Irish Maritime Development Office

Irish Ports Capacity Study

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EY DKM

ARUP

Contents

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Executive Summary

Executive summary

Scope

This study assesses the capacity within the port system to meet present and future demand over the period to 2040, as required in the National Ports Policy (2013)[1].

The Terms of Reference[2] for this work required consideration of the following:

- **Demand**
  To prepare a forecast of the likely demand for Irish imports and exports (goods only).
- **Capacity**
  To carry out an assessment of existing capacity and capacity to be added in the short-term, as well as future planned capacity of the Irish ports.
- **Connections**
  To understand the importance of connections to the hinterland and how these support the ports.
- **Risks**
  To profile the potential risks and threats to future capacity likely to affect the ports.

This study covers all the Irish ports categorised in the NPP as Tier 1 and Tier 2 ports, as well as those of regional significance, with the exception of New Ross. The study has also taken account of the port of Greenore, which is privately owned, and the Northern Irish ports of Belfast, Larne and Warrenpoint.

The ports assessed are presented in Figure I with their classification and 2017 throughput illustrated.

A key objective of the study is to develop a standardised approach to demand and capacity assessment for the Irish ports going forward. The baseline analysis was undertaken in 2018 using Eurostat data from 2017 and information received from the ports in June 2018.

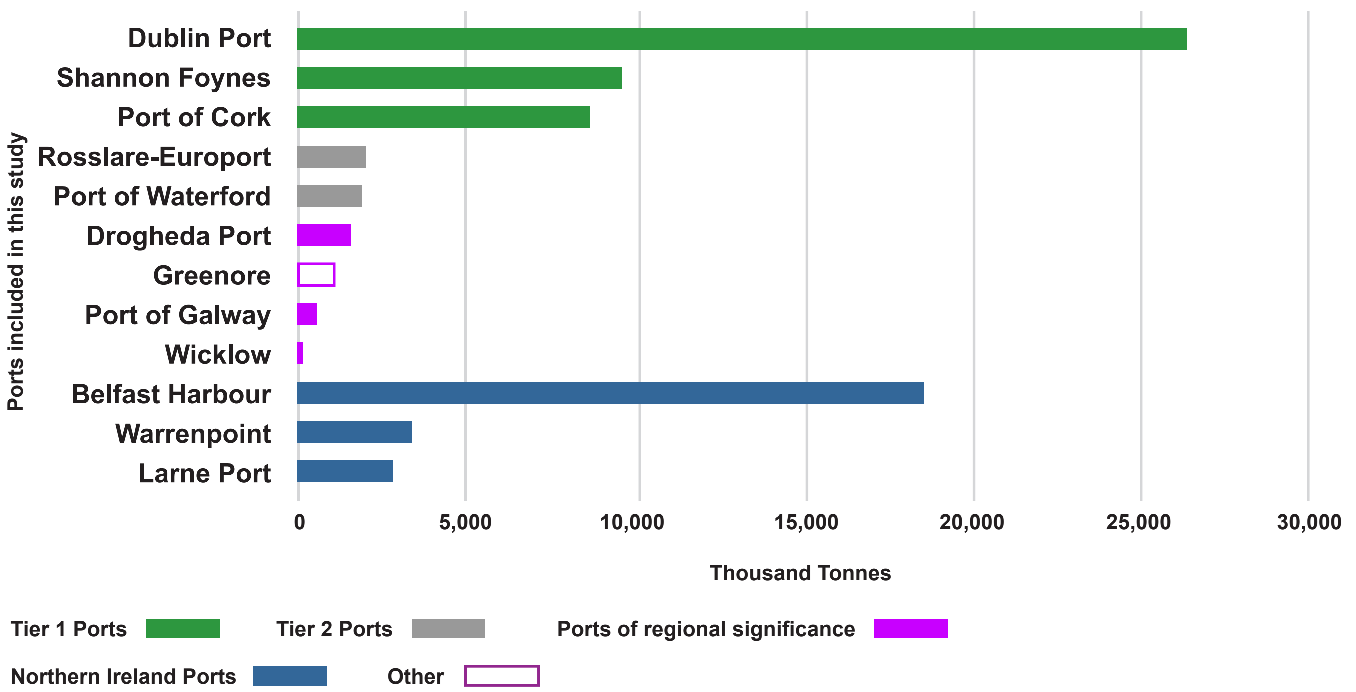

Figure I: 2019 throughput in thousand tonnes *(Source Eurostat)*

[1] National Ports Policy, 2013, Department of Transport
[2] See full Terms of Reference in Appendix 1

Overall approach

In order to analyse the capacity of the Irish Ports to handle the forecasted demand up to 2040, a demand forecast model has been developed. This assesses the likely throughput of trade goods over this period. The outputs of this model have been compared to the results of a capacity assessment undertaken for each of the Irish ports.

The key data sets used were the annual Eurostat Maritime Statistics mainly for the period up to 2017, supplemented by engagement with the port companies in June 2018 and the individual relevant Port Masterplans. Additional more recent data sets were provided by the IMDO and also extracted from the annual Eurostat Maritime Statistics where required for the assessments.

It has taken time to agree the methodology with all parties and stakeholders involved. Brexit has led to significant uncertainty. This report, therefore, presents different economic growth scenarios and can be adapted to take account of variable economic factors.

The approach followed is illustrated in Figure II. Based on site visits and data collected from the ports, separate demand and capacity forecasts were produced. These were then brought together into a single assessment for each port which allowed the identification of capacity gaps or surpluses. This assessment was undertaken for each of the four cargo modes: RoRo, LoLo, Dry & Break Bulk (dry and break bulk were combined to reflect the practice of using the same facilities to manage both types of cargo) and Liquid Bulk. The results of the capacity assessment were also benchmarked against other similar facilities worldwide. The individual port capacity assessments were combined to provide an assessment of the combined Irish ports capacity.

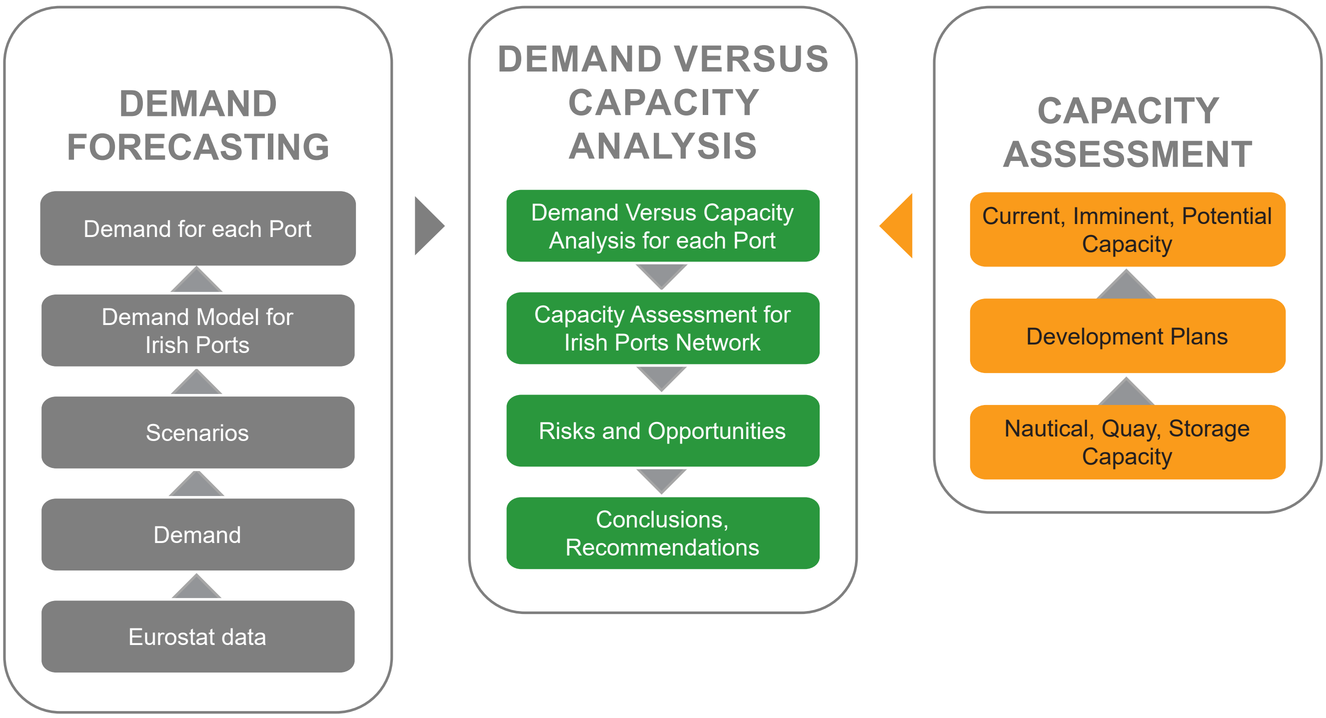

Figure II: Approach to the study

Executive summary

Demand forecasting

Eurostat data was used as the baseline input to the demand forecasting model in order to ensure a consistent set of data for ports in Ireland and Northern Ireland.

The demand model constructed is based on the finding that GDP (and, by proxy, private consumption) growth drives demand for imports and, in turn, for port capacity. The study found that there is a strong correlation between economic indicators, in particular GDP (and, by proxy, private consumption), and trade volumes.

GDP includes foreign trade. Therefore, this would not be independent of the trade forecasts. To avoid this problem of interdependence, a private consumption variable was used instead.

The key components of the demand forecasting model were:

- **Volume forecasts**
  Used to estimate the throughput for each port. These were based on a demand approach which linked trade volumes to economic performance. Long run forecasts, provided by Oxford Economic Forecasting[3], were then used to predict future economic performance and linked trade volumes.

- **Scenario modelling**
  Due to uncertainties around Irish growth prospects at the time of forecast, and the impacts of Brexit, a total of three economic growth rate scenarios, as presented in Table I, were assessed.

	Average Growth
High	3.1%
Base Case	1.8%
Low	1.5%

Table I: Average annual growth rates scenarios

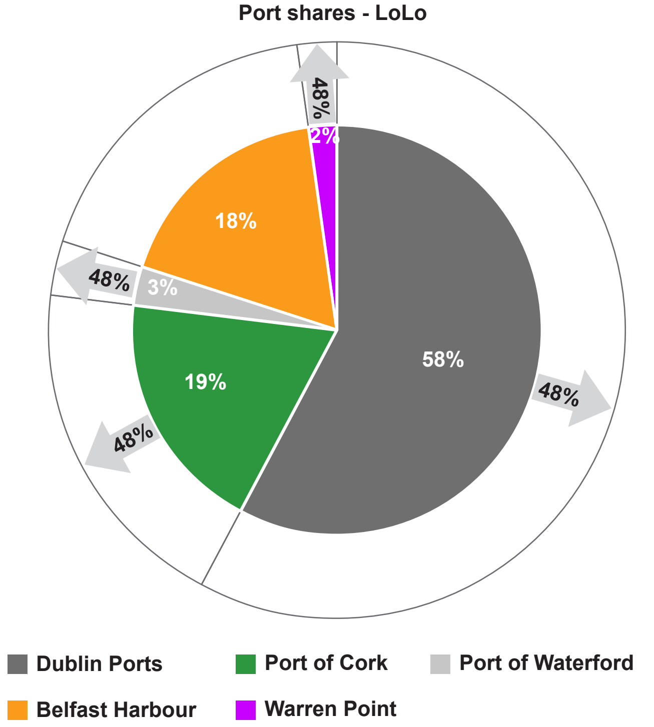

Figure III: LoLo - Example of constant port shares with 48% growth until 2040

Capacity assessment

The capacity assessment considered each of the four separate categories of cargo (RoRo, LoLo, Dry & Break Bulk and Liquid Bulk) with the following operational sub-systems:

- **Nautical**
  From navigation access to berth.

- **Quay**
  Goods movement from quay edge to storage.

- **Storage**
  Capacity of container stacking yard / silos for dry bulk / tanks for liquids, etc.

The limited capacity of these three sub-systems is a constraining factor.

Hinterland connectivity also has an impact on the capacity of some of the ports studied. Where this is the case, connectivity constraints have been identified and assessed.

[3] Oxford Economic Forecasting (OEF)

	RoRo-freight ('000 units)	LoLo ('000 TEUs)	Dry & Break Bulk ('000 tonnes)	Liquid Bulk ('000 tonnes)	Trade cars ('000 units)	Passenger cars ('000 units)
Dublin Port	1,459	1,397	3,554	5,155	319	515
Port of Cork	6	446	2,623	2,994	105	26
Shannon Foynes	-	-	3,352	870	-	-
Rosslare-Europort	235	-	82	-	57	273
Port of Waterford	1	75	2,354	-	-	-
Drogheda Port	-	-	1,380	40	-	-
Galway Port	-	-	258	655	-	-
Belfast Harbour	762	444	12,676	2,724	-	-
Larne Port	313	-	39	5	-	-
Warrenpoint	233	61	1,544	-	-	-
	3,007	2,423	27,863	12,443	481	814

Table II: 2040 demand forecasts by cargo type (Highest Growth Scenario, i.e. minimal impact)

The assessment considered three potential capacity stages:

- **Current capacity**
  Defined as the port infrastructural configuration at the time of the assessment including projects that were under construction.
- **Imminent capacity**
  Includes expansion projects or developments that have received planning permission, have secured financing and are in the process of being designed and constructed.
- **Potential capacity**
  Includes potential expansion projects or developments planned in the longer term that are not yet formalised.

A high-level estimate was made for the expected timescale of each port's planned capacity expansion in order to assess if it can be delivered in time to meet forecast demand.

Demand versus capacity analysis

The results of the demand forecast were plotted against the capacity estimation for each port and each cargo category.

For illustrative purposes, Figure IV presents demand versus capacity for Dublin Port LoLo.

Executive summary

	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
Lo-Lo	M TEUs/y	0.77	1.02	1.02	1.35

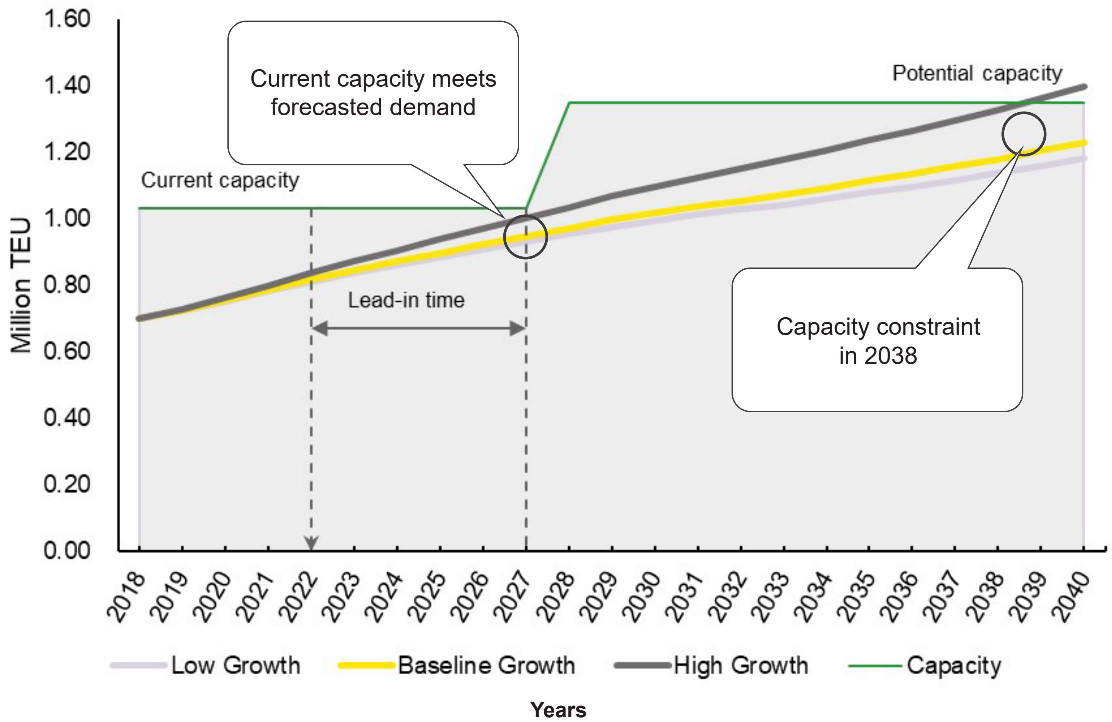

Figure IV: Dublin Port - LoLo – Demand vs Capacity

Figure IV shows the three different growth rate lines for LoLo demand. It also shows the current LoLo capacity in Dublin Port and the increase in capacity as a result of potential developments including the estimated lead-in time for these developments.

The assessment uses the highest growth scenario to show the earliest point at which capacity could be constrained.

The demand versus capacity analysis for each of the ports shows that the Irish ports generally have sufficient capacity to accommodate current and forecasted demand until 2040. The only exception is the LoLo capacity in Dublin Port which is estimated to run out of capacity around 2038 in the High Growth Scenario.

The lead-in time analysis shows that sufficient new capacity developments are planned and are mostly programmed to commence on time, although financing and planning consent difficulties may still cause delays.

Combined Irish ports capacity analysis

The Irish ports as a network

In order to provide an insight into the capacity of the combined Irish Ports to respond to the current and forecasted demand, the information from the capacity estimation for the individual ports was collated for each cargo mode.

Graphs were prepared showing the combined Irish ports system capacity development (for each cargo mode) versus the whole of the Island of Ireland demand and show that the combined Irish ports have, in theory, sufficient capacity to handle demand until approximately 2040.

Combined RoRo capacity

Most of the RoRo operations on the Island of Ireland are concentrated in Dublin, Rosslare, Belfast and Larne with smaller throughputs in Cork and Warrenpoint.

Figure V shows the combined RoRo freight capacity on the Island of Ireland.

Following the High Growth Scenario line in Figure V, it is shown that the available theoretical capacity in the network of Irish Ports can meet demand up until 2039. Nevertheless, the planned RoRo terminal extension in Dublin will allow for further growth around that time. During the second half of the 2030s, the network of Irish ports will be approaching capacity and so throughput may need to be spread to lower throughput terminals.

Dublin Port is by far the dominant RoRo freight port on the Island of Ireland and as ferry companies look to group their services together, the demand in Dublin is expected to increase over time. Looking at the current Irish ports masterplans available, this dominance in RoRo is only set to increase with Dublin Port heading to circa 2M units/year RoRo freight capacity.

The Port of Cork has potential to increase capacity through additional sailings and Rosslare Europort has potential to increase its yard utilisation. Improvements in hinterland connectivity in these ports will be required to accommodate any surplus demand from Dublin Port.

In addition to RoRo freight, the network of Irish Ports has sufficient capacity to handle the forecasted demand until 2040 for passenger cars. In terms of trade cars, increased demand expected for trade cars across the Island of Ireland may cause capacity constraint problems by the mid-2030s.

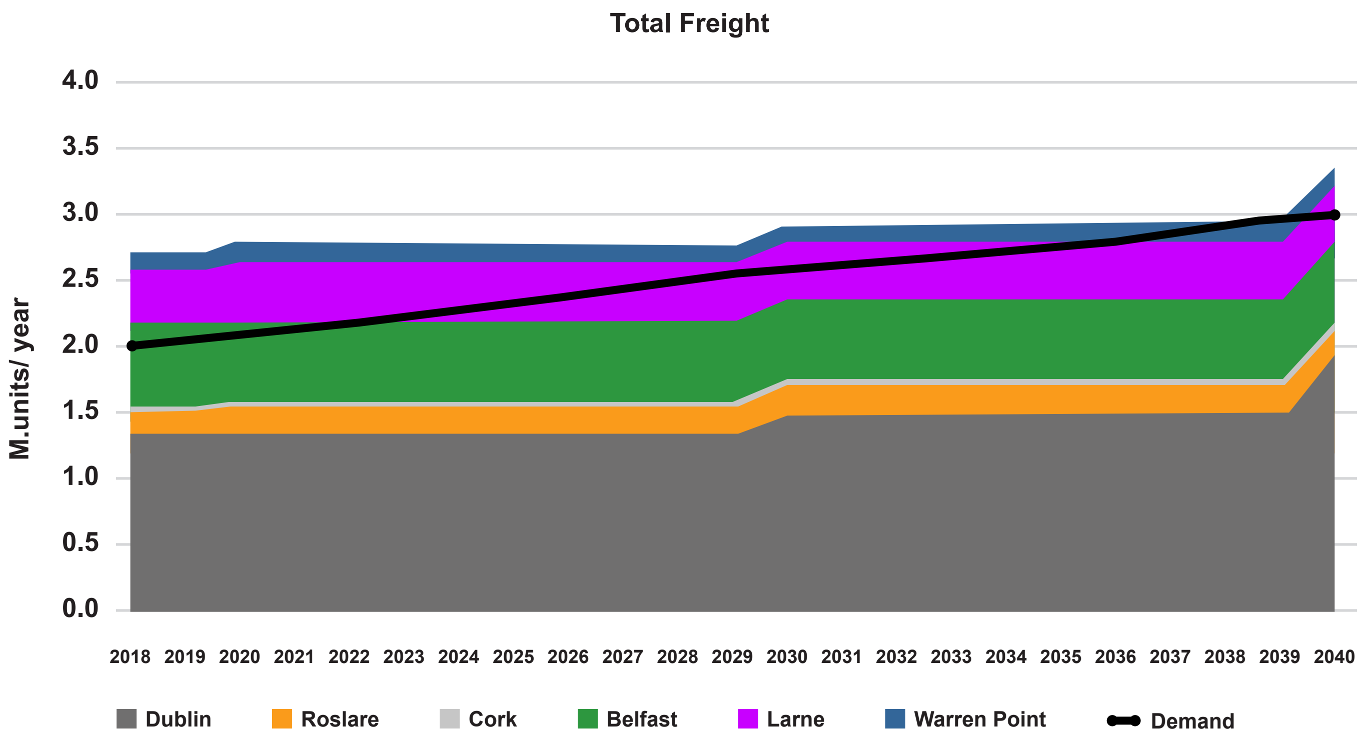

Figure V: Capacity and demand for total RoRo freight on the Island of Ireland until 2040

Executive summary

Combined LoLo capacity

Most of the current capacity on the Island of Ireland for handling LoLo is situated in Dublin, Cork, Waterford and Belfast.

Dublin Port has by far the greatest LoLo throughput and, considering its current market share, this is unlikely to change. Dublin Port will need to increase its capacity around 2027 and is planning for this. The throughput in Dublin Port is three times the throughput of Port of Cork, which is the second largest LoLo port.

A significant increase in LoLo capacity is planned for the next 5-7 years in Port of Cork. This increase is planned in the new Ringaskiddy container terminal, which is expected to require an expansion by 2030.

Overall, the network of Irish Ports has just enough capacity planned to meet demand for LoLo until 2040. Some additional short-term precautions may be required in 2039 as the forecasted demand is very close to the estimated capacity.

Combined Dry & Break Bulk capacity

The capacity for handling Dry & Break Bulk is more evenly spread between all the ports on the Island of Ireland. Belfast Harbour has the largest throughput of Dry & Break Bulk at nearly 8 million tonnes per year. This is more than double the capacity of any of the other ports in Ireland currently handling Dry & Break Bulk.

The ports with the largest capacity for handling Dry & Break Bulk in Ireland are Dublin Port and Shannon Foynes. There is also spare capacity at Port of Waterford which could be used to meet any significant increases in demand over that forecast period reflected in this report.

The capacity versus demand assessment shows that the network of Irish ports has enough capacity planned to meet demand for Dry & Break Bulk up until 2040.

Combined Liquid Bulk capacity

There is a lot of uncertainty in relation to the development of demand for Liquid Bulk in particular fossil fuels. Per-capita demand changes are expected with the drive from the EU to reduce carbon emissions, the Government's 2030 Internal Combustion Engine car-sales ban policy and the cost of renewable energy sources coming down. Any uncertainty with respect to demand suppression will be combined with a growth in volume driven by GDP, the economy and a growing population. At the time of the forecasts there is no definite understanding as to how fast such per-capita efficiencies could appear, their magnitude and how this will compound with overall anticipated GDP and population growth.

For the purpose of demand forecasting and capacity assessment, in this study we have assumed that liquid bulk demand will steadily increase up to 2040 in line with the economic forecasts included in this report. We note, though, that this increase will be offset, in part, by improved fuel efficiency.

Overall, the network of Irish Ports has enough capacity planned to meet demand for Liquid Bulk until 2024 when a reduction in capacity in Dublin Port may cause a capacity constraint until the Foynes Island development can be brought on-line. It is noted that the additional capacity that has recently become available in Port of Cork is not included in the combined capacity.

Risk assessment

A risk assessment was undertaken to identify the risks associated with current and planned port capacity. The following categories of risks were identified:

- **Exceedance of Growth Estimates:** There remains the risk that economic forecasts and the derivative capacity assessment undertaken in 2018 exceed forecast expectations. Growth in both overall port movements and individual port movements exceeding estimates creates the risk that capacity may be exceeded beyond the assessment undertaken. Although this is considered an apparent and clear risk, an iterative approach to the review and update of capacity assessments, and the continuous investment in Irish port capacity can alleviate this risk, within reasonable limits.

- **Operational and infrastructure deficits:** There is a risk that underinvestment, lack of maintenance or damage could occur to critical port infrastructure which could result in a sudden capacity deficit for the ports.
- **Deficits in connectivity to hinterland:** Congestion or complete blockage of intermodal connectivity can also lead to capacity deficits (motorways, waterways, rail lines and the Dublin Port tunnel, in particular).
- **Funding:** Funding is cited by all ports as the biggest impediment to capacity increases.
- **Planning and programming:** There is a risk that some developments will take longer than expected to obtain planning consent. Some may not be granted planning permission at all.
- **Climate Related Regulations and Impacts:** As governments move to implement regulations and supporting mechanisms for the mitigation of climate impacts, the shipping and ports industry will need to undergo significant changes. This will manifest as direct industry impacts, and changes to product demands.

Conclusions and recommendations

Overall, the analysis undertaken as part of this study shows that:

- There is a strong link between economic variables, in particular GDP (and, by proxy, private consumption) and trade volumes. The economy appears to be acting as a magnet for goods and the ports ensure that this demand is met.
- The Irish ports included in this study currently have sufficient capacity for RoRo (with the exception of trade vehicles), LoLo, and Dry & Break Bulk, and are planning adequate capacity increases in time to manage future demand for these cargoes for the period up to 2040. Additional expansions for the trade vehicles and liquid bulk cargoes should be planned where necessary to avoid constraint by the late 2020s and 2030s respectively.

  Nevertheless, for both these cargoes the demand figures have high levels of uncertainty considering the ongoing transformation of these industries and represent conservative scenarios.
- The lead-in time analysis shows that sufficient new capacity developments are planned and can be delivered on time, although financing and planning consent difficulties may cause some delays and associated capacity constraints.
- Dublin Port will remain the dominant port in Ireland. The Dublin Port Masterplan 2040 sees a further increase in capacity for RoRo, LoLo and Dry & Break Bulk. A full feasibility assessment will be required closer to that time once more is known about certain drivers for the proposed development of a new port on the East coast of the Island.
- There are opportunities to make use of surplus RoRo capacity in Rosslare Europort and Port of Cork and LoLo and Dry & Break Bulk capacity in Waterford. However, these ports will require better hinterland connectivity and a range of investments in port facilities.

- The development of demand for Liquid Bulk is an area where there is a lot of uncertainty. Environmental considerations about the use of fossil fuels and decarbonisation targets in Ireland's Climate Action Plan could lead to a reduction in demand for Liquid Bulk, but there is uncertainty about when this reduction may take place and how it will manifest in port specific demand.

The main recommendations are:

- A standardised form of reporting by the Irish ports for capacity indicators in Tier 1 and Tier 2 ports is needed, in conjunction with the Northern Irish ports to ensure uniformity in reporting.
- The predicted capacity constraints only happen if growth continues and there needs to be regular monitoring of the situation across the Island of Ireland. The capacity assessment should be revisited at regular intervals to capture economic variances and future developments.
- The implementation of digital port operating systems and port clearance document control systems should be investigated for those ports not already using these. Ideally, all Irish ports should use compatible systems.
- There is a need to investigate the impact efficiency measures and pricing structures will have on the capacity in Dublin Port.
- There is a need to investigate the development of the Liquid Bulk demand and establish high and low growth scenarios.


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Chapter 1

Introduction

1 Introduction

1.1 Background

Ports play a key role in the Irish economy. In a small open economy with a strong export focus, ports are fundamental to sustaining economic and population growth. The National Development Plan 2018-2027[4] and Ireland's National Ports Policy (NPP) have acknowledged that Ireland depends on the quality and efficiency of port services to a much greater degree than many of its trading partners.

Ireland's future economic success is dependent on its ability to trade internationally. In 2019, ports in the Island of Ireland handled 76.4 million tonnes of merchandise goods, with import volumes equivalent to almost twice the level of exports. This reflects large import volumes of low value goods (such as animal feed) and smaller volumes of exports of high value goods (such as pharmaceuticals). Exports are a key contributor to economic growth and mostly comprise of unitised trade (i.e., RoRo and LoLo cargoes), while port imports are dominated by bulk cargoes. For the Irish economy and population to continue to grow, it is vital that ports have sufficient capacity to sustain economic growth and trade and to cater for and respond to future increases in demand.

Ireland's future investment priorities include significant investment in facilitating international access through the ports. Indeed, a core objective of the National Development Plan is to safeguard and enhance Ireland's international connectivity by supporting the ongoing and planned capital investment programmes by the commercial ports. This investment, which is not funded by the Exchequer, is considered fundamental to Ireland's competitiveness, its trading performance and its attractiveness as a host country for foreign direct investment.

Figure 1.1: Irish Ports included in this study (Source: Arup & Open Street Map)

[4] National Development Plan 2018-2027, Government of Ireland

The aim of the National Ports Policy is to 'facilitate a competitive and effective market for maritime transport services' and to ensure that the system has 'adequate and efficient capacity'.

It introduced several changes, in particular related to governance, and included an explicit commitment to undertaking regular independent assessments of port capacity starting in 2018. Similarly, the port capacity study is also referenced in the review of progress on the integrated marine plan for Ireland as an important element for facilitating future planning[5].

The National Ports Policy states that the Department of Transport (DoT) will instigate a more formalised approach toward capacity forecasting through commissioning independent analyses at regular intervals from 2018 onwards. In response to this, the Irish Maritime Development Office (IMDO), on behalf of DoT, has commissioned Arup/EY-DKM to assess the capacity within the Irish port system to meet present and future demand over the period up to 2040[6].

This study was first undertaken in 2018, based upon available data sources to 2017 and in the context of the time, with foresight but uncertainty around the upcoming impacts of Brexit. Although the longer-term impacts of Brexit are still unknown, the short-term impacts observed to date are broadly considered to fall within the bounds of scenarios within the forecasts undertaken by EY-DKM in 2018. As such it is considered that Brexit's shorter-term impacts are acceptably reflected within this estimate at this time. The impacts of the short-shocks of the Covid-19 pandemic could not have been foreseen and as such will be considered only in terms of minimum capacities in this port capacity study. These periods of time should not be used as a basis for long-term capital and capacity planning. It was proposed by the IMDO and accepted by Arup at time of publication that the capacity assessment incorporating 2019 data will better reflect the long-term perspective of port capacity than more volatile Covid-19 impacted 2020-21 data.

The ports included in this study are shown in **Figure 1.1**.

1.2 Data

This report - the 'Irish Ports Capacity Study'- sets out a methodology for and presents the first capacity forecast under the National Ports Policy 2013. The data used for the analysis presented was the most recent available during the preparation of this study in 2018 and was supplemented through engagement with the port companies. The key data sets used are the 2017 Eurostat Maritime Statistics and the responses from the individual ports, provided in June 2018.

Additional data for RoRo traffic for the period between 2018-2020 provided by IMDO for Dublin Port, Port of Cork, and Rosslare Europort was used in addition for the RoRo capacity assessments for these ports taking also into account the significant increase in RoRo traffic at Rosslare Europort in 2021.

[5] Harnessing Our Ocean Wealth – An Integrated Marine Plan for Ireland, Review of Progress 2017, Department of Agriculture, Food and the Marine, June 2018

[6] The Terms of Reference for this assignment are included in Appendix 1

The Port Masterplans referenced are based on their status in 2021 where available at that time.

This report has not investigated new demand for Irish Port capacity outside the current cargoes. This demand could come from offshore wind developments requiring marshalling/ assembly locations and Operations and Maintenance (O&M) facilities and other Offshore Renewable Energy (ORE) developments, see also relevant Policy Statement by DoT[7], or particular local projects as hydrogen, or other alternative fuels.

1.3 Key terminology

- The term *'Ireland'* is used when talking about the Republic of Ireland,
- The term *'Island of Ireland'* is used when talking about the island as a whole.

1.4 Overall Methodology

Structure

The structure of this report is schematically outlined in **Figure 1.2** and follows the overall methodology applied for this study, which is summarised as follows hereafter.

[7] Policy Statement on the facilitation of Offshore Renewable Energy by Commercial Ports in Ireland, Department of Transport, December 2021

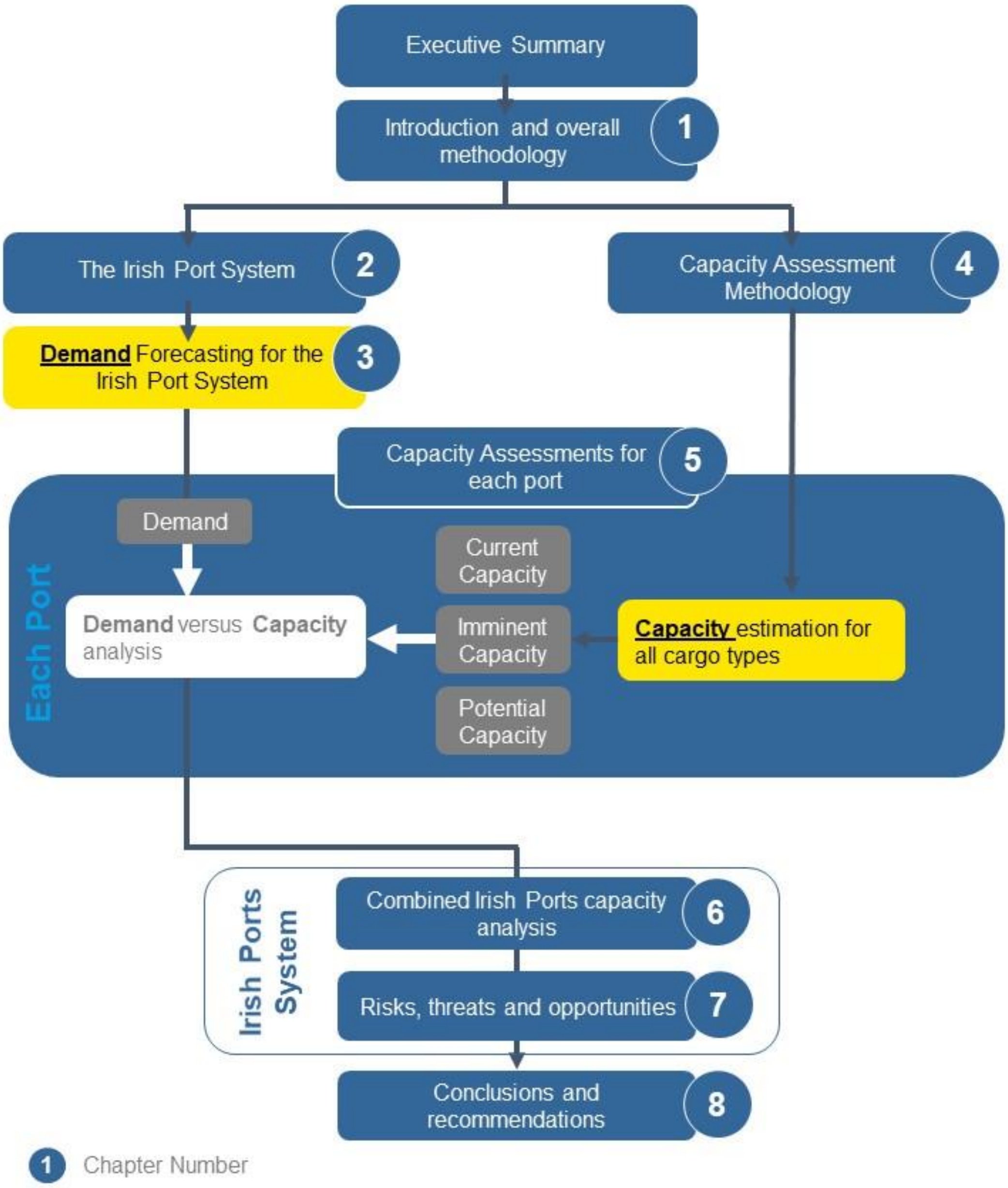


Figure 1.2: Report Structure

Chapter 2: The Irish ports system

The analysis commences in **Chapter 2,** with a review of Ireland's port network and an analysis of the composition of trade by port, type of cargo and region.

The National Ports Policy classifies Irish ports into 3 categories:

- Ports of national significance – Tier 1: Dublin, Cork and Shannon Foynes
- Ports of national significance – Tier 2: Waterford and Rosslare
- Ports of regional significance

This study covers all the Irish ports of national and regional significance, with the exception of the ports of New Ross and Dun Laoghaire, whose volumes do not exceed the threshold for inclusion in Eurostat reporting. The study has also taken account of the port of Greenore, which is privately owned, and the Northern Irish ports of Belfast, Larne and Warrenpoint.

Figure 1.3 illustrates the relative size of the ports covered in this report based on their throughput in 2019 obtained from Eurostat:

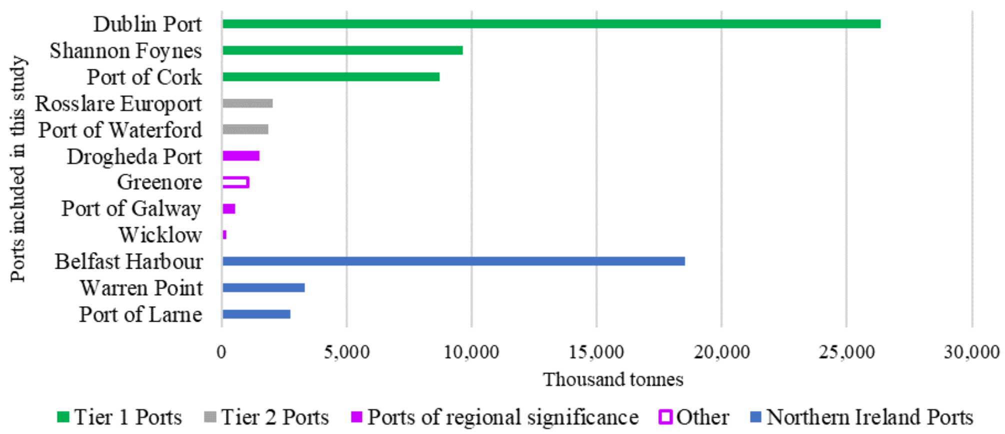


Figure 1.3: Irish Ports - 2019 throughput in thousand tonnes (Source: Eurostat)

Chapter 3: Demand forecasting

The assessment of demand follows in **Chapter 3**, with a range of scenarios used to produce demand forecasts for all cargo types by port. In order to predict forecasted demand until 2040, a model was constructed which assesses the likely throughput of trade goods over this period.

As the focus of the study is the capacity of the Irish ports to handle goods, the model constructed deals solely with the volume of goods. Eurostat data is used as the basis for the analysis, to ensure a consistent set of data for ports in Ireland and Northern Ireland.

The data used for forecasted Irish economic growth was obtained from Oxford Economic Forecasting (OEF). This source was used as it provides a single and consistent set of forecasts for all relevant economies and for the period until 2040.

Baseline, high and low growth cases were then examined, and traffic forecasts for all cargo types were generated.

The resulting demand for the Island of Ireland is then allocated to each port assuming the relative shares of the different ports will remain at the 2017 levels. **Section 3.2.1** explains why and how this was done.

Chapter 4: Methodology for capacity assessment

In **Chapter 4**, the methodology for the capacity assessment of Irish ports is described. This Chapter is divided into two sections:

Section 4.1 describes the overall approach to the capacity assessments. It outlines how the comparison between the forecasted demand for each of the ports and the capacity estimation is made for each of the following four cargo types:

- RoRo: Roll-on Roll-off traffic on RoRo vessels. This includes passenger cars, buses, trade vehicles, accompanied (freight trucks) and unaccompanied (drop-) trailers, cassettes and roll-trailers (MAFI)
- LoLo: Containers lifted on and off a vessel
- Dry & Break Bulk: Goods that are not in containers such as coal, animal feed, timber and steel. Eurostat use the terms 'Dry Bulk' for goods such as coal, agricultural products, etc., and 'Other' for products like steel, timber, iron, etc.
- Liquid Bulk: Liquid products that are stored in tanks such as aviation fuel, petroleum and crude oil

Subsequently, it shows how the development of port capacity is estimated over time, based on the port's proposed development plans, and how the additional capacity is quantified and compared to the forecasted demand.

Section 4.2 outlines the general methodology for the capacity estimation for each port, the various subsystems for which the capacity is estimated and what issues (berth occupancy, parcel sizes, seasonality etc.) are considered during the capacity estimation. This section also explains how the standard methodology will be adapted for the various types of cargos.

Chapter 5: Individual port capacity assessments

In **Chapter 5**, the capacity assessment for each of the individual ports is described. The port development plans are reviewed and an analysis of the current, imminent and potential capacity for each cargo type is provided.

Graphs with the development of demand and capacity into the future are introduced to assess whether the ports have sufficient spare capacity to accommodate the forecasted increase in demand up to 2040.

For each port two high level benchmarking KPI's are presented and compared to selected international ports.

Chapter 6: Combined Irish ports capacity analysis

The Irish port system can be defined as a network of ports that combine to provide port services. Using the information from the capacity estimations for each individual port, we provide in **Chapter 6** an insight into the combined capacity available for each cargo mode for the Island of Ireland. The ports in Northern Ireland are an important component of the maritime transport offering on the Island of Ireland and given the inter-dependency between Ireland and the Northern Ireland ports, the study also takes account of capacity in the Northern Irish ports.

Chapter 7: Key risks, threats, and opportunities

A profiling of the potential risks and threats to future capacity as well as potential opportunities is provided in **Chapter 7**.

This section also reflects on events following the study period, including Brexit and Covid-19 and will be used as a basis for considering options for moving forward.

Chapter 8: Conclusions and recommendations

The outcome of the analysis in **Chapter 5, 6** and **7** forms the basis for the conclusions of this study which are contained in **Chapter 8** Conclusions and Recommendations. These focus on strategic development requirements and what actions need to be taken to ensure that the ports can continue to play their key role in the economic wellbeing of Ireland and do not act as an impediment to future economic growth.

1.5 Uncertainty

The forecasts that are provided in this report, undertaken by EY-DKM in 2018, are robust and provide reliable estimates for the purpose of this study. As with any forecasting and future modelling exercise, assumptions and estimates were used where empirical data was unavailable and have been extrapolated to create the demand and capacity forecasts. Furthermore, due to the long run nature of capital investment planning at ports, forecasts have been provided up to 2040 which is considered a long period regarding economic forecasts.

1.6 Summary

This study provides the first independent assessment of demand and capacity as required under the NPP and is undertaken by Arup, EY-DKM and STS International.

The key objective of the study is to assess the capacity within the Irish port system to meet present and future demand. In doing so an appropriate investment plan for the long-term can be developed by the ports.

This will ensure that ports can respond flexibly to future increases in demand, and there will be enough margin between capacity and demand for new port infrastructure to ensure ports can respond appropriately.

Chapter 2

The Irish Ports System

2 The Irish Ports System

2.1 Introduction

In order to understand whether the Irish ports system has the capacity to manage the future trade volumes required to sustain long term economic and population growth, it is necessary to produce a forecast of the throughput that ports will handle over that period. This requires an understanding of the current traffic handled by the network of ports in the Irish port system.

2.2 Approach

This Chapter examines port traffic volumes handled by the network of Ireland and Northern Ireland ports. It reviews the traffic handled by each port and the composition of that traffic by mode. An understanding of the throughput handled within the Island of Ireland Ports System is important as ports are responsible for 99.7% of the total merchandise freight handled in Ireland[8] in 2019. This Chapter will also provide a picture of how Irish ports, including ports in Northern Ireland, differ in terms of their size, their current capability and future potential.

The data used to measure the throughput at ports is primarily sourced from Eurostat as opposed to using separate sources for Irish ports (CSO) and Northern Ireland ports (ONS). Although Eurostat data is not as detailed as the CSO, since data must be changed to make it comparable at an EU level, Eurostat is the only dataset where it is possible to compare Ireland and Northern Ireland on a consistent basis. There are thresholds below which the CSO are not obliged to give data to Eurostat in relation to the ports, but it was not possible to ascertain clarity in relation to these thresholds.

Having established the baseline for port traffic in the Irish port system, this Chapter also provides an analysis of Ireland's merchandise trade by trading partner, focusing predominantly on trade volumes rather than trade values. The approach here is to use CSO trade data, which classifies trade by commodity codes set down by the EU, which each business trading outside the EU provides when lodging a customs declaration in a Member State. For Member States trading within the EU, all businesses are legally required to provide information on their total sales and purchases (values and volumes) to and from other EU countries. The trade data classifies the nature of goods traded between countries by type of commodity. However, the nature of goods handled by port is not similarly identified by product type.

The trade classification is also important if we are to understand the composition of trade handled by Irish ports since approximately 90% of goods traded in the Island of Ireland are handled by the shipping sector (as opposed to the airline sector).

[8] Source: CSO Port Traffic and Aviation Statistics for 2019

Using CSO trade data Ireland's trading relationship with the UK, the EU-26 (excluding Ireland) and the Rest of the World (RoW) is examined from the composition of trade between them. This provides the context for the assessment of port capacity in the Irish ports system, as the composition of the traffic handled by ports is not identified by product type.

2.3 Ports in Ireland and Northern Ireland

2.3.1 Current traffic

Ireland is a small, open economy and is very dependent on international trade and the global environment to sustain both economic and population growth. From a trading perspective, Ireland remains highly dependent on maritime transport; therefore, the continuing success of the economies in both jurisdictions relies on the ports having the capacity to handle both imports and exports.

The total volume of goods handled by Irish ports reached 51.8 million tonnes in 2019, a reduction of 3.7% in the corresponding throughput in 2018, according to Eurostat.

When the 24.6 million tonnes handled by the Northern Ireland ports of Belfast, Larne and Warrenpoint are included, the total goods handled by ports in Ireland and Northern Ireland was 76.4 million tonnes in 2019.

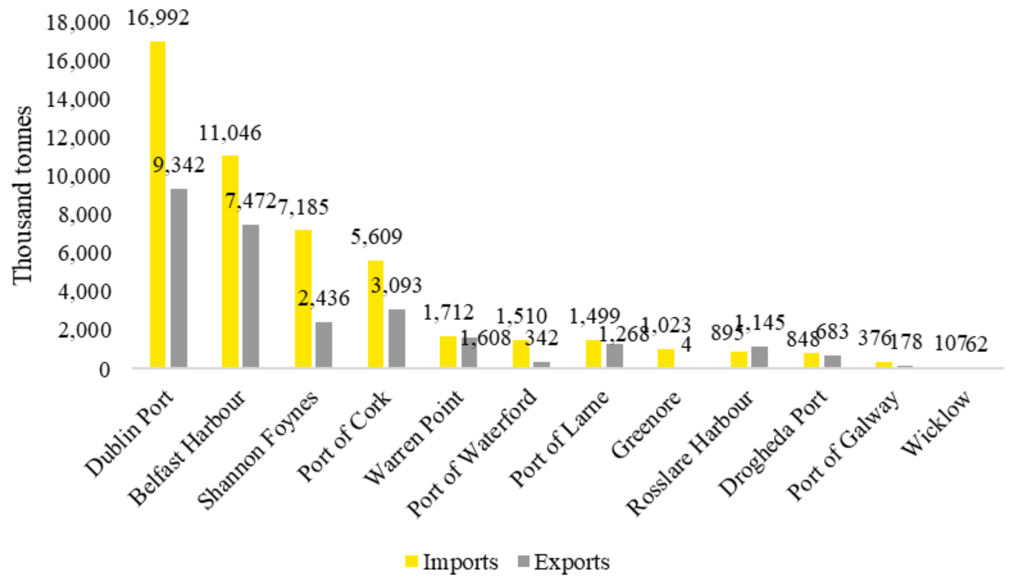


Figure 2.1: Total Exports and Imports by Port, 2019 (Source: Eurostat)

The ports differ greatly in terms of their size, their current capability and future potential.

As illustrated in **Figure 2.1**, the larger ports are Dublin, Belfast, Shannon Foynes and Cork who between them handle 83% of all traffic through ports in the Island of Ireland in 2019.

Considering the three port categories set out in the NPP statement, according to their overall tonnage and potential:

- The ports of National Significance, known as Tier 1 Ports, are Dublin Port Company, the Port of Cork and Shannon Foynes Port Company (SFPC). They were responsible for almost 86% in total of the overall tonnage throughput in Ireland in 2019.
- The other ports of National Significance, known as Tier 2 Ports, are the Port of Waterford and Rosslare Europort. These two ports between them were responsible for 8% of the overall tonnage throughput in 2019.
- The ports of Regional Significance are represented by the remaining State-owned commercial ports. These ports accounted for another 4% of total tonnage throughput in 2019, not accounting for tonnage handled in Dún Laoghaire and New Ross whose volumes do not exceed the threshold for inclusion in Eurostat reporting.
- The remaining balance of 2% of total tonnage throughput in 2019 was reported for Greenore Port which is a private facility.

The definitions used in Eurostat (see **Appendix 2**), in terms of what volumes are captured, require further consideration as follows[9]:

- The Eurostat data for SFPC includes volumes handled at Aughinish, Tarbert and Moneypoint. As these facilities are not available for public use, they are not included in the scope of this study, and the tonnage handled at these terminals is not included in the analysis which is undertaken in the following chapters. Eurostat does not provide a breakdown of the traffic handled at these facilities.

  Based on estimates obtained from other sources and verified with the Irish ports, 19% of the total Dry and Break Bulk throughput assigned to SFPC is assumed to represent the traffic handled at the public facilities in Foynes Port and Limerick Docks, and in the case of Liquid Bulk cargo, 69% is assumed to be handled at the public facilities.
- The Eurostat data for Cork include volumes handled at Bantry Bay and Whitegate. As above, these are private terminals and are therefore excluded from the analysis which is undertaken in the following chapters. In the analysis, 70% of the total Eurostat volumes for Dry and Break Bulk and 25% of the total Liquid Bulk cargo are attributed to the port's non-private terminals in City Quays, Tivoli, Ringaskiddy and Marino Point.
- In Northern Ireland, Eurostat include the ports of Belfast, Larne and Warrenpoint, which account for around one-third of the total port traffic on the Island of Ireland, with Irish ports handling just over two-thirds, as shown in **Figure 2.2**.

[9] The respective percentages as to what is assumed to reflect the volumes handled at facilities available for public use in the ports of Cork and Limerick, and thus by how much the Eurostat figures are reduced by in the analysis, are also set out in Appendix 2.

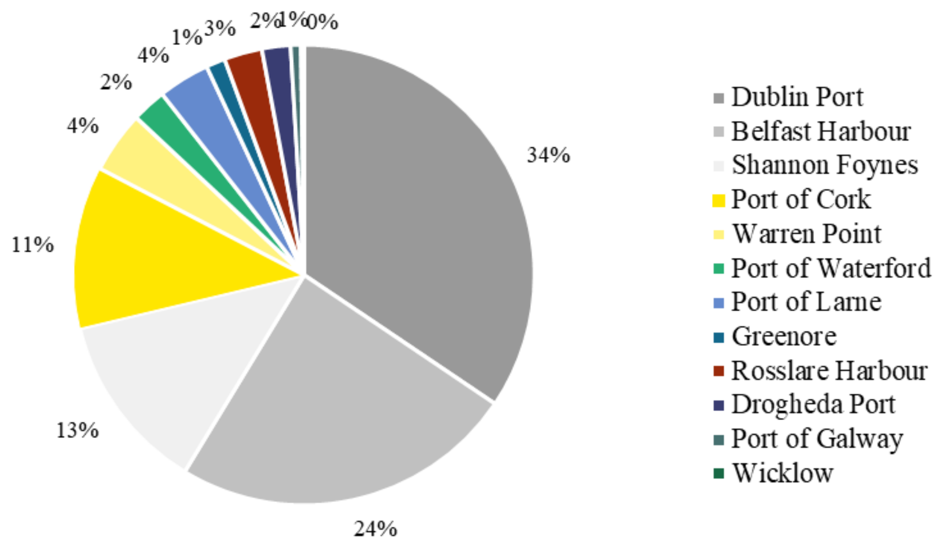


Figure 2.2: Total Throughput at Ports in Ireland and Northern Ireland, 2019 (port tonnage shares including private facilities at SFPC and Port of Cork) (Source: Eurostat)

2.3.2 Port traffic by cargo mode

The approach taken to understanding (and forecasting) demand categorises the throughput at each port by the following cargo modes (as does the capacity assessment):

- RoRo[10]: Roll-on Roll-off traffic on RoRo vessels. This includes cars passenger cars, buses, trade vehicles, accompanied (freight trucks) and unaccompanied (drop-) trailers, cassettes and roll-trailers (MAFI)
- LoLo: Containers lifted on and lifted off a vessel
- Dry and Break Bulk: Goods that are not in containers such as coal, animal feed, timber and steel. Eurostat use the terms ‘Dry Bulk’ for goods such as coal, agricultural products, etc., and ‘Other’ for products like steel, timber, iron, etc.
- Liquid Bulk: Liquid products that are stored in tanks such as aviation fuel, petroleum, kerosene and crude oil

Based on an analysis of imports, the dominant RoRo ports are Dublin, Belfast, Larne and Rosslare. Dublin, Cork and Belfast are the main LoLo ports. Liquid Bulk cargo and/or Dry and Break Bulk cargoes are mostly received at SFPC, Belfast, Cork, Dublin and Waterford. This is illustrated in **Figure 2.3** (private facilities at SFPC and Port of Cork also included).

[10] The capacity assessment uses RoRo which includes both RoRo freight and RoRo passenger and trade vehicles. See explanation in Chapter 4.2.5.

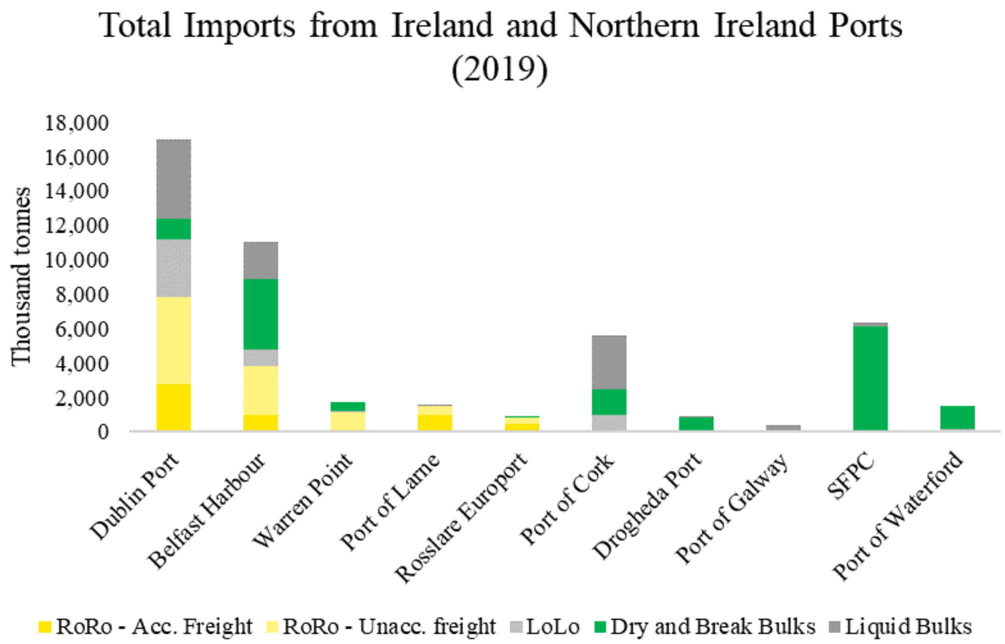


Figure 2.3: Total Imports at Ireland and Northern Ireland Ports by Cargo Type, 2019 (Source: Eurostat)

A corresponding analysis of exports from Ireland and Northern Ireland ports, shows that Dublin, Belfast, Larne and Rosslare are the dominant RoRo ports. RoRo accounts for almost two-thirds and almost 50% of exports from Dublin Port and Belfast Harbour respectively. Most of the Dry and Break Bulk cargo moves through Belfast and SFPC.

This cargo includes agricultural and construction products, as well as renewable and recycled cargoes in the case of Shannon Foynes. Significant Liquid Bulk cargo in Cork reflects oil traffic at Whitegate and the Whiddy Bantry Zenith Oil Storage Facility. This is illustrated in **Figure 2.4** (private facilities at SFPC and Port of Cork also included).

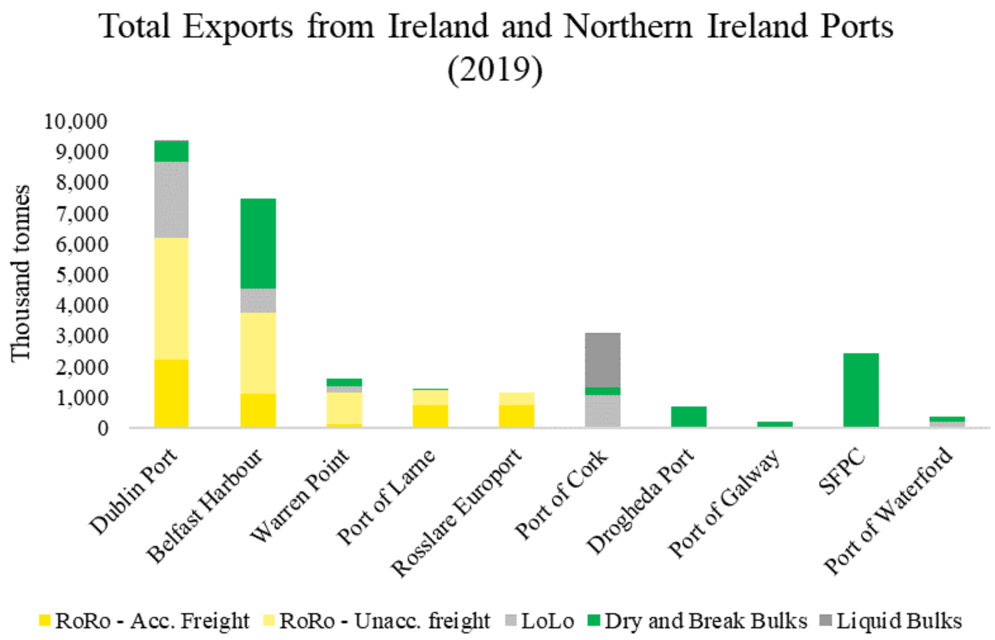


Figure 2.4: Total Exports from Ireland and Northern Ireland Ports by Cargo Type, 2019 (Source: Eurostat)

The three Northern Ireland ports handle around 45% of RoRo exports and almost 21% of LoLo exports on the Island of Ireland. Their imports are slightly less, with around 42% of RoRo and 19% of LoLo.

It is challenging to assess trade moving across the Northern Ireland border. Trucks can carry different cargoes, make several trips in a day or goods can be transported into warehouses and be re-aggregated for return across the border. Imports which are destined for Ireland, such as animal feed, often come in via Northern Ireland ports, whilst goods such as retail often come in via Ireland to be taken to Northern Ireland. The trade data that is available for goods moving between Ireland and Northern Ireland is set out in **Section 2.4** and **Section 2.7**. Reference is also made to the Landbridge study[11] undertaken by the IMDO in 2018 which quantifies the volume of Irish import and export traffic that uses the Landbridge.

Dry and Break Bulk cargo is generally imported and tends to be either Agri or construction products, such as cement and steel. Liquid Bulk is mainly fuel imports, both crude and refined products. Natural gas which is imported via pipelines from the UK is not captured in port traffic as it is not transported on ships. It is however captured in the classification of traded products, details on which follow below.

2.3.3 RoRo traffic

The previous section set out the weight of RoRo cargo (exports and imports) at each port in thousand tonnes, based on Eurostat data.

[11] The Implications of Brexit on the Use of the Landbridge, 2018, IMDO

The CSO provide breakdowns of RoRo traffic handled by ports split between the numbers of RoRo freight units (both laden and empty), general vehicles and new trade vehicles, as shown in **Table 2.1**. This breakdown is provided by the CSO for Irish ports only. The corresponding data for Northern Ireland ports in **Table 2.1** is obtained from the Northern Ireland Statistics and Research Agency (NISRA).

The three categories represent the following:

- General vehicles, which refer to passenger cars, passenger buses, motorcycles and accompanying trailers/caravans. Dublin Port and Rosslare Europort accounted for the vast majority (95%) of the 796,723 vehicles handled by Irish ports, while ports in Northern Ireland, notably Belfast and Larne, handled a further 468,165 vehicles in this group in 2019.
- The number of trade vehicles or new vehicles handled by ports on the Island of Ireland totalled 193,660 in 2019. The vast majority (98%) of trade vehicles handled at ports in Ireland are imports, which totalled 146,934 in 2019, with over two-thirds arriving in Dublin Port.

  This figure is close to the number of new vehicle registrations in 2019, which according to the Society of Irish Motor Industry (SIMI), amounted to 117,100 new car registrations and 25,350 new commercial vehicle registrations, generating a total of 145,104 new vehicle registrations in 2019[12].
- Loaded and empty RoRo freight vehicles and trailers handled by ports on the Island of Ireland totalled 2.2M units in 2019. Of the total, 11.8% were empty. The corresponding proportion was 10.5% for Irish ports and 14% for ports in Northern Ireland.

2.3.4 Cruise traffic

The cruise sector in Ireland has grown over recent years with an increasing number of ports accommodating cruise ships. Ireland and Northern Ireland attracted 462 cruise ships carrying over 710,000 passengers in 2019. The dominant ports in the cruise sector are Dublin and Cork in Ireland and Belfast in Northern Ireland. The ports of Waterford and Dún Laoghaire have attracted small numbers of cruise ships in recent years. This is illustrated in **Table 2.2**.

The marketing of Ireland and Northern Ireland as a cruise destination is promoted by Cruise Ireland, a marketing co-operative whose members include ports, ground handling agents, ship agents and visitor attractions. The individual ports also undertake their own marketing, usually in conjunction with the tourism authorities and service providers in their area.

This overall marketing effort across Ireland has resulted in the number of cruise calls to Ireland increasing from 190 to 313 between 2015 and 2019 or by 8% per annum on average.

Figures for Northern Ireland ports show that Belfast is a significant location for cruise tourism.

[12] National Vehicle Statistics, 2019, SIMI

Reducing the number of cruise calls in Dublin Port, due to the need for increased container capacity post-Brexit, may impact on the wider cruise ship market in Ireland.

Notwithstanding developments at Dublin Port, the Port of Cork has targeted cruise tourism as a growth opportunity. Cobh is Ireland's only port with dedicated cruise facilities and had 100 cruise calls in 2019.

Covid-19 had a devastating impact on the cruise industry, with impacts felt globally. The short-term impact of the pandemic appears to be subsiding however as post-2021 volumes return to near pre-Covid levels.

In the long-term there remains a lack of clarity as to whether demand will return to pre-covid levels, and as such a long-term investment plan should consider the opportunities for the cruise industry with this perspective in place.

Table 2.1: RoRo Traffic Handled by Ireland and Northern Ireland Ports, 2019

	Dublin Port	Port of Cork	Rosslare Europort	Irish Ports	Belfast Harbour	Port of Larne	Warren Point	Northern Ireland Ports	Total Ireland and Northern Ireland Ports
Roro Freight Vehicles/Trailers Loaded (Number)									
Imports	541,741	3,267	57,006	**602,014**	246,584	95,684	53,067	**395,335**	**997,349**
Exports	517,311	3,237	65,969	**586,517**	222,236	82,280	46,451	**350,967**	**937,484**
Total	**1,059,052**	**6,504**	**122,975**	**1,188,531**	**468,820**	**177,964**	**99,518**	**746,302**	**1,934,833**
Empty Freight Vehicles/Trailers (Number)									
Imports	24,774	285	1,570	**26,629**	35,754	3,982	739	**40,475**	**67,104**
Exports	111,590	314	867	**112,771**	65,556	10,288	5,077	**80,921**	**193,692**
Total	**136,364**	**599**	**2,437**	**139,400**	**101,310**	**14,270**	**5,816**	**121,396**	**260,796**
General Vehicles (Number) (Passenger Cars, Motorcycles and Accompanying Trailers/Caravans, Passenger Buses)									
Imports	289,651	19,353	100,939	**409,943**	179,909	64,765	40	**244,714**	**654,657**
Exports	269,830	20,182	96,768	**386,780**	163,211	60,193	47	**223,451**	**610,231**
Total	**559,481**	**39,535**	**197,707**	**796,723**	**343,120**	**124,958**	**87**	**468,165**	**1,264,888**
Trade Vehicles (Number)									
Imports	105,872	26,807	14,255	**146,934**	33,000	0	9,000	**42,000**	**188,934**
Exports	1,392	911	423	**2,726**	1,000	0	1,000	**2,000**	**4,726**
Total	**107,264**	**27,718**	**14,678**	**149,660**	**34,000**	**0**	**10,000**	**44,000**	**193,660**

Source: CSO, NISRA and UK Department for Transport Statistics.

Table 2.2: Cruise Calls and Passengers at Ireland and Northern Ireland Ports, 2019

Ports	Cruise Ship Calls (No)	Passengers (No)
Dublin	158	229,032
Cork	100	169,042
Killybegs	17	11,097
Waterford	11	5,429
Galway	11	8,208
Bantry Bay	10	5,420
Dún Laoghaire	6	3,335
Total Irish Ports	**313**	**431,563**
Belfast	149	279,865
Warrenpoint	0 (assumed)	0
Total Northern Ireland Ports	**149**	**279,865**
Total Ireland and Northern Ireland Ports	**462**	**711,428**

Source: IMDO Maritime Economist, CSO TBA10, NISRA.

2.4 Port Traffic by Region and Composition

There is data available on the regional breakdown and composition of port exports and imports at Irish ports (**Table 2.3**). The volume of RoRo goods imported from the UK accounted for 83% of total RoRo imports and 87% of total RoRo goods exports in 2019. RoRo also accounted for 58.3% of all goods imported from the UK and 73.8% of all goods exported to the UK (regardless of cargo type).

Table 2.3: Port Traffic handled by Irish Ports by Region, 2019

2019	UK		EU (exc. UK)		Rest of World		Coastal trade		Total
Imports	000's Tonnes	% by Type	000's Tonnes	% by Type	000's Tonnes	% by Type	000's Tonnes	% by Type	000's Tonnes
RoRo	7,330	83%	1,461	17%	5	0%	-	0%	**8,796**
LoLo	326	8%	3,835	89%	88	2%	67	2%	**4,316**
Liquid Bulk	4,086	43%	1,575	16%	3,197	33%	721	8%	**9,579**
Dry Bulk & Other	824	6%	5,925	47%	5,653	45%	301	2%	**12,703**
Total	**12,566**	**36%**	**12,796**	**36%**	**8,943**	**25%**	**1,089**	**3%**	**35,394**
Exports									
RoRo	6,448	87%	938	13%	1	0%	-	0%	**7,387**
LoLo	386	10%	3,117	84%	44	1%	145	4%	**3,692**
Liquid Bulk	416	19%	329	15%	600	28%	813	38%	**2,158**
Dry Bulk & Other	1,481	32%	2,318	50%	516	11%	295	6%	**4,610**
Total	**8,731**	**49%**	**6,702**	**38%**	**1,161**	**7%**	**1,253**	**7%**	**17,847**

Source: CSO TBA03. Note: *Coastal Trade refers to trade between Irish ports excluding Northern Ireland.

Thus, 41.4% of Ireland's goods that are exported use RoRo and of that total, 87% go to the UK. For imported goods, RoRo accounted for 24.9% of the total, with 83% coming from the UK.

Hence, the UK (Great Britain and Northern Ireland) is a significant market for Ireland. An estimated 21.3 million tonnes of goods handled by Irish ports are imports from and exports to UK ports (40% of total), including 12.5 million tonnes of imports and 8.7 million tonnes of exports. Of this total, RoRo accounts for 13.7 million tonnes, including almost equal volumes of imports (7.3 million tonnes) and exports (6.4 million tonnes). Some of this trade will include traffic using the landbridge to get to mainland Europe. The IMDO Landbridge study (2018) estimated the volume of goods transported using the landbridge at 3.05 million tonnes (20% of total RoRo), comprising 1.03 million tonnes of imports and 2.02 million tonnes of exports.

Table 2.4 sets out the number of RoRo units which moved between Ireland and the UK in 2019. Using a conversion factor of 14 tonnes per RoRo unit, the total volume of RoRo units moving to/from the UK from Irish ports was 985,000 in 2019. Of this total, almost 90% is handled at Dublin and the balance of 10% is handled at Rosslare. The total corresponded to 85% of all RoRo units handled by Irish ports in 2019.

Table 2.4: Irish RoRo Traffic to/from UK and Europe, 2019

	Tonnes (000s)	**RoRo Units (000s)**
RoRo exports to UK	6,448	461
RoRo imports from UK	7,330	524
RoRo traffic with UK	13,778	985
RoRo exports to Europe, excl. UK	938	67
RoRo imports from Europe, excl. UK	1,461	105
RoRo traffic with Europe, excl. UK	2,399	172
Total RoRo exports, incl. RoW	7,386	528
Total RoRo imports, incl. RoW	8,796	628
Total RoRo traffic, incl. RoW	16,183	1,156

Source: CSO TBA03

The total number of RoRo units moving via ports in Northern Ireland was approximately 867,000 in 2019. From consultations it was established that Northern Irish companies also use the landbridge through Dublin (in both directions) but the figure is not available.

The chart below illustrates the dominance of RoRo trade between Irish ports and ports in the UK, in addition to liquid bulk imports, while LoLo trade volumes are more prevalent with respect to Ireland's trade with ports in the rest of the EU.

Ireland's trade with the RoW consists predominantly of Dry Bulk and other cargo (61.1% of total) and Liquid Bulk (37.6% of total).

The Coastal Trade amounts to 2.35 million tonnes in total trade between Irish ports excluding Northern Ireland, comprising mostly of Liquid Bulk, Dry Bulk and other cargos.

In order to get a deeper understanding of Ireland's trade, **Section 2.5** examines its composition together with Ireland's main trading partners. It concludes with an analysis of Ireland's trade with the UK.

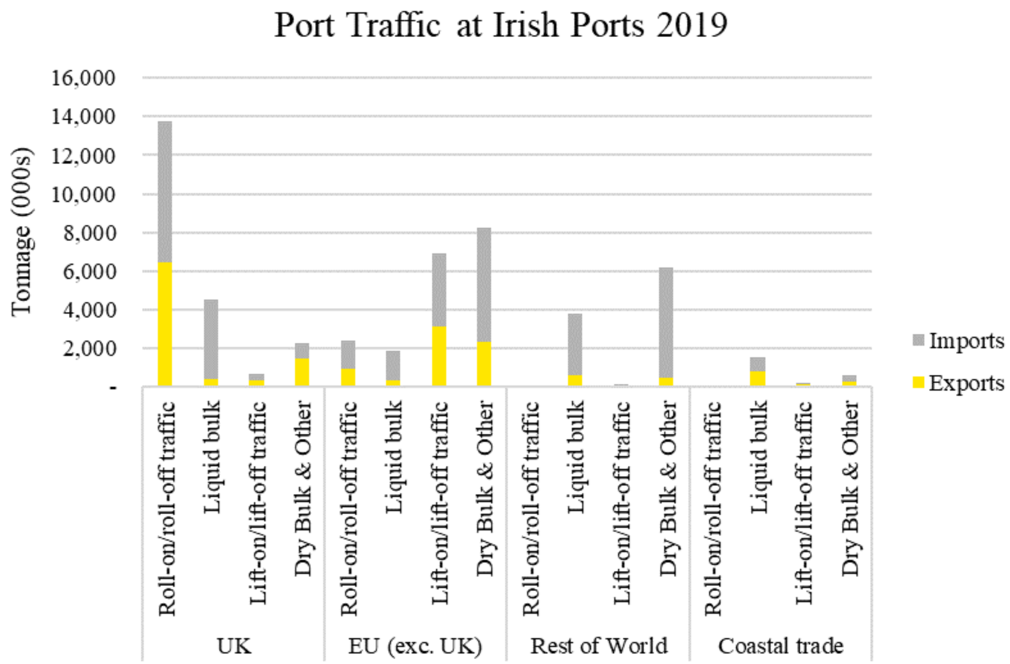


Figure 2.5: Port Traffic handled by Irish Ports by Region, 2019 (Source: CSO TBA03)

2.5 An Analysis of Ireland's Merchandise Trade

The term merchandise trade is used for all goods transported (i.e., exports and imports) to and from the country.

Since joining the EU in 1973, Ireland has substantially increased its trade and diversified into new markets, while also attracting significant FDI from companies keen to establish a presence in Europe. The country's success is evident using a standard measure of trade intensity, whereby Ireland's openness has increased markedly since it entered the EU, rising from 76% to 209% in 2017[13.] The close relationship with the EU, including the UK, has served the Irish economy well over that time.

Ireland's international trade comprises of trade in both goods and services. The total value of goods and services exported from Ireland was €440.3bn in 2019 while the corresponding value of goods and services imported was €390.3bn. This implies that Ireland had an overall trade surplus of €50bn in 2019, compared with €107.4bn in 2018[14].

[13] Using a standard measure of trade intensity, defined as the total volume of goods and services trade relative to GDP.
[14] Based on CSO National Accounts for 2019.

The value of goods exported from Ireland was €227.1bn in 2019. The corresponding value of goods imported was €104.3bn[15]. Thus, Ireland had a merchandise trade surplus of €122.7bn in 2019.

This analysis concentrates on the volume of merchandise goods only. In tonnage terms, the total of goods imported (41.4 million tonnes) was 2.26 times the corresponding tonnage of goods exported (18.3 million tonnes), implying that Ireland had a trade deficit in volume terms in 2019.

This suggests that the average value of goods exported is substantially higher, at almost three and a half times the average value of goods imported.[16] Using CSO data on merchandise trade volumes, it is also evident that the UK is an important trading partner for Ireland (**Table 2.5**).

Table 2.5: Total Irish Goods Exports and Imports, 2019 (000s tonnes)

	Exports		**Imports**	
		% share		**% share**
UK	9,881	53.91%	17,040	41.14%
of which				
Great Britain	6,353	34.66%	13,154	31.76%
Northern Ireland	3,527	19.25%	3,887	9.38%
Rest of EU (EU 26)	4,706	25.68%	9,120	22.02%
USA	620	3.38%	3,709	8.95%
Rest of the World	3,122	17.03%	11,550	27.89%
Total	**18,328**	**100%**	**41,420**	**100%**

Source: IMDO

In tonnage terms, the UK accounted for over half (53.91%) of Irish goods exported in 2019. The volumes of exports to and imports from Northern Ireland are similar, although Northern Ireland is an important destination for Ireland, as it accounts for 19.25% of exports.

[15] Based on data received from the External Trade section of the CSO.

[16] This tonnage data differs from the data reported in the Maritime Statistics from the CSO. This is because the sources of the data are different, with one set of data collected from the ports and the other from the External Trade section of the CSO.

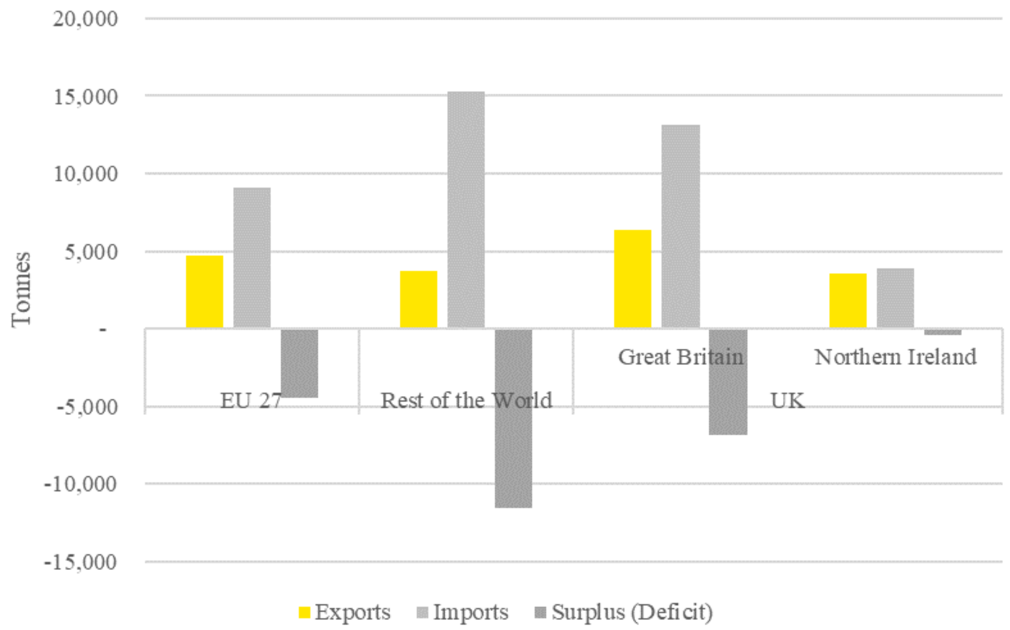


Figure 2.6: Ireland Total Merchandise Exports and Imports by Region, 2019 (Source: IMDO)

The EU-26 (i.e., excluding Ireland), as a trade bloc, is an important destination for Irish merchandise goods. As can be seen in **Figure 2.6**, import volumes from the region are significantly higher than exports.

2.6 Ireland's trading partners

The importance of Great Britain for Ireland is also evident from an analysis of Ireland's top trading partners by country. Great Britain is ranked top of the list in terms of value of imports, and fourth in terms of value of exports. The USA receives the highest value of Ireland's exports, about 45% of which is medicinal and pharmaceutical products, and accounts for 20% of the total value of Ireland's imports.

Thus, the UK accounts for 23% of the value of Ireland's imports and receives 10% of the value of Ireland's exports. Northern Ireland accounts for a further 3% of the value of Ireland's exports and receives 2% of the value of Ireland's exports. It should be noted that it is not always possible to ascertain the final destination of goods as they may be transhipped or purchased by wholesalers for redistribution into other countries.

In terms of exports, the EU-26 bloc is represented in the top 15 by Germany, France, Belgium, the Netherlands, Italy and Spain, although tonnage traded to the latter two countries was below 1,000,000 in 2019.

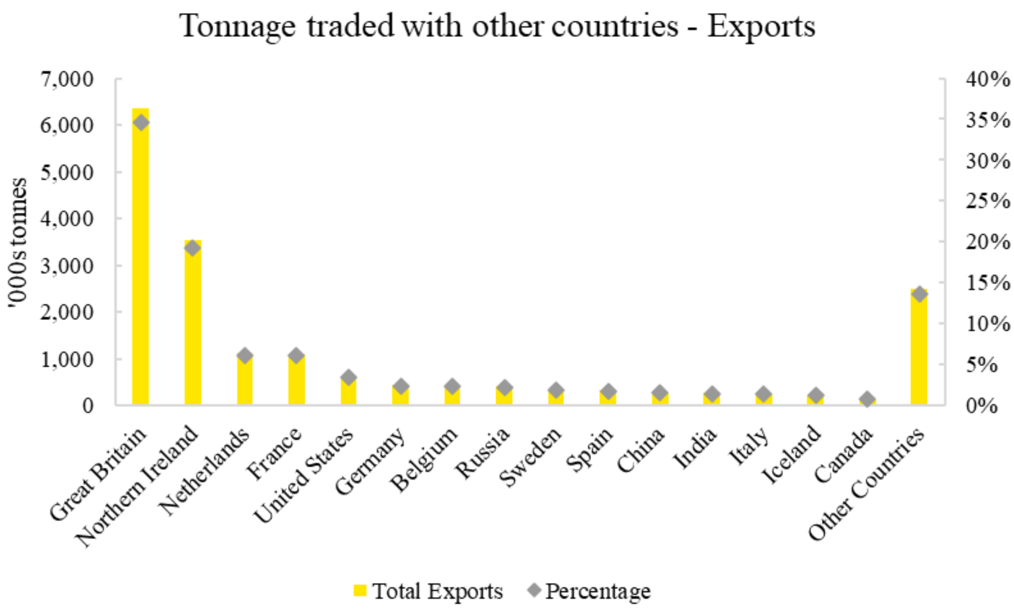


Figure 2.7: Ireland's top 15 Export Partners in 2019 (Source: IMDO)

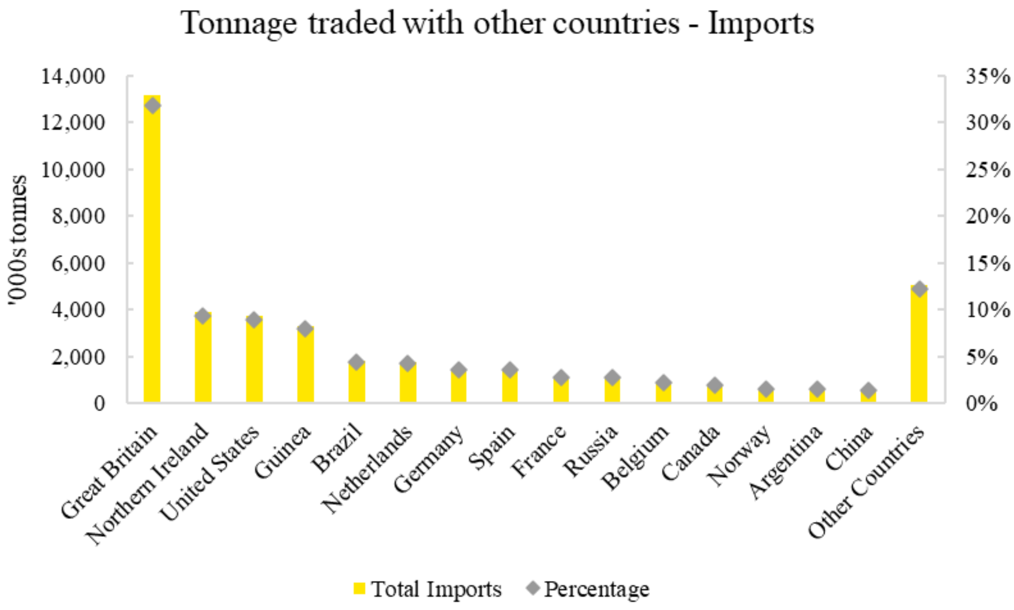


Figure 2.8: Ireland's top 15 Import Partners in 2019 (Source: IMDO)

The UK Landbridge remains an option for Irish importers and exporters, support for which has increased as familiarity with customs declarations and related procedures has improved. However, as the short-term impacts of Brexit begin to become clearer, it is apparent that more direct-links with continental Europe are being sought, with the Ireland-Great Britain Landbridge being considered an cumbersome process for transportation to mainland Europe.

In support of this, figures [17] note that Ireland to Great Britain traffic is down, and Ireland to Europe trade and traffic is up. In addition to this, Northern Ireland to Great Britain traffic has increased, as has Trade between Ireland and Northern Ireland. It is noted that in response to these developments, the shipping industry has replanned direct routing accordingly.

2.7 Composition of Ireland's trade

A more detailed analysis of the composition of Ireland's trade is important for an assessment of capacity within the Irish ports system. While values are important from the perspective of the balance of payments, the tonnage of products is the more relevant metric for assessing the capacity of ports in Ireland and Northern Ireland. The assessment of the volume of trade below is based on 2019 data.

From an analysis of the composition of Ireland's trade by volume, as can be observed in **Figure 2.9**, it is evident that the most prominent commodity groupings are:

- Food & live animals
- Crude materials, except fuels
- Manufactured goods classified chiefly by material
- Mineral fuels, lubricants & related products

The above products account for over 80% of Ireland's total merchandise trade.

One quarter of exports in 2019 consisted of food and live animals (25.2%), over one-fifth made up crude materials excluding fuels (24.1%) and approximately one-fifth was manufactured goods (21.1%). Mineral fuels, lubricants and related products made up almost one-third of imports, with food and live animals (22.3%) and crude materials excluding fuels (20.1%) each accounting for around one-fifth of the total.

Although machinery and transport equipment are the largest import commodity group by value and the second largest export commodity group by value, this group represented around 2.5% of both imports and exports by volume.

It is possible to disaggregate further the 10 commodity groups above to identify the main products within each group (**Figure 2.10** and **Figure 2.11**). The CSO identifies 69 product descriptions in total and based on a more detailed analysis, the top ten products in Ireland account for 71.6% of the total volume of imports and 70.7% of the total volume of exports.

[17] Trade between Great Britain, Northern Ireland and Irish Republic continues to change, 2022, The IOE&IT, UK

Figure 2.9: Composition of Ireland's Imports and Exports, 2019 – All Commodity Groupings (% shares) – (Source: CSO, nes = not elsewhere stated, nec = not elsewhere classified.)

Looking more specifically at the composition of Ireland's trade across the border with Northern Ireland and Great Britain separately, it is evident that mostly the same products appear in the top 10 exports and imports to and from both jurisdictions (**Table 2.6**).

Looking at volumes of imports and exports in both jurisdictions:

- Natural gas account for 28.8% of total imports from Great Britain with petroleum product and related materials accounting for 22.1% of total imports from Great Britain. As governments move to implement carbon-related restrictions on fossil-fuel derived products, it is anticipated that the volume of this import being impacted. The direct and derivative impact of these developments on products developed in Ireland should be considered specifically in future iterations, as we understand further the real result of the transition to the lower carbon economy. This point is further expanded upon within **Chapter 7**.
- A number of the product descriptions captured under the commodity group, Food and Live Animals, figures prominently in the top 10[18]. This overall commodity group accounted for 29.4% of total exports to Northern Ireland and 36.1% of imports from Northern Ireland, measured in tonnes.

[18] Trade in Food and Live Animals includes trade in live animals, meat, dairy products, fish, vegetables and fruit, cereals, coffee, tea cocoa and spices, and feeding stuffs for animals.

The corresponding proportions of Irish trade with Great Britain which were represented by this commodity group were lower, at 21.5% of exports and 15.4% of imports.

- There is a surprising absence of chemical and related products, which figured prominently in overall trade, with none of the specific product descriptions captured under this product category appearing in the top 10 products.

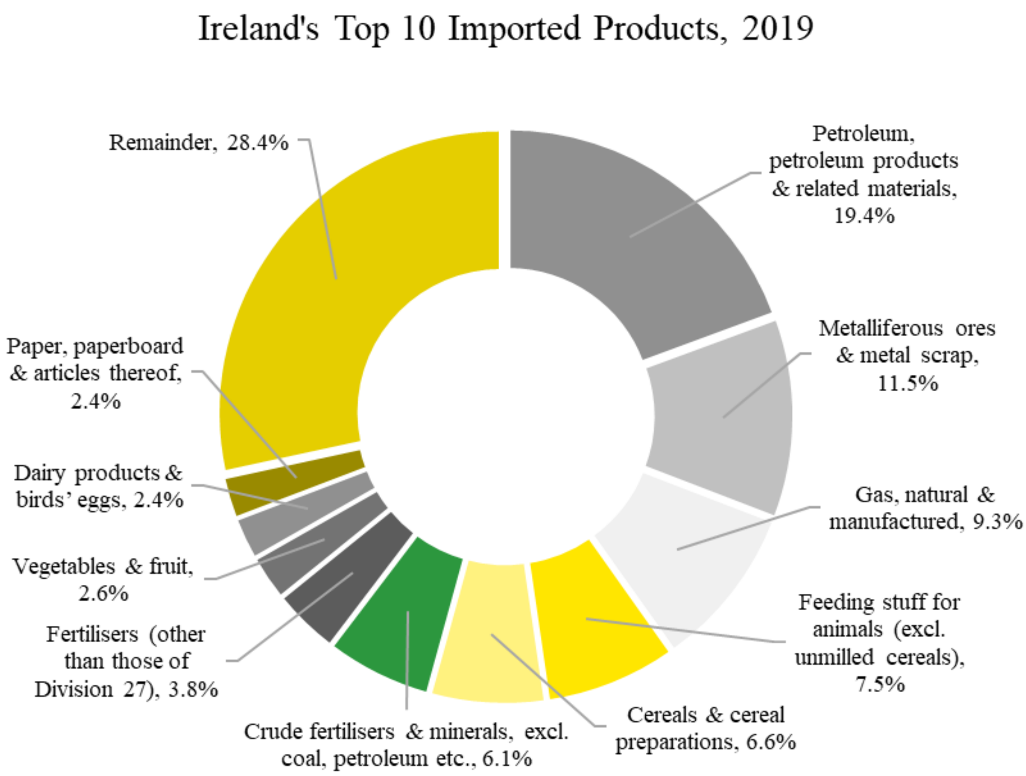


Figure 2.10: Ireland's Top 10 Products Imported, 2019 (% share, in tonnes) (Source: CSO11, IMDO)

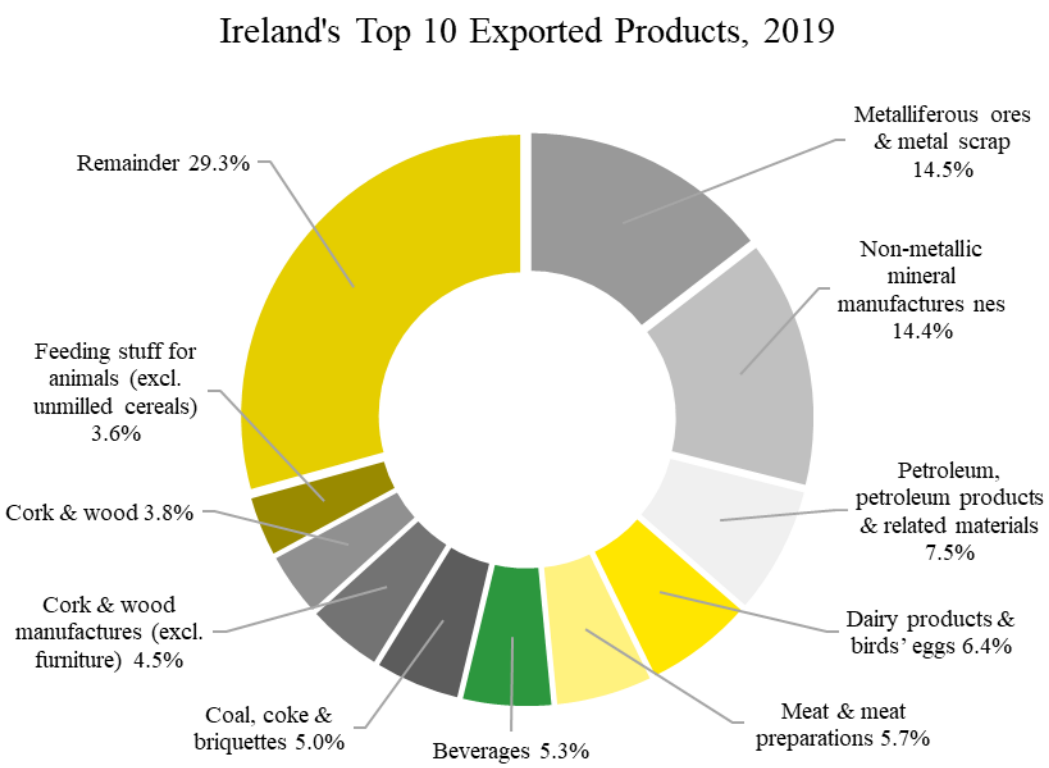


Figure 2.11: Ireland's Top 10 Products Exported, 2019 (% share in tonnes) (Source: CSO13, IMDO)

Table 2.6: Top 10 Exports/Imports to/from Ireland to Northern Ireland and Great Britain, 2019

Exports to Northern Ireland		Imports from Northern Ireland	
Total tonnes (000s)	3,527	Total tonnes (000s)	3,887
Share of Total		***Share of Total***	
Non-metallic mineral manufactures nes	25.2%	Crude fertilisers & minerals, excl. coal, petroleum etc.	30.4%
Cork & wood manufactures (excl. furniture)	11.2%	Dairy products & birds' eggs	17.8%
Feeding stuff for animals (excl. unmilled cereals)	10.4%	Feeding stuff for animals (excl. unmilled cereals)	9.2%
Cereals & cereal preparations	7.4%	Beverages	7.0%
Cork & wood	7.2%	Petroleum, petroleum products & related materials	6.3%
Dairy products & birds' eggs	6.1%	Cereals & cereal preparations	6.2%
Beverages	5.7%	Non-metallic mineral manufactures nes	3.3%
Coal, coke & briquettes	3.6%	Cork & wood	2.7%
Metalliferous ores & metal scrap	2.9%	Coal, coke & briquettes	1.4%
Crude fertilisers & minerals, excl. coal, petroleum etc.	2.7%	Iron & steel	1.2%

Exports to Northern Ireland		**Imports from Northern Ireland**	
Remainder	17.6%	Remainder	14.6%
Exports to Great Britain		**Imports from Great Britain**	
Total tonnes (000s)	6,353	Total tonnes (000s)	13,153
Share of Total		***Share of Total***	
Non-metallic mineral manufactures nes	24.2%	Gas, natural & manufactured	28.8%
Coal, coke & briquettes	7.6%	Petroleum, petroleum products & related materials	22.1%
Petroleum, petroleum products & related materials	7.4%	Cereals & cereal preparations	5.3%
Cork & wood	6.5%	Paper, paperboard & articles thereof	4.7%
Beverages	6.3%	Iron & steel	3.2%
Meat & meat preparations	6.1%	Crude fertilisers & minerals, excl. coal, petroleum etc.	2.9%
Metalliferous ores & metal scrap	5.5%	Miscellaneous manufactured articles nes	2.8%
Cork & wood manufactures (excl. furniture)	4.6%	Vegetables & fruit	2.6%
Dairy products & birds' eggs	3.8%	Non-metallic mineral manufactures nes	2.4%
Cereals & cereal preparations	3.2%	Beverages	2.1%
Remainder	24.8%	Remainder	23.1%

Source: CSO, nes = not elsewhere stated, nec = not elsewhere classified.

Given the complexity of trade handled by ports, and the fact that it is not always possible to establish the type of goods being carried on trucks and in containers, the above analysis on the composition of trade with Northern Ireland and Great Britain nonetheless provides some understanding of the type of products routinely carried by hauliers.

2.8 Conclusions

To ensure the sustainability of economic and population growth across the island of Ireland, it is imperative that ports have the capacity to handle imports and exports.

The ports analysed in this study differ in terms of their size and current traffic. The dominant RoRo ports are Dublin, Belfast, Larne and Rosslare; and Dublin, Cork, Belfast and Waterford are the main LoLo ports. Liquid Bulk cargo and/or Dry and Break Bulk cargoes are mostly handled at SFPC, Belfast, Cork and Dublin. The Tier 1 Ports were responsible for almost 90% of the overall tonnage through ports in 2019.

The ports in Ireland handle two-thirds of the total traffic on the island of Ireland, with the other third handled by ports in Northern Ireland.

RoRo is the singular dominant mode in Northern Irish ports. It is challenging to assess trade moving across the Northern Irish border because trucks can carry different cargoes, make several trips a day or goods can be transported into warehouses and be re-aggregated for return across the border. Goods which are destined for Ireland can often arrive via Northern Ireland while the reverse flow is also common in respect of other goods. Reference is also made to the IMDO Landbridge study.

The analysis of port traffic is supported by an analysis of the composition of trade, given that it is not always possible to establish the type of goods being carried on trucks and in containers.

The UK is an important trading partner for Ireland, with Great Britain ranked top of the list in terms of exports and imports in tonnage terms, followed by Northern Ireland based on an analysis of Ireland's top trading partners by country. Thus, in 2019, the UK received over half (54%) of Ireland's exports and accounted for 41% of Ireland's imports. As the short-term impacts of Brexit begin to become clearer, the Irish shipping industry is responding by adding capacity on both LoLo and RoRo modes, delivered by a combination of incumbents and new entrants, on existing and new routes.

Numerous countries from the EU-26 bloc are absent amongst Ireland's top 15 trading partners.

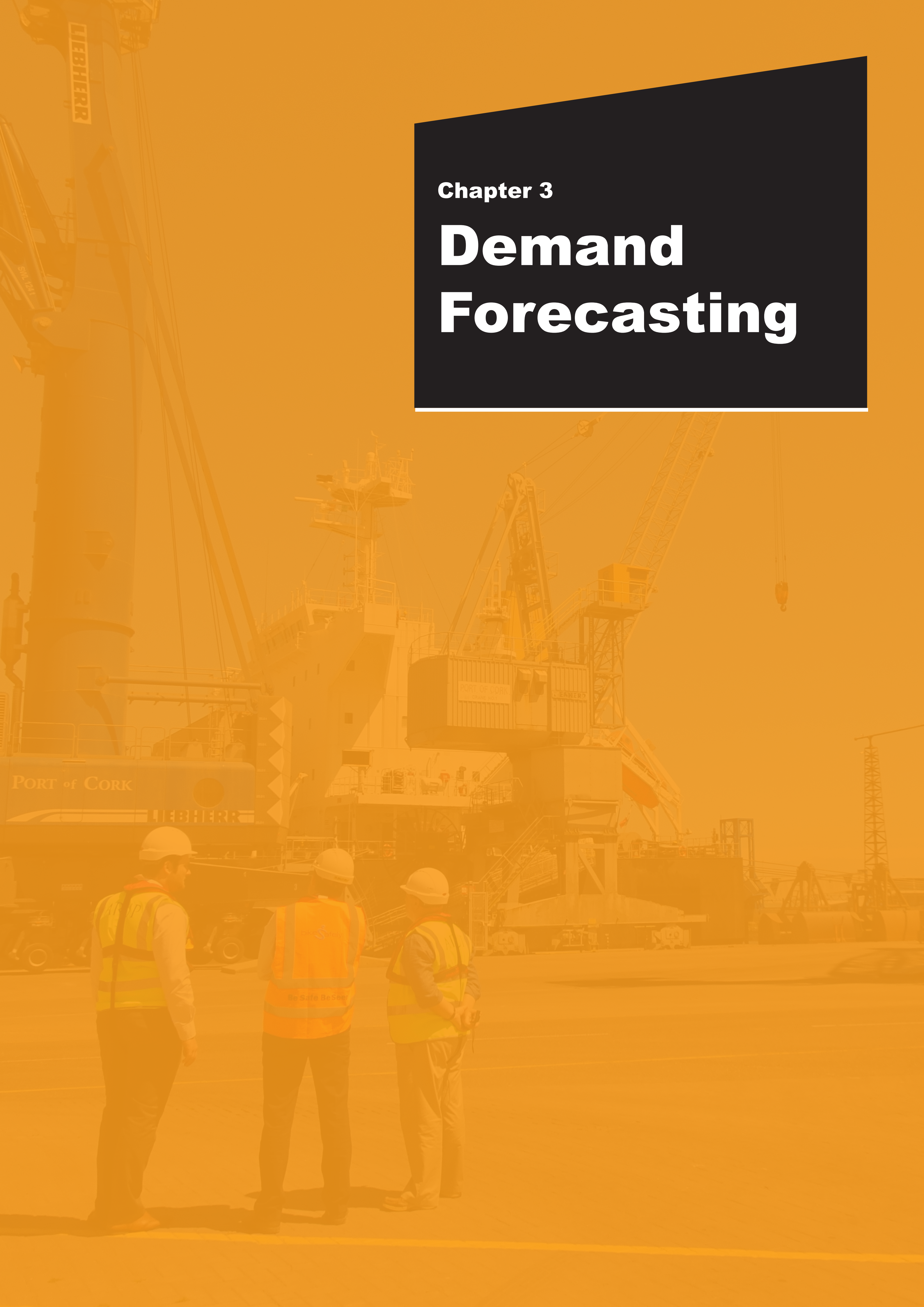
The most prominent commodity groupings in volume terms which emerge in an analysis of the composition of Ireland's overall trade are crude materials (except fuels), food & live animals, manufactured goods and mineral fuels, lubricants & related products.[19] Mostly the same products appear in an analysis of the composition of Ireland's trade across the border with Northern Ireland.

This Chapter has focused on setting out the factual context with respect to the current trading position of ports on the island of Ireland. The baseline position with respect to port volumes and cargo types was established, with an understanding of the traffic flows between ports in Ireland and Northern Ireland. The next Chapter derives a forecast of what ports volumes will be needed to accommodate future population and economic growth over the long term.

[19] It must be noted that these figures are influenced by the nature of the goods traded.

Chapter 3

Demand Forecasting



3 Demand Forecasting

3.1 Introduction

In order to understand whether the Irish port system has the capacity to manage future traffic, it is necessary to produce a forecast of the likely throughput that the ports will handle over the long term. This forecast needs to be based on an assessment of what port volumes will be needed to accommodate future population and economic growth. This standalone assessment of the future demand for goods traded can then be set against a separate assessment of Irish port capacity. This will reveal whether there is sufficient capacity available to accommodate the forecasted demand and, if there is not, what measures need to be taken to address any emerging capacity gaps.

This Chapter sets out the approach and methodology used to forecast port traffic based upon the EY economic model, traffic model and subsequent port volume allocations. An economic forecast model was developed in by EY in 2018, based upon 2017 data, to derive the forecasts. This model forecasted the upcoming impacts of known-future events such as Brexit but was unable to forecast unknown shorter-term future-shocks such as the Covid-19 pandemic. It is considered that the scenarios utilized represent the realized impacts of Brexit at the date of writing sufficiently and therefore the economic forecast undertaken sufficiently considers the impact of Brexit as it is known at the time of writing. Future iterations of the capacity study will update this forecast accordingly.

The attribution of port shares of this forecasted volume is based upon constant shares from 2017 data, as explained in **Section 3.2**. It is noted that this is a practical limitation of the current study, and if considered pertinent, the team has provided comprehensive commentary as to how a variation in port share might lead to impacts in capacity. This is reflected in **Chapter 5** most notably.

As the purpose of this report is to calculate the total capacity that ports will need, both now and in the future, the model is focused on the volume of goods that ports will handle, rather than on the value of those goods. Data on port traffic is measured based on where the goods are imported from and exported to, rather than their origin or final destination. This Chapter also presents the outputs of the forecasting exercise.

As shown in **Chapter 2**, the transport market is highly integrated and goods will regularly be received in an Irish port for consumption in Northern Ireland (and vice versa). Producing individual models for both economies separately would require an understanding of the complexities of these trade flows, which would allow trade volumes to be accurately attributed to each jurisdiction. However, this is not possible at this time, hence the approach followed in the model is to undertake an Irish and Northern Irish approach and forecast at an aggregate level. As a result, all trade data for the ports in Ireland and Northern Ireland is combined for the purpose of undertaking the forecasting exercise. It is noted that Eurostat does not report yearly statistics for passenger cars and trade cars handled in Northern Ireland Ports and therefore were not included in the analysis.

3.2 Forecasting traffic up to 2040

3.2.1 Approach

The model assumes that the volume of traffic required is driven by demand in the local economy. This rests on the basis that economies act as magnets for goods and draw in the total volume of goods that they require in order to sustain their economic and population growth. As exports from Ireland are imports to other countries, this approach is used for both imports and exports. Once the overall forecasts for each type of trade cargo have been derived, they are distributed across the ports in the model, based on the assumption that the shares across the ports will remain constant at 2017 shares as shown in **Figure 3.1** for LoLo as an example, considering that it is not possible to accurately forecast the results of competition between the ports over the forecast period. This means that it is assumed that the throughput for all ports will grow equally over the forecast period.

The 2017 port shares for the different cargo modes are shown in **Figure 3.2** to **Figure 3.7** for reference.

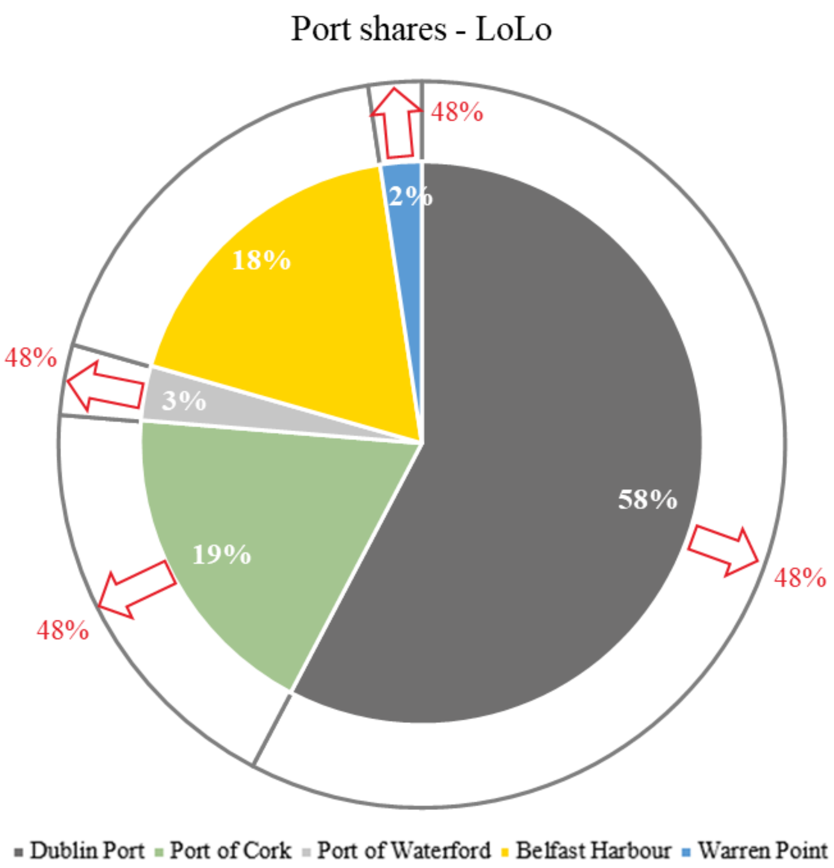


Figure 3.1: LoLo - Example of constant port shares with 48% growth until 2040

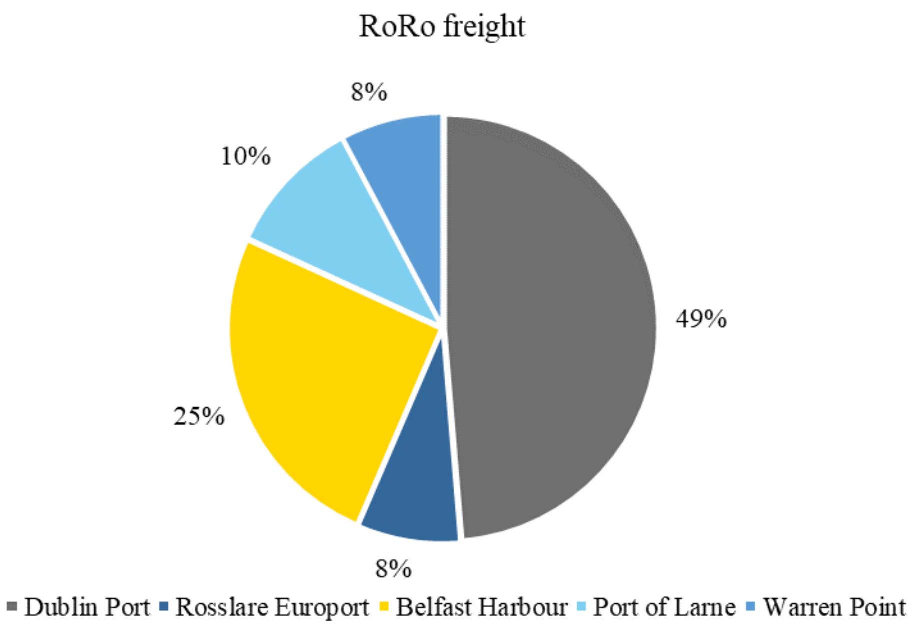


Figure 3.2: Port shares in 2017 - RoRo freight (Source: Eurostat)

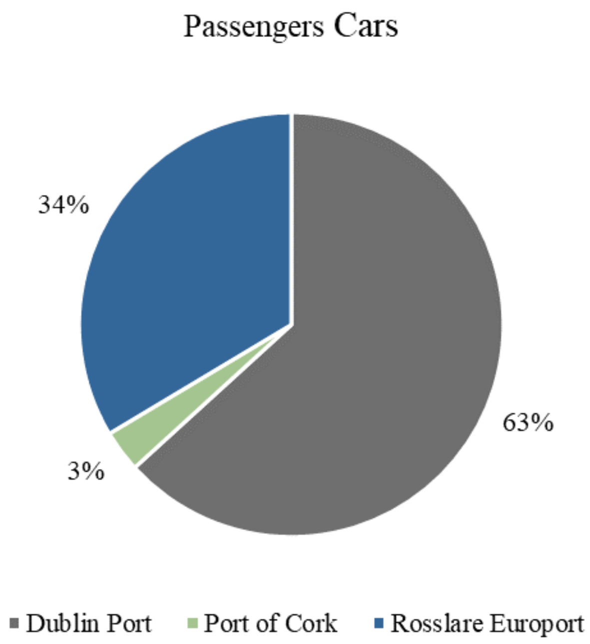


Figure 3.3: Port shares in 2017 – Passengers cars (Source: Eurostat)

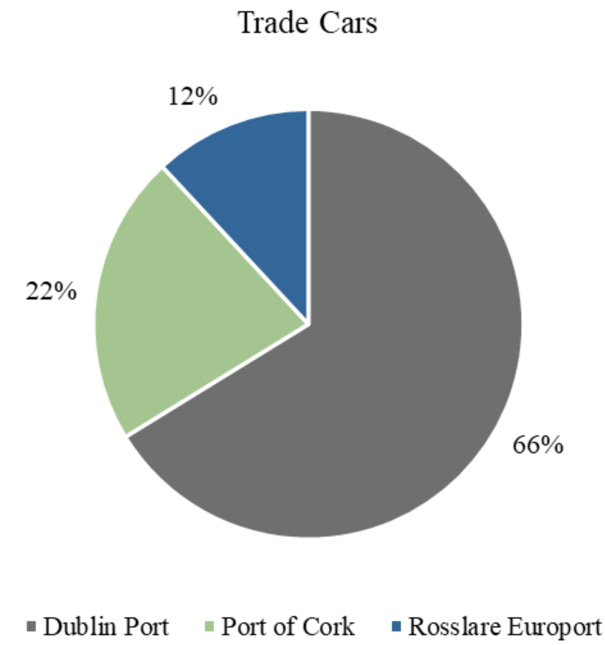


Figure 3.4: Port shares in 2017 – Trade Cars (Source: Eurostat)

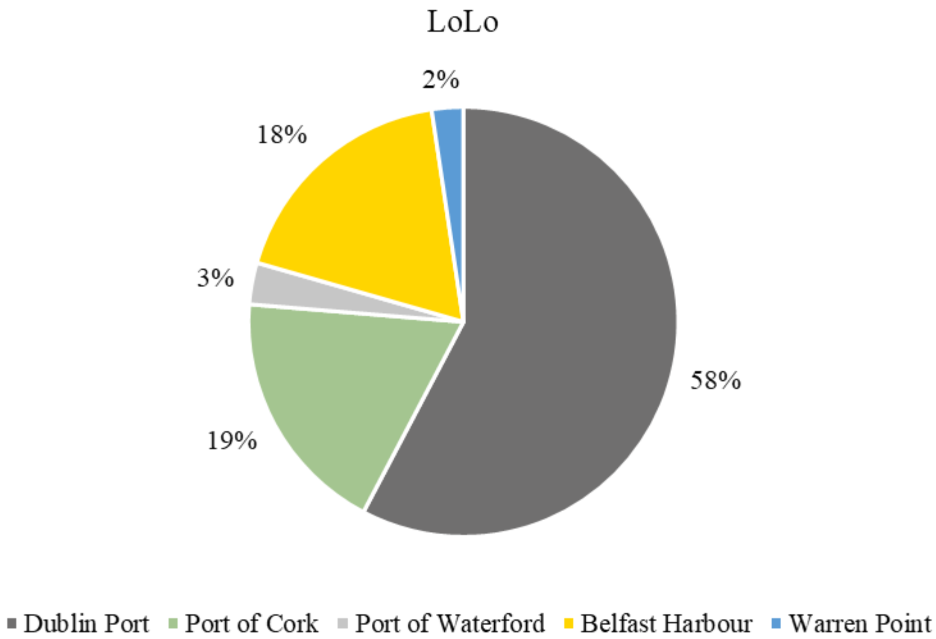


Figure 3.5: Port shares in 2017 – LoLo (Source: Eurostat)

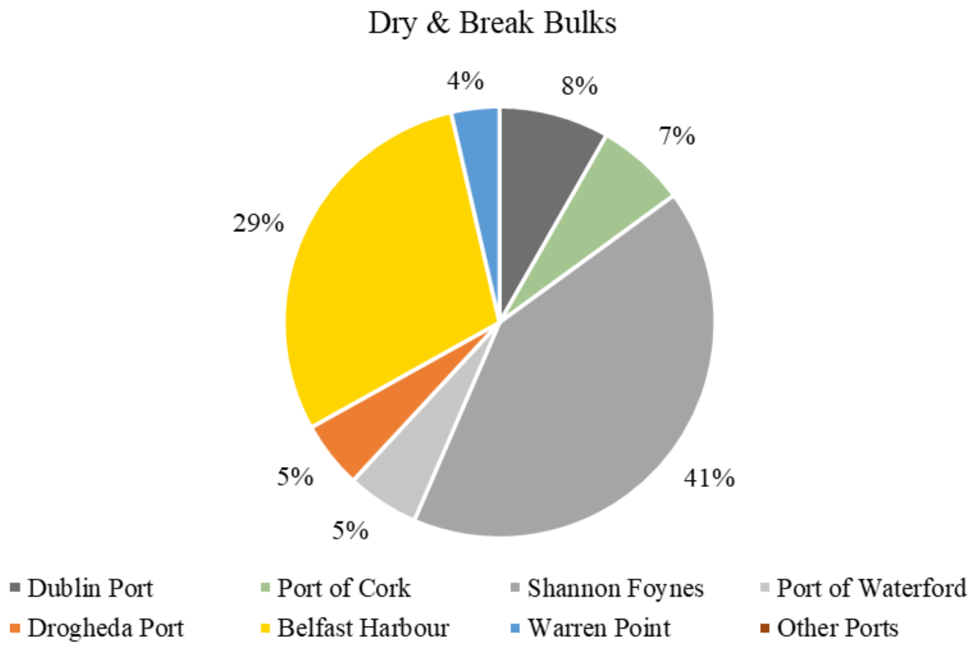


Figure 3.6: Port shares in 2017 – Dry & Break Bulks (Source: Eurostat)

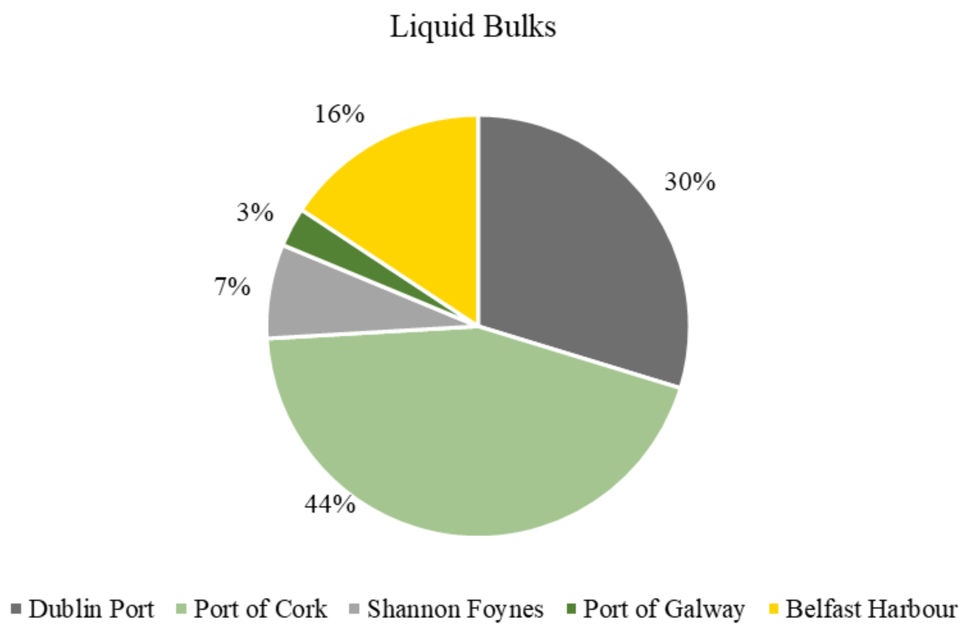


Figure 3.7: Port shares in 2017 – Liquid Bulks (Source: Eurostat)

This Chapter draws on the analysis in the previous Chapter and uses the same volume-based data. As with the previous Chapter, the main data source is Eurostat rather than CSO data. This is only for trade volume data. This shows the destination which the goods were shipped from, or to, rather than the final destination (which may be different). In addition, forecasts of economic performance were required in order to forecast traffic volumes.

This data has been provided by Oxford Economic Forecasting (OEF), who are experts in forecasting and modelling and are one of just a few forecasting companies to provide long-term detailed macroeconomic forecasts for most economies. Whilst the approach for imports in Ireland and Northern Ireland is relatively straightforward (using Ireland and Northern Ireland variables), the approach needed for goods exported is more complicated as the goods go to several different countries. As shown in **Chapter 2**, the vast majority of goods exported from Ireland and Northern Ireland go either to the UK or the EU26 (i.e., EU27 minus Ireland)[20], with the remainder going to a wide variety of countries.

Therefore, the decision was made to split the goods exported into three categories: UK, EU26 and the RoW. A separate model was developed for each one and the outputs of these combined to produce the forecast for goods exported.

Finally, it is important to note that as Eurostat data is provided based on tonnage, forecasts are also calculated on this basis. Separate conversion factors are used to convert tonnes to freight units in the case of RoRo and to TEUs in the case of LoLo.

3.2.2 Key independent variables

Trade volumes are assumed to be driven by a number of independent variables gathered for the economies of interest. The selection of the variables used for this is based around previous studies and where there is a strong rationale for inclusion. A standard econometric approach was used where all potentially relevant variables were reviewed and statistically tested to assess whether they were significant in predicting volumes.

The independent variables considered for inclusion in the model were as follows:

- **Economic Growth:** Economic theory would suggest that as any economy grows it will need more imports to satisfy the additional demand. The standard measure for economic performance is GDP growth. However, this measure includes foreign trade and therefore this would not be independent of the trade forecasts. To avoid this problem of interdependence, a private consumption variable was used instead.

  This also avoids issues with GDP data in 2015 (when GDP jumped significantly due to problems with transfers of intellectual property rights). More details on this approach can be found in **Appendix 4**. All forecasts are therefore based on private consumption.

As can be seen in **Figure 3.8,** private consumption and imports have grown in line with one another (though this did break down to an extent between 2008 and 2011).

[20] The UK's separation from the EU bloc (Brexit) was completed on the 31st of December 2020.

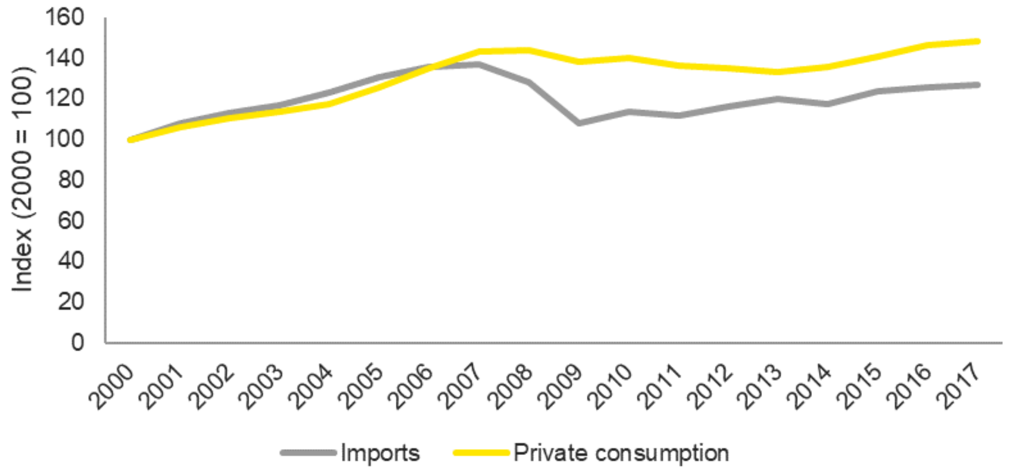


Figure 3.8: Ireland and Northern Ireland, Imports and private consumption, 2000 – 2017 (Source: Eurostat, OEF)

- **Population:** It is equally reasonable to assume that as the population grows, the demand for imports should grow to satisfy this source of additional demand. The population has grown consistently over the last 20 years, but not as quickly as imports have grown (**Figure 3.9**). This suggests that whilst economic growth has been a stronger driver, population growth is also important and should be considered.

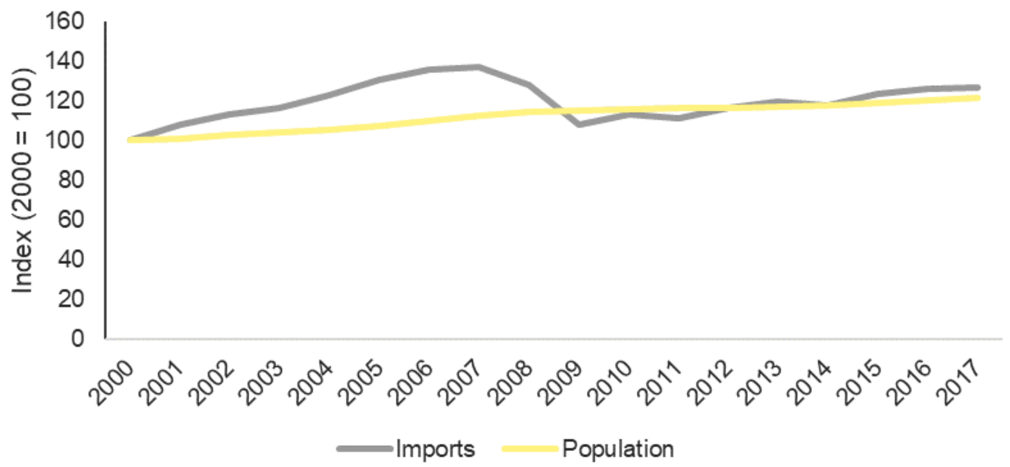


Figure 3.9: Ireland and Northern Ireland, Imports and population, 2000 – 2017 (Source: Eurostat)

- **Exports:** Ireland has a large export focused industrial sector and a positive trade balance in value terms. Given that much of this trade is focused on the export of final goods, it is likely to require a considerable amount of imports of basic and intermediate goods to support this production. This means that an increase in exports is likely to be accompanied by an increase in imports.

  There was a strong relationship between these two variables for most of the last two decades (**Figure 3.10**). This would also explain the fact that the composition of imports and exports tends to be similar.

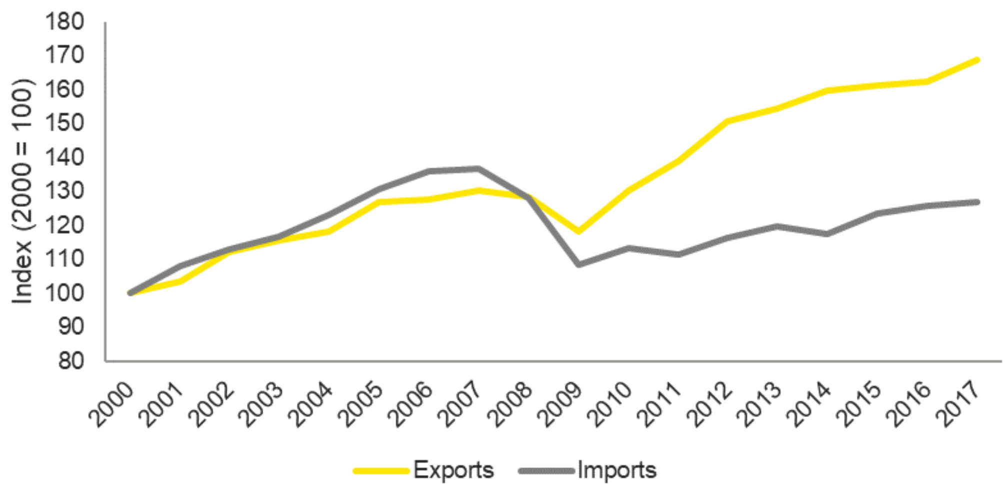


Figure 3.10: Ireland and Northern Ireland goods imported and exported, 2000 – 2017 (Source: Eurostat)

- **Price:** The affordability of goods may also have an impact on the total volume of trade. Typically, inflationary impacts are matched by commensurate increases in wages, dampening price increase effects on purchasers. Therefore, overall affordability of goods can be largely unchanged. However, in the post-covid era of 2022, it is unclear whether the inflationary forces being felt are transitory impacts of restarting the economy after an unprecedented, prolonged lockdown or more permanent reversions to a typical economic cycle. If inflation continues to be sharp and unmatched by labour market evolution (wage increases etc.) then import markets may be impacted by consumer spending. In any case, anything which changes the relative affordability of imports over domestic goods may lead to increases in demand for imports. Factors which might lead to this substitution effect include:
- **Shipping costs:** Ships of all descriptions are carrying increasingly large amounts of cargo (**Figure 3.11**). This is likely to have an impact on the cost of shipping goods, due to economies of scale, and this should in turn be passed onto the consumer in the form of lower relative prices.

  There are no publicly available data sources on shipping costs directly, therefore the average tonnage per ship has been used as a proxy for this. With the exception of specialised trades, the average tonnes of cargo per ship has been rising slowly since 2000.

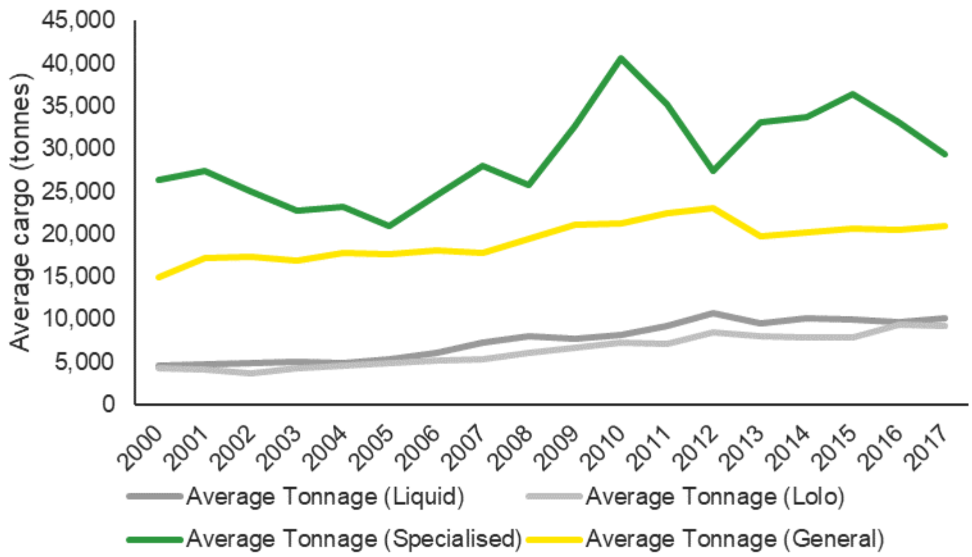


Figure 3.11: Ireland, Average cargo weights, 2000 – 2017 (Source: CSO)

- **Technology:** Technology may also reduce the relative price of goods, thus increasing affordability of both domestic goods and imports alike. Technology itself is hard to measure reliably and therefore Total Factor Productivity (TFP) is used instead. TFP is a measure of economic efficiency, showing how labour and capital combine to produce output. Changes in TFP are normally associated with changes in technology. As such, this is considered the best proxy available to measure technological change. TFP has been extremely volatile over the last few years (**Figure 3.12)** but it had been increasing until 2015.

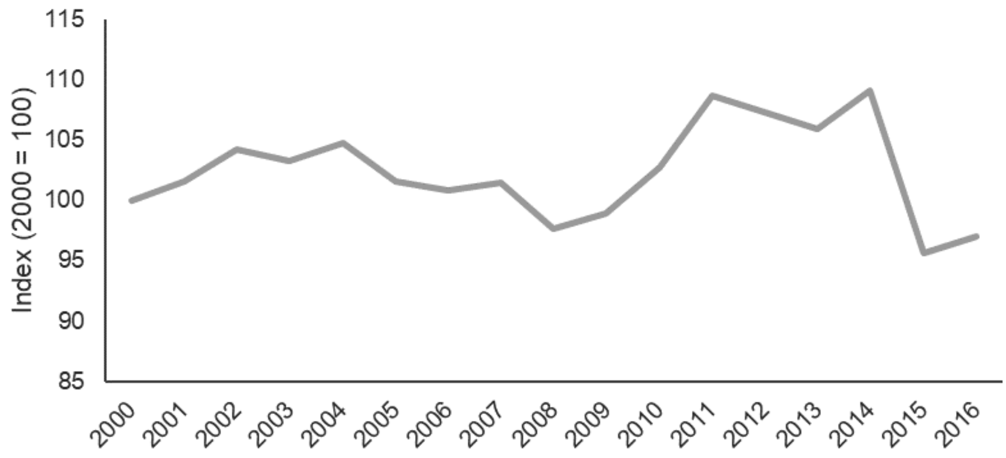


Figure 3.12: Ireland, Total - Factor Productivity, 2000 – 2016 (Source: CSO)

- **Exchange rates and Purchasing Power**: Exchange rates will also impact relative affordability. An increase in the Euro to Pound (more GBP per EUR unit) exchange rate would make imports more affordable relative to domestic goods, which in turn may lead to greater traffic imports. They may also impact on goods exported to the UK, though not the rest of Europe (due to the use of the Euro), thus leading to lower exports.

As illustrated in **Figure 3.13**, the exchange rate has risen strongly over the period between 2001-2019, leading in part to a potential increase in imports from the UK market. In recent years, the Euro to GBP exchange rates have stabilized, although the trajectory of future purchasing power and exchange rates are beyond the scope of this study it should be noted that they are an important investment risk or opportunity.

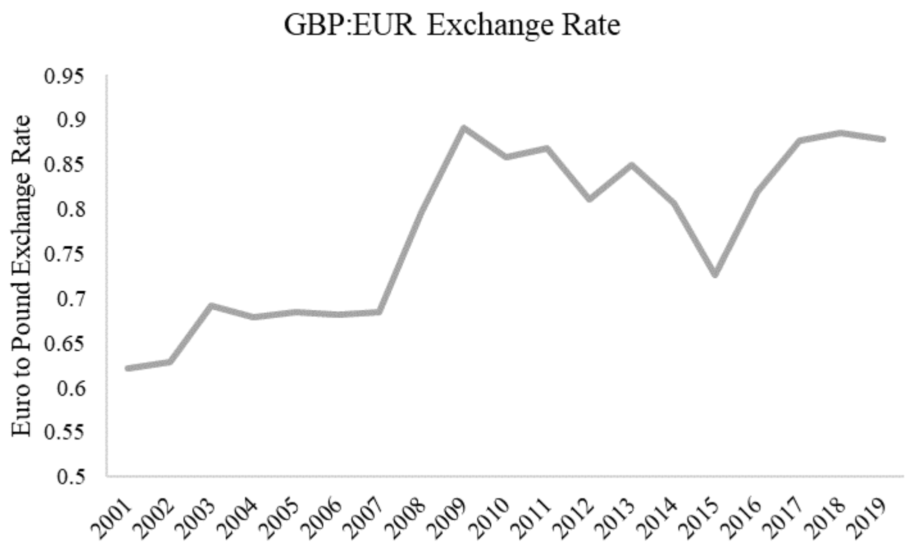


Figure 3.13: Pound Sterling to Euro Exchange Rate, 2000 – 2019 (Source: Central Bank of Ireland, Annual Averages[21])

These variables were then used to create an econometric forecast for demand for imports and exports by cargo type. This was then split by port, based on an assumption around port shares. All models were fully statistically tested, and all the equations and variables which were used were statistically significant[22].

It is noted that as developments in the application of the circular economy, and its further embodiment within Irish and European society continues, balances of international trade may shift. Future updates to this methodology should include this consideration where specifically measurable and sufficiently impactful. At this stage the circular economy is not considered to be having a measurable significant impact on import-export volumes.

Details on the modelling approach can be found in **Appendix 4**.

3.2.3 Conversion factors

The econometric model chosen provided a forecast for traffic volumes expressed in tonnes as the original data provided by Eurostat was in tonnes.

[21] Exchange Rates, Central Bank of Ireland
[22] This was defined as 95% statistically significant

In order to compare the traffic forecast with the capacity assessment, it is necessary to convert tonnes to appropriate units. This is done as follows:

- RoRo freight: An analysis of the available data generated an average net weight of 14 tonnes for a freight unit.
- Twenty Foot Equivalent Units (TEUs): Based on data received from the ports in both tonnes and TEUs, it was possible to calculate the average weight of a TEU, which was 10 tonnes.

Dry Bulk and Liquid Bulk are always measured in tonnes and therefore do not need to be converted.

3.2.4 Trade and passenger vehicles

The RoRo tonnage forecast does not include private vehicles or trade vehicles and therefore these need to be calculated separately. Two separate forecasts were calculated, for trade vehicles (i.e., new cars) and passenger vehicles (including second hand cars).

Figure 3.14 shows that the total number appears to have been in slow decline over the last 17 years. Whilst there has been a small amount of growth in passenger cars since 2015, further analysis showed that this was almost entirely due to the growth in second hand vehicles imported from the UK.

Such cars are not considered to be trade vehicles and are counted as passenger vehicles in the statistics. These vehicles also appear to be displacing sales of new cars which has led to the number of trade vehicles falling in the two years prior to 2017.

The trend was not impacted by the recession from 2008 onwards and once second hand imports are excluded, there has been no upturn since the recovery. There is no evidence to suggest that numbers of passenger vehicles (without considering second hand imports) will grow over the period under consideration.

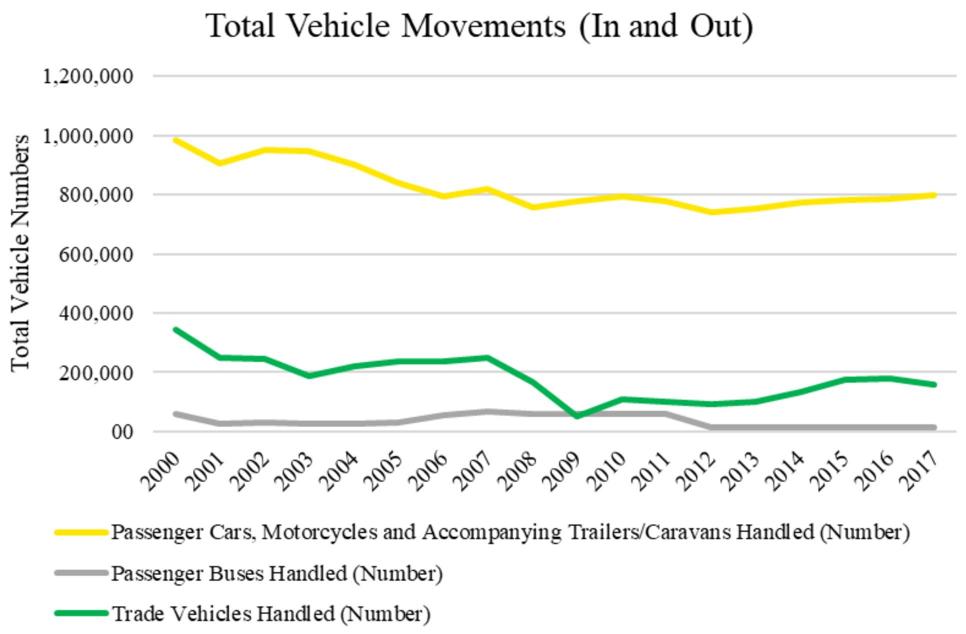


Figure 3.14: Ireland, Total Vehicles (in and out), 2000 – 2017 (Source: CSO)

There has been significant growth in tourism over the last 40 years, with more recent growth driven by continental and transatlantic tourists as shown in **Figure 3.15** for the period between 1976-2017. As these will mainly come through airports, this would support the evidence that passenger vehicle numbers have been flat over the recent past.

Therefore, it is assumed that passenger vehicle numbers remain at their current levels for the duration of this assessment, or that they will increase at a level that will not challenge RoRo capacity at Irish Ports.

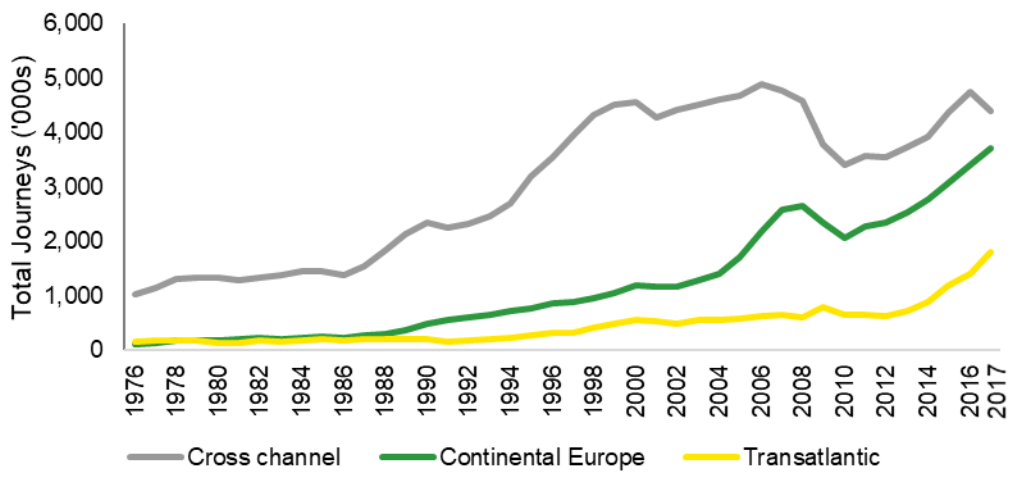


Figure 3.15: Ireland, Total Visitor Journeys, 1976 – 2017 (Source: CSO)

Trade vehicle forecasts are more complicated as they are impacted by several factors. As the driving age population increases (the 17 – 85 age group is forecast to grow on average by 1.1% per annum between now and 2030), and becomes wealthier, more cars will be needed to meet this demand.

However, this is offset by an increasing lifespan for cars (in the period between 2007-2017 the average age of cars in Ireland has gone from 6.02 to 8.25 years old[23]) plus there has been a significant increase in the number of second-hand cars imported from the UK (up 33% in the period between 2015-2017). Other factors, such as environmental factors and increased investment in public transport, may also negatively impact the demand for new cars in the longer term. This means that it is challenging to provide reliable forecasts for the total new trade vehicles over the period to 2040. Therefore, it was assumed that trade vehicle demand would grow in line with the driving age population growth.

3.2.5 Cruise passenger forecasts

Cruise passenger numbers are also forecast separately. The cruise market in Ireland and Northern Ireland is dominated by Cork, Dublin and Belfast (**Figure 3.16**). Cruise ships occasionally dock at other Irish ports, but the numbers are very small in comparison.

For all ports, the passengers may come from a wide range of countries and are driven by many different factors, meaning that the numbers cannot be forecasted using the same approach as above.

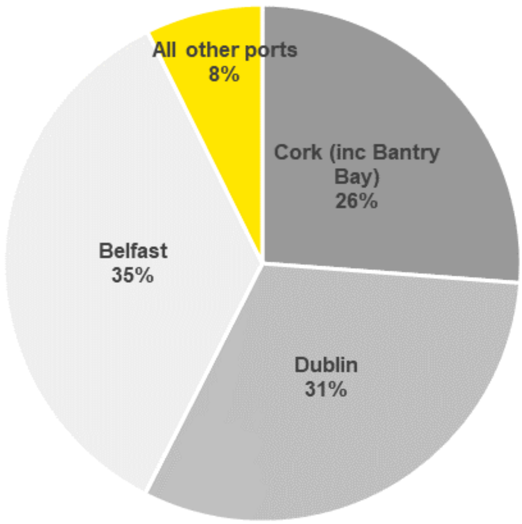


Figure 3.16: Ireland and Northern Ireland, Average share of cruise market, 2006 – 2017 (Source: IMDO)

The most recent forecasts for the European cruise market are for an annual growth of 3.3% in cruise tourism.[24] As growth rates in Dublin, Cork and Belfast have been higher over the last few years, it is assumed that their current growth rates will slowly fall towards the European average forecast over the next 5 years and remain at 3.3% thereafter for the rest of the forecast period.

[23] Irish Bulletin of Vehicle and Driver Statistics 2017, Department of Transport (plus previous editions)
[24] Source: Cruise Market Watch. Commentary on the impact of Covid-19 pandemic is provided in Section 2.3.4

For all other ports it is assumed that there is no further growth and that the average number over the last 5 years would continue until 2040.

3.2.6 Additional assumptions made

In addition to the specific assumptions discussed in the previous two Sections, several other assumptions have had to be made to create the overall volume forecasts. The key assumptions are as follows:

- **Landbridge:** The issue of RoRo traffic using the Landbridge to continental Europe is extremely complicated[25]. As this forecast considers the ports that goods are exported to, rather than their final destination, this is captured in the RoRo traffic to the UK. It did not prove possible to construct a model which included private consumption in both the rest of the EU and the UK as separate variables and therefore they were combined into a single variable for EU26 (i.e., EU27 minus Ireland) and UK combined. This therefore assumes that the relative impact of an additional Euro of private consumption in the UK and the rest of Europe on traffic is the same.

  This was tested using a number of additional econometric models and was found to be sufficient to be used in the modelling. More detail on this can be found in **Appendix 4**.
- **LoLo traffic:** A similar issue exists for LoLo traffic to the UK. Much of this will be re-aggregated and shipped onwards to other countries on larger vessels from ports such as Liverpool.
  Given that the majority of LoLo trade is to the EU26, it is assumed that the relative impacts across Europe were also the same for LoLo in the UK as in the EU26.
- **Recession:** The forecasts for future growth of private consumption are based on the OEF forecasts. These do not include any assumption about future recessions. Whilst it would seem likely that a recession will occur over this period, it is not possible to predict when and as such this has been excluded.
- **Capacity constraints:** The OEF forecasts for private consumption growth are based on the assumption that the economy is not held back at any time due to a lack of port capacity. It would not be possible to model directly the impact of this as there is no comparable capacity constraint historically which could be used as a comparison.
- **Inflation:** Typically, inflationary impacts are matched by commensurate increases in wages, dampening price increase effects on purchasers. Therefore, overall affordability of goods can be largely unchanged. However, in the post-covid era of 2022, it is unclear whether the inflationary forces being felt are transitory impacts of restarting the economy after an unprecedented, prolonged lockdown or more permanent reversions to a typical economic cycle.

[25] Commentary on the recent developments regarding the Landbridge is provided in Section 2.6

If inflation continues to be sharp and unmatched by labour market evolution (wage increases etc.) then import markets may be impacted by consumer spending. For the purposes of this study, it is assumed that inflation does not directly impact trade volumes.

- **Port shares:** The forecasts generate total traffic across all ports and all cargo types. Forecasting at an individual port level is not possible for all ports due to the relatively small volumes in certain cases. Port shares are based on the actual percentage shares in 2017 according to Eurostat. This means that whilst the growth scenarios discussed below will impact on the overall growth rates, they will not have a differential impact across the ports.
  This approach has been taken as it was not possible to accurately forecast the likely port share changes which could occur. The associated risks are discussed in **Chapter 7**.
- **Emission policy impacts:** Currently 59.1% of all Liquid Bulk imports are for fuel products. However, in order for Ireland to meet its legally binding EU emission targets, it will need to shift to considerably more fuel-efficient modes of transport and energy production. In order to allow for this in the model it is initially assumed that demand for fuel will fall by 1.8% per year on average[26]. Once such policy targets and emissions budgets are formally confirmed on a non-emissions trading scheme (ETS) sector by sector basis for Irish Transport, the Maritime Sector and for the importing of liquid hydrocarbons in particular, this study can be updated to reflect the potential impact on demand this may have. At this time, there is insufficient information from Government to reflect an understanding of the impact of such policies beyond an assumed recognition that a reduction in demand may occur (see also **Section 3.4.2**).

3.3 Scenario modelling

3.3.1 Introduction

As stated above, the data used for forecasted Irish economic growth was obtained from OEF. This source was used as it provides a single and consistent set of forecasts for all relevant economies and for the period until 2040.

However, long run economic forecasting is complex and subject to considerable uncertainties. It is important to consider the uncertainty in the forecasts and to model the results. Economic conditions in Ireland are likely to change significantly over the next 22 years, and it is impossible to say with any degree of certainty what the exact level of economic growth or private consumption[27] will be, or how this will impact on traffic volumes. Thus, three cases are examined:

[26] This has been calculated by looking at the reduction which would be needed to reduce fuel imports to 40% of total liquid bulk. This would bring Ireland into line with Sweden's levels of imports (Sweden has the lowest level of emissions per capita of any major European country). See also commentary in Section 3.4.2.

[27] Private consumption growth is highly correlated to GDP growth and therefore differences in GDP growth forecasts will have a similar impact on Private consumption.

- High Growth Scenario: The economy grows faster than the OEF forecast. This represents the most optimistic forecast and would require strong and stable global growth to be achieved.
- Baseline Growth Scenario: The economy grows at the rate predicted by the OEF and includes some consideration of the impact of the current trade environment.
- Low Growth Scenario: The economy grows slower than the rate predicted by the OEF. This is the pessimistic scenario and would be likely to reflect a trade environment with increased trade wars and global uncertainty.

Note: The OEF forecasts assumed Brexit would happen, albeit a minimal impact was assumed, and this is used as the baseline. The UK's separation from the EU bloc (Brexit) was completed on the 31st of December 2020, which saw the UK withdrawing from membership of the European Union. Agreements reached between the UK and the EU allow for continuing trade under a number of new agreements; however, the full, and long term, impacts of these new agreements on trade volumes are not yet known. For the purpose of this study no further analysis of Brexit impacts has been undertaken, given the three OEF scenarios (Baseline Growth, High Growth and Low Growth) cover the full range of anticipated impacts on economic growth.

3.3.2 Irish growth forecasts

As discussed in **Chapter 2**, the key variable used to forecast the traffic volumes at ports in Ireland and Northern Ireland is private consumption. As this is used as a proxy for GDP growth, with the two normally moving in line with one another, this Section considers the range of uncertainty in GDP forecasts.

There are a number of different routine forecasts[28] generated for Irish economic growth, provided by a range of forecasters. This range is shown in Table 3.1. The general trend in growth is largely the same, with the current rapid economic growth expected to moderate to a more sustainable long-term trend (estimated by the OEF to be 2.0% per annum). The OEF are at the more cautious end of the forecasting range.

Table 3.1: GDP Forecasts, 2018 – 2023

Irish GDP	2018	2019	2020	2021	2022	2023
Department of Finance	7.5%	4.2%	3.6%	2.5%	2.6%	2.7%
DAVY	5.7%	4.5%				
European Commission	5.6%	4.0%				
EY Economic Eye	5.0%	4.3%	3.7%	3.8%	3.3%	
OEF	5.0%	2.4%	2.3%	2.2%	2.2%	2.1%
ESRI	4.7%	3.9%				
Central Bank	4.7%	4.2%				
PWC	4.6%	3.3%	2.8%			
IMF	4.5%	4.0%	3.5%	3.0%	2.8%	2.8%
AIB	4.5%	4.0%	3.5%			

[28] These are normally produced on a quarterly or annual basis

Irish GDP	2018	2019	2020	2021	2022	2023
OECD	4.0%	2.9%				
Average	**5.1%**	**3.8%**	**3.2%**	**2.9%**	**2.7%**	**2.5%**

Source: As stated

Throughout this period, OEF is at a maximum 1.4 percentage points (2019) lower than the average forecast. The high growth GDP (and therefore private consumption) forecast is therefore assumed to be 1.5 percentage points above the OEF forecast. As the OEF forecast sits at the bottom of the range, it is not possible to use the range of forecasts presented above to set the low growth assumption. Nevertheless, it is assumed for the purposes of this analysis that the Low Growth Scenario is 0.5 percentage points below the OEF forecast.

It is noted that, as with many of the forecasting attempts in this study, the recent economic impacts as a result of the Covid-19 pandemic have not been considered at this time. At the point of undertaking such impacts were not reasonably forecastable. Future works should consider the economic and societal emergence from the pandemic in reflecting upon short-term forecasts. Longer term assessments are assumed to be unlikely to be significantly impacted as a result.

3.3.3 The scenarios used in the modelling

The average long run Irish Consumption Rates which were calculated are set out in **Table 3.2** and **Table 3.3** for the period up to 2040.

Table 3.2: Long run average growth in Irish consumption, 2018 – 2040

	Average Growth
High	3.1%
Base Case	1.8%
Low	1.5%

Source: EY Analysis

Table 3.3: Long run average growth in UK consumption, 2018 – 2040

	Average Growth
Base Case	1.4%

Source: EY analysis

3.4 Forecasts up to 2040

3.4.1 Traffic forecasts

Using the coefficients derived in the econometric model for each of the cargoes, a forecast of future traffic volumes could be constructed.

This assumes that the GDP and private consumption growth forecasts remain as forecasted by OEF in their current figures, which assumes a minimal impact from

Brexit until 2030[29].These are shown in **Figure 3.17** and **Figure 3.18**. They both show that there is strong growth forecast for all cargo types over the period in question.

Total growth in goods imported over the period is forecast to be 48%, whilst growth in goods exported will be 121%. As the modelling was undertaken in 2018, the forecasts begin in that year.

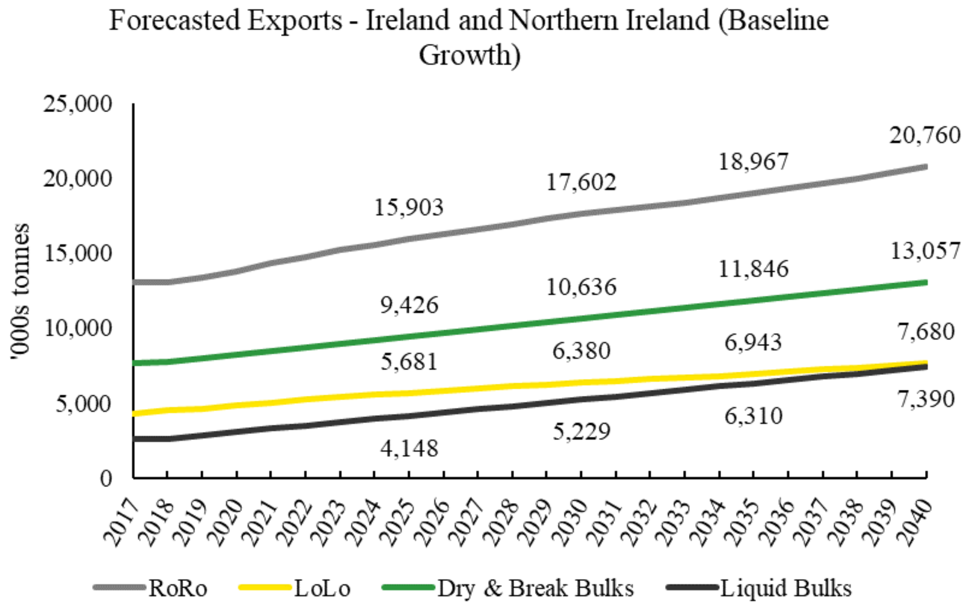


Figure 3.17: Ireland and Northern Ireland, Forecasted exports (Baseline growth), 2017 – 2040 (Source: EY Analysis)

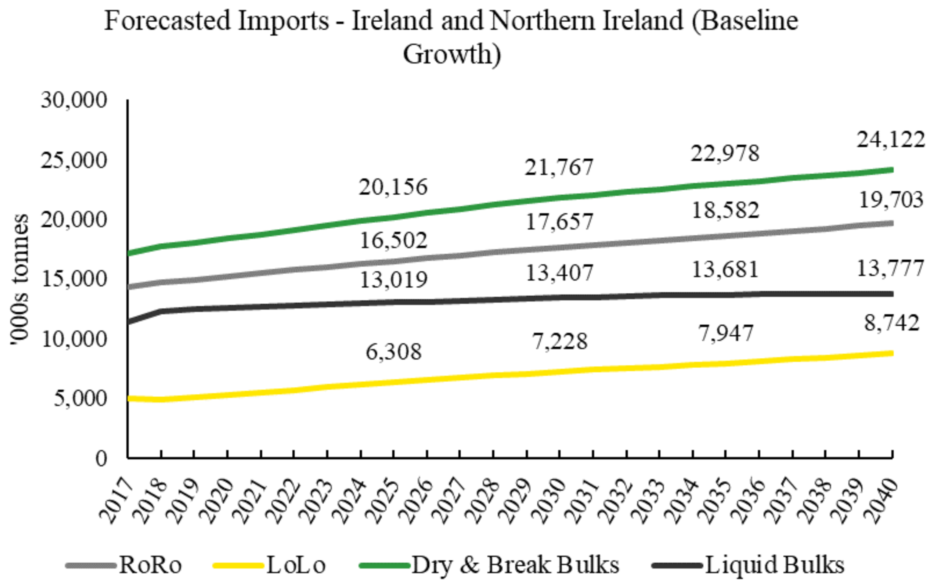


Figure 3.18: Ireland and Northern Ireland, Forecasted imports (Baseline Growth), 2017 – 2040 (Source: EY Analysis)

[29] The OEF Baseline Growth Scenario forecasts assume a Brexit with no new trade tariffs and a two-year adjustment period

3.4.2 Scenario forecasts

Based on the growth assumptions set out above, traffic forecasts for all cargo types and scenarios were generated. **Table 3.4** shows the total growth rates for all of the results. These are only calculated for 2018 – 2030 as this is the period assumed to be impacted by Brexit. The impact of different growth assumptions has a relatively small impact on annual growth rates[30]. The Baseline Growth Scenario is highlighted.

Table 3.4:Total growth rates, all scenarios, 2018 - 2030

	RoRo	**LoLo**	**Dry and Break Bulk**	**Liquid Bulk**
Low Growth	31.8%	44.7%	27.8%	20.3%
Baseline Growth	32.7%	48.0%	31.3%	20.3%
High Growth	35.8%	59.4%	43.3%	20.3%

Source: EY Analysis

This forecast was undertaken independently of the forecasts which have been undertaken by the ports themselves. The comparison between these forecasts and the port forecasts is shown in **Table 3.5** below.

Table 3.5: Total Growth rates, all scenarios, 2018 - 2030

	RoRo	**LoLo**	**Dry & Break Bulk**	**Liquid Bulk**
Cork	0%	40%	16%	0%
Dublin	62%	43%	24%	0%
Shannon Foynes	-	-	11%	189%
Waterford	-	159%	56%	-
EY	33%	48%	31%	20%

Source: Individual ports

This is based on the information provided by the ports in a questionnaire sent out as part of the data gathering exercise for this report. The forecasts produced in this report are for the most part, more cautious than the forecasts produced by certain ports.

It is noted that the forecasts provided in this forecast for RoRo and LoLo would suggest lower growth than has been observed over the last few years. They also suggest that LoLo will grow faster than RoRo despite RoRo growing faster in the last few years. This is because they are based on an assessment of 20 years of data and as such consider the economic boom leading up to 2008.

As can be seen in **Figure 3.19** which represents 17 of the 20 years of data, during the first period leading up to 2008, LoLo grew faster and was more responsive to changes in economic factors than RoRo appears to have been.

[30] As modelling showed that economic growth did not appear to be having a major impact on liquid bulk, the total growth rates do not change under the different scenarios.

This forecast therefore assumes that these long-term trends will re-exert themselves over the assessment period.

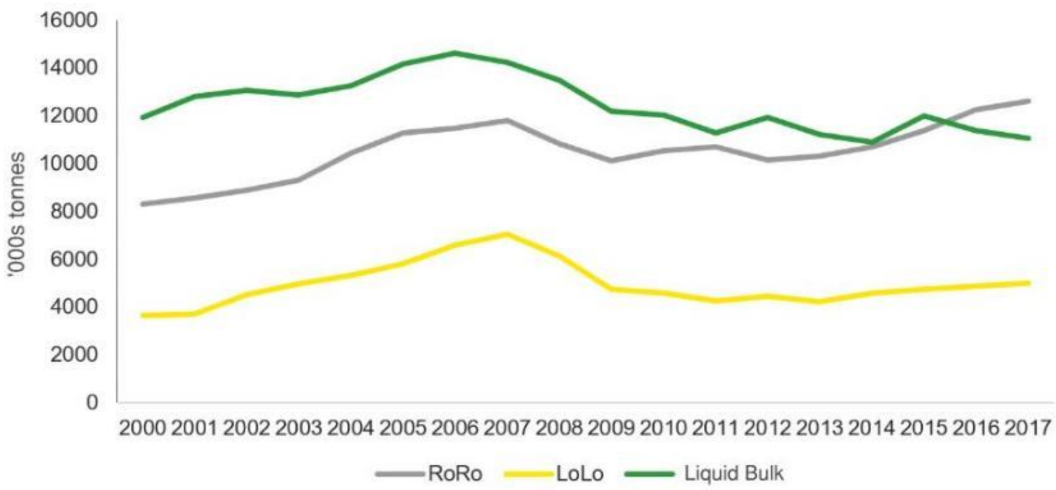


Figure 3.19: RoRo, LoLo and Liquid Bulk, Imports, 2000 – 2017 (Source: Eurostat)

Another area of considerable difference between our forecasts and the port forecasts is around Liquid Bulk imports. These are primarily fuel imports and have been in decline over the last few years.

As previously noted in **Section 3.2.1** the forecast model in this report assumes the volume of cargo traffic required is driven by demand in the local economy and is based on cargo shares across the ports remaining constant at 2017 shares. However, significant changes to Ireland's dependency on fuel imports are expected in the coming years and this will likely impact the volume of liquid bulk that requires transport and storage.

The Climate Action and Low Carbon Development (Amendment) Bill 2021[31] published in March 2021, commits Ireland to net zero emissions by 2050 with an overall interim target of a 51% reduction in CO2 emissions by 2030 relative to a baseline of 2018. Although specific sector budgets are not available at the time of writing of this report, it can be assumed that for this to be achieved, there will need to be a radical shift in behaviour and consumption of energy across Ireland, leading to a significant impact on the volume of liquid bulks required.

In lieu of sufficient information on emissions budgets and sector specific targets, some assumptions can be made, in particular in accordance with the Government's commitment to ban the sale of all new petrol and diesel vehicles by 2030.

In 2018, oil accounted for 73% of total imports[32], driven mainly by transport demands and as such a reduction in Internal Combustion Engine (ICE) vehicle uptake driven by a limitation on vehicle sales will likely reduce bulk liquid demand accordingly.

[31] Climate Action and Low Carbon Development (Amendment) Bill 2021, Houses of the Oireachtas
[32] Energy Security in Ireland 2020 Report, Sustainable Energy Authority of Ireland

While the growth forecasts in the modelling are based on population growth, the expected increase in overall consumption should be offset on a per-capita basis by decreasing demand over the longer term for oil due to the growth of electric and alternative fueled vehicles[33].

The impact of the transition away from fossil fuel consumption and the use of ICE vehicles, both from government policy and from market drivers, is considered in further depth in **Section 7.2.**

Liquid bulk fuels also currently play a significant role in domestic heating in Ireland. As noted by the SEAI in their Energy Security in Ireland 2020 Report[34], Ireland's energy import dependency was 67% in 2018, down from an average of 89% between 2001 and 2015. While this this reduction was mostly due to the production of gas from the Corrib field, the increasing use of indigenous renewable energy has also already played a role.

In 2019, the International Energy Agency's (IEA) in-depth review (IDR)[35] noted that Ireland has successfully advanced the transformation of its energy over the course of the last decade, with now the third-highest share of wind in electricity generation of all IEA member countries in 2017. This ever-increasing reliance on domestic and renewable sources of energy is likely to continue.

Looking to 2030, the SEAI[36] also noted that further significant displacement of imported oil and gas with energy efficiency and indigenous renewable supplies will lead to an increase in Ireland's self-sufficiency, with a decreasing need for liquid bulk imports.

Therefore, it is expected that the further actions contained in the Climate Action Plan, in addition to the commitments made in the Climate Action and Low Carbon Development (Amendment) Act 2021, will result in a further decrease in demand for liquid bulk in the period up to 2040.

This differs from the projections envisaged by the individual ports in their replies to the questionnaire sent out in 2018 (refer to **Table 3.5**); however, there has been a significant shift in the approach from both the Irish government and international community in the period since then.

For the purpose of the capacity assessment in this report, the growth rates for Liquid Bulk as outlined in **Table 3.4** are utilized as it is considered they reflect the highest level of growth anticipated and leads to a conservative assessment of capacity for the cargo type, albeit for the reasons outlined above it is more realistic to assume that despite economic and population predictions for the period up to 2040, liquid bulk requirements will remain constant, or more likely continue to fall, in line with Ireland's national and international commitments.

[33] It is still worth noting that it will take some time before this results in a substantial decrease in need for such fuel for private vehicles. In 2020 only 7.4% of new passenger sales were Electric Vehicles, compared with 74.8% in Norway and 18.1% in Finland. Given the current slow pace of migration to EVs, even in the years after 2030, the majority of cars on the road will probably still be powered by fossil fuels, as the average lifespan of a private vehicle is 14 years. So while a shift in demand will commence in the coming years, it will be some time before the demand decreases dramatically.

[34] Energy Security in Ireland 2020 Report, Sustainable Energy Authority of Ireland

[35] Energy Policies of IEA Countries – Ireland, 2019 Review, Executive Summary, International Energy Agency

[36] Energy Security in Ireland 2020 Report, Sustainable Energy Authority of Ireland

3.5 Conclusions

The evidence presented in this Chapter shows that there is a strong link between economic variables, in particular GDP (and, by proxy, private consumption), and trade volumes. The economy appears to be acting as a magnet for goods and the ports ensure that this demand is met. The graphs below show the maximum volumes which could be reached by 2040 by cargo type.

The High Growth Scenario highlights the earliest point by which developments in the ports will be required. All other scenarios would lead to lower overall volume, and therefore capacity forecasts.

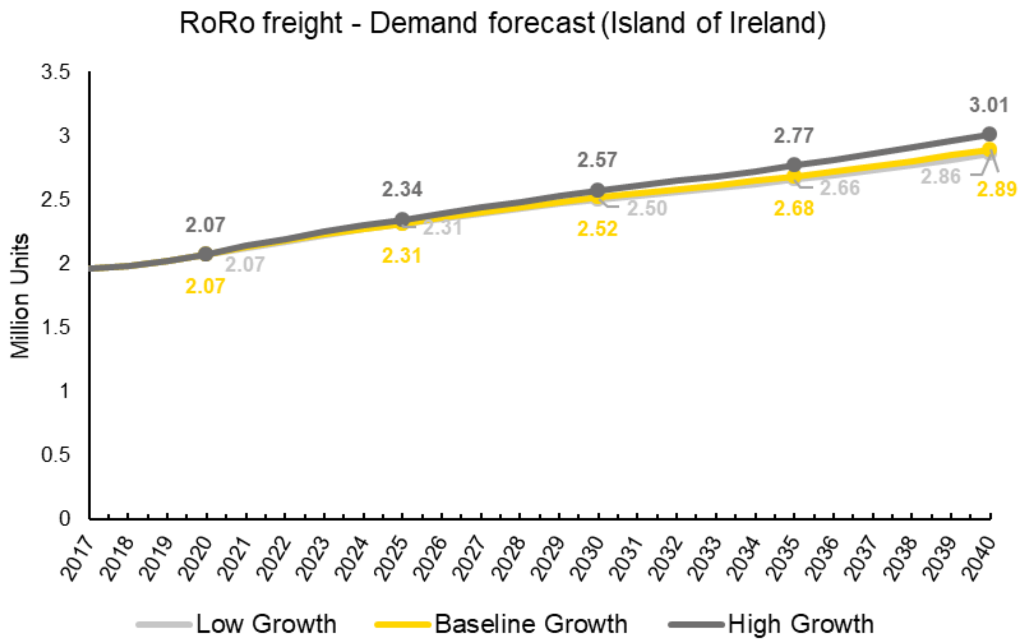


Figure 3.20. RoRo Freight, Ireland and Northern Ireland (Source: EY Analysis)

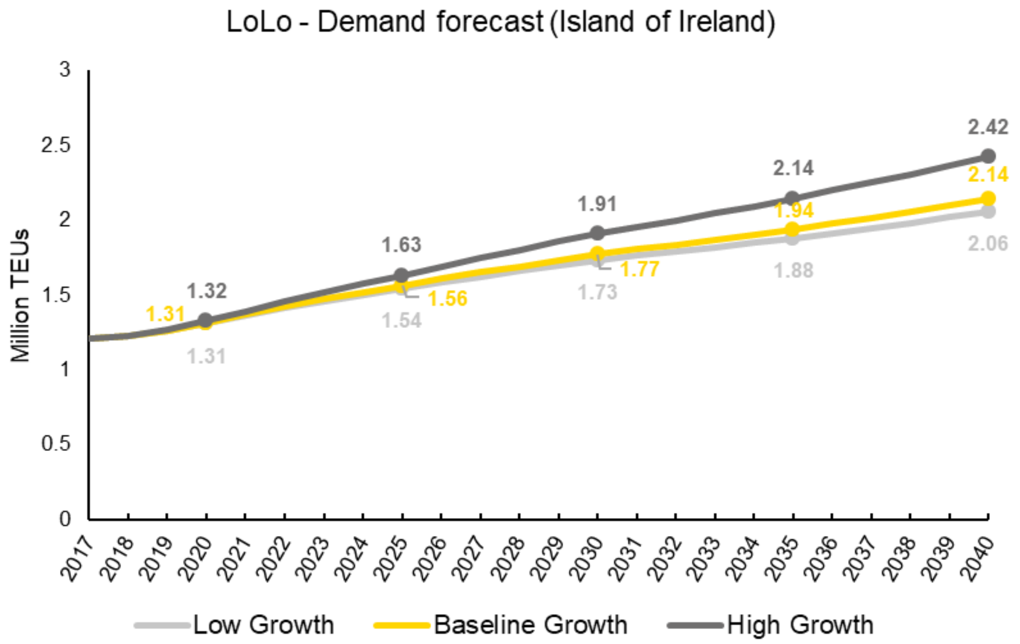


Figure 3.21: Lolo Total, Ireland and Northern Ireland (Source: EY Analysis)

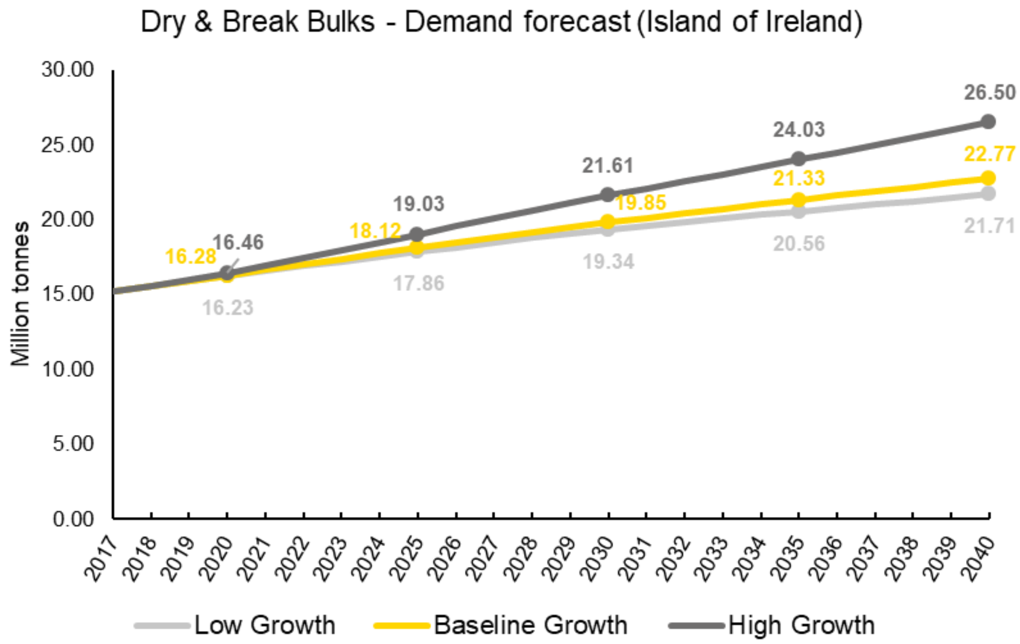


Figure 3.22: Dry & Break Bulk Total, Ireland and Northern Ireland (Source: EY Analysis)

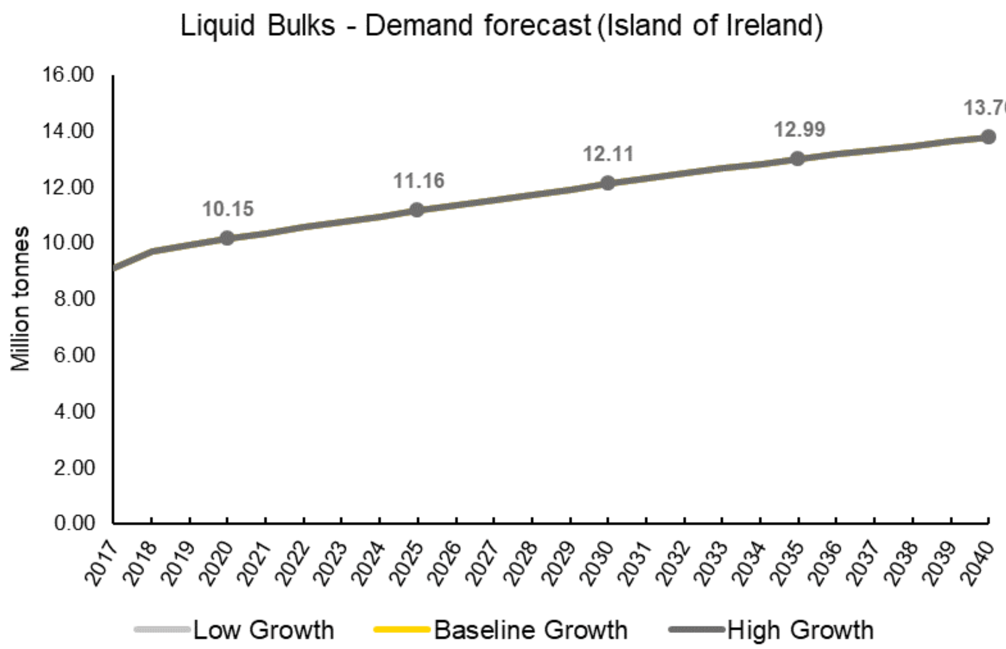


Figure 3.23: Liquid Bulk Total, Ireland and Northern Ireland (Source: EY Analysis)

*Note: Figures include some smaller ports not included as part of the study

Table 3.6 shows the 2040 forecast per mode per port in the High Growth Scenario. As noted in **Section 3.2**, the port shares are kept constant in the model throughout this period.

Table 3.6: 2040 forecasted demand per port - High Growth Scenario

	RoRo-freight (000's units)	LoLo (000's TEU's)	Dry & Break Bulk (000's tonnes)	Liquid Bulk (000's tonnes)	Trade cars (000's units)	Passenger cars (000's units)
Dublin Port	1,459	1,397	3,554	5,155	319	515
Port of Cork	6	446	2,623	2,994	105	26
Shannon Foynes	-	-	3,352	870	-	-
Rosslare-Europort	235	-	82	-	57	273
Port of Waterford	1	75	2,354	-	-	-
Drogheda Port	-	-	1,380	40	-	-
Galway Port	-	-	258	655	-	-
Belfast Harbour	762	444	12,676	2,724	-	-
Larne Port	313	-	39	5	-	-

	RoRo-freight (000's units)	LoLo (000's TEU's)	Dry & Break Bulk (000's tonnes)	Liquid Bulk (000's tonnes)	Trade cars (000's units)	Passenger cars (000's units)
Warrenpoint	233	61	1,544	-	-	-
	3,007	2,423	27,863	12,443	481	814

Table 3.7 and **Table 3.8** show the 2040 forecast per port in the Baseline and Low Growth Scenarios respectively.

Table 3.7: 2040 forecasted demand per port - Baseline Growth Scenario

	RoRo-freight (000's units)	LoLo (000's TEU's)	Dry & Break Bulk (000's tonnes)	Liquid Bulk (000's tonnes)	Trade cars (000's units)	Passenger cars (000's units)
Dublin Port	1,399	1,229	3,116	5,155	319	515
Port of Cork	5	400	2,150	2,994	105	26
Shannon Foynes	-	-	2,847	870	-	-
Rosslare-Europort	228	-	66	-	57	273
Port of Waterford	1	68	1,902	-	-	-
Drogheda Port	-	-	1,211	40	-	-
Galway Port	-	-	256	655	-	-
Belfast Harbour	733	324	11,102	2,724	-	-
Larne Port	301	-	35	5	-	-
Warrenpoint	224	51	1,434	-	-	-
	2,890	2,071	24,118	12,443	481	814

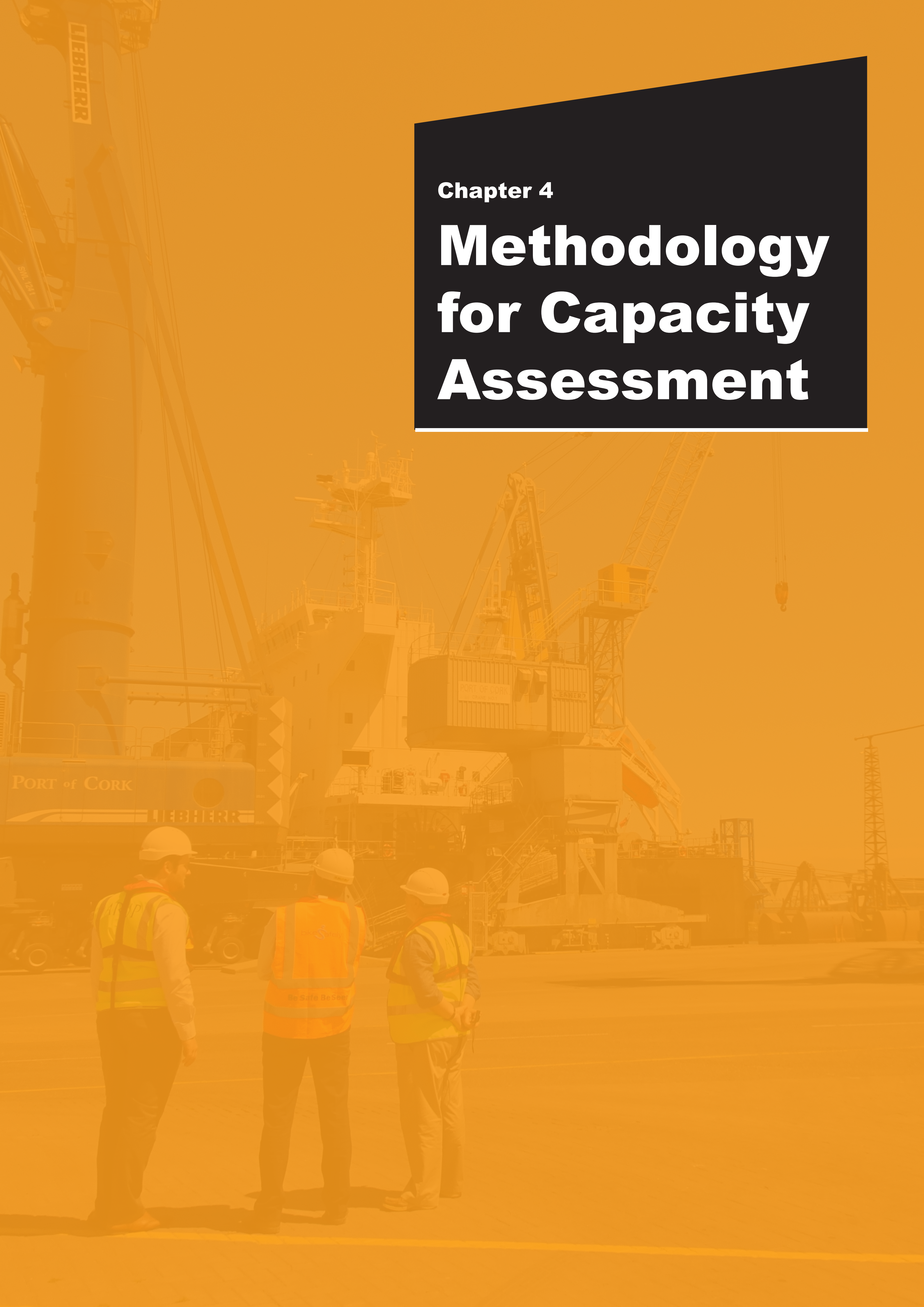
Table 3.8: 2040 forecasted demand per port - Low Growth Scenario

	RoRo-freight (000's units)	LoLo (000's TEU's)	Dry & Break Bulk (000's tonnes)	Liquid Bulk (000's tonnes)	Trade cars (000's units)	Passenger cars (000's units)
Dublin Port	1,382	1,181	2,990	5,155	319	515
Port of Cork	5	387	2,015	2,994	105	26
Shannon Foynes	-	-	2,703	870	-	-

	RoRo-freight (000's units)	**LoLo (000's TEU's)**	**Dry & Break Bulk (000's tonnes)**	**Liquid Bulk (000's tonnes)**	**Trade cars (000's units)**	**Passenger cars (000's units)**
Rosslare-Europort	226	-	61	-	57	273
Port of Waterford	1	65	1,773	-	-	-
Drogheda Port	-	-	1,162	40	-	-
Galway Port	-	-	255	655	-	-
Belfast Harbour	724	375	10,653	2,724	-	-
Larne Port	298	-	34	5	-	-
Warrenpoint	221	48	1,403	-	-	-
	2,857	2,057	23,048	12,443	481	814

Chapter 4

Methodology for Capacity Assessment



4 Methodology for Capacity Assessment

4.1 Introduction

The previous Chapters outlined the approach taken to forecast demand for the Irish ports, for all cargo types, until 2040. In this Chapter, **Section 4.2** outlines the methodology for the capacity assessments for the Irish Ports, the various subsystems for which the capacity is estimated and what issues (berth occupancy, parcel sizes, seasonality etc.) are considered as part of the capacity assessment. It also describes how this methodology will be adapted for various types of cargo.

The ports' capacity will be assessed for each of the four cargo types (as described in **Section 1.4** Overall Methodology):

- RoRo units/year
- LoLo TEUs/year
- Dry & Break Bulk tonnes/year
- Liquid Bulk tonnes/year

Section 4.3 describes how the capacity estimated is then compared to the forecasted demand for each cargo in each of the ports. The capacity assessments for each of the individual ports are prepared to determine whether the ports have sufficient spare capacity to accommodate this forecasted increase in demand up to 2040.

Aiming to assess the development of port capacity over time, the proposed development plans are reviewed and the additional capacity to be obtained from these developments is quantified and compared to the forecasted demand.

4.2 Methodology for capacity assessment

4.2.1 Data collection and consultation with the ports

The information used for the assessment was obtained from public sources (CSO, Eurostat), the Arup port capacity database, port site visits, consultation meetings and information provided by the ports in response to a questionnaire.

The initial task included a review of available reports, maps, statistics, websites and other related documents, as well as the preparation of a comprehensive summary to be used as the main data source for this analysis. This also included an in-depth analysis of the critical vessels for port operations for each facility.

A questionnaire was prepared and distributed to the ports to collect more detailed information.

For the Tier 1 and Tier 2 ports, the questionnaire was followed up with face to face meetings and site visits. Belfast Harbour was also visited as part of the study.

All 12 ports as listed in **Chapter 1** were sent the questionnaire but some of the smaller ports and Northern Ireland ports were unable to provide the information required for the capacity assessment.

For these ports, an assessment of the minimum capacity available was prepared based on publicly available information. They are dealt with separately in **Section 5.9**.

The documents and reports provided by the ports and their responses to the questionnaires were used for analysing the capacity of the port and its operational needs.

Also, some relevant and publicly available information was considered, including the most up-to-date data for the shipping industry and handling equipment. A list of documents used is shown in **Appendix 10**.

As part of the study, the ports' masterplans were reviewed and discussed with the ports during the consultations. The masterplans typically have useful information on where the port consider development is required and what the port's constraints are. These masterplans were used to assess the additional capacity that could be achieved by the ports if these developments were implemented. It is noted that some masterplans have been more recently revised than others.

4.2.2 Capacity definition

This Section describes how the capacity for each of the ports and each of the cargo types was calculated.

For each port there are four operational subsystems to consider:

1. **Nautical**: from navigation access to berth
2. **Quay**: from quay edge to the storage
3. **Storage**: container stacking yard / silos for dry bulk / tanks for liquids etc.
4. **Hinterland connectivity**: dispatch to the hinterland by land transport modes (road and rail).

The capacity is constrained by the minimum capacity of all the subsystems.

4.2.3 Capacity assessment

Introduction

The capacity of the whole port system was assessed as shown in the flowchart in **Figure 4.1**.

The capacity of each component was estimated by considering the main subsystems as described under **Section 4.2.2**.

Nautical: The complete sequence of nautical operations to be performed by the design vessels from the arrival at port up to when they can commence discharge/ loading was considered for the assessment.

The assessment considered the main met-ocean constraints such as tidal windows as well as a review of the berth availability.

Berth/Quay: The throughput during unloading or loading operations was assessed by considering the berthing length and its configuration, the characteristics of the different design vessels, as well as the capacity of the different quay handling equipment and operational systems.

Storage: The available storage areas and facilities such as vertical storage and tanks were reviewed. The capacity of each of the different sections of the stacking yard and storage facilities were checked and any segmentation defined. Different operational systems, including the most common for each type of traffic, were considered for this analysis, including, as an alternative, changes to the systems during the lifecycle of the terminal. A separate analysis was performed for each type of traffic before combining these into a single figure.

Hinterland connectivity: Constraints in the hinterland connectivity were identified.

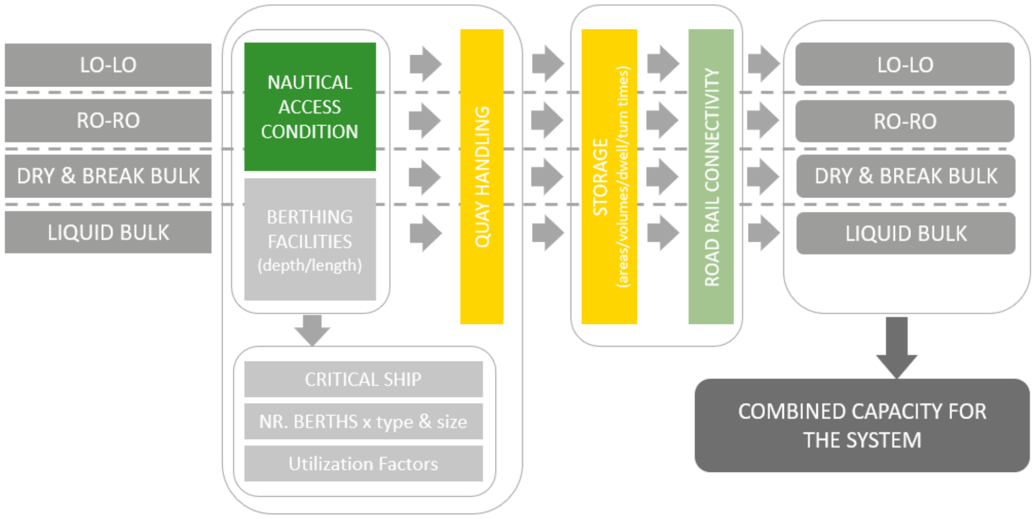


Figure 4.1: Capacity assessment flowchart

Specific indicators benchmarked from the Arup marine terminal database[37] were used to evaluate the throughput rates of the different subsystems.

The integration of all subsystems allowed for the identification of potential bottlenecks, and poor, insufficient or unnecessary investments at any point on the chain.

Seasonality is a critical factor for most cargo types, which has been taken into account by considering ‘peak factors’ each time. When the data obtained from the ports was insufficient (e.g.: provided on a ‘quarter by quarter’ basis), assumptions were made based on expert advice from within Arup globally.

[37] Information about the Arup marine terminal database is included in Appendix 12

Where relevant, operational efficiencies that could lead to capacity increases were identified.

Capacity calculations

The capacity assessment performed for this study aims to obtain the practical or *effective capacity*. This indicates the maximum throughput that can be achieved at a quality of service acceptable to most customers, for instance by incorporating a general tolerable level of congestion.

In order to obtain the *effective capacity* figure, various methodologies are used. There is not one single capacity estimation calculation that can be applied to all ports and all cargo types. The outcome is also not an exact figure; the result is within a range of accuracy depending on the quality and quantity of data obtained for the analysis.

As outlined in **Section 4.2.2**, a port has consecutive operational sub-systems which need to be assessed separately. The capacity is constrained by the minimum capacity of all the subsystems. The two main sub-systems are the berth/quay and the storage. The other sub-systems are assessed in a qualitative way, to identify if there are bottlenecks, in which case they would require a more detailed analysis.

The combined berth and quay handling capacity is generally calculated separately for each cargo type by multiplying the berth occupancy rate, number of Ship to Shore (STS) cranes and its relevant productivity rate (measured in units or tonnes handled in units of time), and the effective time at berth. Berth occupancy indicates the degree of utilization of available berths. See **Section 4.2.4**.

$$\text{Combined berth and quay handling capacity} = \text{Berth occupancy rate} \times \text{Number of STS cranes} \times \text{Crane productivity} \times \text{Yearly working hours}$$

Port storage facilities are used for receiving, storing and handling all cargo passing through the port. Storage of goods over a long period is not considered as part of this study. The facilities considered were those located within the port boundaries. The main factors to consider for the capacity assessment of the storage facilities are the type of cargo and the handling systems (mainly their productivity rates). Every type of storage (container yard, silo, warehouse) has its own physical capacity, usually expressed in number of units, tonnes, volume, or TEUs.

The **storage capacity** is generally calculated for each cargo type (RoRo, LoLo, Dry & Break Bulk, Liquid Bulk) separately by dividing the storage area or volume by the product of the mean dwell time and the peak factor. Dwell time refers to the time cargo spends within the port or its extension. The peak factor is a figure to measure the seasonality. Seasonality is a characteristic of a time series in which the data experiences regular and predictable changes that happen recurrently every year. Some traffic has little sensitivity to seasonality (e.g.: minerals). Consumption can also influence this factor for some products.

For instance, increased traffic to facilitate demand for goods leading up to the Christmas period and summertime is the peak season for cruise traffic.

$$Storage\ capacity = \frac{Storage\ area}{mean\ dwell\ time \times peaking\ factor}$$

Capacity assessment methodology in detail

The main steps followed in this study to obtain the capacity are:

1. Data collection from the answers to questionnaires issued to the ports and publicly available information
2. Processing and organising the following data:
   - Historical performance (throughput for each type of cargo per year, occupancy rates, seasonality).
   - Commodities handled, split per type of cargo.
   - Port layout, area size and area use, split by cargo or user.
   - Technical characteristics of the port (maximum vessel size, berths assigned to each type of cargo, STS handling equipment, storage facilities).
   - Vessels operating at the port (number per year, size distribution).
   - Port availability (working hours, delay statistics).
3. Calculation of parcel size (if required). See clarification in **Section 4.2.4**.
4. Overview of nautical access operations (met-ocean data), and identification of critical constraints (if any).
5. Analysis of berthing subsystem (assigning cargo per berth, for each type of cargo: identifying sharing patterns, estimating handling rates, verification of berth occupancy rates for each berth).
6. Analysis of storage subsystem per type of cargo (capacity based on dwell time and turnaround times, or inverse calculation to verify if figures are aligned with expected values and consistent with throughput).
7. Overview of gates connecting with hinterland, and identification of critical constraints (if any).
8. Establish capacity for the current scenario (per type of cargo), after performing calibration.
9. Calculation of main KPI’s (quay productivity and land utilisation).
10. Replicate steps for the “Imminent” and “Potential” scenarios, adjusting all input data relevant to the development plans.

In order to obtain a result consistent with reality the following two tools are used in addition to the KPI benchmarking and calibration described above.

Benchmarking during the capacity assessment

Benchmarking is defined as a continuous process of evaluation of products, services, and practices with respect to others (e.g.: strongest competitors or enterprises recognized as leaders). It can be used for assessing the competitive situation of units or even complete systems.

There are multiple aims to benchmarking. Within the port industry it is used to seek performance improvements. It is necessary to differentiate between functional and generic benchmarking, both applied in this study:

- Functional benchmarking is focused on operational performance; it looks for best practice in comparable facilities. It has been applied to appraise the performance of the Irish ports compared with other ports similar in size, traffic split, location, etc.
- Generic benchmarking not only encompasses a larger and broader scope, it also makes comparisons against the best processes around regardless of similarities. It has been applied for checking if the data is realistic, or for complementing it.

In ports, as in other industries, the reference parameters on which the benchmarking exercise is based are the key performance indicators (KPI). A KPI could measure a certain output in relation to a certain input (both real values) and an indicator could either focus on a broad picture per port or be specific for a specific type of terminal (e.g., container terminal). For this study two KPI’s have been chosen as the key parameters to assess capacity, as well as to compare performance within the industry. The two main sub-systems are Quay and Storage so the indicators used are chosen to match these: quay productivity and land utilisation which were measured as follows:

- Throughput per length of quay per year (t/m/y; TEUs/m/y; units/berth/y)
- Throughput per port gross area per year (t/ha/y; TEUs/ha/y; units/ha/y)

These two KPIs are widely recognized by the industry as the main method to measure productivity for each of the sub-systems under consideration.

One of the sources of information for the benchmarking figures is the Arup Marine Terminal database. This database includes intelligence gained from many projects and due diligence assignments performed globally. Most of these projects are confidential and therefore specific data per port cannot be disclosed. For further details see **Appendix 12**.

It is also possible to obtain figures from research papers, as well as from analysis carried out by Arup on publicly available information. There are however some constraints regarding the collection of such data:

- Some ports and most of the specialised terminals do not publish the breakdown of throughput data.
- Operators are reluctant to share data that enables productivity benchmarking with third parties.

- Ports are, in many cases, not convinced of the value of a collective indicator (related to productivity) development effort (as intended by some organisations like IAPH, ESPO, AAPA, etc.), thus the number of ports that provide this data are limited.

A separate section about benchmarking is provided in **Chapter 5** for each port directly after the capacity assessment.

Calibration with historical throughput

The historical throughput is used to calibrate the initial model which is used to estimate the current capacity. Calibration is a trial-and-error iterative process impacting a number of variables included in the calculation. It is for instance not logical to have the historical throughput exceeding the calculated capacity. This could be the case due to historical changes in the port infrastructure, but if there were no changes then the capacity obtained should be reviewed.

To estimate the capacity for the expanded (imminent and potential) scenarios, the calculations should be based on the calibrated present (current) scenario.

Some variables can (or should) be improved before applying them to future scenarios considering technological evolution, a better performance due to economies of scale, or other operational improvements.

The more years that are covered by the port's records, and the more the year to year throughput can be associated with the facilities extension and equipment improvements, the better the capacity estimation will be. It is also important not to only look at the evolution of the total capacity figure, but to also look at each specialized cargo type with special consideration of the shifts from one type to another, even if the total figure remains stable.

In this study, this has been a key element in order to understand how the ports operate and to explain how they have reached the present configuration and performance, as well as helping to understand some of the reasons for their future expansion plans.

Productivity increase

An increase in capacity can also be achieved through an increase in productivity. Ports and port terminals are under continuous pressure to perform better. Every single stage of the supply chain is under pressure financially and that obliges everyone to increase productivity at each subsystem. Poor productivity is not accepted on terminals that want to retain a long-term position in the market.

The improvement of productivity of ports and maritime terminals can be achieved by:

- Increased vessel sizes. Vessel capacity has increased more than 3 times since the 80's, and this growth continues for each market segment and traffic type. With the increase in volume and capacity from the carrier's side, terminals need to keep up with these volume increases by performing better.

- Another factor is the economy of scale gains obtained from bigger terminals. Each time a terminal increases its size significantly, the productivity rates can be improved. Looking at different terminals worldwide it is easily understood how productivity increases with size.
- Technological changes are another big source of productivity gain; especially in relation to quay and storage handling equipment. For example, automation increases the productivity and reduces the vessel turnaround time. Terminals are investing millions of dollars in terminal operating systems to make the process as efficient as possible, with gains in terms of capacity and efficiency.
- Facilitation of the commercial and customs procedures has contributed significantly to improve productivity at ports. All activities linked to any type of control, including security, impact negatively on productivity. Within the EU, the reduction of border controls has been one of the pillars of its success.

Capacity increase by productivity increase is generally difficult to quantify but where opportunities do exist, they have been identified for the individual ports.

4.2.4 Issues considered whilst assessing the capacity of the Irish ports

Introduction

When performing the capacity assessment for a series of ports, an adjustment of the methodology must be made for each port. Because of the differences in size, throughput, configuration, traffic handled, location etc., the capacity needs to be analysed on a “case by case” basis. Below are some of the considerations that were considered when carrying out the capacity assessments for each of the Irish ports.

Mix of cargo modes

Each of the ports included in this study operate with a different mix of cargo types and each of these cargo types has its own circumstances which require adjustments to the capacity assessment approach. **Section 4.2.5** provides information on the different assessment methods for the different cargo types. The main cargo types per port are shown in Table 4.1.

Table 4.1: Different cargo types handled in Irish ports

	RoRo	Container (LoLo)	Dry & Break Bulk	Liquid Bulk
Dublin Port	✓	✓	✓	✓
Port of Cork	✓	✓	✓	✓
Shannon Foynes		✓ (In 2040)	✓	✓
Port of Waterford		✓	✓	
Rosslare Europort	✓			
Drogheda Port			✓	
Port of Galway			✓	✓

Availability and consistency of data

A questionnaire was circulated to the ports to obtain their certified data as an input for the capacity assessment. The answers provided by each of the ports to the questionnaire varied significantly. Some were incomplete or contained inconsistencies. The first task for each set of incoming data from the ports was therefore to compare it to the publicly available information (e.g., the CSO), in order to fill in the gaps. In some cases, the required figures have been assumed based on our experience from similar ports, or from relevant research studies publicly available.

Berth occupancy

Berth occupancy indicates the degree of utilization of available berths. It is defined and calculated as the total time of vessels at berth divided by the total time a berth is available, for a stipulated period (usually a year). The berth occupancy could also be based on ship length, in that case, the time at berth is adjusted by a factor based on ship length and berth length.

The acceptable level of berth occupancy is typically based on maintaining an average ratio of waiting time to service time. Acceptable berth occupancy figures vary depending on the number of berths available in the terminal as well as the type of terminal. Values recommended are based on the queuing theory and have been applied accordingly for each capacity assessment performed for this study.

The analysis considered that some berths are only available for a specific type of traffic (e.g.: RoRo, container, liquid bulk). RoRo, Ro-Pax, and Cruise vessels generally have scheduled services, and a berth assigned exclusively to each. In these cases, the queue theory does not apply.

Sharing facilities for different types of cargo

One typical circumstance found in Irish ports which required an adjustment of the methodology on a “case by case” basis was the fact that different types of traffic is often sharing common facilities. There is only a limited number of specialised terminals, dedicated exclusively to a single type of cargo. In many cases two, three or even four different types of cargo are handled at the same berth.

In the case of RoRo, there is in most cases a mix of containers, trailers loaded conventionally, imported automobiles, and passenger vehicles.

For those cases where one (or more) berth(s) operate with different cargoes the methodology applied was to distribute the turnaround time (time at berth) to each of the cargoes. This was done proportionally to the total service (operational) time assumed as required in the year (considering total volume handled per year and handling rates), and then assigning a percentage, of the time per year, to each.

An analysis of the time a ship spends at a port is shown in the following **Figure 4.2**.

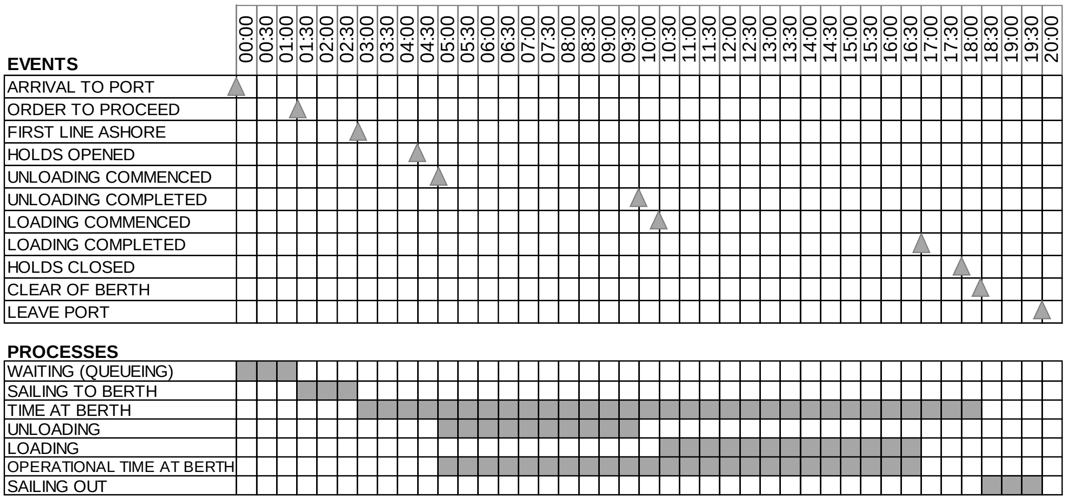


Figure 4.2: Berthing time analysis

Parcel sizes

Another particularity common to many of the Irish ports is the fact that the vessels are not fully unloaded and/or loaded in a single port.

Therefore, in most cases the parcel size has been considered instead of the DWT[38] (or capacity) of the vessels. A parcel is an individual consignment of cargo for shipment. Its size depends on the product, the market requirements, the route, the type of service, the location of the port, the scale of the port, the end of route etc.

In the case of charters for single routes (origin – destination) and single products, the parcel size is usually the same as the vessel's DWT. For this study the required data needed to be collected, sometimes from different sources, in order to obtain the parcel size. This was mainly done by combining the quantity of cargo carried with the number of vessels, as shown in **Table 4.2**.

Table 4.2: Analysis of parcel sizes

Port	Total goods handled (tonnes)			Number of vessel arrivals			Parcel size (t)		
	Liquid Bulk	Dry Bulk	Lo-Lo	Liquid Bulk	Dry Bulk	Lo-Lo	Liquid Bulk	Dry Bulk	Lo-Lo
Bantry Bay	846,000			20			42300		
Cork	5,548,000	1,499,000	1,724,000	347	270	305	15,988	5,552	5,652
Drogheda	33,000	987,000		24	11		1375	89727	
Dublin	4,285,000	2,034,000	5,332,000	470	44	834	9,117	46,227	6,393
Galway	452,000	92,000		119	52		3798	1769	
Greenore		567,000			76			7,461	
Kinsale		15,000			5			3000	
New Ross	10,000	335,000			115			2,913	
Shannon Foynes	1,037,000	9,966,000		74	164		14014	60768	
Sligo		13,000			9			1,444	
Waterford		1,212,000	291,000			101			2881

Seasonality

Most Irish ports did not provide information on seasonality or broken-down figures per month, so seasonality could not be assessed from the ports' figures.

[38] DWT: Dead Weight Tonnage

Therefore, data obtained from different sources, such as the IMDO quarterly figures, was used to determine the peak factor for each port.

Dwell time

Dwell time refers to the time cargo spends within the port or its extension. It also refers to the efficiency of port/terminal operations. It mainly impacts on the storage capacity.

Dwell times can be influenced by many factors, some of which are unrelated to the service quality, like commercial stocks. For bulk cargo the turn ratio (times per year that the storage facility is filled and unfilled) is most often considered.

Information on dwell times was very scarce for this study and, when unavailable from the ports, a figure has been adopted on a case-by-case basis from our experience and benchmarking. Where possible dwell times were back calculated from throughputs to aid this process.

Figure 4.3 shows an example of dwell times for containers at different ports all around the world (excluding empties, reefers, transshipment). It provides an insight into how dwell times could change from port to port.

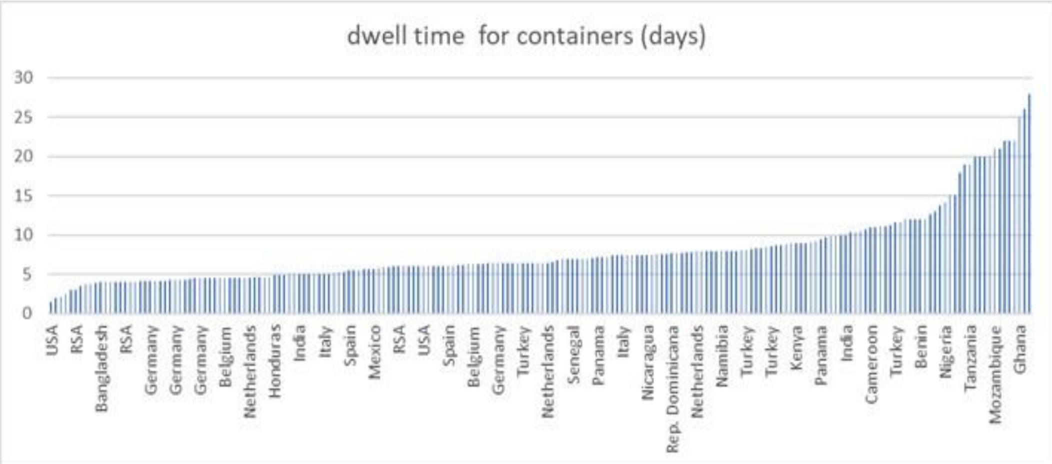


Figure 4.3: Dwell time for containers (days) (Source: Confidential study for African Development Bank)

Dwell time for containers also varies for each type of container and cargo (full, empty, import, export, transhipment, reefers, etc.), as well as from year to year.

4.2.5 Specific assessment methodologies for different cargo types

Introduction

The generic methodology described in this Chapter, including the main subsystems, applies to all cargo types, but it needs to be adapted for the specific circumstances of each cargo type.

The units for capacity (even if they can eventually all be converted to tonnes) are different for containers (TEUs), and for RoRo (units) than for the other types of traffic (tonnes). Secondly, the method of storage is different for each cargo type. Some cargo storage is on surface and measured in square metres and other cargo storage is in tanks and measured in cubic metres.

Hereafter follows a brief presentation of the main components to be considered while assessing the capacity for each type of cargo:

LoLo (Containers)

For assessing the capacity of facilities handling container boxes, the following should be considered (among others): size of container vessels, STS handling rate, storage yard area and handling equipment available, number of gates. The capacity is expressed in TEUs (twenty feet equivalent units), which could be transformed to tonnes applying a conversion factor.

One important piece of data required for the assessment is the TEU factor, which is obtained by dividing the number of TEUs by the number of boxes handled. It informs us about the number of moves based on TEUs which is important to assess the STS handling rate.

The TEU factor varies according to the location and year to year, as can be seen in **Figure 4.4**.

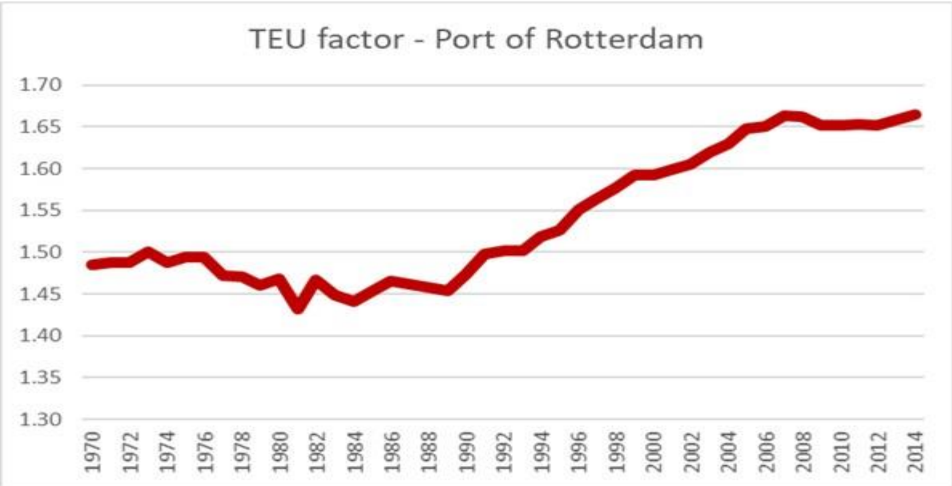


Figure 4.4: TEU factor variability in the Port of Rotterdam (Source: Arup)

RoRo

RoRo traffic includes many different types of traffic on a variety of vessels: RoRo Freight (trailers accompanied or unaccompanied), RoPax (a mix of trucks, trailers, and passenger vehicles, plus passengers traveling without car), and Car-carriers (trade vehicles and sometimes also second-hand vehicles).

On many Irish RoRo terminals all types of RoRo are brought in on the same vessel.

The RoRo capacity was, therefore, calculated based on available lane-meters and then split into different traffic types assuming the 2019 historical throughput split. The quantity of available lane-meters in terms of berth loading and yard storage was then compared to determine the limiting factor at the terminals

The RoRo capacity was, therefore, able to be expressed in number of units split by the main categories of vehicles (accompanied and unaccompanied trucks, passenger vehicles, trade vehicles imported and other vehicles) despite high levels of shared space.

The quay/berth capacity depends on the number of services, frequencies, and capacities of vessels. The loading/unloading rates for all vehicles depend on berth configuration as well as vessel sizes, characteristics, and capacities. For this specific traffic, the berthing length is not considered for the quay capacity because the operations are only performed through the ramps (with the exception of ConRo vessels). Therefore, the number of berths is considered, each with its maximal vessel size. For some ships with multiple ramps (e.g., car-carriers) the quay layout could also impose restrictions on some berths.

For RoRo Freight the storage could become critical. Therefore, the duration of stay of unaccompanied trucks (split in export and import) needs to be known.

The storage capacity of RoRo terminals is thus assessed considering:

- Typical dwell times for each category of vehicle
- Storage area, total and the area required per type of unit
- Average storage occupancy of yards or utilisation of marshalling lanes

As mentioned previously, the capacity is constrained by the minimum capacity of all the subsystems. In the case of RoRo when there is a mix of different types of traffic it may be that some types of traffic will not require storage, while for others storage could become the main constraint. For example: a RoPax vessel to Dublin Port and Rosslare Europort will deliver accompanied and unaccompanied trailers, as well as passenger vehicles. From that mix, only the unaccompanied trailers will usually stay at the terminal. All other traffic will just proceed to the hinterland after unloading. These unaccompanied trailers are unloaded and parked in the yard until a truck can pick it up. This will mean that during some days these unaccompanied trailers will be staying at the port. Their stay will be measured as the specific dwell time for this type of trade.

Dry Bulk

Dry bulk cargoes include products such as minerals, fertilizers, agribulks, scrap, etc.

For Dry Bulk, the factors to be considered are:

- The nature of the material flow (size of vessels, trains, trucks)
- The direction of the flows (imports or exports) is critical for this traffic because loading operations usually have a much better performance than unloading

- Seasonal considerations (quite significant for some types of products)
- Types of products, considering if the storage should be enclosed or not, and if they need to be segregated by type or by customer
- Transit/buffer storage or strategic requirement (turn ratios)

Break Bulk

Break bulk cargo is also defined as general cargo. This type of cargo is loaded onto ships as individual pieces, unitized on pallets or in bundles and is transported in whole or part shiploads. Break bulk includes many different types of cargoes (neobulks, conventional, project cargo, heavy lifts, machinery, timber, steel products, etc.). They are usually unloaded and loaded with cranes operating at the berth or by means of the vessels' own gear.

The STS handling rates are wide ranging, due to the differences from one type to another. Operations can be performed at berths where other traffic also operates.

Storage requirements vary a lot depending on the type of cargo; some could be stored in open air, others (like cellulosic and steel products) require specific buildings.

Liquid Bulk

Liquids handled as bulk in ports include a wide range of products, some of which are dangerous (e.g.: petrol and its derivates), while others require special conditions (e.g. alimentary).

Usually the berths for tankers cannot be used for other traffic, but there can be exceptions.

The berth handling rates depend on the pump rates.

The storage is usually in tanks and its capacity is related to the size of the design vessel.

4.2.6 Benchmarking

Looking at international benchmarking for ports, port productivity is improving worldwide. The charts included in **Figure 4.5** obtained for global international container operators show how in 8 years (2009 to 2017) the main KPIs have changed for this type of terminal.

Results obtained from Drewry - Global Container Terminal Operators 2010, 2015, and 2018, are shown by geographical area. It is evident that absolute values and trends vary significantly from one region to another. In the case of Europe, in the period considered the yearly average increase of quay productivity was 2.3% (TEUs per m of berth) and 1.9% in terms of quay crane productivity (TEUs per unit of STS crane). A further graph showing a decrease of -0.9% in terms of area productivity (TEUs per hectare of terminal area) is provided in **Appendix 7**.

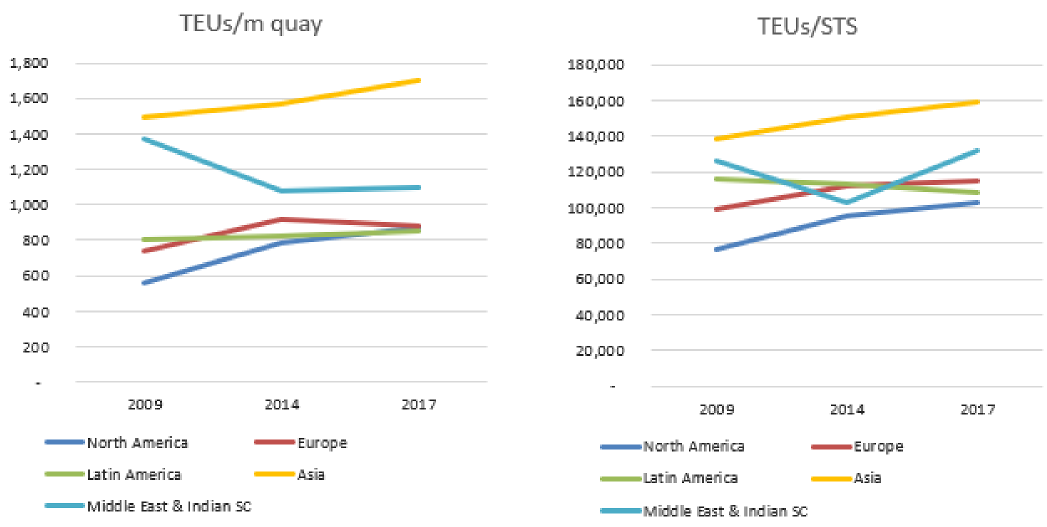


Figure 4.5: Container terminal KPI's from Drewry

For the Irish ports analysed as part of this study indicators for quay productivity (tonnes/year/metre quay) and the land utilisation (tonnes/year/hectare) for RoRo, LoLo and Dry & Break bulk have been calculated and are analysed as part of the calibration of our capacity assessment figures. In order to obtain these KPI's the total throughput for each port was calculated by converting the throughput for all cargo's in tonnes/year so they can be added up.

4.2.7 Hinterland connectivity

The capacity assessment has been carried out to the port boundary; however, the hinterland connectivity also has an impact on the capacity of some of the ports studied. Where this is the case, these connectivity constraints have been identified in the capacity assessment.

4.3 Methodology for demand versus capacity analysis

4.3.1 Capacity assessments

A detailed explanation of the methodology used for undertaking the port capacity assessments has been provided in the previous **Section 4.2**. This Section explains how the results of the capacity assessments are used for a demand versus capacity analysis and how this analysis is presented throughout the report.

The capacity assessments need to be carried out for the present day and for the planned developments over the next 20 years in order to see how the capacity will develop. The planned developments obtained from the ports' masterplans were therefore split into three categories depending on the predicted timescale of implementation. Where no masterplan was available, the information provided in the questionnaire and publicly available information were used. The three categories are:

- **Current capacity:** includes the current port infrastructural configuration including projects that are under construction
- **Imminent capacity:** includes expansion projects or developments that have received planning permission and financing and are in the process of being designed and constructed
- **Potential capacity:** includes potential expansion projects or developments in the longer term that are not yet formalised

The capacity assessments were carried out for these three categories. For example, all proposed RoRo developments in a port that have planning permission were combined into the 'Imminent capacity' category and the additional capacity obtained from these developments estimated.

In addition to the increased capacity available due to the infrastructure developments, the assessment of capacity also considers:

- The technology currently available and the technology that is anticipated and will result in a more efficient operation of the whole facility.
- Procedures for improving efficiency. For example, considering best practice implemented in the leading ports of continental Europe and the Far East.
- Investments in equipment and infrastructure. Implementing these where they are most profitable, considering the strengths and weakness of the whole system, and each of its components.

4.3.2 Demand versus Capacity

The output of the capacity assessments is plotted in a graph for each port and for each cargo type. The graph shows the forecasted demand up to 2040 and the current, imminent and potential capacity. An example graph is shown in **Figure 4.6**.

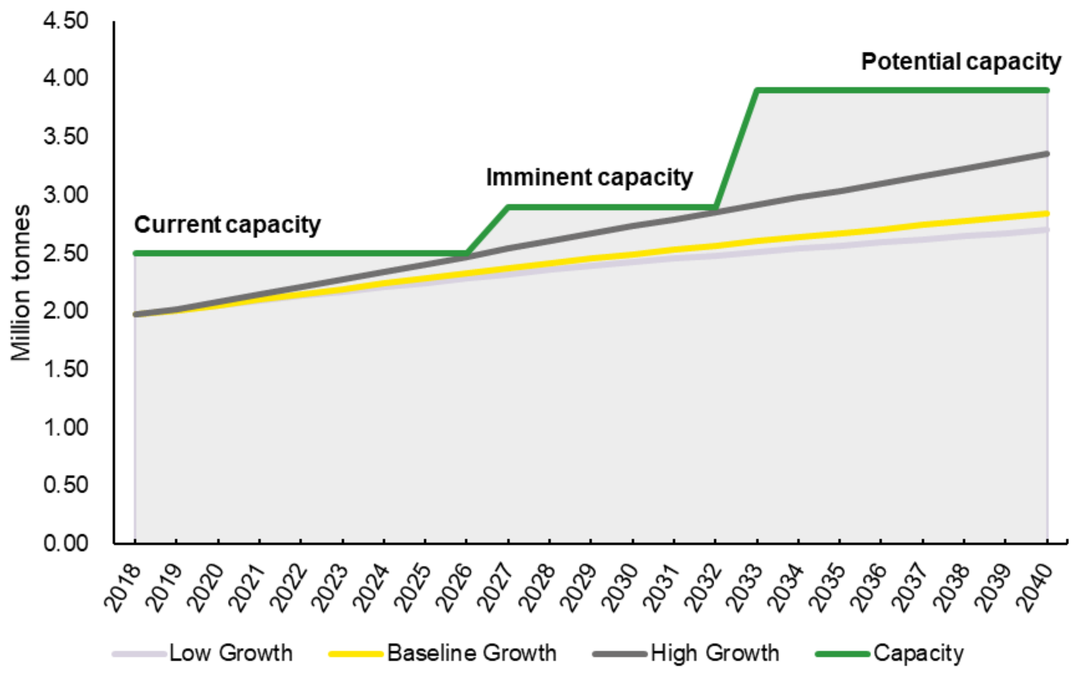


Figure 4.6: Example of Demand versus capacity graph

The dark grey, grey, and yellow lines on the graph represent the forecasted demand for this cargo type in this port, until 2040. Each of the lines represent a different growth rate as described in **Section 3.4.2**. The demand curves are forecasted from a starting point of the 2017 throughput which is taken from Eurostat. More information on the processing of the 2017 Eurostat data is outlined in **Appendix 2**.

The green line represents the current capacity with steps for the imminent and then for the potential capacity. The location of the step represents the point at which the forecasted demand (for the High Growth Scenario) reaches the capacity. At this point, the port requires additional capacity in order to accommodate the demand.

4.3.3 Proposed developments and lead-in times

The ports' proposed developments as outlined in their masterplans, will typically have different lead-in times depending on various factors. 'Lead-in time' refers to the period, prior to the development becoming open and operable, during which a series of stages in the project lifecycle need to be carried out. Such stages could include a feasibility study, scheme design and Environmental Impact Assessment (EIA), consenting, detailed design, tender, and construction. More detail on what these stages could entail is provided in **Appendix 6**. These lead-in times can vary by port and by individual development. In carrying out the capacity assessment of each port, an assessment was made for the lead-in time of each proposed development.

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	Lead-in time
		months						years
Current Capacity								
Imminent capacity	Expansion of drop trailer compound	0	1	0	5	3	9	**0.75**

Figure 4.7: Example of lead-in time calculation

The grey arrows in **Figure 4.8** represent the 'lead-in time'. The vertical grey dashed lines correspond to the time by which the project lifecycle must commence to ensure all aspects are completed in time for when the demand is forecasted to exceed the capacity.

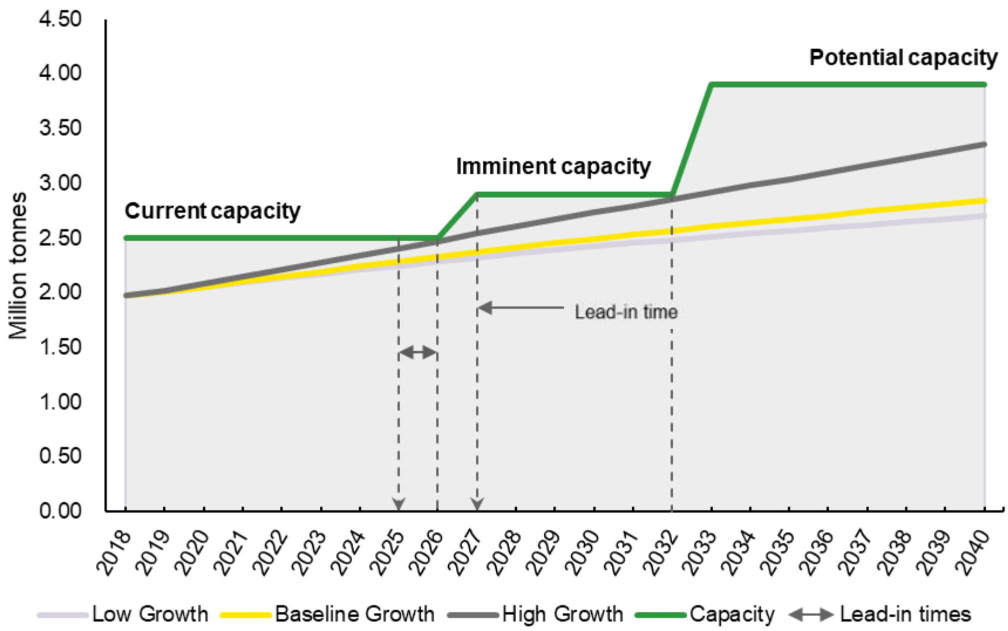


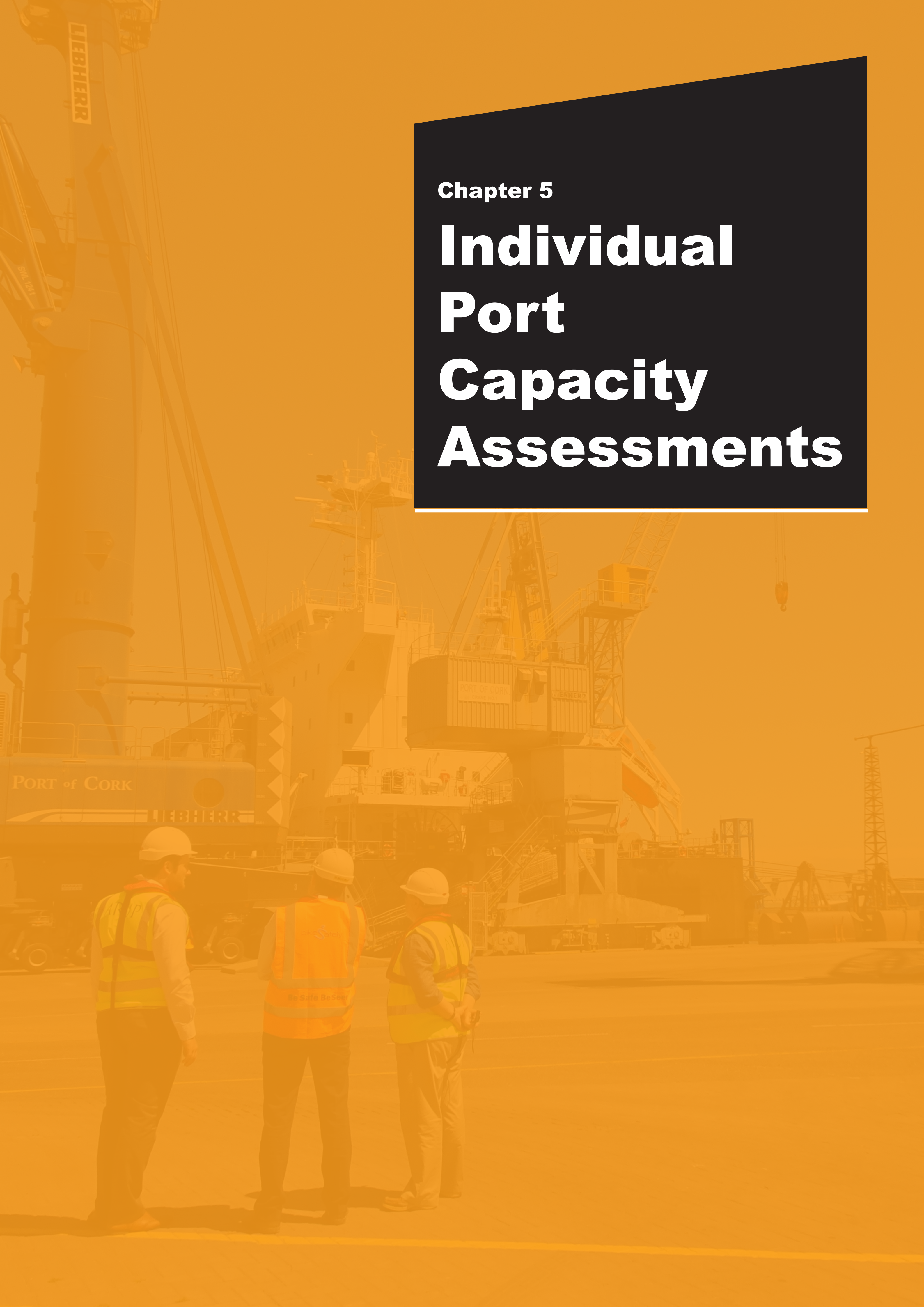
Figure 4.8: Demand versus capacity graph with lead-in times

4.4 Conclusion

This Chapter outlined the general methodology for the capacity assessments and explained what issues (berth occupancy, parcel sizes, seasonality etc.) are considered during the capacity assessment.

It also explained how this methodology will be adapted for the various types of cargos. In **Chapter 5**, this methodology will be used to calculate the capacity in each individual port for each of the types of cargo.

The use of the capacity assessment in a demand versus capacity analysis for each cargo in each of the ports was also explained. Graphs showing when the demand will exceed capacity were introduced as well as the methodology for determining the timelines for development of the capacity increases shown in the port's development plans.



Chapter 5

Individual Port Capacity Assessments

5 Individual Port Capacity Assessments

5.1 Introduction

In this Chapter, the capacity of each port is assessed individually as outlined in the flowchart below. A summary of the port's infrastructure and the cargo types that it handles is presented, followed by a review of the historical throughput. The proposed development plans for each port are assessed, followed by a summary of the capacity calculations for the current capacity, and the imminent and potential developments in the port. Where appropriate the results of the capacity assessment are then benchmarked against other similar facilities worldwide to understand the relative performance.

The total forecasted demand for the individual ports (see **Section 3.5**) were compared against the calculated effective capacity to identify which cargo types in the port are operating close to capacity and an assessment is made about when further capacity developments will be required. Large infrastructure development plans can have long lead-in times, so an assessment of when its project lifecycle should commence has also been provided.

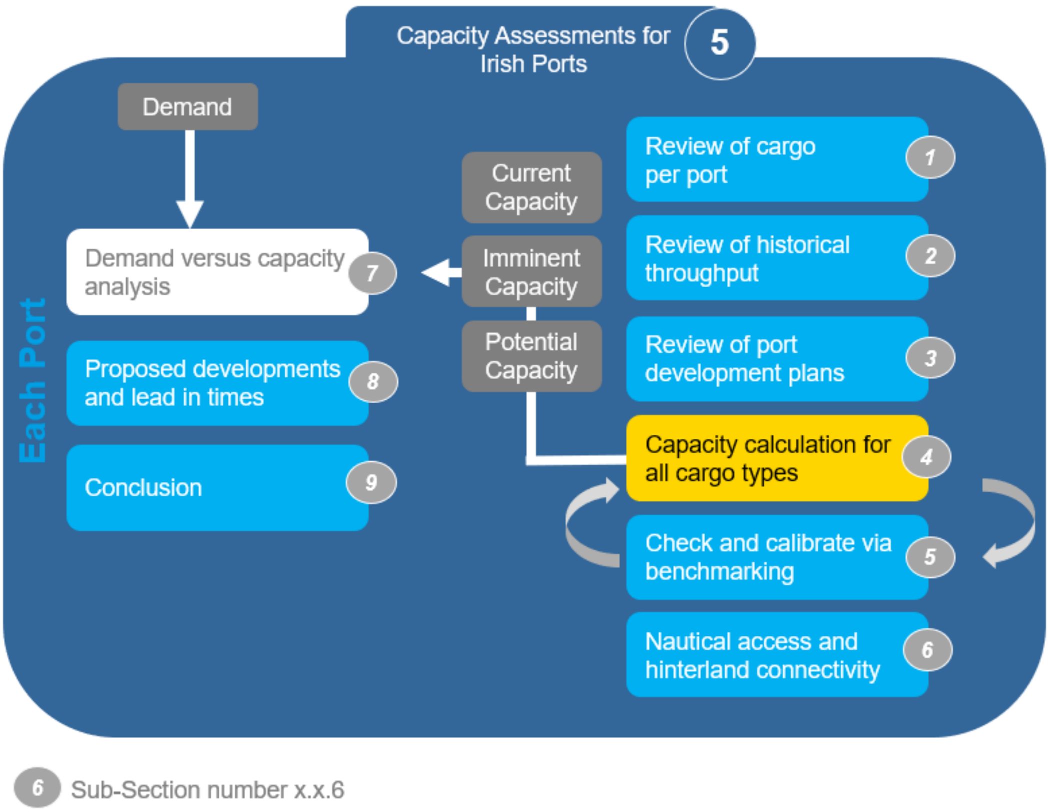


Figure 5.1: Flowchart for the individual port capacity assessments

This chapter assesses the individual port capacity development against a maximum growth scenario.

This indicates the earliest point at which development might be required at a port level and does not consider the capacity of the combined Irish Ports as a network as outlined in **Chapter 6**.

5.2 Dublin Port

5.2.1 Description of the port and cargo handled

General

Dublin Port is the largest freight and passenger port on the Island of Ireland with all cargo handling activities being carried out by private sector companies in an intensely competitive market within the port.

Dublin Port handles a significant proportion of cargo volumes for the Island of Ireland. In 2019 Dublin Port handled:

- 52% of the RoRo freight volumes (1st of Island of Ireland ports)
- 59% of the LoLo cargo (1st of Island of Ireland ports)
- 29% of the Liquid Bulk (2nd of Island of Ireland ports), and
- 8% of the Dry Bulk (3rd of Island of Ireland ports)

Dublin Port also handles ~1% of the Island of Ireland's Break bulk cargo ranking 12th out of 15 Irish and Northern Irish ports.

Dublin Port has grown over centuries by way of the continual canalisation of the River Liffey and infill into Dublin Bay with further potential to increase port capacity through future infrastructure expansion projects.

Characteristics of the main infrastructure and equipment

Dublin Port handles LoLo, RoRo, Dry & Break bulk, Liquid bulk, and Cruise traffic.

Figure 5.2 shows the berth numbering and current location of the different terminals by type of cargo.

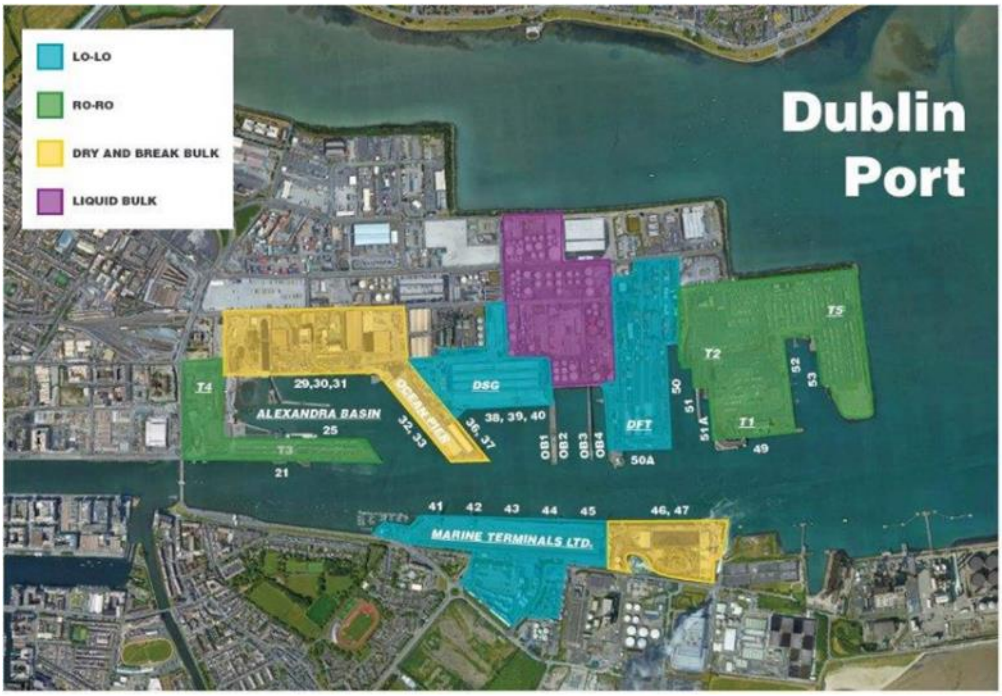


Figure 5.2: Location of Dublin Port terminals by type of cargo

<u>RoRo Terminals</u>

There are five dedicated RoRo terminals currently in operation in Dublin Port with an aggregate land area of approximately 36ha and eight berths currently accommodating a range of vessel sizes. These terminals have been leased exclusively to ferry operators providing multiple daily sailings mainly to and from UK ports.

The eight RoRo berths are equipped with linkspans to provide vehicle access to the ferry vessels. Two of the berths include double tier linkspans.

Appendix 8.1 summarizes the main dimensions and characteristics of the RoRo terminals. The ferry routes to Dublin are also shown in **Appendix 8.1**.

<u>Container Terminals</u>

Dublin Port has three container terminals operated by Dublin Ferryport Terminals (DFT), Marine Terminals LTD (MTL) and Doyle Shipping Group (DSG), which occupy 43ha of land in total and have an aggregate berthing length of 2,180 meters.

The terminal operators equip the quays with STS cranes and Mobile Harbour Cranes (MHC). In the yard, container boxes are handled by means of Reach Stackers, Rail Mounted Gantries (RMG), Rubber Tyre Gantry (RTG) cranes, Empty Container Handlers (ECH) and Tractor Trailer Units (TTU).

Appendix 8.1 summarizes the main dimensions and characteristics of the container terminals. Some of the berths (e.g., 35, 38, 39, 40, etc.) are occasionally used for cruise vessels.

Bulk Terminals

Dublin Port facilities handling bulk products include Alexandra Quay West, Ocean Pier, South Bank Quay and the Liquid Bulk terminals.

The main dimensions and characteristics of Dublin Port's bulk terminals are summarized in **Appendix 8.1**.

5.2.2 Historical throughput

Based on the available information, Arup/EY-DKM have undertaken a review of the historical throughput (2007-2019) handled at Dublin Port by type of cargo. **Figure 5.3** shows how RoRo volumes have grown from 2007 to 2019. In more recent years, the COVID-19 pandemic caused a 50% drop in passenger vehicles in 2020 which only recovered slightly in 2021.

RoRo passenger volumes at Dublin Port increased 50% between 2008 and 2019, with a small peak experienced during 2010-2011 and more regular increases during 2013-2017. The historical RoRo throughput is shown in **Appendix 8.1**.

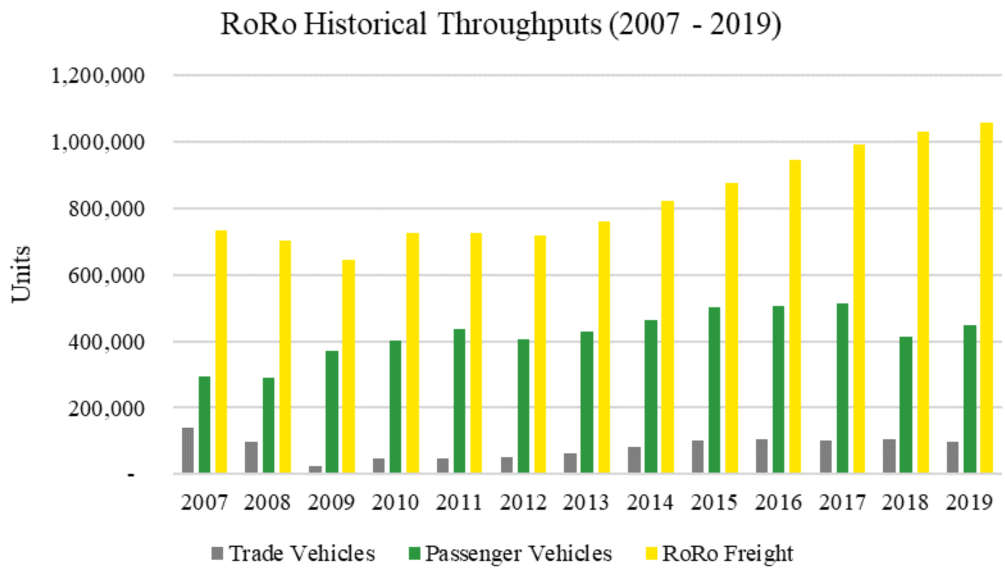


Figure 5.3: Dublin Port RoRo historical throughput in units (Source: Dublin Port and IMDO)

The yearly throughput figures between 2007 and 2019 are shown in Table 5.1 below.

Table 5.1: Tonnage for all goods handled in Dublin Port (Source: Dublin Port and IMDO)

	Dry Bulk	Liquid Bulk	LoLo	Break Bulk	Dry Bulk	RoRo Freight
	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)
2007	2,503,128	4,075,028	7,151,461	69,919	2,503,128	10,263,974
2008	2,428,838	4,076,905	6,556,355	164,162	2,428,838	9,858,926
2009	1,583,315	4,051,029	5,422,172	101,873	1,583,315	9,025,744
2010	1,471,087	3,787,861	5,675,369	73,202	1,471,087	10,189,214

	Dry Bulk	Liquid Bulk	LoLo	Break Bulk	Dry Bulk	RoRo Freight
2011	1,635,516	3,619,731	5,430,782	85,210	1,635,516	10,145,702
2012	1,814,410	3,443,664	5,347,863	58,875	1,814,410	10,067,722
2013	1,984,744	3,530,862	5,171,615	38,456	1,984,744	10,663,114
2014	1,885,265	3,624,318	5,512,308	37,093	1,885,265	11,506,264
2015	1,789,661	3,856,899	5,963,210	49,866	1,789,661	12,289,564
2016	2,053,199	4,016,703	6,327,536	47,427	2,053,199	13,223,434
2017	2,033,571	4,281,357	6,673,315	22,116	2,033,571	13,888,868
2018	2,374,678	4,621,640	7,262,115	23,704	2,374,678	14,446,558
2019	1,819,969	4,662,140	7,740,555	17,102	1,819,969	14,827,442

Figure 5.4 shows the historical throughputs at Dublin Port between 2007 and 2019.

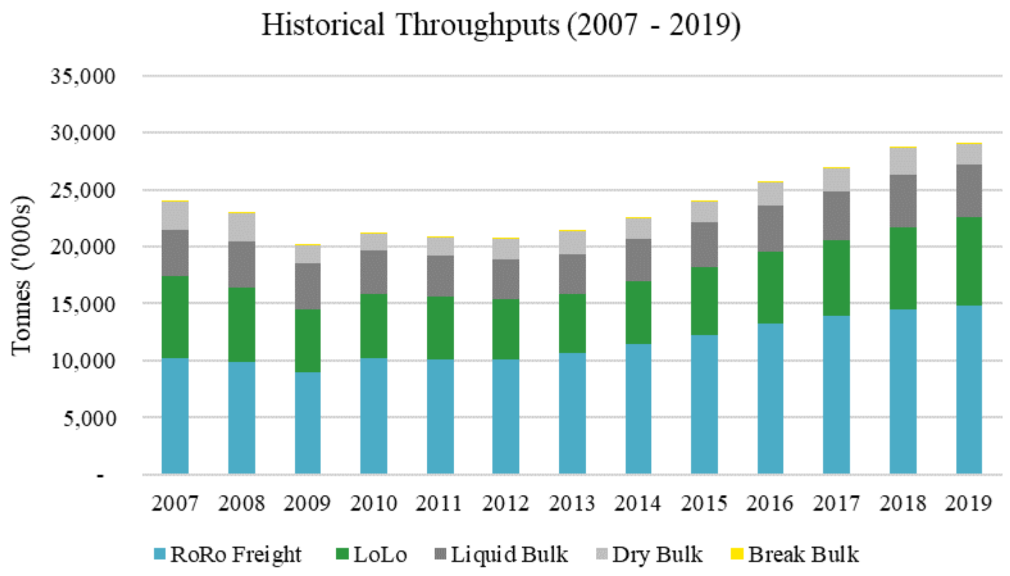


Figure 5.4: Dublin Port historical throughputs in tonnes (Source: Dublin Port and IMDO)

LoLo annual volumes have remained broadly constant between 500,000 to 600,000 TEUs since 2007 but in 2019 reached 775,000 TEUs. This has increased to 845,000 TEUs in 2021.

In 2007 liquid bulk volumes were approximately 4Mt and this throughput declined until 2012 where throughput was approximately 3.3Mt. Since then, liquid bulk volumes have experienced a 40% increase to 4.6Mt in 2019. In more recent years this volume has fallen to 3.9Mt in 2020 and 2021.

Solid bulk throughput has remained constant at approximately 2Mt throughout this period. Dry bulk represents 97% of the solids handled at Dublin Port, while the 3% remaining corresponds to break bulk cargo.

The historical throughput of bulk goods is presented in the graphs shown in **Appendix 8.1.**

Dublin Port receives passengers from RoRo ferries and from cruise ships, with a distribution in 2019 of 89% and 11% respectively.

A total of 158 cruise ships called in Dublin Port in 2019, embarking/disembarking 229,032 passengers. **Appendix 8.1** presents passengers numbers handled in recent years.

Traffic seasonality has been reviewed for the RoRo and container segments for 2017 which indicates limited variation in volumes month by month. **Appendix 8.1** shows the total monthly throughput at Dublin Port in 2017.

Typically, RoRo traffic experiences a decline of volumes handled during the month of December.

5.2.3 Review of Dublin Port development plans

Current capacity in Dublin Port

The analysis of the current capacity in Dublin Port is based on the existing infrastructure, current vessel types and call schedule, and any infrastructure developments that are currently being implemented which are scheduled to be completed in the short-term as outlined in the Dublin Port Company (DPC) Masterplan 2040 which was revised in 2018.

These developments relate to the Alexandra Basin Redevelopment and include:

All cargo modes:

- Demolition of the existing bulk jetty for exporting minerals concentrates to accommodate bigger ships in Alexandra Basin West

RoRo:

- Redeveloped and expanded T4 area

Imminent capacity in Dublin Port

The imminent capacity of Dublin Port includes developments for which DPC has already obtained planning permission but have not yet commenced. These developments include:

- The creation of a Unified Ferry Terminal, which will incorporate the existing Terminals 1, 2 and 5, and a different berth configuration that will improve the berthing/unberthing operations as well as the efficiency of the land-side infrastructure.
- Infilling berths 52 and 53 to create a larger storage area (additional 3ha)
- Deepening of the channel to -10mCD

Potential capacity in Dublin Port

The potential capacity of Dublin Port considers all other future development plans outlined in DPC's 2040 Masterplan which will increase the future port capacity.

The main infrastructure development options considered in the potential capacity analysis (described in the 2040 Masterplan) are:

RoRo:

- The construction of a new jetty at the eastern end of the port to provide a fifth RoRo berth for the Unified Ferry Terminal. The total number of dedicated RoRo berths would then increase from eight to nine.
- Redevelopment of the existing MTL facility (located at Berths 41- 45) as a RoRo freight terminal and relocation of the existing container terminal. The new RoRo terminal will have one dedicated RoRo berth with two multi-purpose RoRo ramps.

Container:

- The relocation of the existing MTL container terminal on South Bank Quay further East in front of the ESB's Poolbeg Power Station. The new terminal will provide a total footprint of 10ha and a 700m berth[39] length.
- Expansion of the existing DFT container terminal by reclaiming the basin between the container yard and Berth OB3 providing a total footprint of approximately 1.7ha.

Multi-purpose/Bulk:

- A new deepwater multi-purpose berth is proposed on South Bank Quay. The terminal would cover an area of 3.5ha with a total berth length of approximately 330m.

Appendix 8.1 shows the Dublin Port infrastructure development options considered in the Potential capacity analysis.

5.2.4 Capacity assessment for Dublin Port

Particular features in Dublin Port

The capacity in Dublin Port has been assessed using the methodology described in **Section 4.2** adapted for the particularities of each cargo mode and those specific for this port.

The capacity assessment methodology was adapted based on the characteristics for each cargo type specifically in Dublin Port. The port's size, layout, location, and the fact that it handles multiple cargo types at the same berth makes it different to other Irish ports.

The following adjustments have been made to the general methodology:

- Operational rates have been assumed based on available historical data and where relevant our experience with similar facilities.

[39] The 2040 Masterplan identifies another area of 7ha which could be developed to add additional capacity. This has not been taken into account as it would require a very detailed study beyond the scope of this capacity assessment

- DPC has imposed land utilisation targets (refer to **Appendix 8.1**) for its concessionaires for RoRo (unaccompanied and accompanied) as well as for containers (LoLo and Con-Ro).
- Most berths are assigned to a single user and, in some cases to scheduled services (e.g.: RoRo shipping lines), while other berths are multi-purpose (common user). The analysis has been adapted to consider the cargo composition at each terminal.
- The RoRo terminals at Dublin port each handle a mix of traffic comprising accompanied, unaccompanied, passenger cars and trade cars in varying amounts. In view of this capacity has been estimated on a lane-meters basis, considering yard space, overall available length of marshalling lanes and average loading rates (based on available data),
- Berth productivity for LoLo has been adjusted to account for the physical characteristics and operational parameters of the berth.
- Dry Bulk traffic has remained relatively constant for the last 10 years, with limited expansion plans in this area, similarly with Liquid Bulk. Productivity rates for these cargo types have been used based on historical data and our experience with similar facilities in other ports.
- The capacity estimate for trade cars considers the utilization of off-dock storage areas.
- Dublin Port has several multi-purpose berths which handle a variety of cargo types. For these berths, we have reviewed historical data to determine a berth utilisation for each cargo type. It should also be noted, when comparing capacities between terminals that capacity and throughput volumes will vary greatly, even for similar sized facilities due to specific operational parameters, physical characteristics, environmental constraints, connectivity issues etc. In the case of RoRo, this includes operational parameters such as vessel size and schedule.
- Traffic composition will have an impact on a terminal's capacity. In some cases, these operational parameters are within the control of the terminal operators and can therefore be adjusted to boost capacity. However, in other cases external factors such as connectivity, market changes, and shipping company preferences may mean there is a limit to how much these factors can be improved without stakeholder engagement. In view of these parameters, it means that terminals of similar sizes can vary significantly in terms of performance and capacity.

By benchmarking key performance indicators of similar facilities, it is possible to gain an understanding of the impact of any operational constraints.

RoRo

The operational parameters adopted for the purpose of estimating the RoRo capacity were based on historical throughput volumes from 2017-2020 together with the physical characteristics of the facilities.

Current capacity

In assessing the current Dublin Port RoRo capacity, two sub-systems were considered: Firstly, the available lane-meters which could be accommodated by the average loading rate at the berth on to the largest vessel currently on service, and secondly, the available landside lane meters.

The berth loading rate sub-system is assessed by looking at vessel size, schedule, vessel turnaround times, a maximum berth occupancy, and an assumed number of hours of operation per year.

Therefore, the berth could handle a greater or smaller volume of traffic if any of the above parameters were to change. These parameters are not always within the control of the terminal operator.

The storage sub-system considers the total terminal storage areas available for RoRo traffic with additional off-dock storage for trade cars. Across the five terminals a total storage of approximately 36ha is available. The trade car off-dock storage facility provides an additional 4.5ha.

In the case of the unaccompanied freight and trade cars facilities the capacity was assessed using an estimated dwell time.

The landside marshalling lanes serve all types of accompanied traffic (cars and freight) therefore, the land-side capacity is heavily dependent on the traffic split. For the purpose of this capacity assessment, the capacity for handling accompanied traffic at Dublin Port was assessed using the 2019 cargo split data.

Furthermore, scheduling accompanied traffic arrivals to optimize utilization of the marshalling areas per vessel call may also provide capacity benefits.

It can be read from **Table 5.2** that the current RoRo-freight capacity in Dublin Port is 1.37m units per year plus 0.66m passenger cars and 0.12m trade cars.

Increasing the number of vessel calls may provide capacity benefits.

Table 5.2: Dublin port capacity

	Current (M units/y)		Imminent (M units/y)	Potential (M units/y)
	Key Parameters	Capacity	Capacity	Capacity
Unaccompanied Freight	1750 slots 22 rows of LoLo stack for ConRo	0.89	0.98	1.08 + 0.29
Accompanied Freight	8.3km of marshalling lanes @ PoD Lane utilization = 35%-55% ~17 ships/day = ~34 loads/day +3000lm average ship size	0.48	0.55	0.61
Passenger Cars		0.66	0.76	0.84
Trade Cars	2,300 slots in DTC storage area On-site slots short-term / bypassed	0.12	0.12	0.12

The effective capacity has been assessed based on the current largest vessel on each service and the current berth utilisation. Any change in the future on any of these will have an impact on capacity.

Imminent (2030) and potential (2040) capacity

In the imminent scenario, the development of the Unified Ferry Terminal is expected to provide an increase in RoRo capacity driven by an increase in yard and berthing efficiencies.

The Unified Ferry Terminal will allow the three pier-end RoRo terminals to combine their landside facilities. Based on limited available information, we are unable to quantify the exact infrastructure developments. We would expect an improvement in the operational performance. The Imminent scenario capacity is therefore derived using the current infrastructure but with peak operational factors carried across these terminals.

In the potential capacity assessment, there are nine dedicated RoRo ramps and up to three RoRo ramps on multi-use berths such as Ocean Pier.

These additional berths combined with the yard side developments will provide an increase in capacity. Additionally, a new freight terminal on the southern bank of the Liffey is proposed with a port-stated capacity of 288,000 freight units.

LoLo

Current capacity

In assessing the current LoLo capacity in Dublin Port, two sub-systems were considered: berth productivity and landside storage area. The quayside cargo handling equipment was considered but found not to be a capacity bottleneck.

The capacity of the quay is obtained by multiplying the quay length with the productivity of the quay.

The historical quay equipment performance data was safely and reasonably assumed based on published benchmark data (See reference in **Appendix 10**) supported by Arup's experience.

The capacity of each sub-system is summarised in **Table 5.3.**

Table 5.3: Dublin Port LoLo capacity summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)
LoLo	Berthing length	2180	m	1.02	2180	m	1.02	2180	M	1.35
	Storage Area	43	ha	1.56	43	ha	1.56	36	ha	1.43
	Capacity			1.02			1.02			1.35

Based on the above assessment, the berth length is the current limiting factor for the LoLo capacity in the port estimated to be 1.02M TEUs per year.

Imminent and potential capacity

The development plans for the imminent scenario, as outlined in **Section 5.2.3**, are expected to have limited impact on the LoLo capacity of the port. However, the development plans outlined in the potential scenario are estimated to increase the LoLo capacity to 1.35M TEUs per year. Although these plans do not include an increase in LoLo berthing length, the new MTL terminal is expected to serve larger parcel sizes due to the deeper dredge depth and new STS cranes. The new STS cranes are expected to provide significant productivity benefits. To capture this a 25% increase in the average crane productivity has therefore been included in the potential capacity. The expected larger parcel sizes and new STS cranes will increase the productivity rate of the quay and overall capacity.

Dry & Break Bulk

Current capacity

In assessing the current Dry & Break Bulk capacity in Dublin Port, three sub-systems were considered: berthing length, quay handling equipment and available storage area.

The current Dry & Break Bulk capacity is estimated at 2.91 million tonnes/year.

The quay handling equipment is considered to not be a capacity bottleneck. The berthing length and storage area were measured, and the productivity of the quay was assumed to be in line with benchmarked ports, see **Section 5.2.5**.

A summary of the capacity assessment including each sub-system is provided in **Table 5.4**. Based on this assessment, the berthing length is the capacity bottleneck for Dry & Break bulk under all development scenarios. The current Dry & Break Bulk capacity in Dublin Port is estimated to be 2.91 million tonnes per year.

Imminent and potential capacity

The development plans for the imminent scenario, as outlined in **Section 5.2.3** are expected to have limited impact on the Dry & Break Bulk capacity of the port. However, in the potential scenario, the Dry & Break Bulk capacity is estimated to increase to 4.48 million tonnes per year because of the proposed deep-water multi-purpose berth on South Bank Quay.

Table 5.4: Dublin Port Dry & Break Bulk capacity summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Dry & Break Bulk	Berthing length	1162	m	2.91	1162	m	2.91	1492	m	4.48
	Storage Area	22	ha	2.98	22	ha	2.98	28	ha	4.81
	Capacity			2.91			2.91			4.48

Liquid Bulk

Current capacity

In assessing the current Liquid Bulk capacity in Dublin Port, three sub-systems were considered: berthing length, quay handling equipment and available storage capacity.

The capacity of each sub-system is summarised in **Table 5.5**. The quay handling equipment is considered not to be a capacity bottleneck. The table shows that the limiting factor for the current Liquid Bulk capacity in Dublin Port is the available landside storage of 0.33million tonnes. This results in the current capacity being 6million tonnes per year. This represents a turn ratio of 18, which is on the upper limit before a bottleneck in the operations will occur.

Table 5.5: Dublin Port Liquid Bulk capacity summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Liquid Bulk	Berthing length	986	m	6.78	986	m	6.78	717	m	5.09
	Storage	0.33	Mt	6.00	0.33	Mt	6.00	0.33	Mt	6.00
	Capacity			6.00			6.00			5.09

Imminent and potential capacity

The development plans for the imminent scenario, as outlined in **Section 5.2.3**, have no impact on the Liquid Bulk capacity of the port. However, in the potential scenario, the Liquid Bulk capacity reduces to 5.09 million tonnes per year.

The storage capacity remains the same, but the number of berths reduces from 4 to 3 because of one of the oil berths (OB4) being filled in for use as a container terminal.

Total port capacity

The total estimated potential capacity for all cargo types combined is ~52 million tonnes per annum. This is approximately in line with the total volume projected in the first version of the DPC Masterplan 2040 of 60 million tonnes. However, this projected volume was revised by DPC after considering the impact of Brexit and increased to 77 million tonnes per annum as a rolling 5-year average.

The rates for converting units to tonnes are as presented in **Section 3.2.3**, **Chapter 3** of this report, namely, 14t per freight unit, 2t per car and 10t per TEU has also been adopted.

Table 5.6: Whole port capacity tonnages

	Units	Current	Imminent	Potential
RoRo Freight	*M tonnes/y*	19.3	21.4	27.72
	M units/y	1.38	1.53	1.98
RoRo Passenger cars	*M tonnes/y*	1.32	1.52	1.6
	M units/y	0.66	0.76	0.84
RoRo Trade vehicles	*M tonnes/y*	0.24	0.24	0.24
	M units/y	0.12	0.12	0.12
LoLo (10t/TEU)	*M tonnes/y*	10.2	10.2	13.5
	M TEUs/y	1.02	1.02	1.35
Dry & Break Bulk	*M tonnes/y*	2.9	2.9	4.5
Liquid Bulk	*M tonnes/y*	6.0	6.0	5.1

Arup/EY-DKM considers that the revised Masterplan forecast is the upper-level scenario as it does not consider any limitations on the port capacity. In addition, it is unknown what conversion factors were used to reach this revised throughput. The total calculated capacity of 52 million tonnes per year is also considered to be a lower-bound figure as it does not consider the introduction of new technologies, commercial strategies and operational improvements.

DPC are also implementing a change to the pricing structure to encourage the quicker movement of unitized cargo through the port which has potential to increase capacity.

It should be noted that the RoRo figures are heavily dependent on market performance and demand as changes in cargo split alter the usage of ship-space and shared yard areas.

5.2.5 Benchmarking

Benchmarking has been carried out to compare Dublin Port's current performance and estimated capacities against other similar facilities (See **Section 4.2.3**).

Performance indicators for the different cargoes within Dublin Port including total throughput, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar profiles to Dublin Port. The results of this exercise are shown in the following sections.

Higher yard performance may be driven by shorter dwell times or more efficient storage of cargo and yard-side operations. Whilst higher quay performance will typically be linked to higher berth utilisations, lower down-times, and efficient quayside loading / unloading operations.

The benchmarking figures do not allow for variations between ports such as specific cargo handled, mode of operations, type of equipment, and operational layouts. Therefore, this benchmarking exercise is used for high level comparison purposes only.

More details on benchmarking at Dublin Port can be found in **Appendix 8.1**.

RoRo

Unaccompanied freight

Table 5.7: Dublin Port RoRo unaccompanied freight benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Dublin	700,000	20,000

Port	2019 Throughput (units)	Yard productivity (units/ha)
Harwich	180,000	12,000
Liverpool	400,000	17,000
Grimsby and Immingham	620,000	17,000
Hull	60,000	18,000
Rosslare	60,000	9,000

Based on the historical productivities summarized in the above table, Dublin Port has a comparatively high level of performance in terms of throughput and yard productivities.

Trade vehicles

Table 5.8: Dublin Port RoRo trade vehicles benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Dublin	75,000	15,000

Port	2019 Throughput (units)	Yard productivity (units/ha)
Barcelona	775,000	13,000
Koper	750,000	11,000
Southampton	760,000	7,600
Antwerp	1,220,000	5,500
Bremerhaven	2,170,000	11,000

The trade vehicle indicators show that Dublin has a comparatively high utilisation of its yard area.

LoLo

Table 5.9: Dublin Port LoLo benchmarking

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Dublin	775,000	774	28,000

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Arhus	574,000	460	8,600
Thessaloniki	678,000	1,300	26,000
Klaipedia	700,000	660	27,000
Gdynia	877,000	560	22,000
Liverpool	885,000	540	21,000
Dewry, Europe	N/A	885	20,000

The LoLo benchmarking shows that Dublin Port is achieving a relatively high performing relative to other European terminals with comparable profiles.

Dry bulk

Table 5.10: Dublin Port dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Dublin	1,820,000	2,500	140,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Split	1,120,000	1,200	45,000
Torino	1,500,000	1,300	12,000
Larnaca	1,240,000	1,900	180,000
Cuxhaven	1,560,000	2,200	100,000

The above table indicates that Dublin Port is achieving a comparatively high level of performance in terms of dry bulk quay and yard productivity.

Liquid bulk

Table 5.11: Dublin Port liquid bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Dublin	4,660,000	4,900	95,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Zeebrugge	9,320,000	9,300	150,000
Bordeaux	4,727,000	4,300	43,000
Livorno	5,547,000	6,300	40,000
Tenerife	4,811,000	8,600	86,000

The above table indicates that Dublin Port historical liquid bulk performance is within the range of other terminals of similar profile.

5.2.6 Nautical access and hinterland connectivity

Introduction

In the previous sections the berthing, handling and storage capacity of the port has been reviewed. In this section, it will be assessed whether the nautical access or hinterland connectivity pose a constraint on this capacity.

Nautical access constraints

The primary constraint for nautical access at Dublin Port is the maintained water depth of the approach channel. This depth was achieved over a considerable period of dredging after the construction of the North Bull Wall which commenced in 1820.

The current channel depth is -7.8mCD allowing Dublin Port to accept ships with draughts of up to 10.2m within a tidal window.

Ships with draughts of up to 7.5m can generally enter the port without tidal restrictions. In practice, the maximum draught for ships operating daily fixed time schedules is 6.8m. Refer to **Appendix 8.1** for a table with the draught assessment.

Ships with a draught of 6.8m can currently access the port and are not a restriction on the capacity. This is important for regular RoRo and LoLo services.

Bulk vessels and specific car carriers (trade vehicles) have a deeper draught but can enter the port in a wide tidal window.

With the ongoing increase in vessel sizes for all traffic modes, Dublin Port will need to increase its channel and berthing pocket depths to accommodate these vessels. The Dublin Port Masterplan 2040 includes a program of construction of deeper quays and channel dredging to -10mCD.

Hinterland connectivity

The capacity of the infrastructure providing the hinterland connectivity is not under the control of the ports. This section provides an overview of the hinterland capacity restrictions and planned developments for context.

The principal road connection is the Dublin Port Tunnel to the north. This links the port with the M50 orbital route and thus with all the national primary routes.

In 2018, Dublin Port Company (DPC) commissioned a Strategic Transportation Study which included an assessment of the Dublin Port Tunnel's future capacity, in consultation with the National Transport Authority (NTA). This confirmed that the Dublin Port Tunnel has adequate capacity to accommodate the increased 3.3% growth per annum by 2040.

This was based on the capacity of the tunnel coded into the National Transport Authority Regional Transport Model. It also found that the Toll Plaza is not a limiting factor to the capacity of the tunnel.

Links to the South side of the port are less developed. The East Link Bridge and Sandymount Road serve an urban residential area and have limited capacity. The Dublin Port Masterplan Review identifies the Southern Port Access Route (SPAR) as one of the most significant transport proposals within the review.

The NTA in its Draft Transport Strategy for the Greater Dublin Area 2022-2042[40] states that Dublin City Council, with the support of TII and the NTA, and with the cooperation of Dublin Port will deliver a new public road which links from the national road network at the Dublin Tunnel to serve the south port lands and adjoining areas (Measure ROAD5).

The capacity of the hinterland connectivity as described above has not been assessed as part of this assignment. However, it was understood from DPC's own assessment that the Dublin Port Tunnel has adequate capacity to connect Dublin Port to the M50 motorway until 2040.

[40] Transport Strategy for the Greater Dublin Area 2022 – 2042, NTA, 2022

To improve connectivity to the South side, several proposals are under consideration by both DPC and the NTA. None of these have statutory approval.

5.2.7 Lead-in times for capacity increase

Between now and 2040, DPC has multiple developments planned which are detailed in their Masterplan. Some of these are large-scale developments which can have long lead-in times before they come into operation and are able to provide additional capacity to the port.

Table 5.12 below indicates the current stage of development of the various projects and provides an assessment of the anticipated timeframe for each stage.

This gives an indication of the total lead-in time so that it is clear when the development of these projects should commence to ensure that the additional capacity is available before demand exceeds supply.

Table 5.12: Lead-in times for proposed developments at Dublin Port

		Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	**Lead-in time**
	Development	**months**						**years**
Current Capacity	Alexandra Basin West Redevelopment	✓	✓	✓	✓	✓		
	Redeveloped and expanded T4 area	✓	✓	✓	✓	✓		
Imminent capacity	Creation of a unified ferry terminal which will incorporate the existing terminals 1, 2 and 5.	✓	✓	✓	✓	10	10	1
	Additional 3ha of storage by infilling berths 52 and 53	✓	✓	✓	✓	24	24	2
Potential capacity	New jetty at Eastern end of port to provide a 5th RoRo berth.	✓	✓	✓	8	8	16	1.5
	Existing DFT container terminal will be expanded by reclaiming the basin between the container yard and Berth OB3.	✓	✓	✓	8	12	20	2
	Existing MTL located at berths 41-45 will be redeveloped as RoRo	4	6	6	8	12	36	3

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	Lead-in time
		months						years
	freight terminal and the existing container terminal will be relocated.							
	Existing MTL container terminal will be relocated further East in front of the ESB's Poolbeg Power Station.	4	12	12	9	24	61	5
	New deepwater multi-purpose berth eastwards of existing South Bank Quay.	4	12	12	9	24	61	5
	Deepening of channel to -10mCD	✓	✓	✓	✓	48	48	4

✓= Stage completed
= Development completed

5.2.8 Capacity versus demand analysis

This Section presents the existing capacity at Dublin Port and a description of any changes to this capacity between now and 2040 because of the proposed developments assessed in **Section 5.2.3**. The graphs also show the forecasted demand curves for each cargo type, considering baseline, low and high growth scenarios.

The lead-in times for the proposed developments as discussed in **Section 5.2.7** are also shown in the graphs.

RoRo

Figure 5.5 shows the current RoRo freight capacity in Dublin Port and the increase in capacity as a result of the potential developments.

Based on the projected demand figures presented in **Table 3.6**, **Chapter 3** it is estimated that demand in Dublin Port will reach current RoRo capacity in 2034. However, it is expected that the imminent capacity will be delivered before 2034 providing suitable capacity until 2040 when the second capacity uplift for potential capacity is operational.

Table 5.13: Demand, throughput, and capacity for all RoRo cargoes in Dublin Port

Cargo type	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.97	1.06	1.37	1.53	1.98
RoRo Passenger	*M units/y*	0.51	0.55	0.66	0.76	0.84
RoRo Trade vehicles	*M units/y*	0.11	0.04	0.12	0.12	0.12

The imminent capacity level is provided through the development of the combined RoRo terminal and the associated efficiency savings for accompanied and unaccompanied freight. At this stage, there are no plans associated with for the combined RoRo terminal.

The potential capacity enhancements will be provided by the following planned developments described in the DPC Masterplan 2040:

- New jetty at the eastern end of the port to provide a new RoRo berth
- Existing MTL terminal located at berths 41-45 will be redeveloped as a RoRo freight terminal. The new terminal will have two berths, each with a linkspan

The Imminent scenario is scheduled to be operational by 2030 with a 2.5-year lead-in time and the Potential scenario is to be developed for 2040 and is estimated to require approximately a 4-year lead-in time.

Reviewing capacity versus projected demand for the different cargo types there is expected to be a capacity restriction for handling trade cars at Dublin Port in 2039. For all other cargo types, it is expected that capacity will be able to meet the projected demand until 2040 based on the current timeline of developments.

Freight

Table 5.14: Demand, throughput, and capacity for freight in Dublin Port

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.97	1.06	1.37	1.53	1.98

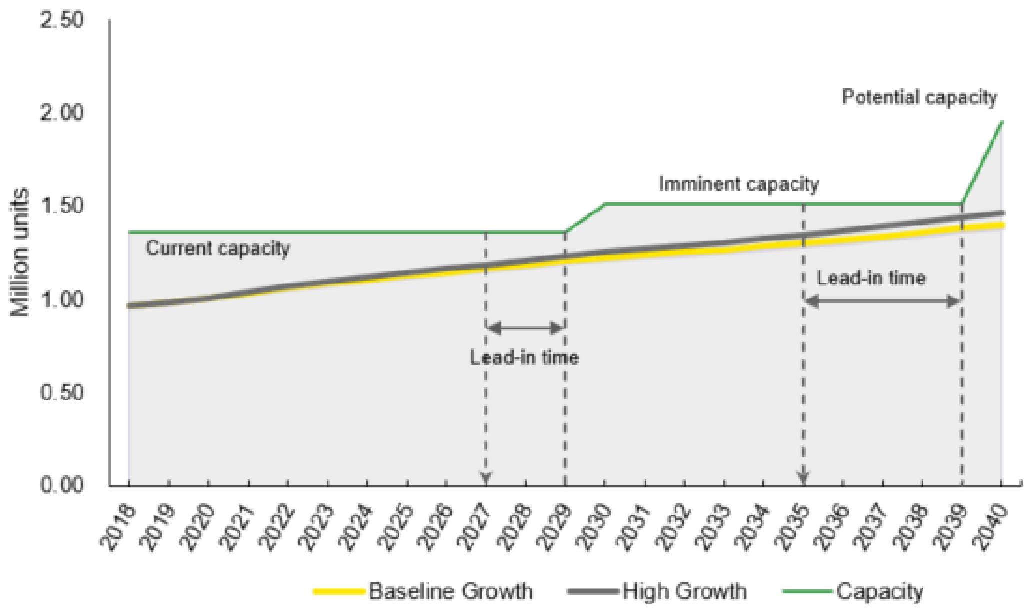


Figure 5.5: Dublin Port – RoRo freight – Capacity vs Demand

Based on the Masterplan, there is expected to be a step-up in capacity for RoRo freight in both the imminent and potential stages at the combined RoRo terminal through an increase in yard-side operational efficiency. Additionally, the development of a new terminal on the southern bank of the Liffey is expected to deliver a capacity increase of 0.29M units.

In terms of the demand split between accompanied and unaccompanied freight there are no capacity limitations within either business.

Passenger cars

Table 5.15: Demand, throughput, and capacity for passenger cars in Dublin Port

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Passenger cars	*M units/y*	0.51	0.55	0.66	0.76	0.84

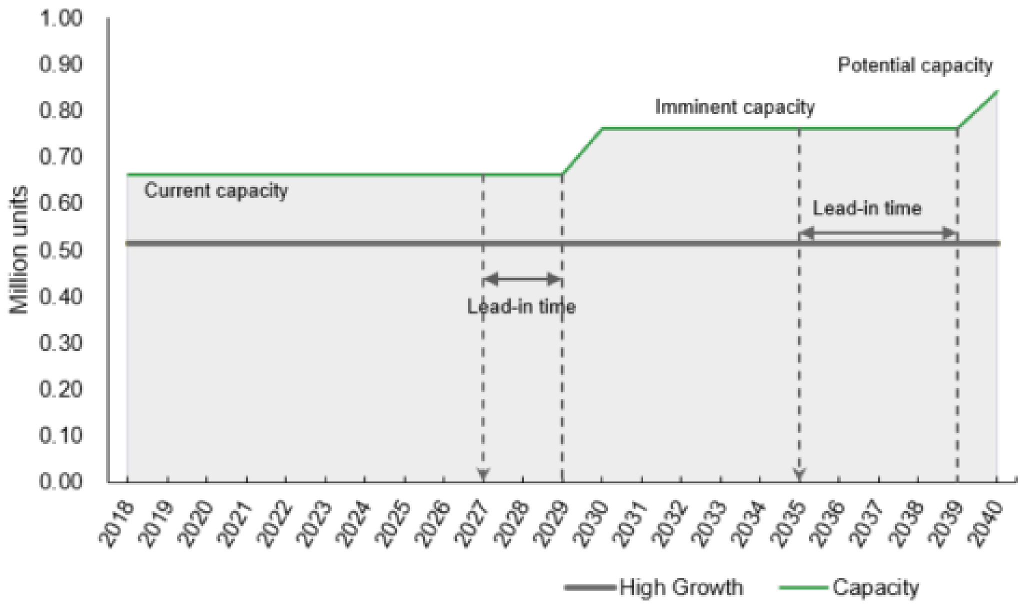


Figure 5.6: Dublin Port – RoRo passenger cars – Capacity vs Demand [41]

There is an expected step-up in capacity for passenger cars in both the imminent and potential stages as the combined RoRo terminal (imminent stage) will bring increased efficiency of yard-side operations with further enhancements in the potential stage, see **Figure 5.6**.

Trade vehicles

Table 5.16: Demand, throughput, and capacity for trade vehicles in Dublin Port

	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
RoRo Trade vehicles	*M units/y*	0.04	0.12	0.12	0.12

The Dublin Port overall trade vehicle business has a throughput of approximately 100,000units with around 40,000 of these units via Dublin Port. The remaining units are handled at Alexandra Basin and are not considered as part of this study.

The projected volumes for Dublin Port trade cars presents an annual 5% growth from 100,000 units and reaches approximately 320,000units by 2040. On the basis that 40% of this demand is expected to be via Dublin Port, the required capacity in 2040 is around 125,000 to 130,000 units. Dublin port is therefore expected to be capacity constrained shortly before 2040.

The capacity to handle trade cars can be increased through additional offsite storage areas.

LoLo

Figure 5.7 shows the current LoLo capacity in Dublin Port and the increase in capacity as a result of the potential developments.

[41] The demand curves represent the most optimistic (i.e., highest growth) scenario. See Section 3.5 for more details.

The capacity and growth lines show that Dublin Port has adequate capacity in terms of its LoLo operations until 2027 based on the high growth scenario.

Table 5.17: Throughput and capacity for LoLo in Dublin Port

	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
LoLo	*M TEUs/y*	0.77	1.02	1.02	1.35

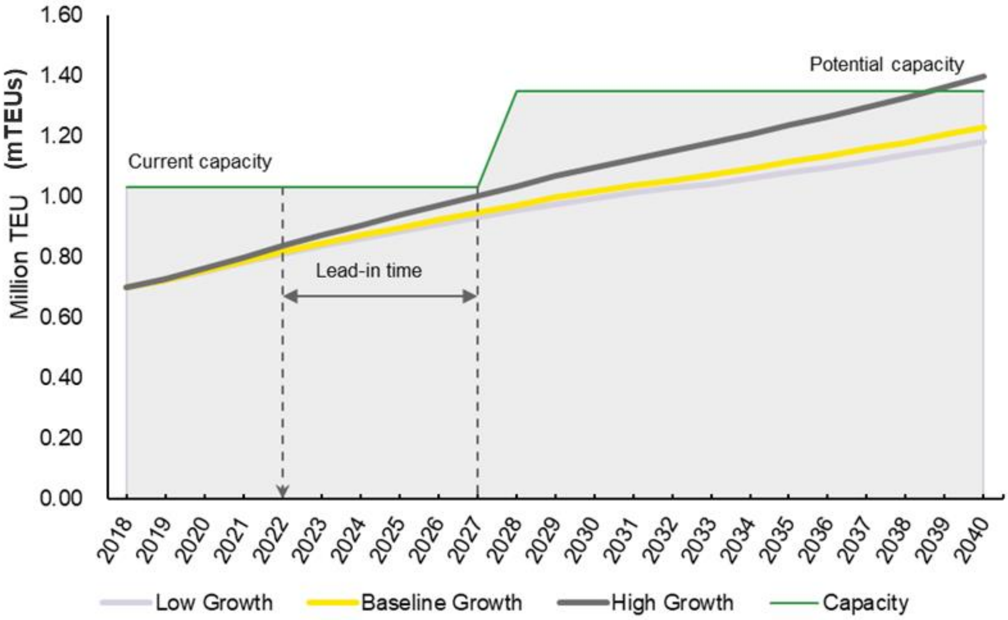


Figure 5.7: Dublin Port - LoLo – Capacity vs Demand

The additional capacity can be achieved by the following planned expansion projects:

- The expansion of the DFT container terminal through reclaiming the basin between the container yard and Berth OB3/4. This causes a decrease in Liquid Bulk capacity which is scheduled for 2024.
- The relocation of the existing MTL container terminal further East in front of the ESB's Poolbeg Power Station.

The estimated lead-in time of 5 years for the delivery of these projects means that they should commence by 2022 for this capacity to be available in time. These Masterplan projects are estimated to provide sufficient LoLo capacity until approximately 2038.

Dry & Break Bulk

Figure 5.8 shows the current Dry & Break Bulk capacity in Dublin Port and the increase in capacity delivered through the potential developments.

Table 5.18: Throughput and capacity for Dry & Break Bulk in Dublin Port

	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
Dry & Break Bulk	*Mt/y*	1.84	2.91	2.91	4.48

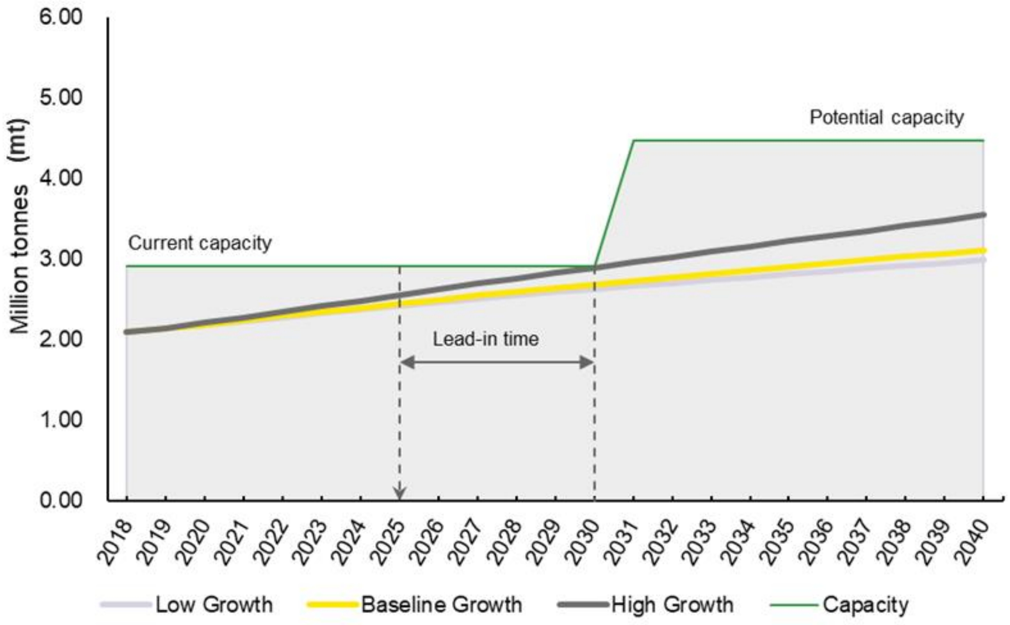


Figure 5.8: Dublin Port - Dry & Break Bulk – Capacity vs Demand

The figure above shows that Dublin Port currently has adequate capacity for its Dry & Break Bulk handling. The graph illustrates that, by 2030, the port will require additional capacity to meet the demand. This can be achieved by the planned development of a new deep-water multi-purpose berth on South Bank Quay.

The estimated lead-in time of 5 years for the delivery of this project means that it should commence by 2025 for this capacity to be available based on the highest growth scenario.

This expansion project is estimated to provide sufficient Dry & Break Bulk capacity until beyond 2040.

Liquid Bulk

The current Liquid Bulk capacity in Dublin Port and the decrease in capacity as a result of the potential developments in the port are shown in **Figure 5.9**.

Table 5.19: Throughput and capacity for Liquid Bulk in Dublin Port

	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
Liquid Bulk	*Mt/y*	4.66	6.00	6.00	5.09

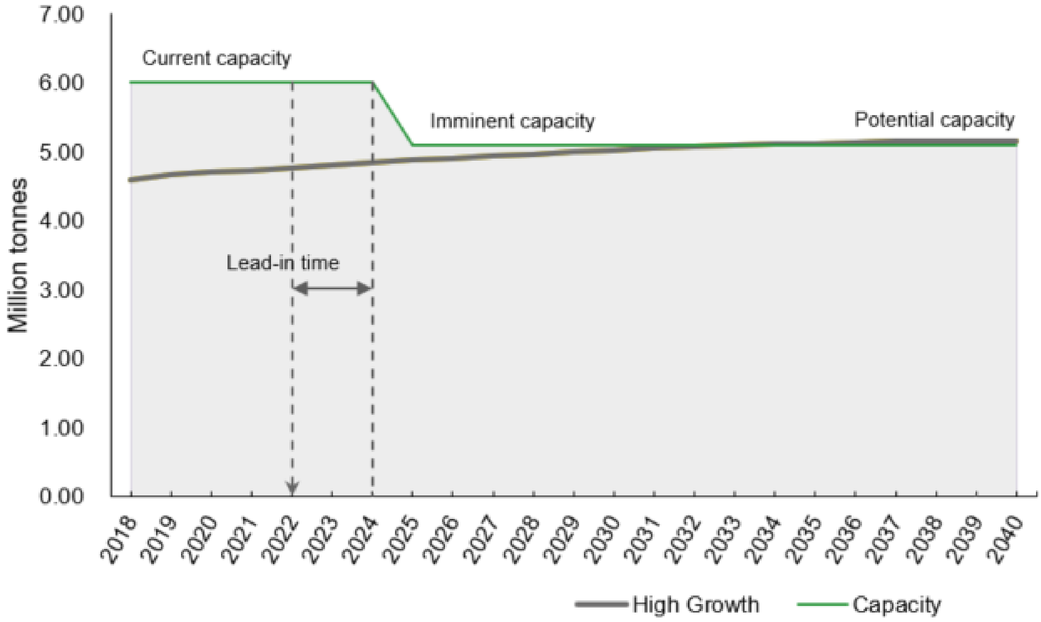


Figure 5.9: Dublin Port - Liquid Bulk – Capacity vs Demand

Figure 5.9 illustrates that Dublin Port currently has sufficient Liquid Bulk capacity. DPC is planning to reduce its Liquid Bulk handling capacity at some point in the future. In its 2040 Masterplan DPC states: *As DPC does not expect any significant increase in the volume of liquid bulk through the Port to 2040 the Port will not seek to facilitate the growth of petroleum products. DPC will actively seek to reduce the land area currently occupied by terminals for petroleum facilities and instead use the land freed up for unitised cargo.*

The removal of Oil Berth 4 (OB4) will result in Dublin Port's Liquid Bulk estimated capacity reducing from 6.0M tonnes per annum, to 5.09M tonnes per annum as illustrated on the graph in **Figure 5.9**.

It is estimated that the expansion of the LoLo capacity at Oil Berth 3/4 will take place around 2027, so the handling of Liquid Bulk in this location is expected to cease two years earlier, around 2025.The lead in time for the LoLo capacity increase is 5 years to 2027 and so there is 2 years of lead-in to the closing of Oil Berth 3/4.

As discussed in **Section 3.4.2**, the EY demand forecast for Liquid Bulk assumes a steady growth aligned with economic growth. This contrasts with the Dublin Port assessment.

This divergence, however, only affects the latter end of the forecast (2026-2040) where large uncertainties around Liquid Bulk growth exist. However, the remaining capacity is expected to be sufficient to handle the forecasted growth as can be seen in Figure 5.9.

5.2.9 Conclusion

The result of the capacity calculations for all cargo types in Dublin Port is shown in **Table 5.20** below. The 2019 actual throughput has been added for comparison.

Table 5.20: Dublin Port capacity study summary by cargo type

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
RoRo Freight	*M units/y*	1.06	1.37	1.53	1.98
RoRo Passenger cars	*M units/y*	0.44	0.66	0.76	0.84
RoRo Trade Vehicles	*M units/y*	0.099	0.12	0.12	0.12
LoLo	*M TEUs/y*	0.77	1.02	1.02	1.35
Dry & Break Bulk	*M tonnes/y*	1.84	2.91	2.91	4.48
Liquid Bulk	*M tonnes/y*	4.66	6.00	6.00	5.09

Conclusions on the capacity versus demand assessment for all ports are presented in **Chapter 6**.

5.3 Port of Cork

5.3.1 Description of the port and cargo handled

General

The Port of Cork is the key seaport in the south of Ireland and is one of only two Irish ports which service all cargo modes: LoLo, RoRo, Liquid Bulk, Dry Bulk, Break Bulk and Cruise.

Port of Cork has several different terminals spread along the River Lee and the Cork estuary. The capacity assessment considers common user facilities including: City Quays, Tivoli and Ringaskiddy. Cobh is a dedicated facility for cruise traffic. Further capacity enhancements included in the assessment include the redevelopment of Marino Point to accommodate commercial cargo.

The facilities in Passage West (Dry Bulk), and Whitegate (Liquid Bulk) are either private or part of an industrial facility and have not been considered within this assessment.

Figure 5.10 shows a plan view of the existing port facilities.

Figure 5.10: Port of Cork. General overview (Source: Google Earth and Arup Analysis).

Characteristics of the main infrastructure and equipment

City Quays

The Port of Cork facilities at the City Quays comprise of a number of individual berthing facilities with a total length of over 1,000m, a navigational approach draught of 5.2m and depths at berths up to 8.8m below CD (Chart Datum).

An overview of the City Quay facilities (North Side and South Side) can be found in **Appendix 8.2**.

Tivoli

Tivoli is located downstream of the City Quays. This terminal handles LoLo and Bulk cargoes. The navigational approach draught is 6.5m and depths at berths range from 5.0 to 8.8m below CD. The total berthing length is 566m (split across LoLo, Dry & Break Bulk, and Liquid Bulk).

Ringaskiddy

This port facility for Dry Bulk, RoRo and Liquid Bulk is a vital component of the industrial infrastructure which has transformed Ringaskiddy into an attractive port related location.

The total berthing length in Ringaskiddy is 1,075m (485m for Dry Bulk at the deep-water terminal at 13.4m depth, 330m for RoRo at 9.2-8.5m depth, and 260m at 9.6m depth at the ADM Pfizer jetty).

An overview of Ringaskiddy Terminal is shown in **Figure 5.11**.

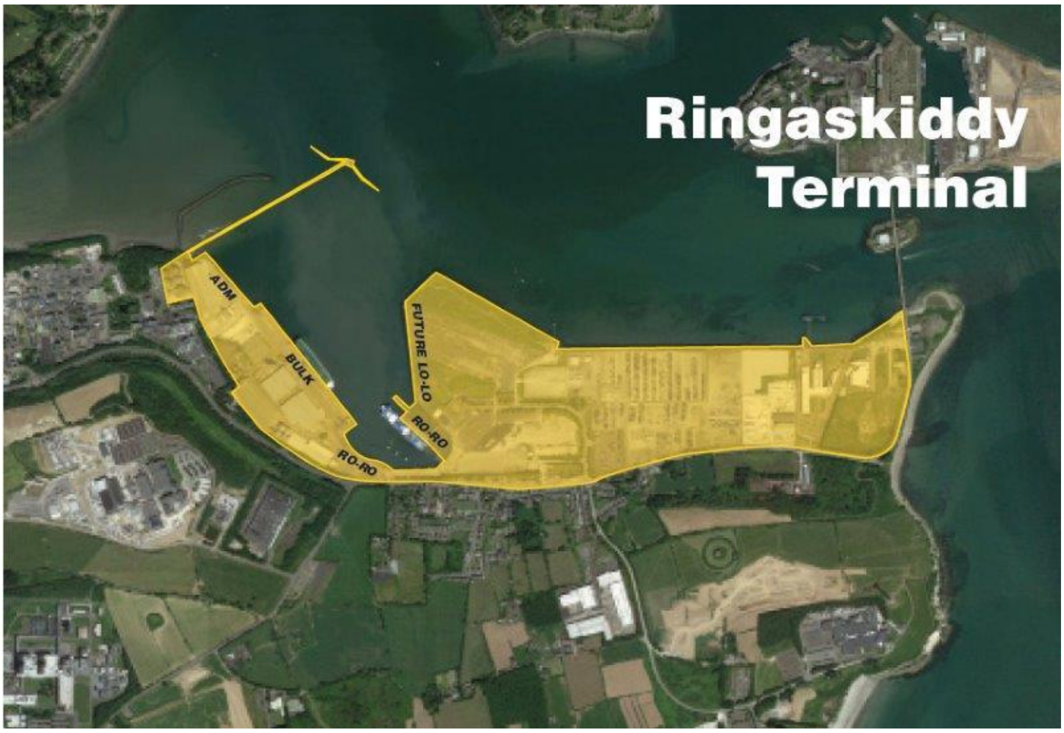


Figure 5.11: Ringaskiddy Terminal. General overview (Source: Arup, based on available drawings and Google Earth)

Marino Point

This terminal, formerly the IFI fertilizer plant, has an existing jetty with a length of 237m and a depth of -10mCD. As of 2022, Port of Cork owns a 51% share of Marino Point.

Future proposals include the demolition of the existing fertilizer plant and re-developed as a bulk terminal for Liquid and Dry bulk.

Bantry Bay

Port of Cork also controls Bantry Bay harbour and has statutory jurisdiction over the marine activity's facilities there. See **Section 2.3.1** for further clarification.

5.3.2 Historical throughput

IMDO provided the following figures for Port of Cork throughput in 2019, disaggregated by type of cargo and port origin/destination.

Table 5.21: 2019 throughput, by type of cargo (Source: IMDO).

	Liquid Bulk (Mt/y)	Dry Bulk (Mt/y)	Break Bulk (t/y)	LoLo (TEUs/y)	RoRo freight (units/y)	RoRo passenger cars (units/y)	RoRo trade vehicles (units/y)
Total	0.2	1.4	352,000	240,000	5,600	40,000	28,000

5.3.3 Review of Port of Cork development plans

Current Capacity in Port of Cork

The analysis of the current capacity of Port of Cork has been based on the infrastructure under operation in 2021 as described in **Section 5.3.1**. The planned developments that have become operable since 2021 or are likely to become operable before 2030 are included in the imminent capacity below. The Port of Cork Company has recently published the Port of Cork Masterplan 2050 (Port of Cork, May 2023), which summarises its plans for development until 2050; therefore, details of the proposed developments were not available at the time of the assessments.

Due to exceptional circumstances, the recent historical berth utilization for the Ringaskiddy RoRo terminal has been very low with one vessel visiting the port every two days. For the purposes of the current capacity calculation, this has been increased to account for up to two vessels calling in a day. It is considered feasible for the vessel calls to increase up to 40% utilisation without requiring changes to the yard side operations.

Imminent capacity in Port of Cork

Port of Cork has recently opened a new container terminal in Ringaskiddy (CCT), which occupies an area of over 13ha and has a berthing length of 360m. This new facility will be operated in conjunction with a smaller Tivoli terminal until a yard expansion is developed at Ringaskiddy in 2030 (Stage 1) when the Tivoli terminal is also taken offline.

The new CCT and the future developments will have major repercussions in the land use at the terminal. Much of the currently under-utilised trade car area will be re-purposed which will bring the capacity more in-line with the expected throughput.

Additionally, the loss of the City Quays is considered in this situation. This means that Port of Cork is withdrawing cargo related activities from the City Quays in the short to medium term.

Potential capacity in Port of Cork

The Port of Cork masterplan considers the potential of redeveloping Tivoli as a mixed residential area in the medium- to long-term.

This would require the relocation of all operations from Tivoli, including the SEVESO activities from Flogas and Calor gas. Also, a 230m extension to the deep-water berth bulk facility in Ringaskiddy is planned.

The Ringaskiddy LoLo terminal will continue to expand during this period with a berth extension and additional yard areas by reclaiming land (Stage 2).

In 2017, Port of Cork purchased Marino Point facility as a JV partner with a private company.

Whilst the site has potential to assist in accommodating trade re-located from Cork City Quays (such as fertilizer) as well as some new business, significant investment will be required for it to become operational as a bulk terminal.

Amendments include clearing the site and re-furbishing and upgrading the jetty. Key advantages of the Marino Point site are that it has the potential to be rail connected and has significant electrical and natural gas connections.

However, the road access is a bottleneck for this site and will be a constraint to any port activity proposed. According to the information provided, this site would provide 24.3ha of land available for Dry and Liquid Bulk.

5.3.4 Capacity of Port of Cork

Particular features at Port of Cork

The following adjustments to the general capacity assessment methodology that was outlined in **Chapter 4** have been made due to the nature of operations at the Port of Cork.

- Any gaps in information provided by the Port of Cork were filled with publicly available information, assumptions based on our experience in similar facilities, and with some benchmarking figures for productivity rates.
- The Port of Cork has facilities at four separate locations, as outlined above, with each of them handling different cargoes. The City Quays, which are in the process of being de-commissioned, still provide a theoretical capacity available to the Port of Cork.
- The Potential scenario for Port of Cork is quite complex with developments at many different locations and port activities being relocated. The information contained in the expansions plans was used to adjust the distribution of traffic per facility for the current and imminent scenarios.
- The contribution of the Whitegate Refinery to the Liquid Bulk traffic is very large, and the information received from the IMDO along with publicly available information was used to determine the throughput and capacity figures for the remaining terminals at the Port of Cork.
- Port of Cork did not provide information on the monthly distribution of the throughput so publicly available data has been used to assess the seasonality for each type of traffic.
- The RoRo terminal manages multiple types of traffic on the same berth simultaneously. These different types of traffic share vessel space and some share terminal storage space. The capacity calculations have, therefore, been undertaken in terms of lane-meters of traffic and use the 2019 cargo split to divide up shared storage areas.

RoRo

Current capacity

In assessing the current Port of Cork RoRo capacity, two sub-systems were considered: firstly, the available lane-meters which could be accommodated by the considered berth utilization, historical average loading rate, and largest vessel currently on service, and secondly, the available storage in terms of multi-use marshalling lanes and dedicated trade car and unaccompanied freight yards.

The berth loading rate is assessed by reviewing historical data at the Ringaskiddy RoRo berth including vessel size, schedule, and vessel turnaround times.

There is currently one operational RoRo ramp in Ringaskiddy and one unused ramp in Tivoli. The second ramp in Ringaskiddy is not available for operation currently (the linkspan has been removed) and has therefore not been included in the assessment.

The landside storage assessment considers the total near-quay storage areas available for storing RoRo which covers an area of approximately 25ha at the Ringaskiddy terminal which is primarily used for trade cars (12Ha) with freight, ConRo, and accompanied traffic marshalling lanes accounting for the remaining space.

The landside marshalling lanes serve all types of accompanied traffic (cars and freight) and therefore, the land-side capacity is heavily dependent on the associated traffic split. For the purposes of this capacity assessment the 2019 cargo split was considered.

It can be seen from **Table 5.22** that the current RoRo freight capacity in Port of Cork is estimated to be 50,000 units per year. Passenger car capacity is estimated to be a further 50,000 units and trade cars, courtesy of the extensive yard area, totals over 250,000 units.

At the time of the assessment the ConRo business was still very new, having opened in the wake of Brexit, with low throughputs and yard allocation. Despite this, the ConRo business was assessed to account for over half of the unaccompanied freight capacity and should be suitable until approximately 2030 according to the High Case Volume Projections given in the Port of Cork 2050 Masterplan. Due to the small scale of this service, there were still many unknowns about how this cargo would develop and therefore, there is potential for this business to grow beyond what is captured within the assessment.

Table 5.22: Port of Cork RoRo Capacity

	Current (M units/y)		Imminent (M units/y)	Potential (M units/y)
	Key Parameters	Capacity	Capacity	Capacity
Unaccompanied Freight	230 slots, 5 days dwell time 1750lm ConRo import lanes 3Hx8Wx4R ConRo export	0.045	0.045	0.045
Accompanied Freight	1750lm at 40% utilization 1 ship/day = 2 loads /day	0.005	0.005	0.005
Passenger Cars	3600lm vessel for both cargos	0.050	0.050	0.050
Trade Cars	12Ha = 7000slots 7-day dwell time	0.260	0.180	0.180

Imminent capacity

In the imminent scenario, approximately half of the current trade car storage area is to be repurposed for container operations, this has been reflected in the capacity assessment. The capacities for the other cargo types are maintained.

The capacity of the Ringaskiddy terminal would then be restricted by the road connectivity.

Potential capacity

After the planned road improvements to the local network and port connection routes have been completed (M28 Cork to Ringaskiddy Road Project, see also **Section 5.3.6**), two dedicated RoRo berths within the port can be utilized. At this point, further yard expansions or improved dwell times will be required to increase capacity. It is expected, however, that these upgrades will not be required to meet 2040 demand figures.

LoLo

Current capacity

In assessing the current LoLo capacity in the Port of Cork (2021), two sub-systems were considered: berth productivity, and landside storage area. The quayside cargo handling equipment was considered but considered not to be a capacity bottleneck.

For the storage area, the net terminal area related to the berth was considered. Further capacity enhancements may include off-terminal storage.

Table 5.23 presents to the estimated capacities. The current capacity is estimated to be 260,000 TEUs per year with the berth being the capacity constraint.

Table 5.23: Port of Cork LoLo Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity M TEUs/y	Quantity	Units	Capacity M TEUs/y	Quantity	Units	Capacity M TEUs/y
LoLo (Tivoli)	Berth length	150	m	0.26	150	m	0.26	N/A	m	N/A
	Storage Area	8	ha	0.28	3 to 0	ha	0.08 to 0	N/A	ha	N/A
	Capacity			0.26			0.08 to 0			N/A
LoLo (Ringaskiddy)	Berth length	N/A	m	N/A	360	m	0.35 to 0.52	520	m	0.77
	Storage Area	N/A	ha	N/A	14 to 21	ha	0.3 to 0.48	27	ha	0.74
	Capacity			N/A			0.3 to 0.48			0.74
Total Capacity				0.26			0.38 to 0.48			0.74

Imminent capacity

The first stage of the imminent capacity is the initial development of the Ringaskiddy terminal with its 360m berth and 14ha of storage area resulting in an uplift capacity to 380,000 TEU as the Tivoli terminal area is stripped back. The new CCT has started operations in 2022.

The development plans then continue in the imminent scenario, as outlined in **Section 5.3.3**, an additional STS crane and 7ha yard expansion at the Ringaskiddy terminal from 14ha to 21ha results in an increase in the estimated LoLo capacity from 290,000 TEUs to 480,000 TEUs. At this point it is assumed that the Tivoli terminal comes offline. The terminal capacity constraint is considered to be the storage area. This expansion will be online by 2030.

Potential capacity

The development plans in the potential scenario, as outlined in **Section 5.3.3**, result in an increase in the LoLo capacity from 480,000 TEUs in the final imminent scenario to 737,000 TEUs by 2040.

This is largely a result of the extension to the container terminal at Ringaskiddy, both in terms of berthing length and yard area.

LoLo crane performance improvements have been considered in the estimate of potential capacity.

Dry & Break Bulk

Current capacity

In assessing the current Dry & Break Bulk capacity in Port of Cork, three sub-systems were considered: berthing length, quay handling productivity and landside storage area.

The estimated capacity of each sub-system is summarised in **Table 5.24**. Based on this assessment, the berth capacity constraint for Dry & Break Bulk for all development stages.

Port of Cork have a significant amount of berth length along the City Quays, but with limited handling equipment which restricts its utilization for cargo handling. The estimated current Dry & Break Bulk capacity in Port of Cork is 2.07M tonnes per year.

Table 5.24: Port of Cork Dry & Break Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Dry & Break Bulk	Quay (berthing length and cargo handling performance)	1577	m	2.07	1577	m	2.07	935	m	2.86
	Storage Area	48.5	ha	6.95	48.5	ha	6.95	50.5	ha	7.15
	Capacity			2.07			2.07			2.86

Imminent capacity

As outlined in **Section 5.3.3**, there is no development planned in the imminent scenario that will impact on the Dry & Break Bulk capacity in Port of Cork. Hence the capacity remains at 2.07M tonnes per year.

Potential capacity

Port of Cork is planning to remove its Dry & Break Bulk operations from the City Quays. It is likely that these operations will be moved to Marino Point to a dedicated facility and to an extension of the facility in Ringaskiddy. The capacity of these new facilities is estimated at 2.86M tonnes per year and limited by the quay handling capacity.

Liquid Bulk

For all cases the Liquid Bulk traffic at Whitegate and Bantry Bay has been excluded as these facilities are not available for common use. The refining capacity is estimated at 3.8M tonnes per year. As of April 2023, the ADM jetty located in Ringaskiddy East is operational and used for importing liquid bulks. Its capacity has not been considered as part of this study.

Current capacity

In assessing the current Liquid Bulk capacity for the Port of Cork, three sub-systems were considered: berthing length, quay handling equipment, and available storage area.

The estimated capacity of each sub-system is summarised in **Table 5.25**.

The landside storage facilities are considered to be the limiting factor for Liquid Bulk for all development scenarios. The current Liquid Bulk capacity in Port of Cork is estimated to be 0.26M tonnes per year comprising approximately 0.1Mt for molasses, 0.09Mt for LPG and 0.07Mt for chemicals.

Table 5.25: Port of Cork Liquid Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
LPG and Chemicals	Berthing length	170	m	0.31	170	m	0.31	170	m	0.53
	Storage	11,000	m³	0.16	11,000	m³	0.16	11,000	m³	0.16
	Capacity			0.16			0.16			0.16
Molasses	Berth usage	250	hr/y	0.1	250	hr/y	0.1	250	hr/y	0.1
	Storage	7	ha	-	7	ha	-	7	ha	-
	Capacity			0.1			0.1			0.1

Imminent and potential capacity

There are no proposed developments in Port of Cork that will result in any change to the Liquid Bulk capacity. It is therefore estimated that the capacity will remain 0.26M tonnes per year until 2040.

Total port capacity

The total port capacity expressed in tonnes of cargo is estimated to reach over 14.3M tonnes by 2040 and is summarized in the table below.

Table 5.26: Whole port capacity tonnages

	Units	Current Capacity	Imminent Capacity	Potential Capacity
RoRo Freight	*M tonnes/y*	7.0	7.0	7.0
	M units/y	0.05	0.05	0.05
RoRo Passenger cars	*M tonnes/y*	0.10	0.10	0.10
	M units/y	0.05	0.05	0.05
RoRo Trade vehicles	*M tonnes/y*	0.52	0.36	0.36
	M units/y	0.26	0.18	0.18
LoLo (10t/unit)	*M tonnes/y*	2.6	3.8-5.6	7.4
	M TEUs/y	0.26	0.38-0.48	0.74
Dry & Break Bulk	*M tonnes/y*	2.1	2.1	2.9
Liquid Bulk	*M tonnes/y*	0.26	0.26	0.26

It should be noted that the RoRo figures are heavily dependent on market performance, cargo composition, and the development of the ConRo business.

5.3.5 Benchmarking

Benchmarking exercise has been undertaken for high level comparison purposes.

Performance indicators for the Port of Cork have been calculated (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) so they can be compared with other selected ports with similar profile.

Higher yard productivities will typically benefit from a shorter dwell time or more efficient landside operations. Higher quay productivities will typically be driven by better high berth utilisations, lower downtimes, and efficient loading and unloading operations.

Comparable benchmarks do not allow for variations between ports in terms of specific cargo handled, mode of operations and operational layouts. Therefore, this benchmarking assessment is used for high level comparison purposes.

RoRo

Table 5.27: Port of Cork RoRo unaccompanied freight benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Cork	1,700	850

Port	2019 Throughput (units)	Yard productivity (units/ha)
Harwich	180,000	12,000
Liverpool	400,000	17,000
Grimsby and Immingham	620,000	17,000
Hull	60,000	18,000
Rosslare	60,000	9,000

Table 5.28: Port of Cork RoRo trade vehicles benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Cork	27,700	1,200

Port	2019 Throughput (units)	Yard productivity (units/ha)
Barcelona	775,000	13,000
Koper	750,000	11,000
Southampton	760,000	7,600
Antwerp	1,220,000	5,500
Bremerhaven	2,170,000	11,000

The Port of Cork yard productivity appears lower than comparable terminals; this is driven by the relatively low frequency of vessel calls in 2019, i.e., 1 to 2 ships per week leading to underutilisation of the terminal facilities.

In the future, it is expected that the Port of Cork vessel call frequency will increase which will result in an increase in productivity towards that achieved by other terminals.

LoLo

Table 5.29: Port of Cork LoLo benchmarking

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Cork	240,000	800	20,000

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Arhus	574,000	460	8,600
Rijeka	290,000	480	26,200
Nantes	176,000	200	5,300
Lübeck	179,000	600	29,800
Ancona	212,000	700	10,600
Dewry, Europe	N/A	885	20,000

The Port of Cork LoLo productivity aligns with other European ports of similar profile. For container terminals yard productivity will be mainly driven by the mode of operation, operational layouts and equipment.

Dry Bulk

Table 5.30: Port of Cork dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Cork	1,400,000	1,400	87,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Split	1,120,000	1,200	45,000
Torino	1,500,000	1,300	12,000
Larnaca	1,240,000	1,900	180,000
Cuxhaven	1,560,000	2,200	100,000

The Port of Cork performance aligns well with other European terminals. Dry bulk yard productivity is heavily dependent on the capacity of storage facilities, i.e., open storage, warehouse, and silo facilities.

Liquid Bulk

Table 5.31: Port of Cork liquid bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Cork	216,000	550	13,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Esbjerg	540,000	2,000	54,000
Harwich	337,000	1,000	34,000
Stockholm	347,000	1,000	10,000
Galway	370,000	2,600	92,000

The Port of Cork quay and yard performance is lower than other similar European terminals.

5.3.6 Nautical access and hinterland connectivity

Introduction and identification of constraints

The hinterland connectivity has been identified as a constraint to the development of the Port of Cork at Ringaskiddy. Planning permission has been obtained for the development of a second linkspan in Ringaskiddy subject to the completion of the M28 road project. Some progress in this development was made in July 2018 when An Bord Pleanála granted permission for the M28 Cork to Ringaskiddy Road Project. This project has since progressed to the Advanced Works Stage where land acquisition and clearing, fencing, utility works, and archaeology works can now commence.

Future connectivity upgrades

M28 Cork to Ringaskiddy Road Project and Motorway Scheme with Service Area at Ringaskiddy

The proposed scheme comprises of 12.5km. It commences at the Bloomfield Interchange on the existing N28/N40 junction and terminates at the Port of Cork to the east of the village of Ringaskiddy.

The NDP 2018-2027 states that strengthening access routes to Ireland's ports through investment to upgrade and enhance the road transport network to improve journey times is and remains a government priority. Examples of such investments include the planned N28 Cork to Ringaskiddy Road.

The proposed M28 also forms part of the TEN-T core route serving the Port of Cork. This is a strategic route of European and national importance.

The Port of Cork is identified as a core port within the North Sea - Mediterranean Core Network Corridor and the Atlantic Corridor. This status enabled Ireland to secure funding for the redevelopment of Ringaskiddy and the related redevelopment of the N28. This €220m project has local, regional, and national significance. Locally, the road scheme increases the capacity and safety of the N28 National Primary Route in the south city environs.

Furthermore, the relocation of the container terminal from Tivoli to Ringaskiddy, frees up a considerable land bank immediately north of the river on the edge of Cork City centre, which will have significant benefits and assist in the development of the Cork region.

Regionally, it delivers critical infrastructure for the port and for the industries in the Strategic Employment Area on the Ringaskiddy peninsula.

Improved access to Ringaskiddy has been specifically identified in the Government's National Planning Framework – Project Ireland 2040 as a key growth enabler for the Cork region, in addition to the upgrade of the M8/N25/N40 Dunkettle Interchange expected to be open in 2022.

R624

Marino Point has a role to play in accommodating business transferred from Cork City Quays, as well being able to accommodate new business.

At Marino Point there is a land bank of 60 acres which could be rail connected but and a new rail station adjacent to the site and other rail infrastructure upgrades would be required. Road access to this site is also inadequate and may prove a constraint to the optimum development of this site. Cork County Council is actively pursuing the planning and design of the R624 upgrade including the provision of an enhanced bridge crossing at Belvelly; however, no specific dates have been released for this future upgrade.

Figure 5.12: Map of the proposed M28 motorway (Source: Cork County Council)

Planning for the M20 Limerick to Cork route is currently being procured by Transport Infrastructure Ireland. This process was originally scheduled to be completed by 2021 but has been delayed. The preferred transport solution was put on display in March 2022. It is expected that the planning application will be submitted in late 2024. This route will provide a much-improved transport link to Limerick and to Galway and beyond on the recently opened M17/M18 corridor.

5.3.7 Lead in times for capacity increase

Between now and 2040, Port of Cork Company has several developments planned. Some of these are large-scale developments which can have long lead-in times before they come into operation to provide additional capacity to the port. **Table 5.32** indicates the current stage of development of the various projects and provides an assessment of the anticipated timeframe for each stage.

The major developments planned for the port are already being progressed through the development process.

Port of Cork already have planning permission for a further extension to the berth of the new container terminal and to the deep-water berth in Ringaskiddy bulk facility. In addition, a planning permission for the site infrastructure works at Marino Point (Stage 1) has been granted.

This gives an indication of the total lead-in time so that it is clear when the development of these projects should commence to meet projected demand. The demand curves are taken from the national forecasted demand curve for each cargo type, covered in **Section 3.4.2** and then proportionately split between the ports, assuming a constant percentage share.

Table 5.32: Lead-in times for proposed developments at Port of Cork

		Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	**Total**	Lead in time
	Development	**months**						**years**
Current Capacity								
Imminent capacity	Container Terminal (CT) to be under operation in Ringaskiddy	✓	✓	✓	✓	✓	✓	
	Major changes to CT yard	✓	12	12	9	24	57	5
Potential capacity	Development of Marino Point (Stage 1)	✓	✓	✓	9	18	27	2.5
	Deep-water berth extension of 230m	✓	✓	✓	9	18	27	2.5
	200m extension of CT berth to be built in parallel with yard expansion below	✓	✓	✓	9	18	27	2.5
	Land reclamation for CT yard expansion and associated works	✓	12	18	12	48	90	7.5

✓= Stage completed
= Development completed

5.3.8 Capacity versus demand analysis

Introduction

The graphs in this Section illustrate the estimated existing capacity for the Port of Cork and any changes to this capacity between now and 2040 as a result of the proposed developments. The graphs also show the forecasted demand curves for each cargo type, considering baseline, low and high growth scenarios.

The lead-in times, as discussed in the previous section, are also shown on the graphs.

In terms of approximate scheduling the Imminent scenario is scheduled to be operational before 2030 and the Potential scenario is to be delivered before 2040.

RoRo

Figure 5.13, **Figure 5.14** and **Figure 5.15** illustrate that the Port of Cork currently has adequate capacity to handle the demand in RoRo. This is assuming that the port of Cork can operate up to two ships per day.

Based on the forecasted demand, the port will not be capacity constrained for RoRo traffic.

Table 5.33: Demand, throughput, and capacity for all RoRo cargoes in the Port of Cork

Cargo type	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.005* (excl. ConRo)	0.005* (excl. ConRo)	0.05 (inc. ConRo)	0.05 (inc. ConRo)	0.05 (inc. ConRo)
RoRo Passenger cars	*M units/y*	0.03	0.03	0.05	0.05	0.05
RoRo Trade vehicles	*M units/y*	0.03	0.03	0.26	0.18	0.18

*ConRo volumes are not available for 2019 Estimated demand and 2019 Throughput. These are however being considered in the capacity assessment.

The imminent scenario involves the development of the Ringaskiddy container terminal which will occupy around half of the existing trade car storage area. There are no further considerations with respect to RoRo operations in the potential scenario.

The estimated demand figures for all cargoes in the Port of Cork are below the estimated capacities subject to operations such as increased RoRo vessel and ConRo.

Freight

Table 5.34: Demand, throughput, and capacity for RoRo freight in the Port of Cork

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.005 (excl. ConRo)	0.005 (excl. ConRo)	0.05 (inc. ConRo)	0.05 (inc. ConRo)	0.05 (inc. ConRo)

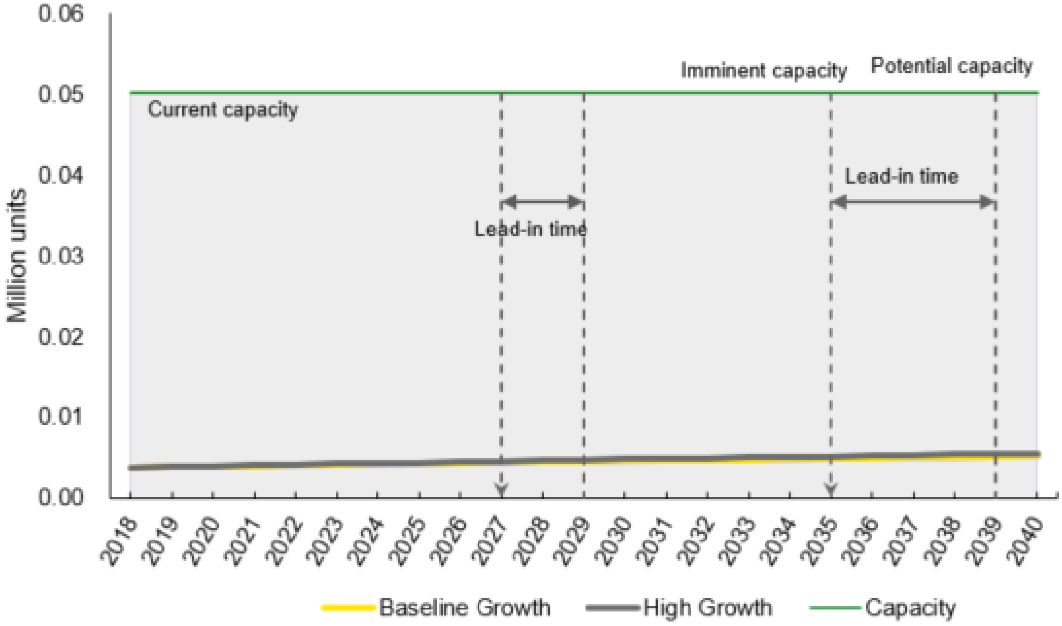


Figure 5.13: Port of Cork – RoRo Freight including ConRo – Capacity vs Demand

The development of the container terminal at Ringaskiddy is not expected to have an impact on freight capacity – the storage area will be maintained, and the marshalling areas are unaffected. The demand for RoRo freight increases steadily until 2040 and the capacity of the terminal is considered sufficient for this time period for both accompanied and unaccompanied freight

The demand curve shown in **Figure 5.13** does not include ConRo forecasts as available demand information is limited, however, it is considered feasible for the facilities to meet the demand until 2040.

Passenger cars

Table 5.35: Demand, throughput, and capacity for passenger cars in the Port of Cork

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Passenger cars	*M units/y*	0.03	0.03	0.05	0.05	0.05

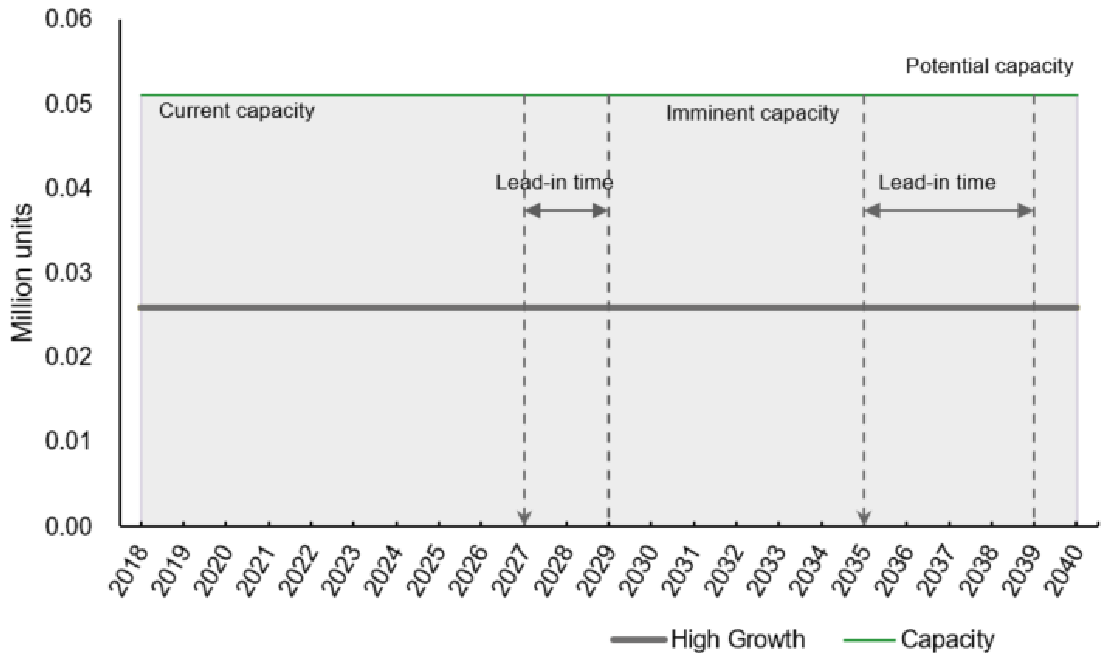


Figure 5.14: Port of Cork – RoRo Passenger cars – Capacity vs Demand

The development of the container terminal at Ringaskiddy does not have an impact on passenger car capacity – the existing marshalling area is not affected. The demand for passenger traffic remains stable until 2040 and so the capacity of the terminal is sufficient for this time period.

Trade Vehicles

Table 5.36: Demand, throughput, and capacity for Trade vehicles in the Port of Cork

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Trade vehicles	*M units/y*	0.03	0.03	0.26	0.18	0.18

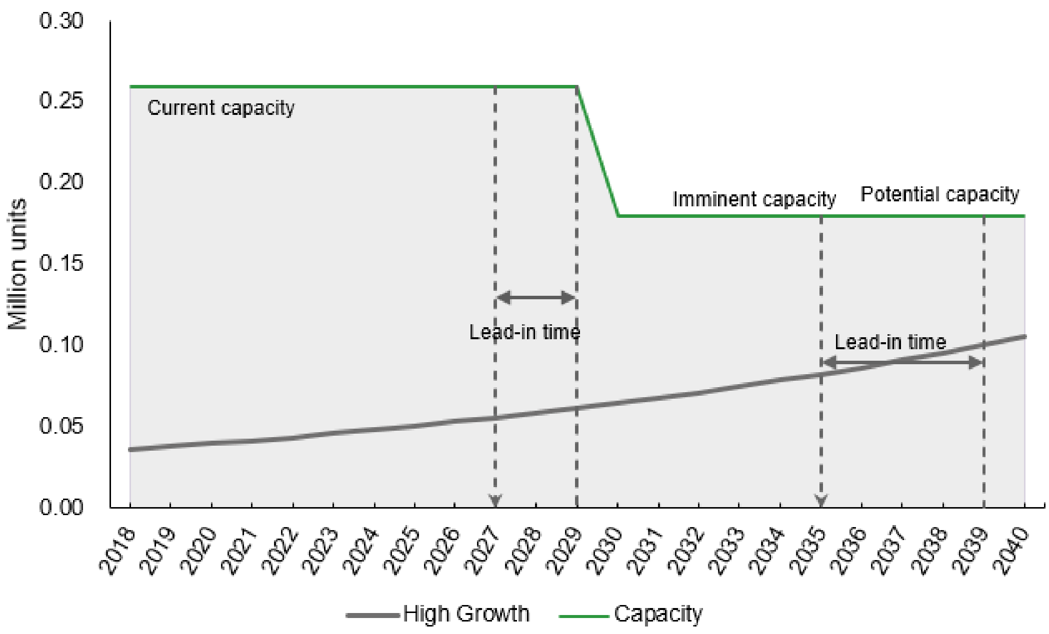


Figure 5.15: Port of Cork – RoRo Trade vehicles – Capacity vs Demand

The development of the container terminal at Ringaskiddy will see half of the trade car yard overtaken by LoLo stacking areas. As the berth is the limiting factor in the current scenario this does not half the trade car handling capacity of the port but does reduce it significantly.

LoLo

Figure 5.16 illustrates the forecasted demand and capacity for LoLo in Port of Cork. Port of Cork is currently understood to be operating at full capacity at its Tivoli LoLo terminal and to have started operations in the new container terminal in Ringaskiddy (opened in April 2022).

When fully operational, the new CCT in Ringaskiddy will increase capacity to 0.38M TEUs which will allow operations to remain unrestricted until 2029. The closing of the Tivoli terminal and extension to the Ringaskiddy terminal will then lift capacity sufficiently until approximately 2040 when a further extension to the terminal will allow for post-2040 growth.

Table 5.37: Demand, throughput, and capacity for LoLo in the Port of Cork

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity 1	Imminent capacity 2	Potential capacity
LoLo	*M TEUs/y*	0.24	0.26	0.38	0.48	0.74

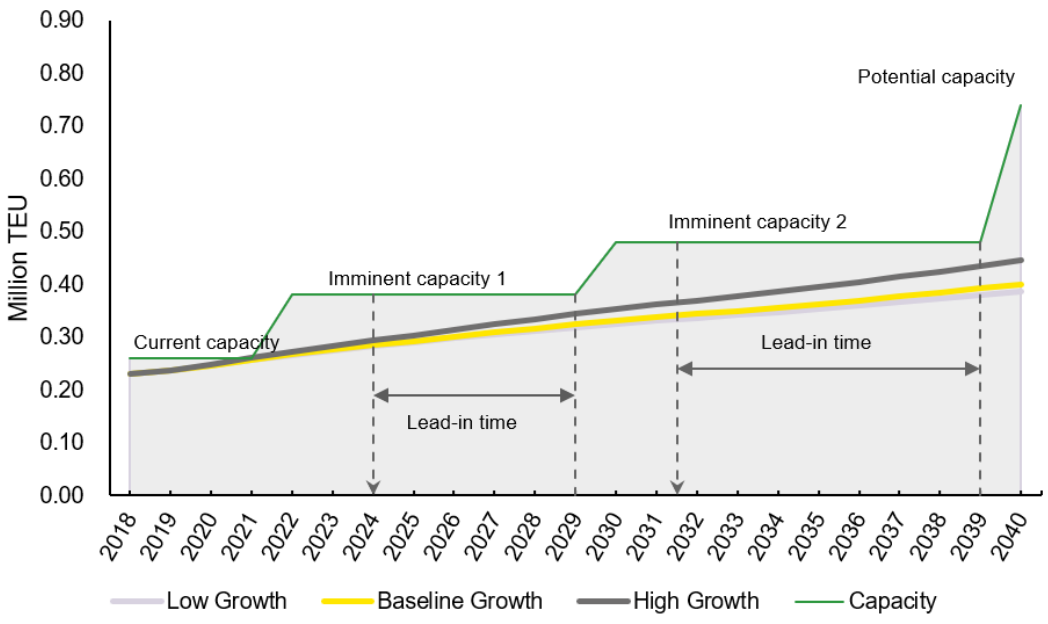


Figure 5.16: Port of Cork – LoLo – Capacity vs Demand

Dry & Break Bulk

Figure 5.17 illustrates that Port of Cork currently has sufficient capacity in terms of its Dry & Break Bulk handling. The capacity of 2.1M tonnes per year is not expected to be exceeded until 2029. Either the Marino Point development or the extension to the Ringaskiddy Bulk terminal will be required before this date to accommodate the relocation of facilities from the City Quays. Port of Cork already have designs and consents for the extension to the Bulk terminal in Ringaskiddy so this can be brought on stream quite quickly.

This assumes that 90% of all Dry & Break Bulk throughput in Port of Cork is through common user terminals. See **Appendix 2** which explains how the Eurostat figures have been adjusted for non-common user facilities.

Table 5.38: Demand, throughput, and capacity for Dry & Break bulk in the Port of Cork

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	1.74	2.1	2.1	2.9

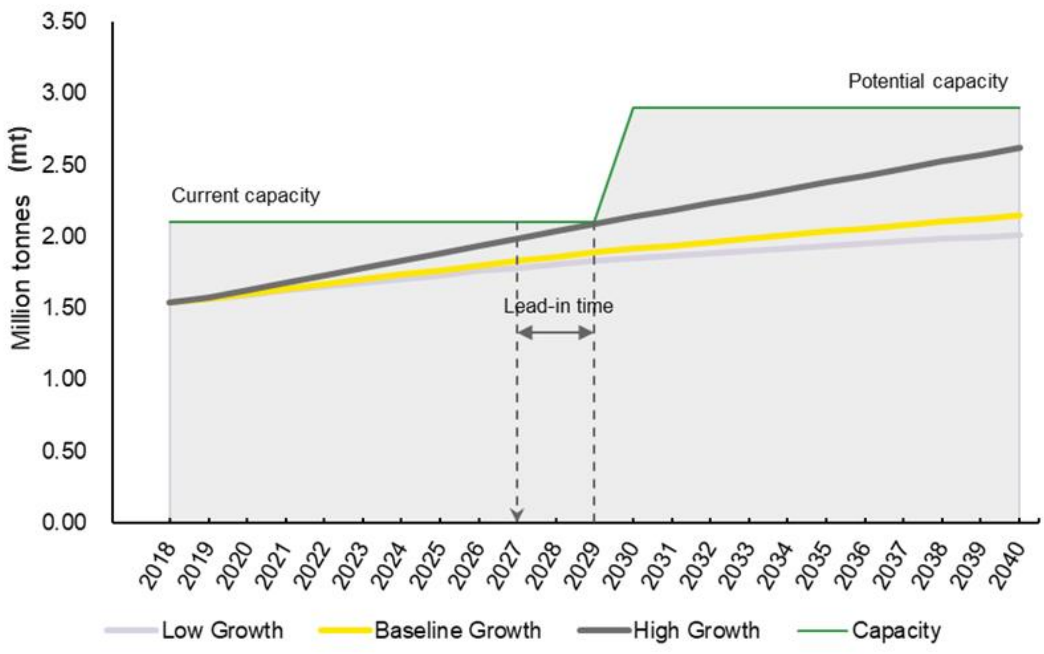


Figure 5.17: Port of Cork – Dry & Break Bulk – Capacity vs Demand

Liquid Bulk

Figure 5.18 shows that Port of Cork had at the time of the assessments no plans to increase their capacity for Liquid Bulk. This contrasts with the forecasted demand that Liquid Bulk will grow in line with economic activity. Notwithstanding this, more recent capacity upgrades in Port of Cork have not been considered as discussed in **Section 5.3.4**.

There is potential for an increase in capacity as the Liquid Bulk operations move away from Tivoli to new facilities at Marino Point. The Tivoli site has been identified in the NDP for housing and therefore Seveso activities will have to be relocated.

Table 5.39: Demand, throughput, and capacity for Liquid bulk in the Port of Cork

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
Liquid Bulk	*M tonnes/y*	0.22	1.7	1.7	1.7

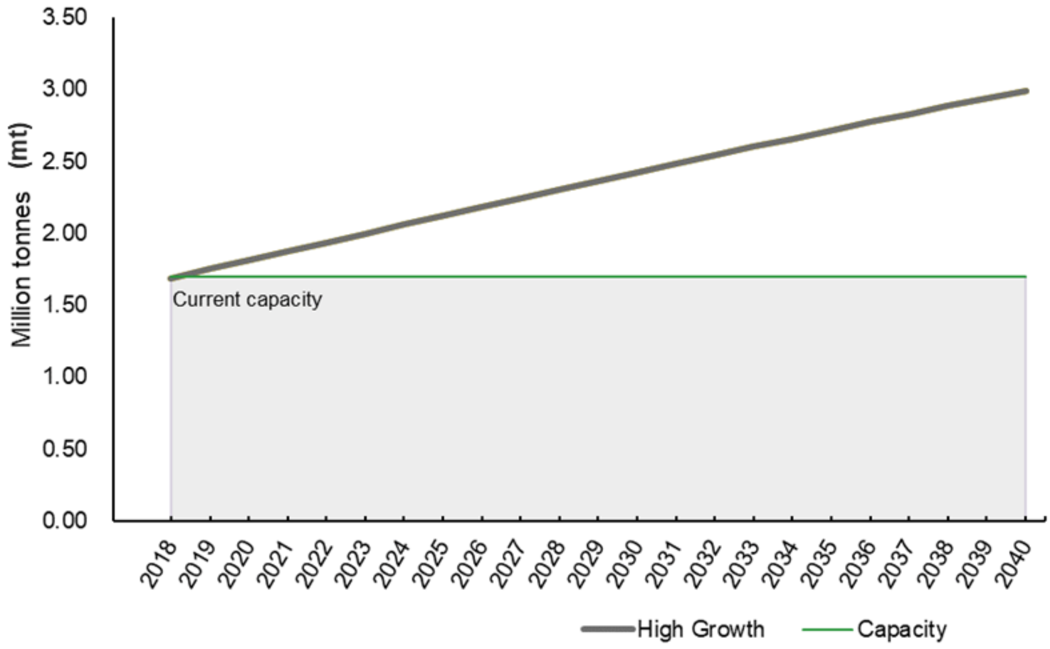


Figure 5.18: Port of Cork – Liquid Bulk – Capacity vs Demand

5.3.9 Conclusion

The result of the capacity assessment for all cargo types in Port of Cork is shown in **Table 5.40.** The 2019 actual throughput has been added to it for comparison.

Table 5.40: Port of Cork capacity summary by cargo type

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
RoRo Freight	*M units/y*	0.0006	0.05	0.05	0.05
RoRo Passenger cars and buses	*M units/y*	0.034	0.05	0.05	0.05
RoRo Trade vehicles	*M units/y*	0.027	0.36	0.18	0.18
LoLo	*M TEUs/y*	0.24	0.26	0.38-0.48	0.74
Dry & Break Bulk	*M tonnes/y*	1.74	2.10	2.10	2.90
Liquid Bulk	*M tonnes/y*	0.22	0.26	0.26	0.26

5.4 Shannon Foynes

5.4.1 Description of the port and cargo handled

General

Shannon Foynes Port Company (SFPC) has statutory jurisdiction over all marine activities in the Shannon Estuary. SFPC has port facilities at Shannon Foynes, Limerick Docks and Shannon Airport (a facility to service aviation fuel imports), and commercial jurisdiction over marine activities on a 500km^2 area on the Shannon Estuary. This includes port facilities operated by private industrial companies at Aughinish (a jetty for bauxite and alumina cargoes serving the alumina production plant), Tarbert (serving the oil-fuelled power station), and Moneypoint (a dedicated facility for coal, used to fuel the ESB-owned generating station). The facilities at Shannon Foynes and Limerick Docks are common use facilities under direct control of SFPC. This capacity assessment covers only the facilities that are in common use.

Aerial images of the facilities at Shannon Foynes and Limerick Docks are shown in **Figure 5.19** and **Figure 5.20**, respectively.

Figure 5.19: Aerial image of facilities at Shannon Foynes

Characteristics of the main infrastructure and equipment

The port area of Shannon Foynes comprises the western jetty (F02, F03), the eastern jetty (F05, F06), and a Liquid Bulk jetty (F07), as shown in **Figure 5.19**.

Table 5.41 summarises the main berths available:

Table 5.41: Shannon Foynes berth characteristics

Berth	F02	F03	F05	F06	F07
Length (m)	270		295		*
Assumed operational depth (m)	10.5		10.5		8.1

* F07 is not a continuous berthing front, the length has been assumed for calculation purposes only

Shannon Foynes port primarily handles the following cargo types:

- Dry Bulk: animal feed, fertilisers, barley, corn, wheat, ores (rock salt, copper, bauxite, gypsum), aluminium hydroxide, ferrous sulphate, iron pyrites, cement, glass cullet, hydrate (alumina hydrate), domestic coal/smokeless fuel, petroleum coke, aggregates.
- Break Bulk: steel (steel pipes and bars), project cargoes, windmills, machinery, metal manufacturers.
- Liquid Bulk: molasses, heavy fuel oil (HFO), bunkering, petroleum, sulphuric acid.
- Other Traffic: passengers, cruisers, livestock, base for survey vessels.

The total actual area of the port is 102ha, with an available total open storage of 12ha, plus the following storage facilities:

- Total covered storage area for Dry Bulk is 52,000m^2
- Total Liquid Bulk storage (tanks) is 85,000m^3.

Figure 5.20: Aerial image of facilities at Limerick Docks

The inner port area of Limerick Docks comprises the wet dock and the graving dock as shown in **Figure 5.20**.

Table 5.42 summarizes the main berths available in Limerick Docks.

Table 5.42: Characteristics of berths at Limerick Docks

Berth	L01	L02 thru L06	L07	L08 & L09
Length (m)	79	422	112	233
Assumed operational depth (m)	6.1	6.1	6.1	6.1

Limerick Docks primarily handles the following cargo types:

- Dry Bulk: animal feed, fertilizer, cement, refuse derived fuel, ore, iron pyrites, rock salt, glass cullet, aggregate and contaminated soil.
- Break Bulk: steel, scrap metal, logs, finished timber, baled waste project cargoes.

The total current area of the port is 11ha, with an available total open storage of 2ha and a total covered storage for Dry Bulk of 4,400m².

5.4.2 Historical throughput

The total traffic figures available from recent years are shown in **Table 5.43** (the maximum figures highlighted in yellow):

Table 5.43: Maximum historical throughput (Source: SFPC and IMDO)

	Dry and Break Bulk (t/y)	Liquid Bulk (t/y)	All (t/y)
2007	1,904,000	777,000	2,681,000
2008	1,342,000	734,000	2,076,000
2009	1,193,000	598,000	1,791,000
2010	1,352,000	593,000	1,945,000
2011	1,090,000	704,000	1,794,000
2012	1,108,000	637,000	1,745,000
2013	1,319,000	673,000	1,992,000
2014	1,410,000	678,000	2,088,000
2015	1,624,000	689,000	2,313,000
2016	1,834,000	736,000	2,570,000
2017	1,928,000	745,000	2,673,000
2018	1,810,090	823,131	2,633,221
2019	1,626,994	739,724	2,366,718

The following graph shows these historical throughputs from 2007 to 2019. Volumes have remained quite constant with a slight increase in the Dry & Break Bulk segment from 2014 onwards. As can be seen, Dry and Break Bulk represent, on average, 70% of the total traffic handled.

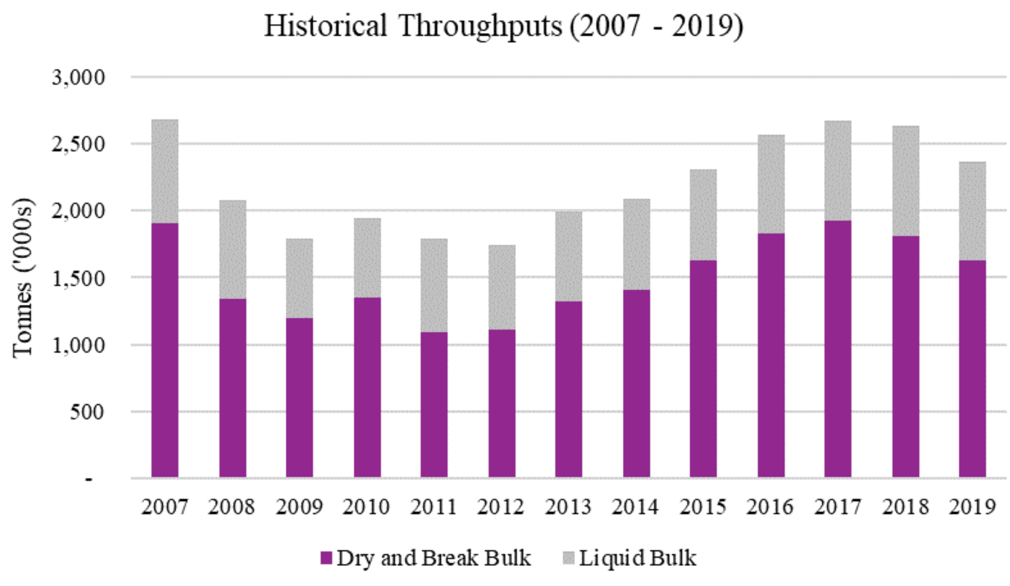


Figure 5.21: Bulk throughput at Shannon Foynes 2007 to 2019

The figures presented in the table and graph above do not include the throughputs of private facilities at the terminals, namely the Aughinish (Iron Ore), Tarbert (Oil) and Moneypoint (Coal).

In the years since 2017 throughput across both private and common user terminals at Shannon Foynes and the Limerick Docks, has remained relatively constant.

Liquid bulk throughput has been approximately 1.1 to 1.2Mt, dry bulk throughput has been over 9Mt/y (except for 2019 and 2020: ~8.2Mt) and break bulk has remained at about 0.3 to 0.35Mt/y in this period too.

Seasonality has been assessed based on the information provided by SFPC month by month for the years 2013 to 2017. Calculations for seasonality have been completed separately for each cargo type and the related peak factors (see **Section 4.2.3**) are shown in **Table 5.44** and **Table 5.45**:

Table 5.44: Shannon Foynes peak factors

Peak Factors	Dry and Break Bulk	Liquid Bulk
max	2.03	2.29
average	1.73	1.74

Table 5.45: Limerick Docks peak factors

	Dry and Break Bulk
Peak Factor	1.77

5.4.3 Review of Shannon Foynes Port Company development plans

It is noted that the SFPC Vision 2041 Masterplan (SFPC, February 2013) was considered in the capacity assessments of this study as they were undertaken prior to the publication of the latest SFPC Vision 2041 Strategic Review (SFPC, September 2022).

Current capacity

Shannon Foynes

Shannon Foynes port construction works commenced in 1846 and significant expansion continued through to the 20th Century.

The existing berthage face at the eastern jetty (F05-F06) was originally partially constructed in 1968, followed by an extension in 1984. Planning permission was awarded in 2012 for a 2.5ha land reclamation project behind the jetty.

The western jetty (F02-F03) was originally constructed in 1934 and then completely upgraded and extended in 1998. The facilities have been considered when calculating the current capacity.

Limerick Docks

Limerick Docks is a tidal dock located on the River Shannon. In the 1850’s a dock was built which would allow ships to enter at high tide. Once the lock gates close, there is a fixed water level inside the dock allowing design ships to stay afloat. The total berth length is circa 900m. The facilities have been considered when calculating the current capacity.

Imminent capacity

Shannon Foynes

SFPC had plans to construct a new berth, F04, between berths F03 and F05 in 2019. This project is currently on site with expected completion in Q2 2023. The second phase of this project is to reclaim some land behind berth F05, this is also on site a headed for completion in Q2 of 2023.

A new 83-acre (circa 33ha) storage area will also be developed at an inland site, where storage facilities will be erected. Phase 1 includes 1.2ha of covered storage and 7ha of open storage. This phase is currently ongoing. Phase 2 will see an additional 1.2ha of covered storage and 2.4ha of open storage. The final stage is for a final 2.8ha of covered storage and 6.1ha of open storage.

This additional berthing length and storage area has been considered in the calculation of the port's imminent capacity.

Limerick Docks

SFPC have no imminent port development plans for Limerick Docks.

Potential capacity

Shannon Foynes

In SFPC Vision 2041 Masterplan, SFPC have undertaken feasibility studies and prepared concept designs for a potential new terminal on Foynes Island. The options to extend the existing port frontage are very limited and therefore expanding the capacity on Foynes Island is the preferred option. The high-level concept design outlined by SFPC for the Foynes Island development is shown in **Figure 5.22** and includes the following:

- A new 700m multi-purpose berth for general use (container, bulk), 20m dredge depth.
- An open piled bridge structure from the mainland to Foynes Island (road and rail)
- Road connection between the new bridge and the proposed new berth (road and rail)
- Site for Panamax liquid berth
- Petroleum products tank farm
- Petroleum products berth

These new facilities will be able to receive vessels of over LOA 300m and 20m draught. No information on the planned equipment is available.

The layout of this development has been updated in the latest SFPC Masterplan (SFPC, September 2022) as outlined in **Appendix 8.3**; however, the changes were not considered in the capacity assessments.

Limerick Docks

It is anticipated that Limerick Docks will continue to maintain its existing cargo throughput with potential for significant projected new business.

According to this plan, berth capacity at Limerick Docks is adequate for any foreseeable future demand and any further increase in bulk capacity can be adequately provided within the existing operational area of the port. Thus, SFPC foresee that Limerick can continue to operate without any significant quay or land expansion in the future.

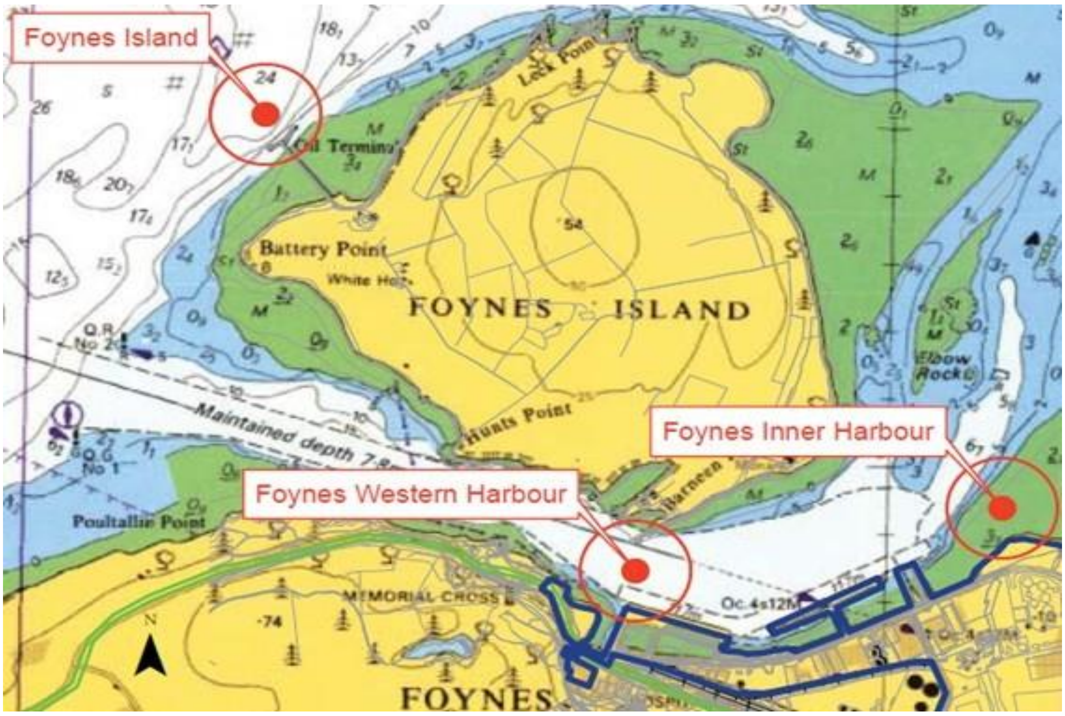


Figure 5.22: The Foynes Island proposed development as per SFPC Masterplan (Source: SFPC)

5.4.4 Capacity of Shannon Foynes Port Company

Particular features at Shannon Foynes Port Company

The following issues have led to adjustments to the general capacity assessment methodology that was outlined in **Chapter 4**.

- SFPC provided detailed responses to all the questions regarding the facilities at Shannon Foynes, and almost all requested information for Limerick Docks. The information for the expansion on Foynes Island was very minimal as the relevant development plans are at an early stage and final operational configuration was not fully developed at that time (2018). Assumptions have been made regarding the possible layout of the new facilities based on information available from different sources.
- Except for one berth at Shannon Foynes, the traffic operations share the facilities, and the berths are multi-purpose (Dry, Break and Liquid Bulk plus some minor operations with LoLo and cruise ships).

A methodology for assigning periods of time throughout the year for each cargo type at each berth was applied for the assessment.

- Definition of parcel size becomes a critical issue and assigning related STS handling rates associated to the different cargo types was performed to obtain the capacity at Shannon Foynes. An average parcel size has been calculated for each berth.
- Limerick is a locked port with limitations regarding the size of vessels, their access to the port, and its limitations regarding future expansion.

  The assessment was organized per berth, considering that the size of the vessels is limited by the size of the entrance gate to the dock. Additionally, the historical and actual occupancy for these berths is quite low.

LoLo

Current Capacity

There is no LoLo current capacity in Shannon Foynes, however there are plans in the short term (1-5) years to commence a small LoLo service of circa 40,000 TEUs/y.

Potential Capacity

SFPC are planning to use part of the Foynes Island development to handle LoLo cargo. Therefore, as shown in **Table 5.46**, for the potential scenario, a potential LoLo capacity of 167,000 TEUs per year is estimated.

Table 5.46: SFPC LoLo Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)
LoLo	Berthing length	N/A	m	N/A	N/A	m	N/A	350	m	0.167
	Storage Area	N/A	ha.	N/A	N/A	ha.	N/A	N/A	ha.	N/A
	Capacity			N/A			N/A			0.167

Dry & Break Bulk

Current Capacity

In assessing the current Dry & Break Bulk capacity in SFPC, two sub-systems were considered: berthing length and available storage area.

Berths and storage areas cannot be disaggregated by type of cargo due to the mix they handle at shared facilities. For the berthing, the type of cargo has been assigned berth per berth as a percentage according to the historical breakdown registered for the period 2013-2017.

For the storage, the turnaround times obtained for each type of cargo from the calculated quay capacities has been checked with benchmarking values and they are within normal operational limits. This allows us to conclude that the storage capacity is not limiting.

For Shannon Foynes the limiting capacity is the berthing length at all stages and for Limerick docks the limiting capacity is the storage area in all stages.

Table 5.47: SFPC Dry & Break Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Dry & Break Bulk	Berthing length	1511	m	N/A	1628	m	N/A	2850	m	N/A
	Storage Area	66	ha.	N/A	102	ha.	N/A	132	ha.	N/A
	Capacity			2.49			2.90			3.90

The table above shows the combined capacity of the Limerick Docks and the Shannon Foynes facility.

Imminent capacity

The construction of berth F04 and the landside works at berth F05 and development of the inland storage area will add both additional berthing length and storage area, resulting in increased capacity for Dry & Break Bulk in Shannon Foynes. The phasing of these works will see incremental steps in capacity as more storage area is brought online.

Potential Capacity

The potential scenario has been based on the development on Foynes Island, which will have a specific berth to accommodate Dry & Break Bulk traffic.

Liquid Bulk

Current Capacity

In assessing the current Liquid Bulk capacity in SFPC, two sub-systems were considered: berthing length and available storage area. The capacity of each sub-system is summarised in **Table 5.48**.

As outlined in the previous section, berths and storage areas cannot be disaggregated by type of cargo due to the mix they handle at shared facilities. For the berthing, the type of cargo has been assigned berth per berth as a percentage according to the historical breakdown registered for the period 2013-2017.

For the storage, the turnaround times obtained from the calculated quay capacities have been checked with benchmarking values and they are within normal operational limits. This allows us to conclude that the storage capacity is not limiting.

Liquid storage capacity considers industrial / private facilities which are common use.

Table 5.48: SFPC Liquid Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Liquid Bulk	Berthing length	665	m	0.8	782	m	N/A	2004	m	4.6
	Storage Area	8.1	ha.	N/A	8.1	ha.	N/A	8.1	ha.	N/A
	Capacity			0.8			0.96			4.6

Imminent and Potential Capacity

Information about liquid storage capacity in the potential scenario is not available. The assessment of the potential capacity has been based on the development on Foynes Island and an increased berthing length to 2004m.

5.4.5 Benchmarking

A benchmarking exercise has been undertaken to review current and expected port performance against other ports of similar profile (See **Section 4.2.3**).

Performance indicators for the different cargoes within Shannon Foynes (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar throughputs to Shannon Foynes. The results of this exercise are shown in the following sections**.**

Higher yard productivities are typically driven by shorter dwell times or from more efficient landside operations. Higher quay productivities are typically due to greater berth utilisations, lower down-times, and efficient loading / unloading of cargo.

The benchmark figures do not allow for variations between ports in terms of specific cargo handled and yard layouts. These figures should therefore only be used as a guideline.

The benchmark exercise includes the throughput, berthing availability, and yard areas of both the private and common user facilities at Shannon Foynes. The private facilities were not included in the capacity assessment.

Dry Bulk

Table 5.49: Shannon Foynes dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Shannon F	8,200,000	4,300	100,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Varna	7,700,000	2,600	170,000
Tarragona	9,760,000	2,800	98,000
Tereneuzen	9,700,000	4,000	190,000
Gdyina	7,360,000	2,200	120,000
Porsgrun	7,080,000	3,600	80,000

The yard productivity compares well with other European terminals; however, the quay productivity is higher. This quay productivity is still below some international terminals, i.e., Australian coal or grain terminals reaching 5,000 to 10,000 tonnes per meter of quay.

Liquid Bulk

Table 5.50: Shannon Foynes liquid bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Shannon F.	1,020,000	4,000	238,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Cardiff	1,020,000	2,900	113,000
Cadiz	1,330,00	2,700	300,000
Trondheim	770,000	3,800	256,000
Cagliari	1,060,000	1,800	24,000

The liquid bulk business at Shannon Foynes compares well with other European terminals, correlating well to productivity in Cadiz and Trondheim.

5.4.6 Hinterland connectivity

Introduction and identification of constraints

Shannon Foynes is the largest port in Ireland for bulk cargoes. The terminal at Shannon Foynes is the only one in the country able to accommodate Panamax and Post-Panamax vessels. It offers access to very deep water, and planning permission has been approved and works have commenced for a significant proposed development by SFPC. This project entails the development of 83 acres on the east side of the existing port as a landbank for marine related industry, port centric logistics and associated infrastructure as well as permission for modifications to its existing jetties and quays, including connecting its two main quays. This will, in turn, extend the area at the port for mooring of vessels and other port related operations. The development is in line with the long-term programme outlined by SFPC under its Vision 2041 Masterplan to transform its ports and the Shannon Estuary into one of the country's premier economic zones.

Shannon Foynes has been designated as a core port on the TEN-T North Sea – Mediterranean Core Network Corridor and the Atlantic Network Corridor. This requires ports handling significant freight or passenger traffic to have road access of motorway or expressway standards.

The Shannon Estuary

The port is currently linked to the national road network by the N69 Limerick – Tralee National Secondary Route. There is also a direct rail link from the port to Limerick City, but this is not currently in use. The port itself has two direct road accesses from the N69 – one is within the town of Foynes itself, and the second lies east on the N69, with a dedicated port access road facilitating additional access to the port, segregated from general N69 traffic.

Future connectivity upgrades

N21/69 Shannon Foynes to Limerick (incl. Adare Bypass)

The proposed scheme entails the provision of a high-quality road to connect Shannon Foynes Port with the M20 at Limerick. The scheme will provide a bypass of Adare in addition to a link to the Shannon Foynes Port from the new N21.

The National Development Plan 2018-2027 states that strengthening access routes to Ireland's ports through investment remains a government priority.

They plan to upgrade and enhance the road transport network and improve journey times. Examples of such investments include the N21/N69 Limerick to Adare to Shannon Foynes Road, to improve access to Shannon Foynes Port.

Limerick City and County Council in consultation with Transport Infrastructure Ireland are working on the realization of the Shannon Foynes to Limerick Road Improvement Scheme.

Planning permission for scheme was granted in August 2022. Under the current proposal, 35km of additional roads (15.6km dual carriageway and 17.5km motorway) are to be built, connecting the port of Foynes to the motorway network. Detailed design is underway and construction is expected to start in 2023.

The development of the M20 between Limerick and Cork (see **Section 5.3** on the Port of Cork) will enhance the connectivity of Shannon Foynes to its hinterland in the south. The M17/M18, completed in 2017, provides improved connectivity to the north and west. The recently completed widening of the M7 has further decreased journey times to Dublin.

Rail connection

The existing Shannon Foynes – Limerick rail freight line was discontinued in 2000. The rail line within the port extends directly up to the East and West Jetties. The 26-mile rail route remains a key asset to the port.

The importance of a rail connection to the port is acknowledged in the Limerick County Development Plan which seeks to safeguard the route corridor from development, as well as in the Mid-Western Regional Planning Guidelines and the Mid-Western Area Strategic Plan. It was also acknowledged in the Shannon Foynes Masterplan (SFPC Vision 2041) where the relative ease of re-instating the rail line was noted.

Irish Rail completed the feasibility and detailed design studies for SFPC in 2019. An 'expression for interest' tender for reinstatement works on the 42km rail line was issued in August 2022.

The appointed Contractor is now on site and the reinstatement works for the rail line are underway. The works to bring the line back in use are expected to take between 6 and 12 months.

Limerick Docks

Introduction and identification of constraints

The common user terminal in Limerick itself has an annual capacity of approximately 1 million tonnes. It is directly accessed from the R510 inner city regional route, known locally as Dock Road via the existing access at Dock Road. The M7, M21 and M18 are easily reachable, providing high quality accessibility to the major radial national routes from Limerick City.

In the Vision 2041 it is anticipated that Limerick Docks will continue to maintain its existing cargo throughput with potential for increases arising from the demands of business in the regional hinterland. In addition to facilities which are sufficient to accommodate current and future needs, there are non-core assets for which alternative uses are being sought.

5.4.7 Lead in times for capacity increase

Between now and 2040, SFPC have two primary developments planned at Shannon Foynes, as outlined in **Section 5.4.3**. **Table 5.51** indicates the current stage of development of the projects and provides an assessment of the anticipated timeframe for each stage. Both developments planned for the port have already begun the process.

This gives an indication of the total lead-in time so that it is clear when the development of these projects should commence in order to ensure that the additional capacity is available before demand exceeds supply.

The demand curves are taken from the national forecasted demand curve for each cargo type, covered in **Section 3.4.2** and then proportionately split between the ports, assuming a constant percentage share.

Table 5.51: Lead-in times for proposed developments at SFPC

	Development	Feasibility study	Scheme design and EIA	Consenting + IROPI	Detailed design and tender	Construction	Total	
		months						years
Current Capacity								
Imminent capacity	Berth F04 and reclamation behind berth F05	✓	✓	✓	✓	✓	6	0.5
	Durnish Lands inshore storage area (Phase 1)	✓	✓	✓	3	12	15	1.25
Potential capacity	Development of Foynes Island	✓	24	48	12	30	114	9.5

✓= Stage completed

The development on Foynes Island could require an IROPI (Imperative Reasons of Overriding Public Interest) application because of its location within a site with an environmental protection designation. This will significantly increase the consenting timeline.

5.4.8 Capacity versus demand analysis

Dry & Break Bulk

As shown in Figure 5.23, SFPC is currently operating at approximately 80% in terms of its Dry & Break Bulk capacity. The demand projection is expected to exceed capacity in 2026, however the additional capacity from the new berth 4 is currently on schedule for 2024.

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	1.63	2.5	2.9	3.9

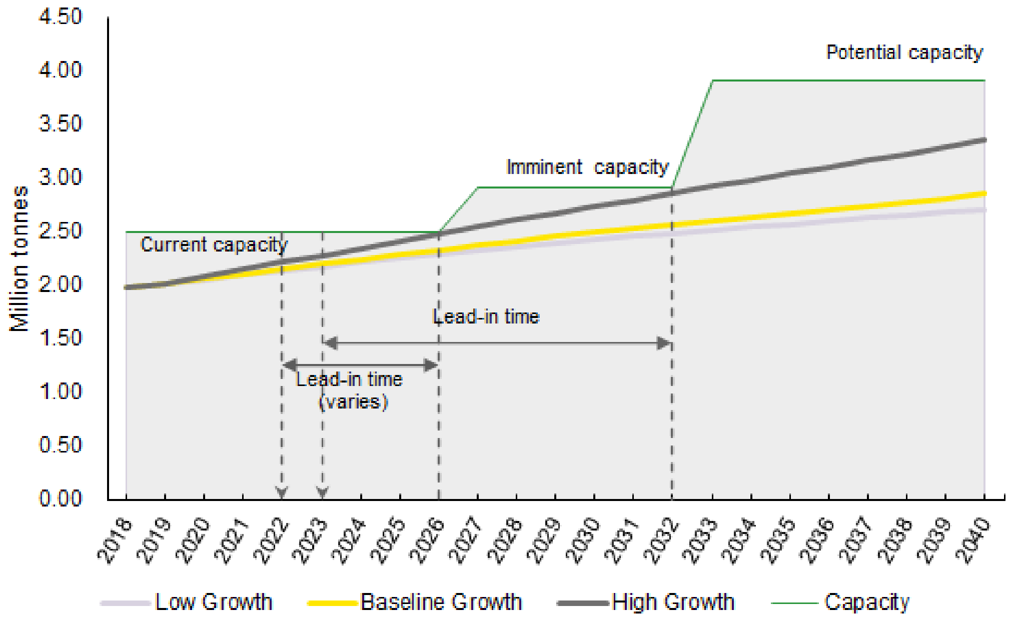


Figure 5.23: SFPC – Dry & Break Bulk Capacity vs Demand

This new berth 4 and the existing berths 2 and 3 have a somewhat reduced operational efficiency due to the environmental restrictions on the width of the deck. It is difficult to quantify this but as a result capacity may be reached sooner than the graph indicates.

The new berth facilities (berth F04) have already been designed and construction was planned to commence in 2019. Construction started in 2022 with an expected completion date in 2023. The new berth combined with the phasing of the inshore storage areas will result in incremental steps in capacity as more storage area is brought online. The exact step-ups in capacity for each phase has not been assessed but the final capacity should be brought online by 2026 to ensure there is no constraint in the high growth scenario.

This increased capacity of 2.9 million tonnes per year will again be exceeded in 2032, which is when the additional capacity on Foynes Island will be required to accommodate the increase in demand. The timeline for this development is estimated at approximately 9.5 years mainly due to the more complicated consenting process because of the environmental designations in the area.

The proposed development will either require planning permissions from Limerick City and County Council or planning consent as Strategic Infrastructure from An Bord Pleanála. Strategic infrastructure projects are generally significant energy, transport, environmental or heath infrastructure projects.

Liquid bulk

As can be seen from **Figure 5.24** it is estimated that SFPC is operating at full capacity in terms of its Liquid Bulk handling.

The 2017 throughput is taken from Eurostat and is processed as outlined in **Appendix 2** to adjust for the private / industrial facilities which are not common use facilities. It will benefit from some additional capacity as a result of the new Berth 04 and additional storage area, as outlined in **Section 5.4.4**. The potential capacity associated with the Foynes Island development will provide a large increase in capacity for Liquid Bulk, this has been scheduled for 2032 to align with the Dry and Break Bulk business requirements.

Table 5.52: Shannon Foynes Liquid bulk throughput and capacity

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
Liquid Bulk	*M tonnes/y*	0.74	0.8	1.0	4.6

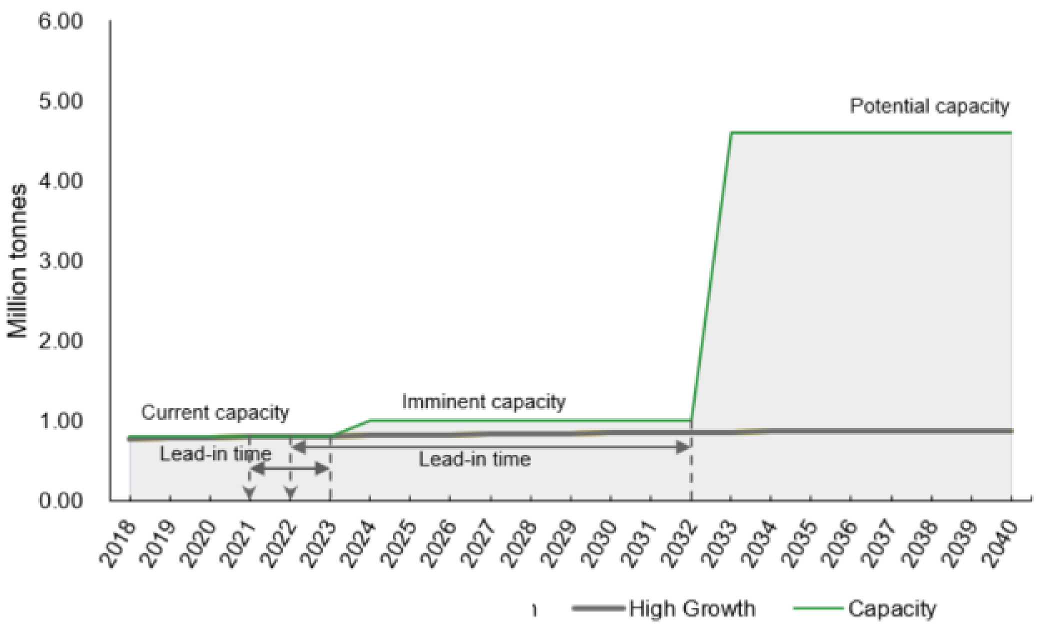


Figure 5.24: SFPC – Liquid Bulk Capacity vs Demand

5.4.9 Conclusion

The throughput at Shannon Foynes is primarily Dry Bulk, Break Bulk and Liquid Bulk, whilst the throughput at Limerick Docks is primarily Dry & Break Bulk. The current, imminent, and potential capacities for each of these facilities is shown in **Table 5.53**.

Table 5.53: SFPC capacity summary by cargo type

	Cargo type	Units	Throughput 2019	Current Capacity	Imminent Capacity	Potential Capacity
SFPC	Dry & Break Bulk	*M tonnes/y*	1.63	2.5	2.9	3.9
	Liquid Bulk	*M tonnes/y*	0.74	0.8	1.0	4.6
	LoLo	*M TEUs/y*	n/a	n/a	n/a	0.17

5.5 Port of Waterford

5.5.1 Description of the port and cargo handled

General

The main centre of operations of Port of Waterford (PoW) is at Belview Port on the River Suir, 8km downstream from Waterford City, as shown on the aerial image in **Figure 5.25**. The port is mainly dedicated to handling LoLo and Dry & Break Bulk. The port is connected to the hinterland by road and rail.

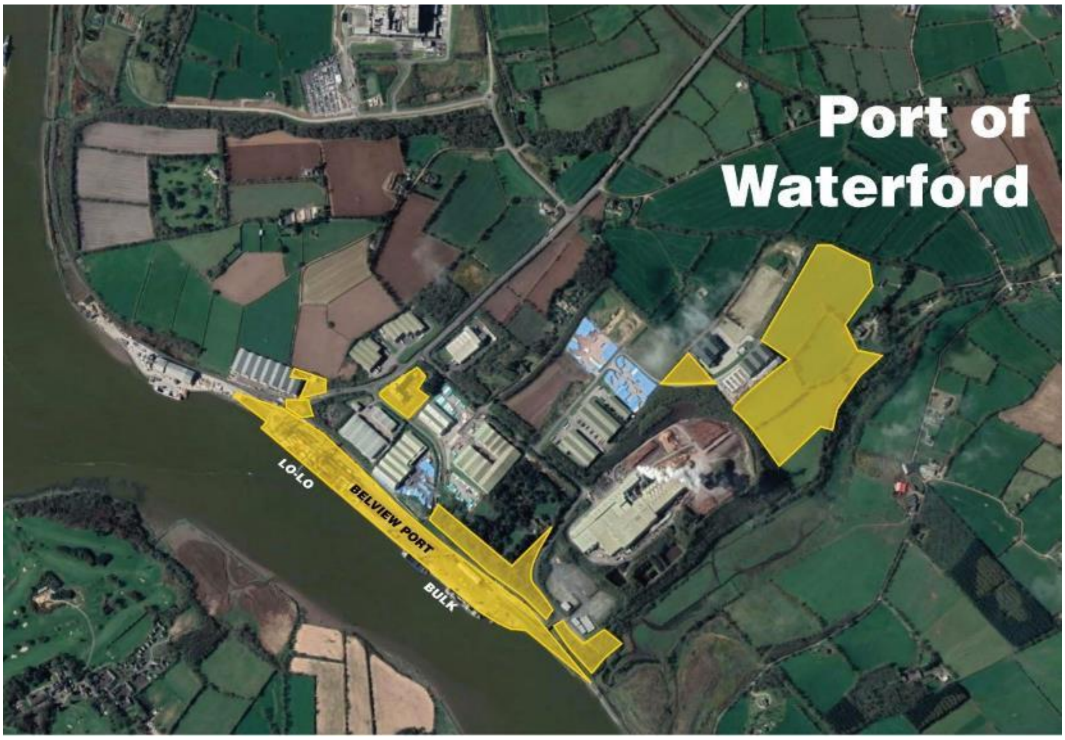


Figure 5.25: Belview Port general overview (Source: Google Earth)

Characteristics of the main infrastructure and equipment

Table 5.54 summarises the two primary terminals within Belview Port and outlines their dimensions and the maximum design vessels they can accommodate.

Table 5.54: Port of Waterford berth characteristics

Facility	Berthing length (m)	Quay draft (m)	Max LOA (m)	Cargo
Belview Bulk Terminal	393	9	190	Bulk & General cargo
Belview Container Terminal	450	8	160	Container and Project cargo

To the south of these facilities there is a private jetty owned by the O'Brien family dedicated to the import of clinker. The capacity at this facility is not managed by Port of Waterford and hence outside the scope of this capacity assessment.

The port has four rail sidings that come right along the quays, allowing containers to be loaded directly to / from ships or road transport.

Bulk Terminal

With a total length of 393m, the quay is equipped with four mobile harbour cranes to handle bulk and general cargo products. **Table 5.55** summarizes the main equipment characteristics.

Table 5.55: Port of Waterford equipment characteristics (Source: Port of Waterford Masterplan)

	Units	Lift capacity	Grab capacity	Productivity
Liebherr 280	1	84 t	30 m³	1500 t/h
Liebherr 250	1	50 t	20 m³	800 t/h
Liebherr LH60	2	8 t	6 m³	400 t/h

The terminal is also equipped with a variety of ancillary handling equipment:

- Breakbulk load spreaders
- Volvo loading shovels
- Hoppers
- Weighbridges
- Fresh supply water hydrants

An aerial image of Belview Bulk Terminal is shown in **Figure 5.26.**

Figure 5.26: Belview Bulk Terminal (Source: Port of Waterford)

Container Terminal

With a total berthing length of 450m, the terminal is equipped with two STS gantry cranes with a 48m rail gauge to lift container boxes on and off.

The long reach gantry cranes store containers directly under the cranes, hence removing the need for secondary handling. The STS cranes have a maximum span of 28m and work at an efficiency of 30-40 moves per hour.

The container terminal is also equipped with:

- 2 Reach Stacker
- 200 refrigerated points
- 4 rail sidings under cranes
- 2 dedicated weighbridges

Figure 5.27 shows an aerial view of Belview Container Terminal.

Figure 5.27: Belview Container Terminal (Source: Port of Waterford)

5.5.2 Historical throughput

The total bulk cargo handled in Port of Waterford in 2019 was 1.5 million tonnes. The main activity is Dry Bulk with mainly fertilisers, animal feed, and cement products as shown in the following table.

Table 5.56: Goods handled at Port of Waterford

Dry Bulk	Break Bulk
Animal Feedstuffs	Cattle
Cattle feed	OSB
Clinker	Pulp Logs
Cement slag	Steel (beams,rail,rebar)
Fertilizer	Wind turbines
Grains	Wooden poles
RDF	
Salt	

The historical throughput for Port of Waterford in terms of LoLo and Dry & Break Bulk are shown in **Figure 5.28** and **Figure 5.29** below.

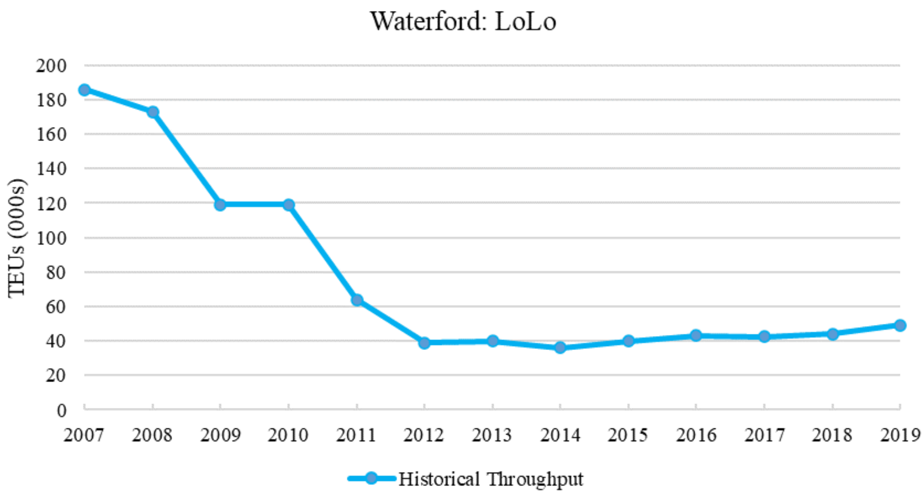


Figure 5.28: Historical LoLo throughput in Port of Waterford (Source: Port of Waterford and IMDO)

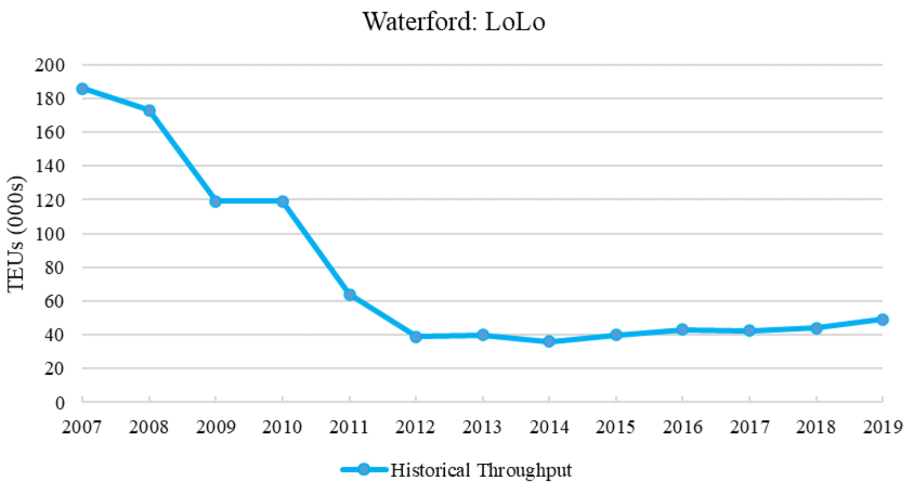


Figure 5.29: Historical Dry & Breakbulk throughput in Port of Waterford (Source: Port of Waterford and IMDO)

Seasonality has been assessed to understand if there is any peak period during the year. Based on the 2017 monthly throughput data, the values for the peak factors for Dry Bulk and LoLo were obtained. These are outlined in **Table 5.57.**

The Port of Waterford has provided a detailed split of the monthly throughput for the different products handled there (e.g.: cattle feed, clinkers, fertilizers, grains, salt, steel products, etc.). In this mix each product follows a different pattern.

After assigning each of the products to one of the four main types of cargo, we calculated the peak factor figures for each cargo type. These are shown in **Table 5.57**.

Table 5.57: Port of Waterford peak factors

	Dry and Break Bulk	Liquid Bulk
Peak Factors	1.25	1.20

5.5.3 Review of Port of Waterford development plans

The Port of Waterford, in 2020, published their new masterplan to 2044. They projected their demand figures at a low, medium, and high growth rate for both their bulk and general cargo business and their LoLo business. In both cases they used 2% and 4% respectively for the low and medium growth scenarios but used 6% and 8% respectively for the Bulk & General Cargo and LoLo high growth scenario.

Considering these projections, the port’s masterplan outlines a couple of potential schemes which will increase the capacity. In their low growth scenario, a 200m berth extension is suggested in 2037 while this is brought forward to 2029 in their medium and high growth scenarios. Furthermore, in their high growth scenario, additional investment in the container terminal is proposed in 2035.

Port of Waterford masterplan also makes reference to an improvement strategy for the navigation channel and some river training (i.e., structural measures to improve the river and its banks) works are required to address sediment accumulation. This will reduce the annual expenditure on maintenance dredging by the port. A sand bar is formed on the confluence of the rivers at Cheekpoint. The Port of Waterford is currently spending €1.3m per year on maintenance dredging, hence this strategy to install a sheet pile wall in the river will look to reduce this spending.

5.5.4 Capacity at Port of Waterford

Particular features at Port of Waterford

The following issues have led to adjustments to the general capacity assessment methodology that was outlined in **Chapter 4**.

- The Port of Waterford completed almost all the questionnaire, thus there was little need to complement it (except for seasonality variations).

- Despite the total port area being very large, the areas adjacent to the berths are limited. Port areas were assigned to specific traffic with different assumptions for LoLo and for Bulk cargo types.

For specific assumptions regarding the capacity assessment, refer to **Appendix 8.4**.

LoLo

Current Capacity

In assessing the current LoLo capacity in Port of Waterford, two sub-systems were considered: berthing length and available storage area. The capacity of each subsystem is summarised in **Table 5.58**.

The proportion of the total lands owned by the port assumed for LoLo is 4.6ha

Table 5.58: Port of Waterford LoLo Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)	Quantity	Units	Capacity (M TEUs/y)
LoLo	Berthing length	450	m	0.324	450	m	0.324	450	m	0.324
	Storage Area	4.6	ha.	0.202	4.6	ha.	0.202	4.6	ha.	0.202
	Capacity			0.202			0.202			0.202

Since the port's planned investment in the container terminal in their 2020-2044 masterplan is only required in their high growth scenario the imminent and potential capacities are considered the same as the current capacity.

However, there is potential for expanding the capacity of the port through the construction of additional berth length, procurement of additional or higher productivity cranes, expanding back-up areas, and deepening and widening the marine access channel to accommodate larger vessels if future demand for facilities increases.

Dry & Break Bulk

Current Capacity

In assessing the current Dry & Break Bulk capacity in Port of Waterford, two sub-systems were considered: berthing length and available storage area. Their capacity is summarised in **Table 5.59**.

The storage capacity has not been analysed because all operations at the apron and adjacent areas are only short term or just for transfer from trucks to the ship (and vice versa). All the longer-term storage takes place at remote facilities.

The area outlined in **Table 5.59** is the area of port lands owned by Port of Waterford (including the area adjacent to the berth and the remote areas).

A fraction of the total berthing length was attributed to the Dry & Break Bulk capacity.

The 2020 Port of Waterford Masterplan gives the Dry & Break Bulk capacity as 1.5Mt/y however, it would be reasonable to assume this capacity is higher given the productivity rates of their current fleet of material handlers (subject to operational factors), as shown in **Table 5.55**.

Table 5.59: Port of Waterford Dry & Break Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Dry & Break Bulk	Berthing length	393	m	1.90	593	m	2.85	593	m	2.85
	Storage Area	21	ha.	N/A	21	ha.	N/A	21	ha.	N/A
	Capacity			1.90			2.85			2.85

Imminent Scenario

The 200m berth extension will increase the berthing length by 50%, and so long as the material handling capability is also suitably increased the terminal's capacity will increase accordingly.

5.5.5 Benchmarking

A benchmark exercise has been carried out to review current and projected port performance against other ports of similar profile (See **Section 4.2.3**).

Performance indicators for the different cargoes within the Port of Waterford (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar throughputs to the Port of Waterford. The results of this exercise are shown in the following sections.

Yard productivities will be higher if cargoes benefit from a shorter dwell time or from more efficient stacking of cargo within the storage area. Quay productivities will be higher with greater berth utilisations, lower down times, and efficient loading / unloading of cargo.

The benchmark figures do not allow for variations between ports in terms of specific cargo handled and yard layouts. These figures should therefore only be used as a guideline.

LoLo

Table 5.60: Port of Waterford LoLo benchmarking

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Waterford	49,000	130	19,700

Port	2019 Throughput (TEU)	Quay productivity (TEU/m)	Yard productivity (TEU/ha)
Rijeka	290,000	480	26,200
Nantes	176,000	200	5,300
Lübeck	179,000	600	29,800
Ancona	212,000	700	10,600
Dewry, Europe	N/A	885	20,000

The Port of Waterford has a yard productivity rate similar to those of much larger terminals. This is due to the compact under-crane storage yard allowing for tight and high packing of containers.

The quay productivity, however, remains relatively low. This can be attributed to the single STS crane at this facility while the quay length is over 400m. At other larger, worldwide terminals there is approximately 100m of quay length per STS crane.

Dry Bulk

Table 5.61: Port of Waterford dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Waterford	1,360,000	3,400	90,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Split	1,120,000	1,200	45,000
Torino	1,500,000	1,300	12,000
Larnaca	1,240,000	1,900	180,000
Cuxhaven	1,560,000	2,200	100,000

The Port of Waterford performance indicators align well with other European terminals. The quay productivity is at the top of end of European ports of a similar size, but other high-throughput European terminals can reach similar levels (see **Table 5.49**).

5.5.6 Nautical access and hinterland connectivity

National Development Plan

The NDP 2018-2027 states that strengthening access routes to Ireland's ports through investment remains a government priority. The plan includes upgrading and enhancing the road transport network and to improve journey times. It notes that the UK's exit from the EU in 2019 highlights the importance of this NSO and the importance of continuing investment to further improve the quality of port facilities.

Those in the South-East such as Rosslare and the Port of Waterford are of particular importance given their role in maintaining transportation linkages with crucial EU markets.

Nautical access

Port of Waterford lies along the river Suir approximately 10 nautical miles (1 hour) from the mouth of the estuary between Dunmore East and Hook Head. The access channel is maintained at -6.5mCD. Dredging is required several times a year.

Hinterland access

The terminal at Belview benefits from access to the M25 which by-passes Waterford city and the M9 motorway to Dublin. There is also a rail connection directly into the port.

Access from the East to the Belview terminal was enhanced by the opening of the Barrow River Crossing on the N25 in January 2020.

5.5.7 Lead-in times for capacity increase

Whilst the improvements to the navigation channel will not directly result in an increase in handling capacity for Port of Waterford, they will reduce annual maintenance costs and potentially increase the draught size of vessels that can be accommodated.

These developments are currently undergoing a feasibility study/concept design, hence the lead-in times are expected to be approximately 3-4 years, as shown in **Table 5.62.**

Table 5.62: Lead-in times for proposed developments at Port of Waterford

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	
		months						years
Current Capacity								
Imminent capacity	River works	✓	10	12	8	12	42	3.5
	200m bulk berth extension	9	9	12	12	18	60	5.0
Potential capacity	Channel deepening	4	6	12	8	12	42	3.5

✓= Stage completed

5.5.8 Capacity versus demand analysis

LoLo

As illustrated in **Table 5.63,** Port of Waterford has no plans to increase its LoLo capacity as it has adequate existing spare capacity.

Table 5.63: Port of Waterford throughput and capacity for LoLo cargo

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
LoLo	*M TEUs/y*	0.05	0.2	0.2	0.2

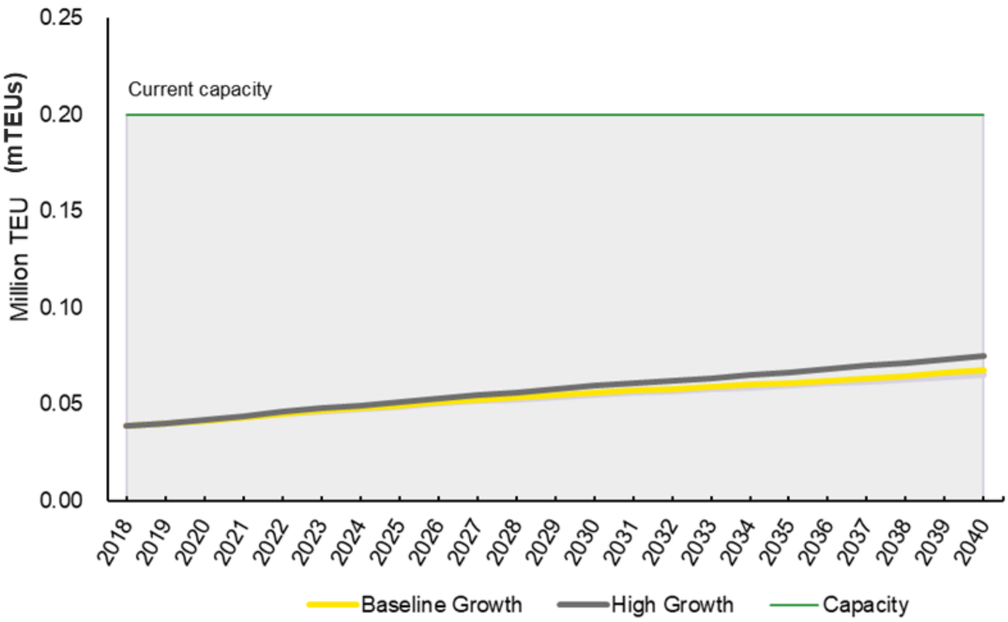


Figure 5.30: Port of Waterford – LoLo Capacity vs Demand

Dry & Break Bulk

As illustrated in **Table 5.64**, the Port of Waterford plans to increase its Dry & Break bulk capacity by 50%. This should be pre-2030 to avoid constraints in the high growth scenario. In the Low or Baseline scenario this should occur by 2040.

Table 5.64: Port of Waterford throughput and capacity for bulk cargo

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
Bulk (inc. project cargo)	*M tonnes/y*	1.36	1.9	2.85	2.85

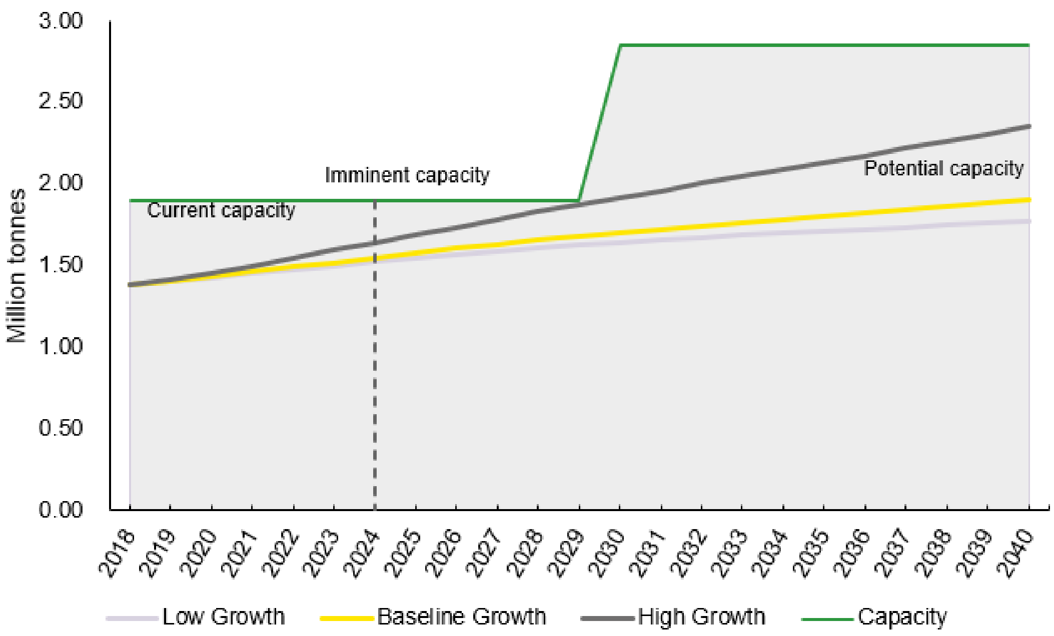


Figure 5.31: Port of Waterford – Dry & Break Bulk Capacity vs Demand

5.5.9 Conclusion

The current, imminent, and potential capacity of the Port of Waterford for each type of cargo is summarised in **Table 5.65**.

Table 5.65: Port of Waterford capacity summary by cargo type

Cargo type	Units	Throughput 2019	Current capacity	Imminent capacity	Potential capacity
LoLo	*M TEUs/y*	0.05	0.2	0.2	0.2
Bulk (inc. project cargo)	*M tonnes/y*	1.36	1.9	2.85	2.85

5.6 Rosslare Europort

5.6.1 Description of the port and cargo handled

General

Rosslare Europort is located on the South-East coast of Ireland and is less than two hours from Dublin by road. It offers daily RoRo and RoPax direct services to the UK and mainland Europe. Facilities are shown in **Figure 5.32**.

Figure 5.32: Rosslare Europort general overview. (Source: Google Earth, Rosslare Europort and Arup)

Characteristics of the main infrastructure and equipment

The port is mainly dedicated to passenger services, handling vehicles (trade cars, passenger cars and coaches) coming by ferries and RoPax vessels, and freight on trailers (unaccompanied and accompanied). In recent years there has been an increase in bulk cargo traffic, but it is still quite low in terms of volume. **Table 5.66** summarises the characteristics of the main berths available.

Table 5.66: Characteristics of the berths available in Rosslare Europort (Source: Rosslare Europort)

	Length (m)	Depth (m)	Ramps	Passenger gangway
Berth 1	221	7.2	2 tiers	no
Berth 2	221	7.2	single tier	no
Berth 3	186	7.2	single tier	yes
Berth 4	145	6	-	no
Fisherman's quay	150	7.2	-	-

Berth 4 and Fisherman's quay are not being utilised for either Bulk or RoRo. Berth 4 does not have a RoRo ramp and the Fisherman's quay is not able to take any significant loading due to its structural make-up. Hence, those berths are out of the scope of this capacity assessment.

The port is mainly dedicated to regular RoRo services, as shown in **Appendix 8.5**. The total area of the port is approximately 26ha, and the total open storage area available is 10ha. The main figures for the short and long-term storage capacity are summarised in **Table 5.67** below.

Table 5.67: Storage capacity at Rosslare Europort (Source: Rosslare Europort)

Unaccompanied trailers	360	trailers
Trade car yard	800	cars
Accompanied traffic marshalling lanes	3800	lane-meters

5.6.2 Historical Throughput

The total throughput figures between 2007 and 2019 are shown in **Table 5.68** (the maximum figures are highlighted in yellow). From 2015 to 2019 a split between accompanied and unaccompanied freight was also provided and so this period formed the main basis for the capacity study.

Table 5.68: Traffic throughput at Rosslare Europort (Source: Rosslare Europort and IMDO)

	Vehicles (cars and coaches)	Passengers	Freight (acc. + unacc.)	Bulk	Trade Vehicles (FBU)
	units/y	passengers/y	units/y	t/y	units/y
2007	324,998	1,074,902	167,968	-	25,739
2008	307,059	1,000,902	156,461	-	17,116
2009	303,746	946,623	133,508	-	8,243
2010	286,079	912,861	122,353	-	17,767
2011	280,137	906,050	118,888	-	15,410
2012	274,123	904,325	113,781	-	10,385
2013	261,779	868,650	118,936	-	9,487
2014	264,838	874,593	121,052	1,700	14,759
2015	270,513	868,587	125,486 (58,000 + 66,000)	20,026	20,376
2016	271,724	840,384	129,789 (59,000 + 70,000)	45,696	22,059
2017	273,378	843,924	129,280 (58,000 + 70,000)	46,699	18,701
2018	254,180	No data	128,414 (60,000 + 68,000)	19,202	20,864
2019	197,707	No data	122,095 (58,000 + 63,000)	35,082	17,969

Figure 5.33 shows how RoRo volumes have changed between 2007 and 2019.

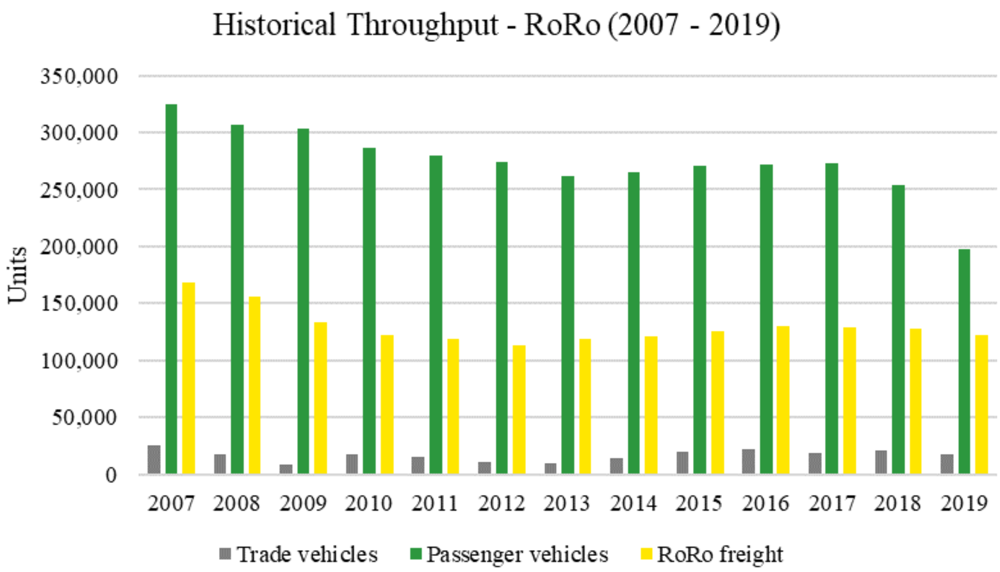


Figure 5.33: Rosslare Europort RoRo historical throughput in units (Source: Rosslare Europort and IMDO)

The services departing from Rosslare Europort are grouped in two corridors: Southern Corridor Irish Sea (all destinations are to UK), and Continental Direct Corridor (France, Belgium, and Netherlands). The number of calls include all vessels operating at the port, except for those devoted to Bulk Traffic & Bunkers.

The historical traffic throughput corresponding to each of these corridors is presented in **Figure 5.34.** In the graph, the data covers a longer period since 2002, which shows the decrease in traffic that occurred after the financial crisis.

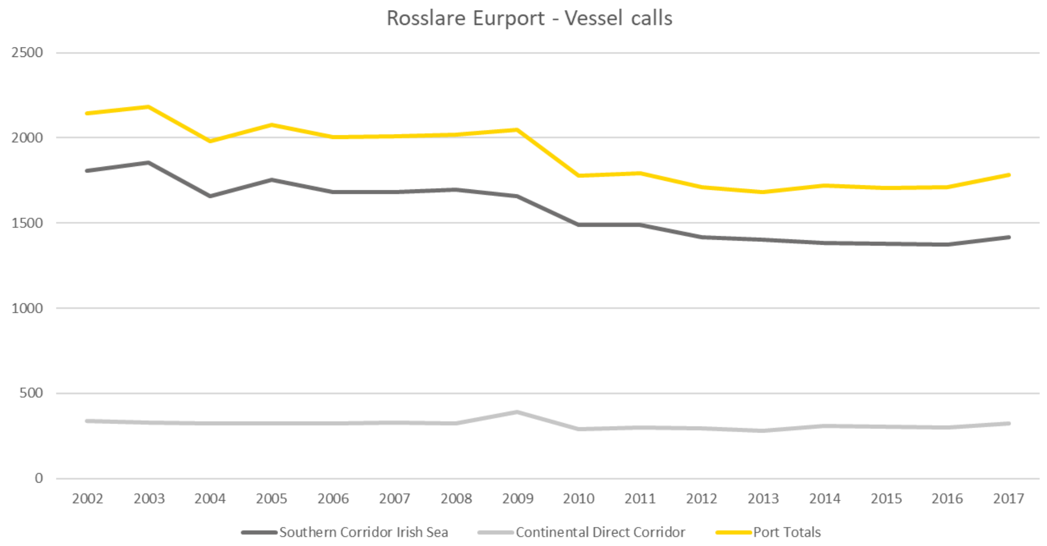


Figure 5.34: Traffic throughput for the last 15 years at Rosslare Europort (Source: Rosslare Europort and Arup analysis)

Seasonality has been assessed based on the analysis of the IMDO quarter to quarter statistics for 2015 which are available at https://www.imdo.ie. The peak factor utilised for capacity estimations in all scenarios is equal to 1.61.

In 2021, following Brexit, Rosslare Euroports freight throughput experienced a step-change from ~120,000 up to 180,000, this throughput is expected to settle down in future years but could mark a change in the forecast volumes.

5.6.3 Review of Rosslare Europort development plans

Since 2018, Rosslare Europort have been planning major infrastructural developments which will bring the port in line with modern RoRo ports. The improvement plans include:

- Pre-2018 the ports trailer compound was utilized to nearly 100% capacity and a CapEx provision was made in 2018 for increasing the size of this compound. This expanded compound was on-line for 2019.
- The designation of the port as an agricultural border post. The plans for the OPW to proceed with the tender for the construction of the joint Customs / Immigration / Agriculture inspection facilities were signed off by the Government in September 2022.
- Integration of technology in the ports Terminal Operation System (TOS) will provide a further intensification of the utilization of the ports facilities.
- The completion of the last section of the N25 motorway linking the port with Dublin through the national high-capacity road network will require a re-design of the access road, including a completely new configuration for the access gates, queueing areas, control zones, etc.

The three scenarios considered for the capacity assessment are:

- Current scenario: pre-2018 situation with the original unaccompanied RoRo trailer compound.
- Imminent scenario: includes the expansion of the port's trailer compound identified as a bottleneck to capacity in the current scenario.
- Potential scenario: includes the improvement of the road access to the port. This will improve the quality of the service and attract more users. This does not result in a quantifiable increased capacity as it is a capital road project outside the boundaries of the port.

It is noted that the latest Rosslare Europort Masterplan was developed in 2020; however, it was not available at the time of the assessments and therefore any changes to the above development plans were not considered. An outline of the development plans in the latest Masterplan has been provided by Rosslare Europort and is included in **Appendix 8.5**.

5.6.4 Capacity of Rosslare Europort

Particular features in at Rosslare Europort

The following issues have led to adjustments to the general capacity assessment methodology that was outlined in **Chapter 4**.

- Rosslare Europort completed most of the questionnaire, thus there was little need to complete or complement it with assumptions. The exception for this was the seasonality of their business.
- Since 2014 the port handles a small amount of bulk which represents around 2% of the total yearly throughput. The port is not adapted for this type of cargo and has not been included in the assessment.
- The RoRo operations at this port include a mix of vehicles (cars and coaches, accompanied and unaccompanied trucks, and trade vehicles) which sometimes travel in the same vessel. The individual capacities for the different vehicle types were found assuming a typical throughput split – this was taken to be the 2019 historical throughput.
- The mix of vehicle types means the capacity assessment has been estimated on a lane-meters basis considering berth utilisation, handling rate, yard space, and shared marshalling lane lengths.

The RoRo capacities are not fixed and depend on the split of cargo which makes up this figure.

RoRo

The capacity assessment for Rosslare Europort has been carried out for all cargoes in terms of available lane-meters and later converted into units using historical throughput splits. This is because there is a mix of users for all berths and some shared yard areas. Changes in this split could materially change the capacity in terms of number of units.

The planned expansion of the trailer compound has been considered in the imminent scenario. This development results in an increased capacity in unaccompanied freight units per year as the terminal is heavily constrained by the yard size, dwell times, and utilization of the marshalling lanes per vessel. Any increases in yard capacity will also increase the overall terminal capacity as the port's capacity constraint is relieved. After this development, the yard capacity will remain as the port's limitation.

There is no additional port capacity development in the potential scenario hence there is no increase in the capacity estimated. These numbers are broken down and summarized in **Table 5.69**.

Table 5.69: Rosslare Europort RoRo-total capacity summary

	Current (M units/y)		Imminent (M units/y)	Potential (M units/y)
	Key Parameters	Capacity	Capacity	Capacity
Unaccompanied Freight	360 slots 2 days dwell time	0.065	0.120	0.120
Accompanied Freight	1800lm at 25% utilization 6 max-sized ships per day	0.093	0.093	0.093
Passenger Cars and buses	2160lm at 15% utilization 6 max-sized ships per day	0.335 cars 0.005 buses	0.335 cars 0.005 buses	0.335 cars 0.005 buses
Trade Cars	space for 800units 7-day dwell time	0.04	0.04	0.04
Unaccompanied freight yard slots increase to 670 at imminent stage, no loss of capacity to other cargo as re-purposing of unused port land				

The maximum historical throughput for passenger vehicles is 325,000 (**Table 5.68**, 2007), this is narrowly less than the current stated estimated capacity. In 2007, this throughput was achieved because the berth occupancy ratio was higher.

Similarly, the overall freight throughput in 2007 (168,000) is higher than the stated estimated capacity (158,000). This is due to the high numbers of accompanied freight units handled on the larger number of ships operating at the terminal at the time. In 2007, approximately 100,000 unaccompanied units and 68,000 accompanied freight units were handled. This was achieved as export dwell times would have been shorter due to the higher number of sailings compared to the present day.

Furthermore, the cargo split will vary from year to year with changes in the freight, tourism, and trade vehicle markets. This will allow more of some cargoes to be handled instead of others, i.e., traffic composition directly affects capacity. This also contributes to the throughput figures exceeding the capacity estimate for some cargo types in 2007, which was based on the 2019 throughput split.

5.6.5 Benchmarking

Benchmarking has been carried out to review current and projected port performance against other facilities of similar profile (See **Section 4.2.3**).

Performance indicators for the different cargoes within Rosslare Europort (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar throughputs to Rosslare Europort. The results of this exercise are shown in the following sections**.**

Yard productivities will be higher if cargoes benefit from a shorter dwell time or from more efficient stacking of cargo within the storage area. Quay productivities will be higher with high berth utilisations, minimal down-times, and efficient loading / unloading of cargo.

The benchmarking figures do not allow for variations between ports in terms of specific cargo handled and yard layouts. These figures should therefore only be used as a guideline.

RoRo

Table 5.70: Rosslare Europort RoRo unaccompanied freight benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Rosslare	60,000	9,000

Port	2019 Throughput (units)	Yard productivity (units/ha)
Harwich	180,000	12,000
Liverpool	400,000	17,000
Grimsby and Immingham	620,000	17,000
Hull	60,000	18,000
Dublin	700,000	20,000

Table 5.71: Rosslare Europort RoRo trade vehicles benchmarking

Port	2019 Throughput (units)	Yard productivity (units/ha)
Rosslare	18,500	12,300

Port	2019 Throughput (units)	Yard productivity (units/ha)
Barcelona	775,000	13,000
Koper	750,000	11,000
Southampton	760,000	7,600
Antwerp	1,220,000	5,500
Bremerhaven	2,170,000	11,000

Rosslare's unaccompanied freight yard productivity rates are at the lower end of the benchmarked range for comparable English and Irish terminals (**Table 5.70**).

This indicates that increases in efficiencies could be explored in terms of yard productivity.

The trade vehicle yard productivity, however, is comparable to other Europe terminals despite the throughputs being quite dissimilar (**Table 5.71**).

5.6.6 Hinterland connectivity

Introduction and identification of constraints

Rosslare Europort is the second largest ferry port in Ireland with services to the UK, France, Belgium and Spain operated by DFDS, Brittany Ferries, Finnlines and Stena Line.

It is located 16km south of Wexford town and linked to the national road network by the single carriageway route N25 which serves the catchment area to the south and south-west.

From the Wexford ring road, the N11/M11 serves traffic from the Dublin area bound for Rosslare.

Recent road improvement works in New Ross (N25) and Enniscorthy (N11) have enhanced connectivity between Rosslare Europort and its hinterland to the North (Dublin region) and the West (Waterford and Cork).

Rosslare Europort is connected to the national rail network. There are four passenger services daily, Monday to Friday and three services daily at the weekend. There are no freight services from Rosslare Europort.

Future connectivity upgrades

National Development Plan

The NDP 2018-2027 states that strengthening access routes to Ireland's ports through investment remains a government priority. This includes upgrading and enhancing the road transport network to improve journey times.

It recognises that the UK's exit from the EU in 2019 highlights the importance of this NSO and the importance of continuing investment to further improve the quality of port facilities, particularly those in the South-East such as Rosslare and the Port of Waterford given their role in maintaining transportation linkages with crucial EU markets.

N25 New Ross Bypass

In recent years traffic coming from the south-west (Cork, Kerry and Limerick) to Rosslare Europort moved quite freely until it encountered the single carriageway bridge across the Barrow in New Ross. This bottleneck was eliminated when the N25 New Ross Bypass project was completed. The new crossing was opened in January 2020, but other local route improvements appear to be on-going.

M11 Gorey to Enniscorthy Bypass

The M11, linking Dublin and the southeast, has recently been extended beyond Gorey where it originally became the N11. The road now bypasses the bottleneck of Enniscorthy and becomes the N11 north of Oylgate at Edermine Court. This scheme also included a bypass of the N30 to the west of Enniscorthy and a link road to the N80 which goes to Carlow.

M11/M50 junction to M11/N11 at Kilmacanogue

The M11, from the M50 junction to Kilmacanogue, is heavily congested during the morning and evening rush hours. Planning has begun to widen this section of road to accommodate current and future demand. This will further improve connectivity between Rosslare Europort and the Dublin region.

Further relevant road developments

The above road projects will enhance access to Rosslare Europort by eliminating major local bottlenecks. What remains to be completed is the development of the M11/N25 link from Oilgate to Rosslare Europort. The preferred route corridor was selected in June 2021. As of February 2022, the Oilgate to Rosslare Harbour scheme has entered Phase 3 “Design and Environmental Evaluation” of the selected route.

Linked to the development of this last phase of the M11/N25 road to Rosslare Europort is a new access road to the port. The design for this new access road was prepared by Arup in 2016. The general outline of the scheme is shown in **Figure 5.35.**

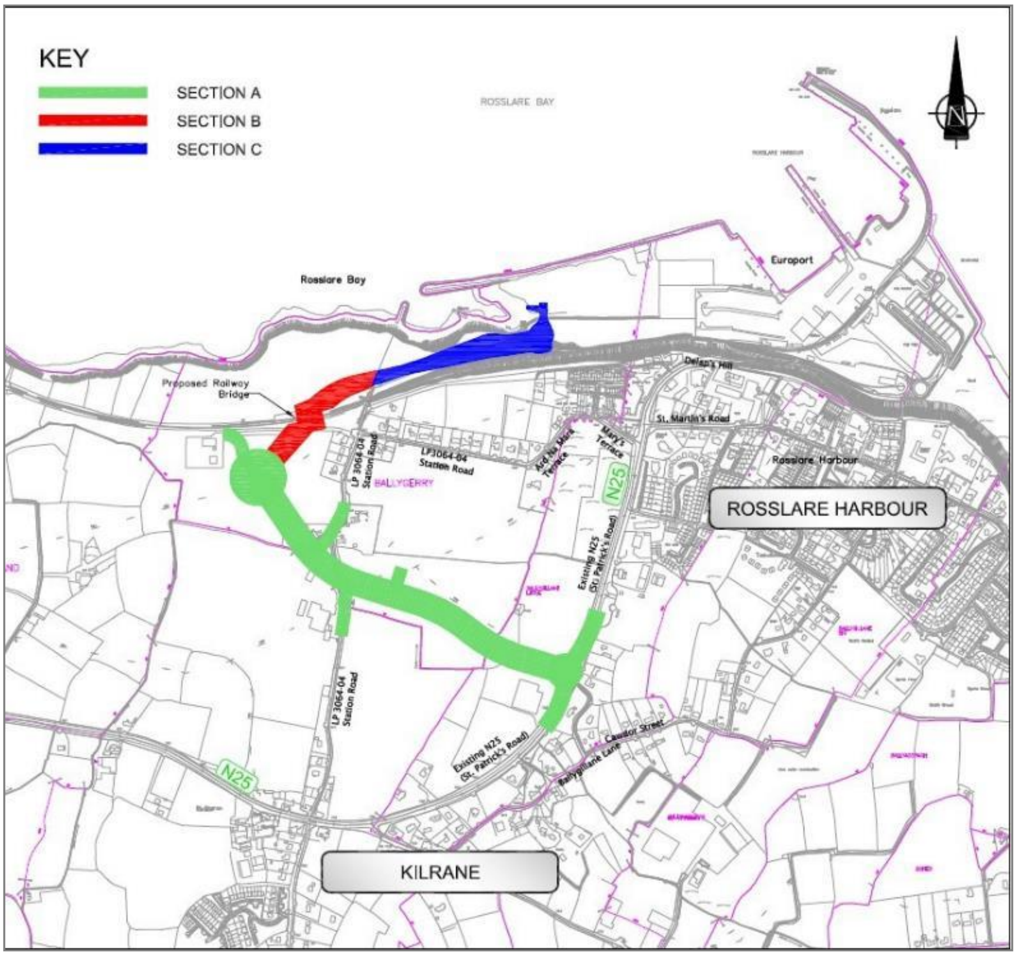


Figure 5.35: General outline of the proposed scheme

The development of this new access road entails a new entrance to the port. Within the port there are plans to move all the check-in and inspection facilities close to this new entrance.

The OPW are currently progressing with their plans for the construction of the new facilities in the port to accommodate the Customs, Department of Agriculture and Gardaí. These will include inspection bays, chilled and ambient areas for trucks and goods, animal welfare facilities as well as the associated offices.

Rosslare Europort naturally hopes that the completion of the new check-in arrangements and the permanent inspection facilities could be coordinated with the development of the new entrance to the port; both require planning permission.

5.6.7 Lead-in times for capacity increase

Rosslare Europort had a 2018 capital expenditure provision for expanding the drop trailer compound in Rosslare Europort. This land is within the port boundary, and as of 2020 was being used for the storage of freight trailers.

Table 5.72: Lead-in times for proposed developments at Rosslare Europort.

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	Lead-in time
		months						years
Current Capacity								
Imminent capacity	Expansion of port's trailer compound	✓	✓	✓	✓	✓	✓	
Potential capacity	Designation of the port as an agricultural border post	✓	4	6	8	8	26	**2**

✓= Stage completed

= Development completed

5.6.8 Capacity versus demand analysis

The capacity versus demand analysis for RoRo, outlined in **Figure 5.38**, shows that there is enough RoRo capacity in Rosslare Europort for the foreseeable future. An additional RoRo service would take up the currently available capacity and Rosslare Europort is actively seeking this.

Table 5.73: Demand, throughput, and capacity for all RoRo cargoes in Rosslare Europort

Cargo type	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.16	0.12	0.16	0.21	0.21
RoRo Passenger cars and buses	*M units/y*	0.27	0.21	0.34	0.34	0.34
RoRo Trade vehicles	*M units/y*	0.019	0.02	0.04	0.04	0.04

The imminent scenario (post-2018) considers an extension to the unaccompanied freight yard; as the yard is the bottleneck to these operations this expansion lifts the terminal capacity from 0.16m to 0.21m freight units. There is no further development planned for the potential scenario.

As there are a relatively small number of lane meters per berth associated with the marshalling of accompanied freight and considering the proportion of vessel space occupied by accompanied freight on each sailing, the accompanied freight business will be capacity constrained by 2024 and measures to increase operational efficiencies should be taken.

Before the trailer park was expanded and brought online the unaccompanied freight business was constrained compared to demand due to the limited number of slots and relatively long dwell times. This created the need to expand the yard.

The trade car business will be constrained in 2034 unless additional storage capacity can be realized.

RoRo

Freight

Table 5.74: Demand, throughput, and capacity for RoRo freight in Rosslare Europort

	Units	Estimate Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Freight	*M units/y*	0.16	0.12	0.16	0.21	0.21

A more detailed analysis looking at the split between accompanied and unaccompanied is required as the accompanied business becomes constrained within the time period. The overall demand has been split based on the 2019 throughput and this breakdown is shown in **Table 5.75**.

Table 5.75: Demand, throughput, and capacity for accompanied and unaccompanied RoRo freight in Rosslare Europort

	Units	Estimate Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo accompanied freight	*M units/y*	0.16*52% = 0.083	0.063	0.09	0.09	0.09
RoRo unaccompanied freight	*M units/y*	0.16*48% = 0.077	0.058	0.07	0.12	0.12

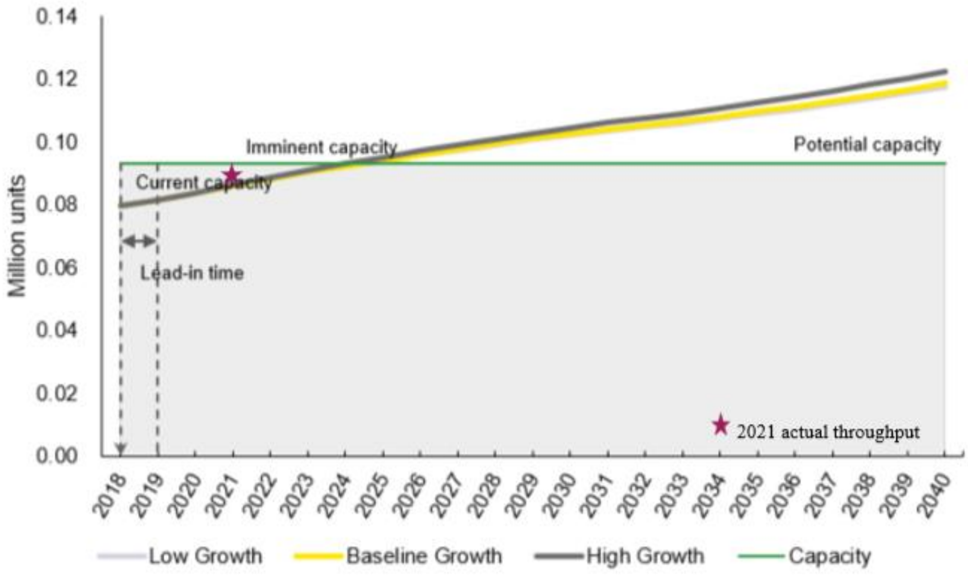


Figure 5.36: Rosslare Europort – RoRo accompanied freight – Capacity vs 52% Demand

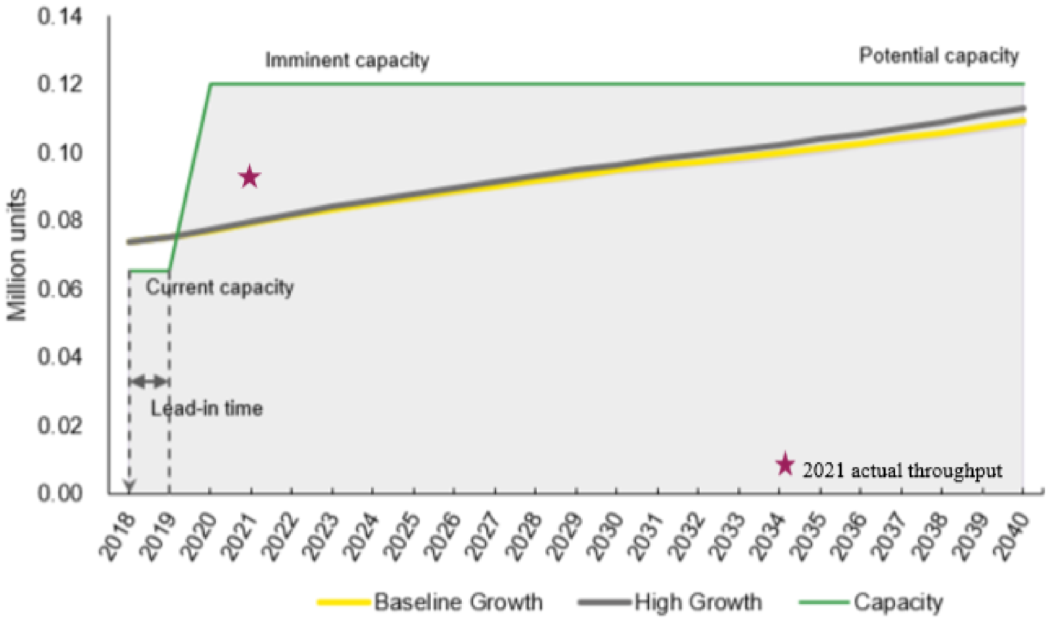


Figure 5.37: Rosslare Europort – RoRo unaccompanied freight – Capacity vs 48% Demand

The 2021 throughput (purple star in **Figure 5.36**. and **Figure 5.37**) at Rosslare Europort was approximately 90,000 units for both unaccompanied and accompanied freight (0.18M units total). This represents a step-change in demand for the unaccompanied business, which is believed may settle down again in the coming years. The accompanied freight throughput was in line with expected demand.

The expanded trailer compound (online from 2020) is comfortably able to handle the 90,000 unaccompanied units without needing to lower dwell times.

The accompanied freight throughput is close to the estimated capacity (imminent scenario); however, this increase in throughput also came with a temporary increase in vessel calls which would lift the accompanied capacity as the marshalling lanes are filled and emptied more times per day.

Assuming the split between accompanied and unaccompanied traffic remains as per the 2019 throughput (52% accompanied), the accompanied business will become capacity restrained in 2024 while the unaccompanied business will still be operating well below capacity.

The capacity analysis shows that Rosslare Europort, which is yard constrained, will, by 2024, need to do one or more of the following:

- Shift the demand split towards unaccompanied freight to try and slow the growth in demand for accompanied freight and prevent constraints.
- Start making more use of their marshalling yard per sailing allowing them to load more cargo on to each vessel. As the demand increases this factor may naturally follow to meet required throughput however this could create other bottlenecks at the terminal (e.g., in terms of traffic flow).
- Put on more services (as in 2021) increasing the number of turns of the marshalling area per year resulting in a higher capacity.

Figure 5.37 shows how important bringing in the larger unaccompanied trailer park was, as estimated demand outweighed the current capacity. Table 5.76 shows how throughput in 2019 was limited to 0.058M units.

Table 5.76: Demand, throughput, and capacity for passenger cars and buses in Rosslare Europort

	Units	Estimated Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Passenger cars and buses	*M units/y*	0.27	0.21	0.34	0.34	0.34

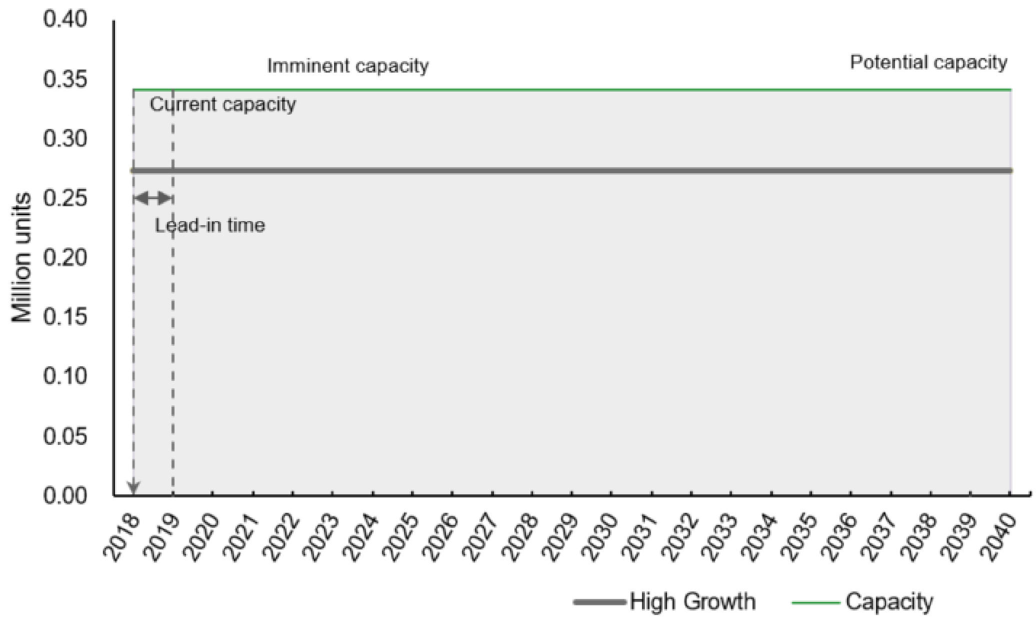


Figure 5.38: Rosslare Europort – RoRo passenger cars - Capacity vs Demand

There are no scheduled developments affecting the passenger car business and the demand is not set to rise between the present day and 2040. The current capacity is adequate to cover the current and future demand.

Trade Vehicles

Table 5.77: Demand, throughput, and capacity for RoRo trade vehicles in Rosslare Europort

	Units	Estimate Demand 2019	Throughput 2019	Capacity		
				Current	Imminent	Potential
RoRo Trade vehicles	*M units/y*	0.019	0.02	0.04	0.04	0.04

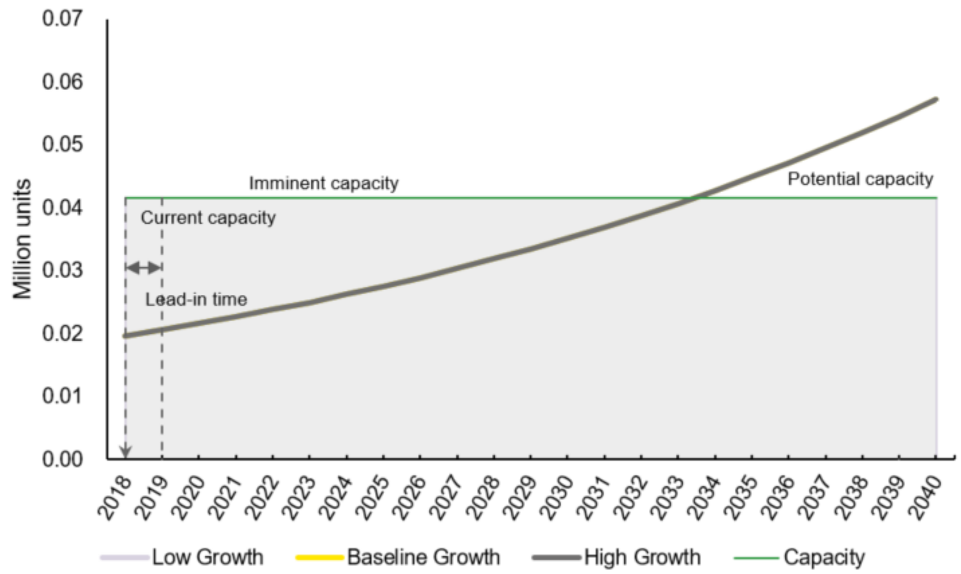


Figure 5.39: Rosslare Europort – RoRo Trade vehicles – Capacity vs Demand

There is strong growth expected in the trade car business at Rosslare Europort. Currently there is only a small trade car storage area. To meet the 2040 demand, either dwell times must be reduced, or additional storage capability must be made available to this cargo type.

5.6.9 Conclusion

The current and imminent capacities at Rosslare Europort are summarized in **Table 5.78**.

Table 5.78: Rosslare Europort capacity summary by cargo type.

Cargo type	Units	Throughput 2019	Capacity		
			Current	Imminent	Potential
RoRo Freight	*M units/y*	0.12	0.16	0.21	0.21
RoRo Passenger cars and buses	*M units/y*	0.21	0.34	0.34	0.34
RoRo Trade vehicles	*M units/y*	0.02	0.04	0.04	0.04

5.7 Drogheda Port

5.7.1 Description of the port and cargo handled

General

The facilities of Drogheda Port Company are located on the River Boyne and include two separate areas with berths for unloading/loading cargoes. Town Quay (TQ) is quite close to the city and Tom Roes Point Terminal (TRP) is located downstream. There are also two private facilities: Flogas (handling petroleum, and liquified gas); and RHI Magnesita (handling supplies and products related to the refractory minerals industry). There is also a minor facility, Fishmeal Quay, of the Department of Housing, Planning and Local Government, located close to the mouth of the river, which is not handling commercial cargoes.

An overview of the port facilities is shown in **Figure 5.40**. In this section, the capacity assessment will be carried out for the two main common use facilities (TQ and TRP).

Figure 5.40: Drogheda Port general overview (Source: Google Earth and Arup)

Characteristics of the main infrastructure and equipment

Town Quay and the Tom Roes Point Terminal are comprised of four and two berths respectively. For each of these facilities, due to the information available not including operational records broken down by facility, the berths were considered altogether for the capacity assessment.

The main characteristics of the two facilities shown in **Table 5.79**.

Table 5.79: Available common use berths in Drogheda Port (Source: Drogheda Port)

Facility	TQ	TRP
Length (m)	450	210
Depth at chart datum (m)	2.0	6.0[42]

Drogheda Port facilities, including those privately owned, mainly operate the following goods:

- Dry Bulk: cement, zinc concentrate, magnesite, coal, fertilizer, grains.
- Break Bulk: paper, timber, steel.
- Liquid Bulk: petroleum, liquefied petroleum gas.

[42] depth of dredged pocket

The total current area of the port is 10ha, with an available total open storage of 5ha, plus the storage facilities shown in **Table 5.80**.

Table 5.80: Available storage sheds and tanks in Drogheda Port (Source: Drogheda Port)

Total covered storage for dry bulk	27,000	m²
Total liquid bulk storage (tanks)	11,500	m³

Schematic plan drawings of Town Quay and Tom Roes Point Terminal and the maximum throughput handled per quay are shown in **Appendix 8.6**.

The yearly throughput figures between 2007 and 2019 are shown in **Table 5.81** below. They cover all operations for both common use and private facilities.

Table 5.81: Tonnage for all goods handled in Drogheda Port (Source: Drogheda Port and IMDO)

	Dry Bulk	**Liquid Bulk**	**LoLo**	**Break Bulk**	**All**
	(t/y)	(t/y)	(t/y)	(t/y)	(t/y)
2007	417,968	126,325	198,424	292,024	1,034,741
2008	361,292	70,050	55,575	176,745	663,662
2009	389,533	35,235	11,973	84,896	521,637
2010	427,774	28,958	1,029	84,428	542,189
2011	366,944	23,451	1,970	121,886	514,251
2012	872,130	26,562	3,134	99,498	1,001,324
2013	787,639	24,965	-	231,429	1,044,033
2014	883,025	27,898	-	309,457	1,220,380
2015	828,294	29,977	-	368,012	1,226,283
2016	895,605	33,057	-	294,121	1,222,783
2017	1,000,514	33,001	-	248,598	1,282,113
2018	1,212,656	35,677	-	207,815	1,456,148
2019	1,236,587	34,696	-	259,159	1,530,442

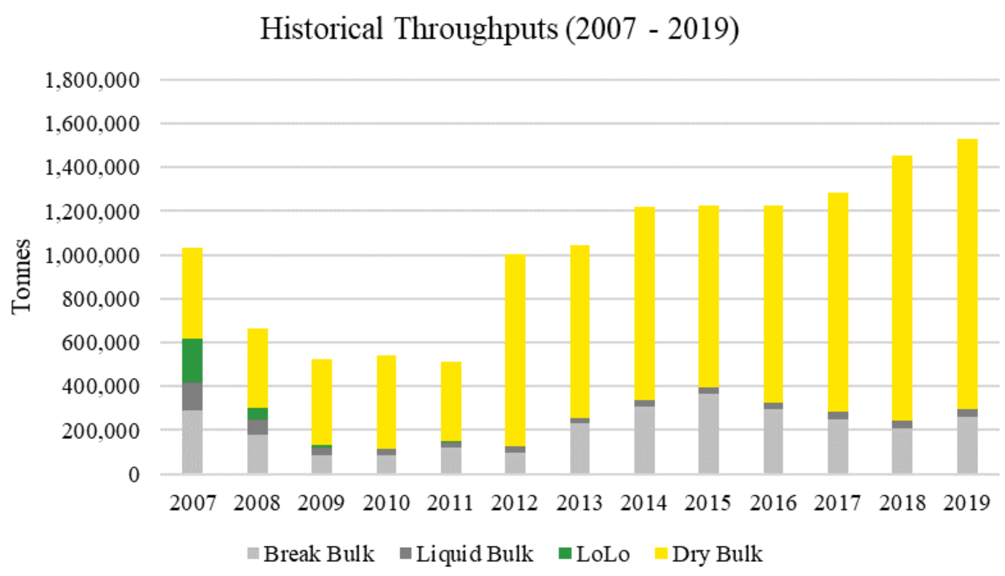


Figure 5.41: Total tonnage handled per year in Drogheda Port (Source: Drogheda Port and IMDO)

From the graph in **Figure 5.41**, an important increase in the Dry Bulk volumes in 2012 and in Break Bulk from 2013 onwards can be observed. The largest proportion of cargo that Drogheda handles is Dry Bulk followed by Break Bulk cargo. There have been no containers (LoLo) handled since 2012.

Seasonality has been assessed based on the month-by-month information provided by Drogheda Port Company for the year 2017. Calculations for seasonality have been completed separately for each cargo type and the results are summarized in **Table 5.82**.

Table 5.82: Seasonality for each type of cargo (Source: Drogheda Port)

	Dry Bulk	Liquid Bulk	Break Bulk
Peak Factor	1.44	1.63	1.61

5.7.2 Review of Drogheda Port development plans

There have been port facilities in Drogheda for several centuries. In 1999 the port completed the largest single development project it had ever undertaken in constructing the facility at Tom Roes Point Terminal to complement the existing Town Quay. These two facilities together have been considered for the current situation.

No imminent situation has been considered as there are no expansion projects with planning consent and financing.

The potential situation considers a Masterplanning Development site area of more than 40.5ha (18.2ha of primary port handling and 22.3ha of onsite port centric activities), with a redevelopment of the existing Town Quay site as well as the relocation of its operations.

The development of a new deep-water port at Bremore, located mid-way between Dublin and Drogheda, is discussed separately - see **Appendix 8.6**.

This development has currently not been included in the capacity assessment as not enough information was available.

5.7.3 Capacity of Drogheda Port

Particular features at Drogheda Port

The following issues have led to adjustments to the general capacity assessment methodology that was outlined in **Chapter 4**.

- There were important gaps in the information provided by Drogheda Port which were filled with publicly available information plus assumptions based on our experience of similar facilities and on some benchmarking figures for productivity rates.
- The port has facilities at four separate locations, but due to the fact that the information provided was not split in a way to allow us to assign the different cargo types to each facility, this was done based on assumptions which have been verified while performing the calibration.
- The port includes private facilities (RHI Magnesita and Flogas), but these are not common use facilities and so these are not included in the capacity assessment. The throughput at the common user facilities is estimated to be 64% of the total throughput (0.8Mt). See **Appendix 2**.

Dry & Break Bulk

In assessing the current Dry & Break Bulk capacity in Drogheda Port, two sub-systems were considered: berthing length and available storage area, whose capacity is shown in **Table 5.83**.

Current Capacity

Since there is no capacity increase currently planned, the imminent capacity is considered the same as the current capacity. The area provided in **Table 5.83** is the open storage area (not the gross area). The total gross port area is 10ha in the existing scenario.

Table 5.83: Drogheda Port Dry & Break Bulk Capacity Summary

		Current			Imminent			Potential		
		Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)	Quantity	Units	Capacity (Mt/y)
Dry & Break Bulk	Berthing length	660	m	2.31	660	m	2.31	1410	m	3.97
	Storage Area	5	ha.	1.30	5	ha.	1.30	14	ha.	2.83
	Capacity			1.30			1.30			2.83

Imminent and potential scenario

There is potential for expanding the capacity of the port through the construction of additional berthing length in the future. The berthing length will be increased by 750m and an additional capital dredging of 1.5m would be provided leading to an operational draught of 6.75m on average.

In the capacity calculations the total gross port area was increased in the potential scenario by 18.2ha of primary port handling and 22.3ha in terms of onsite port centric activities. The storage area for the potential scenario has been calculated by keeping the same ratio between gross and storage areas used for the base scenario.

These modifications to the port configuration started in 2018 and will last until 2050.

5.7.4 Benchmarking

A benchmark exercise has been carried out to review port current and projected performance against facilities of similar profile (See **Section 4.2.3**).

Indicators for the different cargoes within Drogheda Port (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar throughputs to Drogheda Port. The results of this exercise are shown in the following sections.

Yard productivities will be higher if cargoes benefit from a shorter dwell time or from more efficient stacking of cargo within the storage area. Quay productivities will be higher with high berth utilisations, minimal down-times, and efficient loading / unloading of cargo.

The benchmark figures do not allow for variations between ports in terms of specific cargo handled and yard layouts. These figures should therefore only be used as a guideline.

The benchmarking includes the throughput, berthing availability, and yard areas of both the private and common user facilities at Drogheda Port. The private facilities were not included in the capacity assessment.

Dry Bulk

Table 5.84: Drogheda Port dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Drogheda	1,240,000	1,800	82,400

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Split	1,120,000	1,200	45,000
Torino	1,500,000	1,300	12,000
Larnaca	1,240,000	1,900	180,000
Cuxhaven	1,560,000	2,200	100,000

Drogheda's yard and quay productivity rates are comparable to other European terminals.

5.7.5 Lead-in times for capacity increase

As is shown in **Table 5.85**, there are no proposed developments in Drogheda Port in the current or imminent scenarios. However, in the potential scenario, there is the 40.5ha masterplan development and the development of Bremore Port. The 40.5ha masterplan development is yet to commence its project lifecycle. The first stage will be to undertake a feasibility study, with the total lead-in time estimated at 3.5 years.

Table 5.85: Lead-in times for proposed developments at Drogheda Port

	Development	Feasibility study (months)	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	(years)
Current Capacity								
Imminent capacity								
Potential capacity	40.5ha masterplan development	4	8	8	8	12	40	3.5
	Bremore Port							

✓= Stage completed

5.7.6 Capacity versus demand analysis

It is evident from **Table 5.86** and **Figure 5.42** that the current Dry & Break bulk capacity in Drogheda Port will be exceeded by 2024. By this point, some additional capacity will be required as a result of the masterplan development. Due to the 3.5-year lead in time, the feasibility studies should have commence4d by 2019.

Table 5.86: Drogheda Port Dry and reak Bulk throughput and capacity

Cargo type	Units	2019 Throughput	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	1.2	1.3	1.3	2.8

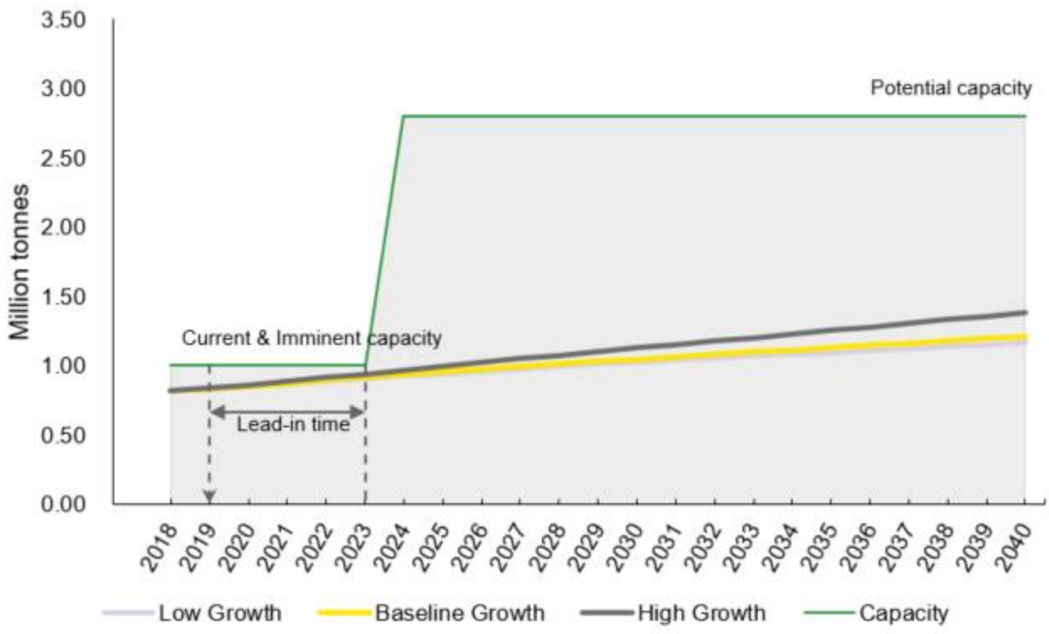


Figure 5.42: Drogheda Port – Dry & Break Bulk – Capacity vs Demand

5.7.7 Conclusion

Drogheda Port facilities primarily handle Dry Bulk, Break Bulk and Liquid Bulk. The Liquid Bulk is primarily handled at the industrial / private facilities excluded from this study. Town Quay and Tom Roes Point Terminal primarily handle Dry and Break Bulk. The current, imminent, and potential capacities for each of these cargo types are shown in **Table 5.87**.

Table 5.87: Drogheda Port capacity summary

Cargo type	Units	2019 Throughput	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	1.2	1.3	1.3	2.8

5.8 Port of Galway

5.8.1 Description of the port and cargo handled

Overview

The Port of Galway is a tidal and gated port located at the centre of Galway City. It comprises approximately 16ha in the inner-city docklands and approximately 16ha at the Galway Harbour Enterprise Park at Renmore to the East. These areas are operated by Galway Harbour Company and the Galway Harbour Enterprise Park respectively. The port handles Dry, Break and Liquid Bulk. Oil and bitumen are the liquid cargoes that generate most of the import throughput. The image in **Figure 5.43** shows a plan view of the existing port facilities.

Figure 5.43: Port of Galway. General overview (Source: Google Earth)

Characteristics of the main infrastructure and equipment

The Port of Galway facilities located in the inner-city docklands include several quays. Three of these handle commercial cargoes: Dun Aengus North Quay, Dun Aengus South Quay and Folan Quay. While Dry and Break Bulk are handled both in South and North Dun Aengus Quays, Dun Aengus North Quay and Folan Quay handle the discharge of oil tankers directly to a tank farm operated by Circle Quay.

The main infrastructural restrictions of the current port facilities are the shallow dredge depth of the shipping channel, the limited length of the quays, size of the quayside areas, the tidal restrictions, and the size of the gates enclosing the docks.

The channel has not been dredged since 2001 and this will be a major cost to the port company as most of the dredge material may have to be taken ashore and disposed to landfill. The dock gates were installed in 1936 and whilst they have been intensively maintained, they are now antiquated and present serious limitations to the port. These constraints render the harbour operational for very limited periods, with access only available around high tide.

The main characteristics of the port facilities are outlined in **Table 5.88**.

Table 5.88: Quays and available depth in Galway docks (Source: Port of Galway)

	Dun Aengus North Quay	Dun Aengus South Quay	Folan Quay
Length (m)	164	161	87
Depth springs (m)	8.6	8.6	8.17
Depth neaps (m)	6.7	6.7	6.27

Each of these quays operates with the following traffic:

Dun Aengus North Quay

- Liquid: oil products (petrol, diesel, kerosene and bitumen)
- Dry and Break Bulk: timber, refuse derived fuel (RDF), stone, steel rebar/coils, stone (limestone-bulk and bagged), project cargoes (wind turbines, heavy lifts, pipes), general cargo and varied dry bulk.

Dun Aengus South Quay

- Dry and Break Bulk: scrap metal, timber, refuse derived fuel (RDF), stone (limestone bulk and bagged), steel rebar and coils and varied dry bulk.

Folan Quay

- Liquid: oil products (petrol, diesel, kerosene and bitumen)

Whilst these quays have accommodated LoLo in the past, there is currently no container traffic in this port.

The total current area of the port is approximately 29ha, with an available total open storage of 9ha, plus the following storage facilities:

- Total covered storage for Dry Bulk is 16,000m^2
- Total Liquid Bulk storage (tanks) is 51,000m^3

5.8.2 Historical Throughput

The total throughput figures between 2007 and 2019 are shown in the following table:

Table 5.89: Traffic figures per year (Source: CSO and IMDO)

	Dry & Break Bulk (t/y)	Liquid Bulk (t/y)	All (t/y)
2007	88,000	857,000	945,000
2008	101,000	737,000	838,000
2009	62,000	661,000	723,000
2010	51,000	620,000	671,000
2011	66,000	487,000	553,000
2012	85,000	415,000	500,000
2013	112,000	409,000	521,000
2014	158,000	405,000	563,000
2015	162,000	401,000	563,000
2016	150,000	438,000	588,000
2017	150,518	450,824	601,342
2018	174,743	403,830	578,573
2019	177,568	368,350	545,918

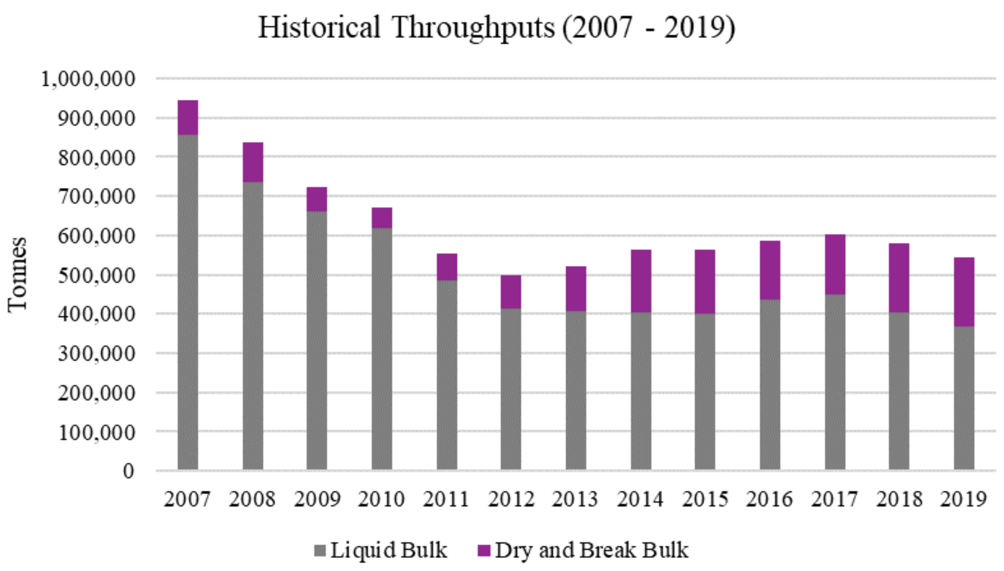


Figure 5.44: Total tonnage handled per year in Port of Galway (Source: CSO and IMDO)

From **Table 5.89**, it can be seen that Liquid Bulk accounts for between 60% and 75% of the total throughput.

It must be noted that significant volumes of break-bulk cargo for the offshore wind industry are being handled at the port. These are however not part of this study.

The port experiences very little seasonality. Petroleum is the main throughput and the tonnage per month remains relatively stable, while bitumen and Dry and Break Bulk experience major variations in import timing. For these reasons, the peak factors outlined in **Table 5.90** have been assumed:

Table 5.90: Peak factors (Source: Port of Galway)

	Liquid Bulk	Dry and Break Bulk
Peak Factor	1.20	1.40

5.8.3 Review of Port of Galway development plans

Port of Galway aims to increase tonnage and product throughput using the current infrastructure before the new development, which has still to be granted planning, will be constructed and become fully operational. However, the channel dredge depth and the lock gates size are limiting factors that make it difficult to increase the throughput significantly.

Current capacity

The current capacity is based on a total area of 29ha and three berths handling commercial cargo. The storage tanks have recently been moved to the Galway Harbour Enterprise Park. Liquid Bulk is pumped from the ship in Port of Galway docks to this location.

The capacity is severely constrained by the access restrictions through the narrow lock gates to the shipping channel, which reduce the berth availability and the maximum size of the vessel that can access the harbour.

Imminent capacity

There is no imminent capacity development at Port of Galway.

Potential capacity

The potential scenario considers the Galway Harbour extension project which is currently going through the planning process.

The planning application consists of circa 24ha of land reclamation, providing an additional 660m of berthing length to -12mCD depth serviced by a -8mCD channel depth. This development will accommodate larger vessels, and it is planned to service significantly larger volumes of freight (including RoRo), as well as passenger liners. A freight rail link to the hinterland is also planned. A schematic drawing of the proposed development is shown in **Appendix 8.7**.

Figure 5.45: Oil tanker offloading in Port of Galway (courtesy Port of Galway)

5.8.4 Capacity of Port of Galway

Particular features at Port of Galway

The following issues have led to adjustments to the general capacity assessment methodology that was outlined in **Chapter 4**.

- There were some gaps in the information provided by the Port of Galway which were filled with publicly available information plus assumptions based on our experience of similar facilities and benchmarked figures for productivity rates.
- Port of Galway is a tidal port. The dock gates maintain a high-water level within the tidal basin and vessels can dock and sail 2 hours either side of high water. The operational restrictions related to this have been considered while assessing the occupancy factor for each berth.

- Even though the total port area is large, the areas adjacent to the berths are limited.
- Areas are assigned to different cargo types.

Dry & Break Bulk and Liquid Bulk

In assessing the current Dry & Break Bulk and Liquid Bulk capacity in Port of Galway, 2 sub-systems were considered: berthing length and available storage area. The capacity of each sub-system is outlined in **Table 5.91**.

Current Capacity

There is a mix of uses on North Dun Aengus Pier which cannot be disaggregated by type of cargo because they use shared facilities. In this assessment 50% of the berthing length has been allocated to each of the cargo types (Dry & Break Bulk and Liquid Bulk).

The storage area value corresponds to the open storage capacity. The storage volume value is the tank storage capacity. The gross port area in the existing scenario is 29ha.

The table below shows first the berthing capacity assessment and thereafter the storage capacity assessment. The total capacity is the lowest of the two.

The limiting factor is the berthing configuration. Considering the total Liquid Bulk storage capacity, the turn ratio is 13, which is the number of times in a year that the storage is completely emptied and filled again.

Table 5.91: Port of Galway Dry & Break Bulk and Liquid Bulk Capacity Summary

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Current</th><th colspan="3">Imminent</th><th colspan="3">Potential</th></tr>
<tr><th>Quantity</th><th>Units</th><th>Capacity (Mt/y)</th><th>Quantity</th><th>Units</th><th>Capacity (Mt/y)</th><th>Quantity</th><th>Units</th><th>Capacity (Mt/y)</th></tr>
<tr><td>Dry & Break Bulk</td><td>Berthing length</td><td>243</td><td>m</td><td>0.27</td><td>243</td><td>m</td><td>0.27</td><td>286</td><td>m</td><td>0.69</td></tr>
<tr><td>Liquid Bulk</td><td>Berthing length</td><td>169</td><td>m</td><td>0.75</td><td>169</td><td>m</td><td>0.75</td><td>374</td><td>m</td><td>1.47</td></tr>
<tr><td></td><td colspan="3">Assumed berthing capacity</td><td>1.02</td><td colspan="2">Assumed berthing capacity</td><td>1.02</td><td colspan="2">Assumed berthing capacity</td><td>2.16</td></tr>
<tr><td rowspan="2">All cargoes</td><td>Storage volume</td><td>51000</td><td>m^3</td><td rowspan="2">2.90</td><td>51000</td><td>m^3</td><td rowspan="2">2.90</td><td>N/A</td><td>m^3</td><td rowspan="2">5.30</td></tr>
<tr><td>Storage area</td><td>9</td><td>ha</td><td>9</td><td>ha</td><td>16</td><td>ha</td></tr>
<tr><td></td><td colspan="3">Assumed storage capacity</td><td>2.90</td><td colspan="2">Assumed storage capacity</td><td>2.90</td><td colspan="2">Assumed storage capacity</td><td>5.30</td></tr>
<tr><td colspan="11"></td></tr>
<tr><td colspan="4">Capacity adopted</td><td>1.02</td><td colspan="2"></td><td>1.02</td><td colspan="2"></td><td>2.16</td></tr>
</table>

Potential Capacity

The Galway Harbour Extension project would increase the berthing length in the potential scenario.

Only the berthing length of the new port extension has been considered as those commercial operations will be reallocated to these new facilities and information regarding the physical Liquid Bulk storage capacity of the final configuration is not available. The development will also increase the storage area. The gross port area in the existing scenario is 29ha and this increases to approximately 53ha in the potential scenario.

5.8.5 Benchmarking

A benchmark exercise has been carried out to compare current and projected performance against facilities of similar profile (See **Section 4.2.3**).

Performance indicators for the different cargoes within Port of Galway (throughput of tonnes, units or TEUs per year per meter of quay and throughput per year per hectare of yard area) have been compared with other selected ports with similar throughputs to Port of Galway. The results of this exercise are shown in the following sections.

Yard productivities will be higher if cargoes benefit from a shorter dwell time or from more efficient stacking of cargo within the storage area. Quay productivities will be high with high berth utilisations, minimal down-times, and efficient loading / unloading of cargo.

The benchmarking figures do not allow for variations between ports in terms of specific cargo handled and yard layouts. These figures should therefore only be used as a guideline.

Dry Bulk

Table 5.92: Port of Galway dry bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Galway	170,000	530	34,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Calais, Fr	324,000	250	18,000
Parnu, Est	265,000	620	37,000
Patras, Gre	155,000	350	155,000
Boston, UK	75,000	880	63,000

The Port of Galway performance indicators are comparable to other European terminals for the dry bulk cargoes.

Liquid Bulk

Table 5.93: Port of Galway liquid bulk benchmarking

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Galway	370,000	1,500	86,000

Port	2019 Throughput (t)	Quay productivity (t/m)	Yard productivity (t/ha)
Esbjerg, Den	540,000	2,000	54,000
Harwich, UK	337,000	1,000	34,000
Stockholm, Swe	347,000	1,000	10,000
Cork, Ire	216,000	500	27,000

The Liquid bulk yard productivity benchmarks for Galway are higher than other similarly sized terminals although quay productivity is comparable.

5.8.6 Nautical access and hinterland connectivity

Port of Galway is restricted by the shallow dredge depth of the shipping channel and the size of the dock gates enclosing the docks.

Port of Galway applied to An Bord Pleanála in 2014 for a ten-year permission to develop a new terminal with access to deeper water. Access to the development will be provided via the existing road at the junction of Lough Atalia Road and Bóthar na Long.

The planning process is not yet complete, largely because the proposed development will be sited mostly in an area which is designated as a candidate for Special Area of Conservation and a Special Protection area. Under the IROPI provision, Port of Galway must designate an appropriate parcel of land as compensation for the habitat which is being lost to the development. In 2021, An Bord Pleanála completed a 'Statement of Case' stating that the proposed development should be given consent under IROPI provision. As per September 2022, the Port was still awaiting a final planning decision. Previous estimates from the Port of Galway suggest that the port extension will take approximately 5 years to become operational once planning consent is received.

In late 2022, Port of Galway has been included in the TEN-T network.

5.8.7 Lead-in times for capacity increase

As discussed, there are no developments planned in Port of Galway in the current and imminent scenarios. However, in the potential scenario, the Galway Harbour Extension Project is considered. The lead-in times for this development are shown in **Table 5.94**.

The feasibility studies and scheme design and EIA have been undertaken, so the remaining lead-in time is estimated to be 3 years.

Table 5.94: Lead-in times for proposed developments at Galway Harbour

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total
		months					years
Current Capacity							
Imminent capacity							
Potential capacity	Galway Harbour Extension Project	✓	✓	6	12	18	36	3

✓= Stage completed

5.8.8 Capacity versus demand analysis

As stated previously, figures for Galway are no longer provided by Eurostat. For the purposes of this assessment CSO data has been used to provide a starting point. It should be noted that there are methodological differences between Eurostat and CSO data and as such this may not be totally consistent with the forecasts provided for the other ports.

Dry and Break Bulk

Table 5.95: Port of Galway Dry and Break-bulk throughput and capacity

Cargo type	Units	2019 Throughput	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	0.17	0.27	0.27	0.69

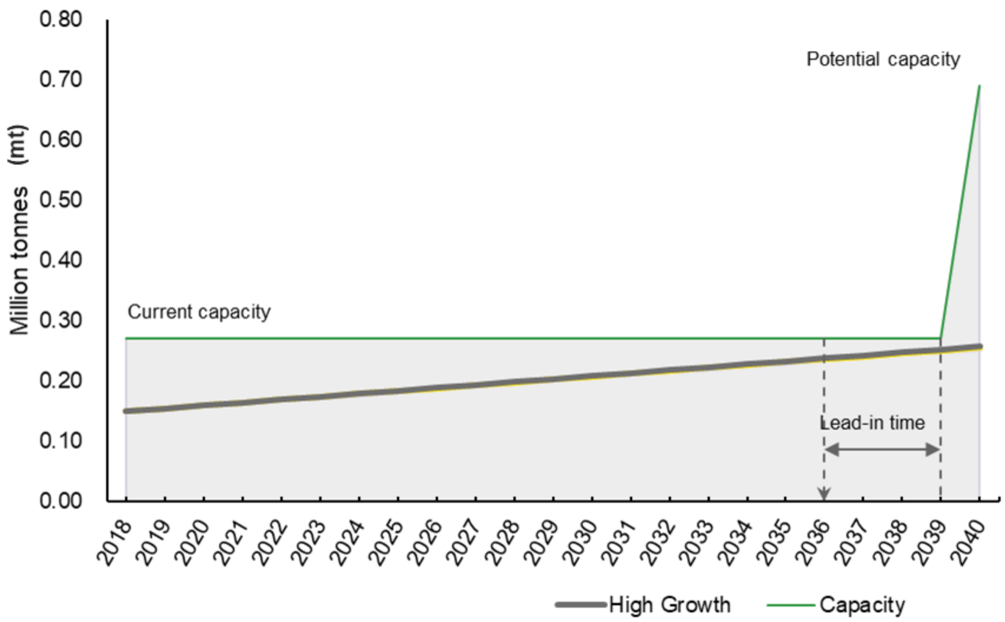


Figure 5.46: Port of Galway – Dry & Break Bulk – Capacity vs Demand

As can be observed in **Figure 5.46**, the capacity versus demand analysis for Dry Bulk shows that there is sufficient capacity for the foreseeable future. In the High Growth scenario, additional capacity would be required by 2039.

Port of Galway currently has expansion plans going through the consenting process. Capacity increase is not the driver for these plans. The EIS states that the economic justification is to enable the port to accommodate the increased vessel sizes the market is moving towards. Without the capacity to handle these vessels the port runs the risk that they will no longer deliver to Galway directly.

Liquid Bulk

Table 5.96: Port of Galway Liquid bulk throughput and capacity

Cargo type	Units	2019 Throughput	Current capacity	Imminent capacity	Potential capacity
Liquid Bulk	*M tonnes/y*	0.37	0.75	0.75	1.47

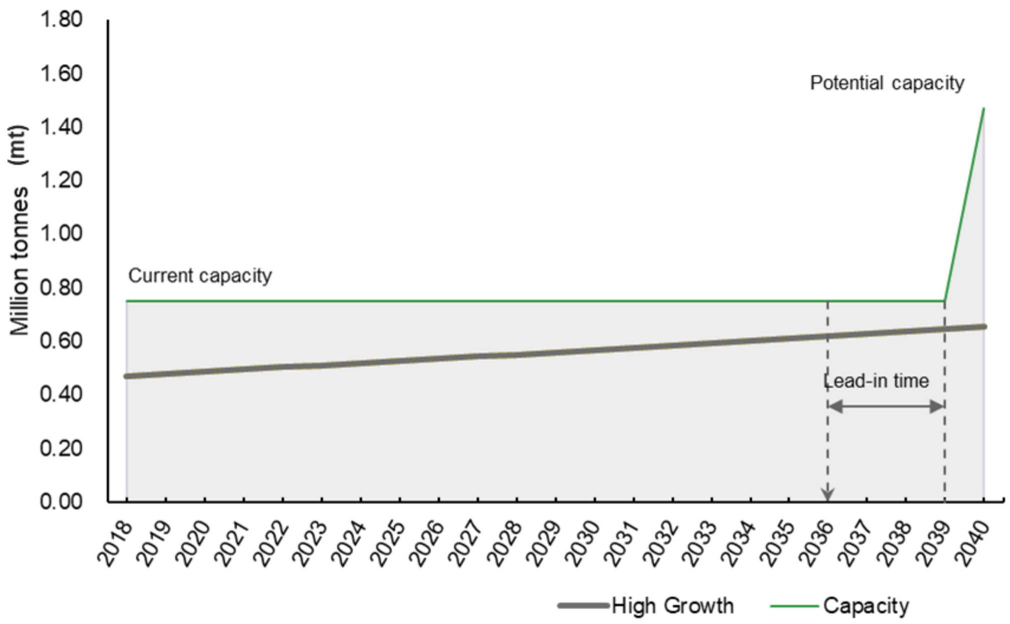


Figure 5.47: Port of Galway – Liquid Bulk Capacity vs Demand

The capacity versus demand analysis for Liquid Bulk (**Figure 5.47**) shows that there is sufficient capacity for the foreseeable future. The expansion plans going through the consenting process also include capacity expansion for Liquid Bulk.

5.8.9 Conclusion

Port of Galway comprises of approximately 16ha in the inner-city docklands and approximately 16ha at the Galway Harbour Enterprise Park at Renmore to the East. Port of Galway handles Dry Bulk, Break Bulk and Liquid Bulk cargo types. The estimated current, imminent, and potential capacities for each of these cargo types are shown in **Table 5.97.**

Table 5.97: Port of Galway capacity summary by cargo type

Cargo type	Units	2019 Throughput	Current capacity	Imminent capacity	Potential capacity
Dry & Break Bulk	*M tonnes/y*	0.17	0.27	0.27	0.69
Liquid Bulk	*M tonnes/y*	0.37	0.75	0.75	1.47

5.9 Other ports

5.9.1 Methodology

For the ports in this Section, only publicly accessible information was available for the capacity assessment. The data used in the assessment was obtained from the Office of National Statistics (Northern Irish ports), Eurostat, CSO, the port’s websites, and in some cases from information provided by the ports themselves.

The capacity assessment has therefore been carried out by reviewing information about the infrastructure in the port and the historical throughput. It was not possible to calculate an independent capacity figure with the available information, but an indication is provided of the minimum estimated available capacity in these ports based on historical throughput up to 2021. It is noted that the capacity could be significantly higher than the historical throughput due to the port operating at a low utilisation, but the method ensures a good estimate for the minimum capacity of the ports. A commentary has been provided of known future developments that are outlined in ports' masterplans.

5.9.2 Wicklow Port

Overview

Wicklow Port is situated at the mouth of the River Vartry and is located approximately 30 miles from Dublin. The port is serviced by a purpose-built port access road, which allows them to serve businesses throughout the country via the national primary network.

The cargo handled is Dry & Break Bulk. The port accommodates approximately 100 cargo vessels per annum. The cargo is mainly forestry products for import and iron and steel for exports. On occasion, glass cullet is exported to the UK. There is also a fishing sector located in the port. The maximum ship's length that the port can handle is 100m and the maximum draught 5.2m.

Figure 5.48: Wicklow Port (Source: Google Earth)

Throughput

The historical throughput since 2006 for Wicklow Port is presented in **Figure 5.49**.

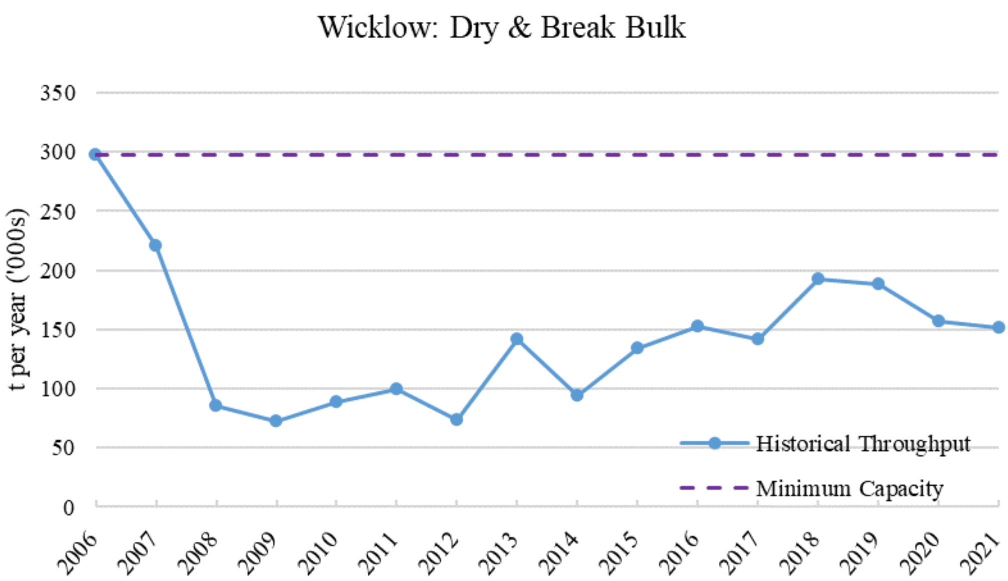


Figure 5.49: Dry & Break Bulk annual throughput (Source: CSO TBA08, IMDO)

Capacity

Table 5.98 shows the minimum estimated capacity for Wicklow Port, based on historical throughput information.

Table 5.98: Wicklow Port minimum estimated capacity

Cargo type	Throughput (2021)	Minimum estimated Capacity
Dry & Break Bulk (t/y)	151,000	297,000

From the historical throughput it can be read that Wicklow Port is currently operating at approximately 90% of its minimum capacity (i.e., 90% of maximum historical throughput).

There are berthing facilities along the North and the South quay, where loading and unloading of the cargo occurs. There are also 25 acres of warehousing facilities present in the port. The port has flexible working hours.

Development plans

Wicklow Port believe that 3 years of growth can be accommodated before developments will be required. Meetings are held regularly with the Maritime Business Development Group[43] to discuss future development of the port. Dredging is required immediately, and the upkeep of the quays are ongoing.

[43] The Maritime Business Development Groups (MBDG) main aims are to develop a Maritime Strategy for County Wicklow and to progress proposals for the major development of port facilities in the County. Source: Wicklow County Council.

5.9.3 Greenore Port

Overview

Greenore Port is situated just inside the entrance to Carlingford Lough.

The port is located next to the important Dublin-Belfast economic corridor, which is connected to the M1 motorway by 15km of roadway. An Bord Pleanála has deemed Greenore Port one of the country's critical infrastructure assets.

Greenore Port is privately owned by Doyle Shipping Group and currently handles only bulk. It imports and exports both Dry and Break Bulk cargoes. Dry Bulk cargoes consist of rock, agricultural feed, and fertiliser, while Break Bulk cargoes consist of steel and project cargoes.

The port has a total berthing length of 260m with a draught restriction of 8.5m. There is a total open storage area of 130,000m^2.

Figure 5.50: Greenore port (Source: Google Earth)

Throughput

Cargoes related to the construction industry such as gypsum, rock and steel arrive on a consistent basis throughout the year. During the winter months, the port tends to see a 20% increase in throughput due to large quantities of fertiliser and animal feed arriving.

The total throughput for the last ten years is shown in **Figure 5.51**.

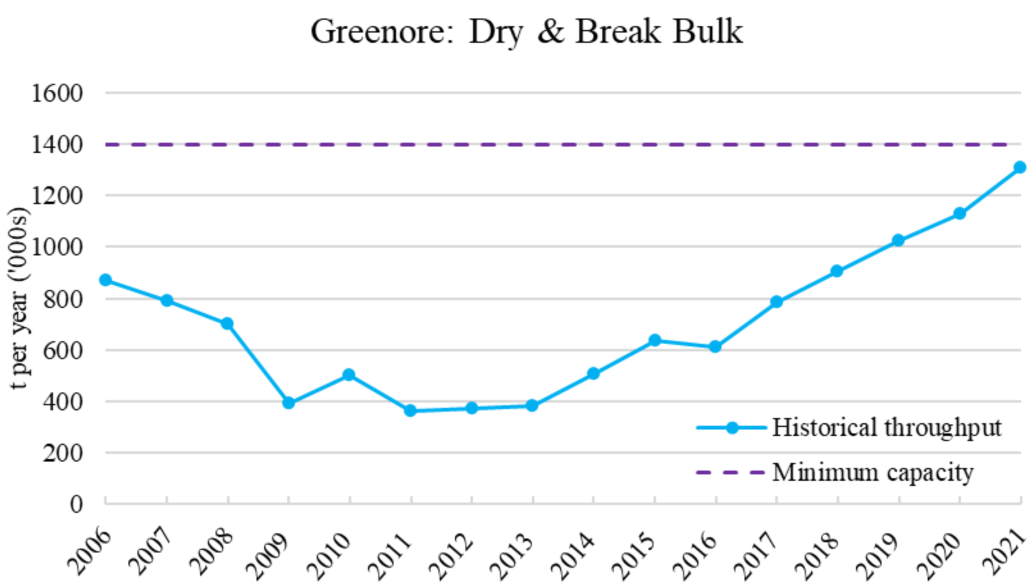


Figure 5.51: Dry & Break Bulk annual throughput (Source: CSO TBA08, IMDO)

Capacity

Table 5.99 shows the minimum estimated existing capacity for Greenore Port, based on historical throughput information.

Table 5.99: Greenore Port minimum estimated capacity

Cargo type	Throughput (2021)	Minimum estimated Capacity
Dry & Break Bulk (t/y)	1,309,000	1,400,000

The port has capacity to store approximately 100,000 tonnes of Dry Bulk products in covered storage.

Normal port working hours are 07:00-20:00 but there are no restrictions on operating 24 hours per day, 7 days per week.

Greenore Port expect to see a significant increase in woodchip importation from 2019, with energy providers having to convert power stations away from traditional peat firing stations. Greenore Port can currently provide sufficient storage space to cater for expected throughput.

Development plans

In mid-2018 the port erected two 12,000-ton capacity grain silos.

In 2021, Greenore Port constructed a new 139m long quay wall in front of the existing wall at Berth 2. This includes a new heavy-duty pavement for handling and storing Dry Bulk cargo.

The port is also dredging at the berth to accommodate larger draught vessels. The initial dredge level will be -7.5mCD.

In the long-term, if market conditions demand it, Greenore Port plans to develop a LoLo and RoRo deep water facility adjacent to the current port to increase capacity for these cargo types.

There is already a slipway which is used for a ferry service to the Greencastle terminal in Northern Ireland. However, there is a storage constraint in the port, so any development of a LoLo service would require procuring or reclaiming additional land.

5.9.4 Belfast Harbour

Overview

Belfast Harbour is the key seaport in Northern Ireland which services all cargo modes: LoLo, RoRo, Liquid Bulk, Dry Bulk, Break Bulk and Cruise. Most bulk imports are petroleum products, grain and feeds, coal, fertilisers, steel, and timber. Most of the bulk exports are stone and scrap. In 2018, the port handled over 24Mt of cargo making it the 2nd largest port in Ireland.

Belfast Harbour is a 2,000-acre estate which makes up 20% of Belfast City. The harbour has an operational berthing length of 8km, over 2,000,000 sq. ft. of warehousing facilities and 900 acres of land zoned for port activity. There is also 26km of road network maintained by Belfast Harbour.

Figure 5.52: Belfast harbour (Source: Google Earth)

Throughput

The historical throughput since 2007 for Belfast Harbour can be seen in the following figures (**Figure 5.53** to **Figure 5.56**) for each type of cargo.

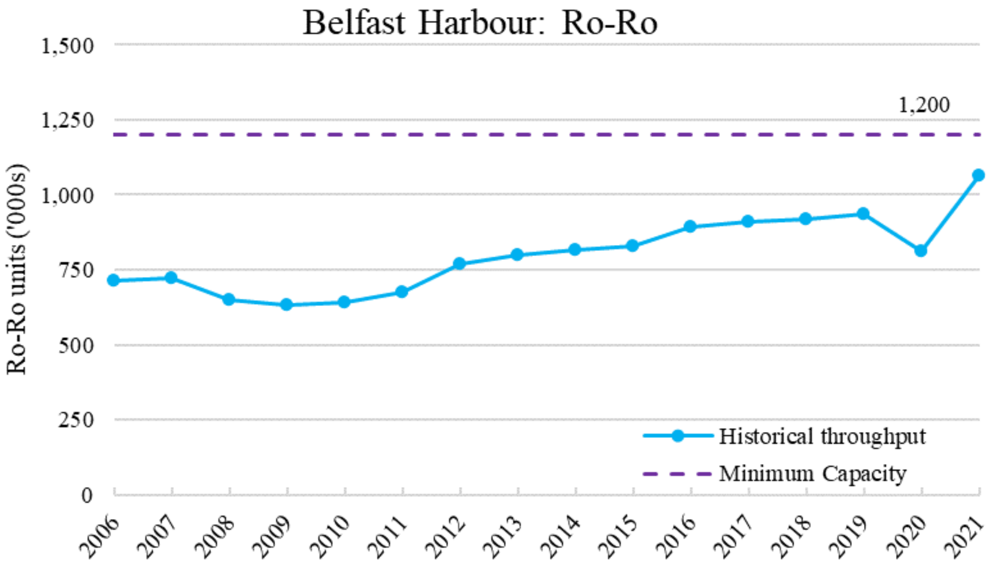


Figure 5.53: RoRo annual throughput (Source: UK Office for National Statistics)

Belfast's RoRo throughput split in 2021 was 0.63M freight units, 0.41M passenger vehicles, 0.02M trade cars. The implied makeup of the 1.2M minimum capacity is 0.7M freight units, 0.45M passenger cars, 0.05M trade cars.

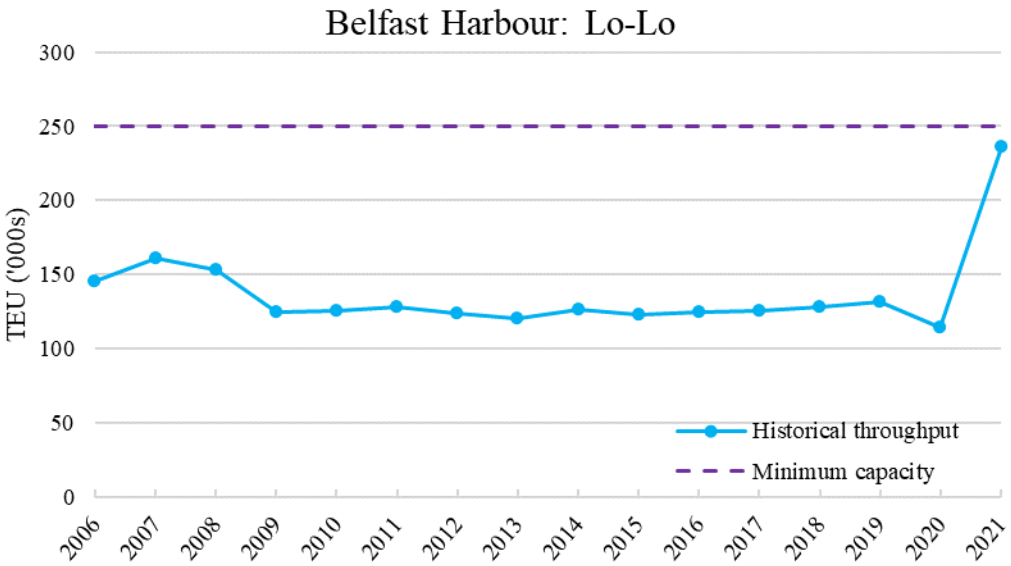


Figure 5.54: LoLo annual throughput (Source: UK Office for National Statistics)

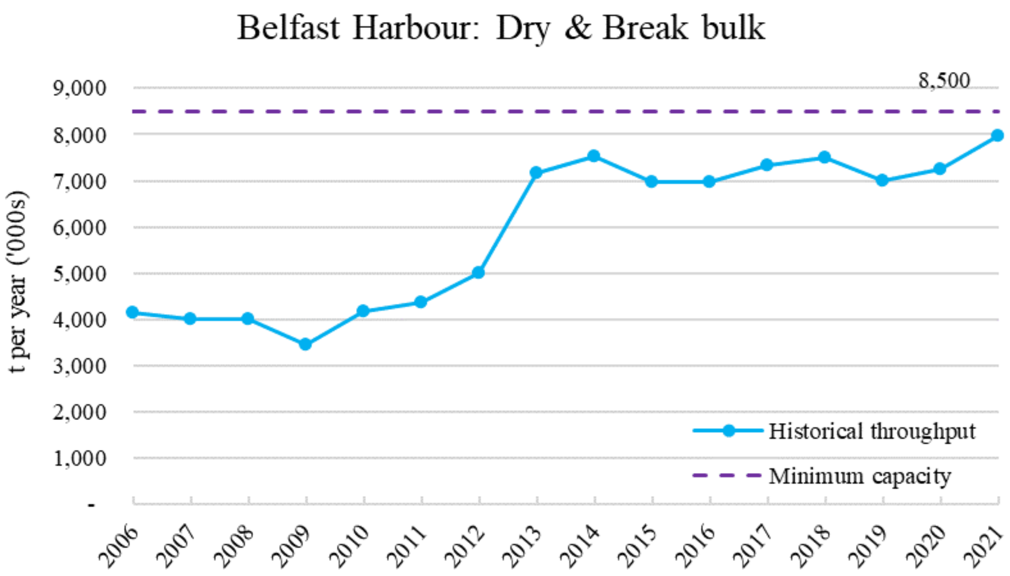


Figure 5.55: Dry & Break Bulk annual throughput (Source: UK Office for National Statistics)

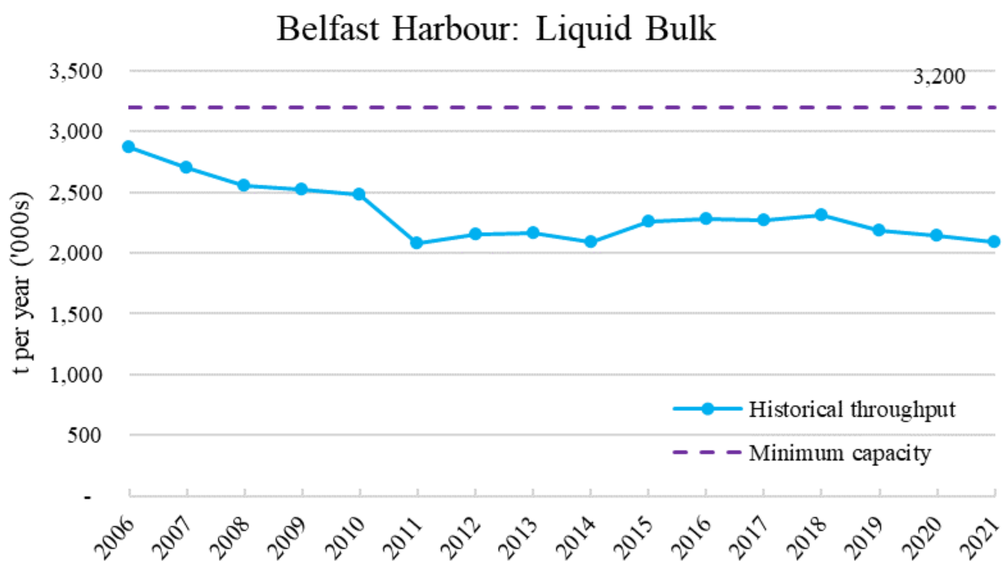


Figure 5.56: Liquid Bulk annual throughput (Source: UK Office for National Statistics)

Cruise is also very popular from spring to autumn and is increasing in volume. There were over 100 cruise calls in 2018, 150 calls in 2019, and there are 130 ships scheduled for 2022. The largest cruise ship that has called to Belfast Harbour is the Anthem of the Seas which accommodates 5,000 passengers and has an overall length of 347m and a draught of 8.8m.

Capacity

With 2,000 acres of land, Belfast Harbour is the largest single port estate in the UK or Ireland. Notwithstanding growth in port tonnages of over 50% in the last 10 years, the port has spare capacity and land available to serve any increases in demand.

Aside from RoRo operations which are 24/7, most port operations are operating on a 16-hour day. However, there are no restrictions on working 24/7.

Bulk cargo is the closest to being at full capacity from a storage perspective, notwithstanding the availability of ample berthing capacity. All other cargo modes have more of an ability to accommodate increased demand from a port infrastructure perspective and BHC has the ability and track record of investing in port infrastructure in response to future anticipated increases in demand.

For example, the construction of the 480m long quay with supporting 200,000sqm hinterland at D1 for the offshore wind sector has provided BHC with the UK and Ireland's first offshore wind port facility and a state-of-the-art terminal facility for general cargo operations.

From the historical throughput figures the minimum capacities outlined in **Table 5.100** can be derived:

Table 5.100: Belfast Harbour minimum estimated capacity by cargo type

Cargo Type	Units	Throughput 2021	Minimum estimated capacity
RoRo	*Units/y*	1,066,000	1,200,000
LoLo	*TEUs/y*	236,000	250,000
Dry & Break Bulk	*Tonnes/y*	7,975,000	8,500,000
Liquid Bulk	*Tonnes/y*	2,086,000	3,200,000

Development plans

BHC has been increasing capacity through a mix of improving efficiencies in equipment and infrastructure and where appropriate undertake physical space expansions. Development plans recently completed or currently ongoing are:

- Installation of a 2-tier RoRo ramp in Victoria Terminal 2 (VT2) to accommodate new Stena E-flexer vessels on the Belfast to Liverpool service.
- Full refurbishment of the Victoria Terminal 1 RoRo ferry berth, from which Stena Line operate their Belfast to Heysham freight service
- At the port's container terminal (VT3) there is a substantial investment programme underway to replace all crane equipment, including new STS cranes and moving from an RMG to RTG operation. Increased stacking heights will increase terminal capacity by around 40% to over 300,000 TEU throughput per annum.
- The port continues to invest in its general bulk crane-fleet with substantial productivity gains for customers. The ability to turn vessels around quicker leads to increases in port capacity.

5.9.5 Port of Larne

Overview

The Port of Larne is a seaport on the East coast of County Antrim, Northern Ireland.

It has been used as a seaport for 1000 years and today is a major passenger and freight RoRo port. The port is perfectly positioned to operate as a dynamic hub for fast and convenient routes to and from Northern Ireland. It is just a 30km drive from Belfast and has the shortest sea crossing to Scotland and England. An aerial image of the Port of Larne is shown in **Figure 5.57**.

Figure 5.57: Aerial view of Port of Larne (Source: Google Earth)

Port of Larne can accommodate ships with a maximum draught of 7m. The maximum quay depth is 7.5m CD. It can also handle cruise vessels with a maximum length of 205m. It has over 20 acres of storage area in and around the port and easy access to the rest of Northern Ireland. There are 6 quays in total.

Throughput

The historical throughput since 2006 for Port of Larne can be seen in **Figure 5.58** to **Figure 5.60** for each type of cargo.

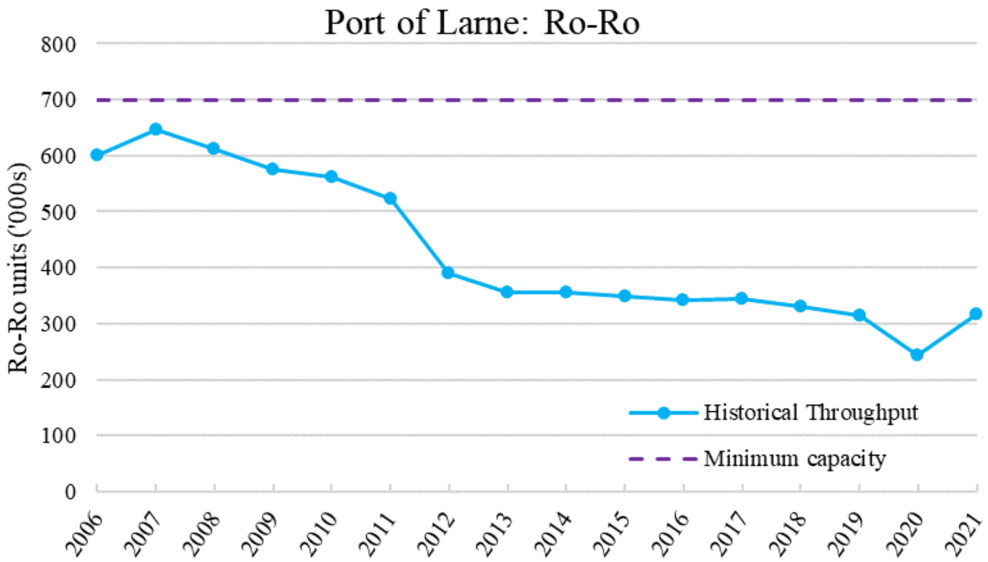


Figure 5.58: RoRo annual throughput (Source: UK Office for National Statistics)

Larne’s RoRo throughput split in 2021 was 0.2M freight units and 0.11M passenger vehicles. The implied make-up of the 0.7M minimum capacity is 0.44M freight units and 0.26M passenger cars.

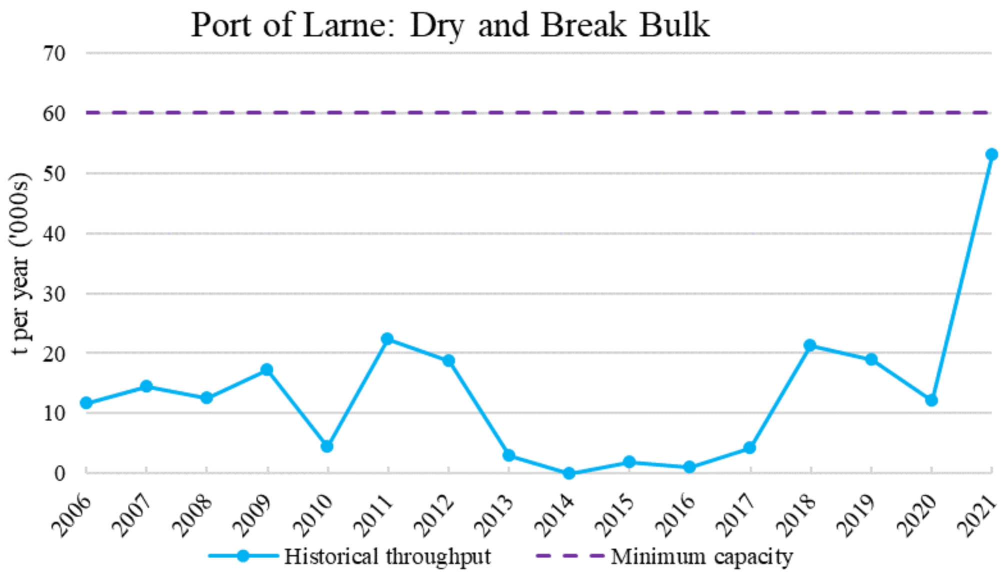


Figure 5.59: Dry & Break Bulk annual throughput (Source: UK Office for National Statistics)

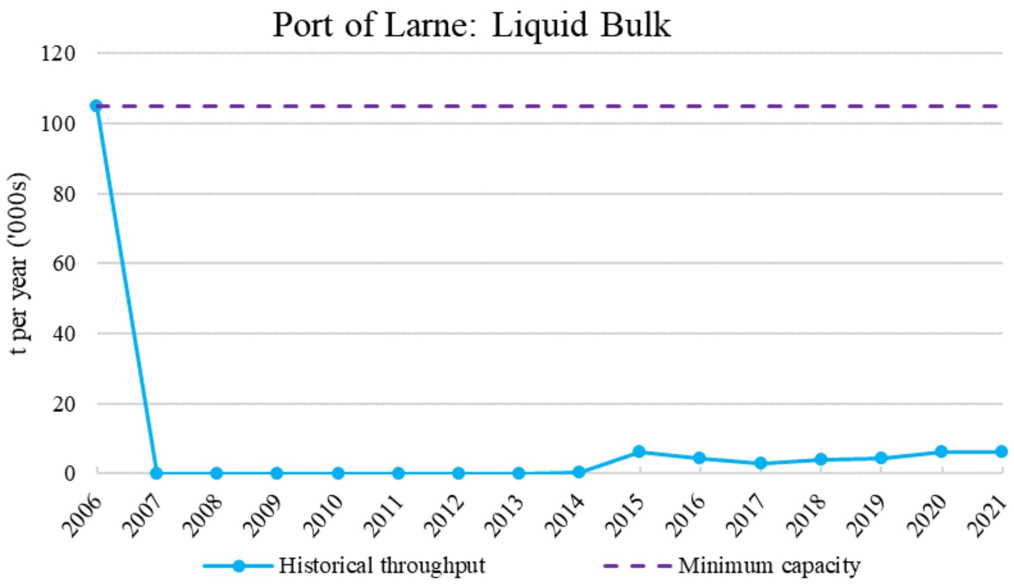


Figure 5.60: Liquid Bulk annual throughput (Source: UK Office for National Statistics)

Capacity

Port of Larne facilitates up to 7 ferry departures daily to Cairnryan operated by P&O Ferries which increases to 20 daily on the Summer Schedule. From the historical throughput figures the minimum capacity, outlined in **Table 5.101**, can be derived:

Table 5.101: Port of Larne minimum estimated capacity by cargo type

Cargo Type	Units	Throughput 2021	Minimum estimated capacity
RoRo	*Units/y*	317,000	700,000
Dry & Break Bulk	*Tonnes/y*	53,000	60,000
Liquid Bulk	*Tonnes/y*	6,000	105,000

The port is increasingly open to other cargo commodities including bulk and project cargoes. One of the quays has a loading capacity of 18t/m^2 and the port has carried out several projects related to onshore renewable energy.

The port has 2,000m^2 of covered storage in the port and have a land bank available to develop for port related activity (e.g., cargo storage).

Development plans

Port of Larne has no development plans published. It aims to promote the tourist industry in Northern Ireland. As mentioned above it can handle cruise vessels up to 205m in length and it hopes to become a gateway for the Antrim Coast.

5.9.6 Warrenpoint Port

Overview

Warrenpoint Port is positioned in a strategic location between Dublin and Belfast. The modern harbour was founded in 1974. In terms of total traffic handled, it is the second busiest port in Northern Ireland and fifth in Ireland. An aerial image of the port is shown in **Figure 5.61**.

It has 6 general cargo/container berths with a total length of 750m and 1 berth dedicated to RoRo vessels. The port has 300m of quays which are dredged to 7.5m below Chart Datum. The remainder of the berths are dredged to a depth of 5.45m below Chart Datum. The main cargo modes Warrenpoint facilitates are Dry & Break bulk, LoLo and RoRo, with RoRo having the largest throughput.

Figure 5.61: Aerial view of Warrenpoint Port (Source: Google Earth)

Throughput

The historical throughput since 2007 for Warrenpoint Port can be seen in **Figure 5.62** to **Figure 5.65** for each type of cargo.

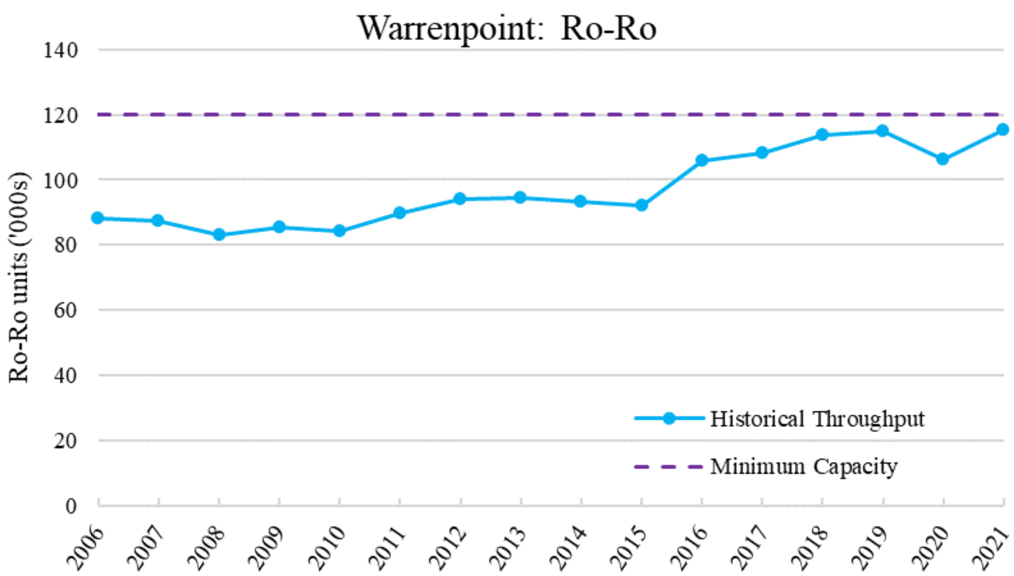


Figure 5.62: RoRo annual throughput (Source: UK Office for National Statistics)

Warrenpoint's RoRo throughput split in 2021 was 0.11M freight units and 0.003M trade vehicles. The implied make-up of the 0.12M minimum capacity is 0.11M freight units and 0.01M trade cars.

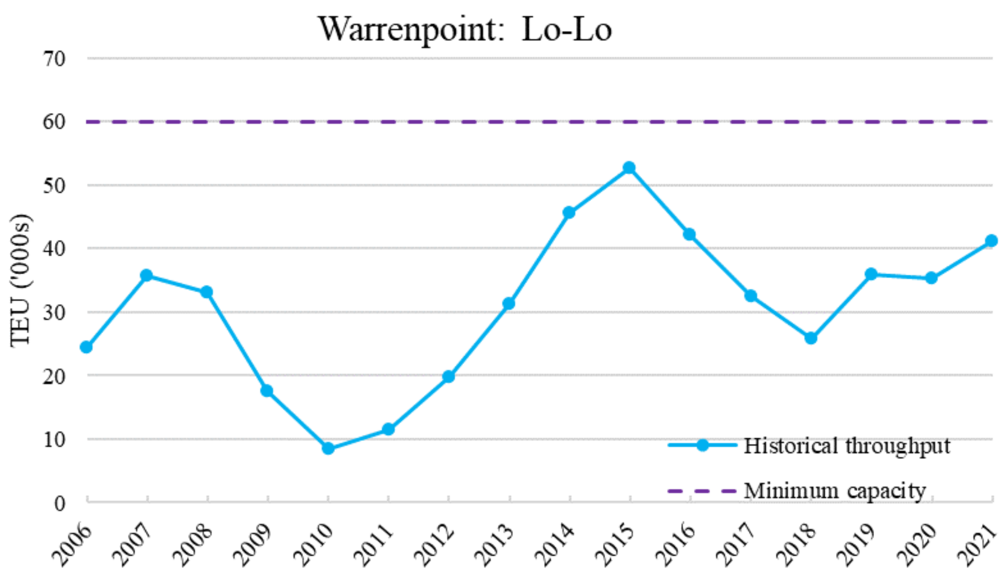


Figure 5.63: LoLo annual throughput (Source: UK Office for National Statistics)

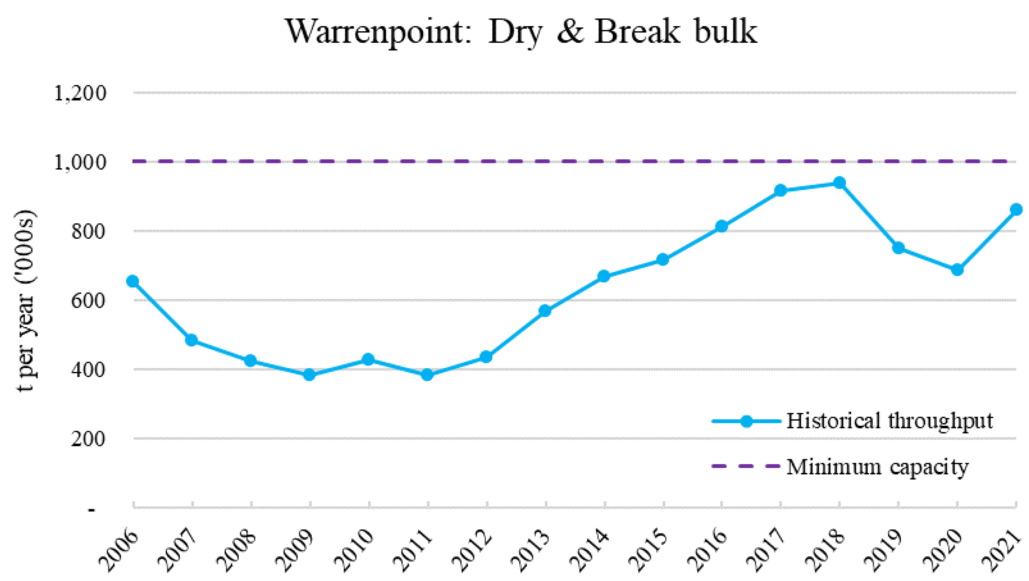


Figure 5.64: Dry & Break Bulk annual throughput (Source: UK Office for National Statistics)

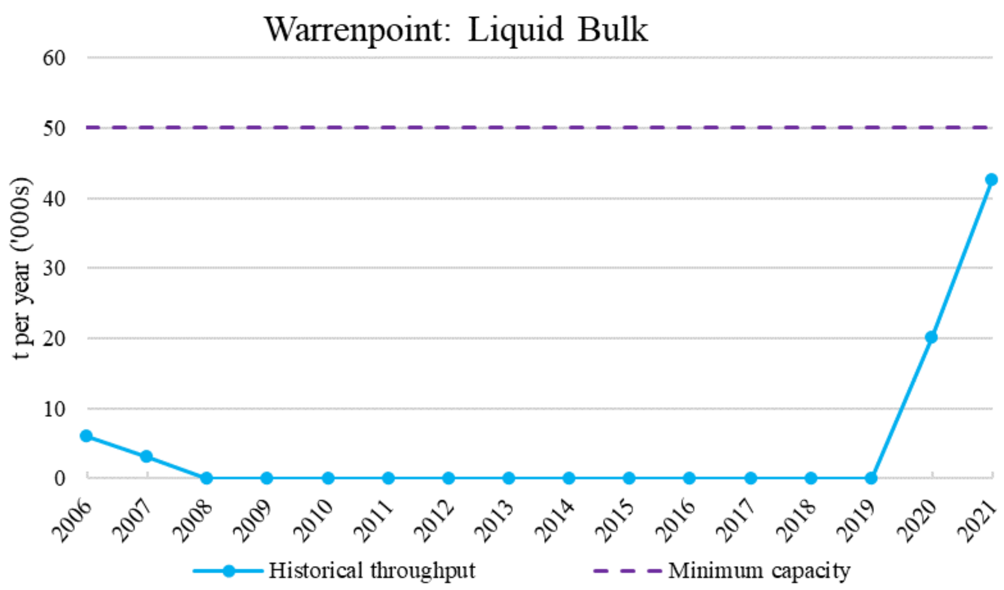


Figure 5.65: Liquid Bulk annual throughput (Source: UK Office for National Statistics)

80% of the freight throughput has been cross channel and 40% of it begins or ends its journey in Ireland.

Capacity

The port's initial area was 28 acres when it was founded, and it has expanded to the current state with a total area of 53 acres. There is little information about the port's capacity apart from the limited storage area that is available (45.600m^2 and 106,600 units for RoRo operations). The RoRo storage was identified as a priority with additional area required as soon as possible.

From the historical throughput figures the minimum capacities outlined in **Table 5.102** can be derived:

Table 5.102: Warrenpoint Port throughput and minimum capacities by cargo type

Cargo Type	Units	Throughput (2021)	Minimum estimated capacity
RoRo	*Units/y*	116,000	120,000
LoLo	*TEUs/y*	41,000	60,000
Dry & Break Bulk	*Tonnes/y*	861,000	1,000,000
Liquid Bulk	*Tonnes/y*	42,000	50,000

Development plans

Warrenpoint Port issued a Masterplan in 2018. The focus is on the following areas:

- Broaden regional strategic access through delivery of the Newry Southern Relief Road
- Enhance marine access through an improved maintenance dredging regime
- Address limited storage area (main constraint)
- Progress in the acquisition of sites within ports
- Create a marina (long term) - expand to Town Dock (short term)

5.10 Conclusions of demand versus capacity analysis

The Irish Ports Capacity assessment shows that the Irish ports included in this study currently have sufficient capacity for RoRo, LoLo, Dry & Break Bulk and Liquid Bulk, and are planning adequate capacity increases in time to manage future demand for these cargoes except for trade cars and accompanied freight in Rosslare where increased operational efficiencies will be needed to keep up with 2040 demand.

Across all other ports and cargoes, if the planned developments are put in place in time, then the capacity will be sufficient to meet the forecasted demand in the highest growth scenario.

Difficulty in obtaining funding and long consenting processes are risks to the capacity development in Irish Ports. This report has not investigated new demand for Irish Port capacity outside the current cargoes. This demand could come for instance from offshore wind developments requiring marshalling/ assembly facilities and O&M facilities or local projects involving green fuels such as LNG and hydrogen facilities.

A selection of the findings in this Section:

Dublin Port will require additional RoRo capacity by approximately 2030. It has identified plans to increase RoRo capacity in its Masterplan 2040.

The lead in times for the proposed developments can be long so it is important that plans progress on time to ensure that the additional capacity is in place ahead of being required. The developments proposed for increasing RoRo capacity in Dublin Port are:

- the construction of a new jetty at the eastern end of the port
- the redevelopment of the existing MTL terminal at berths 41-45 as a RoRo freight terminal.

These developments are likely to have lead-in times of up to 5 years so they should begin by ~2027.

Port of Cork is currently operating at maximum LoLo capacity at its Tivoli terminal and have started operations in the new container terminal in Ringaskiddy. The capacity at the Tivoli container terminal is being stretched to the maximum while the Ringaskiddy terminal is still freshly opened.

However, it is forecasted that demand will meet capacity once again in 2030, at which time the port will require the proposed 7ha yard extension. Then, by 2040, the 200m berth expansion and further yard expansion will be required. The predicted lead-in time for this development is 2-3years in both cases.

Shannon Foynes Port Company handles a large proportion of Ireland’s Dry & Break Bulk. The port is forecasted to reach its capacity by 2024. Additional capacity is being brought on stream with the construction of new berth 4 currently ongoing.

However, this additional capacity will soon be fully used once again, and the port will be looking towards the Foynes Island development for additional capacity. This development is expected to have a long lead-in time of 9.5years. Early feasibility studies have been carried out and scheme design and EIAs should be progressed in 2023 to ensure that the required capacity is ready for the forecasted increase in demand. The Shannon Foynes Port area handles an even larger amount of Dry& Break Bulk through operations in Aughinish and Moneypoint. These have been excluded from our assessment.

Port of Waterford handles mainly LoLo and Dry & Break Bulk. It has significant spare capacity for both modes. LoLo Capacity (200,000 TEU) is less than 20% when compared to Dublin’s (1,020,000 TEU) but it is comparable to the Tivoli terminal in Cork (260,000 TEU). Demand however is much lower than the other ports. Its current focus is on developing new services and routes and the immediate improvement of navigational access to the port including river training works aiming to reduce the annual spend on dredging works.

Rosslare Europort is primarily dedicated to RoRo (freight, passenger and trade vehicles). The limiting factor was the storage area for unaccompanied trailers. Rosslare Europort already has increased this capacity.

Trade car forecasts are set to increase sharply in the coming years and without a reduction in operating efficiencies or an increase in storage area the business will be capacity constrained by 2033.

Currently, Rosslare's accompanied freight business is very close to the estimated capacity based on the current amount of terminal marshalling lanes available per berth and the proportion of accompanied freight which occupies each sailing. As the demand increases this proportion may also increase to meet demand although it is currently at a recent historical high.

It was not possible to calculate an independent capacity figure with the available information from **Wicklow Port, Greenore Port,** and the **ports in Northern Ireland**, but an indication was provided of the minimum estimated available capacity in these ports based on historical throughput.

Chapter 6

Combined Irish Ports Capacity Analysis

6 Combined Irish Ports Capacity Analysis

6.1 Introduction

This Chapter provides an insight into the capacity of the combined Irish ports on the Island of Ireland, as a network, to respond to the current and forecasted demand. The information from the analysis for the individual ports, which was presented in **Chapter 5**, will be used to assess this combined capacity, and draw conclusions on the capacity of the Irish Ports System. Small ports which only represent 2% of total throughput and private/industrial facilities which are not available for public use were not included in the capacity assessment, although these ports may still be part of the demand forecast.

In order to obtain the capacity for the four cargo modes for the whole Island of Ireland, the individual capacities obtained in **Chapter 5** were all added up per cargo mode. The demand forecast for the Island of Ireland is available from the demand model built by EY-DKM as described in **Chapter 3**.

The graphs presented in this section show the demand versus capacity analysis for the Island of Ireland in the same way as shown for each individual port previously.

The capacity for the whole of the Island of Ireland cannot be obtained by simply adding up the individual port's capacities. Traffic cannot be easily diverted from one port to another without considering the capacity of the seaside and landside infrastructure and the competitive advantages between the ports. The capacity presented here is therefore not a network capacity but a very broad estimation of the combined capacity available in the Irish ports system, which will provide insight into the spread of capacity over the various ports on the Island of Ireland.

In the graphs, the Irish ports are shown in different colours at the bottom and the Northern Ireland ports are shown in greyscale at the top of the graph. This allows us to also look separately at the split, not just in terms of different terminals but also in terms of Ireland vs N.I.

We note that during the development of this study there was not sufficient information available to assess the capacity for the ports in Northern Ireland, so their capacity was estimated from historical throughput and kept constant, as explained in **Section 5.9.1**.

6.2 Assessment of the combined Irish Ports capacity for RoRo

As can be seen in **Figure 6.1**, **Figure 6.2**, and **Figure 6.3** most of the RoRo operations in the Island of Ireland are concentrated in Dublin, Rosslare, Belfast, and Larne with smaller throughputs in Cork and Warrenpoint.

Overall, the Island of Ireland just has sufficient capacity to accommodate total demand up until 2039.

Nevertheless, the planed RoRo terminal extension in Dublin will allow for further growth around that time. During the second half of the 2030s, the network of Irish ports will be approaching capacity and so throughput may need to be spread to lower throughput terminals.

Dublin is by far the dominant RoRo freight port on the Island of Ireland and as ferry companies look to group their services together, the demand in Dublin is expected to increase over time. Looking at the current set of Irish ports masterplans, this dominance in RoRo is only set to increase with Dublin Port heading to circa 2M units/year in terms of RoRo freight capacity.

The Port of Cork has potential to increase capacity through additional sailings and Rosslare Europort has potential to increase its yard utilisation. Improvements in hinterland connectivity in these ports will be required to accommodate any surplus demand from Dublin Port.

Based on recent historical data, Belfast Harbour is operating close to full RoRo capacity whereas the Port of Larne has some available capacity.

Figure 6.1 shows that Dublin Port, via its unified ferry terminal and potential additional berths, will be driving the increases in national RoRo capacity. A small increase at Rosslare also occurs in 2019 following the enlarged unaccompanied freight storage area. Freight capacity is level for the Northern Irish Ports (see **5.9**) and Cork (see **5.3**).

This study assumes that the relative ports shares will remain constant.

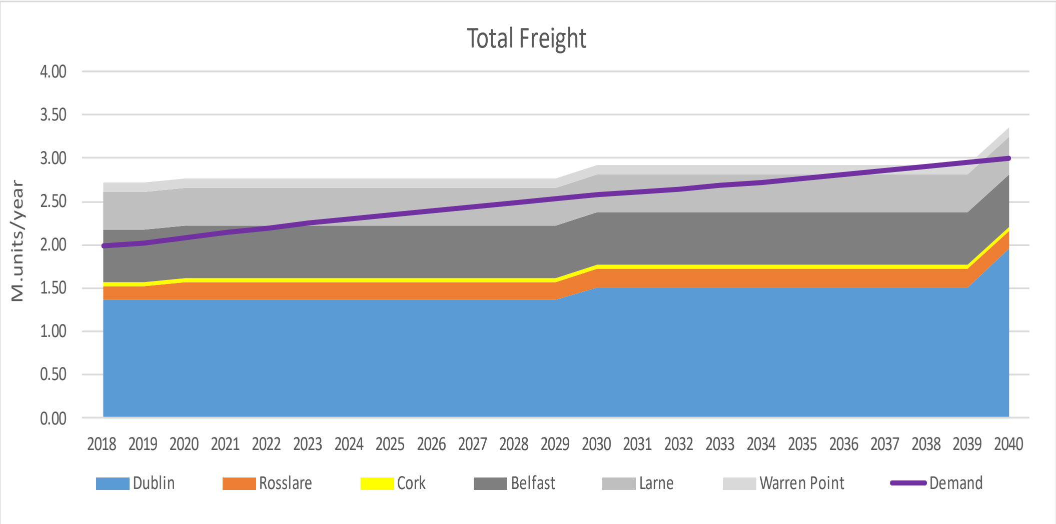


Figure 6.1: Capacity and demand for total freight on the Island of Ireland until 2040

Figure 6.2, shows how Dublin Port is the only port making any advancements in their passenger vehicle capacity across the whole Island of Ireland with uplifts in both the imminent (2030) and potential (2040) timeframes. The figure also shows how there is suitable capacity for future demand. The additional capacity could be released for accompanied freight, if desired. However, the space required for a single freight unit is comparable to approximately 4.5 passenger vehicles.

This means a surplus capacity of 0.8M vehicles corresponds to a possible 0.18M accompanied freight units capacity; however, this is spread across the whole Island of Ireland and therefore this is unlikely to be usefully repurposed.

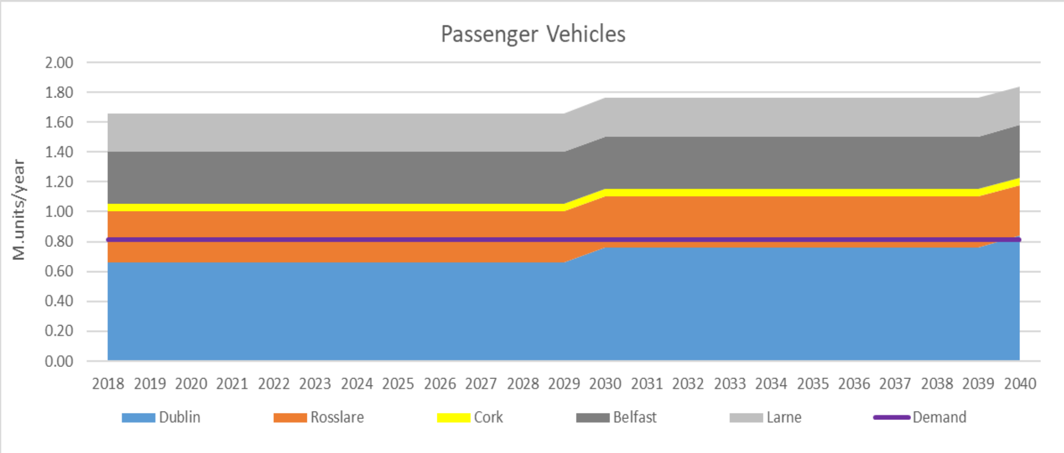


Figure 6.2: Capacity and demand for passenger vehicles on the Island of Ireland until 2040

Figure 6.3, highlights the high levels of increased demand expected for trade cars across the Island of Ireland over the next two decades and how reductions in yard space in the Port of Cork may cause capacity constraint problems by the mid-2030s.

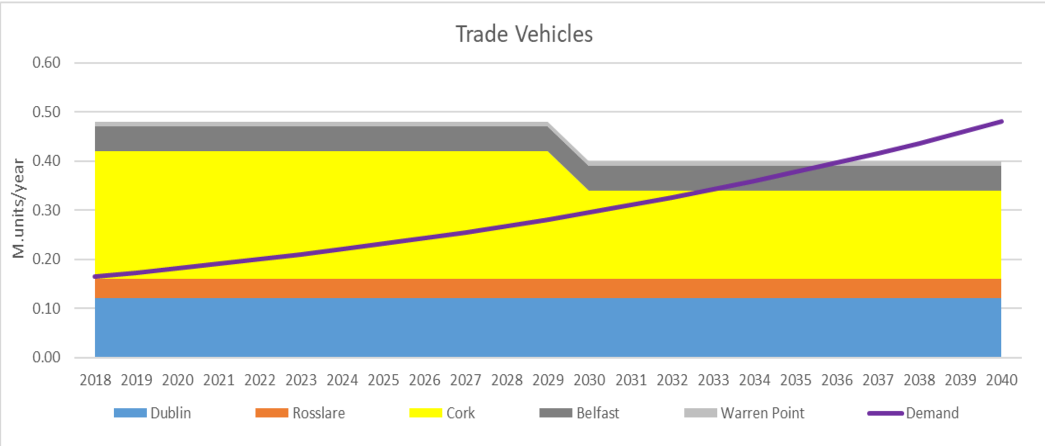


Figure 6.3: Capacity and demand for trade vehicles on the Island of Ireland until 2040

6.3 Assessment of the combined Irish ports capacity for LoLo

Most of the current capacity in Ireland and Northern Ireland for handling LoLo is situated in Dublin, Cork, Waterford, and Belfast.

As can be seen in **Figure 6.4**, Dublin Port has by far the greatest LoLo throughput and, considering its current market share, this is unlikely to change. Dublin Port will need to increase its capacity around 2027 and is planning for this. The throughput in Dublin Port is three times the throughput of Port of Cork, which is the second largest LoLo port.

Figure 6.4 shows that a significant increase in LoLo capacity is also planned for the next 5-7 years in Port of Cork. This increase is planned in the new Ringaskiddy container terminal, which is expected to require an expansion by 2030 as discussed in **Section 5.3.8**.

The Port of Waterford has approximately 0.15M.TEU of spare capacity which will be needed as total LoLo demand nears capacity by the end of the 2030s. The Port of Waterford also has good rail and road connectivity which has recently been improved with the recent upgrading of the N25.

Overall, the network of ports in Ireland has just enough capacity planned to meet demand for LoLo until 2040. Some additional short-term precautions may be required in 2039 as the forecasted demand is very close to the estimated capacity.

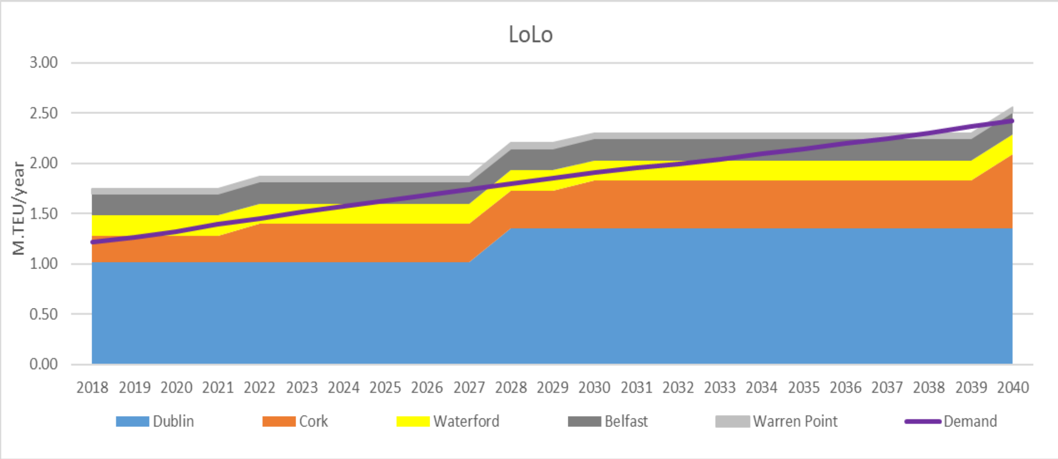


Figure 6.4: Capacity and demand for Total LoLo on the Island of Ireland until 2040

6.4 Assessment of the combined Irish ports capacity for Dry & Break Bulk

The capacity for handling Dry & Break Bulk is more evenly spread over all the ports in the Island of Ireland. As can be seen in **Figure 6.5**, all ports in the Island of Ireland that were considered in this study, with the exception of Rosslare, handle some Dry & Break Bulk.

Belfast Harbour has the largest throughput and capacity of Dry & Break Bulk at nearly 8 million tonnes per year. All ports within Ireland which handle Dry & Break Bulk, except for the Port of Waterford, have plans for expansion of capacity in this sector. In **Figure 6.5**, the combined capacity can be seen to grow slower than the demand and so spare capacity across the network will become more utilised.

It was estimated in **Section 5.2** that Dublin Port will reach its capacity for handling Dry & Break Bulk by 2030 at the earliest. It is planning a new deep-water multi-purpose berth on South Bank Quay which will add to its Dry & Break Bulk capacity.

There is currently spare Dry & Break Bulk capacity in the Port of Cork. The capacity of 2.1 million tonnes per year is not expected to be exceeded until 2029 (see **Section 5.3.8**). The Marino Point development will be required before this date to accommodate the relocation of facilities from City Quays.

The Port of Waterford has adequate spare capacity which could be used if required.

It was estimated in **Section 5.4.8** that Shannon Foynes Port Company (SFPC) will require additional capacity in 2026. SFPC have an imminent capacity increase on schedule for 2024 with the construction of the new berth 4.

Overall, the network of ports in Ireland has enough capacity planned to meet demand for Dry & Break Bulk until 2040, as illustrated in **Figure 6.5**.

Both Dublin Port and the Port of Cork are planning to add approximately 1.5 million tonnes of Dry & Break Bulk capacity in the next 15 years, even though adequate spare capacity seems to be available in other ports such as Waterford and Drogheda. In this context, it is important to understand the differences between Dry Bulk and Break Bulk. Unlike Break Bulk (wind turbine elements for instance), Dry Bulk (such as cement) needs to be handled at specialised terminals. Therefore, demand cannot be easily diverted from one port to another.

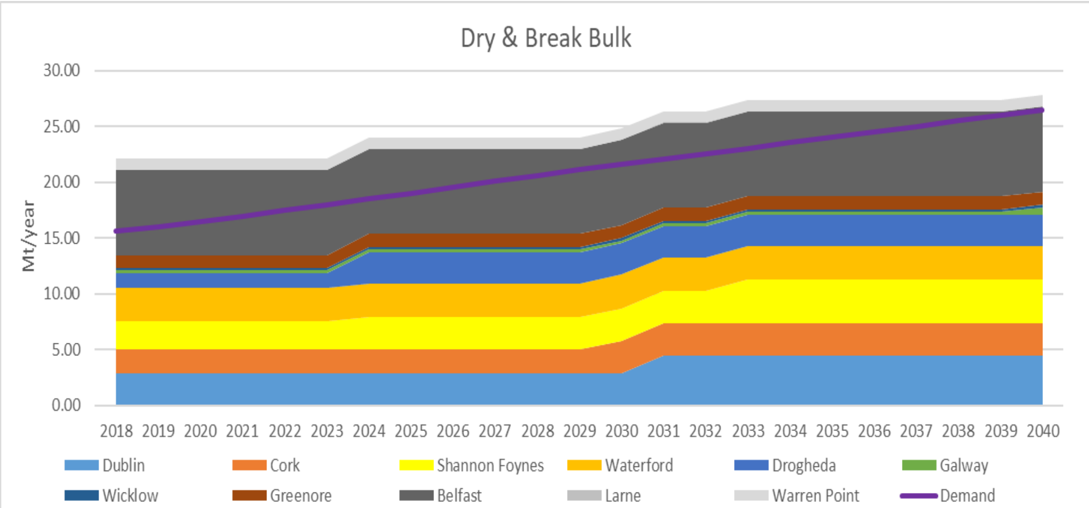


Figure 6.5: Capacity and demand for Total Dry and Break Bulk cargo on the Island of Ireland until 2040

Further study into the exact makeup of the Dry & Break Bulk demand, the regional spread of the demand, the transport network capacity, and the commercial attractiveness of the various Dry & Break Bulk terminals would be very helpful in order to identify the feasibility of using the spare capacity instead of building additional facilities.

6.5 Assessment of the combined Irish ports capacity for Liquid Bulk

The development of demand for Liquid Bulk is an area where there is a lot of uncertainty. Environmental considerations about the use of fossil fuels should lead to a reduction in demand for Liquid Bulk but there is uncertainty about when this reduction will take place.

As discussed in **Section 3.4.2**, the demand forecast for Liquid Bulk in this study over the period to 2040 assumes a steady growth in line with economic growth. This contrasts with the Dublin Port Company assessment which assumes a reduction.

Overall, the network of ports in Ireland has enough capacity planned to meet demand for Liquid Bulk until 2024 when a reduction in capacity in Dublin Port may cause a capacity constraint until the Foynes Island development can be brought on-line. It is noted that the additional capacity that has recently become available in Port of Cork is not included in the combined capacity.

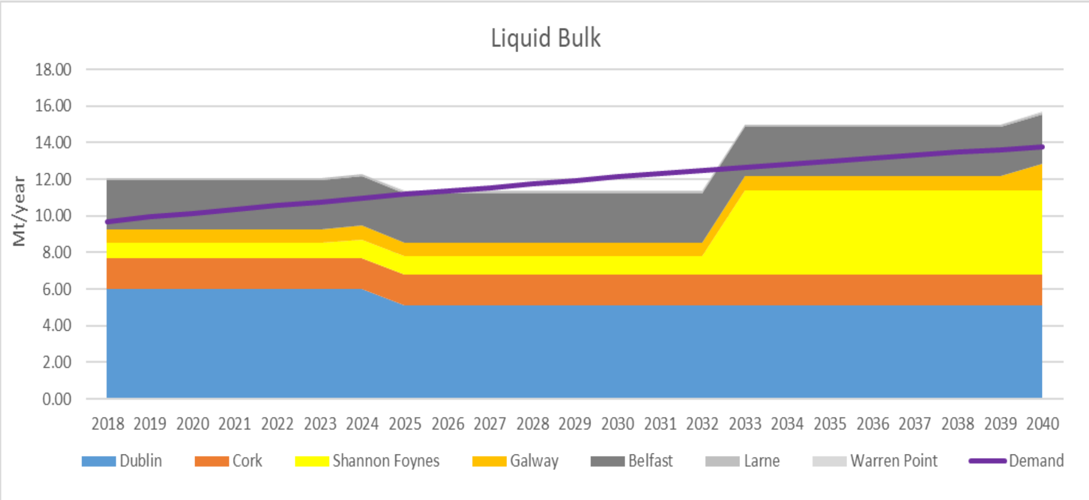


Figure 6.6: Capacity and demand for Total Liquid Bulk cargo on the Island of Ireland until 2040

A terminal-by-terminal breakdown is given below. There is sufficient capacity to cover demand across all terminals except for Port of Cork over this period.

Dublin Port has the largest capacity and throughput for Liquid Bulk handling. Dublin Port has no plans to increase its capacity; in fact, the capacity is expected to be reduced in the future as a result of the removal of berth 4. This may have the effect of bringing the network's capacity below the expected demand although northern Irish ports may well be able to cover this increase in demand. If not, the Foynes Island development may have to be brought forward.

Belfast has the second largest capacity for Liquid bulk on the Island of Ireland and the largest in NI. Belfast is currently operating at approximately 80% of historical peak throughput (**Section 5.9.4**). This means there is some spare capacity although potential enhancements to the terminal may be needed as demand increases.

The **Port of Cork** is currently operating near its full capacity. It has no plans to increase its Liquid Bulk capacity in Tivoli and is looking to move these facilities elsewhere.

Shannon Foynes Port Company has a large increase in potential capacity planned in the Foynes Island development, but this is not scheduled until 2033.

Port of Galway has an expansion plan including Liquid Bulk. Capacity increase is not the driver for these plans but to enable the port to accommodate the increased vessel sizes the market is moving towards. These plans are not scheduled until 2040 however, with increasing ship size the port runs the risk that liquid bulk carriers will no longer deliver directly to Galway.

With questions over the demand development in Liquid Bulk there may not be a case for developing two new liquid bulk facilities in the west of Ireland.

6.6 Conclusions

6.6.1 RoRo

Dublin Port remains the primary RoRo port on the Island of Ireland and the port's share in the overall business is set to increase. RoRo operations are also carried out in Rosslare, Belfast, and Larne with lower volumes in Cork and Warrenpoint.

There is sufficient capacity, considering currently planned expansion projects, across the whole network of Irish Ports to manage the expected demand in terms of freight and passenger cars, however the growth in trade vehicles expected over the next two decades may see capacity constraints seen by the mid-2030s.

6.6.2 LoLo

Dublin Port has by far the greatest LoLo throughput, and this share is unlikely to change over the next two decades. Significant LoLo operations are also situated in Cork, Waterford, and Belfast.

There is sufficient capacity, considering currently planned expansion projects, across the whole network of Irish Ports to manage the expected LoLo demand until 2040; however, some additional short-term precautions may be required in 2039 as demand is very close to the capacity.

6.6.3 Dry & Break Bulk

Belfast Harbour has the largest throughput and capacity in terms of Dry & Break Bulk; every port, apart from Rosslare, considered as part of this study has some kind of Dry & Break Bulk industry and many of the terminals are planning expansions to keep up with demand until 2040.

There is sufficient capacity, considering currently planned expansion projects, across the whole network of Irish Ports to manage the expected Dry and Break

Bulk demand until 2040; however, current spare capacity is to become progressively more utilized and further study into the feasibility of transferring cargoes to other ports to make use of this spare capacity should be investigated.

6.6.4 Liquid Bulk

Dublin Port has the greatest Liquid Bulk capacity on the Island of Ireland however, this share is expected to decrease. There is also significant Liquid Bulk capability at Belfast as well as plans to develop a large terminal in Shannon Foynes in the early 2030s. Cork, Galway, Larne, and Warren Point also handle Liquid Bulk, but to a lesser extent.

There is sufficient capacity, considering currently planned expansion projects, across the whole network of Irish Ports to manage the expected Liquid Bulk demand until 2024 when the reduction in capacity in Dublin Port may cause a capacity constraint until the Foynes Island development can be brought on-line. It is noted that the additional capacity that has recently become available in Port of Cork is not included in the combined capacity.

Chapter 7

Key risks, Threats and Opportunities

7 Key Risks, Threats, and Opportunities

7.1 Introduction

This chapter highlights the key risks and threats to the capacity of the individual ports and to the port capacity on the Island of Ireland that have been identified in the course of this study.

Some of the risks identified are generic and affect ports throughout the world, but most are specific to the ports in Ireland.

Issues discussed include infrastructure resilience, hinterland connectivity issues, funding, planning and political risks such as Brexit. After obtaining the opinions and experience of a number of key stakeholders, key experts from Arup, EY-DKM and STS International took part in a risk workshop where the key risks and threats were analysed and ranked on a national level (see **Section 7.2**) and at a port specific level (see **Section 7.3**). These risks were then given a risk value based on the likelihood of them occurring and the impact they would cause should they occur. Where possible and within the scope of this study proposed mitigation measures were identified.

The following categories of risks were identified:

- Exceedance of growth estimates: There is a risk that, due to myriad variables and unforeseen circumstances that estimates are exceeded. This could manifest as an overall growth exceedance or pressure at particular ports.
- Operational and infrastructure deficits: There is a risk that underinvestment, lack of maintenance or damage could occur to critical port infrastructure which could result in a sudden capacity deficit for the port.
- Port shares and trade distribution: There remains the risk that in the future, there is a shift in the balance of how trade is distributed around the Irish Ports network, and as a result, this could lead to capacity strains in specific ports over others. This is relevant in the context of the constant port shares used for practicality.
- Deficits in connectivity to hinterland: Congestion or complete blockage of intermodal connectivity can also lead to capacity deficits (motorways, rail lines and the Dublin Port tunnel, in particular).
- Funding: Funding is cited by all ports as the biggest impediment to capacity increases.
- Planning and programming: There is a risk that some developments will take longer than expected to obtain planning consent. Some may not be granted planning permission at all.
- Brexit / Political risks: There is a risk that, post Brexit, border controls requirements will result in a shortage of storage space.

- Climate Related Regulations and Impacts: There is an ongoing need to decarbonise the industry and the wider economy and as a result of Government and market action there could be a need to develop and change port infrastructure accordingly.

7.2 Risks and threats to the Irish ports

This Section covers the key risks and threats to the ports on the Island of Ireland. A full list of the risks, threats and possible mitigation measures identified can be found in **Appendix 9**. A summary is provided hereafter.

Exceedance of Growth Estimates

There remains the risk that economic forecasts and the derivative capacity assessment undertaken in 2018 exceed forecast expectations. Growth in both overall port movements and individual port movements exceeding estimates creates the risk that capacity may be exceeded beyond the assessment undertaken. Although this is considered an apparent and clear risk, an iterative approach to the review and update of capacity assessments, and the continuous investment in Irish port capacity can alleviate this risk, within reasonable limits.

Operational and infrastructure deficits

Investment in capacity, infrastructure and equipment is essential to achieve success in the future within Ireland's ports. Any capacity development unrealised will put strain on the overall potential to mitigate the risk of growth estimates being exceeded.

In addition to this, a malfunction or breakdown of key port infrastructure could lead to immediate constraints in capacity. If a RoRo linkspan breaks down the ship cannot offload its trucks and cars or if a STS crane is out of operation a container ship cannot offload its containers.

In order to mitigate these risks, ports will need to operate efficient asset management systems to improve the resilience of their operations.

Port Shares and Trade Distribution

The port capacity assessment and the basis of throughput is predicated on past-events and investments that are measured at a fixed point in time. It is noted at the time of writing of this report that if there is a shift in port shares and trade distribution around the Irish Ports network, this could lead to capacity strains in focused areas.

Although this is considered an apparent and clear risk, the iterative approach to the review an update of capacity assessments, ongoing asset management at all ports, and the continuous investment in Irish port capacity can alleviate this risk within reasonable limits; allowing port operators and owners to respond to changes in the market to maximise value.

Deficits in connectivity to hinterland

Port access routes are critical and a ship sinking in the access channel, siltation or a blockage of a hinterland access route could cause major congestion.

These scenarios are not as uncommon as they may seem. A sudden siltation happened in Rosslare several years ago and created a sand bank at the harbour entrance.

Having the ability to switch shipping routes between several ports will mitigate this risk.

Funding

Funding is cited by all ports as the biggest impediment to capacity increase. The Tier 1 and 2 ports operate as independent commercial companies but require ministerial (Minister for Transport) and legal consent before taking out loans.

Planning and programming

The timelines for obtain planning consent are a concern for some ports; particularly if they are in environmentally sensitive areas.

This report provides an insight in the timelines for obtaining planning consent for the planned developments. Early identification and consultation with stakeholders and the preparation of detailed planning application documents are required to prevent surprises and setbacks.

Political risks including Brexit

Political risk is of constant importance to industries and infrastructure operating on the interface between nations and regions. Recent events, including that of the UK's exit from the European Union, are anticipated to have significant impact on the future of Ireland's port infrastructure, and we will explore these risks below in summary. Further risk assessment detail can be seen in **Appendix 9**.

- UK export – The supply of goods exported to UK from Ireland decreases in light of cost-passthroughs to customers. Given the current trade surplus that Ireland holds this could be a point of emphasis for future economic growth. An impact to the ability to service this trade surplus will undermine the foundations of Ireland Inc and will reduce the return on investment made in Irish ports. The UK demand includes NI intra-Island demand, and goods carried via the 'blue highway' from Belfast to Dublin for example.
- Landbridge Efficiency – The efficiency of the Landbridge, following the ramifications of Brexit is under pressure.

  Given the emerging issues, remaining future uncertainty and the fact that RoRo is likely to be highly sensitive to transit times, travel times for a number of different potential routes which could be viable have been analysed. Whilst this analysis shows that the Landbridge remains the fastest route, certain routes might only add 5 – 10 hours to journey times so major delays or additional costs could lead to these becoming more attractive.

- UK Imports – A significant proportion of goods bound for Irish consumers come from the UK, either directly (UK produced) or via the UK Landbridge (see above).

  The efficiency of UK imports to Ireland, from a financial perspective, will be based primarily on the favourable terms of exchange rate between the Euro and the GBP, and on the friction to trade created by the exit of the UK from the European Union. Mitigations for the latter should be considered in association with other such risks posed by Brexit.

- Trade Vehicles – Ireland is one of just two right-hand drive markets in the European region. The UK is the other. As the Government's Climate Action Plan relies heavily upon an unprecedented uptake of one million electric vehicle owners by 2030 in order to achieve the country's climate targets the impact on trade vehicle imports should not be underestimated. Currently there are around 45,000 EV owners in Ireland. For this target to be achieved there are myriad variables that must align but one critical area of pressure is the ability to serve a market the size of Ireland with both the demand for EVs and other vehicles (as demanded) in this period. It is possible to assume that overall demand for new vehicles may stay static over this period with vehicle fleet turnover staying at around 12% or 8 years of average life, but this should be considered nonetheless as it is by no means certain.

- Passenger Vehicles – It is currently assumed in the forecasting models that passenger vehicle volumes in and out of the Island of Ireland do not significantly change over the period of the forecast. This assumption should be monitored over time but given the 10 year trend to date and public policy focused on increasing the density of passengers per trip and vehicle, and promoting PT and active modes, it is anticipated that the existing level of demand for visiting and leaving passenger trips is a reasonable assumption to make. Should future passenger trip volumes trend significantly upwards, specific volume and capacity assessments will be required for passenger vehicles at key points of entry.

- NI Demand/Supply to Ireland (Dublin) – As above it is still unclear the proportion of internal transfer demand and supply that moves through NI to Ireland that may be subject to the evolution and development of the NI Protocol (which is still in flux at the time of writing). The reliance of Ireland on this avenue of transfer from the UK, both for the export of trade and import of goods to Ireland is of critical consideration. Impacts to customs inspections, holding periods and charges are of critical consideration, as is the potential for moving goods onto other modes of transport such as road freight and rail. Political disruptions to the employment of the protocol may also add further complexity to the ongoing volatility surrounding the NI-Ireland customs borders, and capacity may be required to support more concentrated periods of demand and supply that could arise as a result.

- UK Tourism inc. Cruise – Similar to other supply-demand based capacity and uncertainty issues raised above, the ongoing demand for tourism is expected to be impacted by the UK's exit from the European Union and its Customs Union. Tourism demand in Ireland is growing, and the cruise industry has grown in line with this.

  Although cruise industries are less impacted than import/export industries, customs, visa and vaccination arrangements that are misaligned and create friction can all present impacts to capacity and throughput.. Particular consideration should be made with respect to this in large-capacity cruise berths such as Cobh in Cork and Belfast.

Irish ports have already been responding to the impacts of Brexit as best as possible but continued and sustained investment into improved processes, facilities and technologies are required to continue to mitigate against the risk it poses.

Climate Related Regulations and Impacts

As governments move to implement regulations and supporting mechanisms for the mitigation of climate impacts, the shipping and ports industry may need to undergo development and changes. Based on prevailing sentiment and messaging surrounding climate policy at this time, it is our opinion that a number of key impacts could arise:

- Petroleum derived products occupied one fifth of imports to Ireland's ports in 2019, focused towards Shannon Foynes and Belfast mainly.

  As industries, nations and regions look to move away from the use of fossil fuel derived products in particular the demand and supply balance for these products may shift. Furthermore, the derivative impact of this rebalance on the final goods market in Ireland should be considered in the context of capacity provision.

- A proportion of final goods provided from Ireland will be from these petroleum derived products. The onward impact to supply and demand for these industry products, and thus the allowance for capacity for these industries may also be subject to volatility. The move away from fossil fuel derived products is an opportunity for all but will introduce growth volatility into associated industries and the c.21.3% (2017) of manufactured goods exports for decades to come.

- Livestock and food related products occupy a further 21% of export movements by tonnage in Ireland's ports. Similar but independent policies to reduce the carbon intensity of dairy and beef industries and their impact on the climate will no doubt also change the landscape of Ireland Inc and the ports accordingly. Consideration should be given to incorporating further detailed studies into the projections for the dairy and livestock industries in Ireland over the study period. It is clear however that volatility will be a constant presence for these industries for the period to 2040, and this will impact supply and demand on port capacity accordingly.

- As noted previously, the embodiment of circular economy (CE) principles across society and industry is hoped to have an impact on the need for such intensive resource consumption. The primary driver for consumption of goods and resources will continue to be economic development but the principles of CE and sustainable design will look to dampen the intensity of consumption over time.

  This may lead to a decline in proportional rate of consumption for economic development. It is not intended to reduce economic productivity however and as such a consideration of the impact of CE on the intensity of consumption proportional to economic development rather than a specific volume-based reduction in import-export should be considered in the future. At this time, CE is cannot be reasonably considered as having a significant impact on resource consumption intensity in Ireland.

- The further regulation of shipping technologies and operations on the climate is another source of potential risk to the ports industry in Ireland. As regulations require a greater level of efficiency and reduced emissions from the shipping industry, there is a risk that additional investment will be required to support this at port infrastructure. Further to this, if the environmental impact intensity of shipping cannot be sufficiently reduced, there may be a longer term impact to the demand for shipping that may impact the long term sustainability of port investments.

7.3 Risks and threats to particular ports

This section covers the key risks and threats to capacity of the Tier 1 and 2 ports. A full list of the risks, threats and possible mitigation measures identified can be found in **Appendix 9**. A summary is provided hereafter.

It is clear from the risk tables that some ports possess greater risks than others. Some of the larger risks are that Dublin Port will need to obtain planning permission and foreshore licences for most of its developments proposed in the Masterplan. The port city interface is challenging in Dublin, and there is a risk that congestion, noise and air quality could become an issue. On review through Arup’s work with the Department and TII on the Freight Decarbonisation Study in 2020, it was noted that the RoRo scheduling into Dublin port is a particular issue. The currently scheduling for arrival lands freight onto the M50 during rush-hour, and representatives from the Irish Road Haulage Association (IRHA) and Freight Transport Association of Ireland (FTAI) both noted that greater consideration of this would be of benefit to congestion on the interface with Dublin.

A large risk also exists in Cork, where the port will have funding restriction for developing Ringaskiddy and Marino Point until they sell City Quays and Tivoli.

The development on Foynes island could require an IROPI (imperative reasons of overriding public interest) application because of its location within a site with an environmental protection designation. This will significantly increase the consenting timeline and increases the risk that consent will not be granted.

Shannon Foynes has a particularly heavy reliance on petroleum product imports and its future business cases should consider the aforementioned risks associated with the continued demand and growth of these products. The further investment in Shannon Foynes should consider this capacity requirement, and the uncertainty that the future may hold.

7.4 Opportunities in relation to port capacity

Contrary to some of the risks outlined in the previous sections, there are also significant opportunities associated with port capacity for reasons such as the UN's Sustainable Development Goals, connectivity, funding and Brexit. Some of these opportunities are outlined below.

Sustainable Development Goals (SDGs)

Ireland has signed up to the UN Sustainable Development Goals. This will create a drive towards more sustainable transport which could benefit Irish ports, as has been highlighted in the risk section. This also provides significant opportunities to be more efficient in the operation and delivery of Ireland's ports, and its support infrastructure.

- It is possible that there is potential for blue highways to remove freight traffic from Ireland's roads. At scale, there are opportunities to move freight supplies at a greater level of carbon efficiency, and to this end support the climate goals of Ireland moving forward. If this opportunity can be realised, the business case for port investment could be significantly improved.

- Air freight holds a not insignificant role of current international freight movements, with 146,000 tonnes moved in 2019, but in proportion to the total tonnage this is limited.

  As previously noted, it would be of value for the Government to undertake discrete industry and value-based study, focused on the areas of risk and opportunity for our ports based upon the value and economic productivity of tonnage moved. It is anticipated that this may paint a more realistic picture of the value balance handled, rather than simple tonnage. Europe and Ireland's climate goals are ambitious, and if policy shifts towards implementing a kerosene emissions tax this may lead to a possible increase in RoRo/LoLo opportunities for ports to combat increased air freight costs. Should such opportunities arise to incorporate air-freight volumes into maritime services, it is anticipated that this tonnage could be incorporated on a capacity basis immediately.

- Air passenger movements dominate international markets, and similarly to above, should there be a significant cost increase for shorter haul continental movements there could be an opportunity to capture some market share for passengers and passenger-RoRo movements.

- As noted in the 7.2, the way shipping is undertaken from a fuel and energy perspective is also likely to change in the future.

This provides an opportunity for Irish ports to differentiate themselves in terms of low-carbon alternative fuelling infrastructure provision, and this should be specifically investigated further. Alternative fuels are being introduced in many ports around the world, enabling them to attract the biggest and most modern vessels.

Capacity Support From Other Sectors

The increased demand for port facilities to support offshore wind developments creates new opportunities for the ports. Many of the facilities required for offshore wind generation and surveying can also be used for shipping purposes thus increasing the overall capacity.

There is an opportunity for more cruise and small ferries to be handled at Dun Laoghaire and other regional ports, and this is being observed in recent times. Sustaining this opportunity could reduce the reliance on Dublin Port and provide additional resilience and redundancy to the overall system capacity.

European Support Funding

In light of the combined effects of Brexit and the Covid-19 pandemic (the specific impacts of which are outside the scope of this specific study but are considered narratively for completeness), there could be opportunity to supplement investment in Irish ports infrastructure with European support funding. Measures such as the EU Green Deal, the Connecting Europe Fund (CEF) and the Risk and Resiliency Funding Framework (RRFF) may provide opportunities to increase the scope of investment for future initiatives or increase necessary, but marginal return on investment projects to fruition.

Political Uncertainty (including Brexit)

Uncertainty politically provides both risk and opportunities for interfacing businesses such as those in Ireland’s ports.

Brexit could lead to opportunities in ports, such as the development of direct RoRo services from Rosslare Europort to the Continent. Due to its location, Rosslare Europort offers the shortest direct crossing to the Continent and has the capacity to add additional RoRo services.

In 2019, Rosslare Europort has been approved as Border Control Post to receive agriculture and food products from outside the EU and is now the second location, besides Dublin, for the inspection of those goods. Rosslare Europort is constrained by the limited land available directly behind the berths; however, with a suitably designed road layout tying into the N25 upgrade and the proposed new port entrance, the new inspection facilities can be developed by reconfiguring the existing layout. It is important that this development is space efficient and leaves sufficient area for future development of storage space as Rosslare Europort is restricted on all sides for further development.

It is noted that in light of the realisation of the Brexit protocol, and the solidifying of a number of short-term impacts, that opportunities to expand direct Ireland-Europe links are being impressed by the market.

Continuing to embrace the post-Brexit approach to direct-shipping is expected to increase opportunities in areas such as Rosslare Europort.

7.5 Conclusions and recommendations

The key conclusions and recommendations arising from the risk assessment are:

- Irish ports need to operate an asset management system with scheduled inspections and maintenance of infrastructure. Resilience is paramount for critical infrastructure such as linkspans (back-up/spares).
- Ensure planning of new port capacity and the relevant stakeholder consultations start early to allow for the consenting process.
- Implement necessary upgrades to infrastructure technology and processes in support Brexit-impact limiting initiatives at each of the ports
- Develop plans for European funding support to bolster investment appraisals
- Review the feasibility of undertaking detailed studies into the specific nature of goods carried at each port (by value and NAT type for example) to better inform individual port planning and business case developments
- Specifically consider the impact of climate initiatives on port business plans, creating business resilience and critical plans to continue to be environmentally efficient and sustainable for years to come.

Chapter 8

Conclusions and Recom-mendations

8 Conclusions and Recommendations

8.1 Introduction

In this Chapter an overview of the conclusions drawn in this report will be provided. For clarity:

- **Chapter 3** established the demand forecast for the Irish ports for the four cargo modes: RoRo, LoLo, Dry & Break Bulk and Liquid Bulk.
- Conclusions on the available capacity for these cargo modes in each of the ports were drawn in **Chapter 5**.
- Conclusions on the capacity of the combined Irish ports as a network were drawn in **Chapter 6.**
- **Chapter 7** highlights the key risks and threats to the capacity of the individual ports and to the port capacity on the Island of Ireland that have been identified in the course of this study.

The Irish Ports Capacity assessment shows that the Irish ports included in this study currently have sufficient capacity for RoRo (with the exception of trade vehicles), LoLo, and Dry & Break Bulk, and are planning adequate capacity increases in time to manage future demand for these cargoes estimated by EY in 2018.

For these cargoes, the planned development programmes must be put in place in a timely manner, for the capacity will be sufficient to meet the forecasted demand in the highest growth scenario. It is noted however, due to a significant number of variables and unforeseen circumstances, that there is a risk that these estimates are exceeded once realised, as the forecasts associated with this report were undertaken in 2018. This could manifest as an overall growth exceedance or pressure at particular ports. This should be continually refreshed in ongoing studies.

Additional expansions for the trade vehicles and liquid bulk cargoes should be planned where necessary to avoid constraints by the late 2020s and 2030s respectively. Nevertheless, for both these cargoes the demand figures have high levels of uncertainty considering the ongoing transformation of these industries and represent conservative scenarios.

This point is also valid for port shares and trade distribution across the Island of Ireland. The port capacity assessment and the basis of throughput is predicated on past-events and investments that are measured at a fixed point in time. There remains the risk that in the future, there is a shift in port shares or how trade is distributed around the Island of Ireland Ports network, and as a result, this could lead to capacity strains in focused areas.

In the case of RoRo, Rosslare Europort may require increases in efficiency or additional capacity enhancements to cover the expected demand in terms of trade cars and accompanied freight up to 2040.

Difficulty in obtaining funding, long consenting processes and the space requirements for border controls are risks to the capacity development in Irish ports.

This report has not investigated new demand for Irish Port capacity outside the current cargoes. This demand could come for instance from offshore wind developments requiring assembly locations and O&M facilities or particular local projects such as hydrogen facilities. The provision of port infrastructure for ORE cargoes is outside the scope of this study but is being currently considered through other mechanisms to ensure that Irish ports facilitate the delivery of renewable energy in line with government targets.

Political risk is of constant importance to industries and infrastructure operating on the interface between nations and regions. Recent events, including that of the UK's exit from the European Union, have a significant impact on the future of Ireland's port infrastructure, as discussed in further depth in **Chapter 7** and also summarised below.

At the end of this Chapter recommendations in relation to the capacity assessment of the Irish Ports are discussed.

8.2 Demand forecast

8.2.1 Results from the demand forecast model

Based on the growth assumptions outlined in **Chapter 3,** traffic forecasts for all cargo types and scenarios were generated.

Table 3.4 and **Table 3.5** in **Chapter 3** show the annualized growth rates for all of the results. The impact of different growth assumptions has a relatively small impact on annual growth rates. The baseline growth scenario is highlighted.

These growth rates have been used in the EY-DKM demand forecast model. The graphs in **Figure 8.1** to **Figure 8.6** show the maximum volumes which could be reached by 2040 by all ports for the different cargo types for the high, baseline, and low growth scenarios.

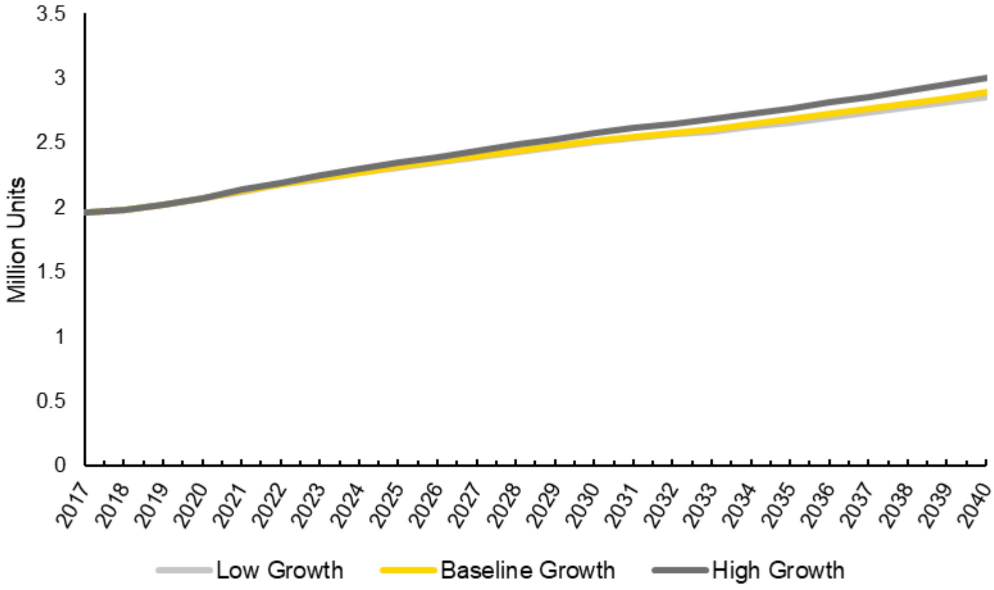


Figure 8.1: RoRo freight demand forecast – Island of Ireland (Source: EY Analysis)

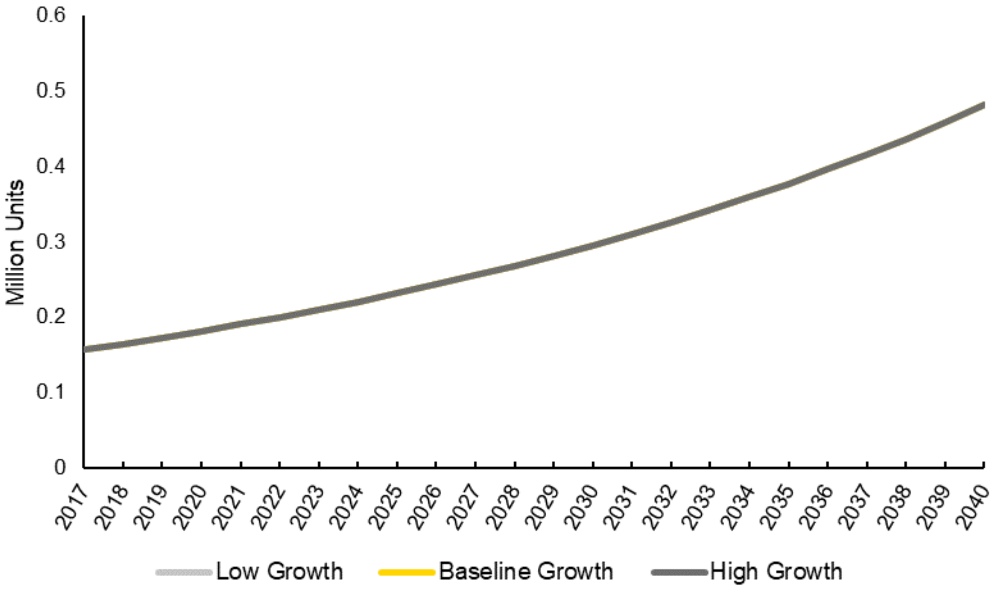


Figure 8.2: RoRo trade vehicles demand forecast – Island of Ireland (Source: EY Analysis)

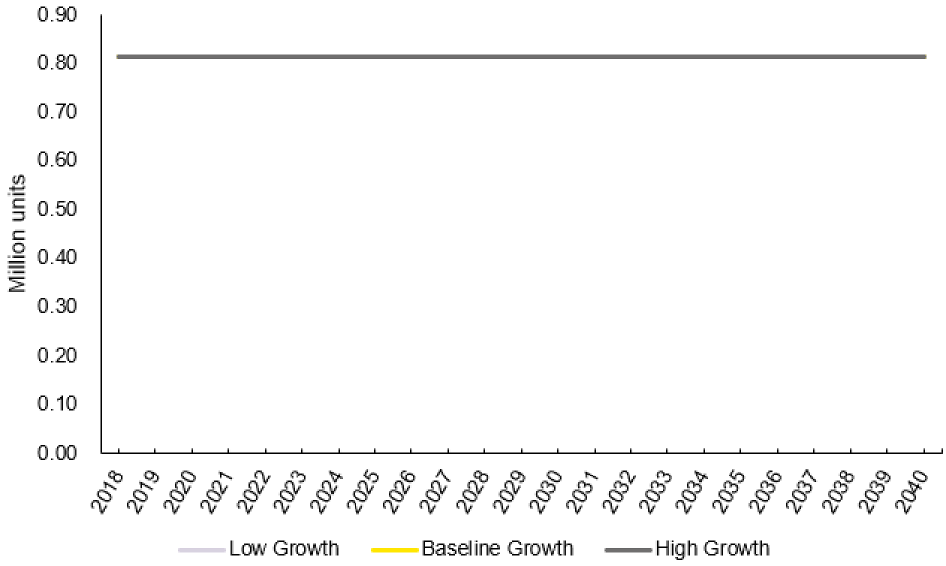


Figure 8.3: RoRo passenger vehicles – Island of Ireland (Source: EY Analysis)

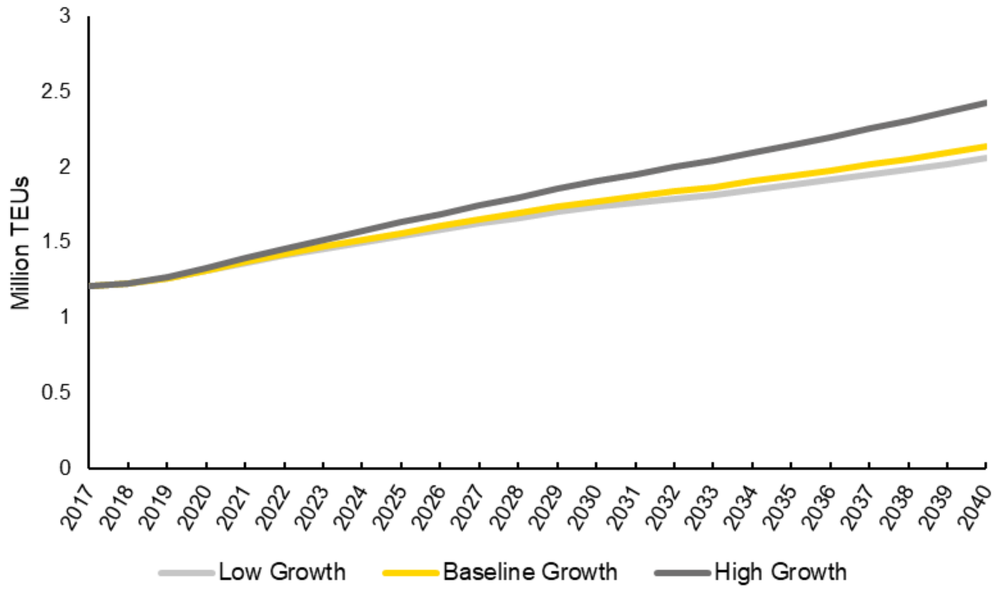


Figure 8.4: LoLo demand forecast – Island of Ireland (Source: EY Analysis)

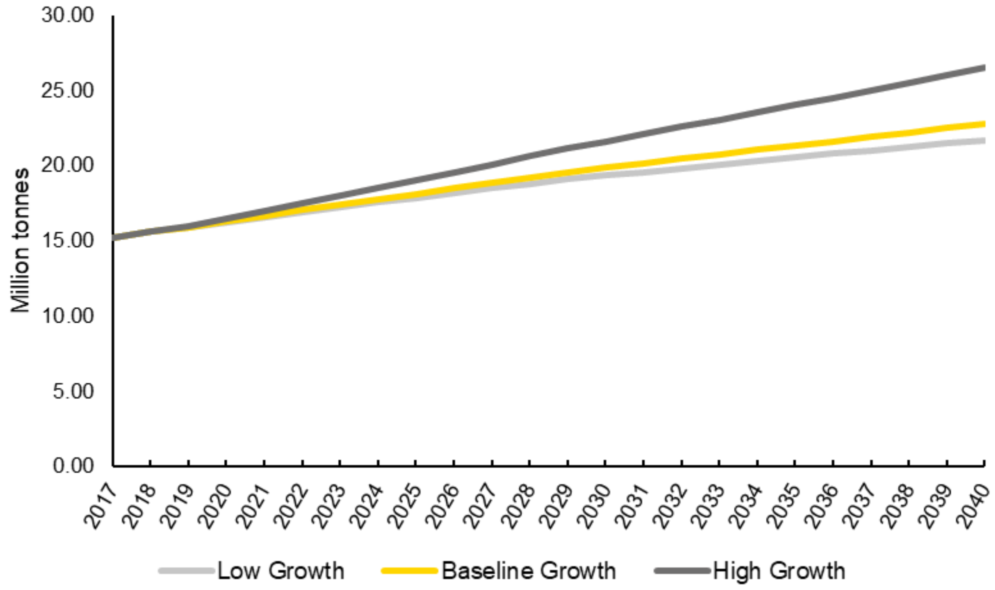


Figure 8.5: Dry & Break Bulks demand forecast – Island of Ireland (Source: EY Analysis)

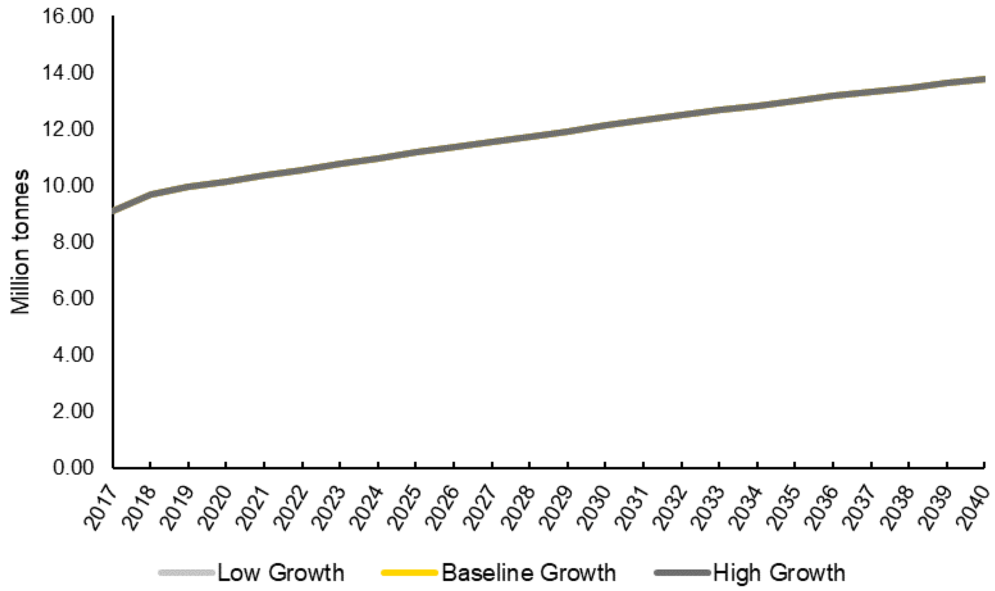


Figure 8.6: Liquid Bulks demand forecast – Island of Ireland (Source: EY Analysis)

8.2.2 Other conclusions from the demand forecast model

Private consumption growth is driving demand for port capacity.

The evidence presented in **Chapter 3** shows that there is a strong link between economic variables, in particular GDP (and by proxy private consumption), and trade volumes. The economy appears to be acting as a magnet for goods and the ports ensure that this demand is met.

Whilst the demand forecast model focusses on how GDP drives trade, the reverse is also likely to be true.

This means that any failure to maintain sufficient port capacity could have a major negative impact on the economy, starving it of the materials it needs to continue strong growth. The same is true for exports, as failure to export would lead to reductions in foreign earnings and loss of trading opportunities for Irish companies.

The predicted capacity constraints only happen if growth continues and there needs to be regular monitoring of the situation across the Island of Ireland. The capacity assessment should be revisited at regular intervals to capture future developments.

8.3 Capacity conclusions

8.3.1 RoRo capacity

The capacity development for RoRo is summarised in **Table 8.1** to **Table 8.3**. The table has been sorted by capacity size and shows that the largest RoRo operations in Ireland and Northern Ireland are concentrated in Dublin, Rosslare, Belfast, and Larne with smaller throughputs in Cork and Warrenpoint.

In **Chapter 5,** this capacity development has been compared to the demand development. The earliest capacity constraint points (based on the highest growth scenario) are also noted in **Table 8.1** to **Table 8.3**. A review of the Masterplans and development timelines shows that both Dublin Port and the Port of Cork are planning for capacity development that will address this constraint before the dates shown.

RoRo ramps in all Irish ports have a low occupancy rate (approximately 40% in Dublin Port) because all demand is concentrated on certain times of the day. If this demand could be spread over the day, then some further capacity increase could be achieved without building new facilities. Generally, the storage capacity or the ability to fill and empty the marshalling lanes and vessels efficiently becomes the bottleneck instead.

Dublin Port remains the dominant port in RoRo

Dublin is by far the dominant RoRo freight port on the Island of Ireland. Looking at the current Irish ports masterplans available, this dominance in RoRo is only set to increase with Dublin Port heading to circa 2M units/year RoRo freight capacity which is more than nine times the expected RoRo freight capacity in Rosslare Europort (0.21M units/year), which is the second largest RoRo port in Ireland.

Table 8.1: RoRo freight capacity development

RoRo freight (M units/y)	Throughput 2019	Current capacity	Imminent capacity	Potential capacity	Earliest capacity constraint
Dublin Port	1.06	1.37	1.53	1.98	2034
Belfast Harbour	0.56	0.7	-	-	-
Rosslare Europort	0.12	0.16	0.21	0.21	2024*
Port of Larne	0.2	0.44	-	-	-
Warrenpoint Port	0.10	0.11	-	-	-
Port of Cork	0.005 (ex. ConRo)	0.05	0.05	0.05	**

*accompanied freight only **unknown without ConRo forecasts

Table 8.2: RoRo trade vehicles capacity development

RoRo trade vehicles (M units/y)	Throughput 2019	Current capacity	Imminent capacity	Potential capacity	Earliest capacity constraint
Dublin Port	0.04	0.12	0.12	0.12	2039
Belfast Harbour	0.03	0.05	-	-	-
Rosslare Europort	0.02	0.04	0.04	0.04	2033
Warrenpoint Port	0.01	0.01	-	-	-
Port of Cork	0.03	0.26	0.18	0.18	>2040

Table 8.3: RoRo passenger cars capacity development

RoRo passenger cars (M units/y)	Throughput 2019	Current capacity	Imminent capacity	Potential capacity	Earliest capacity constraint
Dublin Port	0.55	0.66	0.76	0.84	>2040
Belfast Harbour	0.33	0.35	-	-	-
Rosslare Europort	0.21	0.34	0.34	0.34	>2040
Port of Larne	0.12	0.26	-	-	-
Port of Cork	0.03	0.05	0.05	0.05	>2040

8.3.2 LoLo capacity

The capacity development for LoLo is summarised in **Table 8.4**. The table has been sorted by capacity size and shows that Dublin Port has by far the largest LoLo capacity in Ireland. In **Chapter 5**, this capacity development has been compared to the demand development. The earliest capacity constraint points (based on the highest growth scenario) are also noted in this table**.** A review of the Masterplans and development timelines shows that both Dublin Port and Port of Cork are planning for capacity development that will address this constraint before the dates shown.

Table 8.4: LoLo capacity development

LoLo-total (M TEUs/y)	Throughput 2019	Current capacity	Imminent capacity	Potential capacity	Earliest capacity constraint
Dublin Port	0.77	1.02	1.02	1.35	2027
Port of Cork	0.24	0.26	0.38-0.48	0.74	2029
Belfast Harbour	0.17	0.22	-	-	-
Waterford	0.05	0.2	0.2	0.2	>2040

New container terminal developments will significantly increase productivity.

Dublin Port will need to increase its LoLo capacity around 2027 and has plans for this in place with the development of a new container terminal on the South East side of the port for MTL. This will be a long and narrow terminal which will also lead to improved productivity.

The existing container terminals in Dublin Port suffer from a suboptimal layout and remote storage areas which restrict their productivity.

Port of Cork recently opened a new container terminal in Ringaskiddy which combined with the LoLo facility in Tivoli will provide sufficient capacity until 2029. The port will also achieve higher productivities associated with the optimised layout of the facility.

Port of Waterford has a good but underused LoLo facility. There will be approximately 150,000 TEU of unused LoLo capacity available in Port of Waterford for the foreseeable future.

8.3.3 Dry & Break Bulk capacity

Table 8.5 shows that the port with the largest capacity for handling Dry & Break Bulk in Ireland is Waterford.

Less than half of Waterford’s capacity is currently being used. The port’s connectivity has recently been improved by the opening of the N25 Barrow bridge in January 2020. It also has a rail connection directly onto the berth. The main issue for the port is the large yearly spending on dredging.

The port has a number of opportunities and is currently working on improvement of navigational access and is investigating river training works in order to reduce the annual spend on dredging works. This would make the port more competitive.

Table 8.5: Dry & Break Bulk capacity development

Dry & Break Bulk	Throughput 2019 (Mt/y)	Current capacity (Mt/y)	Imminent capacity (Mt/y)	Potential capacity (Mt/y)	Earliest capacity constraint
Belfast Harbour	7.00	7.60	-	-	-
Waterford	1.36	3.00	3.00	3.00	>2040
Dublin Port	1.84	2.91	2.91	4.48	2030
Shannon Foynes	1.91*	2.50	2.90	3.90	2026
Port of Cork	1.74	2.1	2.1	2.9	2029
Drogheda Port	1.2	1.3	1.3	2.8	2024
Greenore Port	1.02	1.2	-	-	-
Warrenpoint	0.75	1.0	-	-	-
Galway Port	0.17	0.27	0.27	0.69	2039
Wicklow Port	0.19	0.20	-	-	-
Port of Larne	0.02	0.025	-	-	-

*2017 throughput (no 2019 data for only common user facilities)

The Shannon Foynes Port Company are planning both imminent and potential capacity developments for Dry & Break Bulk. Shannon Foynes Port will also benefit from proposed improvements in rail and road connectivity.

Dublin Port Company also has plans to increase its Dry & Break Bulk capacity, but Waterford and Shannon Foynes could take that traffic as well if the conditions are right for the market.

8.3.4 Liquid Bulk capacity

Environmental considerations about the use of fossil fuels should lead to a reduction in demand for Liquid Bulk, but there is uncertainty about when this reduction will take place.

Given the strong forecasts for the Irish economic growth included in this report, which is linked to private consumption, it is assumed that overall fuel imports will grow in the period up to 2040, although it must be noted that this will be offset in part by increased fuel efficiency. This is not certain however. On a per-capita basis, factoring policies with regard to demand management, ICE vehicle sales and the climate, consumption per capita could be supressed or even reduce significantly. Such a perspective would accord with the assumptions of the Dublin Port Company assessment which assumes a reduction. At this time it is unclear how the demand for Liquid Bulks, in particular petroleum fuels, will be impacted by a move to more renewable sources of energy.

Overall, the network of ports in Ireland has enough capacity planned to meet demand for Liquid Bulk until 2024 when a reduction in capacity in Dublin Port may cause a capacity constraint until the Foynes Island development can be brought on-line.

8.4 Summary findings and recommendations

8.4.1 RoRo capacity

In Dublin Port the storage and berthing capacity are closely matched, this is also the case in Rosslare Europort. It is therefore important to ensure that both the berthing and the storage capacity are used optimally. We would suggest that the following would be required for capacity planning:

Insight into the impact of pricing on land utilisation

Dublin Port already has land utilisation targets and manages dwell time through pricing. Rosslare Europort offers low cost longer dwell times as an additional attraction to use the port. It would be useful to investigate what the impact of reducing dwell times through pricing would be in Rosslare Europort.

Assessment of the feasibility of middle of the day RoRo services

There is a preference for RoRo services arriving early in the morning which creates a capacity constraint. It would be useful to investigate the viability of a lower cost RoRo service in the middle of the day.

8.4.2 Dry & Break Bulk capacity

Investigate the feasibility of re-distributing demand in Dry & Break Bulk

Both Dublin Port and Port of Cork are planning to add approximately 1.5 million tonnes of Dry & Break Bulk capacity in the next 15 years even though adequate spare capacity is available in other ports such as Waterford and Drogheda. Naturally the question arises if this demand could be re-distributed to the spare capacity instead of building additional facilities. This is not a straightforward re-distribution issue and further study will be required into:

- The make-up of the demand: Dry and Break Bulk are handled very differently. Dry Bulk needs specialised quay equipment.
- The regional spread of the Dry Bulk demand: Where are the goods coming from and going to?
- The regional spread of the Break Bulk demand: Where are the goods coming from and going to?
- The transport network capacity: Are some locations more accessible than others?
- The commercial attractiveness of the various Dry & Break Bulk terminals: Are some locations commercially more attractive than others?

8.4.3 Liquid Bulk capacity

Investigate the development of Liquid Bulk demand

There is a lot of uncertainty in relation to the development of demand for Liquid Bulk in particular fossil fuels. Per-capita demand changes are expected here with the drive from the EU to reduce carbon emissions, the Government's 2030 ICE car-sales ban policy and the cost of renewable energy sources coming down. Any uncertainty with respect to demand suppression will be combined with a growth in volume driven by GDP, the economy and a growing population. At the time of the forecasts there is no definite understanding as to how fast such per-capita efficiencies could appear, their magnitude and how this will compound with overall anticipated GDP and population growth.

Some ports are planning for a continued increase in demand, whereas others are planning for a decrease in demand. Decreasing the capacity too early could lead to capacity constraints.

It would be advisable to investigate the boundaries of this uncertainty and establish high and low end scenarios.

8.4.4 Efficiencies

The implementation of IT systems

There are several ports where paper management systems are still the order of the day. This is often inefficient and does not allow for quick capture and sharing of data to be used in decision making. A number of good digital port operating systems and port clearance document control systems are available on the market that will allow for efficiency increases in port management operations. The implementation of these systems should be investigated. Ideally Irish Ports should use compatible systems.

Implementation efficiency measures in Dublin Port

The impact of pricing structures, to encourage the movement of unitised cargo through the port more speedily, and the impact of the implementation of a shared RoRo terminal on the capacity should be studied in more detail. These measures are expected to increase efficiency but the additional capacity this brings is currently not quantified.

8.4.5 East coast development

From the current demand forecasts and capacity estimates presented in **Chapter 5** of this report, Dublin Port will remain the dominant port in Ireland and will be approaching capacity constraint by the late 2030s. Thereafter it will likely become uneconomical to increase capacity in Dublin Port.

On their own website DPC state that: *By 2040, more port capacity at another east coast location will likely be needed.*

A full feasibility assessment will be required closer to the time once more is known about the certain drivers for the new port. These are, but not limited to:

- Volume projections for the late 2030s
- Any changes in capacity by Dublin Port and the other local existing ports due to unforeseen changes in operations and/or any other constraints not currently forecasted
- If the new terminal will be able to secure the necessary vessel traffic to make it economical
- The estimated economical, and political climate of the late 2030s

8.4.6 Data collection

Standardised form of reporting on port capacity is needed

The preparation of a capacity assessment requires detailed information about all the ports' infrastructure and operations.

Many of the ports were not able to provide all the required information for the capacity assessments and on many occasions, information had to be complemented by using industry standard figures.

Given the difficulties encountered with the assessment of capacity at some ports, some standardised form of reporting should be agreed by the Tier 1 and Tier 2 Irish ports, in conjunction with the Northern Irish ports, in order to ensure uniformity in reporting. This reporting might provide a range of capacity indicators on an annual basis, such as storage area for each cargo type, berthing length, berth occupancy and berth productivity.

It would also be hugely beneficial if this information would be available for Northern Irish ports to aid the capacity assessment for these ports.

Benchmarking KPIs between Irish Ports and international ports

This report presents an indication of the relative performance of the Irish ports for a mix of cargo modes (RoRo, LoLo etc) compared to selected international ports. A comparison on detailed KPI's for the individual cargo modes would allow the identification of areas where ports are excelling or need improvement.

This type of benchmarking should be done on a terminal by terminal basis. It will not be possible to do this for all ports in Ireland as many terminals share different types of traffic on one terminal, but it could be done for terminals that are dedicated to one type for traffic, such as dedicated container terminals.

8.4.7 Risk Identification and Mitigation

The period in which this report is published is one of significant uncertainty, with the study identifying the following key 'risks' that will need monitoring and consideration as part of future capacity-related decision-making:

- **Exceedance of growth estimates:** There is a risk that, due to myriad variables and unforeseen circumstances that estimates are exceeded. This could manifest as an overall growth exceedance or pressure at particular ports.
- **Operational and infrastructure deficits:** There is a risk that underinvestment, lack of maintenance or damage could occur to critical port infrastructure which could result in a sudden capacity deficit for the port.
- **Port shares and trade distribution:** There remains the risk that in the future, there is a shift in the balance of how trade is distributed around the Irish Ports network, and as a result, this could lead to capacity strains in specific ports over others. This is relevant in the context of the constant port shares used for practicality.
- **Deficits in connectivity to hinterland:** Congestion or complete blockage of intermodal connectivity can also lead to capacity deficits (motorways, rail lines and the Dublin Port tunnel, in particular).
- **Funding:** Funding is cited by all ports as the biggest impediment to capacity increases.
- **Planning and programming**: There is a risk that some developments will take longer than expected to obtain planning consent. Some may not be granted planning permission at all.
- **Brexit / Political risks:** There is a risk that, post Brexit, border controls requirements will result in a shortage of storage space.
- **Climate Related Regulations and Impacts:** There is an ongoing need to decarbonise the industry and the wider economy. As a result of these changes, the landscape for port capacity could change dramatically.

Contrary to some of the risks outlined above there are also significant opportunities associated with port capacity for reasons such as the UN’s Sustainable Development Goals, connectivity, funding and Brexit. Some of these opportunities are outlined below:

Sustainable Development Goals (SDGs)

Ireland has signed up to the UN Sustainable Development Goals. This will create a drive towards more sustainable transport which could benefit Irish ports, as has been highlighted in the risk section. This also provides significant opportunities to be more efficient in the operation and delivery of Ireland’s ports, and its support infrastructure.

Capacity Support From Other Sectors

The increased demand for port facilities to support offshore wind developments creates new opportunities for the ports. Many of the facilities required for offshore wind generation and surveying can also be used for shipping purposes thus increasing the overall capacity.

There is an opportunity for cruise and small ferries to be handled at Dun Laoghaire. This could reduce the reliance on Dublin Port and provide additional resilience and redundancy to the overall system capacity.

European Support Funding

In light of the combined effects of Brexit and the Covid-19 pandemic (the specific impacts of which are outside the scope of this specific study but are considered narratively for completeness), there could be opportunity to supplement investment in our ports infrastructure with European support funding. Measures such as the EU Green Deal, the Connecting Europe Fund (CEF) and the Risk and Resiliency Funding Framework (RRFF) may provide opportunities to increase the scope of investment for future initiatives or increase necessary, but marginal return on investment projects to fruition.

Political Uncertainty (including Brexit)

Uncertainty politically provides both risk and opportunities for interfacing businesses such as those in Ireland’s ports.

It is noted that in light of the realisation of the Brexit protocol, and the solidifying of a number of short-term impacts, that opportunities to expand direct Ireland-Europe links are being impressed by the market. Embracing the post-Brexit approach to direct-shipping could increase opportunities in areas such as Rosslare Europort. The significant burden of European travel for Irish hauliers threatens the long-term attractiveness of the industry to the younger workforce. Consideration of the long-term sustainability of the haulage industry is of intrinsic importance to port investment strategies, and there is an opportunity to further engage in this regard.

In summary, to capitalize on opportunities and mitigate risks appropriately, the following is recommended:

- Irish ports need to operate an asset management system with scheduled inspections and maintenance of infrastructure. Resilience is paramount for critical infrastructure such as linkspans (back-up/spares).
- Build resilience by spreading the current throughput over a greater number of ports; particularly in RoRo.
- Ensure planning of new port capacity and the relevant stakeholder consultations start early to allow for the consenting process.
- Implement necessary upgrades to infrastructure technology and processes in support Brexit-impact limiting initiatives at each of the ports
- Develop plans for European funding support to bolster investment appraisals
- As noted in **Chapter 7**, there is potential benefit in assessing the impact of climate related policies and Brexit on sub-sets of high-value consumer and manufactured goods coming in and being exported from Ireland.

It is recommended that the IMDO consider undertaking such studies into the specific nature of goods carried at each port (by value and NAT type for example) to better inform individual port planning and business case developments

- Specifically consider the impact of climate initiatives on port business plans, creating business resilience and critical plans to continue to be environmentally efficient and sustainable for years to come.

Appendices

Appendix 1:

Terms of Reference

Appendix 1: Terms of Reference

The scope of work is set out in the IMDO tender - **Invitation to Tender for the Port Capacity Study for the Irish Maritime Development Office, Wilton Place, Dublin 2 (Ref: ITT18-002)**

Introduction

The Irish Maritime Development Office (IMDO) is a Service Area of the Marine Institute and operates under the aegis of the Department of Transport, Tourism & Sport.

The IMDO is responsible for the development, promotion and marketing of the Ireland's maritime sector, wishes to invite tenders under an open procedure with the objective of assessing the capacity within the Irish port system to meet present and future demand. The study should also assess likely response times in meeting demand increases and differentiate between capacity increases that can be delivered through operational efficiencies and those that require significant new infrastructure investment by the port. The study should also consider international best practice in the ports sector.

The Irish ports system can be defined as the network of ports that combine to provide port services. Given the inter-dependency between Republic of Ireland and Northern Ireland ports, the study must also take account of capacity in the Northern Irish ports network.

In the event that Brexit results in the re-imposition of hard borders, current trade patterns and modalities may change. In assessing future demand, the study should evaluate capacity under different scenarios that take account of such changes.

Scope of Tender

This is an Open Invitation to Tender with any service providers invited to respond.

At present a requirement exists for following items in one lot:

1. Forecast of future port volumes
2. Lead times for the delivery of the new infrastructure
3. Assessment of capacity within the port system
4. Profiling of risks and threats
5. Recommendations of potential measures to improve capacity development within the Irish port system
6. Methodology that can be replicated in future assessments of port capacity

Further details can be found under Service Specifications below.

Service Specification

National Ports Policy (NPP) sets the direction for the future development of Irish ports and lays emphasis on the strategic importance of planning and delivering adequate capacity to meet the future needs of our growing economy, while also complying with all international, EU and national legislative and regulatory requirements. NPP states that the Department of Transport, Tourism and Sport (DTTAS) will instigate a more formalised approach toward capacity forecasting through commissioning independent analyses at regular intervals from 2018 onwards. In view of the likely implications of Brexit, the Department has asked the IMDO to have this analysis carried out immediately.

The purpose of the study is to assess capacity within the Irish port system to meet present and future demand.

The study should also assess likely response times in meeting demand increases and differentiate between capacity increases that can be delivered through operational efficiencies and those that require significant new infrastructure investment by the port. The study should also consider international best practice in the ports sector.

The Irish ports system can be defined as the network of ports that combine to provide port services. Given the inter-dependency between Republic of Ireland and Northern Ireland ports, the study must also take account of capacity in the Northern Irish ports network.

In the event that Brexit results in the re-imposition of hard borders, current trade patterns and modalities may change. In assessing future demand, the study should evaluate capacity under different scenarios that take account of such changes.

The project will include areas of work including, but not limited to:

Forecast of future port volumes

Based on established economic forecasting methods, the study should contain a forecast of short, medium and long term port demand and service requirements for all major cargo modes serviced through Irish Ports. These include unitised trades, consisting of lift-on / lift-off, roll-on / roll-off and conro services, as well as non-unitised services, consisting of dry bulk, liquid bulk, break bulk and specialised cargo modes. The study should also address tourism traffic, broken down between passengers and cars, as well as cruise tourism.

Lead Times

The lead times assumed for the delivery of new infrastructure should take account of:

- The Master Planning Exercises that have been undertaken by port companies.
- Planning and licensing cycles.
- Construction time frames for major infrastructural projects.

Assessment of capacity within the port system

Based on the various demand profiles identified for each cargo mode, the study should recognise the following factors:

Capacity across all components of the port system.

The assessment of port capacity should include all the components of the port infrastructure system including, but not limited to:

- Marine side capacity (as determined by depth of water and available quay space).
- Channel capacity.
- Landside capacity (as determined by availability of land for marshalling and storage of cargo).
- Intermodal connectivity infrastructure (including access to major transport infrastructure, both road and rail).

The assessment should be cognisant of the implications of the imposition of hard borders following Brexit and the consequences of this on the terminal space required to control and marshal traffic awaiting customs clearance, immigration, security procedures, agricultural and other related inspections.

Current capacity development cycles

The assessment should take account of:

- Existing capacity.
- Optimising use of existing space and infrastructure.
- Additional capacity that is under development and will be delivered in the short term.
- Future planned developments in capacity detailed in port masterplans.
- Future capacity that could be added but requires significant additional infrastructure.
- Cruise and marine leisure facilities, offered currently, and planned in the future.
- Current capacity to manage the shift in cargo modes that may result from Brexit (e.g. reduced use of UK Landbridge and move from RoRo to LoLo)

The assessment therefore should account for the following three planning phases:

- An assessment of capacity to meet future demand based on existing capacity as determined by current port infrastructural configurations.
- An assessment of capacity to meet future demand based on imminent capacity as determined by existing projects to expand the port infrastructural network.

- An assessment of capacity to meet demand based on potential capacity as determined by potential but as yet unrealised capital infrastructure projects to expand the port infrastructural network beyond existing boundaries.

Profiling of risks and threats

The study should contain a profiling of potential risks and threats to future capacity provision including but not limited to the following:

- Risks associated with potential infrastructural and operational deficits leading to under supply or underutilisation of port infrastructure
- Risks associated with deficits in connectivity to hinterlands – road / rail
- Risks associated with planning delays related to foreshore and environmental issues
- Risks associated with the capability of Irish port companies to finance future port development.

Recommendations of potential measures to improve capacity development within the Irish Port System

Based on the findings and profiling of risks, the study should identify measures and make recommendations to strengthen the future provision of capacity within the Irish ports system, safeguarding against threats to Ireland's capability to trade internationally or to sustain economic growth.

Methodology

It is a specific requirement that the study be carried out using a well specified methodology that can, if necessary, be replicated and used for regular port capacity forecasting in the future and that all economic modelling is based on methodologies approved by the Department of Finance.

Oversight

In completing the tasks outlined above it is expected that the study will involve a high level of consultation with stakeholder groups including but not limited to Irish port companies, private port service providers, other port services partners, users of port services, the relevant regulatory and governmental bodies, and other relevant stakeholder groups. The successful applicant will be required to provide a progress report at defined intervals to a steering group consisting of representatives of key stakeholder groups.

In completing the tasks outlined above it is expected that the study will involve a high level of consultation with stakeholder groups including but not limited to Irish port companies, private port service providers, other port services partners, users of port services, the relevant regulatory and governmental bodies, and other relevant stakeholder groups.

The successful applicant will be required to provide a progress report at defined intervals to a steering group consisting of representatives of key stakeholder groups.

Appendix 2:

Issues Encountered

Appendix 2: Issues Encountered

A2.1 Difference between gross and net tonnage

Gross weight includes the weight of the container itself (i.e., either a TEU or a truck) whereas net weight excludes this. In the case of RoRo traffic, the standard net weight is 14 tonnes whereas the standard gross weight is 24 tonnes. Many ports (such as Dublin Port) report in gross tonnage; however, both the CSO and Eurostat report in net tonnage. Care must therefore be taken when comparing figures to ensure that the correct conversion factors are used.

A2.2 Eurostat versus CSO data

As outlined in 2.3.1 the CSO statistics capture a higher throughput for ports in Ireland than Eurostat. Whilst all of the data originates from the ports, Eurostat only includes larger ports in their reporting and has slight methodological differences in how they standardise the data (this is to ensure consistency across Europe). Eurostat data should be used when considering any issue which relate to both Northern Ireland and Ireland.

A2.3 Eurostat data coverage per port jurisdiction

Eurostat provides figures per port jurisdiction. This means that the Eurostat figures for Shannon Foynes include not only Shannon Foynes Port Company, but also Moneypoint, Aughinish and Tarbert. The latter 3 are industrial facilities and, not only is the capacity of these facilities not available to the public but the capacity is also assigned to the handling of specific products. This means that the capacity of the Aughinish terminal is defined by the capacity of the mining operation to produce aluminium.

For this study only the port facilities available for public use are of interest, and therefore for its purposes it was necessary to remove the throughput for the private/industrial port facilities from the total Eurostat figure. Unfortunately, Eurostat does not provide either a breakdown of these figures, nor does it state which facilities are included in its figures.

Table A.1 below shows what has been assumed to be included in the figures and by how much the Eurostat figures were reduced to obtain the throughput for the port facilities for public use. These percentage reductions were verified with the Irish Ports.

Table A.1: Commercial and industrial facilities assumed to be included in Eurostat figures

	Dry & Break Bulk		**Liquid Bulk**	
	Port Facilities available for public use	**Private/ Industrial Port Facilities***	**Port Facilities available for public use**	**Private/ Industrial Port Facilities***
Dublin Port -	100%		100%	
Port of Cork -	90% - Ringaskiddy - Tivoli - City Quays - Marino Point	10% - Passage West	25% - Tivoli	75% - Bantry Bay - Whitegate
Shannon Foynes -	19% - Shannon Foynes - Limerick Docks	81% - Aughinish - Moneypoint	69% - Shannon Foynes - Limerick Docks	31% - Tarbert - Moneypoint
Rosslare Europort -	100%		100%	
Port of Waterford -	100%		100%	
Drogheda Port -	64% - Tom Roes Point - Town Quay	36% - RHI Magnesita	100% - Tom Roes Point - Town Quay	0% - Flogas
Port of Galway -	100%		100%	

*Port facilities that are not available for public use

A2.4 Eurostat data coverage for smaller ports

Figures for Galway are no longer provided by Eurostat. For the purposes of this assessment CSO data has been used to provide a starting point. It should be noted that there are methodological differences between Eurostat and CSO data (discussed above) and as such this may not be totally consistent with the forecasts provided for the other ports.

A2.5 Missing port capacity data

Information such as berth occupancy, seasonality, port boundaries, storage areas was not available for several ports. Thus, in order to complete the capacity assessments, assumptions have been made based on experience and measurements of Google Earth imagery.

There are also ports which have multi-purpose facilities where quays are being used for a number of cargo types. In order to be able to estimate the capacity per cargo type assumptions based on experience have been made.

A2.6 Ports in Northern Ireland

It has not been possible to obtain the same level of information for the capacity assessment from ports in Northern Ireland. In order to assess the available capacity, publicly available information has been used with the minimum capacity available derived from the historical throughput.

Appendix 3:

Glossary

Appendix 3: Glossary

A3.1 Definitions used in this report

- Capacity
    - Current capacity: An assessment of capacity to meet future demand based on existing capacity as determined by current port infrastructural configurations at the time of the assessments.
    - Imminent capacity: An assessment of capacity to meet future demand based on imminent capacity as determined by existing projects to expand the port infrastructural network.
    - Potential capacity: An assessment of capacity to meet demand based on potential capacity as determined by potential but as yet unrealised capital infrastructure projects to expand the port infrastructural network beyond existing boundaries.
- Goods imported and exported are used to refer to the throughput handled by ports, as opposed to imports and exports, which are recorded in the trade data.
- Cargo types:
    - RoRo: Roll-on Roll-off traffic on ferries. This includes cars (passenger and trade vehicles), busses, accompanied (trucks) and unaccompanied (drop) trailers, cassettes and roll-trailers (MAFI).
    - LoLo: Containers lifted on and off a vessel.
    - Dry and Break Bulk: Goods that are not in containers such as coal, animal feed, timber and steel. Eurostat use the term 'Dry Bulk and Other' which is assumed to be the same as Dry and Break Bulk.
    - Liquid Bulk: Liquid products that are stored in tanks such as aviation fuel, petroleum, kerosene and crude oil.
- Irish Ports:
    - Tier 1 Ports: Dublin Port Company (DPC), the Port of Cork (PoC) and Shannon Foynes Port Company (SFPC).
    - Tier 2 Ports: Port of Waterford and Rosslare Europort,
    - Ports of regional significance: Drogheda, Galway, Wicklow, New Ross
- Landbridge: the terms used to describe a route to market that connects Irish importers and exporters to international markets, via the UK road and ports network.
- Ireland and Northern Ireland
    - We use Ireland when talking about the Republic of Ireland
    - We use the Island of Ireland when talking about the island as a whole.
    - The Irish Ports Capacity Study deals with all ports on the Island of Ireland

A3.2 Abbreviations

- Brexit: The withdrawal of the United Kingdom (UK) from the European Union (EU)
- CSO: Central Statistics Office
- EU-26 refers to the EU28 minus the UK and Ireland
- FDI: Foreign Direct Investment
- RoW: Rest of the World
- IAPH: International Association of Ports and Harbours
- ESPO: European Sea Ports Organisation
- AAPA: American Association of Port Authorities
- ORE: Offshore Renewable Energy

Appendix 4:

Modelling Approach

Appendix 4: Modelling Approach

A4.1 Introduction

It is necessary to examine which of the above variables significantly impacts traffic volumes, and if so, by how much, if a forecast is to be constructed. These relationships were assessed using a suite of standard econometric forecasting tools.

Historical traffic data exhibits strong growth over time, alongside a clear seasonal pattern, and therefore an approach known as the Auto Regressive Integrated Moving Average (ARIMA) was chosen. This is a statistical analysis modelling approach which allows for an understanding of how traffic volumes change in both the long and short runs. It assumes that there is a long run relationship between traffic volumes and the independent variables but also allows for short run deviations from this model. This means that a disturbance, such as a wet summer impacting on dry goods, can be allowed for within the model. As with all econometric models, the outputs from the ARIMA model are a set of coefficients which show how much a change in the independent variable impacts traffic, alongside an estimate of whether this variable is significant[1].

A4.2 Mathematical model

In order to allow for population growth in the model it was decided to convert all the variables into per capita terms as this brought a number of econometric advantages over including population as a standalone variable[2]. The formula which was estimated using the ARIMA model was therefore as follows:

$$\Delta TC_t = C + \Delta PC_t + \Delta MFP_t + \Delta SV_t + \Delta ER_t + \Delta EX_t + \sum_{t-1}^{j} \Delta t_{t-j} + \sum_{t-1}^{k} \Delta u_{t-k}$$

Where:

TC=Traffic per capita

C= Constant

u= the error term of the equation[3]

t= time period

[1] Statistical significance is defined as a result which is unlikely (less than 5% probability) to have occurred by chance.

[2] In particular it reduced the number of variables which needed to be estimated (which was important due to the limited sample size) and reduced the amount of correlation between the variables (which can cause estimation problems).

[3] This is a standard component of all regression equations and captures everything that the independent variables do not explain.

PC=Private consumption per capita	j= number of lags for the autoregressive component of the ARIMA model[4]
MFP= Multi Factor productivity	k=number of lags selected for the moving average component of the ARIMA model
ER = Exchange rates	Δ = the change in a variable (i.e., the amount that traffic changes in that period of time)
EX = Export Volumes (imports only)	

However, this approach was not considered appropriate for exported Dry & Break or Liquid bulk traffic. Whilst there has been some growth over time, these cargoes do not appear to be closely linked to economic variables, or to any seasonal pattern. This means that an ARIMA approach is not well suited and hence a simpler approach was taken. This used the Ordinary Least Squares (OLS) approach to estimate an average growth rate over time based on the following formula:

Where:

- T= Traffic
- C= Constant
- t= time period
- u= the error term of the equation

A4.3 Modelling approach

The coefficients of the mathematical model set out above were estimated in a statistical package called Stata. This is a package specifically designed for such estimation work and is an industry standard package for this type of modelling work.

All variables were initially tested for stationarity using the Durbin Watson approach. As all variables were found to be (1) variables no further differencing was needed and the cointegration variable of the ARIMA model was set to 1. In addition, investigation of the data suggested an annual pattern in the data and therefore the AR lags were initially set to 3 (i.e. the current quarter plus the 3 remaining quarters of the year). MA lags were initially set to zero to avoid over specification issues leading to the model becoming inefficient. This was then tested using Akaike and Bayesian information criteria to select the final lags. This confirmed that the addition of extra lags for either the AR or MA terms did not lead to a statistical improvement in the model and therefore the final selection of the model was an ARIMA (3,1,0) model.

[4] The inclusion of lagged Traffic and the error term is a standard component of an ARIMA model. The values of j and k were selected using the Akakie's selection criteria and a standard approach of j=3 and k=0 was chosen.

This model was then used to estimate the final coefficients. In line with a general to simple approach any variable found to be insignificant was rejected from the model. This improved efficiency and ensured that the final model was correctly specified. This was particularly important due to the relatively small degrees of freedom in the model (due to using a sample size of only 80 data points).

The final forecasts were then based on the OEF forecasts for the dependant variables and the coefficients estimated by Stata. Only the deterministic component of the model was used to provide the forecast as the AR component only model short-term quarterly variation in the data. It also allowed for the modelling of different scenarios without needing undertake complex dynamic modelling. Testing of the annual outputs from the full model (i.e. including the AR component) compared to the deterministic version of the model (i.e. excluding the AR component) showed that the annual results were identical across the two versions of the model.

In addition, it was decided to exclude the constant from the ARIMA equation. This was because it was considered unreasonable to assume growth in traffic without accompanying growth in either population or private consumption.

A4.4 Private consumption v GDP

The decision not to use GDP was based on three arguments:

1. GDP includes net exports (i.e., exports minus imports) and therefore it would introduce an element of autocorrelation into the model which could lead to biased coefficient estimates.
2. Since 2015 there have been significant issues with GDP figures, largely due to transfers of IPR between divisions of global companies. This has led to GDP estimates being considered to be an overestimate of the actual economic performance since 2015.
3. It is difficult to measure GDP on a sub national basis meaning there is no suitable measure for Northern Ireland.

As such it was decided that private consumption was a better and more reliable measure. As can be seen in Figure A.1, private consumption moved closely alongside GDP growth, but without the same level of volatility. This makes is a good predictor variable, especially given the small sample size. In addition, the correlation coefficient between GDP and private consumption was 0.98 (i.e. a near perfect correlation).

Other variables such as Modified Domestic Demand and GNI* have now been created to overcome some of the issues associated with GDP however these were not considered suitable as they do not have historic back series and are not available for Northern Ireland.

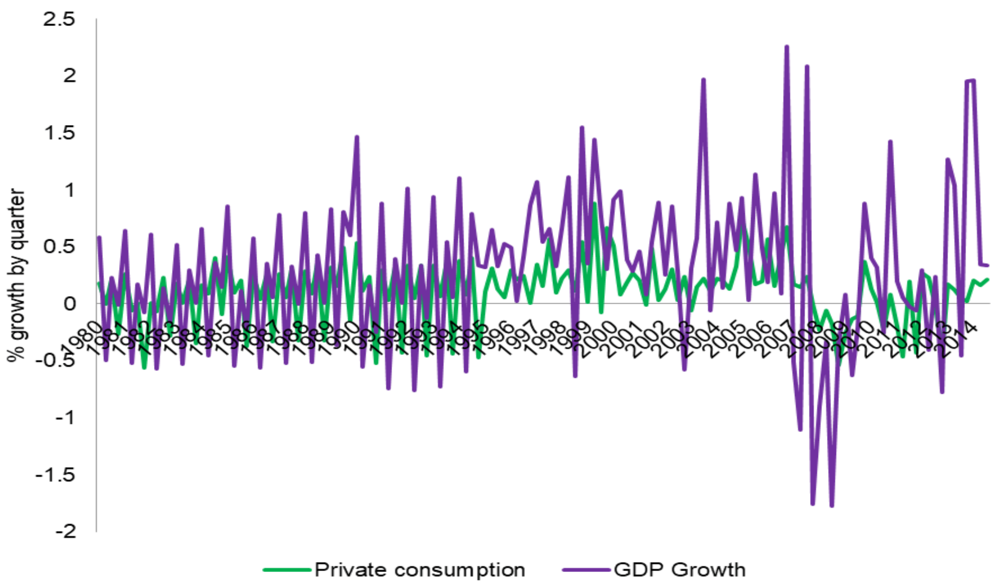


Figure A.1: GDP and private consumption changes, 1980-2014

A4.5 Rejected variables

The advantage of using an econometric approach is that it allows for an assessment of whether a variable adds significantly to the forecast or not. Where a variable was found not to add to the forecast it was dropped to improve the efficiency of the econometric approach.

The econometric approach led to all of the price variables discussed above being dropped as none were found to be statistically significant. While it is not possible to say with certainty why these variables were not found to be significant, probable reasons may include:

- **Volumes not values:** This work focuses on forecasting volumes and not values; thus relative prices may have less impact on volumes
- **Proxy variables:** It was not possible to obtain reliable historic measures for either shipping costs or technology and therefore proxies were used (average shipping volumes and TFP).

  It is possible that these are poor proxies for the variables of interest, with the result that they did not have a significant impact
- **The recession:** The recession clearly had a strong impact on trade volumes, and this may have led to a deviation from some of the longer run relationships. Due to only having 20 years of data it was not possible to estimate relationships by excluding the recession period

A4.6 The Landbridge issue

A particular challenge for this modelling was the issue of the Landbridge, which is discussed in detail in the main body of the report. This presented modelling issues as much of the RoRo trade going to the UK was to satisfy demand in the rest of Europe.

As such private consumption in Europe was likely to be driver of exports for this share of the traffic. Whilst the IMDO have made an estimate of the share likely to be going to Europe, this was not available until near the end of the study and it did not provide a sufficiently robust method to create a time series of data going back 20 years.

It was therefore necessary to use the RoRo data without splitting for final destination. This provided significant challenges and the initial approach was to include EU27 and UK private consumption as separate variables. However, this produced an unstable model which lacked statistical significance, despite a number of different specifications and approaches being tested. This led to this approach being rejected.

Models were then tested using the UK private consumption and EU27 private consumption individually on the total RoRo traffic. This tested whether there were differences in the impact on RoRo exports of UK or EU consumption changes. This allowed us to test the hypothesis that the coefficient for both the UK and EU consumption was the same (which would explain why the previous model attempt was unstable). The testing found the coefficients were not significantly different and therefore the hypothesis was accepted and a single EU model was created.

LoLo estimates were also based on a similar EU approach. This was because there is minimal LoLo traffic to the UK and reporting suggests that much of this is for shipping to the rest of Europe and the World via ports such as Liverpool. Most Irish exports to the UK go via RoRo. As such pan European model was found to be the best approach

A4.7 Final model used

The final equation estimated in the ARIMA process for imports was[5]:

A4.8 Model coefficients

The coefficients produced by stata are given in Table A.2 to Table A.5. All figures are shown to two decimal place (or 2 significant figures when required) and are statistically significant at the 95% level or higher:

Table A.2: Import coefficients

	Private consumption	Exports	Industrial index
Liquid	0	0.00010	0.0018
Dry	122.79	0	0
RoRo	32.99	0.000059	0
LoLo	44.05	0.000068	0

[5] The formula for Liquid bulk also includes +Δ〖IX〗_t where IX represents the industrial index

Table A.3: UK Export coefficients

	Private consumption	**Time**
Liquid	0	4.51
Dry	0	12.46
RoRo	1.55	
LoLo	0.64	

Table A.4: EU Export Coefficients

	Private consumption	**Time**
Liquid	0	1.28
Dry	0	19.50
RoRo	1.55	
LoLo	0.64	

Table A.5: RoW Export Coefficients

	Time
Liquid	7.71
Dry	11.31

Note: Modelling on RoRo and LoLo totals to the Rest of the World found no statistical evidence of growth over time. No RoRo is directly sent outside of Europe and LoLo totals are also extremely low due to the fact most LoLo goods are shipped via ports such as Rotterdam.

Appendix 5:

Travel Times via Alternative Routes

Appendix 5: Travel Times via Alternative Routes

In this section, the different connections and travel times from Ireland to Europe as estimated in 2018 are presented.

Table A.6: Landbridge via the UK Limerick to Paris

Mode	**Stage**	**Distance kms**	**Time (hrs)**
Road	Limerick to Dublin Port	217	2.5
Ferry	Check-in time		1.0
	Dublin Port to Holyhead		3.3
Road	Holyhead to Dover	600	7.5
	Mandatory rest period*		0.8
Tunnel	Check-in time		1.0
	Dover to Calais		0.5
Road	Calais to Paris	293	3.5
TOTAL HOURS			**20.0**
* A rest period of 45 mins must be taken after 4.5 hours driving.			

Table A.7: Direct via Dublin-Cherbourg

Mode	**Stage**	**kms**	**(hrs)**
Road	Limerick to Dublin Port	217	2.5
Ferry	Check-in time		1.0
	Dublin Port to Cherbourg		22.5
Road	Cherbourg to Paris	355	4.5
TOTAL HOURS			**30.5**

Table A.8: Direct via Rosslare Cherbourg

Mode	**Stage**	**kms**	**(hrs)**
Road	Limerick to Rosslare Europort	200	3.0
Ferry	Check-in time		1.0
	Rosslare Europort to Cherbourg		17.0
Road	Cherbourg to Paris	355	4.5
TOTAL HOURS			**25.5**

Table A.9: LoLo container via Zeebrugge

Mode	Stage	kms	(hrs)
Road	Limerick to Dublin Port	217	2.5
LoLo	Dublin Port to Zeebrugge		49.0
service			
Road	Zeebrugge to Paris	311	3.3
TOTAL HOURS			**54.8**

Appendix 6:

Lead-in Times - Project Stages for Developments

Appendix 6: Lead-in Times - Project Stages for Developments

Feasibility study

For large port developments, a concept design and a feasibility study proving the initial technical and commercial feasibility are normally prepared as a first step.

Scheme design and EIA

For a planning application, the design of the development needs to be detailed enough to ensure that the environmental impacts can be sufficiently assessed. Depending on the type of project, the scheme design will often involve site investigations, both marine and land based. A foreshore licence is required for marine site investigations. This can add considerably to the timeline of the project.

Projects of a certain type or above a certain size require an Environmental Impact Assessment (EIA). The timeline for the preparation of the EIA report (EIAR) is determined largely by the environmental surveys that need to be carried out. For instance: surveys of birds and fish may need to be carried out in specific seasons (depending on the species of interest) and traffic counts cannot be carried out during holiday periods.

Consenting

Planning permission

Planning permission generally needs to be obtained from the local planning authority (typically a City or County Council). From receipt of a valid application for planning permission, the planning authority has eight weeks to decide to grant permission or request further information (RFI). If there is no RFI or appeal, permission should be granted 12 weeks after receipt of a valid application.

If there is an RFI, a decision to grant should be made four weeks after the response to the RFI has been submitted to the planning authority, with the permission granted four weeks after that.

If the planning application is appealed to An Bord Pleanála (ABP), the timeline can extend over months, or even years. ABP aims to decide on appeals within 18 weeks from receipt, but this timeline is often exceeded, as they have the power to request further information, and also to hold an oral hearing.

Application for consent

Applications for consent under the Planning and Development (Strategic Infrastructure) Act 2006 are made directly to ABP. Strategic infrastructure developments are generally significant energy, transport, environmental or health infrastructure projects.

Development types listed in the 7th Schedule of the Planning and Development Act 2000, as amended, can be deemed strategic infrastructure development (SID), and ABP determine whether they regard the project as SID, based on a pre-application consultation process.

After the application is made, the planning authority for the area (as above, typically a City or County Council) is required to submit a report to ABP within ten weeks. There is a duty on ABP to make its decision as expeditiously as is consistent with proper planning and sustainable development, and to avoid delays. Their statutory objective is to decide within 18 weeks from the last day for making submissions or observations by the public. This timeline is often exceeded, and in the case of planning appeals, ABP has the power to request further information, and to hold an oral hearing.

Foreshore leases and licences

A foreshore lease or licence for site investigation, dredging or construction on the foreshore must be obtained from the Department of Housing, Planning and Local government, except for the fisheries harbours which are licensed by the Department of Agriculture, Food and the Marine.

A licence for dumping at sea must be obtained from the Environmental Protection Agency.

There is no statutory timeline for issuing foreshore licences; they can typically take from three months to a year, or even longer, depending on the works to be carried out and the location.

If a project is designated as a Strategic Infrastructure Development, then one can apply to ABP directly for both planning permission and a foreshore licence.

Detailed design and tender

For each development an assessment has been made of the duration of the detailed design, specifications, Bill of Quantities and tender documents.

The duration of the tender process depends not only on the size and complexity of the project but also on the legislative requirements. For projects above the EU Procurement Directive Threshold publication on the Official Journal of the EU is obligatory and in an open procedure the minimum time limit for submission of tenders is 35 days from the publication date of the contract notice.

For large projects, there will be added time for pre-qualification of contractors, tender interviews, the preparation of tender assessment reports etc.

Construction

The construction duration of projects in ports also takes account of the mobilisation time of specialist equipment, such as dredging vessels and jack-up barges.

Table A.10: Lead-in times for proposed developments at Rosslare Europort

	Development	Feasibility study	Scheme design and EIA	Consenting	Detailed design and tender	Construction	Total	Lead-in times
		months						years
Current Capacity								
Imminent capacity	Expansion of port's trailer compound	0	1	0	5	3	9	0.75

Appendix 7:

Container Terminal KPI's

Appendix 7: Container Terminal KPI's

The following benchmark information from Drewry[6] has been used.

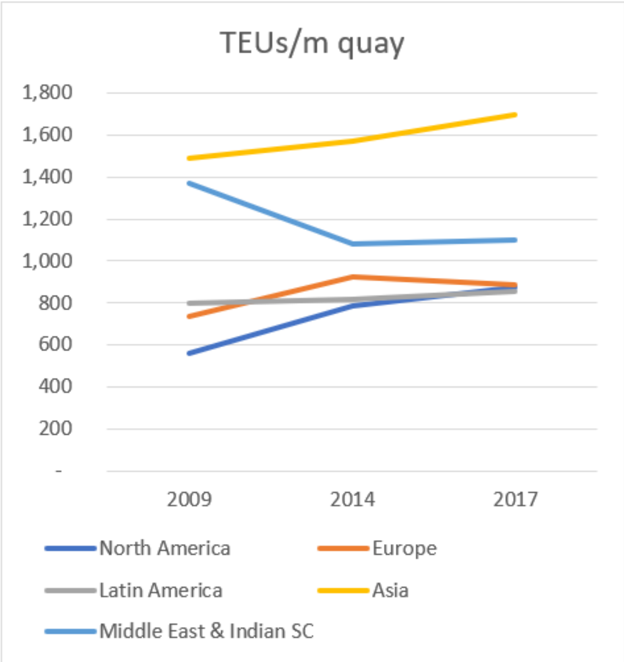


Figure A.2: Development of TEUs/m quay

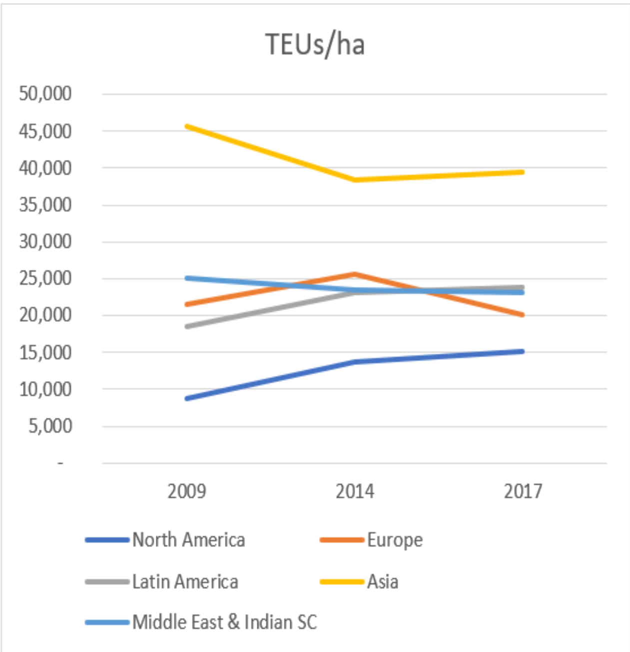


Figure A.3: Development of TEUs/ha

[6] Global Container Terminal Operators 2018, Drewry Maritime Research

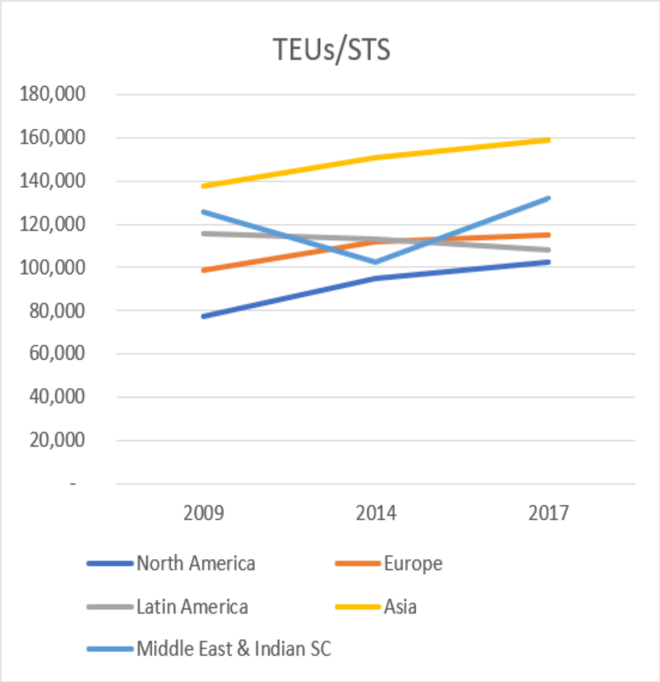


Figure A.4: Development of TEUs/STS

Appendix 8:

Further Background Information for Port Capacity Assessments

Appendix 8: Further Background Information for Port Capacity Assessments

A8.1 Dublin Port

Ferry routes to Dublin Port in 2019

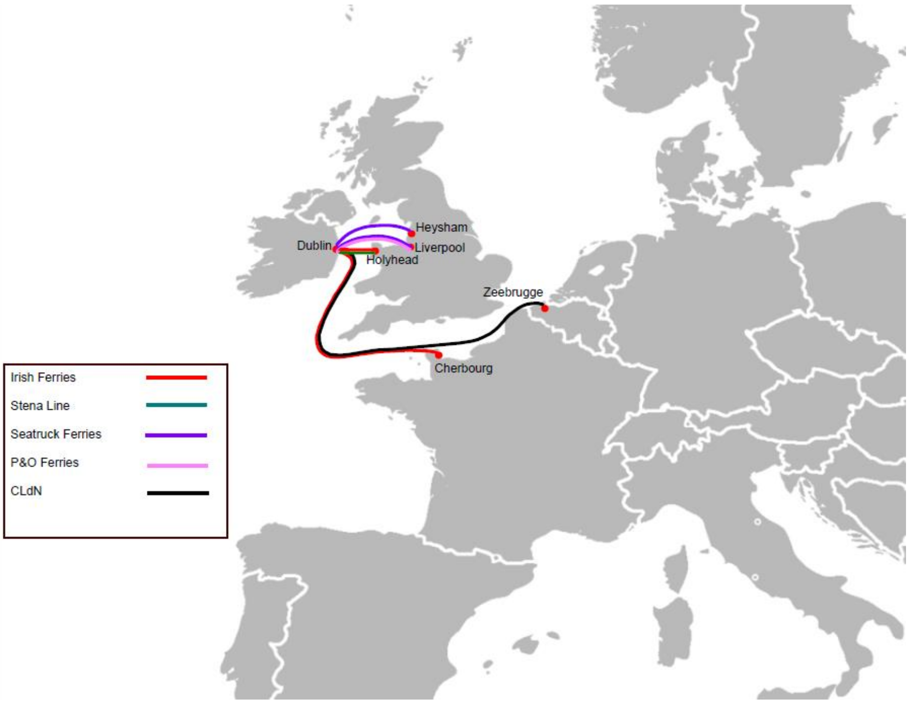


Figure A.5: Ferry routes to Dublin in 2019

Direct multi-purpose cargo ferry routes from Dublin were to Liverpool, Holyhead and Cherbourg. There were also direct freight-only ferry routes to Heysham and Zeebrugge.

Information on RoRo berths

Table A.11: RoRo berths characteristics

Current scenario									
Terminal	Total Ro-Ro	T1	T1	T2	T3	T4	T5	T5	Ocean Pier
Operator*1		Irish Ferries	Irish Ferries	Stena Line	P&O Ferries	P&O Ferries	Seatruck Ferries	Seatruck Ferries	CLdN Ro-Ro SA
Berth №	8	49	51A	51	21	25	52	53	36/37
Length (m)		213	190	205	238	290	200	156	200
Depth at LAT (m)		11	8	8	7	7.7	8	5.9	10.3
Facility Details		No. 5 ramp Two Tier Ramp	No.9 ramp Single Tier Ramp	Ramp No. 1 Two Tier Ramp	Ramp No.6 Single Tier Ramp	Ramp No.4 Double Tier Ramp	Ramp No. 7 Single Tier Ramp	Ramp No. 8 Single Tier Ramp	Ramp No. 2 Single Tier Ramp

Information on container terminals

Table A.12: Main dimensions and characteristics of Dublin Port's container terminals (2017 data)

Terminal	Dublin Ferryport Terminals	Marine Terminals Ltd	Alexandra Quay East /West
Operator	DFT	MTL	DSG
Berth Nº	50 & 50A	41,42,43,44,45	32,33,38,39,40
Length (m)	580	700	900 (partly multi-purpose)
Depth at LAT (m)	9.00 – 11.00	8.50 – 11.00	10.00
Facility Details	Cranes 3 x 40 tonnes STS gantry cranes Secondary Handling equipment 10 x 40 tonnes RTG cranes 1x 45 tonnes RS 4 x 18 tonne ECH 250 Reefer points	Cranes 3 x 45 tonne STS Gantry Second-handling equipment 4 x 40 tonne RMG Reefer Points 300	Cranes 1 x STS 45 Ton Panamax Capacity 2 x 400 mobile (104 tonnes SWL) 3 x 250 mobile (65 tonnes SWL) 7 x RTG's Second-handling equipment 3 Kalmar RS 25 Terminal Tractors 15 Novatech Flexmasters Reefer points 300 Warehousing 300,000sq feet

Information on bulk terminals

Table A.13: Main dimensions and characteristics of Dublin Port's bulk terminals (2017 data)

Terminal	Alexandra Quay West / Ocean Pier	South Bank Quay	Liquid Bulk
Operator	Common User	Common User	Common User
Berth Nº	29,30,31,32,33,34	46,47	OB1, OB2, OB3, OB4
Length (m)	795 (partly multi-purpose)	370	990
Facility Details	Cranes 2 x 400 mobile (104 tonnes SWL) 3 x 250 mobile (63 tonnes SWL)	Cranes 2 x 250 mobile	30 Hectare oil zone storage capacity 330,000 tonnes facilities for handling oil products, bitumen, chemicals and liquid petroleum gases linked to a common user pipe line system.

Historical throughput

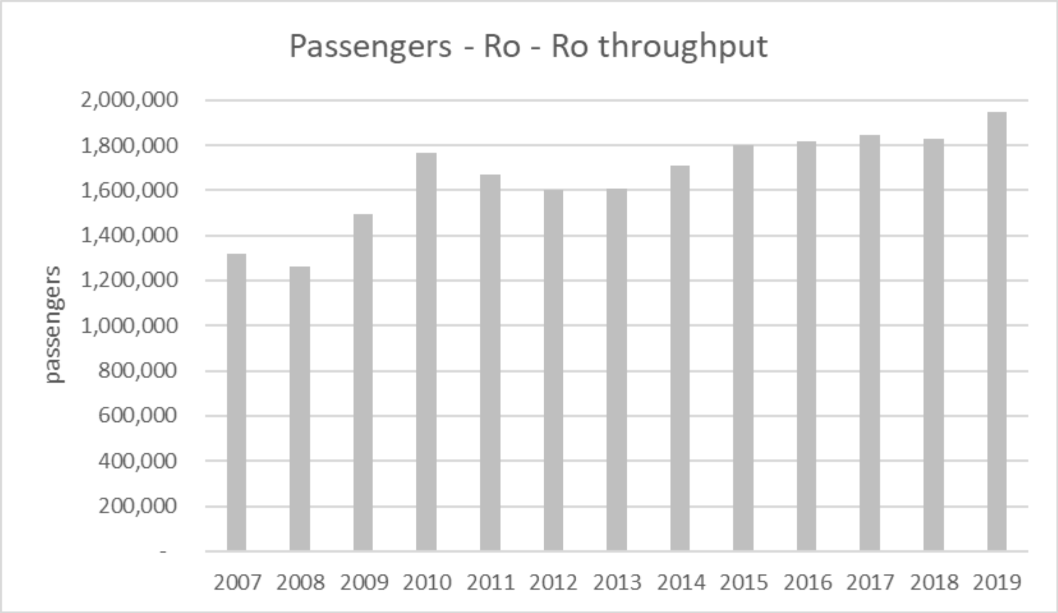


Figure A.6: Passengers – RoRo throughput.

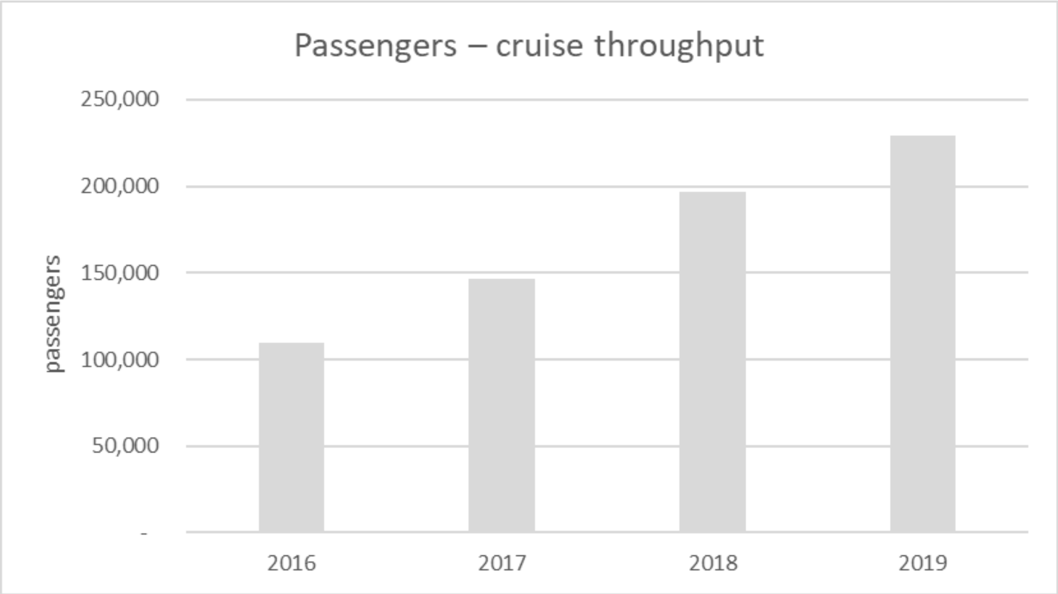


Figure A.7: Passengers – Cruise throughput

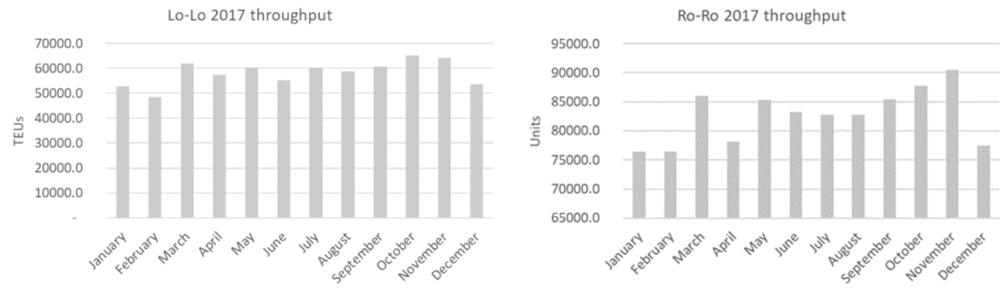


Figure A.8: Seasonal variation of RoRo and LoLo throughput (2017 data)

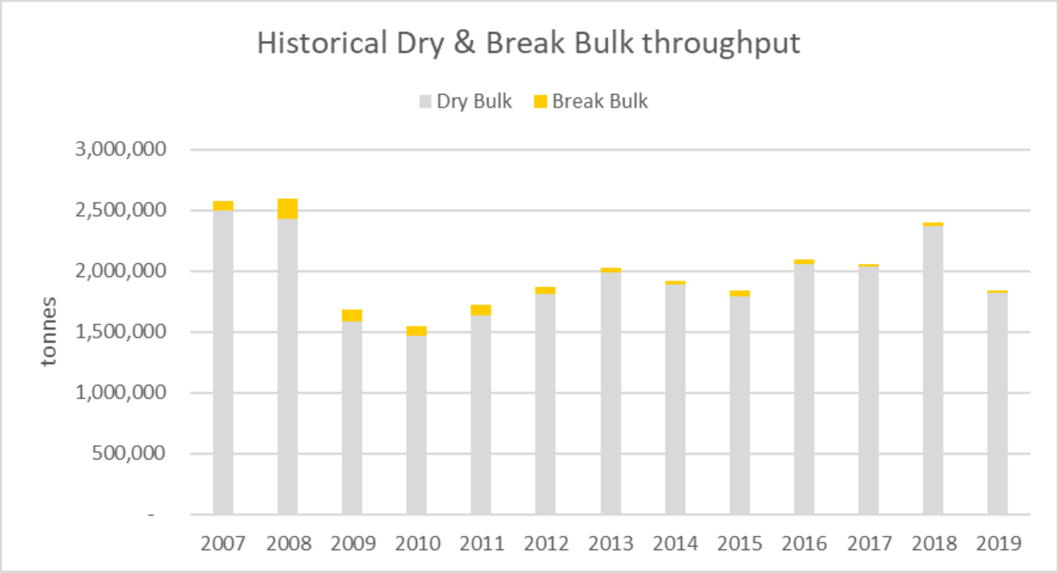


Figure A.9: Historical Dry & Break Bulk throughput

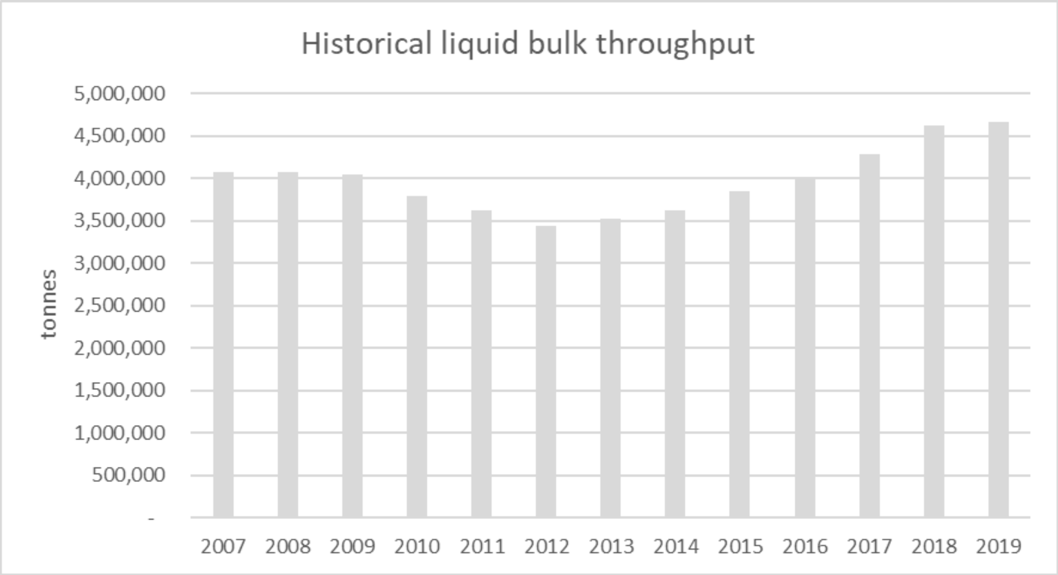


Figure A.10: Historical liquid bulk throughput

Table A.14: Draught handling capabilities at different channel depths (DPC, ABR Project - Project Rationale, 2014)

Current maintained depth: 7.8m	Mean high water	Channel depth	Max draught*		Mean low water	Channel depth	Max draught*
Spring tides	4.1m	11.9m	10.9m		0.7m	8.5m	**7.5m**
Neap tides	3.4m	11.2m	**10.2m**		1.4m	9.2m	8.2m

Proposed maintained depth: 10.0m	Mean high water	Channel depth	Max draught		Mean low water	Channel depth	Max draught
Spring tides	4.1m	14.1m	13.1m		0.7m	10.7m	**9.7m**
Neap tides	3.4m	13.4m	**12.4m**		1.4m	11.4m	10.4m

* Assumes an under keel clearance of 1.0m

Figure below provided by Dublin Port Company.

Annotated layout of Dublin Port

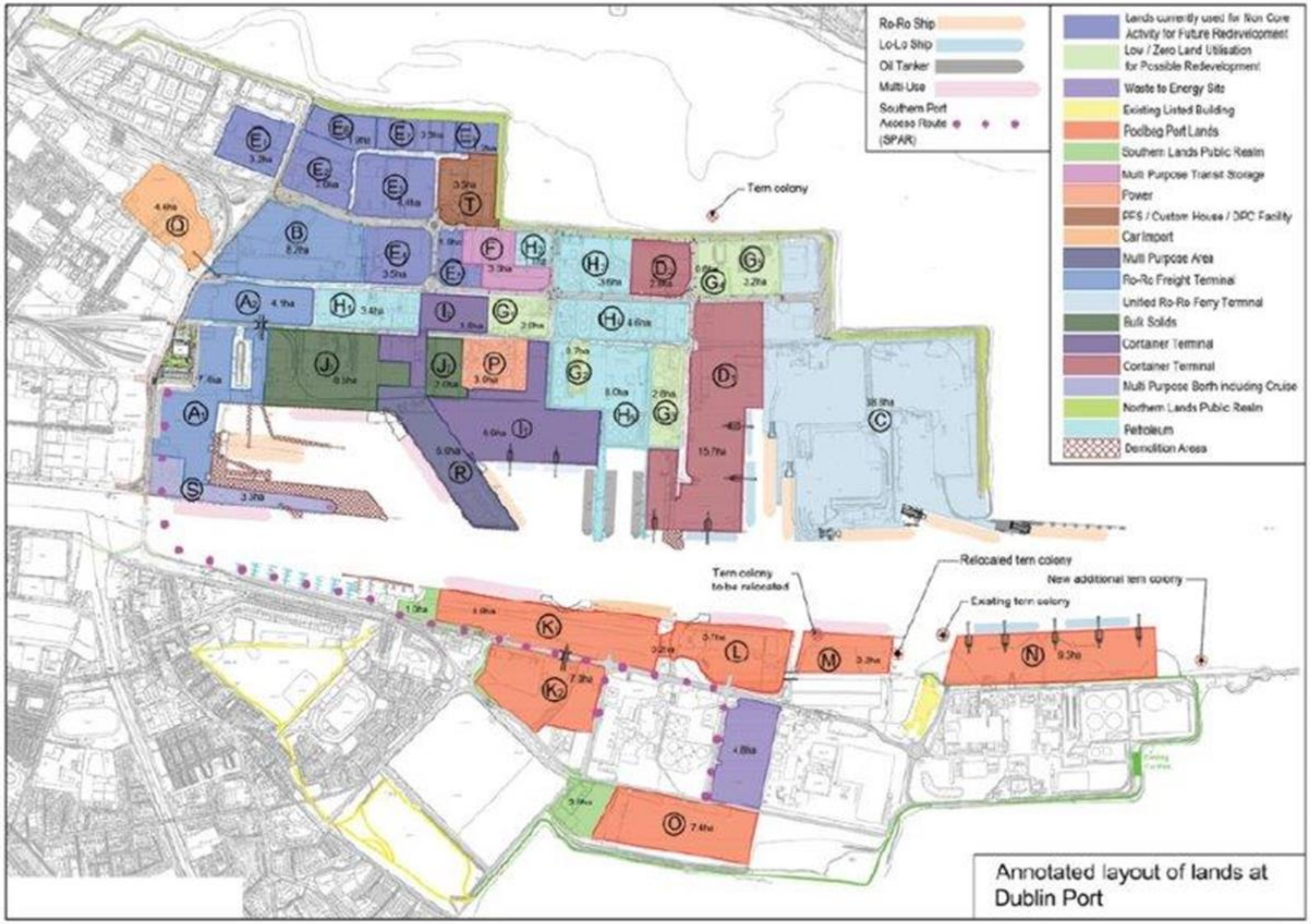


Figure A.11: Potential Scenario (DPC Masterplan 2040, 2018)

Indicators for benchmarking exercise

One of the potential constraints in Dublin Port is the lack of land area available for port operations and storage.

Due to these port area limitations, it is necessary that the port achieves minimum land utilisation targets as stated in its Franchise Policy:

Table A.15: Minimum count utilisation target

Accompanied trailers	40,000	Units per ha per annum
Unaccompanied RoRo trailers	20,000	Units per ha per annum
Container terminals	40,000	TEUs per ha per annum

Unaccompanied RoRo trailers

The target for land utilization for unaccompanied RoRo trailers is 20,000 units per hectare per annum. Unaccompanied RoRo is land hungry. The longer the dwell time of export or import trailers, the more terminal land is required.

Based on the unaccompanied RoRo throughput Arup have undertaken a review of the land utilization. shows the yearly evolution of the land utilization for unaccompanied RoRo trailers (units/ha). It can be concluded that the requirement of 20,000 units/ha has been achieved in 2019.

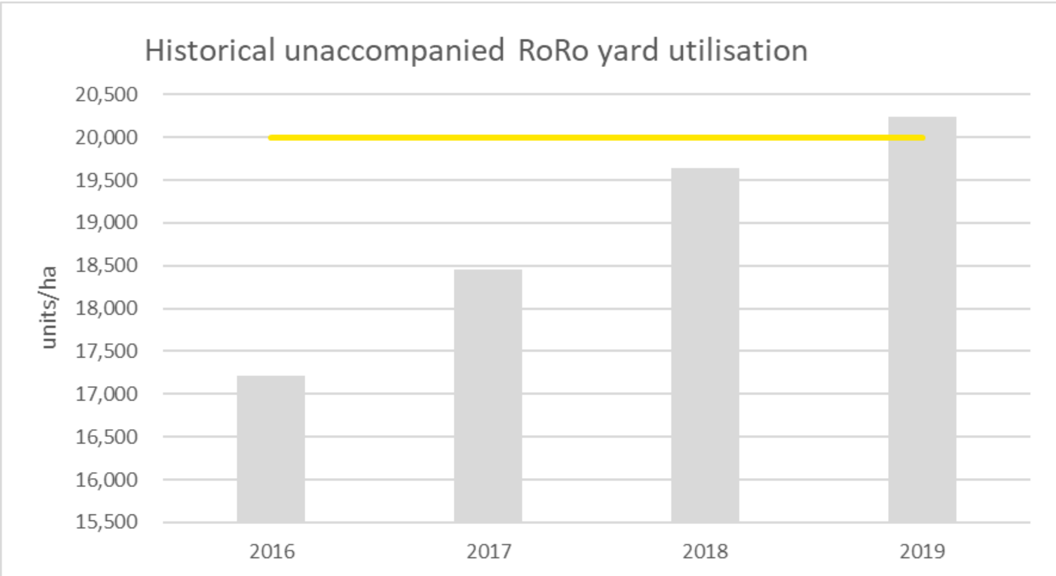


Figure A.12: Historical Yard Utilisation for unaccompanied RoRo trailers, units/ha

Containers

Land utilisation in the container terminals in Dublin is currently slightly higher than elsewhere in Europe for which the average is 26,000 TEU/ha. This figure does not capture containers arriving on RoRo vessels.

The historical land utilization was, on average, 25,500 TEUs/ha, between 2016 and 2019, approximately 64% of the port's 40,000 TEUs/ha objective.

shows the evolution of the container yard utilization between 2016 and 2019 for which a continued improvement can be seen.

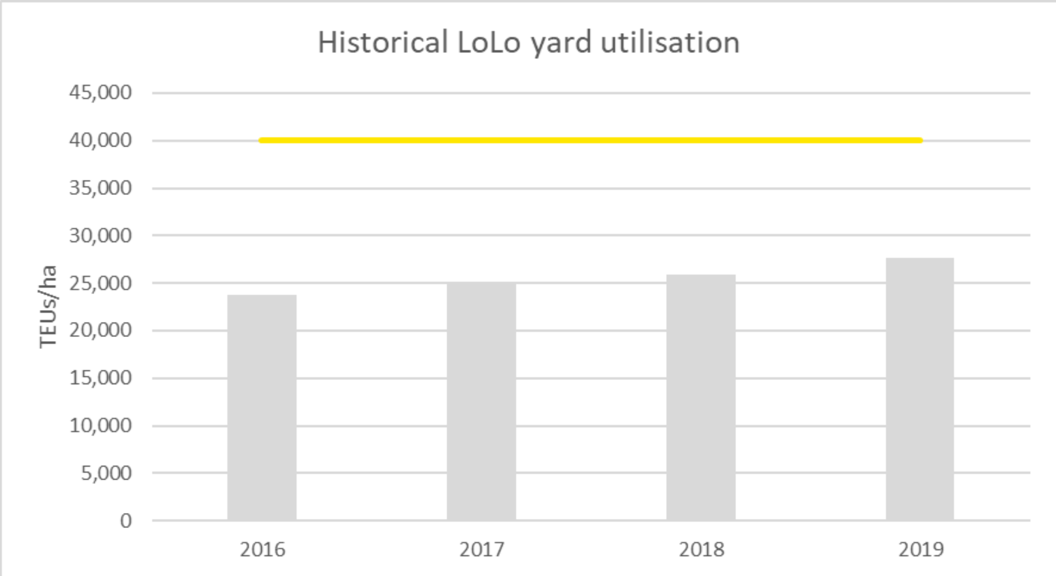


Figure A.13: Historical Yard Utilisation for containers, TEUs/ha

Dry & Break Bulk

Land utilization at Dublin port for storing dry and break bulk has been analysed based on the historical information and considering a total terminal area of 13ha. The maximum utilization was 180,000 tonnes/ha in 2018.

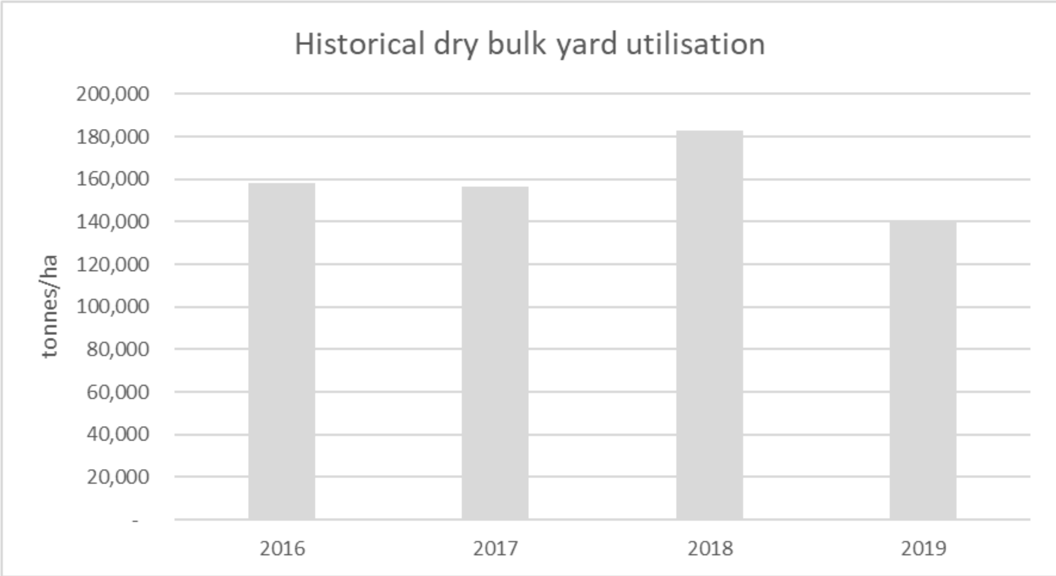


Figure A.14: Land Utilisation for Dry & Break Bulk, tonnes/ha

A8.2 Port of Cork

The area occupied by each individual terminal assessed in Port of Cork is shown in the following figures. Ringaskiddy is included in the main body of the report.

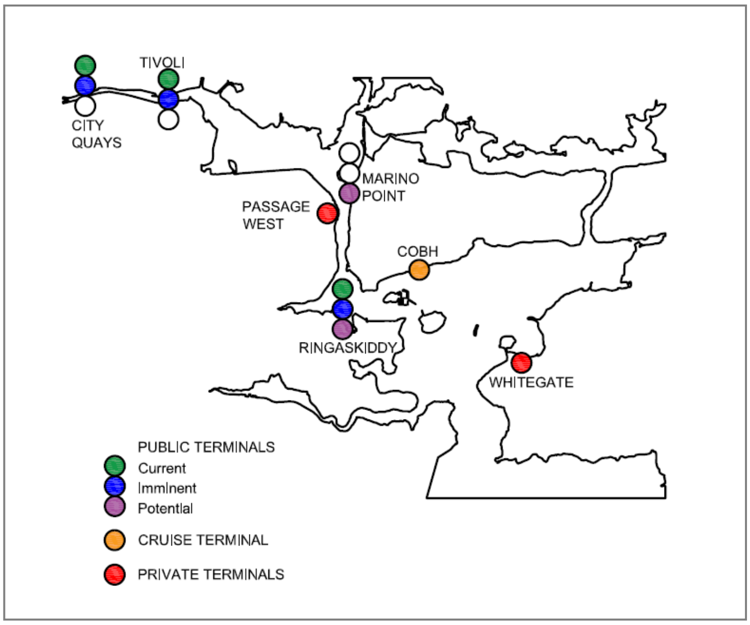


Figure A.15: Location and situations' changes over time (source: Arup, based on available drawings and Google Earth)

Figure A.16: City Quays Facilities. General overview (source: Arup, based on available drawings and Google Earth).

Figure A.17: Tivoli Terminal. General overview (source: Arup, based on available drawings and Google Earth).

A8.3 Shannon Foynes

In relation to the proposed developments, SFPC provided Figure A.18 and Figure A.19 and the following information in April 2023.

Figure A.18: Shannon Foynes Port Estate

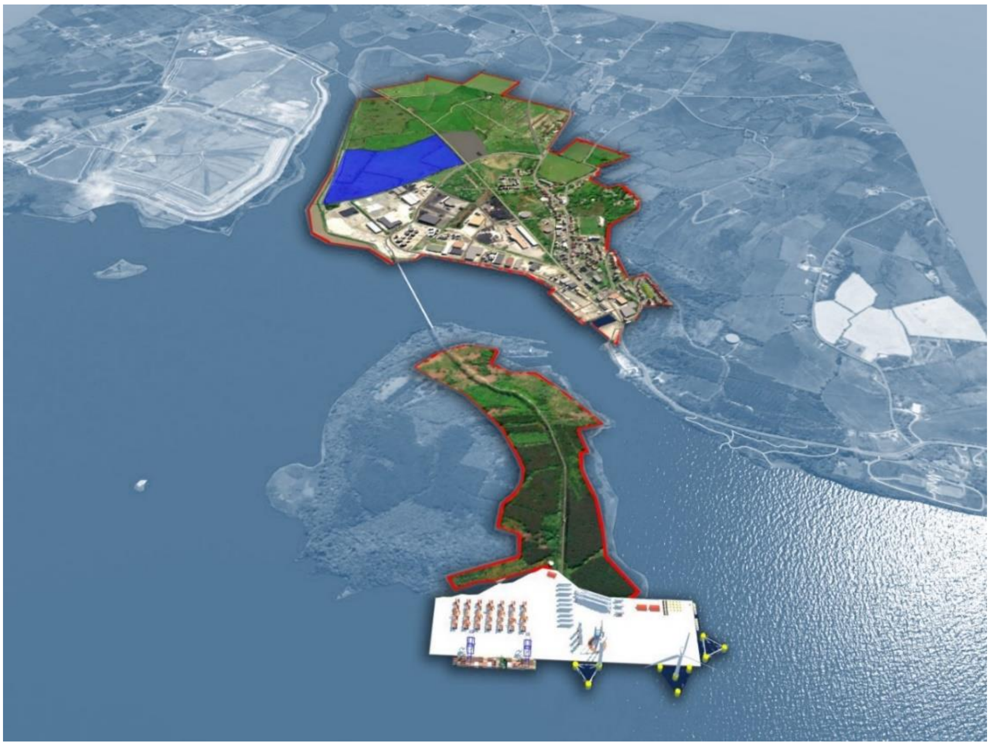


Figure A.19: Foynes Deepwater Port and Port of Foynes Estate, artist rendering

The Deepwater Port on Foynes Island will be developed in several phases. Phase 1 will be a new 800m multi-purpose berth for general use (ORE, LoLo, Bulk and

Breakbulk) to accommodate vessels with a maximum length of 300m and maximum draught of 20m. Future phases will allow for an additional 800m of quays for vessels of the same size.

Reference is also made to the SFPC Vision 2041 Strategic Review Masterplan, which was published in September 2022.

A8.4 Port of Waterford

The assumptions used in capacity assessment are presented below.

Assessment of the bulk terminal capacity

The following assumptions have been made:

- Bulk products (dry bulk, break bulk and others) are handled at the 393m length berth.
- Total workable hours per year ≅ 4,600h
- Berth utilisation ≅ 50%
- Effective quay equipment productivity ≅ 800 t/hour
- Capacity = 1.9M

Assessment of the container terminal capacity

The following assumptions have been made:

- Only containers are handled at the 450m length quay, equipped with 2 STS gantry cranes with an average productivity of 30 moves/hour
- TEU Factor = 2
- The yard area dedicated to containers is approximately 4.6ha

An assessment of the three main container terminal subsystems has been undertaken (berthing length, quay handling equipment, storage area) to calculate the terminal's capacity which is estimated at 200,000 TEUs/year.

A8.5 Rosslare Europort

RoRo services in Rosslare Europort in 2019

Table A16: RoRo services in Rosslare Europort in 2019 (Source: Information available online)

Line	STENA LINE	IRISH FERRIES*	STENA LINE	NEPTUNE LINES
Vessel's Name	STENA EUROPE	ISLE OF INISHMORE	STENA HORIZON	NEPTUNE DYNAMIS, NEPTUNE AEGLI
Type of vessel	Ro-Pax	Ro-Pax	Ro-Pax	Vehicles Carrier
LOA (m)	149	174	187	159
Route	Rosslare / Fishguard	Rosslare / Pembroke	Rosslare / Cherbourg	Santander / Le Havre / Southampton / Portbury / Rosslare
Service	Passengers, Passenger vehicles and RoRo Freight	Passengers, Passenger vehicles and RoRo Freight	Passengers, Passenger vehicles and RoRo Freight	Trade Vehicles and RoRo Freight
Frequency	Twice daily	Twice daily	3 times weekly	Once weekly

* Note: Irish Ferries moved their service from Rosslare Europort to France to Dublin Port in 2019.

Rosslare Europort Developments

An Infrastructure Masterplan for Rosslare Europort was prepared by Iarnród Éireann in 2020 which envisaged the delivery of improvements to port traffic and storage areas within the Europort lands over 4 phases. The masterplan will also accommodate other developments at the site, including the Office of Public Works (OPW) proposed Terminal 7 new Border Control Post and the proposed N25 Rosslare Europort Access Road (REAR) project, which is being progressed by Transport Infrastructure Ireland and Wexford County Council. The Rosslare Europort Masterplan also includes upgrades to the Port Terminal Management System (PTMS) and upgrades to Berth 3.

The key elements of the Rosslare Europort Masterplan (see Figure A.20) are as follows:

- Phase 1 – New circulation route through the port and a new Freight Check-In Area. Phase 1 will also accommodate the proposed N25 Rosslare Europort Access Road project;
- Phase 2 – Additional Freight, Bulk Cargo and Trade Car Storage areas;
- Phase 3 – Upgrade of the Marshalling Areas at the Berths;

- Phase 4 – Additional Freight Storage areas and upgrade of the Passenger Vehicle Check-In facilities;
- Berth 3 Upgrade - 90m extension to the berth, the provision of a new double tier linkspan, upgrades to the existing mooring and fendering on the berth and the provision of new quayside working areas.

Also, a Port Digitisation project will provide upgrades to the Port Terminal Management System. This is likely to create increased efficiencies on the terminal.

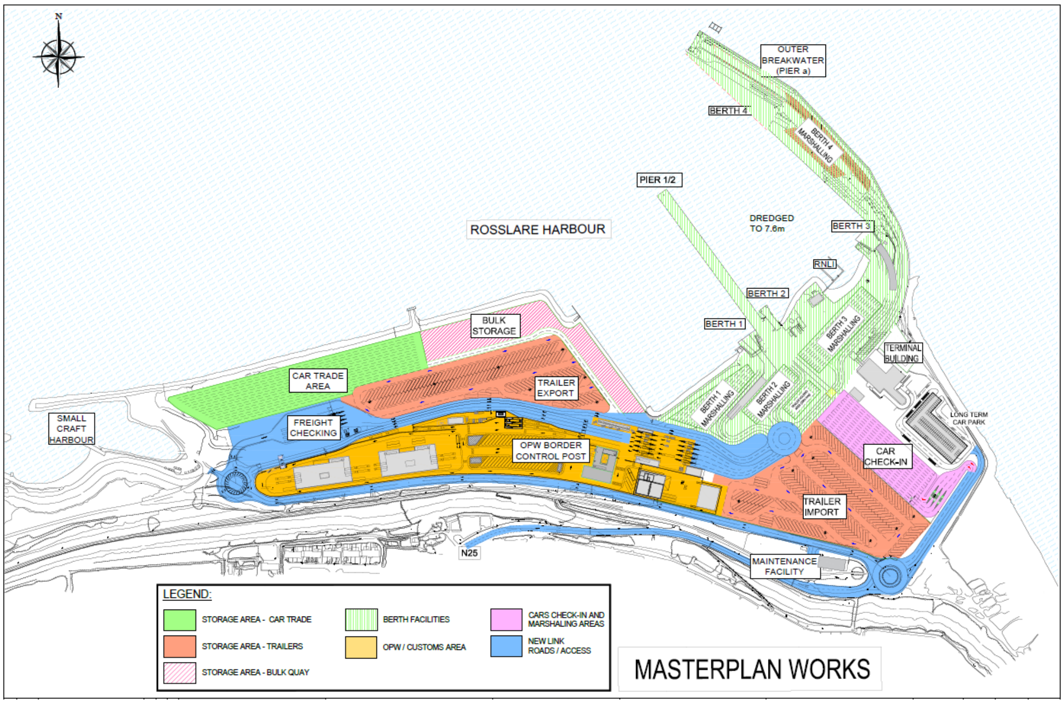


Figure A.20: Proposed Rosslare Europort Facility Layout

Rosslare Europort indicated the following timelines for their infrastructure developments:

- Tenders for the construction of Terminal 7 (the new Border Control Post) and associated enabling works at Rosslare Europort were issued by the OPW in September 2022 and the tender process is expected to be concluded in Q2 2023, with construction works due to commence in Q3 2023.

Other elements of the Masterplan are also being progressed by Rosslare Europort with construction due to commence in Q2 2023

- Rosslare Europort's Port Digitisation project commenced in 2022.
- Planning permission has also been granted for the proposed Berth 3 Upgrade project. The Berth 3 Upgrade is currently at detailed design stage and construction is expected to commence in 2024.
- Wexford County Council are awaiting a decision on planning permission for the proposed N25 REAR development. A decision is expected in Q2 2023 and the construction stage of the project is currently scheduled to commence in Q1 2024.

- The main development works at Rosslare Europort, including the Terminal 7 facility, N25 REAR project and Rosslare Europort Infrastructure Masterplan are scheduled to be completed by Q4 2025.

Rosslare Europort are also progressing plans for the development of infrastructure that can facilitate fixed bottom wind farm projects in the Irish and Celtic Seas. The port has indicated that this development will also provide capacity to introduce RoRo services in the future. This project is in the early stages of design and planning.

A8.6 Drogheda Port

The area occupied by each individual terminal assessed in Drogheda Port is shown in the following figures.

Figure A. 21: Schematic layout of Tom Roes Point Terminal

Figure A.22: Schematic layout of Town Quay, TQ (source: Drogheda Port and Arup)

Table A.17: Maximum throughput handled per terminal (source: Arup analysis)

	Dry Bulk (tonnes)	**Break Bulk (tonnes)**	**Total (tonnes)**
Town Quay	126,327	69,930	196,257
Tom Roes Point Terminal	939,482	169,616	1,109,098
TOTAL	1,065,809	239,546	1,305,356

Bremore deepwater port development

In 2006, Drogheda Port Company carried out an initial feasibility study into developing a multi-modal deepwater port at Bremore. Between 2006 – 2009 a full suite of studies and designs were prepared, and onshore and offshore site investigations were carried out. A full port design was completed in 2010 in addition to a strategic business plan. The project was put on hold at the time due to the major economic downturn.

Drogheda Port Company have partnered with Ronan Group Real Estate to form a joint venture development vehicle for a deepwater multi modal energy port at Bremore.

The Bremore development is a project on the EU Core Network - Greater Dublin Area Port Cluster and was added to the national port planning landscape as Government policy in December 2021.

During 2023/2024 the project team, which includes marine and landside design engineers; planning consultants; environmental, ecological and heritage specialists, are preparing the necessary material for a planning application in 2025/2026, including a public consultation process, and substantive discussions with port users and other stakeholders.

It will have four primary economic clusters: Port logistics, Alternative energy, Community and Commercial.

Key project objectives:

- Direct Link to M1 motorway;
- Direct link to Dublin-Belfast rail line;
- Core port on the EU Ten-T network;
- Fully integrated supply chain;
- Ireland's first energy port — wind energy to green hydrogen;
- Green Port;
- ‘Fit for 55’ EU plan for green transition.

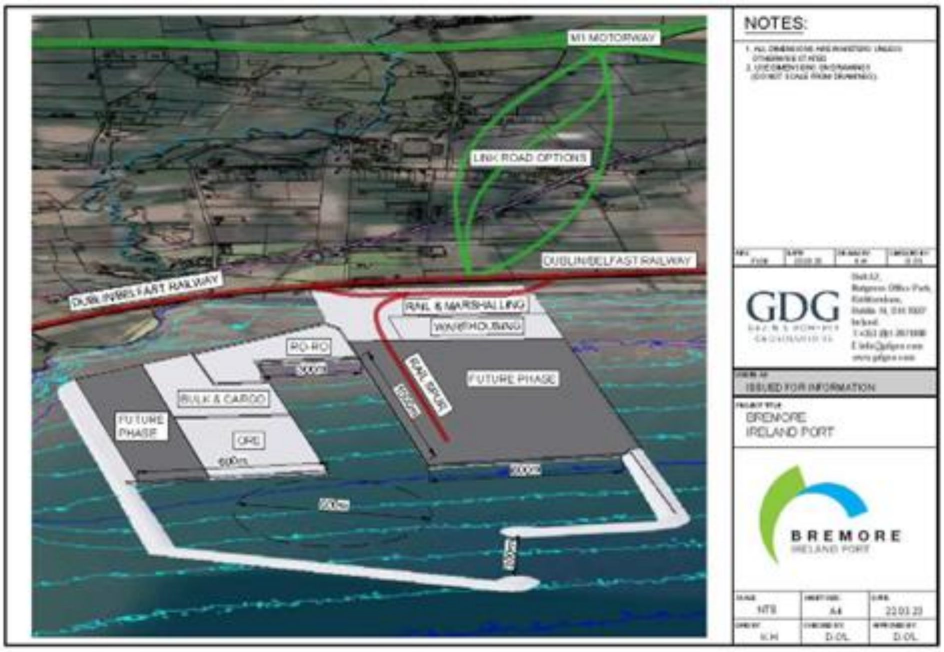


Figure A.23: Bremore Ireland Port Schematic

A8.7 Port of Galway

In Figure A.24, the proposed new port development is shown in grey.

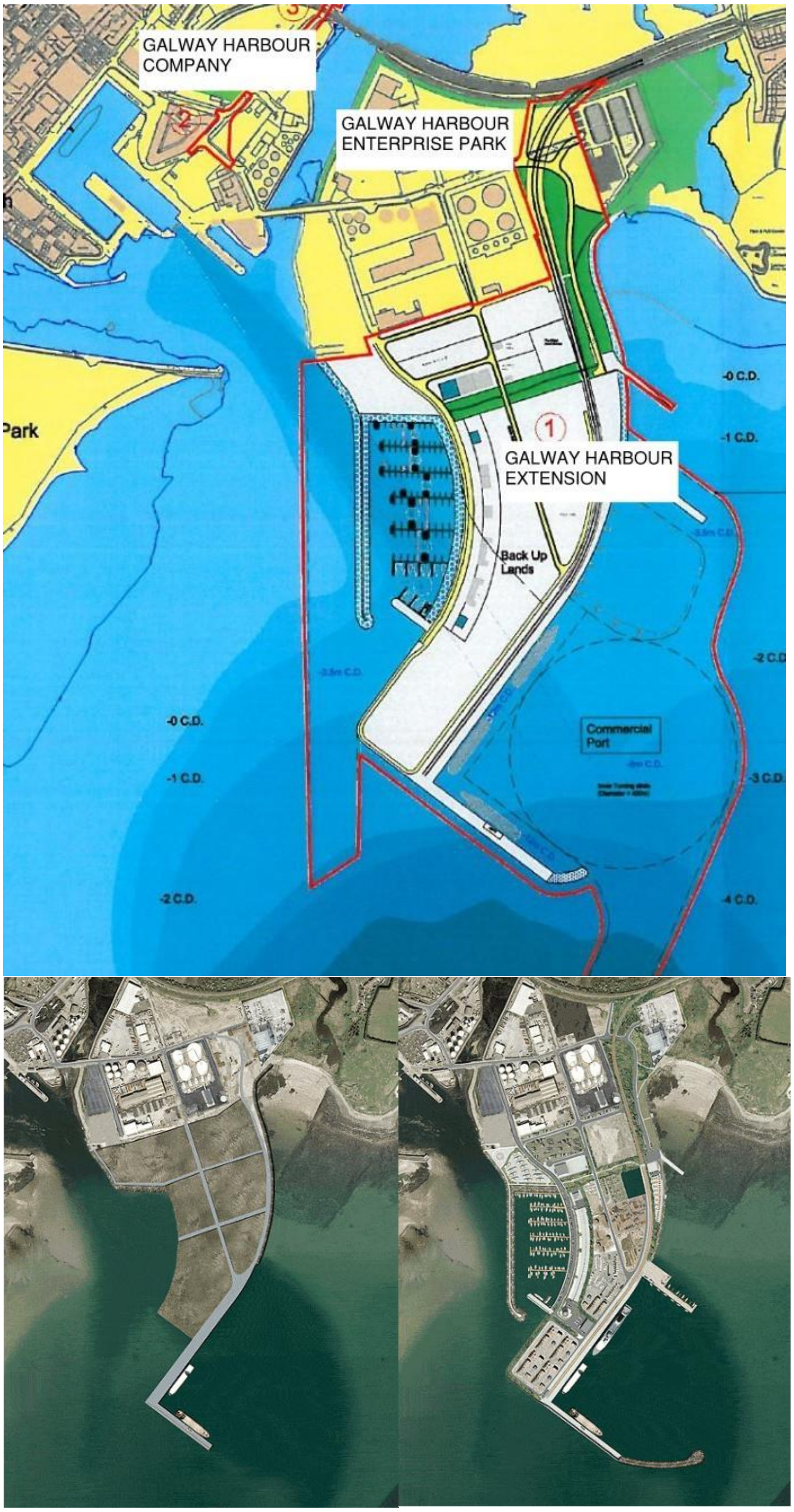


Figure A.24: The Galway Port Expansion Plan (source: Port of Galway)

Appendix 9:

Risks, Threats and Opportunities

Appendix 9: Risks, Threats and Opportunities

A9.1 Risks and threats to the Irish Ports network

This section covers the key risks and threats to the port network on a national scale.

Legend – Overall Risk/ Opportunities Rating

- 1 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 and above

Table A.18: Risks and threats to the Irish Ports Network

	Risk to port capacity	Likelihood	Impact	Overall	Mitigation measures
1) Operational and infrastructure deficits	Linkspan bridges: A malfunction or break down will become an immediate constraint on offloading RoRo traffic from the vessels using that linkspan. Whilst smaller repairs may be quickly resolved they will lead to a ship waiting to offload for several hours unless it can be re-directed to another linkspan. Structural and mechanical damage may take a long time to repair due to the bespoke nature of linkspan bridges.	2	5	10	Asset management system with maintenance and inspection procedures
	Ship to Shore (STS) and mobile harbour cranes. A malfunction or break down will become an immediate constraint on offloading containers. Most ports have more than one STS crane per berth and mobile harbour cranes can be moved between berths.	3	3	9	Asset management system with maintenance and inspection procedures. Ability to move cranes between various locations.
	Quays and jetties: A failure of civil infrastructure is very uncommon although fendering systems are vulnerable to damage. This can generally be overcome with some temporary fendering arrangement. Damage through vessel impact may be more substantial and, even though it rarely leads to complete collapse, the repairs can take months.	2	4	8	Asset management system with maintenance and inspection procedures. Ensure that sufficient vessel impact risk assessment has been carried out and ensure that temporary fendering systems are available at short notice.
	Navigation channel: A blockage of the navigation channel by either a sinking ship or by siltation	1	5	5	Adequate maintenance dredging strategy
	Climate change will lead to sea level rise, increased storminess and more intense rainfall. These could result in flooding of	3	4	12	Ensure that infrastructure is designed to be climate resilient

	Risk to port capacity	Likelihood	Impact	Overall	Mitigation measures
	quaysides and standing areas, reduced access to shipping channels and quaysides due to high waves and wind and damage to breakwaters.				
2) Deficits in connectivity to hinterland	Some proposed developments for ports are contingent on hinterland connectivity projects being realised.	3	3	9	Ensure that hinterland connectivity is developed on time
	Congestion or complete blockage of intermodal connectivity can also lead to capacity deficits (motorways, rail lines and the Dublin Port tunnel, in particular.	3	3	9	Asset management system with maintenance and inspection procedures
3) Funding	Funding is cited by all ports as the biggest impediment to capacity increase. The Tier 1 and 2 ports operate as independent commercial state companies but require permission from the Department for Transport.	4	5	20	Investigate suitable strategies for securing funding with the support of financial/ commercial advisors in consultation with the Department
	A reduction in goods export throughput undermines return on investment. The supply of goods exported to UK from Ireland decreases in light of cost-passthroughs to customers from numerous exogenous risks including economic performance and political risks (including Brexit). Given the current trade surplus that Ireland holds the economic impact of this risk could be greater than other such similar risks and therefore undermine funding greater than other risks.	2	4	8	Investigate goods exported by NAT type, by value and specific sub-industry type to establish a clearer picture of the potential the impact on Irish industries. Build in sufficient risk adjustment into investment appraisals to support potential volatile future economic landscape. Implement plans to reduce friction with exports as far as is possible (increase customs facilities, waiting zones, improved technology).
	A significant proportion of goods imported to Ireland come from the UK, either directly (UK produced) or via the UK from Europe. Similarly to exports, fluctuations in economic cycles and other such exogenous risks could impact the throughput and capacity requirements, thus reducing return on investment and funding for future growth.	2	4	8	Align financial forecasting of ports with Dept. Finance guidance on fiscal and economic policies. Implement plans to reduce friction with imports as far as is possible (increase customs facilities, waiting zones, improved technology). Build in sufficient risk adjustment into investment appraisals to support potential volatile future economic landscape.

	Risk to port capacity	Likelihood	Impact	Overall	Mitigation measures
	There is likely to be competition amongst the ports for funding. Access to funding will be based on an ability to demonstrate increased volumes and potentially market share which may mean that one port's success will come at the expense of other ports. In this circumstance timing issues will be important, as the first port to secure funding may not be the most viable.	2	3	6	There will be a need to have clear communication and co-ordination to ensure that the most viable projects are supported in making funding applications. They will need to be supported by robust business cases which ideally show that they are not totally dependent on gaining market share at the expense of others.
	There is a risk that Tier 2 ports may struggle to gain funding due to competition from the larger ports, and the lack of a large asset base to secure funding. This may mean that if funding is available, the terms obtained would be considerably less favourable than for larger ports, increasing the associated commercial risks.	2	2	4	Robust business cases will be particularly important to reassure investors and bring down the associated risks. Other commercial opportunities may also need to be explored to bring in additional revenue streams to support borrowing. Other potential sources of funding should be explored, such as ISIF or EIB.
	There is a risk that some developments will take longer than expected to obtain planning consent. Some may not be granted planning permission at all.	4	3	12	Ensure proper consultation with stakeholders and preparation of detailed planning application documents to prevent surprises and setbacks.
4) Planning and programming	All ports could face objections to their planning consent applications.	4	3	12	See above
	There is spare capacity in ports around Ireland, but Dublin Port is highly utilised. Continued investment in Dublin in the form of roads and connectivity is also having an impact on competition between the ports. In 2013 the Competition Authority noted that: 'Export focused LoLo and RoRo cargo is becoming increasingly concentrated within Dublin Port at the expense of smaller ports like Rosslare Europort and Port of Waterford. In 2012, Dublin handles 43% of RoRo cargo and 57% of LoLo cargo on an all-island basis'. In 2017 these figures were 49% for RoRo and 57.5% for LoLo.	3	3	9	
5) Brexit	There is a risk that border controls requirements will result in a shortage of storage space.	4	3	12	Border controls requirements to be accommodated as part of Masterplanning/ planning for port facilities upgrades.

	Risk to port capacity	Likelihood	Impact	Overall	Mitigation measures
6) Climate	Petroleum derived products occupied one third of imports to Ireland's ports in 2017. As industries, nations and regions look to move away from the use of fossil fuel derived products in particular the demand and supply balance for these products may shift. This may impact the business case for a number of ports.	4	3	12	Undertake a Climate focused risk and opportunities assessment for the Irish Ports and consider the impact of Climate Change and the transition to a lower carbon economy to the business plans and operation of Irish ports.
	In addition to the direct industry impact, the derivative impact of the rebalance from petroleum derived product on the final goods market in Ireland should be considered in the context of capacity provision.	4	2	8	
	Livestock and food related products occupy a further 21% of export movements by tonnage in Ireland's ports. Similar but independent policies to reduce the carbon intensity of dairy and beef industries and their impact on the climate will no doubt also change the landscape of Ireland Inc and the ports accordingly	4	3	12	Consult with Department of the Environment and Communications in order to represent the ports industry in discussions related to the regulation and optimisation of Livestock and Food related emissions.
	The regulation of shipping emissions may lead to a requirement for additional investment in portside infrastructure and facilities.	4	4	16	As part of a wider Climate Resilience, Risk and Opportunities assessment consider the impact that a lower-carbon shipping industry may have on land-side infrastructure and facilities.
	The regulation of global shipping emissions may lead to a reduction in shipping use, reducing the return on investment of port investments, and undermining future capacity.	2	5	10	As part of a wider Climate Resilience, Risk and Opportunities assessment consider the impact that a lower intensity shipping industry could have on the sensitivity of prevailing business models for Irish ports.

A9.2 Risks and threats to port capacity (Tier 1 and 2 ports)

This section covers the key risks and threats to the capacity of the Tier 1 and 2 ports.

Table A.19: Risks and threats to Dublin Port capacity

	Dublin Port				
	Risk	**Likelihood**	**Impact**	**Overall**	**Mitigation**
1) Deficits in connectivity to hinterland	The Dublin Port tunnel is critical to the road connectivity of Dublin Port. Any restrictions will cause capacity constraints in the port.	2	4	8	Asset management system with maintenance and inspection procedures. The Southern Port Access Route (SPAR) is envisaged to take traffic to the southern side of the Liffey. This will be increasingly important once the developments on the south side are realised.
		3	3	9	
2) Funding	Difficulty with securing funding for the implementation of the masterplan.	2	5	10	Refer to Table A.18 above
3) Planning and programming	Dublin Port Company will need to obtain planning permission and foreshore licences for most of its Masterplan. The port city interface in Dublin is challenging. Noise and air quality could become an issue.	5	3	15	Seek innovative ways for noise and dust suppression in the port.
	A change of government policy could lead towards the designation of part of port lands for housing.	2	5	10	

Table A.20: Risks and threats to Port of Cork capacity

	Port of Cork				
	Risk	**Likelihood**	**Impact**	**Overall**	**Mitigation**
1) Operational and infrastructure deficits	Port of Cork currently has large vessels navigating to Tivoli and the City Quays. There is a channel width and draught restriction, but also an air draught restriction due to the overhead cable across the River Lee. An accident in this very confined area would cause serious operational issues.	2	5	10	Move away from handling larger vessels at City Quays and Tivoli. Until then tug support may be required on occasion to provide better control.
2) Deficits in connectivity to hinterland	The capacity of the new container terminal in Ringaskiddy cannot be increased until the M28 road project has been completed.	3	4	12	
3) Funding	Port of Cork will have funding restrictions for developing Ringaskiddy and Marino Point until City Quays and Tivoli are redeveloped.	4	4	16	Refer to Table A.18 above
4) Planning and programming	The port city interface in Cork is challenging. Noise and air quality could become an issue.	4	3	12	Seek innovative ways for noise and dust suppression in the port.

Table A.21: Risks and threats to Shannon Foynes Port capacity

	Shannon Foynes Port				
	Risk	**Likelihood**	**Impact**	**Overall**	**Mitigation**
1) Operational and infrastructure deficits	There is a risk that the consenting process could take longer than expected due to the environmental designations in the area.	4	2	8	Ensure the planning process is started in a timely manner to allow for the likely long lead-in time.
2) Deficits in connectivity to hinterland	The importance of the re-instatement of the rail connection between Shannon Foynes and Limerick is acknowledged. There is a risk that this service will not be realised.	1	1	1	
	The Shannon Foynes Island scheme requires the provision of a high-quality road to connect Foynes Port with the M20 at Limerick. There is a risk that this road will not be realised.	3	3	9	

Table A.22: Risks and threats to Port of Waterford capacity

	Port of Waterford				
	Risk	**Likelihood**	**Impact**	**Overall**	**Mitigation**
1) Operational and infrastructure deficits	Changes in siltation patterns could affect access to Port of Waterford.	3	4	12	Undertake works to prevent siltation build up in the estuary or ensure there is an adequate maintenance dredging strategy in place.

Table A.23: Risks and threats to Rosslare Europort capacity

	Rosslare Europort				
	Risk	**Likelihood**	**Impact**	**Overall**	**Mitigation**
1) Operational and infrastructure deficits	Changes in siltation patterns could affect access to Rosslare Europort	2	4	8	Undertake works to prevent siltation build up in the estuary or ensure there is an adequate maintenance dredging strategy in place.
2) Deficits in connectivity to hinterland	The only access road into Rosslare Europort is built on a steep embankment. Instability of this road would completely block off port access.	1	5	5	As part of the N25 upgrade there is a proposal to create a new port access road.

3) Funding	Difficulty with securing funding for capacity improvements.	3	3	9	Refer to Table A.18 above
4) Planning and programming	Rosslare Europort has been developed on an ad hoc basis before preparing the Masterplan in 2020, responding to specific demands.	3	4	12	Implement the recent strategic Masterplan to facilitate improvements in port infrastructure

A9.3 Opportunities Related to Irish Port Capacity (Tier 1 and 2 Ports)

This section covers the opportunities to the capacity of the Tier 1 and 2 ports.

Table A.24: Opportunities to the capacity of the Tier 1 and 2 ports

	Opportunity for Port	Likelihood	Impact	Overall	Capitalising Measures
1) UN Sustainable Development Goals	There is an ongoing potential for blue highways to remove freight traffic from Ireland's roads. At scale, there are opportunities to move freight supplies at a greater level of carbon efficiency, and to this end support the climate goals of Ireland moving forward.	2	4	8	Asset management system with maintenance and inspection procedures
	Europe and Ireland's climate goals are ambitious, and if policy shifts towards implementing a kerosene emissions tax this may lead to a possible increase in RoRo/LoLo opportunities for ports to combat increased freight costs.	3	2	6	Asset management system with maintenance and inspection procedures. Ability to move cranes between various locations.
	Air passenger movements dominate international markets, and similarly to above, should there be a significant cost increase for shorter haul continental movements there could be an opportunity to capture some market share for passengers and passenger-RoRo movements.	2	4	8	Asset management system with maintenance and inspection procedures. Ensure that sufficient vessel impact risk assessment has been carried out and ensure that temporary fendering systems are available at short notice.
	There is an opportunity for Irish ports to differentiate themselves in terms of low-carbon alternative fuelling infrastructure provision, and this should be specifically investigated further.	2	5	10	Adequate maintenance dredging strategy
2) Capacity support from other sectors	The increased demand for port facilities to support offshore wind developments creates new opportunities for the ports. Many of the facilities required for offshore wind generation and surveying can also be used for shipping purposes thus increasing the overall capacity.	3	3	9	Review port business plan proposals for Rosslare Europort, Port of Cork, in support of Offshore Wind and other facility

	Opportunity for Port	Likelihood	Impact	Overall	Capitalising Measures
					diversification proposals.
	There is an opportunity for cruise and small ferries to be handled at Dun Laoghaire. This could reduce the reliance on Dublin Port and provide additional resilience and redundancy to the overall system capacity.	3	4	12	Review port business plan proposals for Dún Laoghaire Cruise terminal to consider the opportunity to offset Dublin Port Capacity.
3) European support funding	There is an opportunity to supplement investment in Irish port infrastructure with European support funding. Measures such as the EU Green Deal and the Risk and Resiliency Funding Framework (RRFF) may provide opportunities to increase the scope of investment for future initiatives or increase necessary, but marginal return on investment projects to fruition.	3	5	15	Undertake dedicated study to investigate potential for EU transition funding to support future Irish port capacity investments.

Appendix 10:

Sources of Data

Appendix 10: Sources of Data

The different sources of information used are presented hereafter.

Masterplans:

- Dublin Port Masterplan 2040 – Reviewed 2018
- Port of Cork Strategic Development Plan 2010
- Shannon Foynes Port Company – Vision 2041
- Belfast Harbour Masterplan – 20-30 Year Period
- Port of Waterford – Corporate Plan 2018-2022
- Port of Waterford – Masterplan 2020-2044
- Drogheda Port 2020-2050 – A vision for our future

Other port documents:

- Dublin Port – Land use requirements and implementation plan 2017 – 2040.
- Dublin Port – Yearbook 2018
- Port of Cork – Annual Report 2017
- Belfast Harbour – Annual Report and Accounts 2017

General Sources

- 2013 Nationals Port Policy, Department of Transport, Tourism and Sport; Ireland.
- CSO statistical releases, Statistics of Port Traffic for the years 2014 until 2017, Ireland.
- UK Department of Transport, Sea Passenger Statistics: Final 2016.
- Review of Maritime transport 2017, UNCTAD – UN Conference on Trade and Development.
- Regional Shipping and Port Development Strategies, UNESCAP – Economic and Social Commission for Asia and the Pacific.
- Merk, O., Dang, T. (2012) “Efficiency of world ports in container and bulk cargo (oil, coal, ores and grain)”, OECD Regional Development Working Papers, 2012/09, OECD Publishing.
- Ferrari, C., Merk, O., Bottasso, A., Conti, M., Tei, A. (2012), “Ports and Regional Development: a European Perspective”, OECD Regional Development Working Papers, 2012/07, OECD Publishing.
- Global Container Terminal Operators 2015, Drewry Maritime Research.

Appendix 11:

Question-naire Template

Appendix 11: Questionnaire Template

The following questionnaire was sent to all the ports.

Introduction

Arup and EY-DKM have been appointed by the Irish Maritime Development Office (IMDO), which operates under the aegis of the Department of Transport, Tourism and Sport (DTTAS) to undertake a port capacity assessment for the Irish port system until 2040. This forms part of the DTTAS's desire of having a more formalised approach toward capacity forecasting of Irish ports through the commissioning of independent analyses at regular intervals from 2018 to 2040.

A key component of the exercise will be to establish a forecast of future port volumes over the short, medium and long terms. Related to these scenarios, we wish to also assess the capacity of ports based on existing, imminent and potential infrastructure capacity. In view of Brexit, the study deals specifically with the implications of a range of scenarios resulting from Brexit.

This template aims to obtain as much relevant information about your port as possible in order to ensure that the outcomes of our study are as meaningful as they can be.

Ports traffic

Context

We are seeking to gain an understanding of the environment that you are currently operating in and the likely changes in capacity over the current, medium (5 to 10 years) and long term (10 years+). This will allow us to build our forecasts of port volumes based on a realistic understanding of the business challenges that you face. The questions below are designed as a prompt to draw out the key influencing factors. Please provide any supporting available documentation alongside your answers or separately.

Questions

Please provide the following information:

Data on volumes through the port and projections

1. Current and historic volumes (received and forwarded) through the port by mode and destination/port of origin from 2007 (if available) to 2017
2. Projections for 2018-2022 and beyond to 2040, if available (from Master Plans for example).

Current imports/exports by origin/destination port

3. Main trading lanes – the main trading routes (and frequencies) that you operate (ports of origin and destination) and describe the modes on those routes – Ro/Pax, Ro/Ro, Lo/Lo Bulk, Cruise.
4. Describe the weekly and yearly seasonality of your business flows by mode.
5. What changes do you expect in these business flows and do you have the capacity to meet them in the short, medium and long term? Please elaborate.

Changing nature of port traffic

a) Describe any major changes in the composition of your business over the last five years or so.

b) What factors have driven these changes?

c) In the absence of Brexit how did you anticipate your business would change?

d) What plans had/have you made to manage any of these potential changes?

The implications of Brexit

a) What parts of your business do you anticipate will be most impacted by Brexit?

b) Do you anticipate any modal shifts in traffic at your port as a result of Brexit, and if so, what are they?

c) Has Brexit led to you to changing any previously made plans?

Ports facilities and operations

Context

We are seeking to gain an understanding of the existing facilities and operations at the port and the physical challenges that you face. This will enable us to assess the port's existing capacity. The questions below are designed to allow us to best understand the port operations. Please provide any supporting documentation alongside your answers.

Questions

Existing facilities

Please provide all available information on the existing port facilities. Specifically, any information on the following areas where relevant to your port:

1. General arrangement drawings and maps of the port.
2. Bathymetry within the port basin(s) and access channel(s).
3. Maximum design vessel at each berth and in access channel(s), including LOA, draught, beam, DWT, TEUs.
4. Occupation rate at each berth.
5. Berthing length and depth at each berth.
6. Total terminal area, total open storage area, total storage volumes for warehouses, sheds and silos.
7. Description of quay and yard handling equipment: type of equipment, year of acquisition, maintenance status, productivity rates, special devices.
8. Stated capacity of each terminal, including any areas in the port that are assigned to 3rd party operators.
9. Weather conditions imposing restrictions.
10. Working hours.
11. Type of commodity handled at each terminal and/or berth (e.g. containers, dry bulks, general cargo, etc.).
12. Volumes handled (throughput) for each type of traffic, if possible on a monthly basis to analyse seasonality.

Current capacity and expansion plans

a) What percentage of current capacity is being used?

b) How many year's growth can be accommodated within current capacity?

c) When do you anticipate major infrastructural projects will be needed in your port?

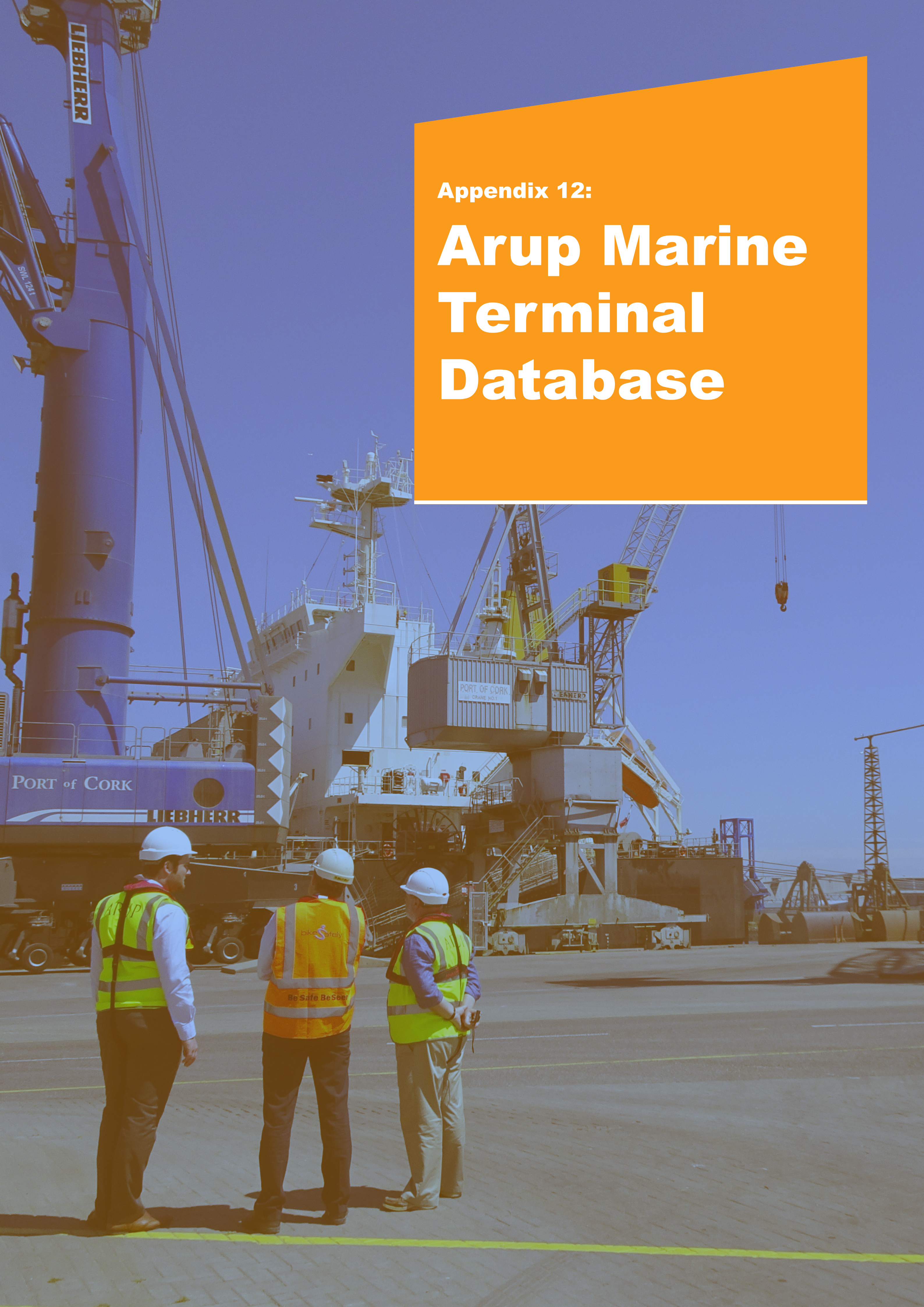
d) Details of any future expansion plans (infrastructure, equipment and operation movements) and projected terminal capacity.

Current condition

a) A (soft) copy of any surveys and/or condition reports of the port infrastructure.

Appendix 12:

Arup Marine Terminal Database



Appendix 12: Arup Marine Terminal Database

Arup has been involved in many assessments of maritime terminals. The intelligence gained from our assessments is contained in the Arup marine terminal database. Some of this data has been obtained from confidential sources which we are not allowed to disclose. The database covers ports and terminals located in more than 30 different countries in all continents, including:

- Africa: Kenya, Nigeria South Africa.
- Americas: Argentina, Brazil, Chile, Colombia, Uruguay, USA.
- Asia: Georgia, Japan, Pakistan, Singapore.
- Europe: Cyprus, Germany, Greece, Italy, Latvia, Montenegro, Netherlands, Portugal, Russia, Spain, Turkey, United Kingdom.
- Oceania: Australia.

The number of terminals assessed within the data base:

- 61 Container;
- 25 Dry Bulk;
- 23 Liquid Bulk and LNG;
- 13 Cruise and Passengers;
- 10 RoRo and Automobile;
- 14 General Cargo and Multi-purpose.

Appendix 13:

List of Consultations and Acknowledgments

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Acknowledgements

This study has benefited from the generous contributions of time, information and insight from many individuals and representative organisations, including the ports, as well as Government departments and industry experts from the port's sector. A list of the individuals and organisations consulted with are set out below.

Particular thanks are due to the ports themselves, who were our primary contact points during this study and gave generously of their time and cooperated with us by providing relevant information and accommodating site visits.

List of consultations with port companies

Dublin Port Company	Questionnaire, Site visit and meeting: 27/06/2018
Port of Cork Company	Questionnaire, Site visit and meeting: 26/06/2018
Shannon Foynes Port Company	Questionnaire, Site visit and meeting: 25/06/2018
Port of Waterford	Questionnaire, Site visit and meeting: 27/06/2018
Rosslare Europort	Questionnaire, Site visit and meeting: 29/06/2018
Drogheda Port	Questionnaire, Site visit and meeting: 23/07/2018
Port of Galway	Questionnaire
Belfast Harbour Company	Questionnaire, Site visit and meeting: 1/10/2018
Wicklow Port	Questionnaire
Greenore Port	Questionnaire
Port of Larne	Questionnaire
Warrenpoint Port	Questionnaire