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BRISK II

Traffic Scenarios

Deliverable 3.1

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This document is developed within the BRISK II project to analyse traffic scenarios in the Baltic Sea and submitted by the Core Project team on 28.11.2025.

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APPENDICES

1 Introduction

1.1 Background

This data report is part of the long-term risk analysis for oil and hazardous and noxious substances (HNS) pollution from shipping accidents to the marine environment in the Baltic Sea, in short BRISK II. The BRISK II project comprises the following deliverables on the analyses:

1 Deliverables under work package 1 include project management related reports (e.g. progress reports).

2 Work package 2: Basic analysis
- 2.1 Method note
- 2.2 Data collection note
- 2.3 Traffic analysis
- 2.4 Cargo analysis
- 2.5 Accident and spill model
- 2.6 Probability of oil release

3 Work package 3: Future damage analysis
- 3.1 **Traffic scenarios *(this report)***
- 3.2 Selection of risk reduction scenarios
- 3.3 Impact mapping of spilt oil and HNS
- 3.4 Mapping of environmental vulnerability
- 3.5 Mapping of environmental damage due to oil
- 3.6 Mapping of environmental damage due to HNS

1.2 Scope

This report describes the prognosis for the future ship traffic in the Baltic Sea for the situation in 2036. Two different scenarios are considered each mirroring a different geopolitical development. The report includes a description of the basis of the data, the methodology, assessments and uncertainties.

The sub-report on traffic scenarios is divided into the following chapters:

Chapter 2: Definition of traffic scenarios
Chapter 3: Prognosis for cargo tonnage
Chapter 4: Prognosis of passenger transport
Chapter 5: Prognosis for average vessel size
Chapter 6: Resulting traffic prognosis

2 Definition of traffic scenarios

2.1 Introduction

Since the end of the BRISK I project, finalised in 2012, various global and regional changes and events have affected the Baltic Sea. These events include the COVID-19 pandemic, Russia's aggression against Ukraine since 2022, and the subsequent EU sanctions against Russia. These sanctions, particularly those limiting Russian exports and imports as well as access to EU ports for certain vessels, have led to the emergence of a 'shadow fleet' in the Baltic Sea. All these factors have had a direct and indirect impact on Baltic Sea transport.

Forecasting future ship traffic patterns has always been complex, even under previously stable geopolitical conditions due to numerous interconnected and unknown factors. Under the current, more unstable conditions, the challenge is even greater. To handle this additional source of uncertainty, it has been decided to define two separate main traffic scenarios, each representing a different course of events. This allows modelling the spill risk results for both traffic scenarios, thereby ultimately making the resulting conclusions and decisions more robust. The two scenarios are described below.

In case of a longer-lasting boom or recession periods in economics, any prognosis can lead to an under- or overestimation, respectively, of the actual growth. A deviation in the order of magnitude of 10 % over a decade is not untypical in that case.

2.2 Scenario 1: Unchanged or worsened geopolitical situation in 2036

- Russia remains excluded from large parts of the global economic interaction.
- The traffic growth to/from Russian Baltic Sea ports correspond to the trend 2022–2024.
- The traffic growth to/from EU Baltic Sea ports is primarily based on case-by-case considerations (each cargo group and country are assessed separately). In some case, the trend 2015-2024 can be representative for the future development, in other cases in can be 2022-2024 or yet another trend.

2.3 Scenario 2: Improved geopolitical situation in 2036

- Russia is reintegrated into the global economy before 2036.
- Traffic growth to/from Russian ports correspond to the trend before the war in Ukraine (i.e., 2015–2021). The logic is that there would be a catch-up effect even if improvement comes late, e.g. in 2030.
- Traffic growth to/from EU Baltic Sea ports is the same as in Scenario 1.
- For crude oil to/from EU Baltic Sea ports, the following is assumed in addition to the growth described in the previous point: If x is the share of Russian crude oil among all crude oil imported to EU Baltic ports before the war, then an improved geopolitical situation will imply that EU Baltic Sea ports will increase their import of Russian crude oil from 0 % to a percentage of x/2. Import of

crude oil from other countries will be reduced correspondingly.

- *Relevant for the accident and spill model (deliverable D2.5): The substandard shadow fleet vessels will be replaced by better maintained and newer vessels.*

3 Prognosis for cargo tonnage

3.1 Introduction

For the BRISK I project, various information resources were used for preparing the cargo tonnage forecast (BRISK, Model report: Part 1 - Ship traffic, 2012). These resources included national data on historical transport development as well as economic prognoses such as the Baltic Marine Outlook 2006 on a regional level and various national prognoses. Unfortunately, it has not been possible to identify any economic analyses that could be used as an input for the BRISK II project. Thus, the project needs to rely solely on analysing and extrapolating historic time series. The main data sources for this subject include Eurostat and data collected by Great Belt VTS as described in the following sections.

3.2 Eurostat data on cargo transport

Data on goods handled in the main ports of the Baltic Sea countries (excluding Russia) from 2015 up to 2024 have been gathered from Eurostat. When reviewing these data, the impacts of recent global challenges- such as the Covid-19 pandemic, geopolitical instability stemming from the war in Ukraine, and other major environmental and political issues- become clearly visible. However, not all the countries were impacted to the same degree. This difference might be due to geographical limitations, internal strategies, market segmentation etc.

Figure 3-1 shows the historic timeline for cargo transport to and from the EU ports in the BRISK II project area, i.e. the Baltic Sea ports including the Swedish North Sea ports. Figure 3-2 and Figure 3-3 show the trendlines for ingoing and outgoing traffic, respectively.

Figure 3-4 to Figure 3-7 show the total numbers (in- and outgoing) broken down into the four types of cargo that Eurostat (Eurostat, 2025) operates with. The cargo types are defined as follows (Eurostat, 2023):

- Liquid bulk: Liquid bulk refers to unpackaged liquid goods that can be handled (i.e. loaded and unloaded) through a pipeline, and which are stored and transported on the vessel or vehicle in tanks. This includes both gases that must be handled and transported under pressure, as well as liquids at ambient temperature and pressure, and molten solids transported at high temperatures. Based on the 'Reference Manual on Maritime Transport Statistics', four different types of liquid bulk cargo are identified at the second level of the directive classification: Liquefied gas, Crude oil, Oil products, and Other liquid bulk goods.
- Dry bulk: Dry bulk: Dry bulk refers to unpackaged solid goods that can be handled and transhipped (i.e. loaded and unloaded) by grab, elevator, auger, or suction equipment. At the second level of the classification, four types of dry bulk cargo are identified: Ores, Coal, Agricultural products (e.g. grain, soya, tapioca), and Other dry bulk goods.
- Large containers: The cargo classification deals with containers that are moved between the vessel and the port by being lifted on or lifted off (Lo-Lo). This involves the use of specialized equipment attached to the container's fittings to allow such movements. While this is most often carried out in highly specialized container terminals, simpler arrangements for these movements are possible in smaller ports. The detailed subheadings for containers classify movements based on container size, as follows:20-foot freight units (1 TEU), 40-foot freight units (2 TEU), Freight units over 20-feet and under 40-feet in length (1.5 TEU), and Freight units over 40-feet long (Code 34) (2.25 TEU).

- Ro-Ro: The critical feature of cargo for classification as 'container cargo' or 'Ro-Ro cargo' is the method by which the goods are moved between the quay and the ship. If the cargo is rolled on or off, it is Ro-Ro cargo. If it is in a container that is lifted on or off, it is Lo-Lo cargo and should be included in large container cargo. However, in some ports, the movements of containers as Ro-Ro cargo are an important element of port activity. Ro-Ro container cargo consists of containers (with or without cargo) loaded on Ro-Ro units, which are then rolled on and rolled off the vessels that carry them by sea.

All cargo types have been allocated to one of those four groups. Since Eurostat does not provide data for general cargo and cars, it has been decided to apply the historic trend observed for dry bulk also to general cargo and cars.

The displayed figures contain several trends that are significant for making a prognosis. These trends include both the beginning of the COVID-19 epidemic in 2020 and the Russian invasion into Ukraine in 2022, alongside with other, more long-term industry trends. Section 3.4 deals with those trends. The detailed numbers behind the displayed figures can be found in Appendix A.

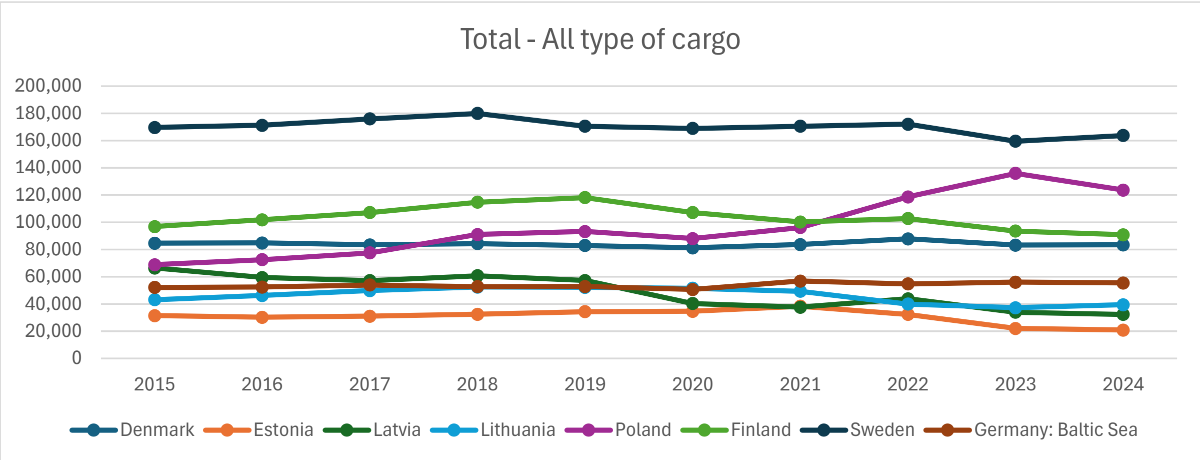

Figure 3-1 Cargo (1,000 tonnes) transported to and from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat

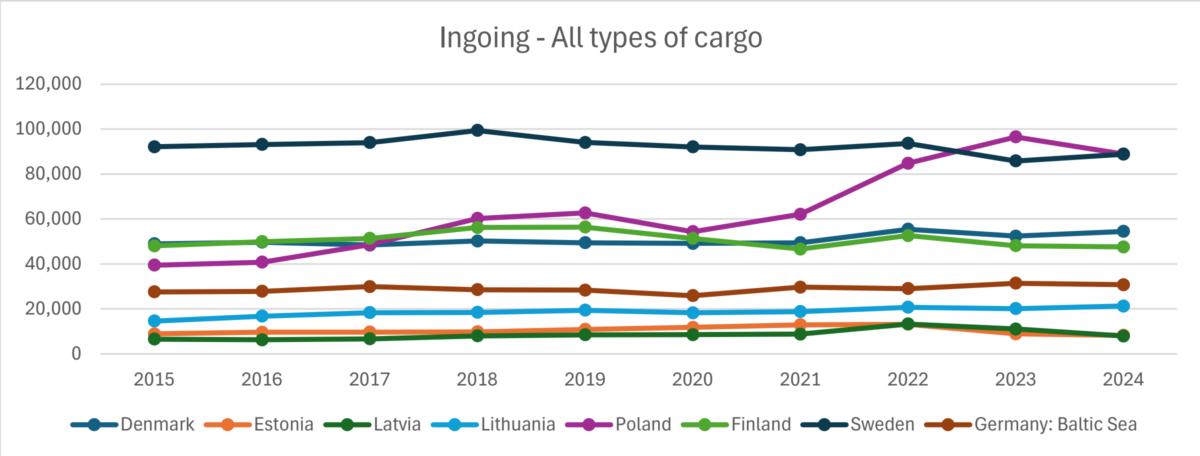

Figure 3-2 Cargo (1,000 tonnes) transported to EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat

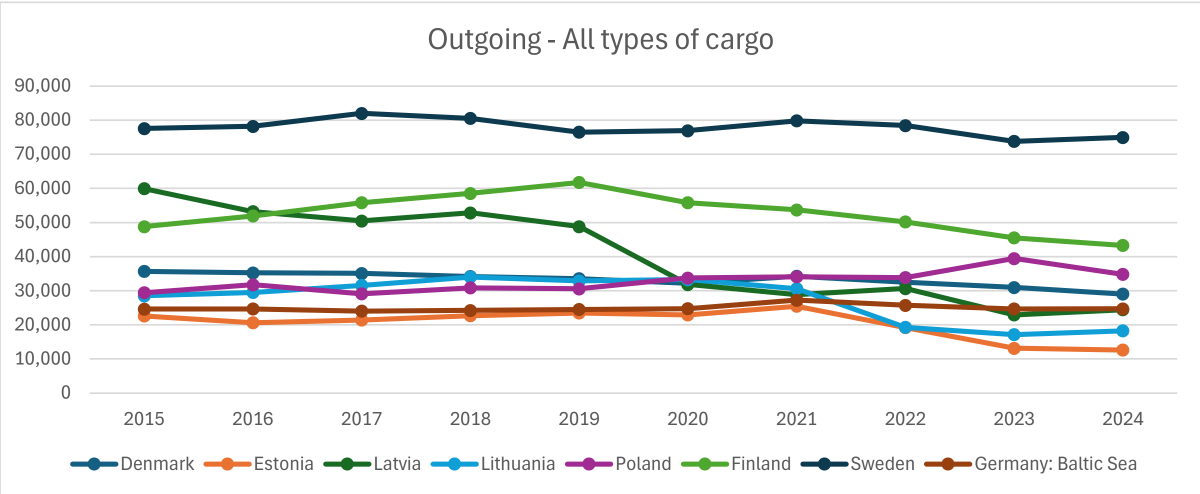

Figure 3-3 Cargo (1,000 tonnes) transported from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat

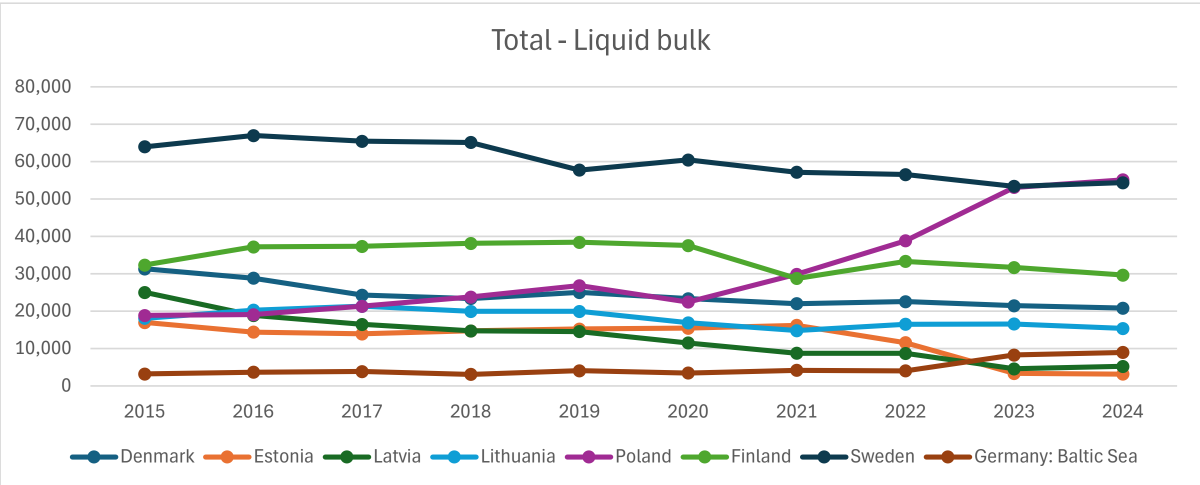

Figure 3-4 Liquid bulk (1,000 tonnes) transported to and from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat

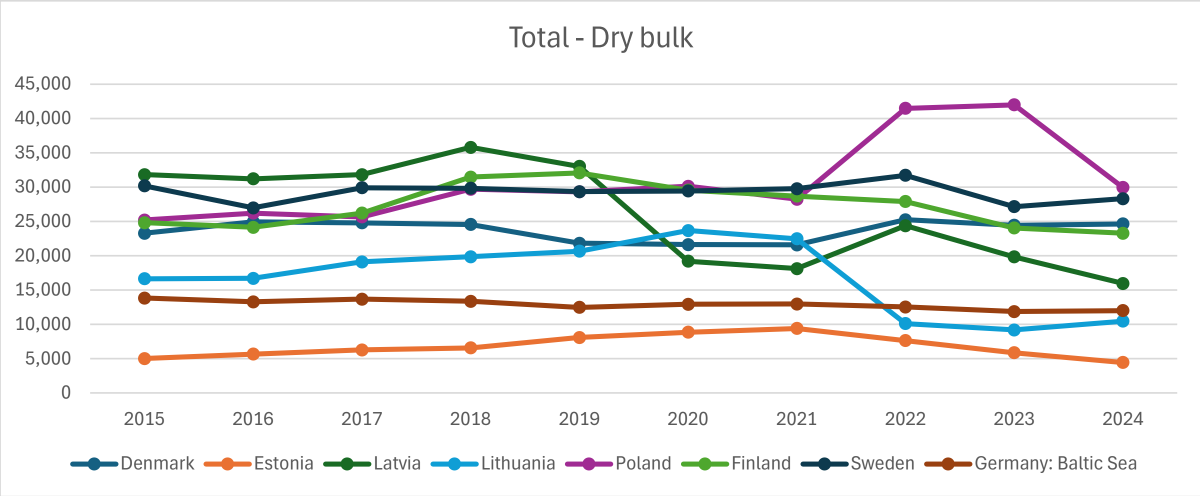

Figure 3-5 *Dry bulk (1,000 tonnes) transported to and from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat*

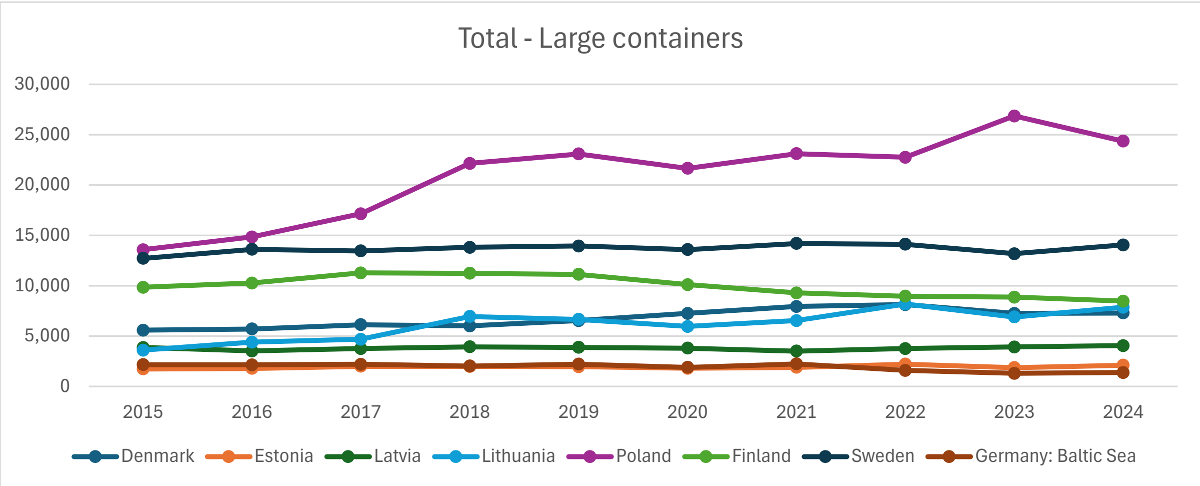

Figure 3-6 *Large containers (1,000 tonnes) transported to and from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat*

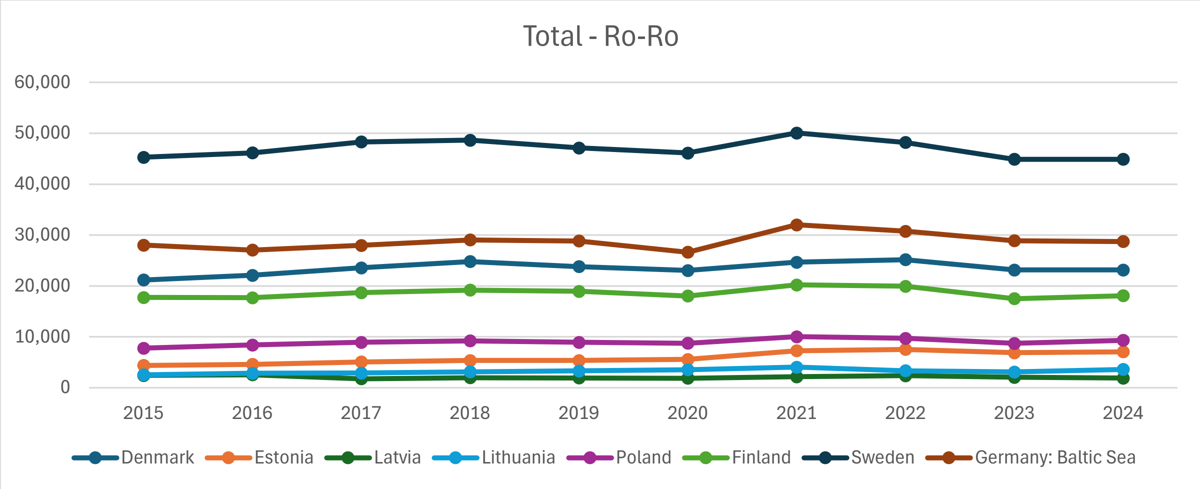

Figure 3-7 Ro-Ro cargo (1,000 tonnes) transported to and from EU Baltic Sea ports (incl. Swedish North Sea ports). Source: Eurostat

3.3 Estimation of cargo tonnages to and from Russia

To analyse the Baltic Sea traffic, it is essential to have an estimation of transactions from all countries bordering the sea. Due to the difficulty in obtaining up-to-date data and historical trend lines covering transport to and from the Russian Baltic Sea ports, data from Great Belt Vessel Traffic Service (VTS) data has been utilised.

Great Belt VTS registers and contacts every vessel with a 50 gross tonnage or more and/or an air draft of 15 meters or more sailing through the Great Belt, collecting detailed information on loaded cargo (i.e. micro-data). Ships can also enter the Baltic Sea via the Sound and the Kiel Canal. However, since the Great Belt is the only deep-sea route allowing deep-draught vessels to enter or leave the Baltic Sea, the dataset provides valuable information that can be applied to maritime traffic across the entire the Baltic Sea, not just its entrances. In the context of the present traffic prognosis, it is important to note that the focus is on the percentual change in cargo tonnage, not the absolute numbers. It is assumed that the percentual development of Russian sea trade via the Great Belt is directly correlated to all the Russian sea trade via the Baltic Sea.

Cargo transportation data to and from Russian ports for the years 2015, 2019, 2021, and 2024 have been extracted. These data are categorised using the same segmentation into types of goods as applied to the other eight countries in the Baltic Sea and are presented in Figure 3-8. The ingoing cargo tonnage (Figure 3-9) is significantly lower than the outgoing cargo tonnage (Figure 3-10). The outgoing cargo tonnage is dominated by liquid bulk. The detailed numbers behind the displayed figures can be found in Appendix A.

Vessels belonging to the so-called shadow fleet, i.e. those figuring on EU's updated sanction list (EU, 2025), can be assumed to be either coming from or going to a Russian Baltic Sea port. This also applies to vessels reporting a non-Russian Baltic Sea port as origin or destination to Great Belt VTS.

An analysis of the 2024 Great Belt VTS dataset shows that roughly 50 percent of the shadow fleet vessels indicated an incorrect origin or destination. Percentage is here understood relative to the cargo capacity (deadweight tonnage) passing the Great Belt.

The figures show that Russian oil exports via the Great Belt doubled after the invasion into Ukraine, presumably as a direct consequence of Russia having to find new buyers outside the Baltic Sea after the introduction of Western sanctions.

Figure 3-8 *Cargo (1,000 tonnes) transported to and from Russian Baltic Sea ports via the Great Belt (corrected for erroneous port information from the shadow fleet). Source: Great Belt VTS*

Figure 3-9 *Cargo (1,000 tonnes) transported to Russian Baltic Sea ports via the Great Belt. Source: Great Belt VTS*

Figure 3-10 *Cargo (1,000 tonnes) transported from Russian Baltic Sea ports via the Great Belt (corrected for erroneous port information from the shadow fleet). Source: Great Belt VTS*

3.4 Historical trend and prognosis for cargo transport

The cargo transport prognosis presented in this section is based on Scenario 1. (Note that Scenario 2 is handled by introducing additional cargo and traffic growth factors in Chapter 6.)

The historical trend lines spanning the ten-year period (2015–2024) show multiple fluctuations in Baltic Sea traffic. For a comprehensive interpretation of these movements, this decade has been divided into three distinct segments based on major geopolitical and health events:

- 2015–2019: The period before the COVID-19 pandemic.
- 2020–2022: The period during and immediately after the COVID-19 pandemic.
- 2022–2024: The period following Russia's full-scale invasion of Ukraine and the subsequent implementation of international sanctions.

The average annual growth rate in the gross weight of goods is calculated per segment for each country (2015-2024), based on the Average Annual Growth Rate (AAGR) formula, covering both total traffic and individual goods categories. This formula is presented in Equation 3-1.

$$AAGR = \left[\left(\frac{Ending\ Value}{Starting\ Value} \right)^{\frac{1}{Number\ of\ Years}} - 1 \right] \times 100 \qquad \text{(Eq. 3-1)}$$

The selection of which AAGR to use as a reference for future trends depends on the specific scenario being modelled and the expected future trajectory for each country. If there is an imbalance between in- and outgoing cargo tonnages for a given combination of country and type of cargo, then the prognosis will be governed by the dominant transport direction. Here, it should be noted that the cargo development analysis carried out in this chapter ultimately serves to estimate the number of vessels passages – and that number is governed by the dominant transport direction.

As for the Russian cargo prognosis, the following assumption has been made based on Scenario 1: Growth in Russian liquid bulk exports will remain static at its 2024 level, since Russia is most likely exporting all the oil it is able to produce (minus its domestic consumptions) already today.

Furthermore, each Baltic Sea country's share of total traffic was determined based on its total cargo tonnage handled in the year 2024.

The historic growth rates, weighting factors and the chosen future growth rates are presented and explained in Table 3-1 to Table 3-4. A manual for reading the tables correctly is provided in Figure 3-11. Note, that the historical trend selected as basis for the prognosis does not necessarily reflect the years shown in the table. As an example, 2023-2024 is used in some cases (the table only display historical data for 2022-2024).

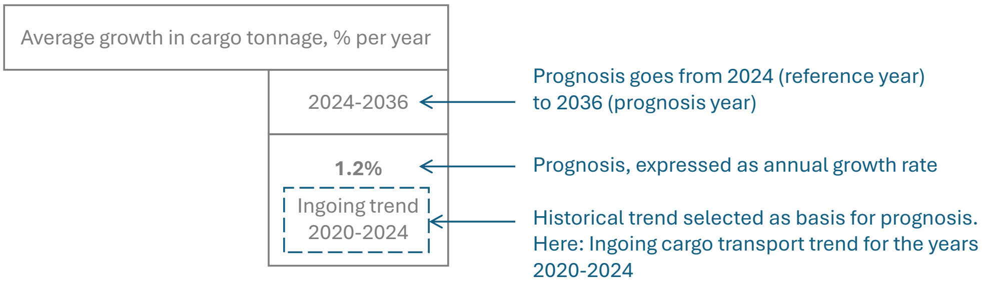

Figure 3-11 Manual for reading Table 3-1 to Table 3-4

Table 3-5 summarises the main results of the cargo tonnage growth prognosis.

Table 3-1 Liquid bulk cargo transported to and from Baltic Sea ports, historic trend and prognosis (Scenario 1).

Countries	Direction	Amount in 1,000 tonnes in 2024	Country weighting	Average growth in cargo tonnage, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	20,822	0.06	-5.60%	-1.78%	-3.95%	**-1.2%** Ingoing trend 2020-2024
	Ingoing	13,493	0.10	-3.36%	0.35%	-2.72%	
	Outgoing	7,329	0.03	-8.27%	-5.19%	-5.49%	
Estonia	Total	3,150	0.01	-2.69%	-11.71%	-46.82%	**0.0%** Ingoing trend 2023-2024
	Ingoing	1,355	0.01	5.06%	-12.35%	-46.82%	
	Outgoing	1,795	0.01	-5.77%	-15.39%	-46.74%	
Latvia	Total	5,231	0.01	-12.46%	-11.71%	-20.33%	**0.0%** > ingoing trend 2023-2024, < earlier years
	Ingoing	2,687	0.02	21.73%	8.47%	-16.33%	
	Outgoing	2,544	0.01	-15.57%	-20.81%	-29.22%	
Lithuania	Total	15,396	0.04	2.46%	-1.26%	-3.23%	**1.2%** Ingoing trend 2020-2024
	Ingoing	11,402	0.08	6.01%	5.46%	-2.78%	
	Outgoing	3,994	0.02	-2.00%	-14.08%	-4.69%	
Poland	Total	55,140	0.16	9.21%	31.29%	17.93%	**3.3%** Ingoing trend 2023-2024
	Ingoing	49,946	0.35	15.41%	36.64%	20.33%	
	Outgoing	5,194	0.02	-6.01%	6.73%	2.23%	
Finland	Total	29,652	0.08	4.40%	-5.78%	-5.60%	**-1.7%** Ingoing trend 2022-2024
	Ingoing	19,826	0.14	3.45%	-4.01%	-1.73%	
	Outgoing	9,826	0.05	5.93%	-7.92%	-11.90%	
Sweden	Total	54,382	0.15	-2.55%	-3.21%	-1.97%	**-3.7%** Ingoing trend 2020-2024
	Ingoing	34,059	0.24	-2.55%	-4.16%	-3.15%	
	Outgoing	20,323	0.10	-2.56%	-1.71%	0.28%	
Germany	Total	8,974	0.03	6.32%	7.92%	49.39%	**6.0%** Ingoing trend 2023-2024
	Ingoing	8,206	0.06	8.05%	16.01%	48.51%	
	Outgoing	768	0.00	1.10%	-20.57%	19.16%	
Russia	Total	191,887	0.45	-	-	-	**0.0 %** See text above table
	Ingoing	564	0.00	-	-	-	
	Outgoing	191,323	0.79	-	-	-	
Total	*Total*	*384.634*	-	-	-	-	***-0.1 %***
	Ingoing	*141,538*	-	-	-	-	
	Outgoing	*243,096*	-	-	-	-	

Table 3-2 *Dry bulk cargo transported to and from Baltic Sea ports, historic trend and prognosis (Scenario 1).*

Countries	Direction	Amount in 1,000 tonnes in 2024	Country weighting	Average growth in cargo tonnage, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	24,643	0.13	-1.59%	8.06%	-1.22%	**1.9%** Ingoing trend 2015-2024
	Ingoing	20,110	0.24	-1.26%	10.96%	1.11%	
	Outgoing	4,533	0.04	-2.50%	-0.61%	-9.92%	
Estonia	Total	4,444	0.02	12.64%	-7.18%	-23.73%	**-1.3%** Overall trend 2015-2024
	Ingoing	1,676	0.02	12.21%	44.33%	-23.42%	
	Outgoing	2,768	0.03	12.73%	-20.13%	-23.91%	
Latvia	Total	15,965	0.08	0.93%	12.67%	-19.10%	**-8.7%** Outgoing trend 2015-2024
	Ingoing	2,945	0.04	6.34%	54.85%	-33.16%	
	Outgoing	13,020	0.12	0.48%	3.97%	-14.48%	
Lithuania	Total	10,466	0.05	5.54%	-34.61%	1.69%	**1.7%** Overall trend 2022-2024
	Ingoing	3,425	0.04	10.44%	-14.10%	16.51%	
	Outgoing	7,041	0.06	4.81%	-38.75%	-3.74%	
Poland	Total	29,951	0.15	3.85%	17.34%	-15.04%	**-0.6%** Ingoing trend 2020-2024
	Ingoing	18,064	0.22	12.77%	28.54%	-23.08%	
	Outgoing	11,887	0.11	-11.41%	-3.04%	4.16%	
Finland	Total	23,291	0.12	6.63%	-2.84%	-8.65%	**-1.2%** Ingoing trend 2020-2024
	Ingoing	15,340	0.18	2.91%	5.94%	-7.81%	
	Outgoing	7,951	0.07	12.27%	-14.48%	-10.20%	
Sweden	Total	28,330	0.15	-0.71%	3.82%	-5.51%	**-0.7%** Overall trend 2015-2024
	Ingoing	15,184	0.18	1.64%	9.69%	-8.53%	
	Outgoing	13,146	0.12	-3.36%	-2.73%	-1.62%	
Germany	Total	12,013	0.06	-2.57%	-1.54%	-2.13%	**-0.8%** Outgoing trend 2015-2024
	Ingoing	4,880	0.06	-1.36%	1.36%	-5.92%	
	Outgoing	7,133	0.06	-3.58%	-3.65%	0.74%	
Russia	Total	44,470	0.23	-	-	-	**-4.7%** Outgoing trend 2021-2024
	Ingoing	1,965	0.02	-	-	-	
	Outgoing	42,506	0.39	-	-	-	
Total	*Total*	*193,573*	-	-	-	-	***-1.9%***
	Ingoing	*83,589*	-	-	-	-	
	Outgoing	*109,985*	-	-	-	-	

Table 3-3 Cargo in large containers transported to and from Baltic Sea ports, historic trend and prognosis (Scenario 1).

Countries	Direction	Amount in 1,000 tonnes in 2024	Country weighting	Average growth in cargo tonnage, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	7,291	0.10	4.09%	5.84%	−5.00%	**0.5%** Overall trend 2023-2024
	Ingoing	3,587	0.12	3.62%	7.64%	−4.49%	
	Outgoing	3,704	0.09	4.47%	4.24%	−5.92%	
Estonia	Total	2,110	0.03	3.02%	10.74%	−2.45%	**5.1%** Outgoing trend 2015-2024
	Ingoing	718	0.02	−1.10%	10.02%	−9.71%	
	Outgoing	1,392	0.03	6.54%	11.19%	2.08%	
Latvia	Total	4,059	0.06	0.08%	−0.44%	3.80%	**2.8%** Outgoing trend 2015-2024
	Ingoing	1,055	0.03	−3.87%	−2.72%	−3.81%	
	Outgoing	3,004	0.07	2.43%	0.67%	6.84%	
Lithuania	Total	7,859	0.11	16.51%	17.38%	−2.03%	**9.0%** Overall trend 2015-2024
	Ingoing	3,748	0.12	15.22%	25.29%	0.48%	
	Outgoing	4,111	0.10	17.30%	9.49%	−4.18%	
Poland	Total	24,349	0.34	14.15%	2.48%	3.43%	**3.0%** Overall trend 2020-2024
	Ingoing	12,738	0.42	11.89%	5.09%	6.57%	
	Outgoing	11,611	0.29	16.69%	0.24%	0.32%	
Finland	Total	8,476	0.12	3.10%	−5.48%	−2.71%	**-4.0%** Outgoing trend 2020-2024
	Ingoing	2,052	0.07	−0.99%	−5.37%	−5.11%	
	Outgoing	6,424	0.16	4.66%	−6.12%	−1.90%	
Sweden	Total	14,056	0.20	2.34%	1.90%	−0.23%	**1.2%** Outgoing trend 2015-2024
	Ingoing	5,637	0.18	2.64%	5.99%	−3.18%	
	Outgoing	8,419	0.21	2.15%	−0.85%	1.98%	
Germany	Total	1,390	0.02	0.71%	−8.09%	−6.31%	**-4.8%** Overall trend 2015-2024
	Ingoing	489	0.02	−0.19%	−2.28%	−15.69%	
	Outgoing	901	0.02	1.55%	−12.98%	−0.55%	
Russia	Total	1,474	0.02	-	-	-	**-4.5%** Overall trend 2021-2024
	Ingoing	501	0.02	-	-	-	
	Outgoing	974	0.02	-	-	-	
Total	*Total*	*71,064*	-	-	-	-	***2.0%***
	Ingoing	*30,525*	-	-	-	-	
	Outgoing	*40,540*	-	-	-	-	

Table 3-4 Ro-Ro cargo transported to and from Baltic Sea ports, historic trend and prognosis (Scenario 1).

Countries	Direction	Amount in 1,000 tonnes in 2024	Country weighting	Average growth in cargo tonnage, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	23,158	0.16	3.09%	4.55%	-4.08%	**0.1%** Overall trend 2020-2024
	Ingoing	11,342	0.17	2.63%	4.75%	-3.87%	
	Outgoing	11,816	0.15	3.33%	4.32%	-4.37%	
Estonia	Total	7,071	0.05	5.17%	16.51%	-3.24%	**6.2%** Overall trend 2020-2024
	Ingoing	3,821	0.06	4.76%	16.03%	0.26%	
	Outgoing	3,250	0.04	5.67%	16.94%	-6.71%	
Latvia	Total	1,881	0.01	-5.60%	12.60%	-10.87%	**0.3%** Overall trend 2020-2024
	Ingoing	863	0.01	-7.25%	16.27%	-6.55%	
	Outgoing	1,018	0.01	-4.01%	10.27%	-13.62%	
Lithuania	Total	3,609	0.02	6.71%	-3.05%	4.04%	**0.5%** Overall trend 2020-2024
	Ingoing	1,587	0.02	3.53%	-1.13%	6.25%	
	Outgoing	2,022	0.03	9.32%	-4.33%	2.43%	
Poland	Total	9,319	0.06	3.53%	5.37%	-1.97%	**1.6%** Overall trend 2020-2024
	Ingoing	4,852	0.07	2.39%	5.40%	-0.48%	
	Outgoing	4,467	0.06	4.93%	5.28%	-3.43%	
Finland	Total	18,085	0.12	1.67%	5.17%	-4.79%	**0.1%** Overall trend 2020-2024
	Ingoing	8,409	0.12	2.71%	5.66%	-7.02%	
	Outgoing	9,676	0.12	0.74%	4.77%	-2.56%	
Sweden	Total	44,886	0.30	1.00%	2.25%	-3.40%	**-0.7%** Overall trend 2020-2024
	Ingoing	22,908	0.34	1.75%	2.33%	-3.28%	
	Outgoing	21,978	0.27	0.26%	2.14%	-3.93%	
Germany	Total	28,740	0.19	0.71%	7.49%	-3.28%	**-3.3%** Overall trend 2022-2024
	Ingoing	14,090	0.21	0.46%	7.54%	-3.68%	
	Outgoing	14,650	0.18	0.98%	7.38%	-3.18%	
Russia	Total	11,528	0.08	-	-	-	**0.0%** Estimated at 0 % due to lack of data points
	Ingoing	74	0.00	-	-	-	
	Outgoing	11,454	0.14	-	-	-	
Total	*Total*	*148,277*	-	-	-	-	***-0.4 %***
	Ingoing	*67,946*	-	-	-	-	
	Outgoing	*80,331*	-	-	-	-	

Table 3-5 Resulting prognosis for cargo tonnage (Scenario 1).

Type of cargo	Prognosis, growth per year (2024-2036)	Prognosis, total growth over 12 years (2024-2036)
Liquid bulk	-0.1%	-1.2%
Dry bulk	-1.9%	-20.3%
Large containers	2.0%	26.3%
Ro-Ro	-0.4%	-4.7%

4 Prognosis of passenger transport

In this section, data from Eurostat on passengers transported from all ports of the Baltic Sea countries (excluding Russia) from 2015 to 2024 are analysed. These data are categorized into two main types: Passengers excluding cruise passengers, and passengers starting and ending a cruise, which are presented in Figure 4-1 and Figure 4-2. The detailed numbers behind the displayed figures can be found in Appendix B.

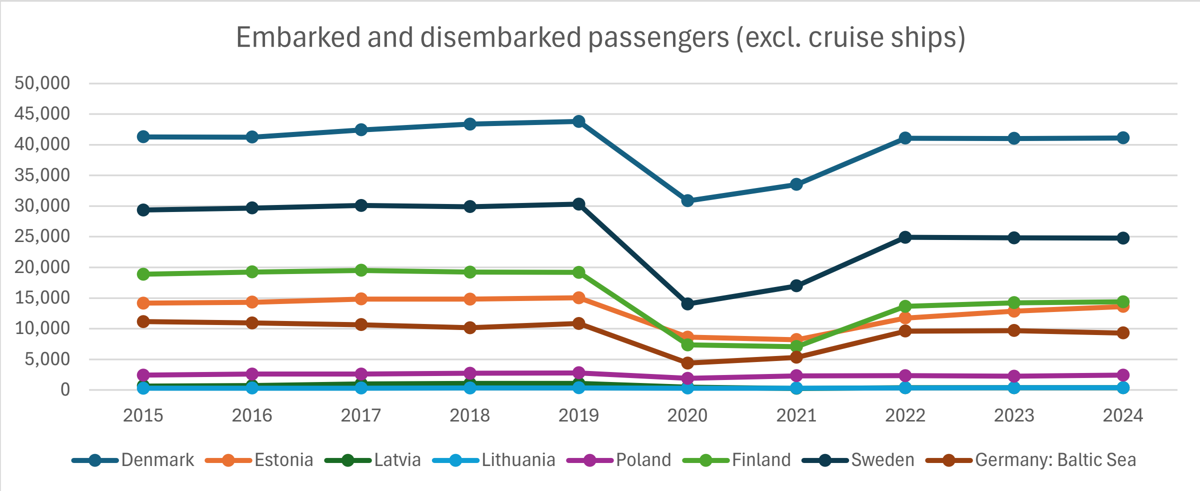

Figure 4-1 Passengers (excl. cruise ships) embarked and disembarked at Baltic Sea ports and Swedish North Sea ports (thousand passengers). Source: Eurostat

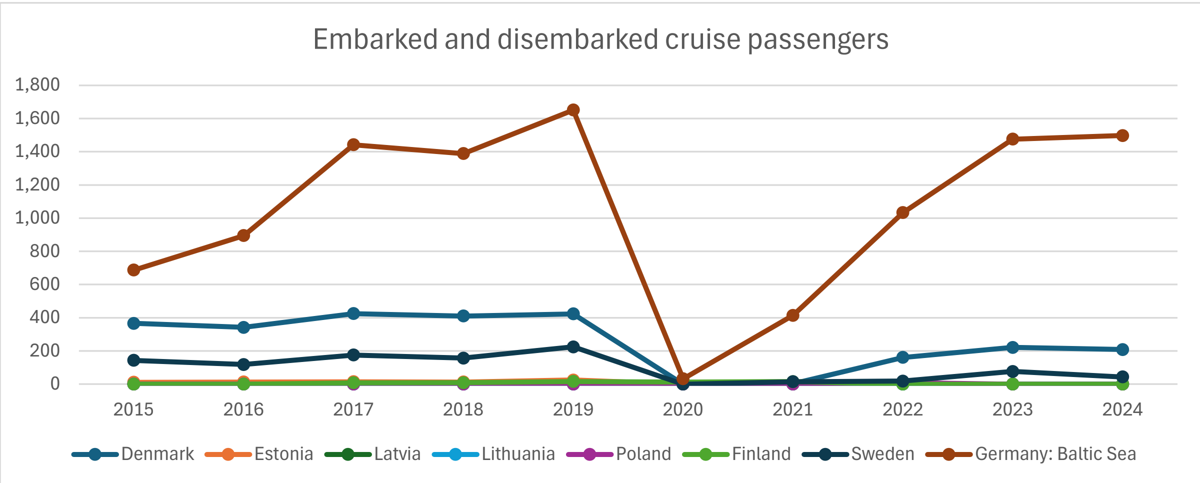

Figure 4-2 Cruise passengers embarked and disembarked at Baltic Sea ports and Swedish North Sea ports (thousand passengers). Source: Eurostat

The average annual growth rate for passengers transported in the Baltic Sea is calculated for each country (2015–2024), based on equation 3-1. The historic growth rates, weighting factors and the chosen future growth rates are presented and explained in Table 4-1[1].

As it can be seen from Figure 4-1, passenger numbers (excl. cruise ships) took at dip during the COVID-19 years but returned to a stable development from 2022 an onwards. For this reason, the observed annual passenger growth rate 2022-2024 has been selected as the best estimate for the future development 2024-2036.

In the case of cruise passengers (Figure 4-2), only three countries had actual embarkments and disembarkments in 2024, i.e. Germany, Denmark and Sweden. In the case of Germany, numbers recovered to their pre-COVID levels during 2020-2023 and subsequently flattened out during 2023-2024. The tendency from 2023-2024 is seen as the most realistic estimate for the future development. Danish and Swedish passenger numbers equally recovered until 2023 but showed a minor decline afterwards. Since both countries feature significantly fewer cruise passengers than Germany, a few single ships can be the cause for this negative trend. It is therefore decided to regard the German future trend to be representative also Danish and Swedish ports.

Table 4-3 summarizes the main results of the passenger growth model prognosis.

[1] The table is structured in the same way as Table 3-1 to Table 3-4. Thus, the manual for reading the tables provided in Figure 3-11 also applies here.

Table 4-1 *Passengers (excluding cruise passengers) embarked and disembarked at Baltic Sea ports and Swedish North Sea ports, historic trend and prognosis.*

Countries	Direction	Passengers Number (in 2024)	Country Weighting (Passengers Number)	Average growth in Passengers, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	41,109	0.39	1.49%	15.28%	0.05%	**0.05%** Overall trend 2022-2024
	Disembarked	20,544	0.39	1.48%	15.22%	-0.06%	
	Embarked	20,565	0.39	1.52%	15.39%	0.17%	
Estonia	Total	13,611	0.13	1.51%	16.87%	7.68%	**7.7%** Overall trend 2022-2024
	Disembarked	6,804	0.13	1.53%	16.87%	7.68%	
	Embarked	6,807	0.13	1.51%	16.64%	7.52%	
Latvia	Total	360	0.00	12.78%	-10.87%	-1.50%	**-1.5%** Overall trend 2022-2024
	Disembarked	178	0.00	13.31%	-11.96%	1.14%	
	Embarked	182	0.00	12.46%	-9.79%	-3.87%	
Lithuania	Total	371	0.00	4.77%	4.75%	4.79%	**4.8%** Overall trend 2022-2024
	Disembarked	177	0.00	5.00%	5.78%	5.17%	
	Embarked	194	0.00	4.38%	3.57%	4.35%	
Poland	Total	2,426	0.02	3.54%	10.91%	2.11%	**2.1%** Overall trend 2022-2024
	Disembarked	1,226	0.02	4.00%	9.27%	3.69%	
	Embarked	1,200	0.02	3.19%	11.92%	0.59%	
Finland	Total	14,369	0.14	0.38%	36.21%	2.64%	**2.6%** Overall trend 2022-2024
	Disembarked	7,209	0.14	0.42%	36.19%	2.60%	
	Embarked	7,161	0.13	0.33%	36.53%	2.70%	
Sweden	Total	24,771	0.23	0.80%	33.43%	-0.25%	**-0.3%** Overall trend 2022-2024
	Disembarked	12,461	0.23	0.97%	34.11%	-0.58%	
	Embarked	12,310	0.23	0.61%	32.50%	0.08%	
Germany	Total	9,305	0.09	-0.64%	48.00%	-1.50%	**-1.5%** Overall trend 2022-2024
	Disembarked	4,619	0.09	-1.61%	48.16%	-1.51%	
	Embarked	4,686	0.09	0.11%	47.89%	-1.50%	
Total	*Total*	*106,322*	-	*1.07%*	*23.74%*	*1.12%*	***1.2 %***
	Disembarked	*53,218*	-	*1.06%*	*23.84%*	*1.04%*	
	Embarked	*53,105*	-	*1.09%*	*23.63%*	*1.22%*	

Table 4-2 Cruise passengers embarked and disembarked at Baltic Sea ports and Swedish North Sea ports, historic trend and prognosis. Only countries with non-zero passenger numbers in 2024 included.

Countries	Direction	Passengers Number (in 2024)	Country Weighting (Passengers Number)	Average growth in Passengers, % per year			
				2015-2019	2020-2022	2022-2024	2024-2036
Denmark	Total	208	0.12	3.68%	N/A	13.66%	**1.5%** Based on German trend
	Disembarked	106	0.12	3.38%	N/A	14.40%	
	Embarked	102	0.12	3.73%	N/A	12.22%	
Sweden	Total	43	0.02	11.87%	N/A	54.56%	**1.5%** Based on German trend
	Disembarked	25	0.03	4.20%	Indefinite	66.67%	
	Embarked	19	0.02	22.96%	N/A	45.30%	
Germany	Total	1,498	0.86	24.51%	468.17%	20.42%	**1.5%** Overall trend 2023-2024
	Disembarked	772	0.85	22.84%	517.02%	20.35%	
	Embarked	726	0.86	26.25%	427.05%	20.50%	
Total	*Total*	*1,749*	-	-	-	-	***1.5%***
	Disembarked	*903*	-	-	-	-	
	Embarked	*847*	-	-	-	-	

Table 4-3 Resulting prognosis for passenger transport

Type of cargo	**Prognosis, growth per year (2024-2036)**	**Prognosis, total growth over 12 years (2024-2036)**
Passengers excl. cruise ships	1.2%	15.8%
Cruise passengers	1.5%	19.4%

5 Prognosis for average vessel size

Because ships are increasing in size over time, the total cargo volume grows faster than the number of voyages, as larger vessels can carry more cargo tonnage per trip. Therefore, forecasting future voyage counts requires more than just predicting cargo growth; vessel size trends must also be considered. For the present analysis, ship size is measured in deadweight tonnage (DWT), i.e. the cargo capacity of a ship indicated in tonnes.

The left part of Table 5-1 indicates the average DWT for the three reference years 2015, 2021 and 2024.

- Great Belt: The numbers show the average DWT of all unique vessels passing the Great Belt.
- Great Belt, per passage: Here, the average DWT is weighted by the number of passages of any given vessel. This number is the most relevant indicator for predicting the future ship size development.
- Global situation: Here, only the number for 2024 is shown. This number is based on S&P Sea-web, a commercial register of the global merchant fleet. The global average DWT helps putting the average DWT observed at the Great Belt into perspective.

The average ship size in the Great Belt is relatively similar to that observed on a global level:

- Crude oil tankers are smaller than on a global level, which can be explained by the draught limitations (shipping lane depth) in the Great Belt (17 m) and in the Kadetrenden between the Danish island of Falster and the German mainland (15 m).
- Product and chemical tankers have almost the same DWT as on a global average when considering the passage-weighted numbers.
- Gas tankers in the Great Belt are slightly bigger, whereas bulk carriers are slightly smaller compared to the global fleet.
- Ro-Ro ships are significantly larger than on a global average.

Table 5-1 Development of the average vessel size globally and at the Great Belt. Source: S&P Sea-web (global data), Great Belt VTS (local data). (GBpp = Great Belt, per passage)

Ship type	Fleet	Average vessel size (DWT)			Yearly growth in average DWT		
		2015	2021	2024	2015-2021	2021-2024	2024-2036
Crude oil tanker	Global			150,802			**0.3%** Trend GBpp 2015-2021
	Gr. Belt	110,940	113,052	119,418	0.3%	1.8%	
	Gr. Belt, per passage	110,423	112,322	116,613	0.3%	1.3%	
Oil product tanker	Global			40,210			**0.7%** Trend GBpp 2015-2021
	Gr. Belt	45,439	41,953	49,913	-1.3%	6.0%	
	Gr. Belt, per passage	30,591	31,860	42,279	0.7%	9.9%	
Chemical tanker (incl. chem./oil prod.)	Global			19,624			**0.6%** Trend GBpp 2015-2024
	Gr. Belt	28,408	29,402	32,275	0.6%	3.2%	
	Gr. Belt, per passage	20,602	21,886	21,654	1.0%	-0.4%	
Gas tanker	Global			36,557			**6.7%** See text below table
	Gr. Belt	20,191	45,009	59,838	14.3%	10.0%	
	Gr. Belt, per passage	16,166	30,517	41,439	11.2%	10.7%	
Bulk carrier	Global			69,932			**0.8%** Trend GBpp 2015-2024
	Gr. Belt	52,960	56,049	55,291	0.9%	-0.5%	
	Gr. Belt, per passage	48,478	53,755	52,039	1.7%	-1.1%	
General cargo ship (incl. reefer)	Global			6,013			**2.0%** Trend GBpp 2015-2024
	Gr. Belt	9,166	9,409	10,973	0.4%	5.3%	
	Gr. Belt, per passage	6,328	6,888	7,576	1.4%	3.2%	
Vehicle carrier	Global			16,109			**4.3%** See text below table
	Gr. Belt	15,813	12,595	14,420	-3.7%	4.6%	
	Gr. Belt, per passage	7,676	9,866	14,558	4.3%	13.8%	
Container ship	Global			52,095			**5.6%** Trend GBpp 2015-2024
	Gr. Belt	43,310	67,490	72,432	7.7%	2.4%	
	Gr. Belt, per passage	29,986	39,352	48,997	4.6%	7.6%	
Ro-Ro ship	Global			9,526			**3.1%** Trend GBpp 2015-2024
	Gr. Belt	10,795	11,734	13,411	1.4%	4.6%	
	Gr. Belt, per passage	10,599	11,593	13,999	1.5%	6.5%	

The right part of Table 5-1 indicates the observed past development and the expected future development of the average ship sizes in annual percentages[2]:

- For most ship types, the long-term trend 2015-2024 is used for estimating the future trend. Oil tankers typically have a life cycle of 20 or more years, whereas other ships are often used for 30 year and more.

[2] The table is structured in the same way as Table 3-1 to Table 3-4. Thus, the manual for reading the tables provided in Figure 3-11 also applies here.

This means that average ship sizes change slowly. Unlike the development of cargo tonnages discussed in the previous chapter, short-term economic shocks do not impact the composition of the global fleet.

- In the case of crude oil and oil product tankers, a major shift took place after the Russian invasion into Ukraine. Russia doubled its transport of oil to countries outside the Baltic Sea (see Chapter 3), while the EU Baltic Sea countries started importing a higher share of their oil from outside the Baltic Sea. Thus, the sudden jump in vessel size 2021-2024 essentially reflects a reallocation of oil tankers from other parts of the world to the Baltic Sea. This is interpreted as a one-off effect that cannot be used for forecasting the future growth of average oil tankers sizes. Thus, it has been decided to base the forecast 2024-2036 on the growth rate observed in 2015-2021.

- The average size of gas tankers in the Great Belt (passage-weighted) has grown by 11 % annually since 2015. However, a continued growth rate in this order of magnitude is unrealistic, as it would lead to an average size of 145,000 DWT in 2036. For comparison, newly built LNG tankers have grown from an average 70,000 DWT in the early 2000s to an average 90,000 DWT in the early 2020s, corresponding to an annual growth rate of 1.25 %. If this trend continues, the average newly built LNG tanker will be 105,000 DWT large in 2036. Tankers usually have a lifecycle of 20 years and more and the annual number of yearly newly built of LNG tankers has only increased relative moderately during the past 20 years. Hence, the average existing LNG tanker in 2036 will most likely be similar in size to a newly built LNG tanker in 2024, i.e. approximately 90,000 DWT. On this basis, it appears unrealistic to assume that gas tankers frequenting the Great Belt in 2036 would be larger than 90,000 DWT on average. Accepting this limit corresponds to a yearly growth rate of 6.7 % for the size of gas tankers in the Baltic Sea.

- For vehicle carriers, the trend 2015-2021 is applied, since using the trend from 2021-2024 (13.8 % per year) would lead to five-time larger vessels by 2036. Firstly, such an explosion in size is unrealistic. Secondly, the non-weighted size (i.e. the average size based on unique vessels) has not changed much between 2015 and 2024. This also indicates that maximum vessel sizes have reached or are close to reaching an upper boundary.

As for passenger ships, it is generally assumed that the vessel size will remain at a stable level. The same goes for all other ship types such as work vessels etc.

On a general note, an increase in average DWT does not mean an increase in maximum DWT. Often, ships cannot become any larger due to draught restrictions. This is principle is discussed and applied in Chapter 6.

Table 5-2 summarises the resulting vessel size development model.

Table 5-2 Resulting prognosis for average DWT

Ship type	Prognosis, growth per year (2024-2036)	Prognosis, total growth over 12 years (2024-2036)
Crude oil tanker	0.3%	3.5%
Oil product tanker	0.7%	8.5%
Chemical tanker (incl. chem./oil prod.)	0.6%	6.9%
Gas tanker	6.7%	117.8%
Bulk carrier	0.8%	9.9%
General cargo ship (incl. reefer)	2.0%	27.1%
Vehicle carrier	4.3%	65.2%
Container ship	5.6%	92.5%
Ro-Ro ship	3.1%	44.9%
All other ship types	0.0 %	0.0 %

6 Resulting traffic prognosis

6.1 Scenario 1 (unchanged or worsened geopolitical situation)

The expected number of ship voyages for each ship type and ship size is based on two input parameters:

- The expected development of cargo tonnage (per type of cargo) and passengers, see Table 3-5 and Table 4-3
- The expected development of the average vessel size in DWT (per ship type), see Table 5-2

Ship types and types of cargo are matched as indicated in Table 6-1. The following should be noted:

- Combined ferry/Ro-Ro ships are linked to passenger rather than Ro-Ro development, as passengers are expected to increase at a higher rate than Ro-Ro cargo, see Table 3-5 and Table 4-3.
- Cargo carried by general cargo vessels and vehicle carriers is assumed to follow the same trend as dry bulk, as discussed in Section 3.2.

Table 6-1 Allocation of cargo/passenger types to ship types

Ship type	Cargo or passenger type
Crude oil tanker	Liquid bulk
Oil product tanker	Liquid bulk
Chemical tanker (incl. chem./oil prod.)	Liquid bulk
Gas tanker	Liquid bulk
Bulk carrier	Dry bulk
General cargo ship (incl. reefer)	Dry bulk
Vehicle carrier	Dry bulk
Container ship	Large containers
Ro-Ro ship	Ro-Ro
Ferry	Passengers (excl. cruise)
Ferry/Ro-Ro	Passengers (excl. cruise)
Cruise ship	Cruise passengers
All other ship types	No change

As ships increase in size over time, the growth in the number of voyages is slower than the growth in cargo tonnage. However, it is assumed that the maximum size of ships measured in DWT within each type will remain unchanged from 2024 to 2036. This prevents the traffic model from predicting voyages that would be physically impossible due to draft and length limitations in ports and fairways int the Baltic

Sea. When considering a given ship type, the number of voyages of larger ships needs to grow at a faster pace than the voyages of smaller ships.

Finding traffic growth rates for each combination of ship type and ship size in a way that satisfies both the cargo transport forecast and the ship size forecast is not a straightforward process. It requires applying a mathematical optimisation process, which is described in Appendix C. For passenger ships, the calculation is simple, as the traffic numbers simply mirror the increase in passenger numbers. The resulting prognosis model is displayed in Table 6-2. Multiplying the prognosis factors in the table with the traffic numbers for 2024 will yield the traffic numbers for 2036.

Several adjustments have been made to the results of the mathematical model:

- For small ships under 3,000 DWT sailing in the Baltic Sea, the situation in the Great Belt is not deemed to be representative. Here, it has been assumed that traffic numbers will be unchanged, thus the prognosis factor has been set to 1. It should be noted that this leads to a slight overestimation of the future traffic measured in miles × DWT and thus to a slight overestimation of the spill risk. However, a little error on the safe side is preferred to the alternative; this would be underestimating the local spill risk in areas only frequented by small ships.

- Also, the prognosis factors for small crude oil carriers under 25,000 DWT have been manually adjusted to a value that is higher than the calculated results. This is again a conservative assumption, albeit with a very limited effect due to the very small number of crude oil tankers in the affected size classes.

- The prognosis factor for container ships under 25,000 DWT has equally been adjusted upwards, to account for operations with feeder ships that are not represented accurately by the situation in the Great Belt. This, again, has a conservative effect and leads to an overestimation of the actual traffic measured in miles × DWT

Table 6-2 Prognosis factors for 2036, Scenario 1 (to be multiplied to the 2024 traffic numbers)

Ship size (DWT) → Ship type ↓	0- 500	500- 3,000	3,000- 10,000	10,000- 25,000	25,000- 100,000	>100,000
Crude oil tanker	1.00	1.00	0.51	0.51	0.51	1.01
Oil product tanker	1.00	1.00	0.34	0.46	0.89	1.52
Chemical tanker (incl. chem./oil prod.)	1.00	1.00	0.92	0.94	1.01	1.00
Gas tanker	1.00	1.00	0.73	0.78	1.02	2.00
Bulk carrier	1.00	1.00	0.58	0.62	0.76	1.01
General cargo ship (incl. reefer)	1.00	1.00	0.67	0.78	1.02	2.00
Vehicle carrier	1.00	1.00	0.77	0.81	0.82	1.00
Container ship	1.00	1.00	0.40	0.45	0.56	1.91
Ro-Ro ship	1.00	1.00	0.41	0.77	1.67	1.00
Cruise ship	1.19	1.19	1.19	1.19	1.19	1.19
Ferry	1.16	1.16	1.16	1.16	1.16	1.16
Ferry/Ro-Ro	1.16	1.16	1.16	1.16	1.16	1.16
All other ship types	1.00	1.00	1.00	1.00	1.00	1.00

6.2 Scenario 2 (improved geopolitical situation)

For the case that Russia is reintegrated into the global economy and sanctions are lifted, the correction factors showed in Table 6-3 are applied to all vessels going to or from Russian Baltic Sea ports (including shadow fleet ships regardless of their origin and destination). The correction factors are multiplied with the traffic resulting from the Scenario 1 model. The following reasoning leads to the numbers in the table:

- For liquid bulk, it is assumed that Russia will export the same amounts as in Scenario 1. This is based on the assumption that Russia is exporting oil at its maximum capacity and that this capacity will not have increased by 2036. Thus, the correction factor for the Russian EEZ is 1.00, meaning no change. However, EU Baltic Sea countries will import half of the Russian crude oil they imported before the war. Consequently, 24 % of the tankers leaving the Russian EEZ will call at an EU Baltic Sea port instead of travelling through the Great Belt. This is reflected by the factor 0.76. When converting this development into a growth rate relative to 2021, it corresponds to an annual rate of 2.8 %.

  Between the Great Belt and the Russian EEZ, the correction factor gradually transitions from 0.76 to 1.00.

- For dry bulk, using the pre-war growth rate of 16.1 % would lead to unrealistically high absolute cargo tonnages. Thus, it has been assumed that the cargo tonnage will grow by the same absolute increment as before the war every year between 2021-2036. When converting this into a growth rate over 15 years, this corresponds to 6.0 % per year.

- For containers, the growth rate is even higher than for dry bulk at 19.0 %. However, this number is not seen as unrealistic given the very low initial value and the global trend towards containerisation.

Table 6-3 *Cargo correction factor for Scenario 2. Applies to ships going to and from Russian Baltic Sea ports (including all shadow fleet vessels regardless of origin/destination)*

Ships to/from Russian Baltic Sea ports	Basis value in 1,000 tonnes	Pre-war growth rate	2021 value in 1,000 tonnes	Assumed growth rate after 2021	2036 estimate in 1,000 tonnes	Factor relative to Scenario 1
Liquid bulk, through Great Belt	104,726 (2015)	-1.4% (2015-2021)	96,369	2.8% (see text above table)	145,826	0.76
Liquid bulk, Russian EEZ in the Baltic Sea	-					1.00
Dry bulk	20,850 (2015)	16.1% (2015-2021)	51,112	6.0% (stable absolute increments)	122,492	4.91
Large containers	595 (2015)	19.0% (2015-2021)	1.690	19.0% (trend 2015-2021)	22,975	27.08
Ro-Ro	49 (2021)	N/A	49	0% (lack of better information)	49	1.00

Table 6-4 displays a correction factor applying to ships carrying liquid bulk and sailing between an EU Baltic Sea port and a non-Baltic Sea port. The factor has been calibrated such that the absolute change in cargo tonnage for the affected vessels harmonises with the absolute change for vessels to and from Russia.

Table 6-4 *Cargo correction factor for Scenario 2. Applies to ships going between EU Baltic Sea ports and non-Baltic ports*

Ships between EU Baltic Sea ports and non-Baltic ports	Factor relative to Scenario 1
Liquid bulk	0.77

6.3 Re-routing due to offshore wind farms

Several offshore wind farms (OWFs) will be constructed between the reference year 2024 and the prognosis year 2036, see Figure 6-1. Routes intersecting planned OWFs are coloured red, whereas routes intersection potential OWFs (i.e. OWFs that have not been approved by the authorities yet) are not highlighted. Potential OWFs are only shown for information purposes but not considered in the model.

The prognosis model takes this into account by relocating the traffic from the 2024 model to adjacent route segments in case the existing traffic intersects with the OWFs.

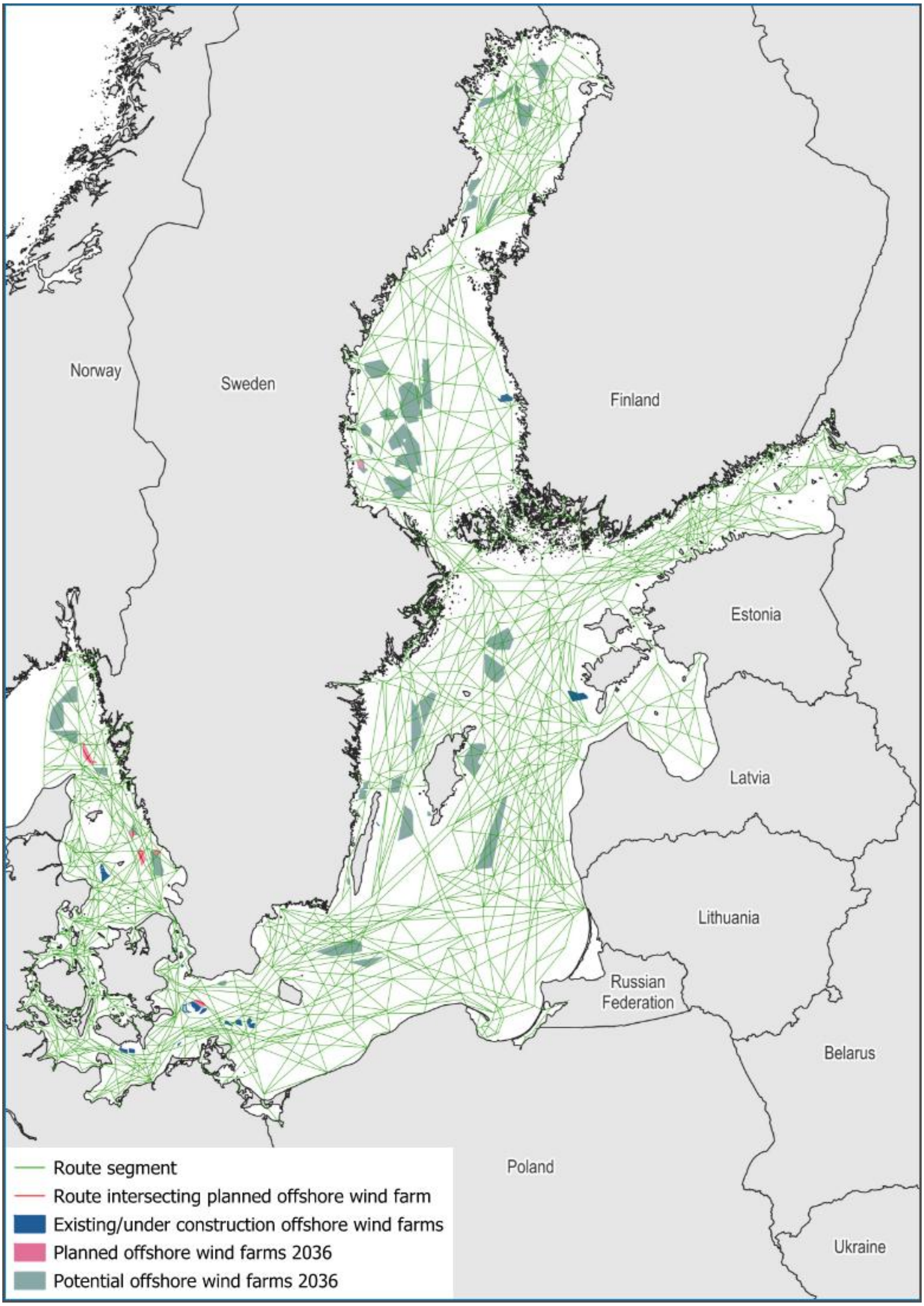

Figure 6-1 Offshore wind farms, existing in 2024 and planned for construction fore 2036

7 Abbreviations

AAGR	Average Annual Growth Rate
AIS	Automatic Identification System
COVID-19	Corona Virus Disease 2019
DWT	Deadweight tonnage
N/A	Not Available
OWF	Offshore wind farm
RO-RO	Roll-On/Roll-Off
VTS	Vessel Traffic Service

BRISK II

8 References

BRISK II, Traffic analysis, 2025	BRISK II, Traffic analysis, deliverable D2.3, 2025
Eurostat, 2023	Eurostat, Reference Manual on Maritime Transport Statistics, Version 4.5, May 2023
Eurostat, 2025	Eurostat, Maritime transport of goods - annual data, (September 2025)
Eurostat, 2025	Eurostat, Passengers embarked and disembarked in all ports by direction - annual data, (October 2025)
EU, 2025	Annex XLII of Council Regulation (EU) 833/2014, designation list updated 23/10/2025 *(Source: https://www.dma.dk/growth-and-framework-conditions/maritime-sanctions/sanctions-against-russia-and-belarus/eu-vessel-designations)*

Appendix A Detailed cargo data

A.1 EU Baltic Sea ports

Table A-1 Total gross weight of goods handled at EU Baltic Sea ports and Swedish North Sea ports (Thousand Tons) - Source: Eurostat

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	84,636	84,918	83,490	84,361	82,964	81,270	83,705	87,879	83,291	83,487
Estonia	31,455	30,226	31,094	32,437	34,373	34,669	38,373	32,369	22,040	20,838
Latvia	66,461	59,428	57,136	60,805	57,247	40,370	37,638	43,897	33,976	32,345
Lithuania	43,126	46,237	49,856	52,465	52,246	51,530	49,385	40,014	37,236	39,495
Poland	68,838	72,542	77,624	91,116	93,258	88,114	96,208	118,631	135,978	123,667
Finland	96,833	101,834	107,145	114,762	118,142	107,163	100,303	102,789	93,607	90,835
Sweden	169,686	171,324	175,964	179,949	170,556	168,969	170,617	172,056	159,612	163,755
Germany	52,182	52,424	53,947	52,764	52,848	50,664	56,872	54,781	56,067	55,470

Table A2 Gross weight of liquid bulk goods handled at EU Baltic Sea ports and Swedish North Sea ports (Thousand Tons) - Source: Eurostat

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	31,318	28,812	24,285	23,393	25,027	23,373	22,026	22,554	21,479	20,822
Estonia	16,974	14,414	13,934	14,746	15,246	15,463	16,214	11,561	3,350	3,150
Latvia	25,018	18,854	16,472	14,741	14,545	11,493	8,750	8,721	4,585	5,231
Lithuania	18,092	20,286	21,325	19,958	19,941	16,908	14,811	16,488	16,580	15,396
Poland	18,849	19,096	21,343	23,779	26,834	22,461	29,889	38,825	53,112	55,140
Finland	32,339	37,194	37,357	38,140	38,450	37,561	28,761	33,322	31,697	29,652
Sweden	63,998	67,013	65,491	65,162	57,763	60,472	57,171	56,569	53,416	54,382
Germany	3,196	3,665	3,855	3,088	4,083	3,450	4,168	4,017	8,259	8,974

Table A3 Gross weight of dry bulk goods handled at EU Baltic Sea ports and Swedish North Sea ports (Thousand Tons) - Source: Eurostat

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	23,286	24,933	24,791	24,570	21,838	21,631	21,586	25,257	24,443	24,643
Estonia	5,022	5,670	6,279	6,583	8,084	8,867	9,414	7,639	5,878	4,444
Latvia	31,823	31,224	31,818	35,799	33,028	19,215	18,124	24,393	19,850	15,965
Lithuania	16,658	16,715	19,113	19,866	20,667	23,672	22,478	10,122	9,196	10,466
Poland	25,209	26,214	25,657	29,698	29,322	30,135	28,240	41,489	41,999	29,951
Finland	24,813	24,159	26,208	31,476	32,076	29,563	28,691	27,908	24,060	23,291
Sweden	30,199	26,986	29,909	29,848	29,355	29,439	29,781	31,730	27,159	28,330
Germany	13,845	13,296	13,684	13,359	12,478	12,938	12,968	12,542	11,873	12,013

Table A4 Gross weight of large containers handled at EU Baltic Sea ports and Swedish North Sea ports (Thousand Tons) - Source: Eurostat

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	5,583	5,705	6,137	6,010	6,544	7,258	7,942	8,132	7,255	7,291
Estonia	1,743	1,789	1,999	1,996	1,965	1,808	1,894	2,216	1,878	2,110
Latvia	3,876	3,524	3,766	3,941	3,889	3,801	3,508	3,768	3,925	4,059
Lithuania	3,610	4,397	4,691	6,951	6,657	5,959	6,536	8,184	6,893	7,859
Poland	13,576	14,841	17,150	22,142	23,085	21,657	23,114	22,755	26,854	24,349
Finland	9,845	10,269	11,281	11,240	11,132	10,112	9,292	8,966	8,871	8,476
Sweden	12,711	13,618	13,452	13,811	13,942	13,596	14,193	14,120	13,184	14,056
Germany	2,160	2,144	2,201	2,029	2,222	1,894	2,244	1,601	1,298	1,390

Table A5 Gross weight of Ro-Ro cargo handled at EU Baltic Sea ports and Swedish North Sea ports (Thousand Tons) - Source: Eurostat

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	21,166	22,089	23,575	24,797	23,814	23,032	24,670	25,173	23,146	23,158
Estonia	4,380	4,587	5,067	5,348	5,365	5,564	7,262	7,545	6,875	7,071
Latvia	2,405	2,538	1,750	1,968	1,916	1,860	2,165	2,362	2,049	1,881
Lithuania	2,548	2,839	2,885	3,119	3,305	3,541	4,050	3,334	3,091	3,609
Poland	7,760	8,405	8,928	9,218	8,925	8,747	10,031	9,702	8,726	9,319
Finland	17,736	17,699	18,691	19,196	18,946	18,026	20,218	19,953	17,504	18,085
Sweden	45,301	46,152	48,297	48,647	47,135	46,120	50,078	48,208	44,909	44,886
Germany	28,030	27,062	27,969	29,041	28,837	26,640	32,016	30,763	28,888	28,740

A.2 Russian trade via the Great Belt

Table A-6 Gross weight of cargos handled at Russian Baltic Sea ports (Thousand Tons) - Reference: Great Belt VTS

	Direction	2015	2019	2021	2024
Liquid bulk goods	Inwards	217.8	190.0	90.0	563.8
	Outwards	104,508.1	103,646.8	96,278.9	191.322.8
Dry bulk goods	Inwards	1,230.3	2,292.6	2,048.5	1,964.6
	Outwards	19,619.0	37,164.0	49,062.9	42,505.9
Large containers	Inwards	211.5	673.6	649.6	500.7
	Outwards	383.7	1,187.5	1,040.7	973.5
RO-RO	Inwards	0.0	0.0	47.9	74.1
	Outwards	0.0	0.0	0.7	11,453.7

Appendix B Detailed passenger data

Table B-1 *Passengers (excluding cruise passengers) embarked and disembarked in all EU Baltic Sea ports incl. Swedish North Sea ports (thousand passengers). Source: Eurostat*

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	41,280	41,242	42,426	43,364	43,804	30,859	33,512	41,064	41,024	41,109
Estonia	14,153	14,321	14,836	14,824	15,032	8,623	8,213	11,749	12,851	13,611
Latvia	661	723	994	1,063	1,072	466	249	371	377	360
Lithuania	286	303	297	323	343	308	312	338	368	371
Poland	2,421	2,602	2,585	2,720	2,787	1,905	2,316	2,326	2,251	2,426
Finland	18,884	19,239	19,507	19,222	19,172	7,343	7,074	13,631	14,216	14,369
Sweden	29,357	29,682	30,091	29,897	30,299	14,020	16,974	24,897	24,804	24,771
Germany	11,159	10,933	10,640	10,146	10,838	4,374	5,324	9,591	9,695	9,305

Table B-2 *Passengers (cruise passengers starting and ending a cruise) embarked and disembarked in all EU Baltic Sea ports incl. Swedish North Sea ports (Thousand Passengers). Source: Eurostat*

Countries	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Denmark	366	342	425	410	423	-	2	161	221	208
Estonia	11	13	14	13	25	-	0	0	0	0
Latvia	-	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-	-	-
Poland	0	0	0	0	0	0	1	9	0	0
Finland	-	-	8	9	16	13	15	-	-	-
Sweden	143	118	175	157	224	0	14	18	76	43
Germany	687	895	1,442	1,389	1,651	32	414	1,033	1,476	1,498

Appendix C Methodology for calculating the future number of cargo ship voyages

C.1 Objective

The objective of the prognosis is to establish change factors that can be multiplied with the 2024 (i.e. current) vessel traffic to obtain the expected vessel traffic in 2036 (i.e. future). For each vessel type, these change factors are estimated for all the DWT classes within that vessel type.

C.2 Criteria

The change factors are established such that the following criteria are fulfilled for each vessel type:

1 The change in cargo tonnage transported to and from the Baltic Sea between 2024 and 2036 as given in the last column of Table 3-5 corresponds to the average change in cargo capacity (sum of DWT for all passages) for that vessel type.

2 The change in vessel size for the Great Belt traffic from 2024 to 2036 corresponds to the average percentage change for that vessel type as given in the last column of Table 5-2.

C.3 Assumptions

The following assumptions are made for each vessel type:

1 The percentage change in number of voyages is assumed to follow a monotonic linear trend with respect to vessel DWT.

2 The average DWT for a given DWT class remains the same in the current and the future situations.

3 For each vessel type, it is assumed that no new DWT classes are created for the future traffic situation. This means that if there is no current traffic in a given DWT class, there will also be no future traffic in that DWT class.

C.4 Procedure

For a given vessel type, criteria 1 in section C.2 (together with consideration 2 in section C.3) can be mathematically expressed as:

$$a = \sum_i DWT_{avg,i} \cdot N_{future,i} - \sum_i DWT_{avg,i} \cdot N_{current,i} \qquad \text{(Eq. C-1)}$$

For a given vessel type, criteria 2 in section C.2 (together with consideration 2 in section C.3) can be mathematically expressed as,

$$b = \frac{\sum_i DWT_{avg,i} \cdot N_{future,i}}{\sum_i N_{future,i}} - \frac{\sum_i DWT_{avg,i} \cdot N_{current,i}}{\sum_i N_{current,i}} \quad \text{(Eq. C-2)}$$

where (all applicable for the vessel type under consideration):

- *a* is the change in cargo tonnage for the Baltic Sea traffic from the current to the future situation – this is calculated using the average change in Baltic Sea traffic tonnage as given in Table 3-5 and the current traffic data extracted from Great Belt VTS data,
- *b* is the change in vessel size (average DWT) for the Great Belt traffic from the current to the future situation – this is calculated using the average change in Great Belt traffic vessel size as given in Table 5-2 and the current traffic data extracted from Great Belt VTS data,
- DWT_i is the average DWT value for DWT class *i* for the Great Belt traffic – the respective average DWT is the same for the current and the future traffic situations as per consideration 2 in section C.3,
- $N_{current,i}$ is the number of voyages in the current situation for the DWT class *i* in the Great Belt, and
- $N_{future,i}$ is the number of voyages in the future situation for the DWT class i respectively for the Baltic Sea traffic and the Storebælt traffic – these are the unknown quantities to be determined.

For a given vessel type and DWT class, the assumptions and considerations made in section C.3 mean that $N_{future,Baltic,i}$ and $N_{future,SB,i}$ can be mathematically expressed as:

$$N_{future,i} = N_{current,i} \cdot (1 + change_i) \quad \text{(Eq. C-1)}$$

with

$$change_i = m \cdot DWT_{avg,i} + c \quad \text{(Eq. C-4)}$$

where m and c are the change factor coefficients for the vessel type under consideration that need to be determined.

For a given vessel type and DWT class, the change factor is then calculated as:

$$changefactor_i = 1 + change_i \quad \text{(Eq. C-5)}$$

These two equations cannot be solved simultaneously to obtain the change factor coefficients.

The change factor coefficients are therefore obtained through an iterative process until the two criteria defined in section C.2 are fulfilled. This iterative process involves the following steps, applied for each vessel type:

4 A guess value *b* for the average vessel size increase for the Baltic Sea traffic is made.

5 The change factor coefficients m and c resulting from the guess value in step 1 are calculated by simultaneously solving equations C-1 and C-2.

6 The number of voyages in the future situation is calculated for all the DWT classes applicable for the vessel type using equation C-3.

7 The resulting increase in average vessel size $b_{calculated}$ is calculated:

$$b_{calculated} = \frac{\sum_i DWT_{avg,i} \cdot N_{future,i}}{\sum_i N_{future,i}} - \frac{\sum_i DWT_{avg,i} \cdot N_{current,i}}{\sum_i N_{current,i}} \qquad (2)$$

8 The calculated average vessel size increase for the Storebælt traffic $b_{calculated}$ is then compared with the required average vessel size increase b (in equation C-2 which corresponds to criteria 2 of section C.2).

9 If the calculated value $b_{calculated}$ and the required value b are not the same, the guess value in step 1 is adjusted and the above steps are repeated till the calculated value for the traffic average vessel size increase becomes equal to the required value.

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