a lower storage space and number of units per linkspan.
***assumed 3 linkspans for Immingham

For a Ro-Ro operator, having a dedicated terminal with a sufficiently sized storage area and sufficiently deep water at an unconstrained berth that it can utilise when required is essential for its commercial offering. These aspects directly influence its competitive position. For unaccompanied trade on the Humber, Immingham and Killingholme are the best suited facilities. The storage capacity at both immingham and Killingholme is highly utilised and a small increase in dwell time for unaccompanied trailers would result in capacity rapidly being put under further pressure.

5. Hinterland Structure

5.1 Introduction

121. The hinterland analysis presented in this section forms a basis for consideration of demand distribution for Ro-Ro traffic to and from the hinterland of the Humber facilities. The analysis in this section feeds into the demand potential assessment for the Humber using the information in parallel with the logistic cost analysis. A range of drivers for Ro-Ro demand are analysed :

- Regional Gross Value Added distribution at the Local Authority level
- Regional population distribution and number of enterprises
- A review of hinterland infrastructure
- Mapping of key distribution centres

5.2 Regional economic activity

5.2.1 Regional Economic Activity

122. Economic activity is a key driver of growth for shortsea container and Ro-Ro demand. The map below represents the aggregated GVA (Gross Value Added) per local authority in the UK in million pounds in 2019, which is the measure of the value of goods and services produced in an area, industry or sector of an economy. The analysis only focuses on the economic sectors which primarily generate trade in goods and excludes services.

123. In 2019, the Humber area[3] was responsible for 8.2% of GDP. In addition, the Humber is ideally located to serve areas with a high GVA including Leeds, Sheffield, Liverpool, Manchester and the Midlands, as can be clearly seen.

[3] NUTS1 region 'Yorkshire and the Humber'

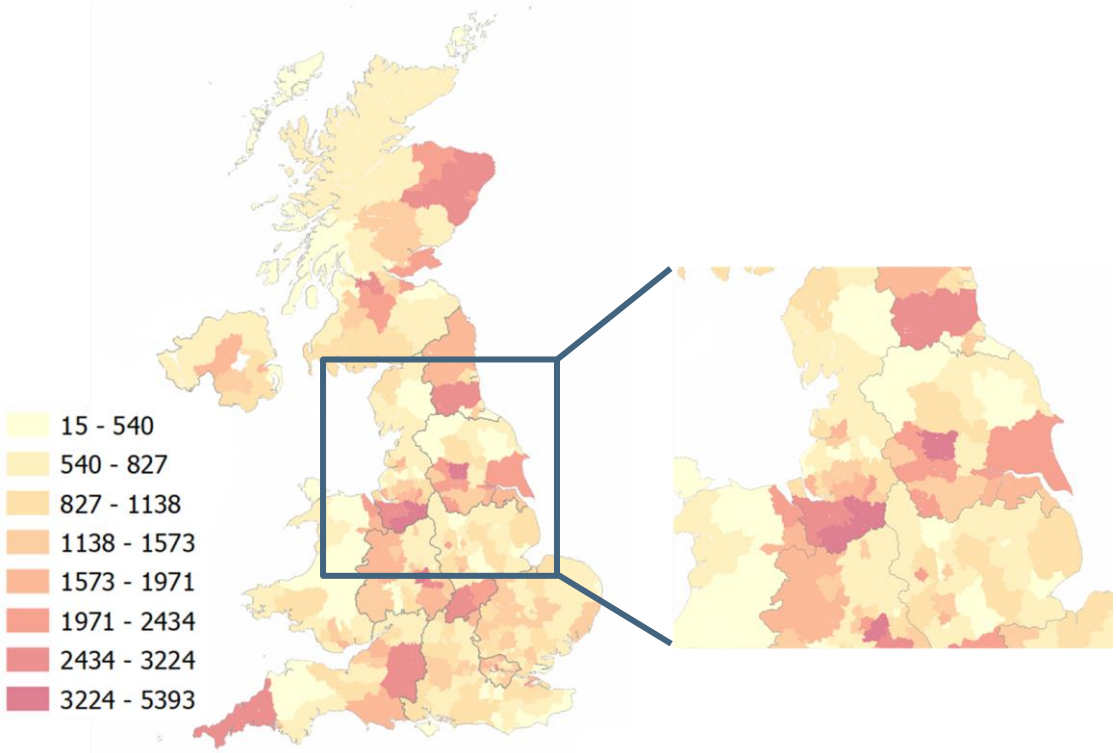

Figure 5-1 Gross Value Added per Local Authority in million pounds (2019). Source: Rebel, Office of National Statistics

5.2.2 Regional Population Distribution

124. A second driver of demand is the population distribution across the UK. The map that follows represents the population density by local authority area in 2022. The Humber area[3] holds 8% of Great Britain's population, with Hull, Leeds and Sheffield being the most densely populated areas within the Humber hinterland. The Humber ports are in the vicinity of other densely populated areas such as Manchester, Liverpool, Nottingham, Leicester and Birmingham.

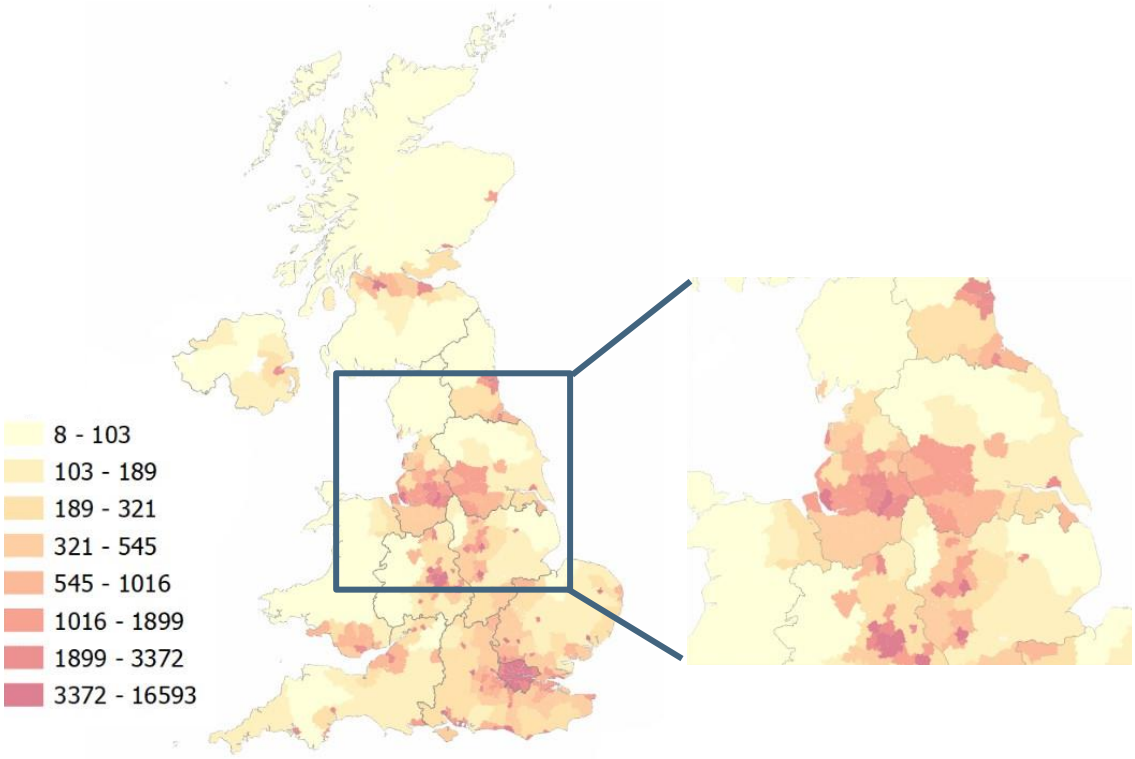

Figure 5-2 Estimated population density in 2022 by Local Authority (people/km^2). Source: Rebel, Office of National Statistics

5.2.3 Business Statistics

125. The third driver of demand used in this analysis is the geographical distribution of companies linked to cargo generation. To analyse this aspect of regional demand the Structural Business Statistics dataset (SBS) released by the Office of National Statistics (ONS) has been used. The dataset is filtered to only include the enterprises active in manufacturing (e.g., fabricated metal products, food product, machinery and equipment) and wholesale trade (e.g., household goods, other machinery, equipment and supplies, food, beverages and tobacco) to represent businesses that are likely to generate shortsea container and Ro-Ro demand. The area around the Humber area[3] holds 8% of the Great Britain's registered businesses in respect of such enterprises. These businesses are primarily located in Leeds, Sheffield and other parts of the Yorkshire region.

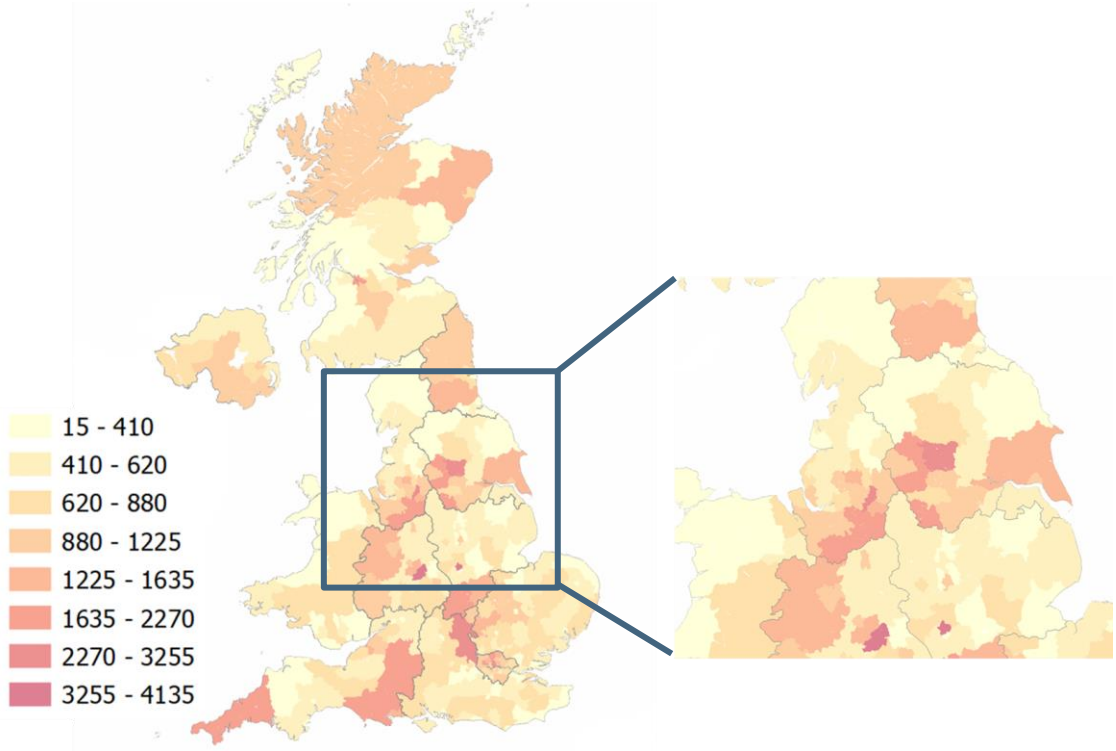

Figure 5-3 Number of enterprises in 2021 by local authority (local units). Source: Rebel, Office of National Statistics

5.3 Key Distribution Centres

126. Figure 5-4 shows the key distribution centres in the United Kingdom. The Humber area[4] holds approximately 20% of the national key distribution centres and is closely located in close proximity to areas that also contain a high proportion of distribution centres such as Manchester, Liverpool and the Midlands. The location of a port in relation to these facilities is important, as it directly determines the inland cost aspect of the transport cost chain.

[4] NUTS1 region 'Yorkshire and the Humber'

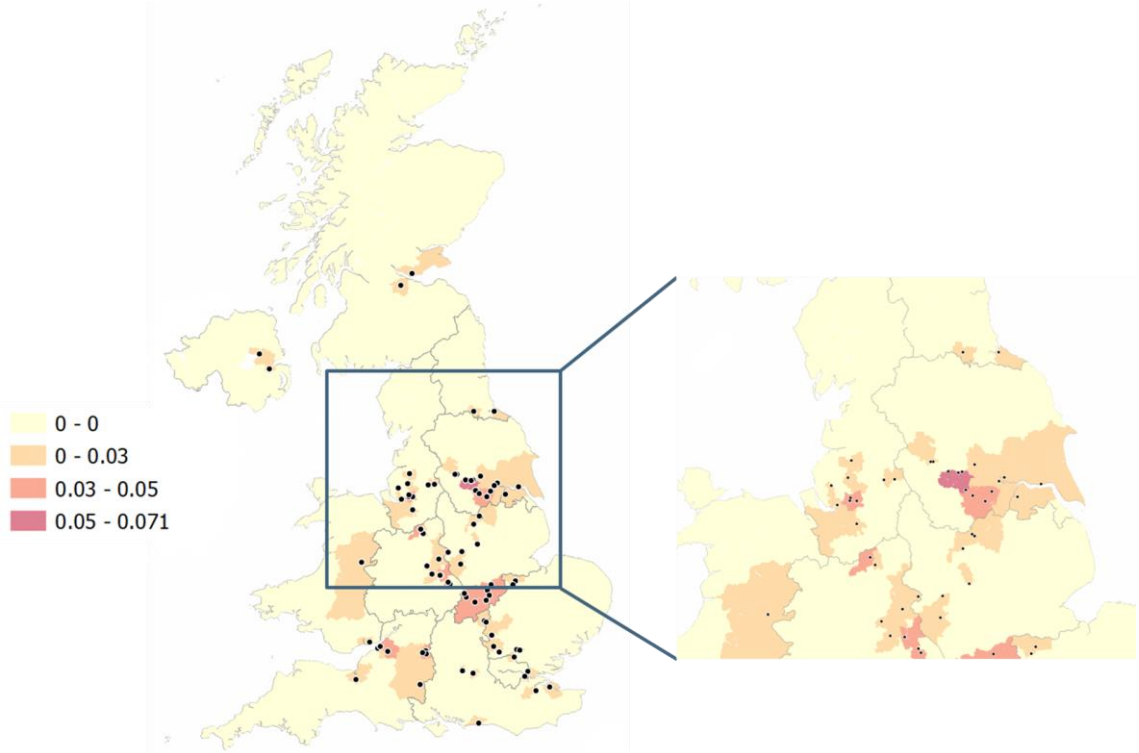

Figure 5-4 Location of key distribution centres. Map is coloured based on the share of distribution centres per Local Authority. Source: Rebel, Logistics Institute Data Observator

5.4 Hinterland infrastructure

127. Figure 5-5 shows the main road infrastructure in Great Britain. The Humber ports are well connected with the hinterland due to the close access to the M62 and the M180. The highway network is focused on East-West connections and located near the North-South arteries as well, creating a corridor to densely populated areas. This enables efficient movement of freight towards areas such as Leeds, Leicester, Manchester and Birmingham.

128. The rail network is less relevant for Ro-Ro traffic. Ro-Ro traffic by nature is focused on subsequent transport by road. Also, the distances of this traffic (mainly being orientated East-West) from port to end market do not generally allow for efficient intermodal transport by rail.

Figure 5-5 Main roads in Great Britain. Sources: Google Maps

The ports on the Humber are well located to serve key markets around Liverpool, Manchester, Sheffield and Leeds. The Humber captive region covers a significant part of UK's economic activity, population, businesses and distribution centres.

6. Shortsea Shipping Structure

6.1 Introduction

129. This Section considers trends in the shortsea shipping sector with a specific focus on Ro-Ro vessel trends, including:

a. General shipping trends

b. Development of sizes of vessels

c. Vessels on the North Sea and the Humber

d. Ro-Ro operators' strategies and anticipated developments

e. Sailing schedules for UK Ro-Ro ferries

f. Berthing window analysis for the Humber facilities

g. Sailing schedules for Humber Lo-Lo services

6.2 Shipping trends

6.2.1 General Shipping Trends

130. There have been significant developments in respect of the size and type of vessels deployed on the North Sea shortsea Ro-Ro trade routes in recent years. Figure 6-1 presents a summary of the current size and age profile of the overall vessel fleet operated by the four major Ro-Ro operators who currently operate services from Humber ports – namely DFDS, CLdN (Cobelfret), P&O and Stena.

131. There has been a steady increase in the capacity of Ro-Ro vessels offered by these operators and several trends emerge:

a. On the basis of the year of build (or conversion – also known as 'jumboisation' where the capacity of an existing vessel is increased) of these vessels, capacity has increased from an average of between 2000-3000 lane metres (lm) in the late 1990s to a current level of around 5400-6000 lane metres for vessels delivered in the period since 2018. Most of the operators have sought to introduce larger vessels into their fleets either by the acquisition of new designs or by the modification of existing vessels. This size trend has occurred despite the overall distribution of the deployments remaining fairly stable.

b. Increased capacity is the consequence of the introduction of longer and broader Ro-Ro vessels. There have been only limited increases in the design draught of vessels over the period, reflecting both the availability of water depth at the terminals being served and also the volume-limited nature of Ro-Ro operations (i.e. Ro-Ro vessels are relatively shallow in comparison to their other dimensions as the vessel's capacity is limited by the number of trucks that can fit on a vessel rather than the total loading of the vessel. As a comparison a container vessel can be more heavily loaded and hence requires deeper draught for a vessel of comparable dimensions. As a result, there has been only

limited requirement for water depth able to accommodate Ro-Ro vessels of greater than 8m draught.

c. It is considered unlikely that there will be further significant increases in Ro-Ro vessel capacity in the coming years. The largest vessels currently deployed present a realistic compromise between economies of scale and flexibility of deployment (time to unload and load a vessel within the berthing window during the day). It is not thought likely that Ro-Ro vessel capacity will extend beyond a maximum of around 8,000 lane metres on the North Sea and on the Humber in the future.

132. In Figure 6-1 the Ro-Ro vessels operating on the North Sea are summarised by year of construction and capacity.

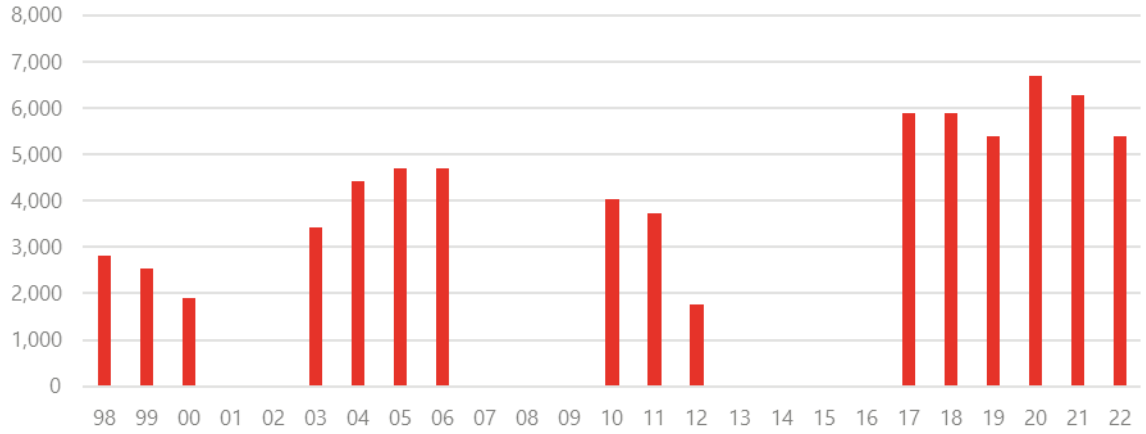

Figure 6-1 North Sea Operators Average Vessel Capacity by Year of Build/Conversion (in lane metres)

6.2.2 Ro-Ro vessels the North Sea

133. The table below provides an overview of the dimensions of the Ro-Ro and Ro-Pax[5] vessels operating on the North Sea.

[5] A Ro-Pax vessels is a vessel which combines accompanied or unaccompanied Ro-Ro traffic with passenger transport.

Table 6-1 Major North Sea Ro-Ro Operator Fleet Size/Age Profile 2022

Built	Vessel Name	Draught	LOA*	Beam*	Lane Metres	Gross Tonnage	Comments
DFDS							
1998	SELANDIA SEAWAYS	7,5	197	25,9	2820	24803	
1999	SUECIA SEAWAYS	7,5	197	25,9	2820	24613	
2000	BOTNIA SEAWAYS	6,7	163	26,6	1890	11530	
2003	MAGNOLIA SEAWAYS	7,4	200	29,5	3830	32523	
2004	BEGONIA SEAWAYS	7,7	230	27,0	4700	37939	Jumboised
2004	PRIMULA SEAWAYS	7,4	230	29,5	4700	37985	Jumboised
2004	PETUNIA SEAWAYS	7,4	200	26,5	3830	32523	
2005	FREESIA SEAWAYS	7,7	230	27,0	4700	37939	Jumboised
2006	FICARIA SEAWAYS	7,7	230	27,0	4700	37939	Jumboised
2017	TULIPA SEAWAYS	6,8	210	26,0	4000	32336	
2019	HOLLANDIA SEAWAYS	7,4	237	33,0	6700	60465	
2020	HUMBRIA SEAWAYS	7,1	235	33,0	6700	60465	
2021	FLANDRIA SEAWAYS	7,1	237	33,0	6700	60465	
2021	SCANDIA SEAWAYS	7,1	237	33,0	6700	60465	
CLdN							
2010	OPALINE	7,4	195	31,0	3923	33960	
2010	PEREGRINE	7,1	195	26,2	2604	25593	
2010	PALATINE	7,1	195	26,2	3678	31340	Jumboised
2010	VESPERTINE	7,1	195	26,2	3678	25593	
2011	AMANDINE	7,1	195	26,2	3923	33960	
2017	CELINE	8,1	234	35,0	7800	74273	
2018	ALF POLLAK	6,8	210	26,0	4000	32936	
2018	DELPHINE	8,1	234	38,0	7800	74723	
2019	HERMINE	8,2	216	32,4	5400	50433	LNG ready
2019	SIXTINE	8,2	217	32,4	5400	50433	LNG ready
2021	FAUSTINE	8,2	21	32,6	5400	50455	LNG
2022	SERAPHINE	8,2	217	32,6	5400	50455	LNG
P&O Ferries							
1999	ESTRADEN	5,9	163	25,2	2270	18205	
2001	PRIDE OF HULL	6,0	215	31.5	3400	59925	RO-PAX
2001	PRIDE OF ROTTERDAM	6,0	215	31.5	3400	59925	RO-PAX
2011	BORE SONG	6,9	195	26,2	2900	25586	
2012	WILHELMINE	5,6	152	24,4	1756	21020	
Stena							
1999	SOMERSET	7,5	183	25,2	2475	21005	
2003	STENA FORERUNNER	7,5	195	25.6	3000	24688	
2009	FIONIA SEA	6,8	187	26,5	3332	25609	
2010	JUTLANDIA SEA	6,8	187	26,5	3332	25609	
2010	STENA BRITANNICA	6,4	240	32,0	5566	62000	RO-PAX
2010	STENA HOLLANDICA	6,4	241	32,0	5566	62000	RO-PAX
2011	STENA TRANSIT	6,3	212	26,7	40560	33690	RO-PAX
2011	STENA TRANSPORTER	6,3	212	26,7	4056	33690	RO-PAX

Source: Alphaliner, Vessel Finder, Stena Official Website, Rebel Group

* Max beam to enter the lock in Hull is 25.7m and LOA 228m and for Immingham lock 26.8m and LOA 197m.

6.2.3 Maximum Ro-Ro Vessel Dimensions Humber

134. In Figure 6-2 below Ro-Ro vessels are again shown by size and year of construction, but the data points are split between vessels calling in the Humber

and in other port regions. It is clearly the case that this overall vessel size development has also been witnessed on the Humber.

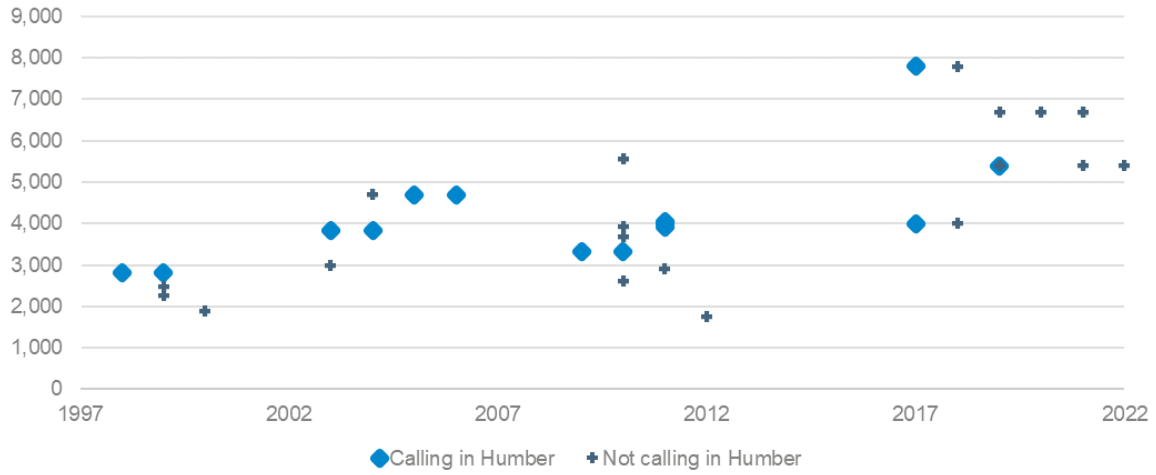

Figure 6-2 North Sea Operators Vessel Capacity by Year of Build/Conversion calling in the Humber (in lane metres)

135. Ro-Ro vessel dimensions can be compared with the maximum dimensions of the vessels which can be handled at the various Humber terminals. The in-dock terminals at Immingham and Hull are not able to handle most of the Ro-Ro vessels currently operating due to beam and length overall (LOA) restrictions.

Table 6-2 Vessel's maximum dimensions per terminal

	Terminal	LOA	Beam	Draught	Approx. Dwt
	Riverside Terminal	240 m	55.0 m	11 m	18,500 t
Immingham	Dockside Terminal	197 m	26.8 m	10.36 m	38,000 t
	Stena Terminal	197 m	26.8 m	10.36 m	38,000 t
Hull	P&O Terminal	214 m	29.0 m	6.5 m	12,000 t
Killingholme		262 m	35.0m	8.4 m*	Unknown

*** 9.35m water depth**

6.2.4 Liner Strategies

136. Each Ro-Ro operator has adopted a different strategy recently towards the vessels they operate and have acquired for the future. However, all operators active on the Humber have placed orders for relatively large Ro-Ro vessels. Although it is not clear which vessels will be deployed to the Humber, it may be expected that some will be calling at the Humber facilities. Given the long lifetime of Ro-Ro vessels, current strategies may affect the Ro-Ro market in the Humber in the next two decades.

6.3 UK East Coast Ro-Ro services

137. Table 6-3 summarises the key characteristics of current Ro-Ro services to the East of England. The table further illustrates the strong competition between the four major operators who dominate the market. Also, the overlap in terms of overseas destinations is clearly visible. The following can be seen from the table.

138. Except for P&O Ferries, most lines operate vessels of up to 5,000-6,000 lane metre capacity. P&O is the only operator calling at Teesport with a Ro-Ro vessel creating a niche offering. However, on the Rotterdam-Hull trade P&O face cost competition from the other operators on this trade who operate with a different business model and sail with significantly larger vessels.

139. Stena Line is currently focused on the connections between the Netherlands and the UK with eight vessels deployed on these routes. Stena Line sails point-to-point services connecting two ports only.

140. DFDS has the largest number of vessels deployed on the North Sea trades, connecting to both Belgium and the Netherlands, as well as a set of North European destinations. In addition to point-to-point connections, DFDS has some lower volume loops on some of its services.

141. CLdN (Cobelfret) operates more of a loop service basis connecting multiple ports. This is a similar concept as found in the container shipping sector. Although calling at multiple ports may increase the transit time of each journey, average vessel utilisation will be higher. The vessels Cobelfret deploys to Killingholme are understood to be the maximum sized vessels which can berth at Killingholme and further increases in vessel size is unlikely to be possible at this facility without further developments.

Table 6-3 Key characteristics of current Ro-Ro services to the Humber (top part) and to other East coast ports in England (bottom part)

	Port of destination (UK)	Vessels	Avr. vessel cap. (in lm)*	Draught (m)	Frequency (per week)	Rotation/Port of origin
STENA LINE		**8**			**35**	
Hoek van Holland (Rotterdam) Killingholme	Killingholme	2	4.056	6	7	Rotterdam
Rotterdam - Immingham	Immingham	2	3.332	not known	6	Rotterdam
CLdN (Cobelfret)		**7**			**28**	
Ro-Ro Services (North Sea and Atlantic)	Killingholme	8	5.570	7,4 - 8,2	15	Zeebrugge, Rotterdam, Gothenburg, Esbjerg, Leixoes Santander
Benelux-Dublin services	Killingholme	4	5.134	7,4 - 8,12	6	Zeebrugge, Rotterdam
DFDS		**11**			**80**	
Cuxhaven - Immingham	Immingham	2	2.820	8	15	Cuxhaven
Esbjerg - Immingham	Immingham	2	3.831	7	15	Esbjerg
Rotterdam - Immingham	Immingham	2	6.700	7,1 - 7,4	12	Rotterdam
Gothenburg - Brevik - Immingham	Immingham	2	4.700	8	8	Gothenburg, Brevik
P&O Ferries		**5**			**27**	
Hull - Rotterdam	Hull	2	3.345	not known	7	Rotterdam
FINNLINES		**1**			**2**	
Baltic-North Sea services and Finland-Baltic Germany services	Hull	1	1.775	7	2	Helsinki
Sea-Cargo A/S		**2**			**5**	
North Europe-Norway services	Immingham	2	327	6,95 - 7,07	5	Aberdeen, Alesund , Alvik, Amsterdam, Bergen, Esbjerg, Floro, Haugesund, Husoy, Molde, Tananger, Trondheim, Ulsteinvik

Source: Alphaliner, Shipping line's websites, Rebel
**** lane meters***
May 2022

	Port of destination (UK)	Vessels	Avr. vessel cap. (in lm)	Draught (m)	Frequency (per week)	Rotation/Port of origin
STENA LINE		**8**			**35**	
Hoek van Holland - Harwich	Harwich	2	5.566	6	14	Rotterdam
Rotterdam - Harwich	Harwich	2	2.738	8	12	Rotterdam
DFDS		**11**			**80**	
Rotterdam - Felixstowe	Felixstowe	2	3.410	6,8 - 7,5	26	Rotterdam
Ijmuiden – Tyne	Tyne	**2**	1410	6,2-6,5	**7**	Ijmuiden, Newcastle
P&O Ferries		**5**			**27**	
Teesport- Rotterdam	Tees	2	2.270	not known	5	Rotterdam
Teesport- Zeebrugge	Tees	1	2.900	not known	8	Zeebrugge

Source: Alphaliner, Shipping line's websites, Rebel
**** lane meters***
May 2022

6.4 Humber Berthing Windows

142. The availability of a free berth upon arrival, served by appropriate and adequate landside infrastructure is of crucial importance for Ro-Ro operators. The frequency of vessel calls places further strains on berth capacity and it is difficult to combine multiple services at a single berth. In the figure below the arrival and departure times of the Ro-Ro services in Killingholme and Immingham are mapped over a week according to published schedules by the operators and times-at-berth. Effectively, two berths are needed at Killingholme for the CLdN services which can go up to three berths in some occasions, four berths for the DFDS services in Immingham and two more berths for the Stena services just to ensure all current services can maintain their intended sailing schedules. One of the Stena services calls at Immingham, however it is using a berth which is principally not intended for Ro-Ro operations. This makes the operations for Stena less than ideal. The other Stena service calls at Killingholme. The splitting of Stena operations between two separate locations is also less than ideal since this will increase management time and reduces the operator's ability to optimise the services and will likely increase its cost base.

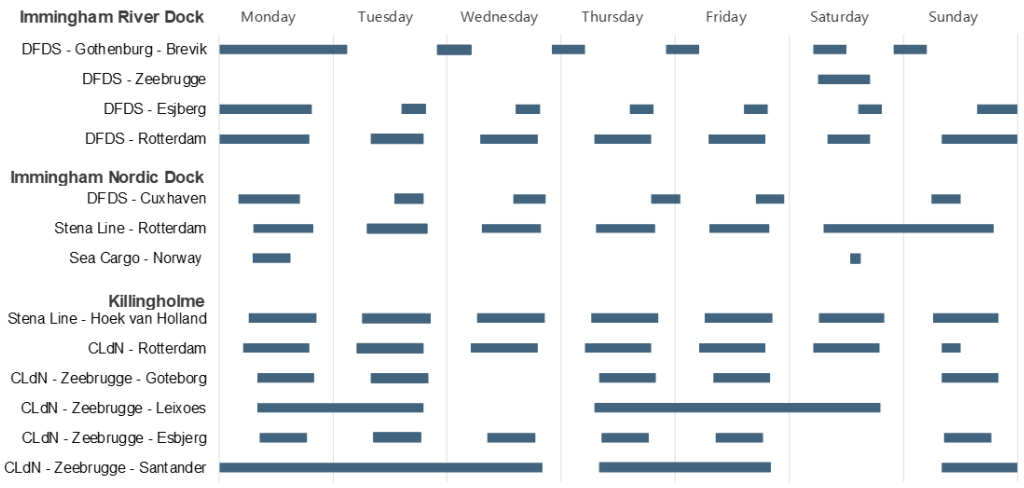

Figure 6-3 Overview of berthing schedule of Ro-Ro services in Killingholme and Immingham as published by the operators (2022) (the CLdN services to Goteborg, Leizoes, Esbjerg and Santander are first connecting with a service to Zeebrugge subsequently connecting from Zeebrugge to these markets)

6.5 Humber region Lo-Lo services

143. The table below summarises the shortsea Lo-Lo services to the Humber region. These services compete with Ro-Ro for lower value goods and goods which are less time critical. The services also call at key ports for Ro-Ro connections such as Zeebrugge and Rotterdam. The Lo-Lo market is however much more fragmented with multiple liners calling at the three key shortsea ports in the region in roughly equal shares.

144. In addition, the typical container shipping loop structures are apparent, with services calling at multiple ports in each loop. As a consequence, the regional UK ports have more Lo-Lo than Ro-Ro connections. However, transit times are significantly higher and sailing frequencies on average lower.

Table 6-4 Overview current Lo-Lo services East Coast UK (Humber & Tees)

	Port of destination (UK)	Vessels	Avr. vessel cap. (in TEU)	Draught (m)	Frequency (per week)	Rotation/Port of origin
Shortsea LO-LO services						
A2B Online		**5**			**30**	
Moerdijk & Rotterdam-UK services	Immingham	5	538	6,55 - 7,09	30	Moerdijk, Rotterdam, Thamesport, Blyth
Eimskip		**1**			**8**	
Iceland-Faroe Islands-UK-Rotterdam service (Yellow Line)	Immingham	1	690	7,40	2	Reykjavik, Vestmannaeyjar, Torshavn Rotterdam, Fredrikstad, Grundartangi
I-MOTION		**1**			**6**	
Ghent-Hull service	Hull	1	340	5,05	6	Ghent

P&O Ferries		**1**			**7**	
P&OF Zeebrugge-Hull container service	Hull	1	648	7,09	7	Zeebrugge
Samskip		**7**			**17**	
Amsterdam-Teesport service	Teesport / Hull	1	326	5,96	4	Amsterdam, Tilbury
Faeroe-Europe service (Coastal route)	Hull	1	508	6,65	2	Rotterdam, Reykjavik, Isafjordur, Akureyri, Reydarfjordur
Rotterdam-UK East Coast services	Hull	5	639	5,91 - 7,3	11	Grangemouth, Rotterdam, Sheerness, Tilbury
Thor Shipping & Transport		**3**			**5**	
Antwerp-Hull-Sweden service (Sun Line)	Hull	3	325	5,93	5	Amsterdam, Antwerp, Mukran, Nynashamn, Oxelosund, Vasteras
Unifeeder		**8**			**11**	
Benelux-UKEC service	Teesport / Immingham	6	686	7,28 - 10,8	7	Felixstowe, Grangemouth, London Gateway Port, Rotterdam,
UK-Germany-Poland service (Szczecin)	Immingham	1	917	6,97	2	Hamburg, Szczecin
UK-Poland service (Gdynia)	Immingham	1	803	7,33	2	Gdynia
Viasea Shipping AS		**2**			**3**	
UK–Moerdijk–Baltic–Norway service	Immingham / Teesport	2	750	7,29	3	Gdynia, Klaipeda, Kristiansand, Moerdijk, Moss, Oslo
Shortsea feeder services						
BG Freight		**5**			**8**	
Benelux-UK service (Butterfly East Coast UK)	Immingham / Hull / Teesport	5	871	7,33 - 8,7	8	Rotterdam, Antwerp, Grangemouth, Felixstowe, South Shields, Grangemouth
Shortsea Multipurpose services						
Ahlmark Lines		**3**			**4**	
UK & Continent to Sweden services	Hull	3	180	5,25-5,74	4	Montrose, Shoreham, Kristinehamn, Vanersborg
DFDS		**2**			**-**	
DFDS-Lys Line - Norway-Continent & UK services	Immingham	2	112	6,60	-	Fredrikstad, Halden, Hamburg, Moss, Oslo, Zeebrugge

Source: Alphaliner, Shipping line's websites, Rebel May 2022

There has been a consistent trend in favour of larger Ro-Ro vessels on the North Sea trades. This trend is unlikely to continue much beyond the 8,000 lm which are currently deployed. These vessels present a realistic compromise between economies of scale and flexibility of deployment (time to unload and load a vessel within the berthing window during the day). This has put pressure on the facilities which have vessel access limitations such as at the in-dock facilities in Immingham and Hull which can not serve today's larger vessels. Also, the draught requirements of the vessels is increasing and this can also cause access problems for regional terminals.

The five Ro-Ro operators active on the East Coast of the UK have frequent sailings across the North Sea. The availability of the berthing windows for loading and unloading is a key competitive factor. There are little to no opportunities for any further attractive berthing windows at prefered timeslots (i.e. during the day) at the current Ro-Ro berths in Killingholme and Immingham.

7. Logistic Cost Assessment

7.1 Introduction

145. The development of comparative transport costs is a key factor in market evaluation. The approach taken is to:

a. Develop a logistic cost model of total transportation costs from origin to destination.

b. Analyse port routing, logistic cost differences and qualitative aspects.

c. Assess the demand (volume and geographical location) for which Humber ports offer the cheapest routing, split by type of traffic.

d. Provide a high-level assessment of the impact of reduction in emissions for routing the cargo over the Humber.

7.2 Mapping of Humber's captive hinterland / Logistic cost differential

146. To assess the cargo demand for the facilities and to identify the Humber's hinterland a detailed logistic cost assessment has been used in combination with demand mapping in the hinterland. The logistic cost model calculates the total transportation costs from a set of overseas locations in Europe to/from each part of the UK. It covers the costs of the shipping, port handling, hinterland transport and the costs of inventories. By analysing the total transportation costs using a range of ports, the competitiveness of the Humber facilities to the UK hinterland can be assessed. The geographical distribution of demand for Ro-Ro cargoes is modelled using the range of data sets summarised in Section 5. The methodology for these steps has been detailed Appendix 2.

147. Key markets for Ro-Ro ports on the East Coast of England include North West Europe and Scandinavia and to some extent the Baltics. The results for the logistic analysis presented in this section therefore analyse the competitive position of Immingham/Killingholme (subsequently referred to as Immingham) for routing Ro-Ro traffic to:

a. Venlo (The Netherlands)

b. Oslo (Norway)

148. The results are presented in three maps for each route:

a. A map splitting the UK to the port which provides the cheapest route option (neglecting the size of the cost differential). This map provides insight into which ports are best located from a cost perspective for each part of the UK. Of course, this does not mean that the port will attract all cargo from that area but does demonstrate the geographical areas where the port should be able to capture the majority of cargo.

b. A map indicating the competitive cost position for Immingham vis-à-vis the cheapest other Ro-Ro terminal or second cheapest terminal behind

Immingham. The cost difference vis-à-vis Immingham expressed in percentage points is plotted in the maps. This indicates how captive the cargo is from each region. The greater the cost advantage for Immingham for cargoes to/from a particular region, the higher the possibility that Immingham will have for attracting cargo from that region.

c. A map indicating the number of ports within a 5% cost differential from the cheapest port, which indicates the level of competition between ports for cargoes from each part of the UK hinterland.

149. Section 7.2.1 and 7.2.2 summarise the logistic cost assessment for Venlo and Oslo respectively.

7.2.1 Venlo

150. The greater part of the Dutch foreland is serviced by Ro-Ro services to/from the Port of Rotterdam. From almost all ports on the East Coast of England there is a Ro-Ro connection to Rotterdam. This results in a very competitive market in which the routing is mainly determined by the distance to each port and the size and frequency of the services from each port. Again, the strong cost position of the Ro-Ro facilities on the South Bank of the Humber can be clearly seen and are indicated by the large green area on the map in the middle in which Immingham has a cost advantage over other ports.

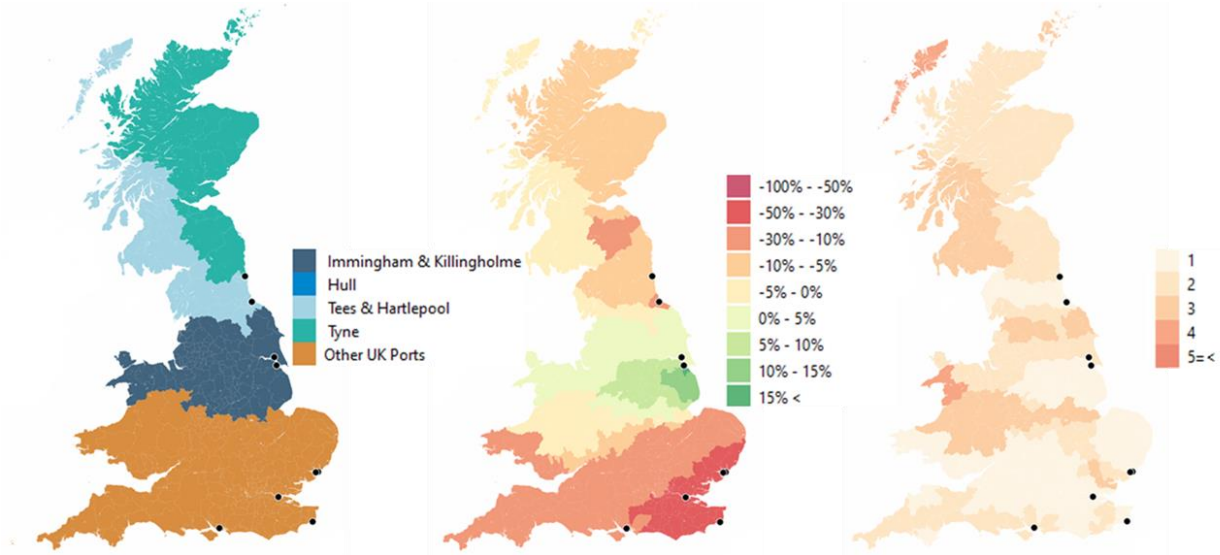

Figure 7-1 Preferred Port (left), Competitive Cost Position of Immingham (centre), Number of ports within 5% cost differential from the cheapest port (right) to/from Venlo

7.2.2 Oslo

151. Not all ports on the North East English coast offer connections to markets in Scandinavia and the Baltics. Due to a large baseload resulting from its proximity to key markets in the UK, the Humber ports have a strong competitive position for

services to other parts of Europe. As a consequence, the Humber ports handle almost the entire market to Scandinavia and the Baltics as can be seen in the figures below. The other port clusters in North East England are seemingly not able to capture sufficient volumes to setup dedicated Ro-Ro services to these areas.

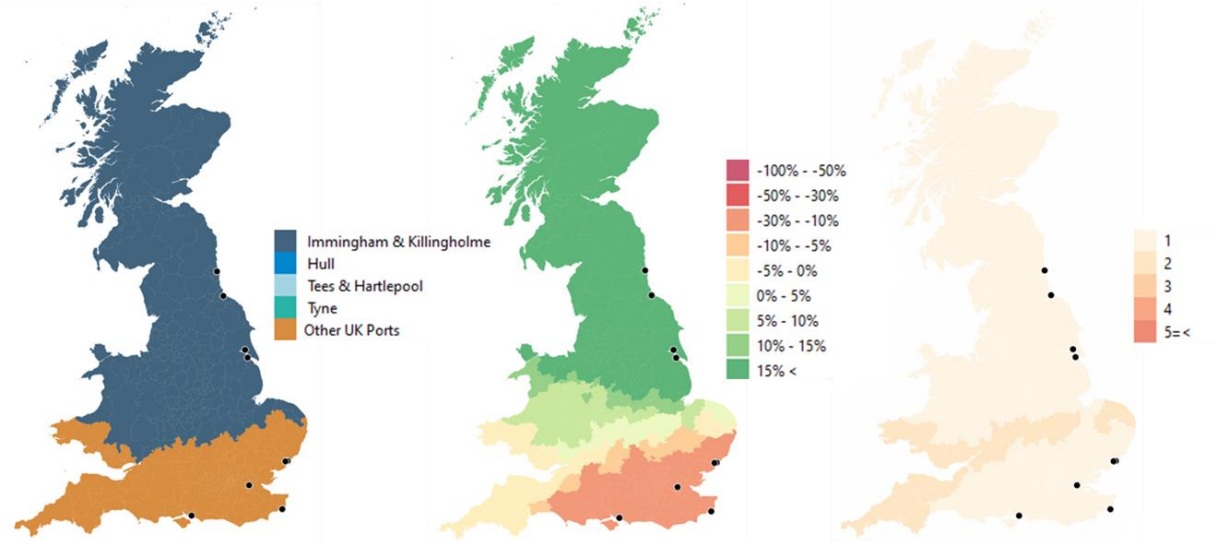

Figure 7-2 Preferred Port (left), Competitive Position of Immingham (centre), Number of ports within 5% cost differential from the cheapest port (right) to Oslo

7.2.3 Northern Ireland

152. Cargo from/to Northern Ireland destined to/from Europe has two main options for its routing. Option 1 is a direct service between the Irish island and Europe. For Option 2 the cargo first crosses the Irish Sea before reaching a UK port for transit (normally by truck) across the UK for onward shipment to mainland Europe. Belfast offers a direct Ro-Ro service to Cairnryan, Heysham and Liverpool. Cairnryan offers the least expensive and fastest connection to mainland UK and is, therefore, used in this analysis. Figure 7-3 summarises the results for the total logistic cost from Belfast to Venlo (Netherlands). Tees & Hartlepool is the preferred routing option form a cost perspective. However, the difference with Immingham is minimal. Therefore, it is assumed that all options on the Humber and Tees Valley are roughly equally competitive.

153. The final pattern of Irish transit trade will be determined by political arrangements between the UK and the EU that are yet to be defined. Overall, this currently constitutes a relatively limited demand for the Humber ports.

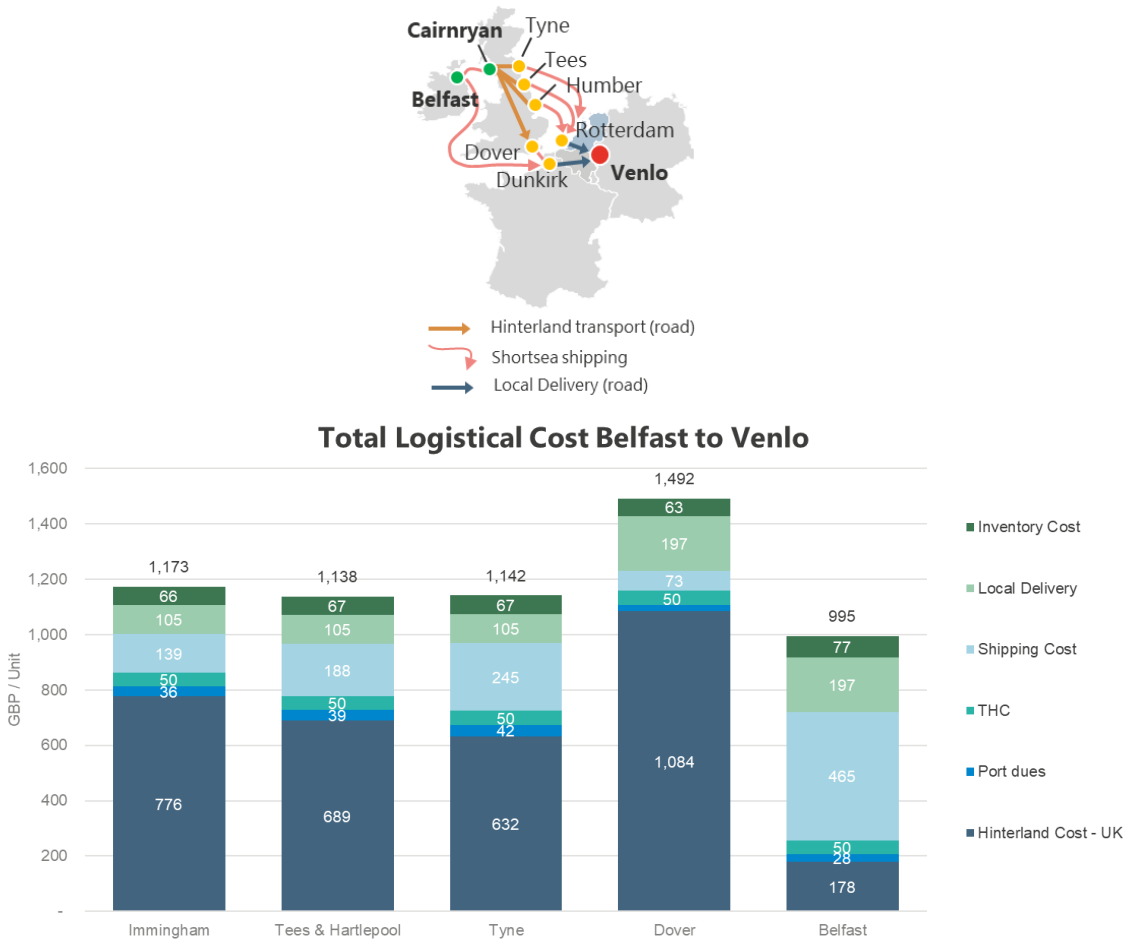

Figure 7-3 Logistical Cost comparison for a Ro-Ro unit going from Belfast to Venlo

7.2.4 Other destinations in North West Europe

154. The port range in North West Europe is highly competitive with multiple ports being able to serve the direct hinterland. Immingham is, for example, competing with Dover for traffic for northern France. However, for location in the Netherlands Dover is less competitive. To analyse Immingham's position in respect of trades to different parts of North West Europe an analysis has been undertaken for the following locations:

a. Lille

b. Liege

c. Hannover

155. The results of the assessment of the other locations listed above can be found in Appendix 5.

156. From the results in Appendix 5 it is demonstrated that Immingham is competitive to all North West European markets for key UK markets such as Sheffield, Leeds, Liverpool and the Midlands. For destinations in Northern France there will be some

competition from routing trailers through Dover, however this remains limited as the overland trucking costs will be significantly higher and are likely to increase in the future. The South bank of the Humber will be the cheapest port to route cargo through for destinations in Germany, the Netherlands and the largest parts of Belgium.

7.3 Market size: Humber's captive hinterland

157. The average cost position for Immingham vis-à-vis its main competitors in the various parts of the hinterland is derived using the logistics cost model. Figure 7-4 takes the weighted average competitive position for all market destinations. Immingham is the preferred option from a cost perspective for the Humber area as well as parts of the East Midlands and North West England.

158. The competitive position for each target market is detailed in Figure 7-4. The total shortsea trade potential is allocated to each Local Authority based on the combination of factors described earlier (population, economic activity, registered businesses and distribution centres). The results from the combination of these two analyses are presented in Table 7-1.

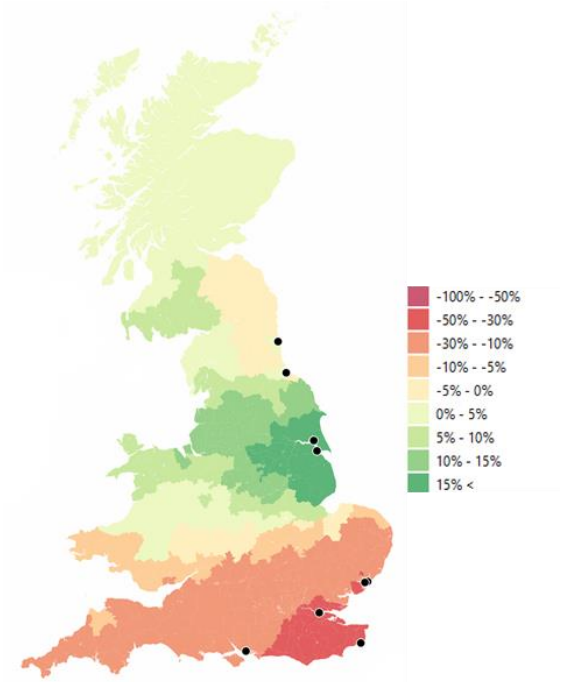

Figure 7-4 Competitive position based on weighted average routing

159. It is clear that the South Humber ports are the cheapest for 35.5% of the UK's shortsea trades for the considered target markets (see top row Table 7-1). This is the case when only direct transportation costs are considered. For another 13.5% of UK's shortsea trade the South Humber is well positioned but will face some competition from other ports. Currently, the South Humber ports only handle around an estimated 25% of UK's shortsea trade (see Figure 7-5). Due to other reasons such as combining shortsea volumes with feeder volumes, availability of certain connections and sailing times some shortsea volumes are routed over other ports.

This however means that there is potential for the South Humber to attract more Ro-Ro traffic if additional capacity becomes available.

Table 7-1 Competitive position of South Humber facilities per target market (Lo-Lo & Ro-Ro)

Competitive position		Belgium kTon	Germany & Poland kTon	Netherlands kTon	Scandinavia & Batlics kTon	France kTon	Share %
Captive market	0% ≤	1,495 (28%)	5,249 (39%)	2,785 (33%)	7,615 (58%)	1,219 (37%)	35.5%
Highly Contestable	-5% - 0%	830	1,786	1,514	1,194	694	13.5%
Contestable	-10% - -5%	639	1,655	878	572	621	9.0%
Uncontestable	≤ -10%	2,694	4,697	4,462	3,555	3,712	42.0%
Total		**5,659**	**13,387**	**9,639**	**12,935**	**6,246**	**100%**

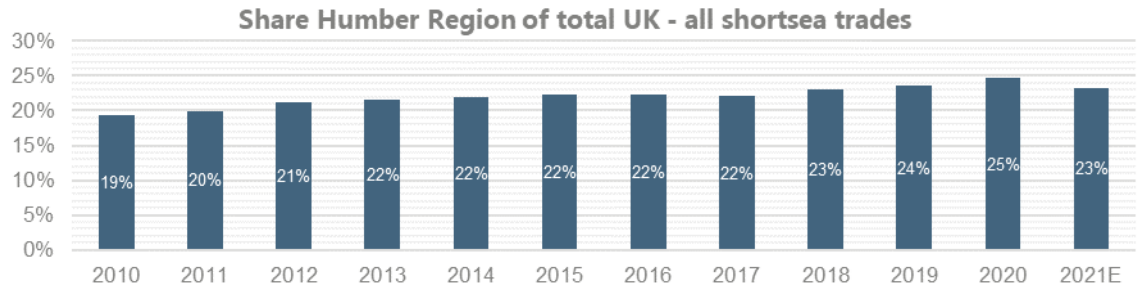

Figure 7-5 Shortsea market share of Humber region

7.4 Emission reductions

160. The emissions from transporting goods are considered likely to become an increasingly important consideration. In general, sea transportation has the lowest emissions per km travelled. This effectively means that in addition to reducing the total distance of transporting goods, increasing the share of maritime transport will lead to significant reductions in overall emissions. Routing cargo from the direct hinterland of the Humber overland by truck to Dover in comparison to the Humber ports, for example, will lead to considerably higher emissions per unit.

161. Following the example of Appendix 2, the CO2 emissions costs from Leeds to Venlo (Netherlands) have been summarised in Figure 7-6. The model accounts for 3.2 kg CO2 / kg fuel at an ETS[6] price of 77.90 GBP/ton CO2. In this example, locations north of Leeds, such as Tees & Hartlepool are at a disadvantage compared to Hull as both trucks and vessels must travel further and thus generate more emissions.

162. This means that if carbon pricing were fully included in the transportation costs, the Humber ports would be even cheaper in comparison to the other ports considered where there is a current cost advantage. As a result, the Humber ports will be able to attract more cargo from/to their direct hinterland. When other emission types like

[6] ETS stands for Emission Trading Scheme and gives a market price for CO2 emission rights.

NOX, SOX and fine particles are included in the transportation cost assessment the difference would further increase and the cost competitiveness of the Humber ports for the key markets of Leeds, Sheffield, Liverpool, Manchester and the Midlands will improve further.

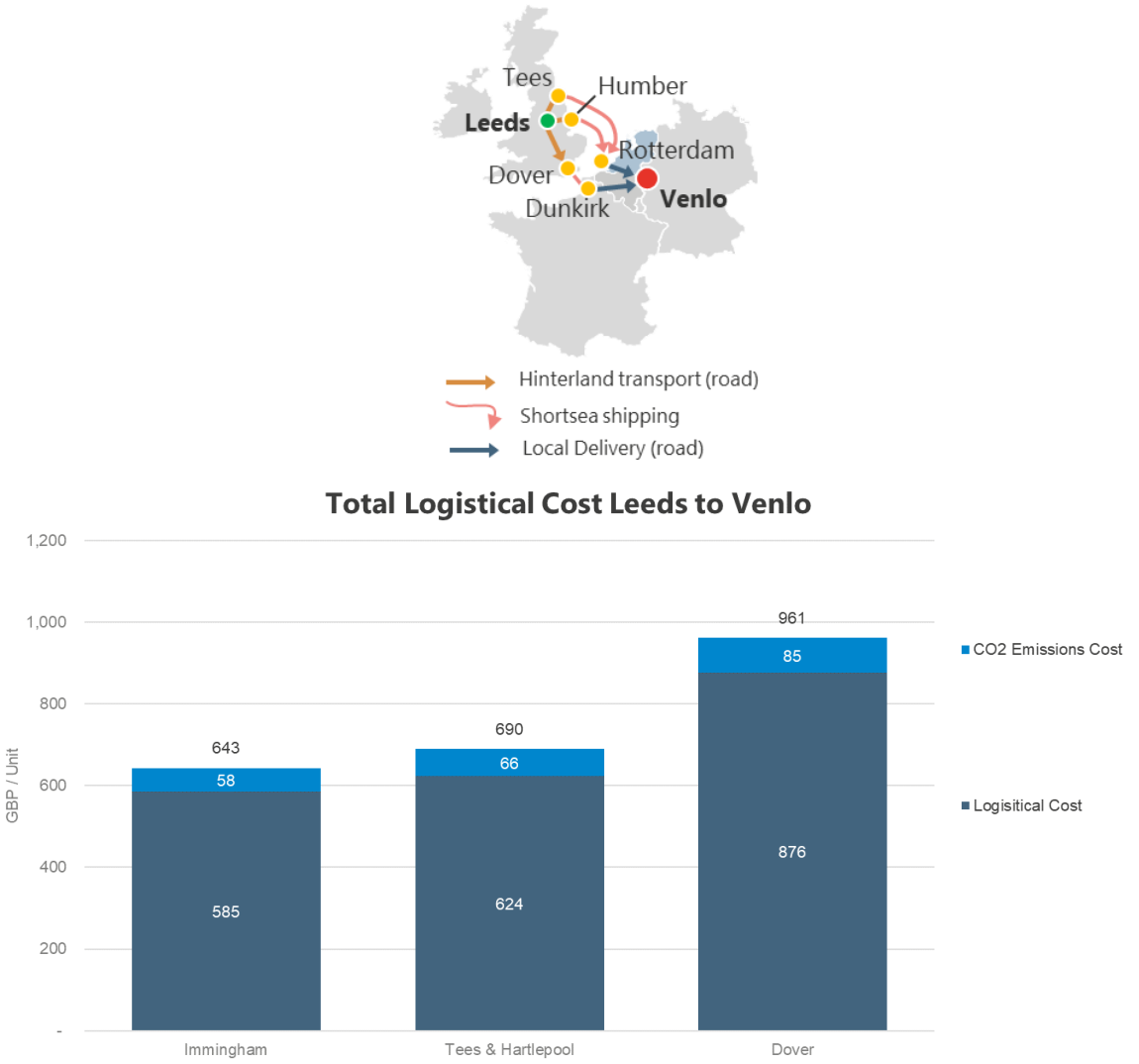

Figure 7-6 Emissions Cost comparison for a Ro-Ro unit going from Leeds to Venlo

The Humber has a clearly defined captive hinterland based on a competitive logistic cost assessment for trades to North West Europe, Scandinavian and the Baltic. The ports on the Humber have transport cost advantages over other UK ports for key markets for Liverpool, Manchester, Sheffield, Leeds and parts of Yorkshire and the Midlands. Using a weighted average of proxies for the size of demand in the hinterland, the Humber ports provide the cheapest route for shortsea cargo for over 35% of total national demand. With an actual market share of just over 25% there is potential to attract even greater volumes in the future.

If carbon pricing were fully included in the transportation costs, the Humber ports would be even cheaper in comparison to the other ports considered where there is a current cost advantage. As a result, the Humber ports have the potential to attract more cargo from/to its direct hinterland if sufficient capacity is available. When other emission types like NOX, SOX and fine particles are included in the transportation cost assessment the difference would increase further.

8. Strategic Roadmap & Projections

8.1 Introduction

163. The various analyses are now brought together to identify the future prospects for the Humber. This is based on:

a. A macro-economic review, including the levelling-up programme

b. A review of the linkage between macro-economic activity and regional demand

c. Definition of macro-economic scenarios

d. UK shortsea projections (broken down by modality)

e. East of UK shortsea projections (broken down by modality)

f. Humber shortsea projections (broken down by modality)

8.2 Forecast Methodology

164. The forecast for Ro-Ro demand is prepared using the steps listed in the table below. Step 1 has been covered in the first section of the report. The specific considerations detailed in previous Sections are used to develop specific forecasts. It is noted that all forecasts presented in this section are based on the assumption that capacity expansions will be timed as such that there will not be any capacity constraints for facilitating the maritime trades.

Table 8-1 Forecast Methodology

Methodology steps to forecast Humber shortsea trade	
Step 1	**Analysis of historic shortsea trade data**
	- Filtering of shortsea trades excluding Irish short sea trades in order to focus on the European trades - Filtering out of the feeder volumes from the European shortsea Lo-Lo trade - UK shortsea trade overviews by Ro-Ro unaccompanied, Ro-Ro accompanied and Lo-Lo
Step 2	**UK Shortsea Forecast**
	- Analyse historic relationships between UK GDP growth, macro-economic developments and shortsea trade - Prepare macro-economic scenarios and other drivers of shortsea trades, including future trade relationships with EU, leveling-up and other initiatives - Prepare UK shortsea forecast in tonnage for import and export separately - Prepare UK shortsea forecast by type of shortsea traffic: Ro-Ro unaccompanied, Ro-Ro accompanied and Lo-Lo - Prepare UK shortsea forecast by type of traffic in units including empty units (using the balance between equipment imported and exported)
Step 3	**East of UK shortsea demand forecast**
	- Prepare East of UK market share forecast, based on: - sub regional GDP outlooks - a review of split in overseas trading partners

- port competitive review
- Prepare East of UK Ro-Ro accompanied, Ro-Ro unaccompanied and Lo-Lo forecast in tonnage and units

Step 4 Humber region shortsea Ro-Ro demand

- Prepare Humber region market share forecast, based on:
  - transportation cost model
  - hinterland demand modeling
  - facilities competitive review
  - trends in the Ro-Ro demand segment
  - trends in Ro-Ro shipping
- Prepare Humber region Ro-Ro accompanied and Ro-Ro unaccompanied forecast in tonnage and units

Step 5 Outlook Demand-Supply Balance Humber region

- Analyse Ro-Ro Capacity Supply outlook
- Analyse utilisation rate projections per facility

8.3 Macro-economic scenarios

165. There has been a historic and widely documented relationship between macro-economic activity and trade. This relationship is used as a basis for the UK's shortsea trade forecast. From the historic data it follows that the UK's shortsea imports grew in line with the UK economy (i.e., with a multiplier of roughly 1). The UK's shortsea exports grew somewhat more slowly with a multiplier of around 0.1-0.2 times in comparison to UK overall GDP. This historic average relationship has been used going forward.

166. The macro-economic outlook is currently uncertain. As a consequence of the post-pandemic recovery and global political unrest, inflation and interest rate issues the outlook is unclear. Consumer spending in the UK has been resilient and a driver of growth in the last few quarters, but it is uncertain whether this will remain the case in a high inflation environment. To account for this uncertainty, these projections utilise a base case developed by Oxford Economics (retrieved summer 2022) in combination with a high and low scenario to account for more favourable or less favourable economic outlooks.

167. In Figure 8.1 the historic GDP growth data for the UK is presented in combination with the macro-economic forecasts. In this study we have used the UK government forecast for 2022 (3.7%) and 2023 (1.7%) and those of Oxford Economics for 2024 and beyond. In 2025, the GDP growth is expected to be 2.2% in the base scenario, 2.4% in the high scenario and 2.0% in the low scenario. By 2050 the GDP growth is expected to reach 1.5%, 1.7% and 1.4% for respectively the base, high and low scenarios.

168. It is also important to note the Government's levelling-up policy which is focused on providing economic stimulus to large parts of the north of the UK. The actual outcome of this policy remains unclear from the current perspective and has been

delayed by the pandemic. However, this policy could well have positive implications for northern ports including the Humber. Some upside for increased market share for the north has, therefore, been included in core projections.

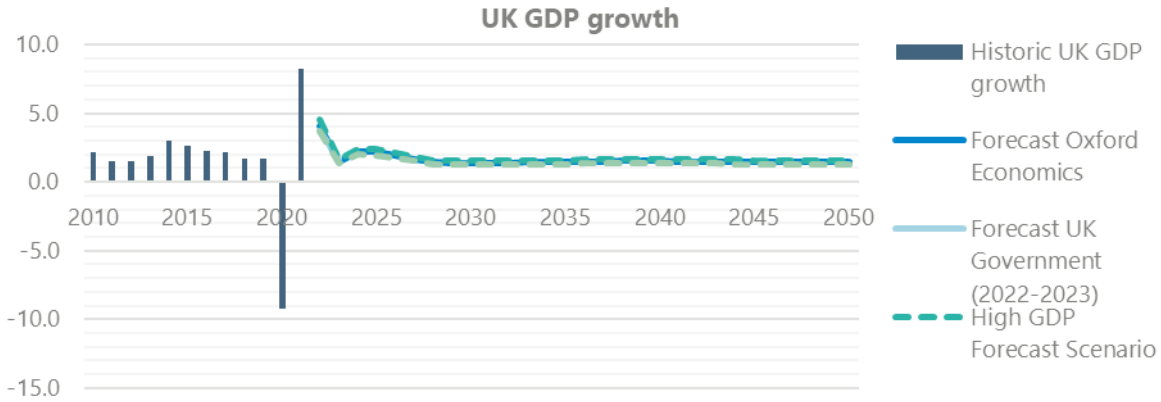

Figure 8-1 UK real GDP projections (in %)

8.4 UK shortsea projections

8.4.1 Forecast shortsea modality

169. Overall, UK shortsea trades are expected to grow in line with GDP developments in the years to come. The CAGR for UK's shortsea tonnage in the periods 2022-2027,2028-2032 and 2032-2050 are respectively 2.3%, 1.5% and 1.4%. This is in comparison to an overall CAGR between 2012 and 2021 of 1.9%. After a period of readjustment of trade resulting from Covid and new custom arrangements, the macro-economic relationship with trade will be re-established. For the overall UK shortsea trade the following developments are anticipated:

a. The share of accompanied Ro-Ro traffic is set to further decline as problems with truck driver shortages and border controls are expected to continue. The share is expected to decline from 38.9% currently to 34.1% in 2032. With increased capabilities for logistical planning, unaccompanied freight will gain market share. Unaccompanied trades and Lo-Lo traffic will grow in line with each other. In particular, on the import side unaccompanied trailers will increase their dominant position due to competitive delivery times.

b. Unaccompanied Ro-Ro is expected to continue its strong growth with a CAGR for this trade of 3.6% in the period 2022-2027, 2.0% in 2028-2032 and 1.5% in 2032-2050. This in comparison to an overall CAGR between 2012 and 2021 of 2.1%. The combination of short time to market and no requirement for a driver during the crossing are the main drivers behind the continued growth.

c. Lo-Lo is also expected to keep growing for parallel reasons. Containerised shortsea trade comprises goods which are less time critical and thereby benefit from the lower per unit transportation cost incurred when using containers. The trade is expected to have a CAGR of 2.8% in the period 2022-2027,1.8% in

2028-2032 and 1.5% in 2032-2050. This in comparison to an overall CAGR between 2012 and 2021 of 6.1%.

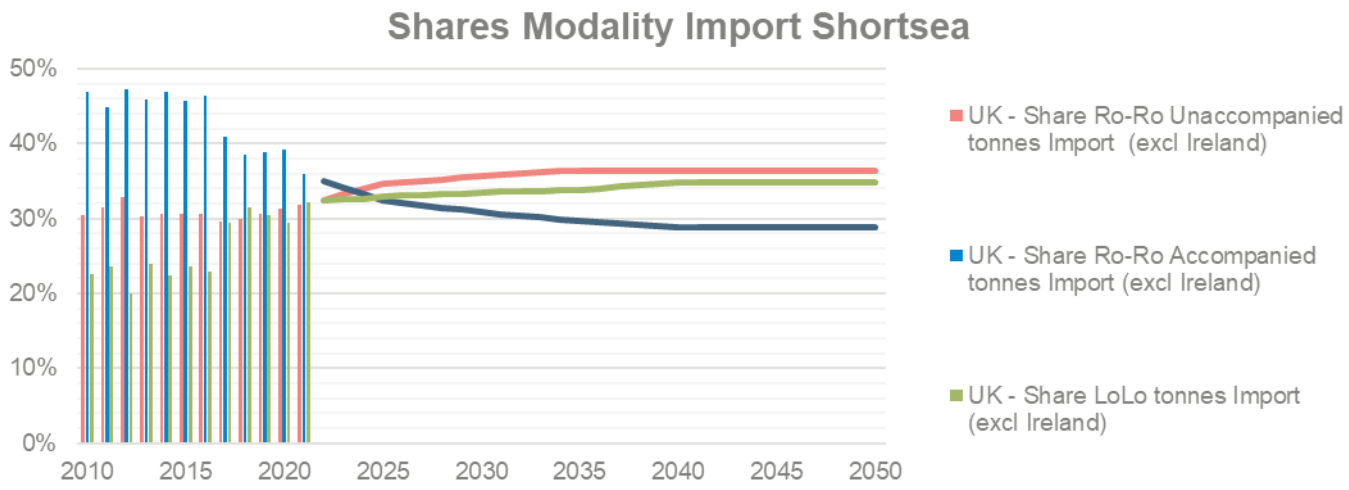

Figure 8-2 UK Shortsea Import Modality Forecast (in % market share)

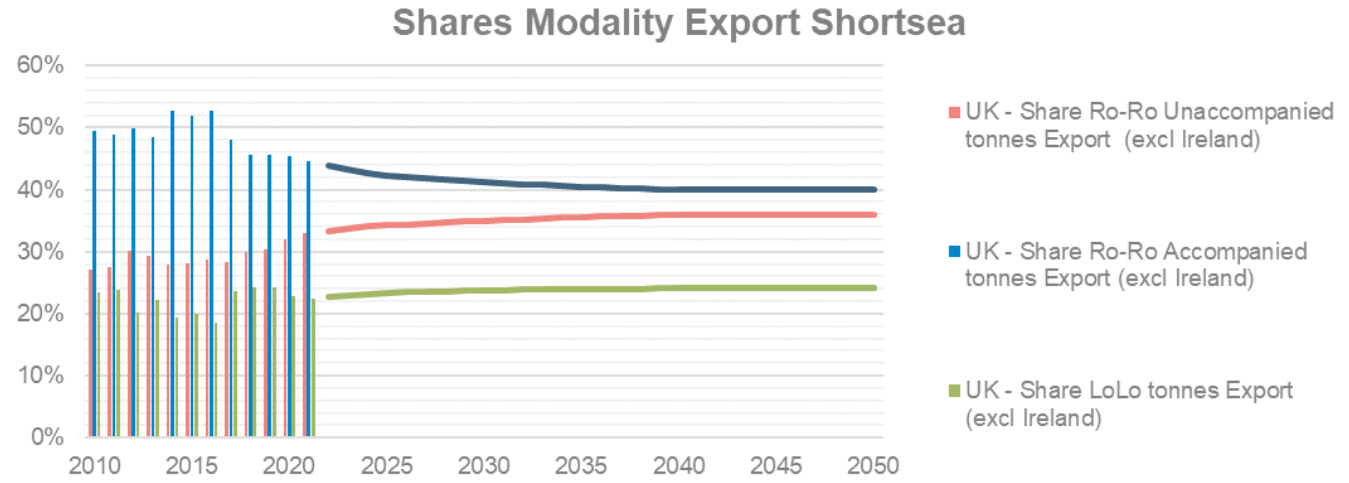

Figure 8-3 UK Shortsea Export Modality Forecast(in % market share)

8.4.2 UK Shortsea Forecast

170. A forecast for the total tonnage of shortsea trade in the UK has been prepared using the GDP-trade relationship. The results are summarised in the two figures below. It should be noted that:

a. Unaccompanied Ro-Ro is expected to continue its strong growth. The combination of short time to market and no requirement for a driver during the crossing are the main drivers behind the continued growth.

b. Lo-Lo is also expected to keep growing for parallel reasons. Containerised shortsea trade comprises goods which are less time critical and thereby benefit from the lower per unit transportation cost incurred when using containers. It is

however noted that in the Lo-Lo segment there is the largest import-export imbalance resulting in a relatively high equipment repositioning costs.

c. The growth in these segments comes at the expense of the accompanied trades, which are expected to plateau on the import side and grow only slowly on the export side. In total, this accompanied Ro-Ro market is not expected to see much growth.

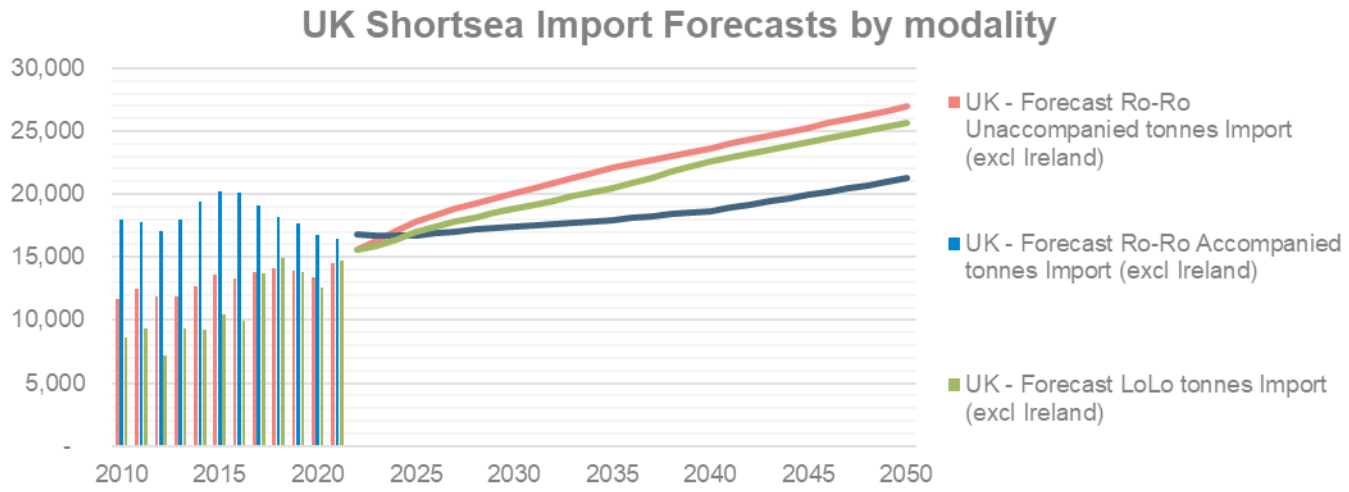

Figure 8-4 UK Shortsea Import Tonnage Forecast (in '000 tonnes)

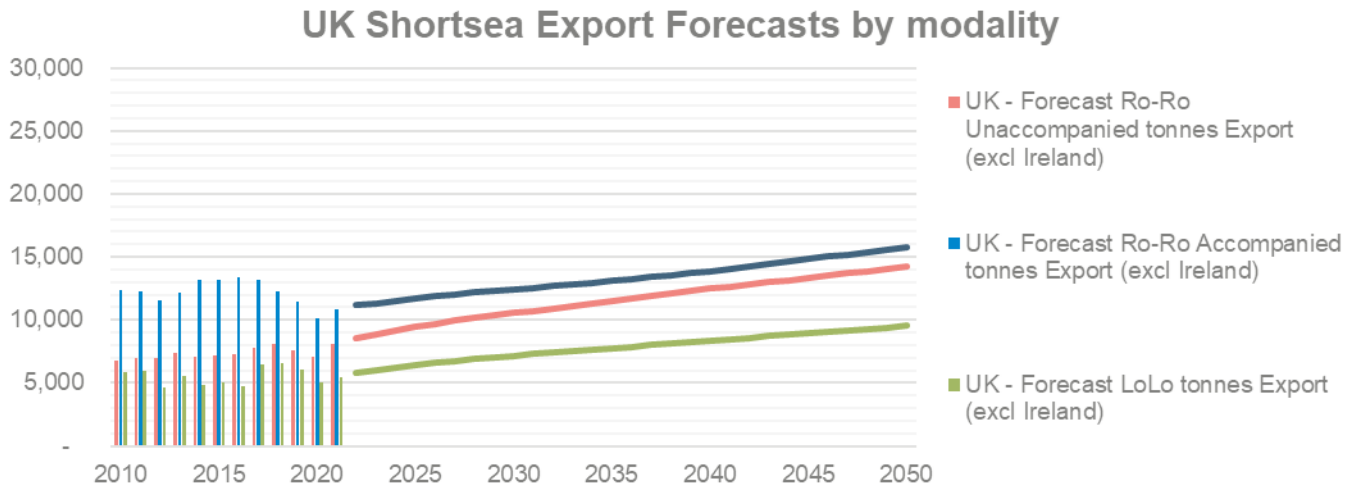

Figure 8-5 UK Shortsea Export Tonnage Forecast (in '000 tonnes)

8.5 East of United Kingdom projections

8.5.1 East of UK shortsea tonnage forecast

171. The ports in the East of the UK are key for handling European shortsea trades. The range includes the ports from Harwich up to Firth of Forth in Scotland:

a. The East of the UK handles the majority of the UK's shortsea trades with Europe in both the unaccompanied Ro-Ro and Lo-Lo segments. The ports in the East of the UK handle between 70%-80% of UK's shortsea trades in these segments.

It is however noted that the unaccompanied tonnage in the East of the UK is significantly larger than the tonnage transported in containerised form.

b. In terms of accompanied trades, it is the reverse with the East of the UK only accounting for just over 10% of the shortsea trades in this segment. As a result of the underlying trend of increasing focus on unaccompanied and Lo-Lo trades the ports in the East of the UK are set to see the volumes increase.

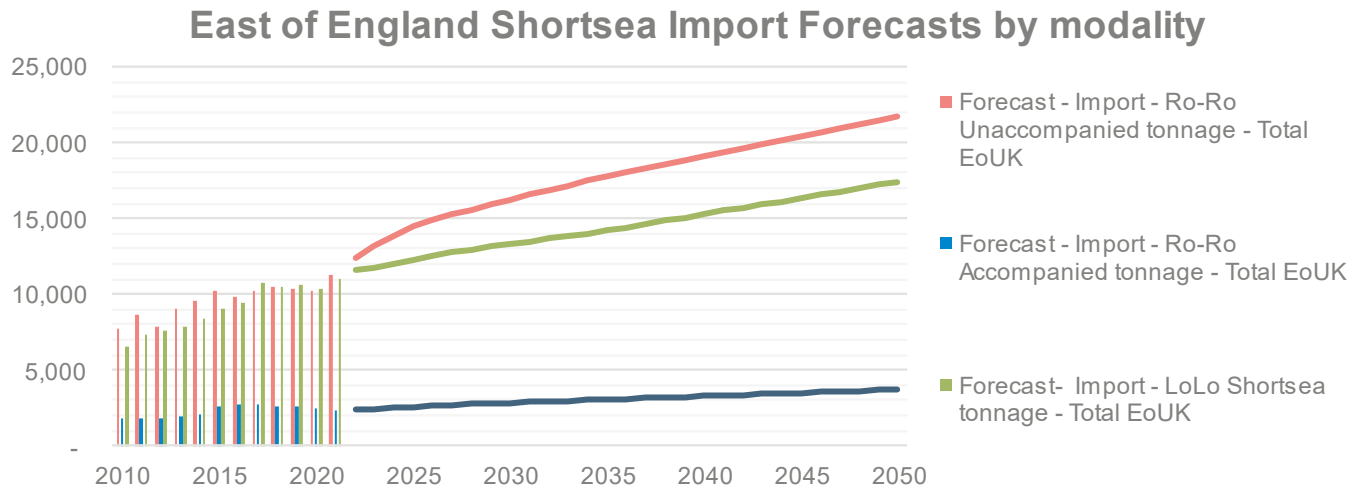

Figure 8-6 East of UK Shortsea Import Forecast (in '000 tonnes)

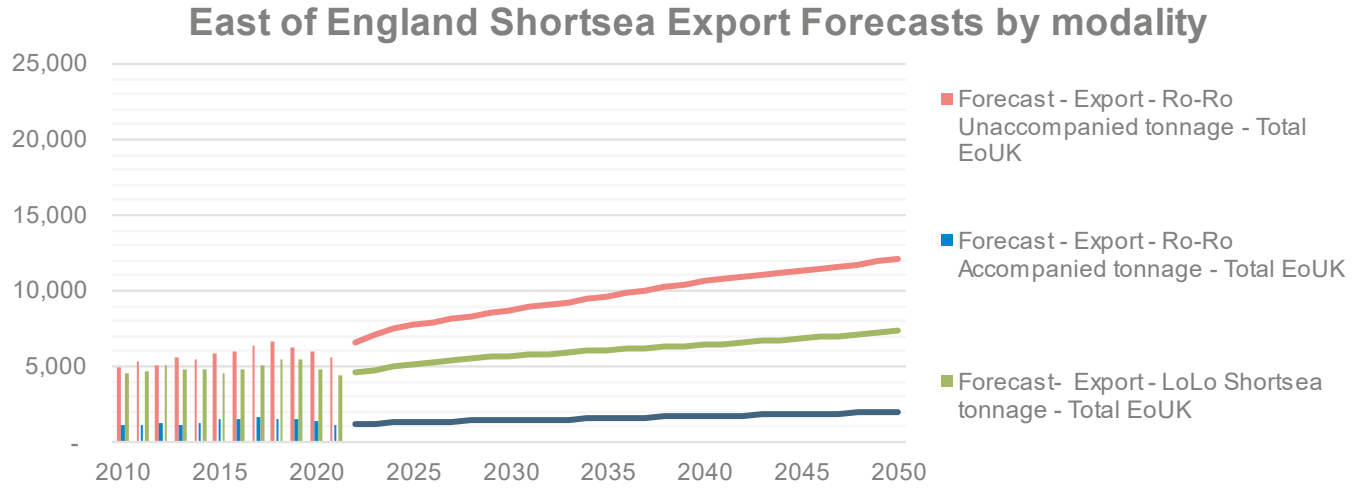

Figure 8-7 East of UK Shortsea Export Forecast (in '000 tonnes)

8.5.2 Forecast average weight per unit

172. Imports are the dominant flow. Empty trailers and empty containers are exported and repositioned to account for the imbalance between full imported trailers and full exported trailers. As a consequence, the average weight per unit for the export flow is much lighter than for imports. To arrive at a forecast in terms of units, average tonnages have been used for imported trailers and containers. Subsequently it is assumed that the exported flow in trailers is equal in size to the imported flow in order not to have empty trailers building up in the UK. For Lo-Lo containers this

balance does not hold as empty containers are sent back via the northern UK ports even if they were imported over a port outside the region. This means that the export flow of containers in the East of the UK is larger than the imported flow. The unit forecast for Lo-Lo is therefore undertaken separately for imports and exports.

173. The following should be noted:

a. The weight per imported unaccompanied trailer in the UK has been declining over the last decade (from 18 tonne / trailer in 2012 to 17.5 tonne / trailer in 2021). This trend is expected to continue to 16.5 tonne per trailer in 2032. While the logistic sector aims to pack more densely in order to realise cost savings, it is expected that more importance will keep being placed on time-to-market with units being less densely packed.

b. In contrast, the average weight of a full import container has been increasing over the last decade. With a larger traffic flow, opportunities to consolidate cargoes in the container have increased. As a result, the growth of Lo-Lo traffic in terms of units has been slower than in terms of tonnage.

c. The average weight of the accompanied trailers is significantly lower than that of unaccompanied units. This is due to the even greater importance of time-to-market for these cargoes and, in some cases, the types of lorries used relative to the larger unaccompanied trailers. The weight per unit has however been relatively stable in the last decade and is expected to remain around the current level.

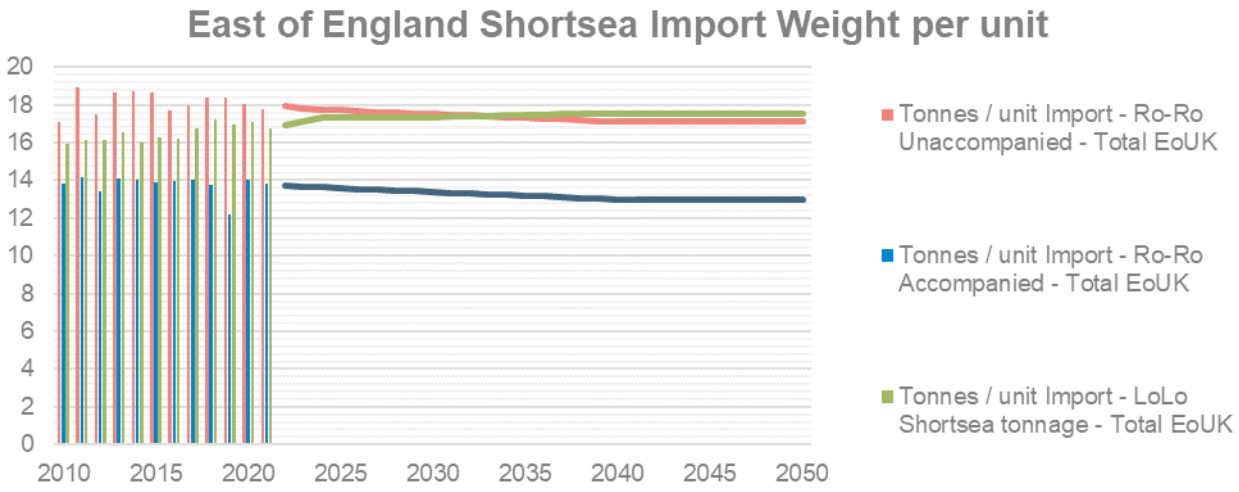

Figure 8-8 Average weight per unit (in tonnes / unit)

8.5.3 East of UK shortsea forecast in units

174. In the figures below the shortsea forecasts for the East of the UK are shown in terms of units (trailers/boxes). The impact of the declining average weight per trailer can be clearly seen in the forecast for the unaccompanied trailers.

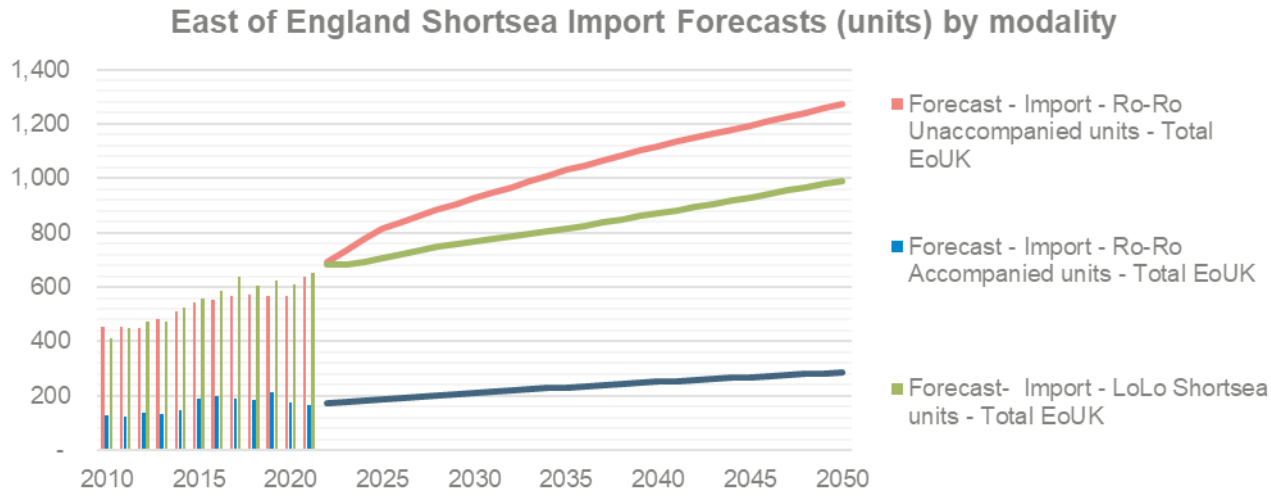

Figure 8-9 East of UK shortsea import forecast in units (in '000 units)

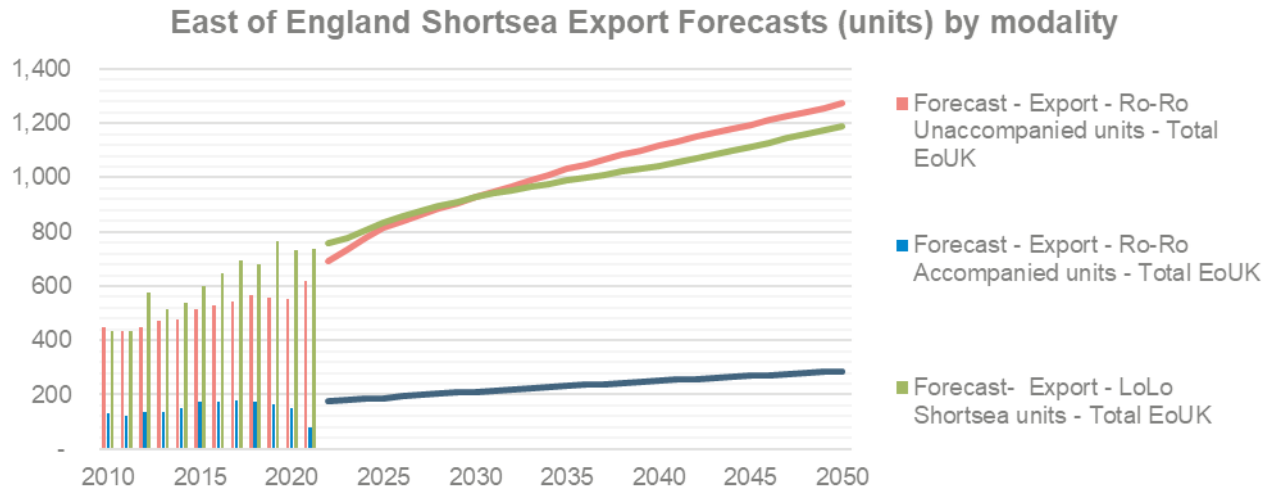

Figure 8-10 East of UK shortsea export forecast in units (in '000 units)

8.6 Humber shortsea projections

8.6.1 Humber market share of East of UK in shortsea markets

175. The figures below detail the market share of the Humber region in the context of the overall East of the UK shortsea market. For unaccompanied trailers this market share has been high and relatively stable at just over 60% of the total UK East Coast volumes, and this is expected to continue in the period to 2050. For accompanied trailers the volatility in market share has been somewhat greater but is still relatively stable. This market share is expected to be stable with a marginal decline to around 40% of the East of the UK shortsea market in the long term.

176. In the shortsea Lo-Lo segment the Humber region has gained market share vis-à-vis other East of UK ports. In particular, for (full) import containers the Humber has recorded above market growth, with this further underlining the good geographical

location in comparison to the major growth markets. The market share of the Humber for shortsea Lo-Lo trades is 38.5% for imports in 2021 and 20.4% for exports. The Humber region has gained market share vis-à-vis other East of UK ports, and this is expected to continue to a share of 42.9% and 20.7% in 2032 for import and export respectively.

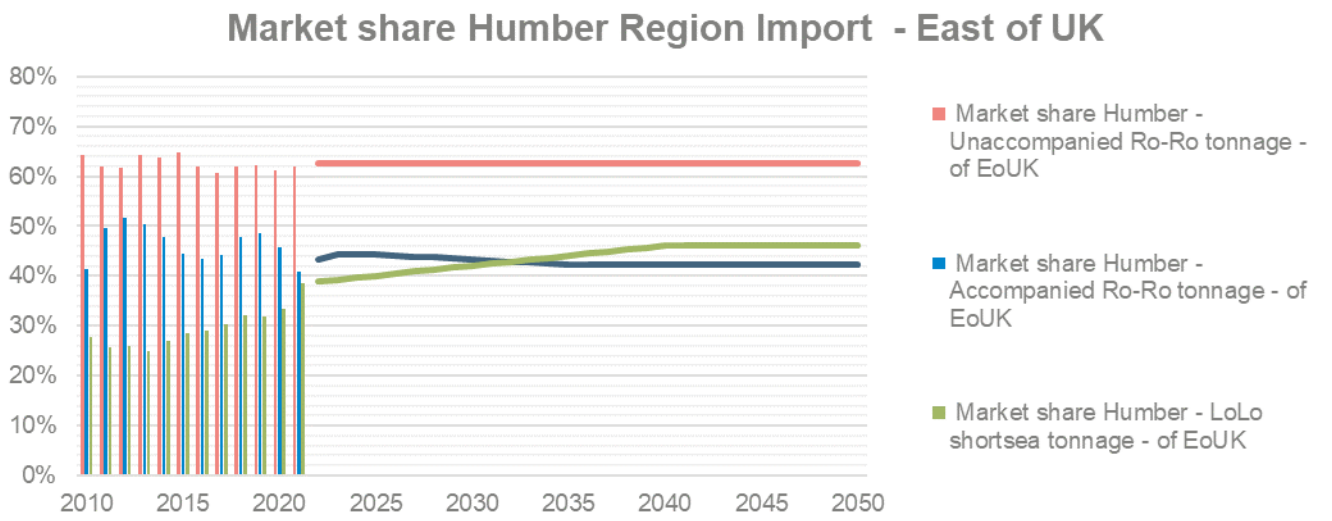

Figure 8-11 Humber region market share import (in % market share)

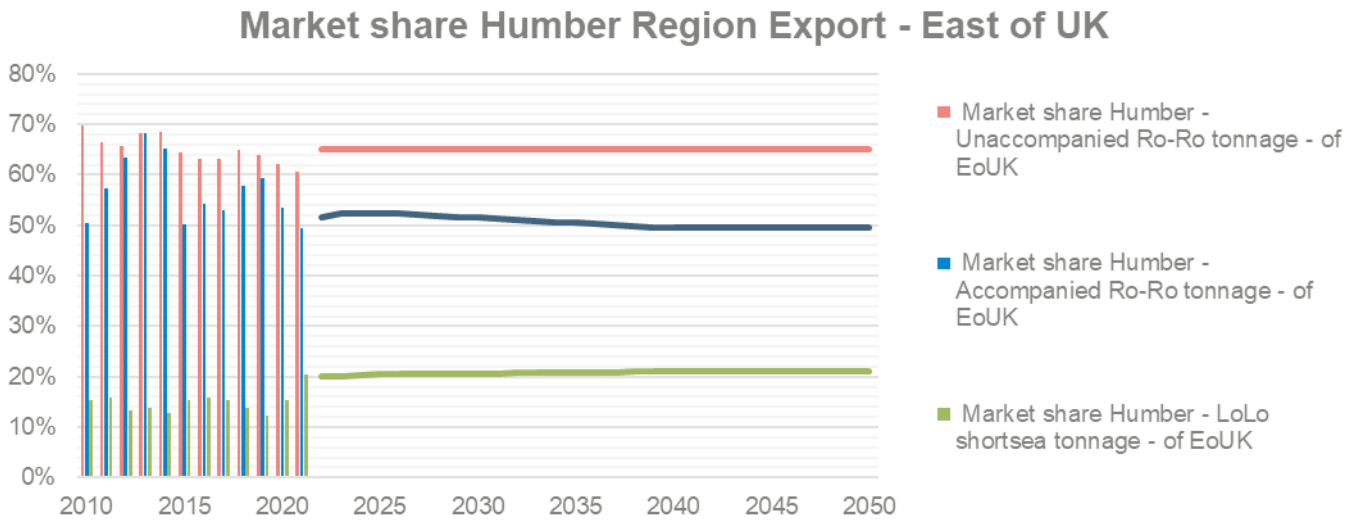

Figure 8-12 Humber region market share export (in % market share)

8.6.2 Humber region shortsea forecast in units

177. The shortsea forecast for the Humber in terms of units is presented in the two figures below. The following key conclusions are drawn based on these projections:

a. Unaccompanied Ro-Ro traffic is expected to see continued and strong growth as a consequence of the set of drivers detailed in the previous sections including a general shift toward unaccompanied traffic and a move away from the

southern ports to the northern ports. The facilities on the Humber are ideal for serving the captive hinterland of the central and north of the UK. A clear growth is therefore expected for the unaccompanied Ro-Ro segment in the Humber region in respect of the number of units with a CAGR of 4.5% in 2022-2027 and a CAGR of 2.3% in 2028-2032 (in comparison to 3.5% in 2012-2021). The CAGR between 2032 and 2050 is expected to be 1.5%. Growth in the short term in tonnage is somewhat lower having a CAGR of 4.2% in the period 2022-2027, 2.3% in 2028-2032 and 1.5% in 2032-2050. The market share of unaccompanied Ro-Ro on the Humber is just above 60% and expected to remain stable. In the period between 2020 and 2032 the CAGR is expected to be 3.8% (in units).

b. Accompanied Ro-Ro traffic in the region will remain the smallest of the shortsea traffic flows. Growth is relatively modest (CAGR (in units) for this trade of 2.8% in the period 2022-2027, 1.7% in 2028-2032 and 1.4% for 2032-2050. This in comparison to an overall CAGR between 2012 and 2021 of -1.6%). As a result, this category will continue to lose market share in the future. Truck driver shortage will continue to limit growth in the next few years.

c. Albeit in smaller volumes, the Humber facilities will also see increased shortsea Lo-Lo traffic. The Humber is well placed for this sector in relation to key centres of production and consumption. Growth in the Lo-Lo segment (in units) is expected to reach a CAGR of 3.1% in the period 2022-2027 and 2.2% in 2028-2032. In the period from 2032 to 2050 the CAGR is 1.7%.

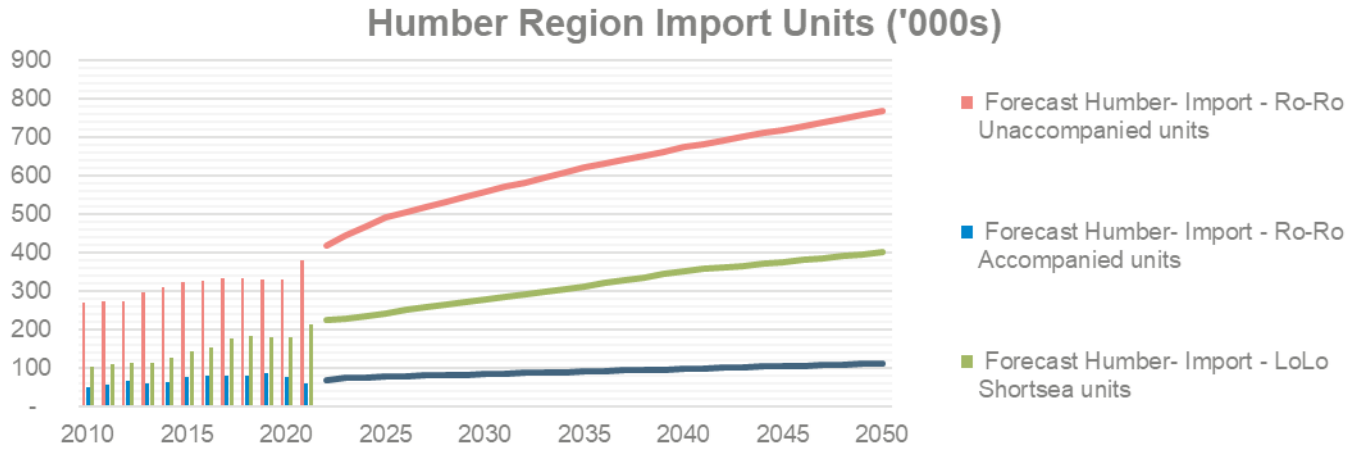

Figure 8-13 Humber Region Import Units

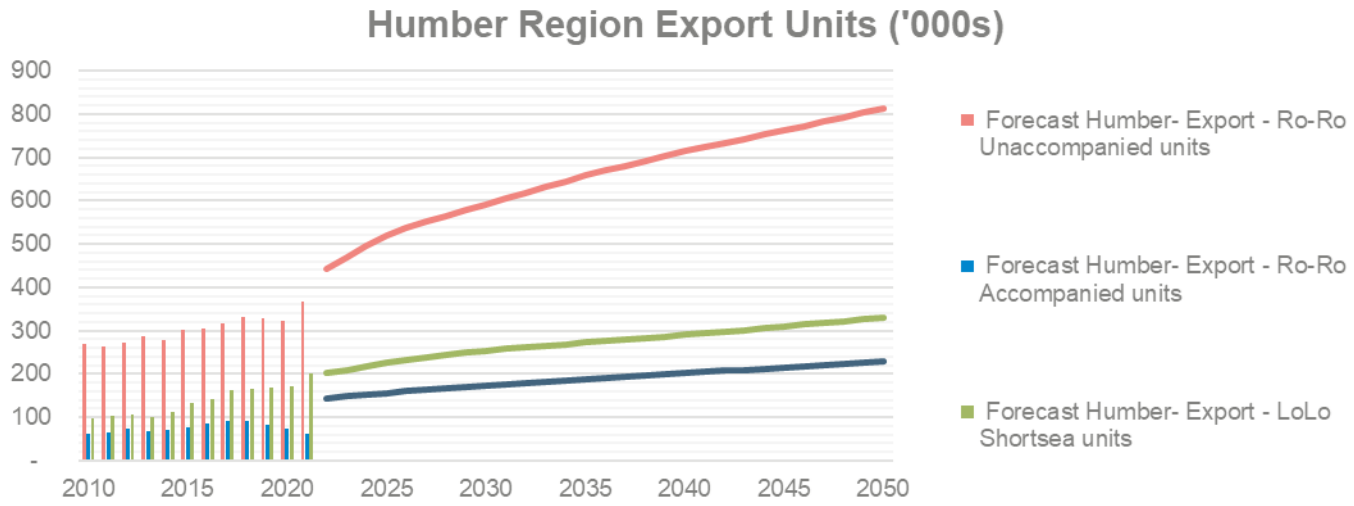

Figure 8-14 Humber Region Export Units

8.6.3 Humber demand-supply balance

178. The shortsea Ro-Ro capacity for the Humber is determined by:

a. The capacity of the vessels being deployed,

b. The number of available berthing slots and

c. The available storage areas.

179. Typically, in a competitive market the shipping capacity will adjust to the available demand. If growth is witnessed in a market segment, operators will choose between either upscaling vessels or increasing the frequencies of the sailings. For the purpose of the analysis it is, therefore, assumed that in the future there will be no constraints resulting from deployed shipping capacity (i.e. shipping lines will keep deploying new or larger vessels if demand is in place).

180. The availability of appropriate berthing windows is essential for a high-quality Ro-Ro service. Shippers have preferences for certain time slots with operators enjoying a competitive advantage if they can control daytime slots in preference to evening or night berthing windows. This particular issue has been considered in section 4.2.

181. The third aspect of Ro-Ro capacity is the size of the available storage area. For accompanied trailers there is little space required in the port because these trucks will leave the port area as soon as they can. The storage area requirement is primarily determined by the needs of unaccompanied trailers. The focus of the current analysis is the balance between unaccompanied trailer demand and the available unaccompanied storage capacity (the capacity assessment is further detailed in section 4.3).

182. The figure below shows an estimate of the demand-supply balance for the Humber region using an average dwell time of 2.25 days. Overall, it can be concluded that the storage areas in the Humber are already utilised at a high level. Under any of the scenarios considered, it is expected that unaccompanied Ro-Ro demand will

reach the capacity estimated to be currently available in the Humber in the coming five years.

183. It should be noted that:

a. The forecast balance implies that traffic can freely move between terminals and storage areas. In practice some facilities will be much closer to their capacity levels whilst others operate at lower utilisation levels. This is a result of the market shares of each of the shortsea shipping lines developing at different rates. Also, variations over the months and weeks may cause temporary peaks in volumes.

b. The capacity assessment is highly dependent on the average dwell time assumptions. Supply chain disruptions can cause dwell times to increase which in turn results in a lower effective available capacity. As a result, capacity constraints on the Humber may occur sooner than in the next five years if dwell times continue their upward trend. At individual terminals which are facing high dwell times, capacity problems may therefore occur even earlier. The impact of changing dwell times is summarised in Table 4-5. For the Humber as a whole, an increase in average dwell time of 0.25 days reduces unaccompanied Ro-Ro estimated capacity by some 10%.

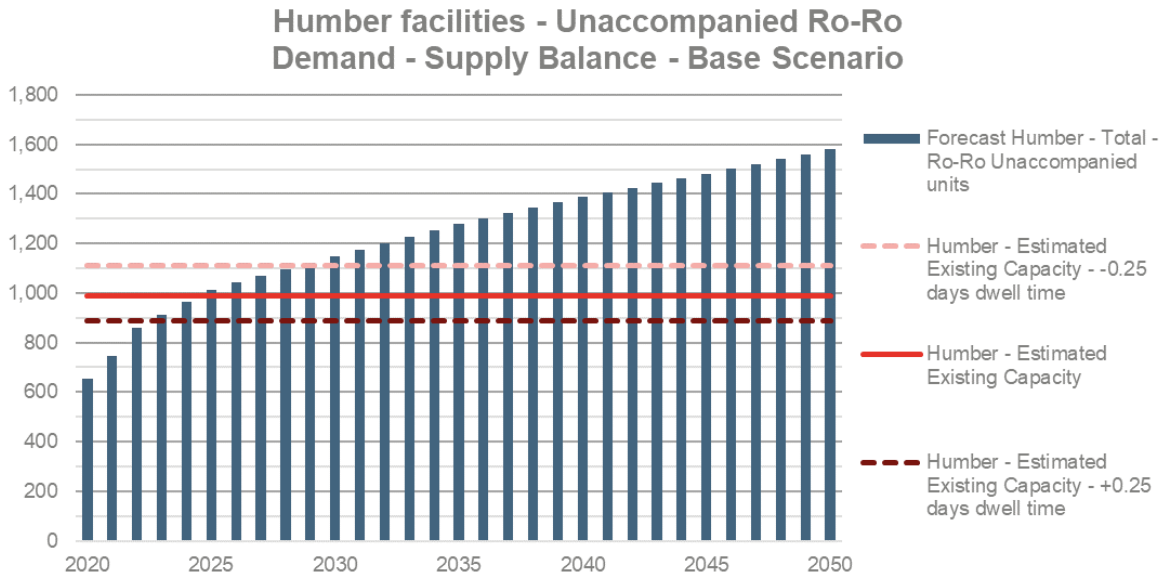

Figure 8-15 Demand - supply balance unaccompanied Ro-Ro Traffic Humber region (in '000 units)

184. The figures below summarise the demand-supply balance for the high and low macro-economic forecast scenario, which were presented earlier in this section. In both alternative scenarios additional capacity in the Humber is indicated as being required in the short term.

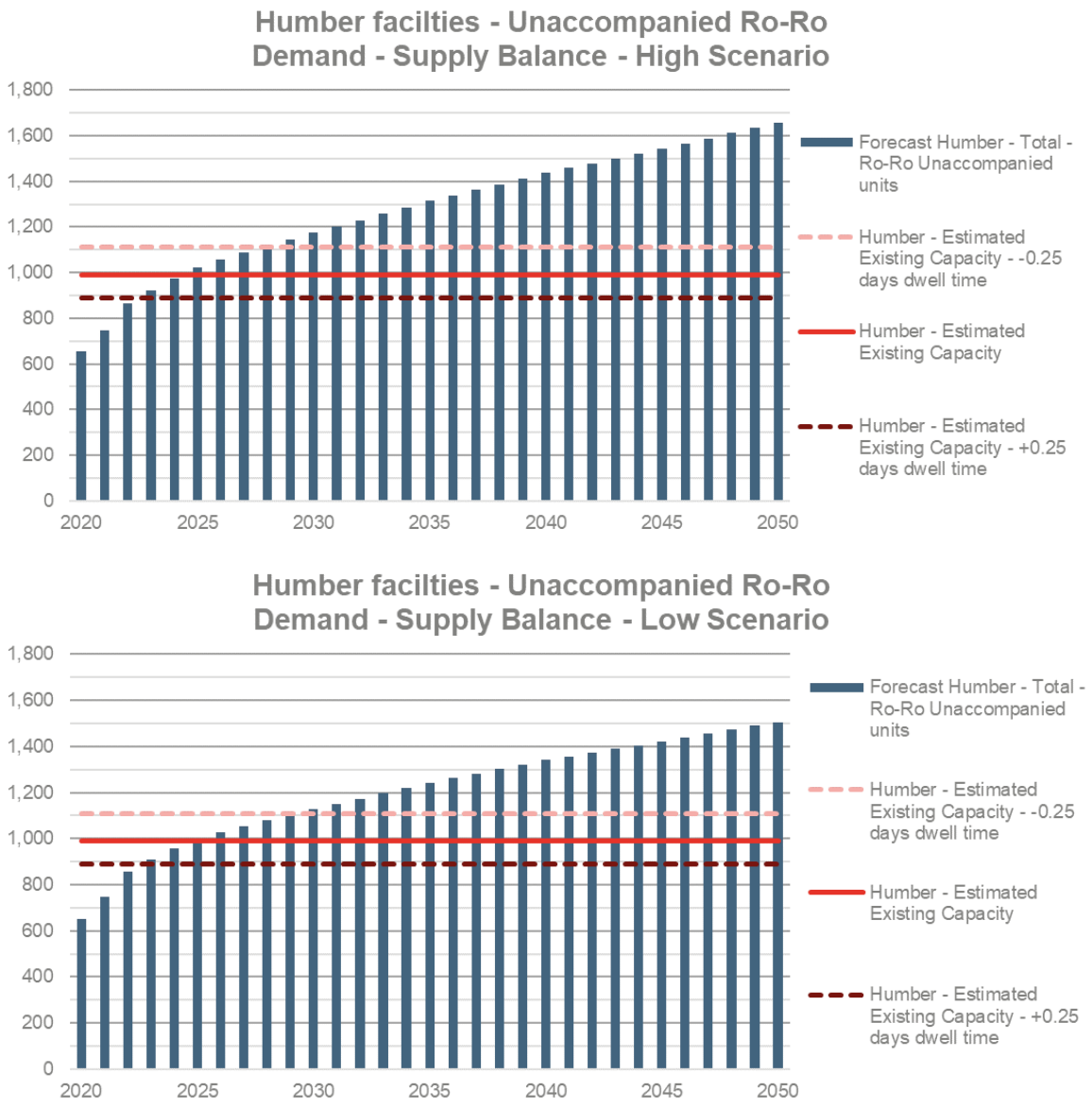

Figure 8-16 High and Low economic scenario and projections for the Humber region ports (in '000 units)

185. Stena had a market share in the unaccompanied trade in the Humber of almost 20% in 2021 (in units). The remainder of the unaccompanied trade is handled by CLdN, DFDS and to a smaller extent P&O and Finnlines. DFDS has the largest market share in the Humber. In the accompanied trade in the Humber region, Stena handled just marginally over 50% of the units. This results in a combined market share for Stena of almost 24% of the Ro-ro traffic in the Humber region. Part of

these volumes are currently handled at the facilities in Immingham in the in-dock berth. The remainder of Stena's Ro-ro volumes are being handled at Killingholme.

Unaccompanied Ro-Ro and Lo-Lo trades will take up the growth in shortsea trade for the UK at the expense of accompanied Ro-Ro. The East of the UK will account for the majority of the growth, with shortsea trade moving to ports closer to their end destinations and origins. With the growth in imported tonnage exceeding exported tonnage and the average weight per trailer reducing, growth in the number of unaccompanied trailers will in turn be higher than the underlying growth in the UK's shortsea tonnage.

A clear growth is therefore expected for the unaccompanied Ro-Ro segment in the Humber region in number respect of the number of units of 4.5% in 2022-2027 and 2.3% in 2028-2032 (in comparison to 2.9% in 2012-2021). The existing estimated storage capacity for unaccompanied Ro-Ro trailers is expected to be exceeded in 2026 using an average industry benchmark for dwell times. If dwell times were to increase by just 0.25 days storage capacity on the Humber would be exceeded by 2024. In the high macro-economic scenario (with no dwell time increase) capacity would be exceeded in 2025.

In all scenarios analysed, additional Ro-Ro storage capacity would be required in the next five years. This is in addition to the requirements for additional berthing windows in the Humber regions which were highlighted in chapter 6. The Humber region is well suited to serve the demand for key consumption and demand centres in the North of England and the Midlands.

Appendix 1 Arrival/Departure Schedules Immingham and Killingholme

Overview sailing schedule RO-RO Services Immingham – Killingholme

DFDS Gothenburg – Brevik – Immingham Averg. Berth time Immingham 5 hours (based on sailing schedule)			
Departure Gothenburg	**Departure Brevik**	**Arrival Immingham**	
Monday 20:00	/	Tuesday 22:00	
Tuesday 20:00	Monday 18:00	Wednesday 22:00	
Wednesday 20:00	/	Thursday 22:00	
Thursday 17:00	Friday 04:00	Saturday 05:00	
Friday 20:00	/	Saturday 22:00	
Saturday 19:00	/	Sunday 24:00	
Departure Immingham	**Arrival Gothenburg**	**Arrival Brevik**	
Tuesday 03:00	Wednesday 08:00	/	
95hursday95 05:00	95hursday 08:00	Thursday 24:00	
Thursday 05:00	95hursd 08:00		
Friday 05:00	Saturday 11:00	/	
Saturday 12:00	Sunday 16:00	/	
Sunday 05:00	Tuesday 08:00	Monday 09:00	
DFDS Zeebrugge – Immingham – Averg. Berth time Immingham 11 hours (based on sailing schedule)			
Departure Frederikstad	**Departure Halden**	**Departure Zeebrugge**	**Arrival Immingham**
Monday 09:00	Monday 18:00	Thursday 12:00	Saturday 06:00
Departure Immingham	**Arrival Zeebrugge**	**Arrival halden**	**Arrival Frederikstad**
Saturday 17:00	Friday 12:00	Tuesday 18:00	Monday 16:00
DFDS Cuxhaven – Immingham -Averg. Berth time Immingham 6 hours (based on sailing schedule)			
Departure Cuxhaven	**Arrival Immingham**	**Departure Immingham**	**Arrival Cuxhaven**
Monday 18:00	Tuesday 13:00	Monday 17:00	Tuesday 13:00
Tuesday 19:00	Wednesday 14:00	Tuesday 19:00	Wednesday 15:00
Wednesday 21:00	Thursday 19:00	Wednesday 20:45	Thursday 16:00
95hursday 22:00	Friday 17:00	Friday 01:00	Saturday 01:00
Saturday 07:00	Sunday 06:00	Friday 23:00	Saturday 19:00
Sunday 01:00	Monday 04:00	Sunday 12:00	Monday 12:00
DFDS Esjberg – Immingham – Averg. Berth time Immingham 5 hours (based on sailing schedule)			
Departure Esjberg	**Arrival Immingham**	**Departure Immingham**	**Arrival Esjberg**
Monday 20:30	Tuesday 14:30	Monday 19:30	Tuesday 15:30
Tuesday 20:30	Wednesday 14:30	Tuesday 19:30	Wednesday 15:30
Wednesday 20:30	Thursday 14:30	Wednesday 19:30	Thursday 15:30
Thursday 20:30	Friday 14:30	Thursday 19:30	Friday 15:30
Friday 20:30	Saturday 14:30	Friday 19:30	Saturday 15:30
Saturday 20:30	Sunday 15:30	Saturday 19:30	Sunday 16:00
DFDS Rotterdam – Immingham – Averg. Berth time Immingham 14,5 hours (based on sailing schedule)			
Departure Rotterdam	**Arrival Immingham**	**Departure Immingham**	**Arrival Rotterdam**
Monday 09:30	Tuesday 05:00	Monday 19:45	Tuesday 05:00
Tuesday 09:30	Wednesday 05:00	Tuesday 19:45	Wednesday 05:00
Wednesday 09:30	Thursday 05:00	Wednesday 19:45	Thursday 05:00
Thursday 09:30	Friday 05:00	Thursday 19:45	Friday 05:00
Friday 09:30	Saturday 05:00	Friday 19:45	Saturday 05:00
Saturday 09:30	Sunday 06:30	Saturday 18:00	Sunday 05:00
Stena Line Rotterdam – Immingham Averg. Berth time Immingham 12 hours (based on sailing schedule)			
Departure Rotterdam	**Arrival Immingham**	**Departure Immingham**	**Arrival Rotterdam**
Monday 19:45	Tuesday 07:15	Monday 19:45	Tuesday 09:15
Tuesday 19:45	Wednesday 07:15	Tuesday 19:45	Wednesday 09:15
Wednesday 19:45	Thursday 07:15	Wednesday 19:45	Thursday 09:15
Thursday 19:45	Friday 07:15	Thursday 19:45	Friday 09:15

Friday 19:45	Saturday 07:15	Friday 19:45	Saturday 09:15
Sunday 19:00	Monday 07:15	Sunday 19:00	Monday 09:15

Stena Line Hoek van Holland – Killingholme Averg. Berth time Killingholme 14,25 hours (based on sailing schedule)			
Departure Hoek van Holland	**Arrival Killingholme**	**Departure Killingholme**	**Arrival Hoek van Holland**
Monday 20:30	Tuesday 06:15	Monday 20:30	Tuesday 09:15
Tuesday 20:30	Wednesday 06:15	Tuesday 20:30	Wednesday 09:15
Wednesday 20:30	Thursday 06:15	Wednesday 20:30	Thursday 09:15
Thursday 20:30	Friday 06:15	Thursday 20:30	Friday 09:15
Friday 20:30	Saturday 06:15	Friday 20:30	Saturday 09:15
Saturday 20:00	Sunday 06:15	Saturday 20:00	Sunday 09:15
Sunday 20:00	Monday 06:15	Sunday 20:00	Monday 09:15
CLdN Benelux Dublin service (Rotterdam – Killingholme) Averg. Berth time Killingholme 14 hours (based on sailing schedule)			
Departure Rotterdam	**Arrival Killingholme**	**Departure Killingholme**	**Arrival Rotterdam**
Monday 20:00	Tuesday 08:00	Monday 19:00	Tuesday 09:00
Tuesday 19:00	Wednesday 07:00	Tuesday 19:00	Wednesday 09:00
Wednesday 19:00	Thursday 07:00	Wednesday 19:00	Thursday 09:00
Thursday 19:00	Friday 07:00	Thursday 19:00	Friday 09:00
Friday 19:00	Saturday 08:00	Friday 19:00	Saturday 09:00
Saturday 17:00	Sunday 08:00	Saturday 17:00	Sunday 10:00
CLdN Benelux – Dublin service (Zeebrugge – Killingholme – Esbjerg) Averg. Berth time Killingholme 10 hours (based on sailing schedule)			
Departure Esbjerg	**Departure Zeebrugge**	**Arrival Killingholme**	
	Monday 19:30	Tuesday 08:30	
Sunday 14:00	Tuesday 19:30	Wednesday 08:30	
	Wednesday 19:30	Thursday 08:30	
	Thursday 19:30	Friday 08:30	
	Saturday 19:30	Sunday 08:30	
	Sunday 19:30	Monday 08:30	
Departure Killingholme	**Arrival Zeebrugge**	**Arrival Esbjerg**	
Monday 18:30	Tuesday 10:00		
Tuesday 18:30	Wednesday 10:00		
Wednesday 18:30	Thursday 10:00		
Thursday 18:30	Friday 10:00	Sunday 09:00	
Friday 18:30	Saturday 10:00	Sunday 09:00	
Sunday 18:30	Monday 10:00		
CLdN Ro-Ro services (Goteborg – Killingholme) Averg. Berth time Killingholme 12 hours (based on sailing schedule)			
Departure Goteborg	**Arrival Killingholme**	**Departure Killingholme**	**Arrival Goteborg**
Monday 12:00	Thursday 08:00	Monday 20:00	Thursday 08:00
Tuesday 20:00	Friday 08:00	Tuesday 20:00	Friday 22:00
Thursday 19:00	Sunday 08:00	Thursday 20:00	Sunday 23:59
Saturday 06:00	Tuesday 08:00	Friday 20:00	Tuesday 09:00
		Sunday 20:00	Thurdsay 09:00
CLdN Ro-Ro services (Leixoes – Killingholme) Averg. Berth time Killingholme 35 hours (based on sailing schedule)			
Departure Leixoes	**Arrival Killingholme**	**Departure Killingholme**	**Arrival Leixoes**
Wednesday 23:00	Monday 08:00	Tuesday 19:00	Saturday 08:00
Saturday 23:00	Thursday 07:00	Saturday 19:00	Wednesday 08:00
CLdN Ro-Ro services (Santander – Killingholme) Averg. Berth time Killingholme 35 hours (based on sailing schedule)			
Departure Santander	**Arrival Killingholme**	**Departure Killingholme**	**Arrival Santander**
Wednesday 04:00	Sunday 08:00	Monday 20:00	Friday 06:00
Friday 12:00	Monday 08:00	Wednesday 20:00	Sunday 14:00
Sunday 20:00	96hursday 08:00	Friday 20:00	Tuesday 22:00
Sources: [redacted] Date: June 2022			

Appendix 2 Methodology Logistic Cost Model and Geographical Distribution of Demand

2.1 Logistic Cost Modelling

2.1.1 Logistic Cost Modelling

186. Logistic costs and transit times are the most important factors in choosing a route for Ro-Ro cargo. However, service levels at each step of the supply chain also have a large influence insofar as they determine broader cost structures. Therefore, to analyse the demand in the Humber estuary a detailed logistic cost model has been developed to determine the relevant hinterland.

187. Rebel has developed a Logistic Cost Model to assess the overall cost of the logistics chain for a shortsea service. This logistic cost model has then been used to analyse the relative cost position of the Port of Immingham vis-à-vis other ports for each trade route. The steps undertaken in the overall assessment are summarised in Figure A2-1.

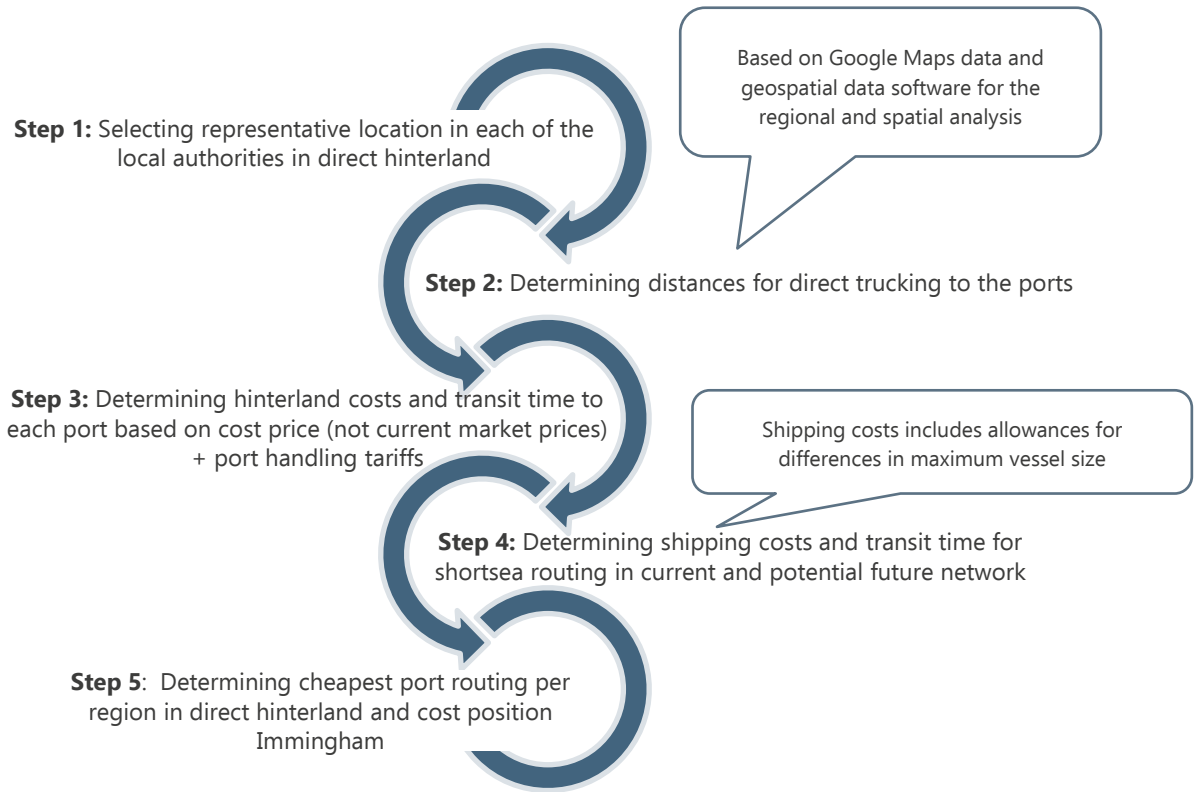

Figure A2-1 Steps of the assessment of Immingham's competitive positioning based on logistic costs

188. The cost model estimates capital costs, operational costs, surcharges and profit and overhead premiums to arrive at total logistics costs for each step. The key figures used in the analysis are based on Rebel's research and experience in

combination with official statistics. Typical operational conditions have been assumed. The list below provides an overview of the components that are included in the cost analysis.

189. As current logistic costs are not typical in historic terms, average costs conditions from the past few years have been used. This is done to ensure a long-term view, rather than distorted decisions based on current conditions, which may alter from 2023. For shipping and trucking long-term baseline costs (i.e., newbuild cost converted to daily costs using cost of capital and typical lifetime rather than current rental/charter rates) have been used. Also fuel costs rates have been taken from the start of the year. This prevents conclusions being drawn based on assumptions influenced by current volatile conditions in specific markets.

190. The model considers the distance, travel time and cost for each Local Authority area in the UK to the considered UK ports in the analysis based on:

- Direct trucking towards end destination
- Direct trucking to the ports
- Intermodal transport to the ports (where appropriate)

191. The empty return charge is a cost surcharge priced in for the return of empty units. This factor is estimated based on the full : empty ratios in combination with a base load.

192. In addition, the model includes the shipping costs based on vessel size, operating costs of the vessel, sailing time, loading and unloading times and port dues. Finally, the cheapest routing option is selected based on hinterland and shipping costs.

193. It has been assumed that Immingham and Killingholme have the same characteristics in terms of shipping distance and hinterland transportation distances as these facilities are located very near to each other.

Figure A2-2 Overview of the steps in the logistic cost model

2.1.2 Inventory Cost

194. The costs of inventory will be important for a shipper (in addition to the direct transportation costs) when choosing the routing. Shippers with expensive goods will prefer faster but more expensive modes of transport due to the higher capital tied up for these commodities. Low value goods will more likely choose the cheapest routing which takes longer. The model calculates inventory costs for the duration of travel based on the assumptions that a 40' container contains on average 40,000 GBP of goods and a trailer 60,000 GBP, using a cost of capital of 10% for calculating the inventory costs on a yearly basis. This equates to a penalty

of around 13 GBP per day. The daily inventory costs will increase with rising interest rates. Units with high value goods above this average will seek to further reduce transit times, while units filled with lower value commodities (or empties) will be less concerned with these issues. Also, the importance of more frequent sailings can be evaluated with this benchmark figure.

2.1.3 Ro-Ro Shipping costs

195. The costs of the maritime transport element are a large contributor to the overall transportation costs between origin and destination. Shipping costs are based on the costs of owning and operating a Ro-Ro vessel. These rates will be different from current quoted freight rates. In the logistic cost model current service structures have been used. To compare transit times, sailing distances and costs, an overseas port has been selected for each target market. These target markets are: Lille, Liège, Venlo, Hannover, Oslo and Helsinki. In addition, for each port, the largest currently deployed vessel operating from that port is included in the calculations. The frequency of each service is captured via variations in dwell times between the ports. Due to this, the total inventory costs for the shippers are subsequently affected, thereby affecting the inventory cost. For example, services with high frequencies will have shorter dwell times as there will be more frequent services to take along the cargoes. Table A2-1 shows the shipping cost while sailing and in the port for a typical Ro-Ro-vessel. The vessel sizes and sailing frequencies assumed for each route can be found in Appendix 4.

Table A2-1 Vessel characteristics for Ro-Ro ships

	Unit	Vessel Characteristics					
Capacity	lm	1,800	2,800	3,300	5,400	6,700	7,800
Utilisation	%	95 %	95 %	95 %	95 %	95 %	95 %
LOA	m	152	197	187	216	237	234
Beam	m	24	26	27	33	34	38
Draught	m	6	8	7	8	7	8
Capital cost	GBP/day	6,284	9,776	11,020	16,394	18,306	21,312
Operational cost	GBP/day	6,539	8,585	9,448	13,027	14,800	16,227
Fuel cost at sea	GBP/day	6,419	9,075	10,297	16,293	19,443	22,270
Fuel cost in port	GBP/day	1,165	1,375	1,419	2,796	3,351	4,141
Total cost at sea	GBP/day	19,242	27,435	30,766	45,713	52,549	59,808
Total cost in port	GBP/day	13,988	19,735	21,888	32,216	36,458	41,680
Cost at sea	GBP/lm/day	11.25	10.31	9.81	8.91	8.26	8.07
Cost in port	GBP/lm/day	8.18	7.42	6.98	6.28	5.73	5.62

2.1.4 Example: Total Logistical Cost from Leeds to Venlo

196. As an example, we have summarised the results for the total logistic cost from Leeds to Venlo (Netherlands). Other examples are included in Appendix 5. A number of routing options are possible to connect the origin and destination of the

cargo using a set of different ports, including via Dover. From the bar chart it is apparent that the Immingham route will be cheapest, resulting in the shortest overland transport distances and quickest sailing connection. The cost advantage of routing cargo through Immingham is estimated to be around 10% under assumed conditions. In the full logistic cost model these calculations are repeated for each local authority to the respective destinations in the assessment.

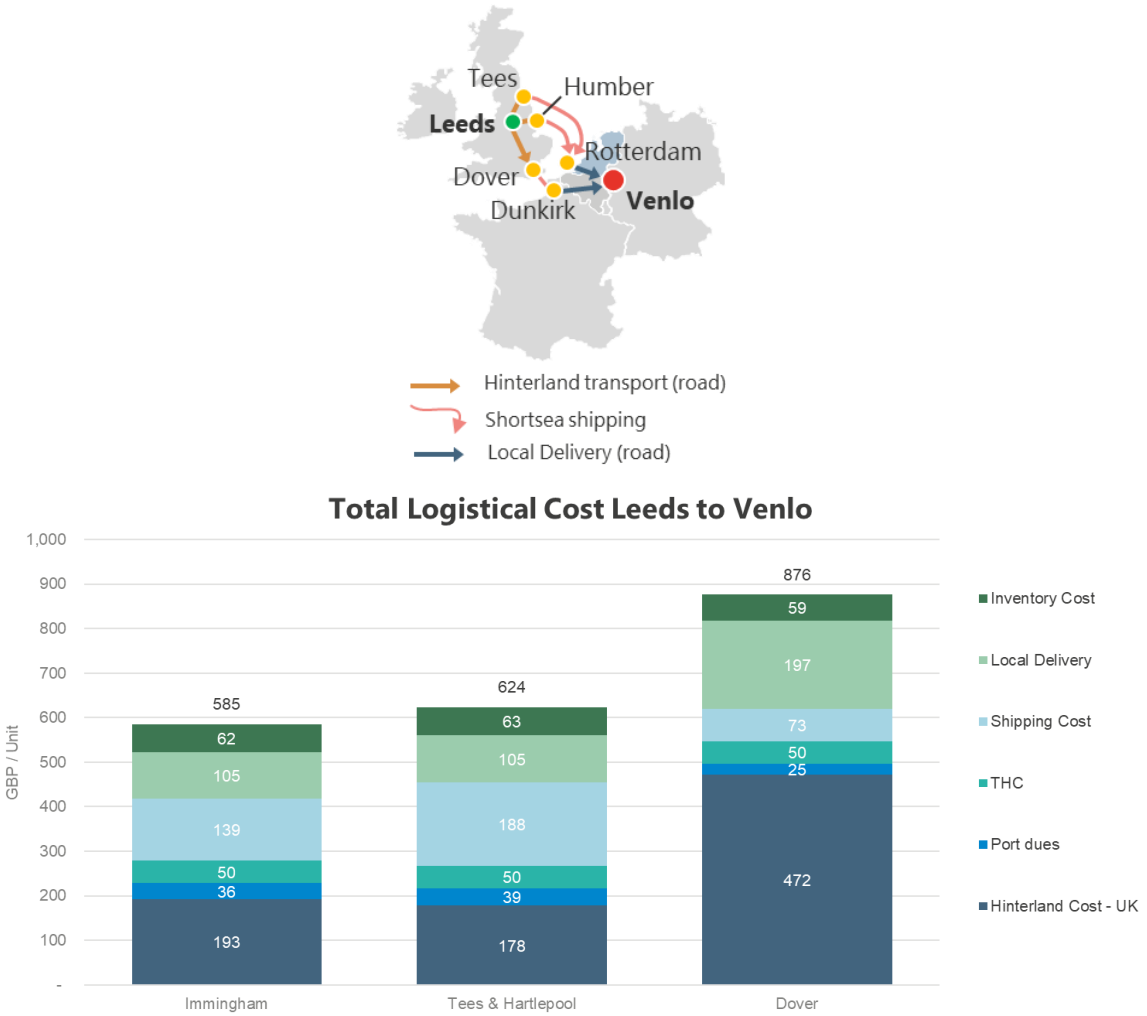

Figure A2-3 Logistical Cost comparison for a Ro-Ro unit going from Leeds to Venlo

2.2 Demand Modelling

197. The distribution of shortsea demand in the UK is analysed by looking at different datasets which provide interpretations of the geographical spread of demand. These include:

a. Economic output

b. Population

c. Number of businesses

d. Distribution centres and key shippers

198. These aspects have been explained and detailed in section 5. These proxies for demand distribution are analysed on a Local Authority area level as reported by the Office for National Statistics. Effectively economic output, population and warehouse location are the key drivers for demand distribution. These drivers are closely related. Business statistics for manufacturing and logistic companies have been added to adjust the demand profile by capturing the low added-value activities and logistic consolidation points.

199. Each dataset was used to define respective regional shares. The indicators were then aggregated by applying weighting factors to each dataset as shown in Figure A2-4. Combining these drivers results in an estimated market share per Local Authority area. Finally, the market share for each entity is translated into an equivalent tonnage based on the total shortsea tonnage for the UK. This tonnage (or equivalent estimated number of units) represents the shortsea traffic which can be transported via Ro-Ro and Lo-Lo combined.

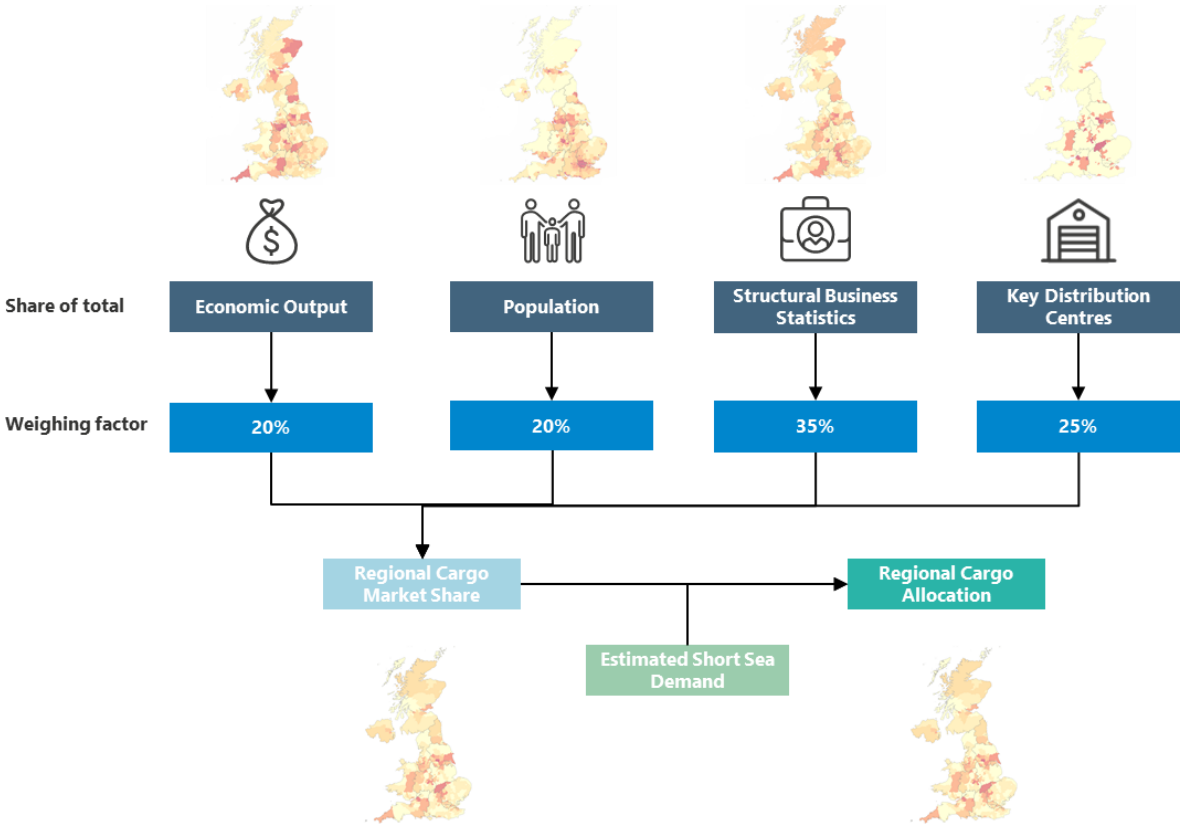

Figure A2-4 Methodology applied for modelling the regional demand

Appendix 3 Parameters Logistic Cost Model

Overview parameters – ships and trucks:

- Capital costs are based on new ship and truck prices, operating assumptions and financing conditions
    - Staff and salary
    - Maintenance cost
    - Insurance
    - Administration costs
    - Fuel cost based on:
        - Very Low Sulphur Fuel Oil (VLSFO) and Marine Diesel Oil (MDO) costs / diesel costs
        - Fuel consumption sailing, slow sailing and in port
        - Fuel consumption driving and waiting
- Port dues of the ports served by the service
- Marine services, including pilotage, mooring and towage
- Overhead costs of the shipping company and the logistics company
- Profit of the storage, shipping company and the logistics company
- 15% surcharge for RO-PAX services compared to LO-LO services

- Routing parameters:
    - Actual Distances
    - Journey times by route planners, average barge speed and train speed on the continental European stretch of the journey
    - Handling rates at barge and rail hubs
    - Surcharge for (partly) empty return sailing/trucking
    - Time at the quay (arrival, waiting time, unloading & loading time, departure)

Appendix 4 Logistic Cost Model – Shipping Structure

Overview of vessel sizes (in lm), sailing frequency and service type (Immingham represents both Immingham and Killingholme)

	Destination				
Origin	**Hamburg**	**Rotterdam**	**Zeebrugge**	**Dunkirk**	**Gotenburg**
Immingham	2,800	5,400	-	-	5,400
Hull	-	3,300	-	-	-
Harwich	-	5,400	-	-	-
Felixstowe	-	5,400	-	-	-
Tees & Hartlepool	-	2,800	2,800	-	-
Tyne	-	1,800	-	-	-
London	-	5,400	5,400	-	5,400
Dover	-	-	-	3,300	-
Portsmouth	-	-	-	3,300	-

	Destination				
Origin	**Hamburg**	**Rotterdam**	**Zeebrugge**	**Dunkirk**	**Gotenburg**
Immingham	Daily	Daily	Daily	-	Daily
Hull	-	Daily	-	-	-
Harwich	-	Daily	-	-	-
Felixstowe	-	Daily	-	-	-
Tees & Hartlepool	-	Daily	Daily	-	-
Tyne	-	Daily	-	-	-
London	-	Daily	Daily	-	Tri-weekly
Dover	-	-	-	Daily	-
Portsmouth	-	-	-	Tri-weekly	-

	Destination				
Origin	**Hamburg**	**Rotterdam**	**Zeebrugge**	**Dunkirk**	**Gotenburg**
Immingham	RORO	RORO	RORO	-	RORO
Hull	-	ROPAX	-	-	-
Harwich	-	ROPAX	-	-	-
Felixstowe	-	RORO	-	-	-
Tees & Hartlepool	-	RORO	RORO	-	-
Tyne	-	ROPAX	-	-	-
London	-	RORO	RORO	-	RORO
Dover	-	-	-	ROPAX	-
Portsmouth	-	-	-	ROPAX	-

Appendix 5 Logistic Cost Assessment

Lille

201. The strong cost competitive position of Immingham and Killingholme for Ro-Ro traffic from, for example, Leeds and Liverpool towards northern France can be clearly seen from the map. For Immingham's direct hinterland it is cheaper to use Ro-Ro services from the Humber than to drive to Dover and cross the Dover Straight. Immingham and Killingholme have an advantage over Hull due to the larger vessels being deployed from the South Bank vis-à-vis Hull. The area for which Teesport is competitive is a narrow band further towards North England which will be using the service to Zeebrugge. However, the current size of the vessel and frequency of sailing make this option less cost competitive.

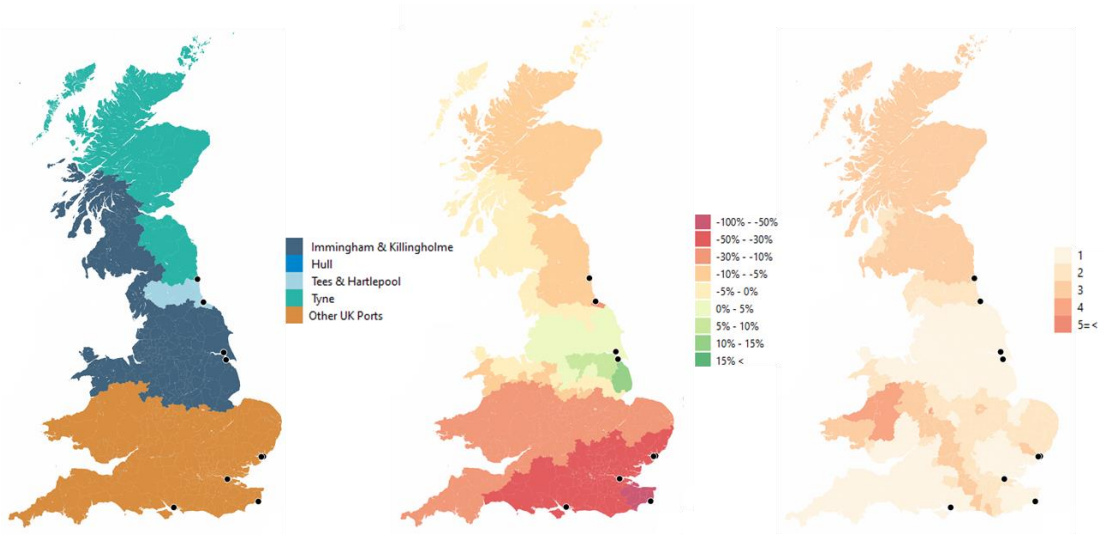

Figure 8-17 Preferred Port (left), Competitive Position of Immingham (centre), Number of ports within 5% cost differential from the cheapest port (right) to Lille

Liège

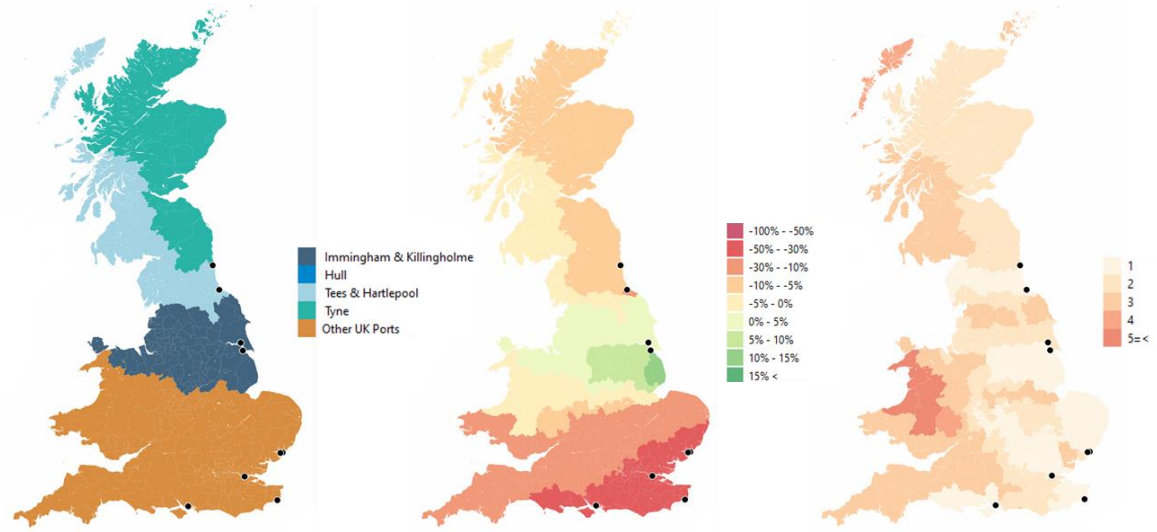

Figure 8-18 Preferred Port (left), Competitive Position of Immingham (centre), Number of ports within 5% cost differential from the cheapest port (right) to Liege

Hannover

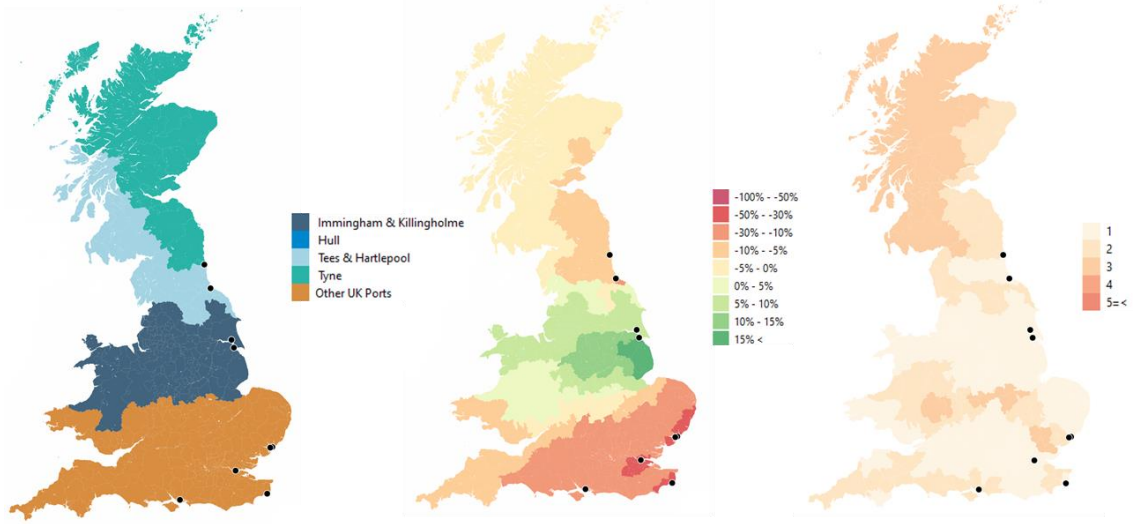

Figure 8-19 Preferred Port (left), Competitive Position of Immingham (centre), Number of ports within 5% cost differential from the cheapest port (right) to Hannover

Appendix 6 Data sources

List of main data sources used for the purpose of this report:

- Trade statistics:
  - UK Maritime Statistics
  - UN Comtrade
  - Ro-Ro and Lo-Lo statistics of Immingham and Hull provided by ABP
- UK Statistics:
  - Office of National Statistics
  - Oxford Economics
- Mapping of key facilities:
  - Google Earth
  - Layouts of Immingham and Hull provided by ABP
- Logistic cost model:
  - Driving distances and travel times: Google Maps

Appendix 7 Storage Capacity Methodology

202. The storage yards available for unaccompanied Ro-Ro traffic at each existing Ro-Ro terminal on the Humber have been analysed in order to provide an estimate of the overall current level of storage capacity for the Humber facilities.

203. As a first step the static yard capacity has been calculated using the number of trailer parking bays on the terminal as well as the ground slots available for stacking conventional containers that are shipped on the Ro-Ro vessels. Such containers transported on the Ro-Ro services are much smaller in number than the trailer units which are transported.

204. The number of trailer parking bays and container ground slots were estimated from a combination of sources including information provided by ABP in combination with up to date satellite images from Google Earth and publicly available information. The estimated container storage capacity has been determined by multiplying the number of ground slots by the estimated stacking height and stack efficiency (which is based on professional judgement and experience). The trailer parking slots and container capacity have then been added together in order to provide an estimate of the static storage capacity (maximum number of units that can be stored simultaneously at any one time).

$$\boldsymbol{Static\ Capacity} = Parking\ Slots + (Ground\ Slots * Stack\ height * Stack\ efficiency)$$

205. Subsequently, the storage capacity has been estimated by multiplying the estimated static capacity by the number of operational days (365 days) and then dividing this by the dwell time (i.e., the number of days a unit will occupy a trailer parking bay or ground slot prior to it being collected or loaded) multiplied by a peak factor (a factor that takes account of the fact that the efficient capacity of a terminal is somewhat lower than the peak capacity of a terminal). The resulting figure has then been rounded up to the nearest 10,000 units, and this has been taken as the estimated efficient storage capacity of the facility.

$$\boldsymbol{Storage\ Capacity} = (Static\ Capacity * 365)/(Dwell\ time * Peak\ factor)$$

206. The industry typically operates with an overall average dwell time (which takes account of both import and export dwell times) of between 1.5 and 2.5 days for unaccompanied Ro-Ro units. In the current operational environment dwell times of between 2 and 3 days have been reported

207. Table 8-2 below shows the capacity calculation for the Humber facilities on the basis of a 2.25 day dwell time.

Table 8-2 Estimated Efficient Storage Capacity of the Humber Facilities

	Trailer Parking Slots (Units)	Container Ground Slots (Units)	Static Capacity (Units)*	Efficient Storage Capacity (Units)**	Sources
Immingham	3660	370	4290	570.000	Information provided by ABP, Google Earth
Killingholme	1790***	220	2190	290.000	Google Earth
Hull	220	380	980	130.000	Information provided by ABP, Google Earth

* for conventional containers stored on the Ro-Ro terminals at the three locations a stacking height of 3 units has been assumed (based on a Reachstacker operation in the yard) and a stack efficiency of 0.6
**based on a dwell time of 2.25 days and a peak factor of 1.25 (i.e. efficient operational utilisation rate of 80%)
***In Killingholme 950 dedicated trailer slots are estimated to be available. Other storage areas are used to park additional trailers. Using satellite images of the terminal a total of 1790 slots are counted, which include slots at areas originally destined to be used for parking trade cars.

208. Depending on the operational environment including aspects like weekly distribution of traffic on the particular service, client base and trade services, dwell times will vary. Therefore, a series of sensitivity analysis have been undertaken using various dwell times to show the sensitivity of the capacity calculations with regard to the dwell time assumption. These are shown in Table 8-3.

Table 8-3 Sensitivity of the capacity based on various dwell times

	Capacity - 1.75 days	Capacity - 2 days	Capacity - 2.25 days	Capacity - 2.5 days	Capacity - 3 days	Capacity - 3.5 days
Immingham	730,000	640,000	570,000	510,000	430,000	370,000
Killingholme	370,000	320,000	290,000	260,000	220,000	190,000
Hull	170,000	150,000	130,000	120,000	100,000	90,000
Total	1,270,000	1,110,000	990,000	890,000	750,000	560,000

List of Acronyms

ABP	Associated British Ports
CAGR	Compound Annual Growth Rate
CLdN	Cobelfret
CO2	Carbon Dioxide
DCO	Development Consent Order
DFDS	DFDS Seaways
DfT	Department for Transport
DWT	Dead Weight Tonnes
EoUK	East of United Kingdom
ETS	Emission Trading Scheme
EU	European Union
GBP	British Pound Sterling
GDP	Gross Domestic Product
GVA	Gross Value Added
ha	hectares
HGV	Heavy Goods Vehicle
HS6	Harmonised System – 6 digit
IERRT	Immingham Eastern Ro-Ro Terminal
km	kilometre
kg	kilogram
LEP	Local Enterprise Partnerships
lm	lane metre
LNG	Liquefied Natural Gas
Lo-Lo	Lift-on / Lift-off
LOA	Length Overall
m	metre
MDO	Marine Diesel Oil
mtpa	million tonnes per annum
NSIP	Nationally Significant Infrastructure Project
ONS	Office of National Statistics
P&O	P&O Ferries
Ro-Ro	Roll-on / Roll-off
Ro-Pax	Roll-on / Roll-off - passenger
TEU	Twenty foot Equivalent Unit
UK	United Kingdom
UN	United Nations
VLSFO	Very Low Sulphur Fuel Oil

About Rebel

No change without a Rebel

209. Rebels work on the issues that affect all our futures, from sustainability, transportation and urban development to healthcare and the social sector. We make an impact, not only as consultants but also as investors. After all, anyone who believes in their own advice should be prepared to invest in it. We are committed to bringing change, initiating and realising our own projects. We provide quality strategic advice & development, business policy & evaluation, partnership consulting & contracts, financial advice & modelling, and investments & fund management.

Thinking beyond existing structures

210. The Rebel adventure began in 2002 with ten chairs around a large round table. Sitting around that table, we decided to continue our careers in consultancy by starting our own company – we were the first Rebels. It was to be a company without a hierarchy, without bosses, without limits. A place where everyone could realize their full potential. We bring everything we have inside to the table. Intrinsic motivation, the urge to bring change, expertise and one constant focus: to make a real impact with our projects around the world. We now work with more than 180 Rebels from our offices in Rotterdam, Amsterdam, Antwerp, Düsseldorf, London, Washington D.C., Nairobi, Johannesburg, Mumbai and Jakarta.

211. The drive and determination of that first step in 2002 informs how we work with and on behalf of our partners to this day. Trust is everything. In everything we do – and we do a lot! – our objective is to have a positive impact on the world. At the interface between the public and the private, because combining social values with a keen business sense is close to the heart of all Rebels. That might seem like an ambitious goal, perhaps, but we have always relished a challenge. We invite everyone to join in, to become part of the change. Let's think beyond existing structures. As governments, as companies and as individuals.

Our Experience in Ports and Logistics

212. Rebel has a long track record in the field of ports, since the very beginning as economic, financial and procurement advisors. Rebel Ports and Logistics offers a mixed team of port economists, engineers, operational and finance experts, advising private and public clients around the world.

213. We offer the standard consulting package, but also foster business innovation working on projects such as Blockchain, Cold Ironing and Port as a Service. To accelerate innovation we work closely together with knowledge institutes, start up and data firms, software companies and equipment suppliers. We embrace practical and fact-based research combined with tailor-made analytics to provide

our clients with the best advice. For this purpose we have developed a comprehensive Port Toolbox.

214. The team has carried out several assignments in the shortsea shipping sector in North West Europe and the UK. Rebel has carried out market studies and strategic assignments for port authorities, investors and terminal operators.

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