SUSMARTOUR PROJECT

Social, economic, and environmental factors and the main trends influencing future maritime tourism in the Baltic Sea Region

November 2022

SusMarTour Project Partners

Project Leader

motus foundation

Project Partners

BPO BALTIC PORTS ORGANIZATION

KLTC-KSRC

CONTENT

1. INTRODUCTION

This report was created as a part of the ‘Building resilient and inclusive sustainable maritime tourism in the Baltic Sea Region’ – the SusMarTour project, in which Motus Foundation was a Project Leader and Baltic Ports Organization together with Klaipeda Shipping Research Centre were Project Partners. The project was initiated and sponsored by the Council of the Baltic Sea States, Project Support Facility. During the reporting time, which includes dates from the beginning of September 2021 till the end of December 2022, Motus Foundation took a part in one of the CBSS conferences, launched two own webinars on the project’s topic, and the Final Conference.

On the 22nd of February 2022, you could watch the project’s representative at the CBSS online conference Branding BSR, presenting the project itself. We were very glad to take this opportunity to promote the SusMarTour. The project presentation was followed by another research entitled: 'Multi-use possibilities for sustainable maritime tourism in the Baltic Sea Region’ prepared by dr. Leila Neimane from the University of Latvia.

On the first SusMarTour webinar entitled: ‘Action Plan and recommendations for the Crisis Situations in BSR Tourism Sector’, which was held on the 31st of May 2022, we started the webinar with excellent welcoming speeches given by Olga Zuin and Daria Akhutina from the CBSS. Later on, we opened the official part of the webinar with the main presentations, which covered the most alarming issues that become a challenge for tourism in the BSR region.

On the 4th of October 2022, we launched our second webinar on the topic of: ‘Baltic Sea Region Tourism – Challenges Into Opportunities’. This autumn event gathered seven excellent speakers connected and contributed to BSR Tourism.

The third and last seminar, which is also SusMarTour’s Final Conference was organized by Motus Foundation in the Ports of Stockholm on the 7th of December 2022. The Final Conference gathered all three project partners' representatives, and during the seminar, the most important project work was presented. The report presents the current market situation in ferry and cruise transport, sustainable solutions in ferry transport and the parameters of ferry and cruise terminals. The second part of the report is dedicated to transport modelling using the graph theory and presenting possible future ro-pax lines in the Baltic Sea Region.

Part 1

2. ANALYSIS OF FACTORS INFLUENCING THE MARITIME TOURISM WITHIN BALTIC SEA REGION

The Baltic Sea is one of the largest brackish water areas in the world, with a surface area of **420 thou. km^2.** The total area of the Baltic countries (or regions of the Baltic countries) is **1.39 mln km^2**, which is over three times larger than Baltic Sea surface area and is inhabited by around **86 million people.** Total length of cost of EU Baltic countries in over **19 thou. km** and the **number of ports exceeds 200**. Baltic Sea is surrounded by nine countries: **Denmark, Germany, Poland, Lithuania, Latvia, Estonia, Russia, Finland and Sweden.**

The whole Baltic Sea region is situated in a **temperate climate zone**. The middle and northern areas have longer winters with stronger frosts, whilst the southwestern and southern areas have relatively moist and mild winters.

Tab. 2.1. Selected data about Baltic countries

Country	Area [km^2]	Length of coast [km]	Population of the country/area [people]
Denmark	40 000	7 314 (incl. North Sea)	5 873 420
Germany* (Berlin; Brandenburg; Hamburg; Mecklenburg-Vorpommern; Schleswig-Holstein)	70 063	2 100 (Baltic Sea)	12 569 286
Estonia	43 470	1 242 (main land) +2 551 (islands)	1 331 796
Latvia	62 092	496	1 875 757
Lithuania	62 630	262	2 805 998
Poland	306 170	770	37 654 247
Finland	303 920	1 250	5 548 241
Sweden	407 310	3 218	10 452 326
Russia* (Kaliningrad, Leningrad, St. Petersburg regions)	101 039	665 (Baltic Sea)	8 160 350
Total (excl. Russia)	**1 295 655**	**19 203**	**78 111 071**
Total (with Russia)	**1 396 694**	**19 868**	**86 271 421**

**only selected regions*

Tourism is important for many countries and regions, this also applies to the **Baltic Sea region**. Tourism plays an important role because of its economic and employment potential, as well as its social and environmental implications.

Tourism sector in the BSR to large extend is based on **maritime transportation**, making it important for mobility and tourism opportunities. Maritime tourism has been growing in Baltic Sea Region for last decades. The sector comprises two segments:

- ferry shipping,
- cruise shipping.

FERRY SHIPPING

There are many ferry connections on the Baltic Sea, between all countries along its coastlines. Ferry shipping is based on regular connections mainly between just two Baltic ports, in two different countries. Ferry transport is often dedicated for dual purpose: cargo transport (trucks) and passenger transport. Moreover, they often also function as some kind of cruise ships offering a lot of attractions onboard. Passenger ferry traffic on the Baltic is constantly growing. In 2019 more than 90 million passengers were transported by ferries in international services. Ferry operators are mainly regional companies than run their business only on the Baltic or North Sea. Ferry tourists on particular routes are mainly people from countries that have connection with each other.

CRUISE SHIPPING

Cruise market has a different character than the ferry market. The cruise operators are often integrational companies that run their business in different parts of the world. The cruise passengers are from many countries in the world, mainly rich countries, as cruise voyages are rather expensive type of spending free time and vacations. On the Baltic Sea region passengers from Western Europe (mainly from Germany and UK) and North America dominate.

The cruise industry in the Baltic Sea is seasonal due to climate and ice conditions. The activity lasts from April/May till September/October with majority of calls during summer months. Most cruise trips in the Baltic Sea last 7 -10 days and include 5-6 ports of call.

Baltic cruise market is constantly growing. This destination has grown in importance over the last 20 years. Year by year, we can observe an increase in number of cruise vessel calls and number of passengers on the Baltic. According to the report by Cruise Baltic, between 2000 and 2019 the number of cruise travelers on the Baltic increased on average at the annual rate of 9.5% per year, from 1.0 million in 2000 to 5.9 million in 2019, whereas the number of cruise calls increased on average at the annual rate by 3.4% per year from 1.4 mln of calls in 2000 to over 2.7 mln of calls in 2020.

Among the basic factor influencing the maritime tourism in the Baltic Sea region are:

- Economic factors – development of economies and increase in the income of societies,
- Socio-psychological factors,
- Ferry and cruise operators offers,
- Promotional activities,

- Other – for example unexpected events such as COVID-19 pandemic or war in Ukraine**.**

ECONOMIC FACTORS

Growing interest in ferry/cruise tourism result from the increase in the income of societies. Generally, tourism demand appears at a relatively high level of income. The general relationship is that: the more developed economies and the higher income of societies results in the higher demand for ferry/cruise tourism.

The Baltic Sea region is not a cheap destination. Hotel price indices, purchasing power parity or fuel price levels all indicate a BSR as a rather high cost destination - this especially refers to Denmark, Finland, Germany and Sweden. On the other hand Poland, Lithuania, Latvia and Estonia are cheaper.

Considering different price levels between the regions in the Baltic Sea, it is not a destination for price-sensitive tourists.

When it comes to economic development and income per capita in EU Baltic countries, the region can be divided into two groups of countries:

- Countries with higher level of economic development (over 30 thou. PPS per capita) and higher mean net income per capita (over 20 thou. PPS per capita): **Denmark, Germany, Finland, Sweden.**
- Countries with lower level of economic development (below 30 thou. PPS per capita) and lower mean net income per capita (below 20 thou. PPS per capita): **Poland, Lithuania, Latvia, Estonia.**

The first group of countries has gained a high level of development and their tempo of growth is now lower than in countries in the second group. In the first group of countries the GDP per capita measured in PPS increased by around 20-30% in 2021 comparing to 2012, while the mean net income per capita by 10-26%. In the case of countries in the second group it was 45-55% increase of GDP per capita, and around 50-100% increase in mean net income per capita. Although the difference in economic development and income level per capita is still clearly visible, these difference decreased looking into 10 years back.

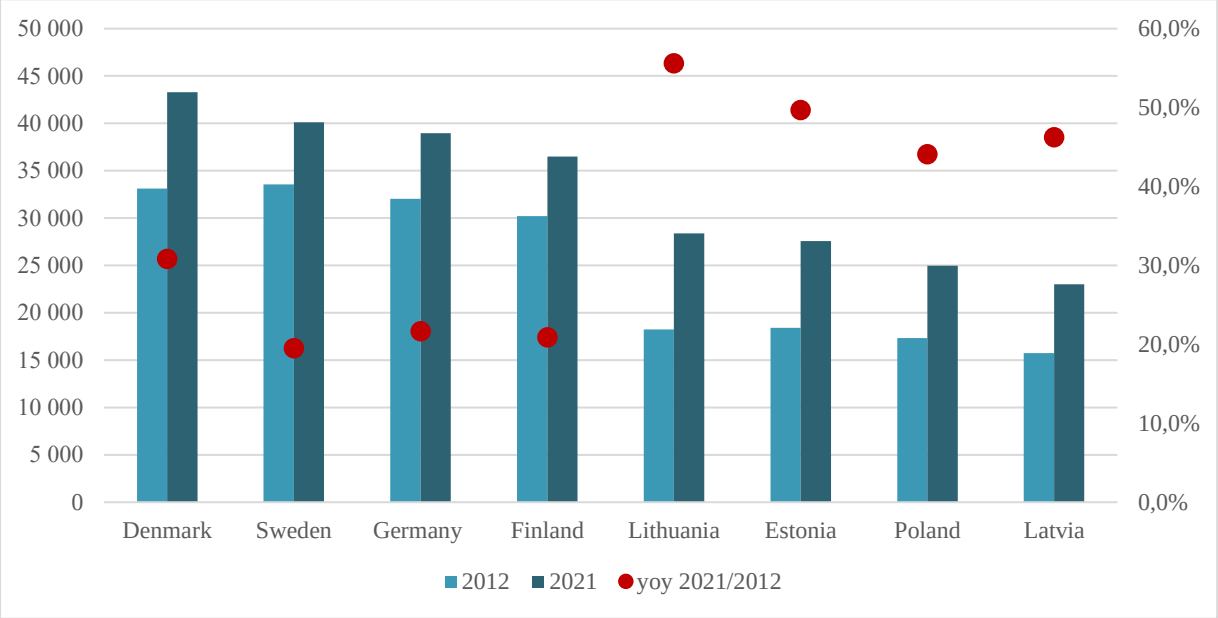

Fig. 2.1. GDP per capita (PPS, current prices)

Source: Eurostat

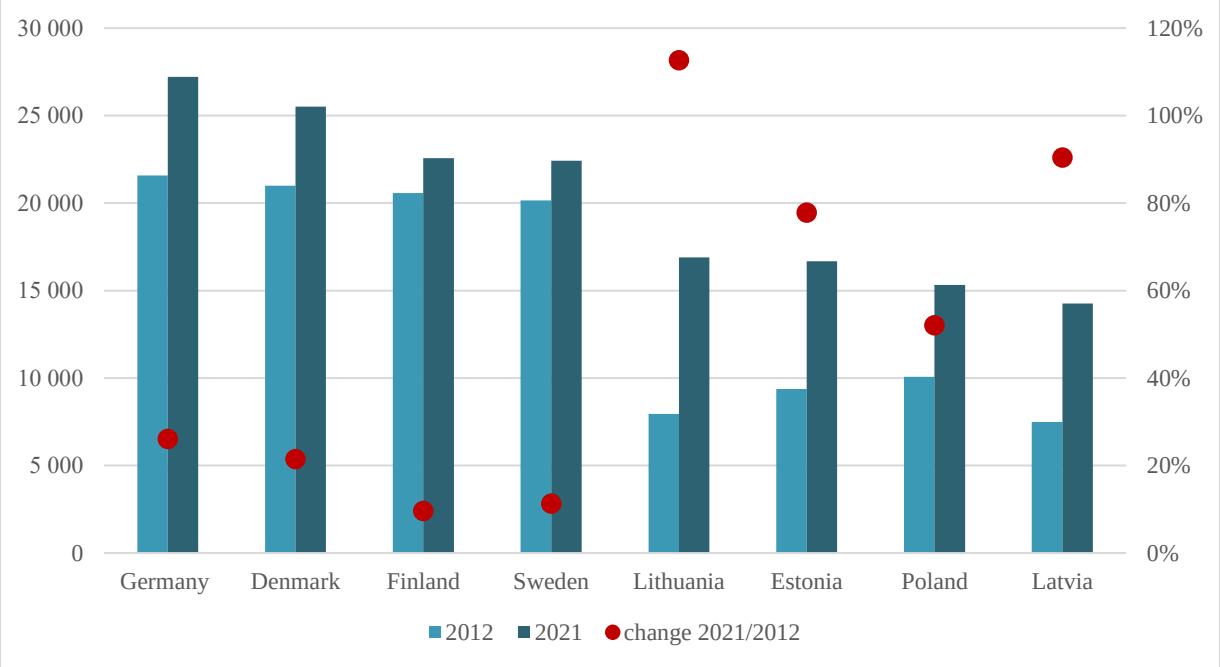

Fig. 2.2. Mean equivalized net income (PPS per capita)

Source: Eurostat

FERRY AND CRUISE OPERATORS OFFERS

The diversified offer prepared by ferry and cruise operators and tour operators, serving appropriate ships, and organizing excursions, create demand for sea tourism.

At present, tourists more often search for more sophisticated holidays. Nowadays, the consumer demand is changing very rapidly, and ferry, cruise operators must follow these changes and adjust their product offer to the needs, requirements, possibilities and preferences of potential customers.

Offers prepared by **ferry operators** are often very diversified, operators also prepare some special/dedicated offers and discounts to attract passengers. Both people with higher and lower budget will find the suitable offer for themselves. Ferry operators prepare such offers as for example:

- voyages without disembarking,
- voyages with sightseeing (several hours/one day),
- voyages with 1-2 day stay in the port city.

Special offers are also prepared for example for those traveling by car, by camper and want to see a bigger piece of Scandinavia or countries of South and South-East Baltic.

Ferries are not only a means of transport, but offer a lot of facilities onboard: restaurants, bars, cafés, duty-free shops, nightclubs, game zones, casino games zone, playground for children, spa zone. This makes the ferry voyage itself (even without disembarking in the port of call) an interesting attraction.

The important opportunities for the development of **cruise ship tourism** market in the BSR include the constant search for alternative route. Substantial seasonality of tourist demand poses significant challenges to the tour operators. For example, in order to make the best use of their fleet, ship owners search for new interesting routes for voyages in regions where, in a particular season, the weather conditions are most favorable. In such cases, the BSR becomes a perfect alternative. In the hurricane season in the Caribbean Sea, ship owners move their vessels to the Mediterranean and Baltic Sea ports.

Moreover, the rich cultural and historic heritage of coastal cities in the BSR, providing a perfect place for interesting themed trips for cruise ship travelers, are very popular among tourists from around the world. Cruise guests are highly attracted to the variety offered by each of the nine countries around the Baltic Sea as they all have their own unique culture and identity. Baltic Sea is the only place in the world, where you are able to visit five different capitals on a one-week cruise. In addition, the Baltic Sea is very safe with very low crime rates and majority of citizens speak English. All these factors contribute to the high evaluation scores from the cruise guests.

In order to meet market requirements, cruise line operators prepare very attractive holiday packages on-board and visiting the seaside tourist destinations. Moreover, in the face of global competition, cruise operators compete with each other to make their holidays more attractive by promoting themed cruises such as: cruises for seniors, for art enthusiasts, educational, adventurous, culinary cruises and many others.

Another trend that can be observed on the cruise ship market is the packaging of offers to reduce the barriers related to the availability of cruises for passengers located far away from the departure port. Therefore, ship owners

offer tourist packages including transport from the place of residence to the departure port, cruise and return, the so-called flight&cruise.

Modern cruise ships are floating entertainment centers with numerous restaurants, cafés, bars, pubs, casinos, sport centers, fitness clubs, mini golf courses, climbing walls, theatres, cinemas, discos, shops as well as beauty shops, and even hospitals offering cosmetic surgery treatments, maternity wards and dentist's. The cruise vessels are attraction by themselves.

Fig. 2.3. Cruise vessel in port of Stockholm

Source: Ports of Stockholm

SOCIO-PSYCHOLOGICAL FACTORS

Socio-psychological factors are related to the motivations to undertake sea voyages, they are manifested by the increased mobility of societies in Europe, the USA and other parts of the world. The growth of free time, fatigue with the urban lifestyle favor the choice of sea voyages. Moreover, people more often search for more sophisticated holidays and ferry and cruise voyages seems to be interesting option.

PROMOTIONAL ACTIVITIES

A significant role in the development of cruise ship tourism is also linked to intensified promotional activities of the BSR as a tourist attraction and the integration of the sector within the activity of organizations and associations acting for the benefit of cruising development, such as Cruise Europe, CLIA Europe and Cruise Baltic.

COVID-19 PANDEMIC

In previous decades changes in external factors determining operations in maritime tourism were to a certain extent predictable. **COVID-19** pandemic started unexpectedly and was an unprecedented crisis for the travel and

economy, with tangible impacts on people employed in the tourist sector and generally the whole tourism industry. This created new challenges for companies involved in maritime tourism.

As a result of social distancing and mobility limitations, a steep decline of employment and economic problems can be especially seen within the tourism and hospitality industries, as it has been affected the hardest by restrictions. Employment opportunities in tourism and HoReCa sector are generally attractive for young people entering the work market, who benefitted from the inclusive travel opportunities within the Baltic Sea Region, and increased work opportunities during the summer season, meaning they are the main labor force for them. However, young people who are usually starting their job or are employed as students or seasonal workers are likely the first to lose their jobs during times of instability. This increases the probability of them facing unemployment during crisis periods such as the current pandemic. The problem is highly relevant across the Baltic Sea Region, where traveling is to a large extend based on the maritime sector. Ferry transportation, along with the cruise sector that operates in many ports, before the pandemic were an important part of mobility, tourism activity and work place within the BSR region. While goods transportation remained rather stable, the decline of passenger traffic was noticeable in many ports receiving only a few cruise calls in comparison to the number of calls in 2019, which reached around 2 772 calls.

Already, in March 2020, at the beginning of the pandemic ferry operators had laid off a significant number of employees largely caused by the massive decline in number of traveling passengers who have been the driving factor of hospitality services.

The consequence of the COVID-19 pandemic has highlighted the transnational dimension of the tourism economy and the demand for harmonized policy action at the local, national, regional and transnational levels to build a more sustainable and resilient tourism economy. It also stressed the need to support the transition toward a greener tourism economy in the nearest future.

RUSSIA'S INVASION ON THE UKRAINE

The pandemic was not yet finally over when another unexpected event occurred - Russia's invasion on Ukraine, that started on 24th February 2022. This will affect the Baltic tourism sector too. Before the start of the war in Ukraine, the Port of St. Petersburg was a very popular port of call for cruise vessels, and was commonly included in trips exploring northern Europe and Scandinavia. Soon after Russia invaded Ukraine many cruise lines cancelled calls to St. Petersburg for summer 2022. Among such cruise lines are inter alia: Aida Cruises, Norwegian Cruise Line Holdings, MSC Cruises, Royal Caribbean Group, Carnival Cruise Line, Windstar, Atlas Ocean Voyages, Poseidon Expeditions.

But the war has prompted several international cruise lines to call off not only their visits to St. Petersburg, but also to other Baltic ports, especially in countries bordering with Russia (Finland and Estonia). Over 100 international cruise ships have cancelled their visit to Helsinki in 2022 due to the invasion of Ukraine by Russia. Only 186 out of over 300 preliminary expected calls remained in calls schedule. A similar case is Port of Tallin. 2022 started out with hopes of nearly 350 cruise ships calling at Tallinn, but after Russia began its full-scale invasion of Ukraine in late February, approximately half of these ships cancelled plans to visit the Estonian capital.

On the other hand, cruise lines have been searching for possible alternative options to swap St. Petersburg out and call at a non-Russian port instead. Such ports often did not handle cruisers at all or were not the top of cruisers

destinations on the Baltic, such as for example Riga, Klaipeda, Kotka, Turku and Gdańsk. This means that some Baltic ports will have more cruise vessel calls during this year's cruise season than initially expected. Another practice linked with the exclusion of Port of St. Petersburg from the schedule is that vessels stay longer than they used to in other Baltic ports.

ENVIRONMENTAL FACTORS

Along with the entire shipping industry, the ferry and cruise sector is under increasing pressure to meet strict environmental regulations. As a semi-enclosed, small and shallow, the Baltic Sea is exceptionally sensitive and therefore covered by even more restrictive regulations then other parts of the world.

The International Maritime Organization (IMO) has designated the Baltic Sea as a Particularly Sensitive Sea Area. The Baltic Sea area has been designated as a specific area in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes I (oil), IV (sewage), V (garbage), and VI (Sulphur). This means that there are strict regulations on discharge into the sea of oil or oily mixtures, sewage from passenger ships, and garbage. The Baltic Sea has also been a Sulphur Emission Control Area (SECA) from 1st January 2015 onwards and a Nitrogen Emission Control Area (NECA) from 1st January 2021 onwards. The IMO has also set targets and goals to decrease GHG emissions from shipping. The energy-efficiency requirements for ships have been introduced as amendments to MARPOL Annex VI and the initial IMO strategy on the reduction of GHG emissions from ships has been adopted. As most of above regulations concern all kinds of vessels, regulations concerning discharge of sewage apply to passenger vessels (i.e. ferries, cruisers). Due to the higher numbers of passengers on board cruise and ferry ships, the inputs of water, food and materials are typically higher than on other types of sea-faring vessels. And so are the volumes of waste streams, such as black water, grey water, bilge water, solid waste, hazardous waste and emissions from on-board waste incineration and electricity generation. A medium-sized cruise ship, carrying around 2 000 passengers and 800 crew members on a one-week voyage, has been estimated to produce approximately 0.75 million liters of black water (i.e. human waste), 3.75 million liters of grey water (i.e. waste water from kitchen sinks, baths, showers, laundry) and eight tons of solid waste[1]. As Baltic Sea is especially sensitive, the proposal to designate the Baltic Sea as a special area for sewage within MARPOL Annex IV was developed by the HELCOM Maritime Working Group. In 2011, IMO designated the Baltic Sea as a Special area under MARPOL Annex IV. Within the special area discharge of sewage from passenger ships (including cruise ships) is prohibited, except when the ship has in operation an approved sewage treatment plant which has been certified by the Administration. Untreated sewage passenger ships should discharge into reception facilities in ports. Regulations already apply since the 1st June 2019 for newly built passenger ships and since the 1st June 2021 for existing passenger ships.

Making the maritime shipping sector (including ferry and cruise sector) more environmentally friendly will require efforts from different actors: shipowners, port authorities, port terminals, legislators and other stakeholders. Among solutions that shipowners can implement are: switching to alternative fuels, installing scrubbers, implementing energy saving and emissions reducing technology and installing sewage treatment plants. Among solutions in ports: offering bunkering for alternative fuels, offering onshore power supply and installing adequate port reception facilities for sewage.

[1] *The environmental challenges of cruise tourism: impacts and governance, Machiel Lamers, Eke Eijgelaar, Bas Amelung, January 2015.*

3. FERRY LINES IN THE BALTIC SEA REGION

The passenger traffic in the Baltic Sea Region is very diverse. As a result, connections offered by operators may serve pure passenger traffic (the tourist traffic with one-two days of sightseeing in holiday destinations), passenger traffic for short distances and sea bridges (very often domestic traffic) and also ro-ro cargo connections (the majority of passengers are truck drivers).

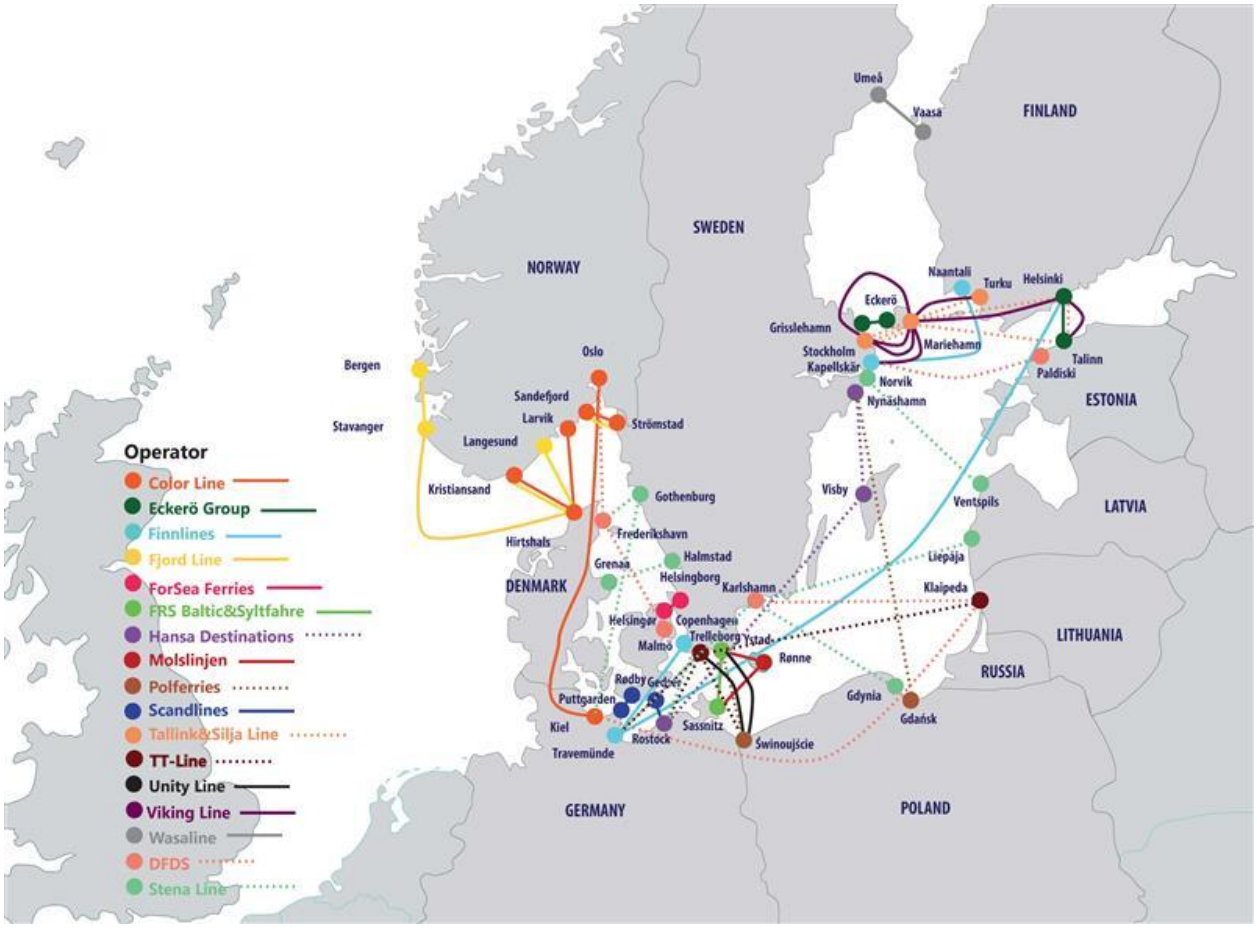

Fig. 3.1. The routes connecting ro-pax ports in 2021 (passenger traffic)

Source: Actia Forum

For the purpose of the study, the ferry connections were divided into groups:

- The international regular ro-pax routes focused on passenger traffic (majority of ferry connections is of tourist nature, connecting ports with popular travel destinations);
- Services to Norway (operated by Color Line and Fjord Line);

- Domestic ferry routes to the Port of Visby (Destination Gotland and Hansa Destinations);
- Operators serving passenger traffic to Åland Islands (connections to Port Eckerö and Port Mariehamn)
- Sea Bridges (mostly used by commuters);
- Passenger routes operated by high-speed catamarans and ferries (routes that allow passengers to have the shortest connection to neighboring countries);
- The ferry routes dedicated mainly to ro-ro cargo traffic (on those routes the majority of passengers on board ships are truck drivers).

THE INTERNATIONAL REGULAR RO-PAX ROUTES FOCUSED ON PASSENGER TRAFFIC

Among the ro-pax routes described below are ferry connections. The routes may vary from 2 hours of duration to overnight departures. In this group both purely passenger connections as well as connections on routes where cargo is transported are presented. Determining the volume of passenger transport depends on the season and the date of departure of the ferry. Here are classified the ro-pax connections with ferries deployed on those routes equipped with passenger facilities to make tourists enjoy the time spent on-board a ship.

The busiest ferry route in terms of passenger traffic is Helsinki-Tallinn. Three operators are offering services on this route: **Viking Line**, **Tallinnk&Silja Line** and **Eckerö Group.**

The ferries deployed on routes operated by **TT Line** have many passenger facilities on-board. Despite the fact that majority of TT line connections are connections to Port of Trelleborg and Port of Lübeck-Travemünde which are very important cargo ports, the passenger capacity of ferries deployed on routes is between 200 and 700 passengers. In July 2018, TT-Line opened its newest service between Trelleborg and Klaipėda.

Among **Polferries** fleet are also ferries with the passenger facilities. Polferries offers ferry connections from Polish ports to Nynäshamn (Stockholm Ports) and to Ystad – important ports in terms of tourist traffic.

The route Karlskrona-Gdynia operated by **Stena Line** is a ferry connection, where majority of passengers are tourists. Since September 2022, the route is served by four ferries, including the Stena Estelle – the E-Flexer ferry.

In August 2020, Stena Line offered new ferry connection: Travemünde-Karlskrona-Liepāja, with one departure daily adding the Port of Karlskrona to existing route Travemünde-Liepāja on Thursday evenings.

Tab. 3.1 Operators on routes in the international regular ferry traffic focused on passenger transport

Operators	Country	Services	Crossing time	Frequency of calls
TT-Line	DE-SE	Rostock-Trelleborg	5-7 hr	2-3 sailings daily
	DE-SE	Travemünde-Trelleborg	7-8 hr	2-4 sailings daily
	DE-SE-LT	Travemünde-Trelleborg-Klaipėda	16 hr 30 min	5 sailings weekly
	DE-SE-LT	Rostock-Trelleborg-Klaipėda	29 hr 40 min	2 sailings weekly

	PL-SE	Świnoujście-Trelleborg	6-7 hours	2 sailings daily
Polferries	PL-SE	Świnoujście-Ystad	6-8 hr	3 sailings daily
	PL-SE	Gdańsk- Nynäshamn (Stockholm Ports)	18 hr	1 sailing daily
Finnlines	FI-DE	Helsinki-Travemünde	30 hr	7 sailings weekly
	SE-DE	Malmö-Travemünde	9 hr	3 sailings daily
Viking Line	FI-ES	Helsinki-Tallinn	2 hr	6 sailings daily
Tallink&Silja Line	FI-ES	Helsinki-Tallinn	2 hr 30 min	3 sailings daily
Eckerö Group	FI-ES	Helsinki-Tallinn	2 hr 15 min	3 sailings daily
Wasaline	FI-SE	Vaasa-Umeå	3 hr 30 min	12 sailings weekly
Stena Line	SE-DE	Gothenburg-Kiel	14 hr	1 sailing daily
	SE-DK	Gothenburg-Frederikshavn	3 hr 30 min	5 sailings daily
	SE-DK	Halmstad-Grenaa	4 hr 35 min	2 sailings daily
	SE-PL	Karlskrona-Gdynia	9 hr 30 min	3 sailings daily
	DE-SE-LV	Travemünde-Karlskrona-Liepāja	26 hr 30 min	1 sailings daily
	SE-LV	Stockholm Norvik-Ventspils	8 hr 30 min	2 sailings daily

Source: Actia Forum based on operator's data

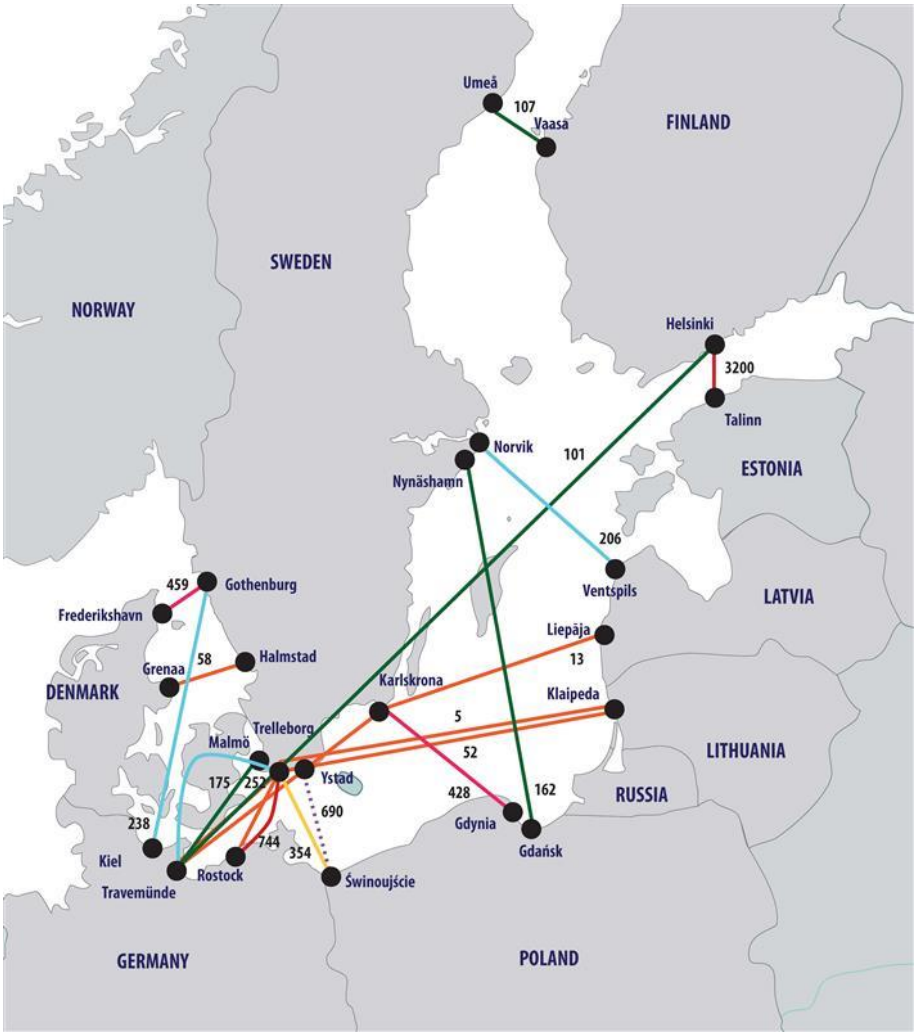

Fig. 3.2. Operators on routes in the international regular ferry traffic focused on passenger transport – volume of passengers on routes in 2021 [thousand passengers]

Source: Actia Forum based on Baltic Yearbook 2020/21

SERVICES TO NORWAY (COLOR LINE AND FJORD LINE)

The operator **Color Line** is providing services to Norwegian ports from German, Danish and Swedish ports. The vessels deployed on route from Kiel to Oslo are Color Magic and Color Fantasy – the biggest ferries in terms of passenger capacity in the Color Line fleet. Among other operators providing services to Norway is **Fjord Line**. The services from Hirtshals to Stevanger, Bergen and Langesund are provided with the use of cruise ferries: Bergensfjord and sister ferry Stavangerfjord, both powered exclusively on LNG. The rest of the routes is served by Oslofjord and Fjord FSTR. The DFDS connection is an overnight connection. The frequencies of calls are presented in the Tab. 3.2.

Tab. 3.2. The frequency of calls on services with Norway operated by Color Line and Fjord Line

Operators	Country	Services	Crossing time	Frequency of calls
Color Line	DE-NO	Kiel-Oslo	20 hr	8 sailings weekly
	DK-NO	Hirtshals-Larvik	3 hr 45 min	14 sailings weekly
	DK-NO	Hirtshals-Kristiansand	3 hr 15 min	14 sailings weekly
	SE-NO	Strömstad-Sandefjord	2 hr 30 min	up to 4 sailings daily
Fjord Line	DK-NO-NO	Hirtshals-Stavanger-Bergen	18 hr	7 sailings weekly
	DK-NO	Hirshals-Langesund	4 hr 30 min	7 sailings weekly
	SE-NO	Strömstad-Sandefjord	2 hr 30 min	14 sailings weekly
	DK-NO	Hirtshals-Kristiansand	2 hr 15 min	up to 3 sailings daily
DFDS	DK-DK-NO	Copenhagen-Frederikshavn-Oslo	19 hours	1 sailing daily

Source: Actia Forum based on operator's data

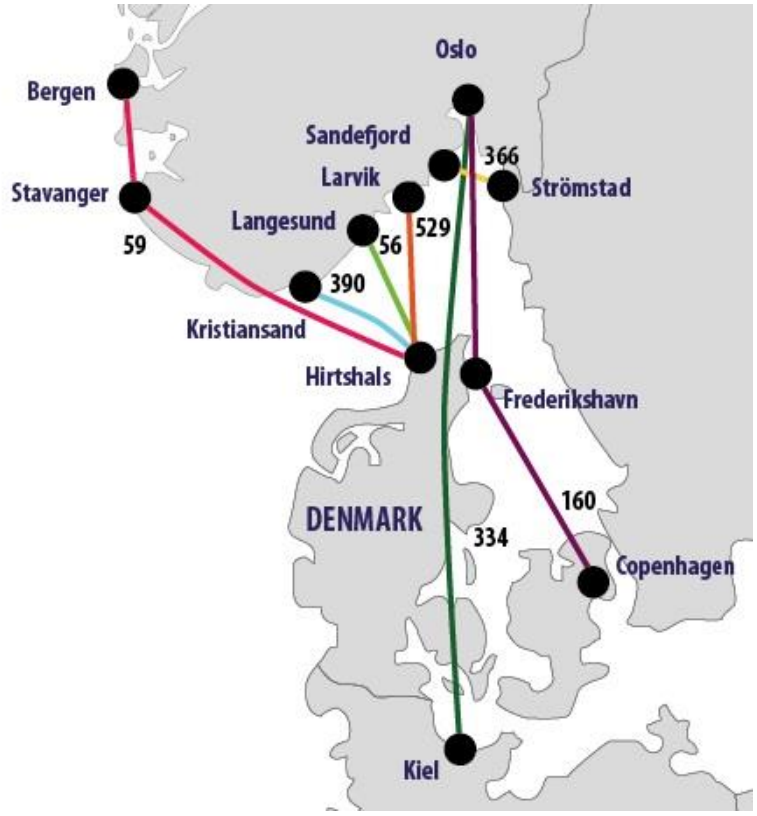

Fig. 3.3. Services to Norway – volume of passengers in 2021 [thousand passengers]

Source: Actia Forum

DOMESTIC FERRY ROUTES TO THE PORT OF VISBY

Destination Gotland is a Swedish ferry-line that runs state-subsidized domestic ferries from Nynäshamn, Västervik and Oskarshamn to Visby on the island of Gotland. The fleet consists of four high-speed ro-pax ferries. During the high season the frequency is up to 16 departures per day to between the mainland of Sweden and the island of Gotland. During the high season the frequency is up to 16 departures per day. The report is presenting the passenger traffic on international routes, so the passenger traffic on domestic routes is out of scope and would not be presented in the following chapters.

There is also a connection from the Port of Rostock to Nynäshamn via Visby, which is operated by Hansa Destinations - ferry Drotten is deployed on route. The maximum passenger capacity of the ferry is 1,500 passengers. The connection was opened in August 2021 – the statistics on route are not available yet.

Tab. 3.3. The frequency of calls on services to Port of Visby – domestic ferry traffic operated by Destination Gotland

Operators	Country	Services	Crossing time	Frequency of calls
Destination Gotland	SE-SE	Nynäshamn-Visby	3 hr 15 min	4 sailings daily
	SE-SE	Oskarhamn-Visby	2 hr 55 min	14 sailings weekly
	SE-SE	Västervik-Visby	2 hr 30 min	9 sailings weekly
Hansa Destinations	DE-SE-SE	Rostock-Visby-Nynäshamn	18 hr	2 sailings weekly

Source: Actia Forum based on operator's data

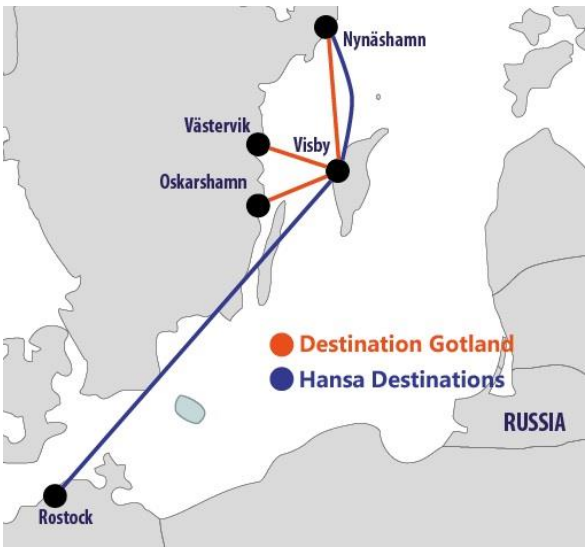

Fig. 3.4. Domestic ferry routes to the Port of Visby – localization of ports

Source: Actia Forum

OPERATORS SERVING PASSENGER TRAFFIC TO ÅLAND ISLANDS

The routes connecting the Swedish ports with the Åland Islands are characterized by high tourist traffic. The ferry connection from Grisslehamn to Eckerö on Åland Islands, which is an autonomous and demilitarized region of Finland is served exclusively by the **Eckerö Linjen.** The rest of the routes is served with the **Tallink&Silja Line**, **Viking Line** and **Finnlines** fleet of cruise ferries. Among the ferries in Tallink fleet are Silja Serenade and Silja Symphony (on route Stockholm-Mariehamn-Helsinki) and Baltic Queen and Baltic Princess (route from Stockholm to Tallinn and from Stockholm to Turku). Viking Line offers connections from Helsinki, Turku and Stockholm to Mariehamn, both overnight and day departures served by Gabriella, Viking Grace and Amorella ferries. The list of all ferries deployed on routes with their specification (passenger capacity, gross tonnage and lane meters) is presented in the Appendix 1.

Tab. 3.4. The frequency of calls on services to Åland Islands (Eckerö Linjen, Tallink&Silja Line and Viking Line)

Operators	Country	Services	Crossing time	Frequency of calls
Eckerö Linjen	SE-FI	Grisslehamn-Eckerö	1 hr 45 min	2 sailings daily
Tallink&Silja Line	SE-FI-FI	Stockholm-Mariehamn-Helsinki	17 hr	7 sailings weekly
	SE-FI-EE	Stockholm-Mariehamn-Tallinn	5 hr 25 min	15 sailings weekly
	SE-FI/FI-FI	Stockholm-Mariehamn/Långnäs-Turku	10 hr 55 min	12 sailings weekly
Viking Line	SE-FI-FI	Stockholm-Mariehamn-Helsinki	16 hr 45 min	1 sailing daily
	SE-FI/FI-FI	Stockholm-Mariehamn/Långnäs-Turku	10 hr 35 min	2 sailings daily
	SE-FI	Stockholm-Mariehamn	6 hr 30 min	1 sailing daily
	SE-FI	Kapellskär (Stockholm Ports)-Mariehamn	3 hr 30 min	2 sailings daily
Finnlines	FI-SE	Naantali-Kapellskär (Stockholm Ports)	8-9 hr	2 sailings daily

Source: Actia Forum based on operator's data

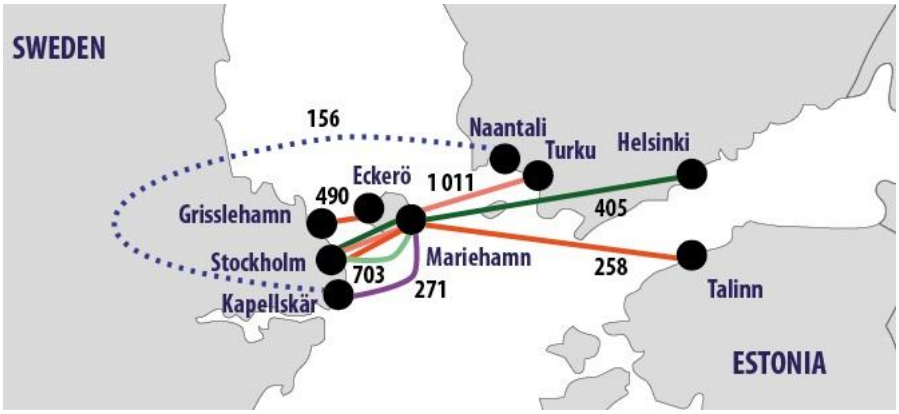

Fig. 3.5. Operators serving passenger traffic to Åland Islands – volume of passengers in 2021 (thousand passengers)

Source: Actia Forum

OPERATORS SERVING SEA BRIDGES

Sea bridges are the connection between neighboring countries, mostly used by people commuting to work. Among operators providing services on sea bridges: between Puttgarden and Rødby, Aarhus and Odden and on Helsingør-Helsingborg route are **Scandlines**, **Molslinjen** and **ForSeaFerries**. The ferry connections are served by 3-4 ferries with max. passenger capacity of 1,200 passengers each. The sea bridges are often domestic ferry connections between Denmark and Danish ports located on island and German ports. The services are offered especially for commuters. The majority of connections allows to save approx. 10-15 litres of fuel and 200 km of driving.

Despite the fact, that the route Rostock-Gedser is not a sea bridge, the frequency and duration of ferry crossing are more similar to connections for commuters.

Tab. 3.5. The frequency of calls on services - Sea Bridges

Operators	Country	Services	Crossing time	Frequency of calls
Scandlines	DE-DK	Puttgarden-Rødby	45 min	Sailings every 30 min, daily
	DE-DK	Rostock-Gedser	2 hr	8 sailings daily
Molslinjen	DK-DK	Odden-Aarhus	1 hr 20 min	Sailings every hour (5:45 first sailing), daily
	DK-DK	Odden-Ebbeltoft	55 min	1 sailing daily
ForSeaFerries	DK-DE	Helsingør-Helsingborg	20 min	Sailings every 30 min, daily

Source: Actia Forum based on operator's data

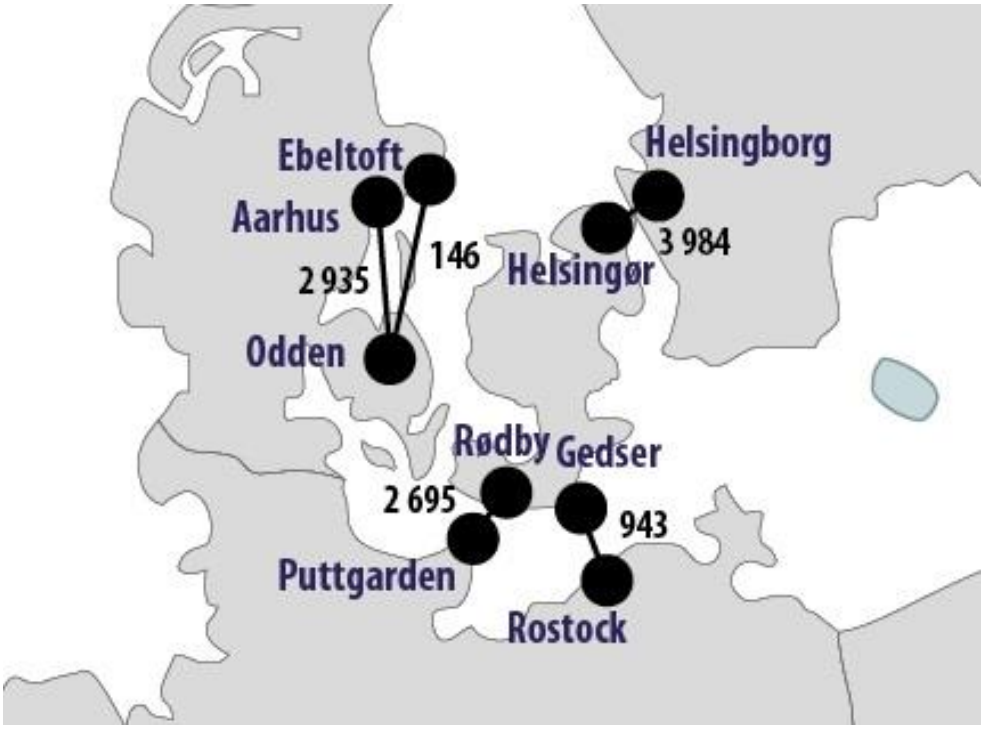

Fig. 3.6. Operators serving sea bridges – volume of passengers in 2021 [thousand passengers]

Source: Actia Forum

PASSENGER ROUTES OPERATED BY HIGH-SPEED CATAMARANS AND FERRIES

Among passengers on the routes operated by high speed vessels are also tourists. It is challenging to indicate the exact number of tourists on board those ships, but the tourist traffic is also a part of the ferries performance. The high-speed catamarans and ferries allow travelers to get in the shortest time to popular travel destinations. The share of tourists is higher during the summer season. FRS Baltic operates the fastest ferry line between the European mainland and Sweden. A high-speed catamaran connects Sassnitz with Ystad in southern Sweden in 2.5 hours. The Bornholmslinjen operates the ferry sailing between the popular holiday islands of Rügen (Port Mukran) and Bornholm. The distance of 55 nautical miles is the shortest direct link from Germany to Bornholm. Bornholmslinjen operates also on route between Ystad and Rønne. The sailings take place few times per day depending on the season.

Tab. 3.6. The frequency of calls – Molslinjen and FRS Baltic&Syltfahre

Operators	Country	Services	Crossing time	Frequency of calls
Molslinjen (Bornholmslinjen)	SE-DK	Ystad-Rønne	1 hr 20 min	4 sailings daily
	DE-DK	Mukran (Sassnitz)-Rønne	3 hr 20 min	4 sailings weekly
FRS Baltic&Syltfahre	DE-SE	Mukran (Sassnitz)-Ystad	2 hr 30 min	2 sailings daily

Source: Actia Forum based on operator's data

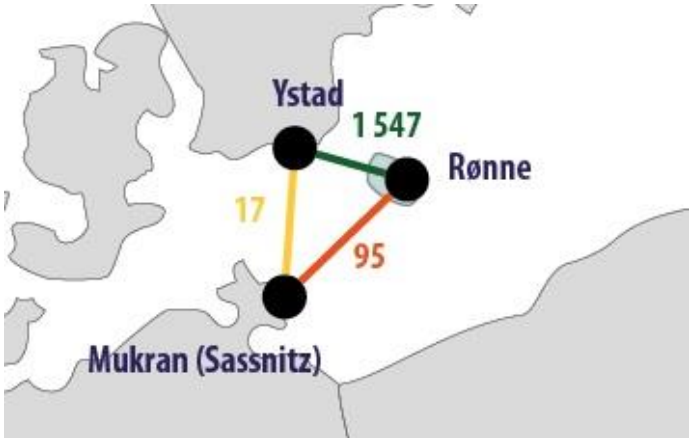

Fig. 3.7. Routes operated by high-speed catamarans and ferries – volume of passengers in 2021 [thousand passengers]

Source: Actia Forum

THE FERRY ROUTES DEDICATED MAINLY TO RO-RO CARGO TRAFFIC

The ro-pax connections to ports of Trelleborg (the biggest port in the Baltic in terms of ro-ro cargo throughput) and Port of Lübeck-Travemünde (serving majority of ro-ro cargo in Germany) are the routes dedicated for cargo traffic. The majority of passengers on board the ships are truck drivers. However, this is not necessarily the case. Among the passengers are also tourists, especially during summer season. Taking into account the fleet deployed on routes we can observe that not only cargo traffic is served by the operators. Among vessels deployed on routes operated by Unity Line are vessels dedicated to passenger transport, among others: Polonia (flagship ferry with all the passenger facilities such as restaurants and shops on-board), Skania, Galileusz and vessels dedicated to freight traffic: Wolin and Jan Śniadecki (designed for transport of railway wagons). The ferries deployed on routes operated by DFDS Seaways (except the route to Norway) are characterized by 1.8 to 2.5 km of loading line. The DFDS ferries are able to carry dangerous goods, freight units, trucks and trailers. The ro-pax vessels are also prepared for passenger transport – there are cabins for passengers with all the necessary facilities such as bars and cafeterias onboard.

Tab. 3.7. Operators on routes serving cargo traffic in the Baltic

Operators	Country	Services	Crossing time	Frequency of calls
DFDS	LT-DE	Klaipėda-Kiel	19 hr	1 sailing daily
	LT-SE	Klaipėda-Karlshamn	14 hr	2 sailings weekly
	SE-ES	Kapellskär-Paldiski	9 hr - 10 hr 30 min	1 sailing daily
Unity Line	PL-SE	Świnoujście-Ystad	6-8 hr	2 sailings daily
	PL-SE	Świnoujście-Trelleborg	6-7 hr	4 sailings daily
Stena Line	DE-SE	Rostock-Trelleborg	6-7 hr 30 min	6 sailings daily

Source: Actia Forum based on operator's data

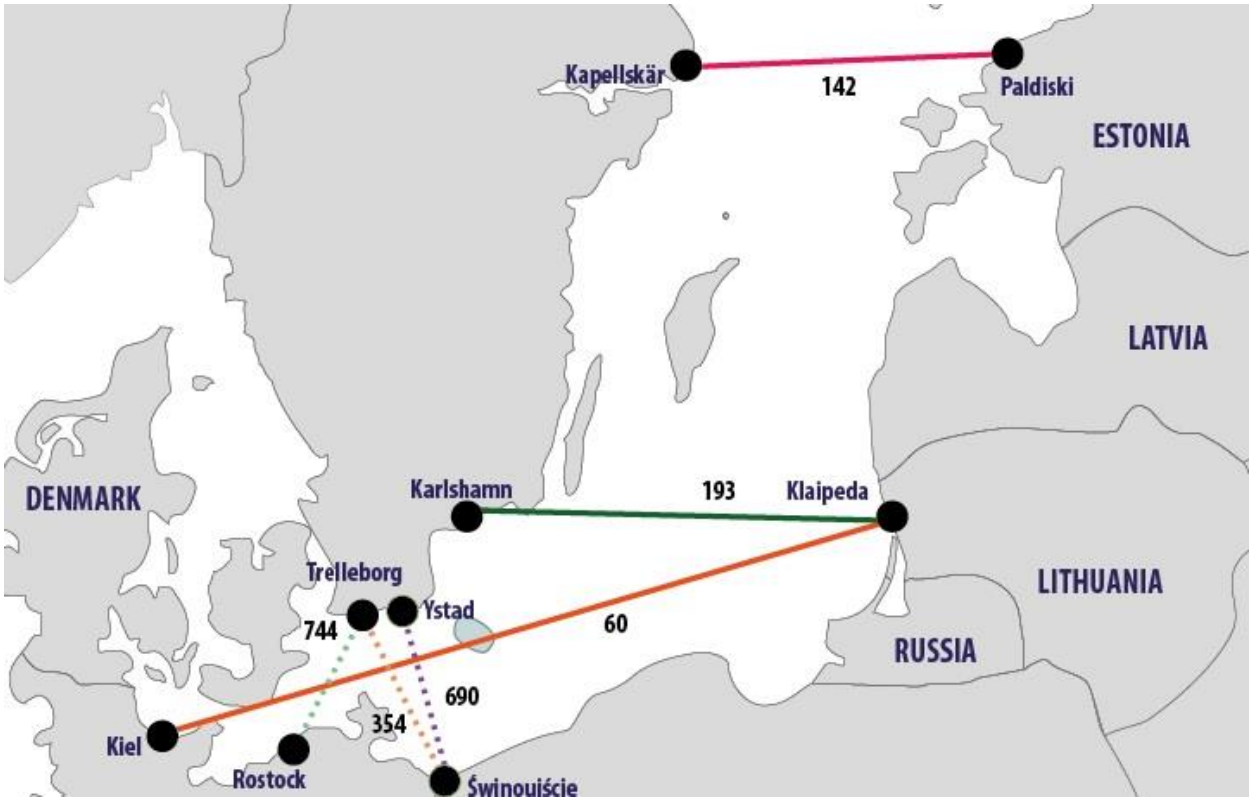

Fig. 3.8. The ferry routes dedicating mainly to ro-ro cargo traffic – volume of passengers in 2021 [thousand passengers]

Source: Actia Forum

4. TOP FERRY PORTS IN BALTIC SEA REGION IN TERMS OF PASSENGER TRAFFIC

In 2021, all countries in the Baltic Sea region served in total 41.7 million passengers in international regular ferry traffic, which is an increase of 5.9% compared to 2020. The Covid-19 pandemic and the restrictions that entered into force to prevent the infection by the virus resulted in reducing the number of passengers on each and every Baltic route. In all countries in the Baltic Sea Region, the results from 2021 haven't reached the pre-pandemic level.

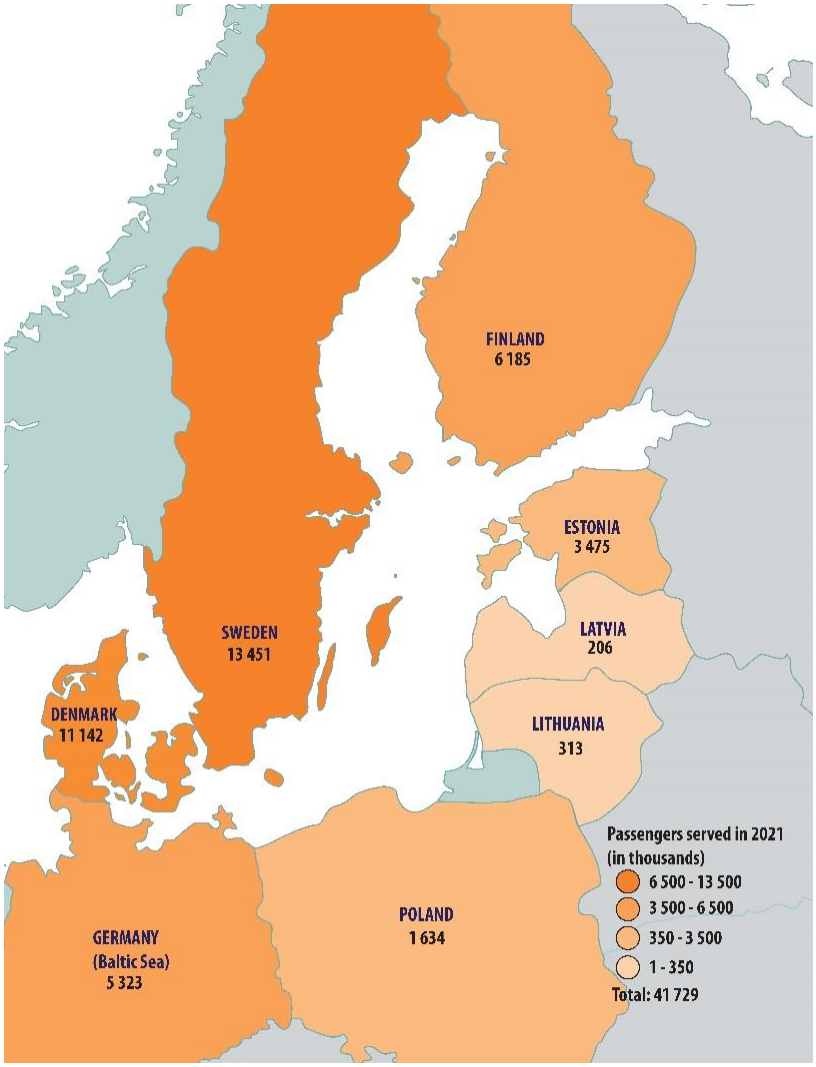

Fig. 4.1. The international passenger traffic in the Baltic Sea Region in 2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The largest ferry traffic in terms of transported passengers was observed in Sweden with a result of 13.5 million passengers, which is an increase by 17% compared to 2020. Sweden is responsible for 32% of all the passengers served in BSR. Danish ports are responsible for 27% of all the passenger traffic (11.1 million passengers in 2021, the increase by 8.34% in comparison with 2020). The busiest routes with Danish ports are Ystad-Rønne, Rostock-Gedser and Gothenburg-Frederikshavn. The declines were observed on the route to Rostock (from 1.7 mln passengers in 2019 to 0.8 mln passengers in 2020) and Gothenburg (the traffic amounted 0.4 mln passengers in 2020 in comparison with the level of 1.2 mln passengers in 2019). The total traffic of Finnish ports decreased by 7.38% (6.2 million passengers in regular ferry traffic in 2021).

During Covid-19 pandemic, especially in 2020 the ferry services on some routes were suspended due to Covid restrictions. The drop was observed in the case of the busiest route: Helsinki-Tallinn and was the cause of the severe decline in passenger traffic in the Port of Helsinki. The connections with Swedish ports also noticed drops. Especially routes to Åland islands declined by 70-80% in 2020 compared to volumes in 2019. Drops were also noticed on the route to Gdynia (-43% in 2020 compared to 2019) and with Kiel (- 63% in 2020 compared to pre-pandemic level).

The volumes of passengers noted in 2021 and in 2022 are becoming similar to the values obtained in the pre-pandemic period. Nevertheless, the return to the level from 2019 is very difficult due to lockdowns in China which appeared recently, new variants of the coronavirus and the geopolitical situation (especially aggression of Russian Federation against Ukraine in February 2022), inflation and strikes in ports.

Tab. 4.1. International passenger traffic in countries in the Baltic Sea Region [in thous. passengers]

	2016	2017	2018	2019	2020	2021	Change 2021/2020 [%]	Change 2021/2019 [%]
Sweden	26 134	26 371	26 362	26 644	11 479	13 451	17.18%	-49.52%
Denmark	22 190	21 999	21 626	21 658	10 284	11 142	8.34%	-48.55%
Finland	18 022	18 220	17 944	17 890	6 678	6 185	-7.38%	-65.43%
Germany (Baltic Sea)	10 930	10 637	10 140	10 837	4 374	5 323	21.70%	-50.88%
Estonia	9 873	10 080	9 954	9 936	4 332	3 475	-19.78%	-65.03%
Poland	1 833	1 932	1 963	1 993	1 515	1 634	7.85%	-18.01%
Lithuania	302	296	323	323	308	313	1.62%	-3.10%
Latvia	510	953	953	1 032	435	206	-52.64%	-80.04%
Total	**89 794**	**90 488**	**89 265**	**90 313**	**39 405**	**41 729**	**5.90%**	**-53.80%**

Source: Actia Forum based on Eurostat

In 2021, total passenger traffic in Top 20 ferry ports amounted 26.7 million passengers, an increase by 5.65% in comparison to 2020. What is more, total passenger traffic obtained by Top 20 ports accounts for 64% of total Baltic ferry ports traffic. The traffic on vast majority of routes is still below the levels from 2019 and the decrease is double-digit, very often exceeding 50% drops.

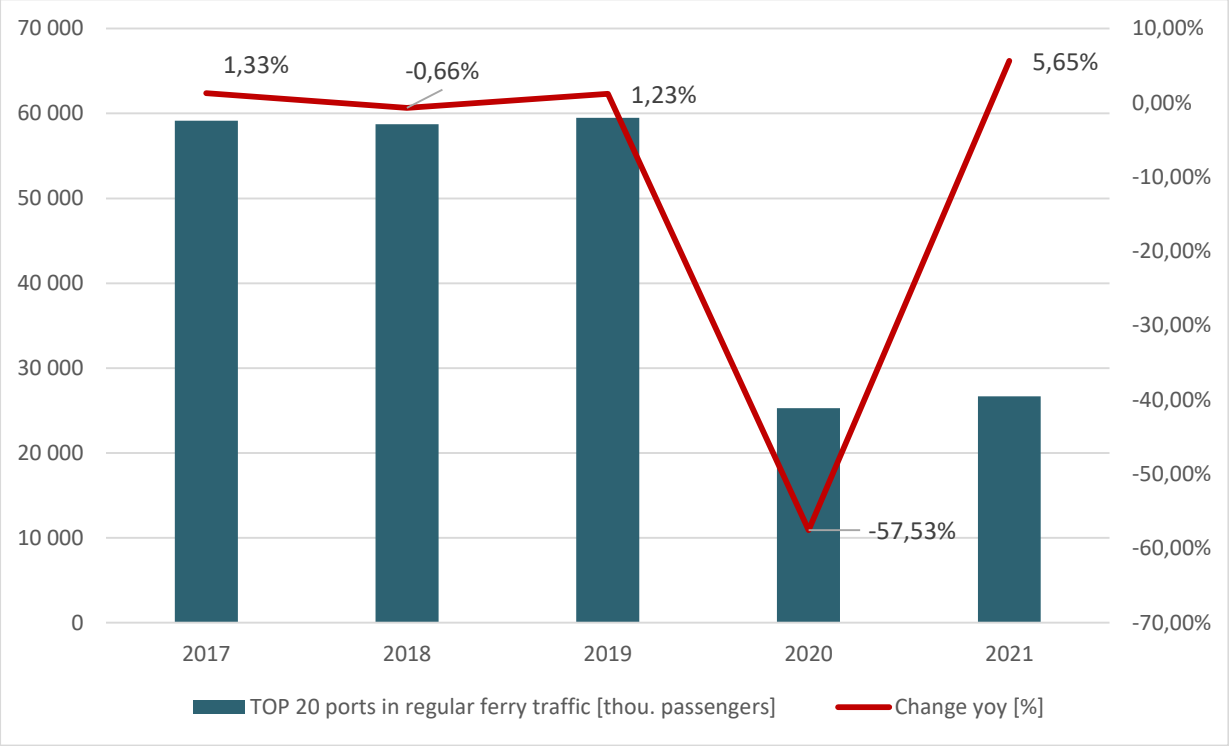

Fig. 4.2. Top 20 ports in regular ferry traffic in thousand passengers in international traffic (domestic ferry traffic is excluded from the figures above)

Source: Actia forum based on Eurostat

The largest port in terms of ferry traffic was the Port of Helsinki which accounts for 14% of the total passenger traffic of Top 20 ports. The traffic on route Helsinki-Tallinn decreased in 2021, but other routes recorded increases (Stockholm-Mariehamn-Helsinki by 8% and Helsinki-Travemünde by 19% compared to 2020). The second place is occupied by the largest Swedish port in terms of passenger traffic, the Stockholm-Nynäshamn-Kapellskär-Norvik port. Port served almost 3.7 million passengers in 2021 (+51% compared to 2020). Among Top 3 ports is the Port of Tallinn (-20%. 3.5 million passengers). The port serves mainly tourist traffic with Finnish ports.

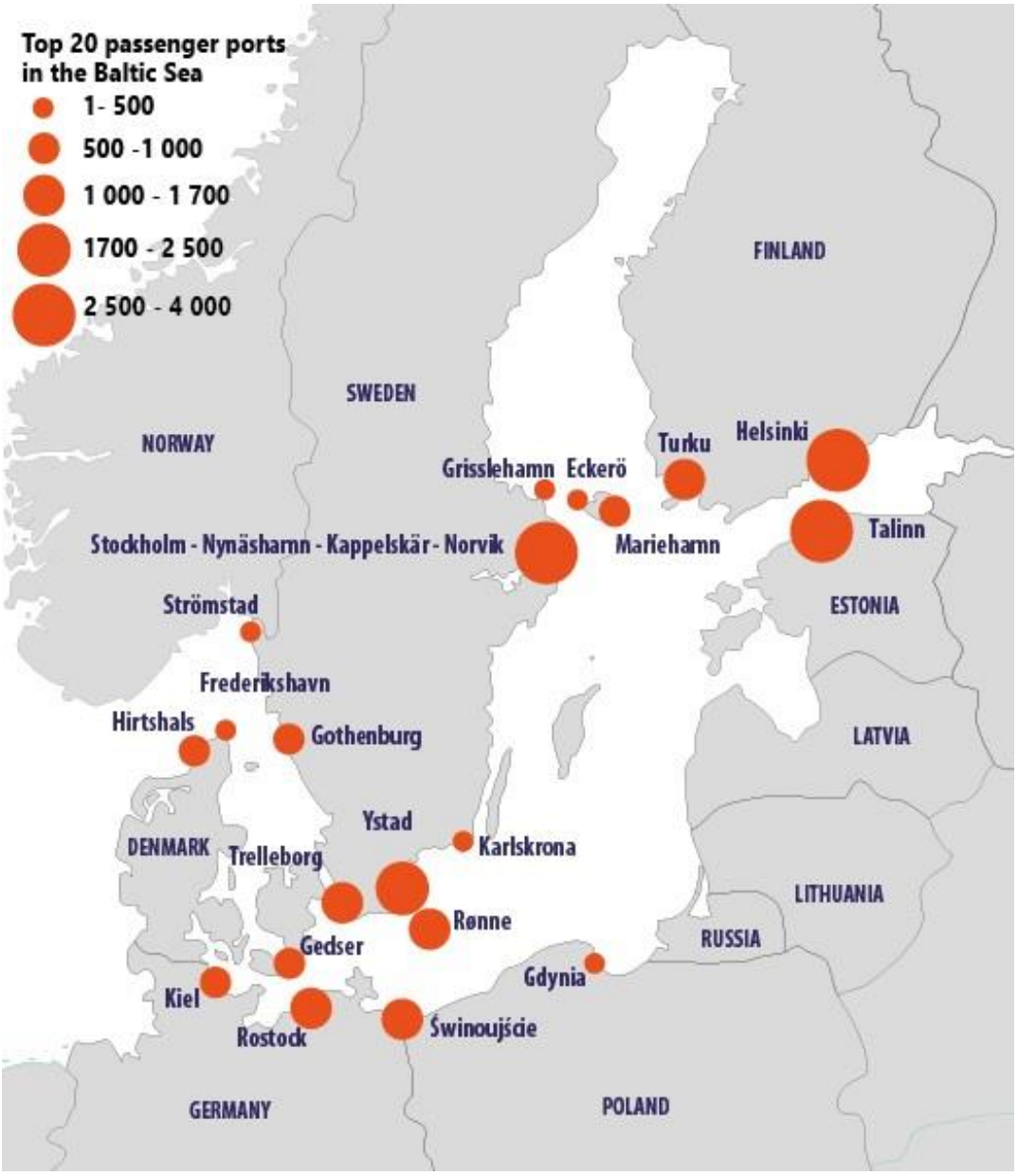

Fig. 4.3. Top 20 ports in regular ferry traffic in international traffic in 2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Among Baltic ports with significant importance for passenger transport are also sea bridges. These connections are used to transport local citizens (commuters). However, it should be noted that tourists may be part of the travelers despite the fact, that the connection doesn't have the tourist character. Among those routes are: Helsingør (DK) - Helsingborg (SE), Puttgarden (DE) - Rødby (DK) and Aarhus (DK) - Odden (DK). Also, in the case of sea bridges, there are noticeable drops compared to 2019 and a slight recovery compared to 2020 due to reductions in restrictions due to Covid-19 pandemic.

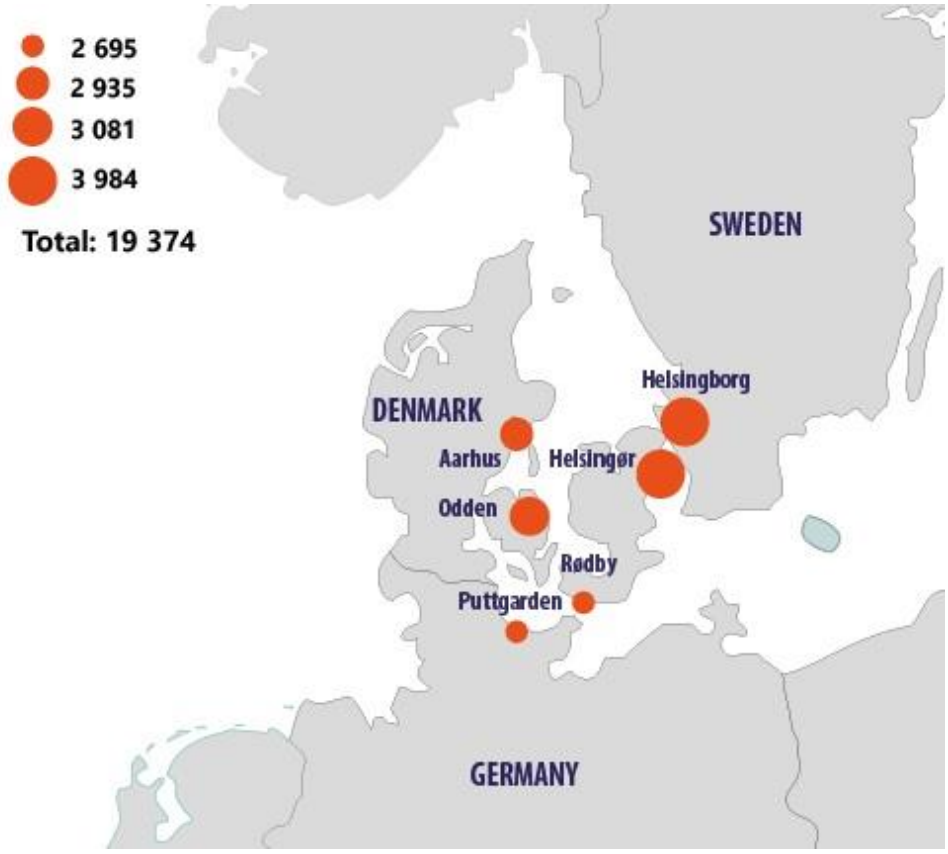

Fig. 4.4. Sea Bridges – ports performance in 2021

Source: Actia Forum

Tab. 4.2. The passenger traffic of ports as sea bridges in years 2017-2021

Country	Port	2017	2018	2019	2020	2021	Change 2021/2020 [%]	Change 2021/2019 [%]
DE	Puttgarden	5 870	5 580	6 007	2 329	2 695	15.7%	-55.1%
DK	Rødby	5 870	5 580	6 007	2 329	2 695	15.7%	-55.1%
DK	Helsingør	7 310	7 152	7 105	3 549	3 984	12.3%	-43.9%
SE	Helsingborg	7 310	7 152	7 105	3 549	3 984	12.3%	-43.9%
DK	Aarhus	2 870	3 144	3 385	2 437	3 008	23.4%	-11.1%
DK	Odden	2 870	3 144	3 385	2 437	3 008	23.4%	-11.1%
Total		32 100	31 752	32 994	16 630	19 374	16,5%	-41,3%

Source: Actia Forum based on Eurostat

The passenger traffic in the period January-June 2022 in all TOP 20 ports increased compared to corresponding period of 2021, especially in ports with international ferry traffic the increases were at the level of up to 200%. The highest increase was observed in the Port of Hirtshals – the traffic to/from Norwegian ports is operated by Color

Line and the recovery of ferry traffic after the pandemic restrictions is noticeable. In total, Top 20 ports served 18.8 million of passengers, an increase of 122% in comparison to January-June 2021.

Tab. 4.3. Top 20 passenger ports in H1 2021 and 2022

Country	Port	H1 2021	H1 2022	Change H12022/H1 2021 [%]
FI	Helsinki	990	3 257	229%
EE	Tallinn	969	2 793	188%
SE	Stockholm-Nynäshamn-Kapellskär-Norvik	706	2 456	248%
DE	Kiel	1 169	1 456	25%
SE	Ystad	837	1 088	30%
DK	Hirtshals	107	950	788%
FI	Turku	238	889	274%
DE	Rostock	492	766	56%
DK	Rønne	544	766	41%
SE	Trelleborg	582	704	21%
SE	Gothenburg	172	519	202%
DK	Gedser	225	508	126%
PL	Świnoujście	458	507	11%
FI	Mariehamn	129	418	224%
DK	Frederikshavn	121	406	236%
SE	Strömstad*	183	340	86%
SE	Grisslehamn	132	308	133%
FI	Eckerö	132	308	133%
SE	Karlskrona	168	221	32%
PL	Gdynia	168	221	32%
Total		**8 522**	**18 881**	**122%**

** Strömstad- estimations based on numer of port calls in Norwegian ports*
Source: Actia Forum based on national statistics

The situation is similar for the sea bridges. The largest increase was observed on the route Puttgarden-Rødby (+188% in comparison to 2021). The reduction of restrictions due to Covid-19 pandemic led to changes in passenger flows, also in the traffic of commuters.

Tab. 4.4. The passenger traffic in sea bridges ports in first half of 2021 and first half of 2022

Country	Port	H1 2021	H1 2022	Change 2021/2020
DE	Puttgarden	627	1 808	188,4%
DK	Rødby	627	1 808	188,4%
DK	Helsingør	1 213	2 687	121,5%
SE	Helsingborg	1 213	2 687	121,5%
DK	Aarhus	1 084	1 533	41,4%
DK	Odden	1 084	1 533	41,4%
Total		5 848	12 056	106,2%

Source: Actia Forum based on national statistics

5. PARAMETRES OF THE FERRY TERMINALS IN TOP 20 PORTS IN BALTIC SEA REGION

PORT OF HELSINKI

The Port of Helsinki is one of the busiest passenger ports in Europe. Passenger traffic in Port of Helsinki was at the level of 3.7 mln passengers in 2021. In January-August 2022, the port recorded increases on routes with Tallinn, Stockholm and Travemünde.

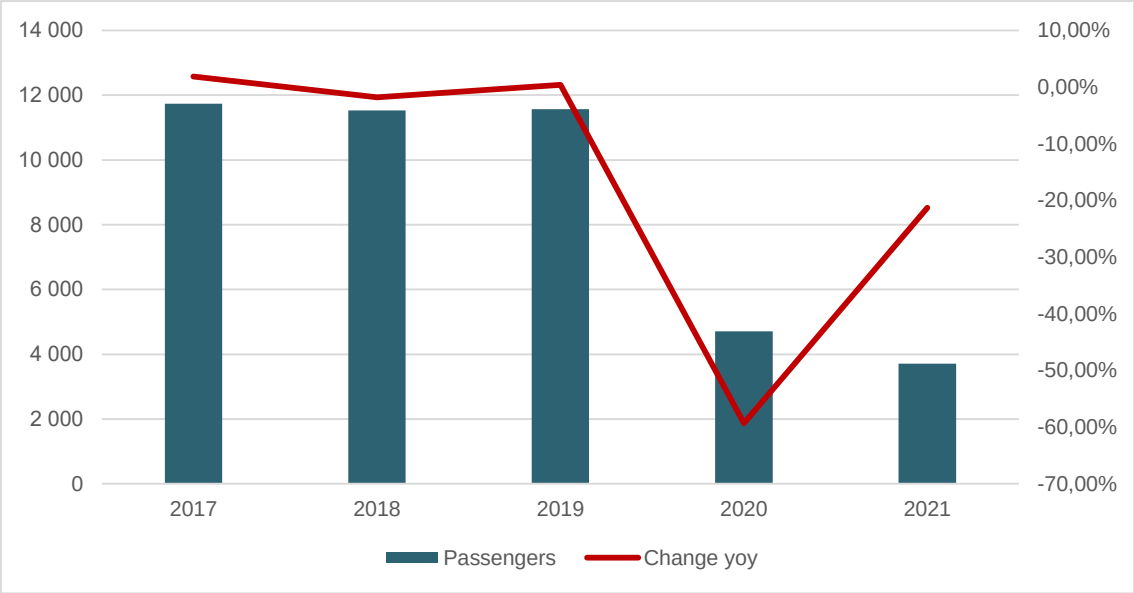

Fig. 5.1. Number of passengers in the Port of Helsinki in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The port consists of six ferry terminals. There are four ferry operators using the facilities of the terminals (Tallink&Silja Line, Viking Line, Eckerö Line and Finnlines). The busiest route in the Baltic in terms of passenger traffic is Helsinki-Tallinn. The ferry terminals are in close vicinity of the city center, especially the Olympia and Katajanoka Terminals with regular Viking Line and Tallink&Silja Line connections to Tallinn and Stockholm.

Tab. 5.1. Port of Helsinki ferry facilities

Ferry terminal	Quay length (m)	Depth (m)	General remarks
West Terminal 1	212*	7.1*	The West Terminal 1 is closed for the winter, Silja Europa operates on the terminal.
West Terminal 2	212*	7.1*	Silja Europa operates on the ferry terminal.
Katajanokka Terminal	260	8.8	Regular Viking Line's ferry connections.
Olympia Terminal	203*	7.12*	Silja Ships to/from Stockholm operate at the terminal.
Makasiini Terminal	250	7.5	No traffic
Hansa Terminal	219*	7.0*	Departures to Travemünde by Finnlines.

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.portofhelsinki.fi/en/passengers

Fig. 5.2. The ferry terminal Katajanokka (the Viking Line ferry mooring at key)

Source: www.googlemaps.com

PORT OF STOCKHOLM-NYNÄSHAMN-KAPELLSKÄR-NORVIK

The Ports of Stockholm consists of four port areas placed in Stockholm, Nynashämn, Kappelskär and Norvik. In the end of 2020 the new terminal in the Port of Norvik was opened. A total of six ferry operators are using the facilities of the terminals.

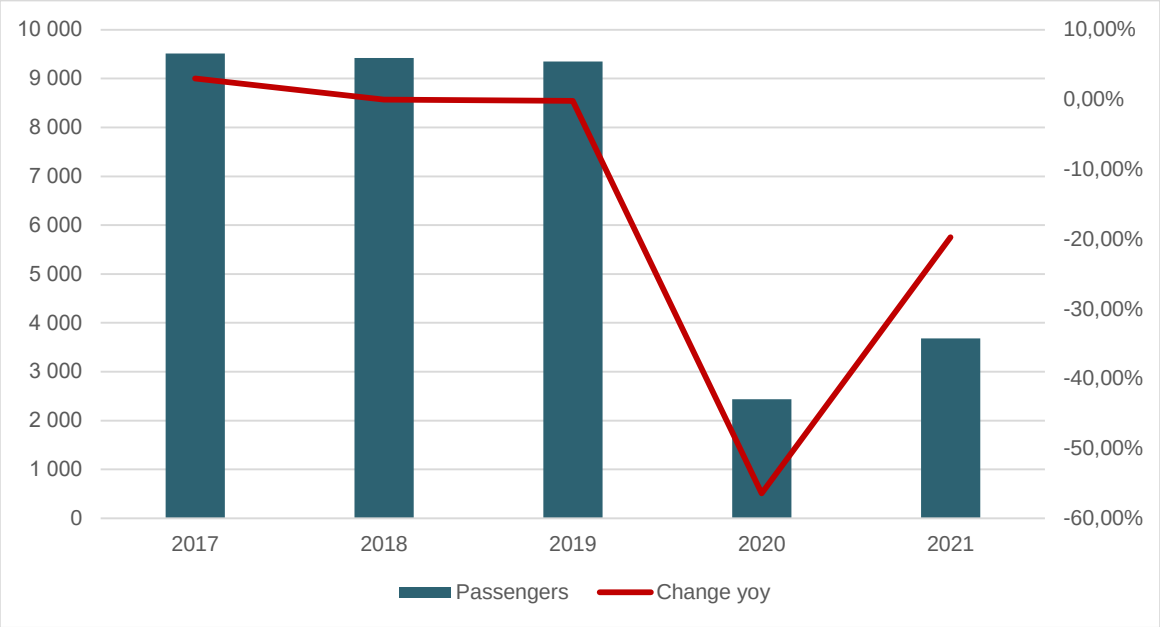

Fig. 5.3. Number of passengers in the Ports of Stockholm in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Majority of the connections from the Ports of Stockholm are to Åland Islands and those routes are the busiest in terms of passenger traffic. The connections from Nynäshamn are operated by Polferries and Destinations Gotland. Hansa Destinations operates on route Rostock-Visby-Nynäshamn since August 2021. A part of Ports of Stockholm is also Kapellskär, providing ferry connections to Paldiski, Naantali and Mariehamn.

Tab. 5.2. Ports of Stockholm ferry facilities

Port	Ferry facility	Quay	Berth length [m]	Depth [m]
Stockholm	Värtahamnen Tallink and Silja Line Terminal Frihamnen Moby Line SPL Terminal Stadsgården & Masthamnen Viking Line Terminal	510	90	8
		511	265	10
		512	222	11
		513	245	9
		514	255	8
		515	255	7
		521-523	320	7,4
		610-611	130	6
		620-625	412	7,5-8,4
		630-631	135	8,5-9
		631-634	211	9-10,6
		634-638	400	10
		640-641	110	7,5
		650-652	222	9
		154-155	215	7,5
		156	120	7,2
		158	70	7,4
		159-161	270	7,4
		162-163	200	8
		164	200	7,8
		165-167	414	9,4
Nynashämn	Destination Gotland Terminal Polferries Terminal	1	200	8
		2	170	7
		3	200	9

Kapellskär	Ferry Terminal Tallink Silja, DFDS, Finnlines, Viking Line	1	245	9
		2	245	9
		3	130	7
		4	200	9
		5	200	9
Norvik	Stena Line Terminal	1	280	10,5
		2	230	10

Source: www.portsofstockholm.com

Fig. 5.4. Värtahamnen – Tallink and Silja Line Terminal in Port of Stockholm

Source: www.portsofstockholm.com/stockholm/port-areas/vartahamnen/

PORT OF TALLINN

The Port of Tallinn was the third largest ferry port in the Baltic Sea in 2021. Among passenger routes to/from Port of Tallinn are Helsinki-Tallinn (described in the Port of Helsinki section) and also Stockholm-Mariehamn-Tallinn, operated by Tallink&Silja Line (258 thou. passsengers in 2021, drop by 74% in comparison with 2019). The average number of passengers before the pandemic was at the level of 1 mln passengers.

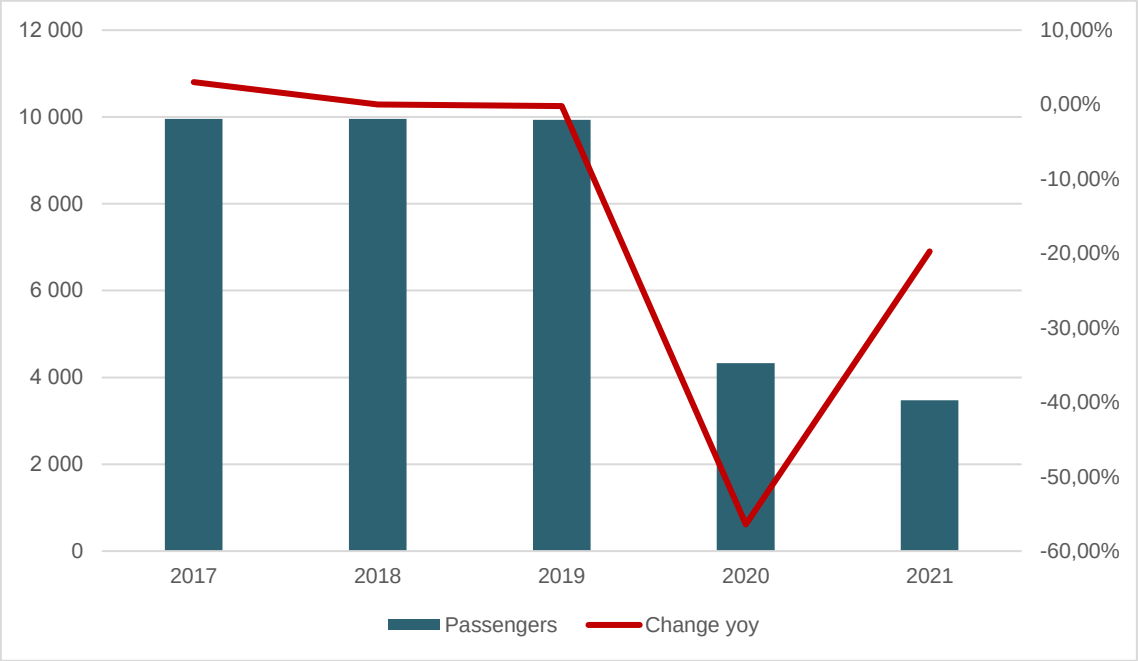

Fig. 5.5. Number of passengers in the Port of Tallinn in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

There are four operators offering passenger services on routes from Tallinn. The ferry terminal is located 10 minutes by car from the city center. The Muuga terminal is located 17 km east of Tallinn and is the cargo terminal.

Tab. 5.3. Port of Tallinn ferry facilities

Ferry terminal	Quay length (m)	Depth (m)	General remarks
Terminal A	185*	6.65*	Eckerö Line, Viking Line
Terminal D	212*	7.1*	Tallink&Silja Line
Muuga	179	6.5	Regular ferry connection between the harbours of Muuga and Vuosaari in Finland (Eckerö Line and Tallink)

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.ts.ee

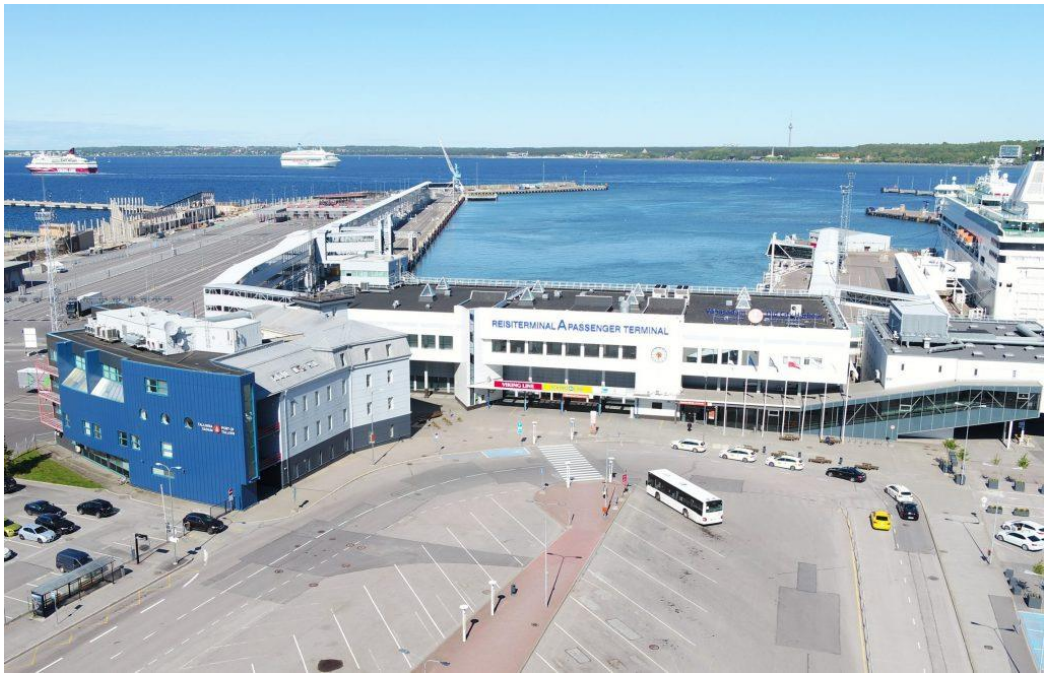

Fig. 5.6. The ferry terminal A in the Port of Tallinn

Source: www.ts.ee

Fig. 5.7. The ferries in the Port of Tallinn (Tallink, Eckerö Line)

Source: www.ts.ee

PORT OF YSTAD

Passenger traffic in Port of Ystad was at the level of 2.4 mln passengers in 2021. Among operators serving passenger traffic to and from Ystad are: FRS Syltfahre, Molslinjen, Polferries, and Unity Line.

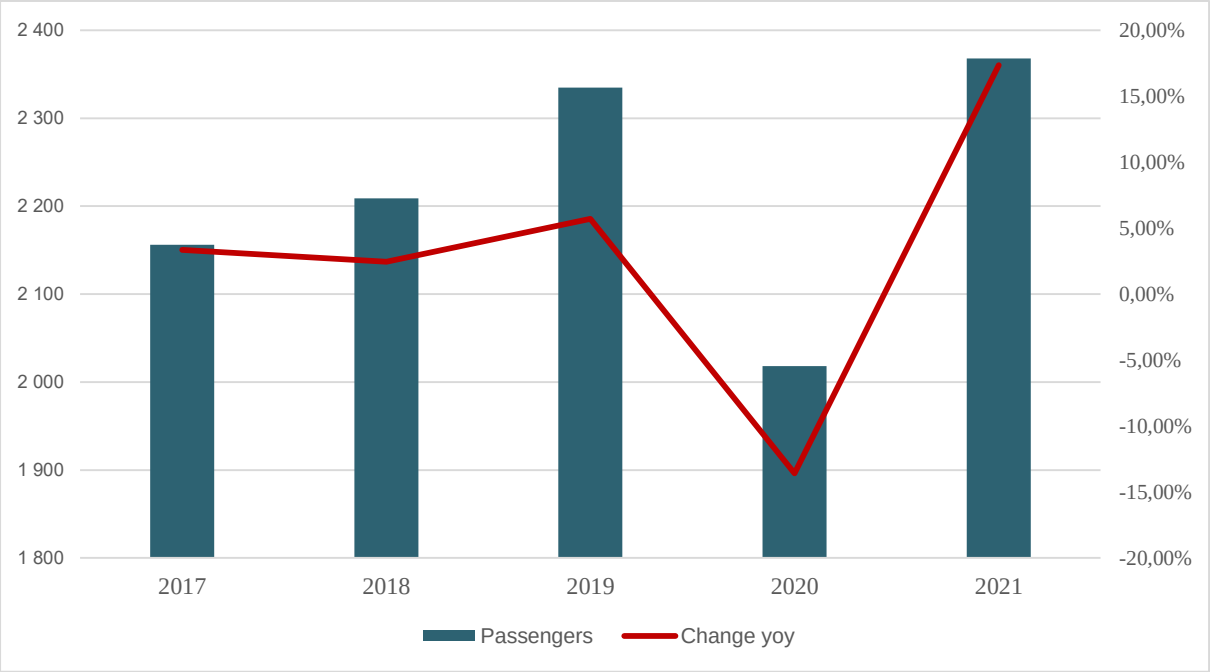

Fig. 5.8. Number of passengers in the Port of Ystad in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Ferry traffic in Port of Ystad takes place on ferry quays 1, 3, 4 and 5, which are reserved for ships in regular traffic. Ferry quay 6 function is a reserve ferry mode. The ferry terminals are located close to the city center, so the tourists have the opportunity to visit the city without additional transport from terminal to tourist facilities.

Tab. 5.4. Port of Ystad ferry facilities

Port Installations	Quay	Quay length (m)	Max LOA (m)	Depth (m)
Nyhemskajen	1	180-200*	180-200*	6,5-7*
Nyhemskajen	3	180-200*	180-200*	6,5-7*
Östrakajen	4	180-200*	180-200*	6,5-7*
Östrakajen	5	100-120*	130*	5-6**
Revhuskajen	6	180-200*	180-200*	6,5-7*

**data not available, approximate length/depth calculated on the basis of mooring ships*
Source: www.ystad.se

Fig. 5.9. Ferry and ro-ro quays in Port of Ystad

Source: www.baltictransportjournal.com/index.php?id=635

Fig. 5.10. Ferries in the Port of Ystad

Source: www.cruisemapper.com

PORT OF ROSTOCK

Port of Rostock is the largest German port in Baltic Sea region in terms of passenger traffic. The ferry traffic in 2021 amounted 1.7 mln passengers in 2021. Among the operators which regularly use ferry facilities are: Scandlines, Hansa Destinations, Stena Line and TT Line.

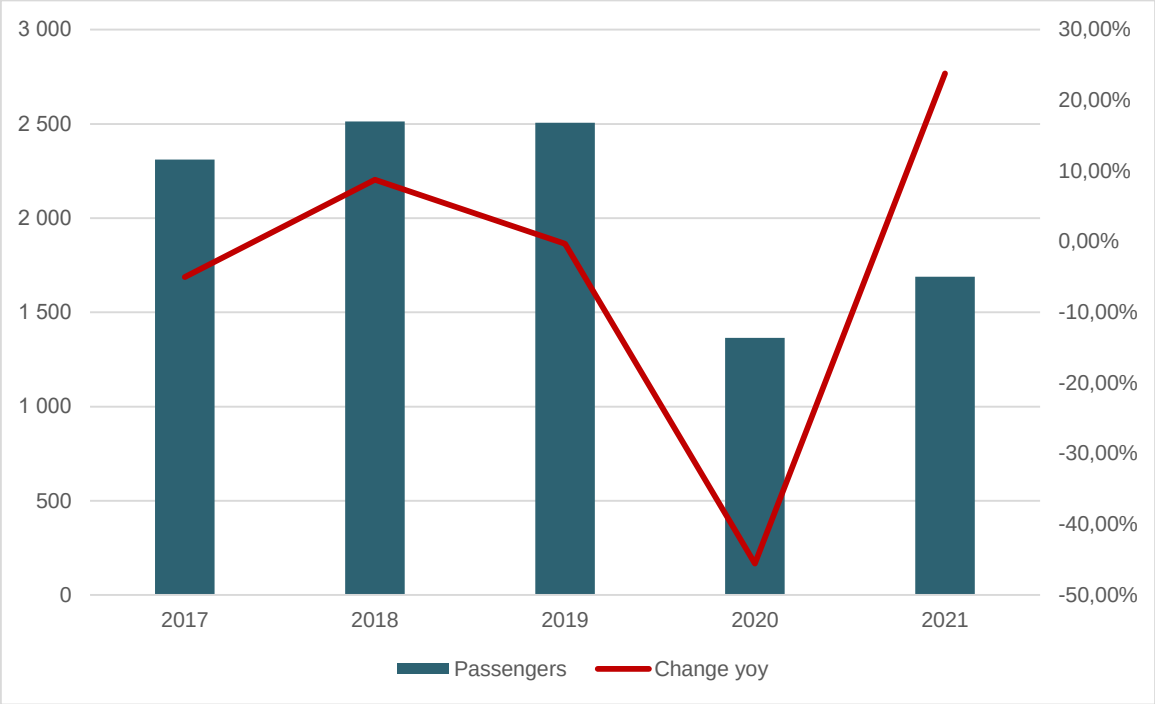

Fig. 5.11. Number of passengers in the Port of Rostock in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The ferry terminal is located on the north from the city centre, although it can be reached in approx. 25-30 minutes by car. Details of the quays are presented in Tab. 5.5 and Fig. 5.12 - Fig. 5.13.

Tab. 5.5. Port of Rostock ferry facilities

Ro-Ro/ferry facility	Quay	Quay length (m)	Max LOA (m)	Max draft (m)
Ferry terminal	53	420	220	9,3
	54	254	170	10,0
	64	235	220	8,1
	66	250	235	8,6
	67	150	140	7,8

Source: www.rostock-port.de/schiffsverkehr/liegeplaetze-nutzungsparameter

Fig. 5.12. Ferry Terminal in Port of Rostock

Source: www.livenowtravel.wordpress.com

Fig. 5.13. Ferry Terminal in Port of Rostock

Source: www.livenowtravel.wordpress.com

PORT OF RØNNE

Port of Rønne is the largest Danish port in the Baltic Sea region in terms of passenger traffic. The ferry traffic amounted 1.6 mln passengers in 2021. Among the operators which regularly use ferry facilities is Molslinjen - routes to Ystad (SE) and Mukran (DE). The Port of Rønne also offers domestic ferry line to Køge which is not taken into account due to the scope of the study.

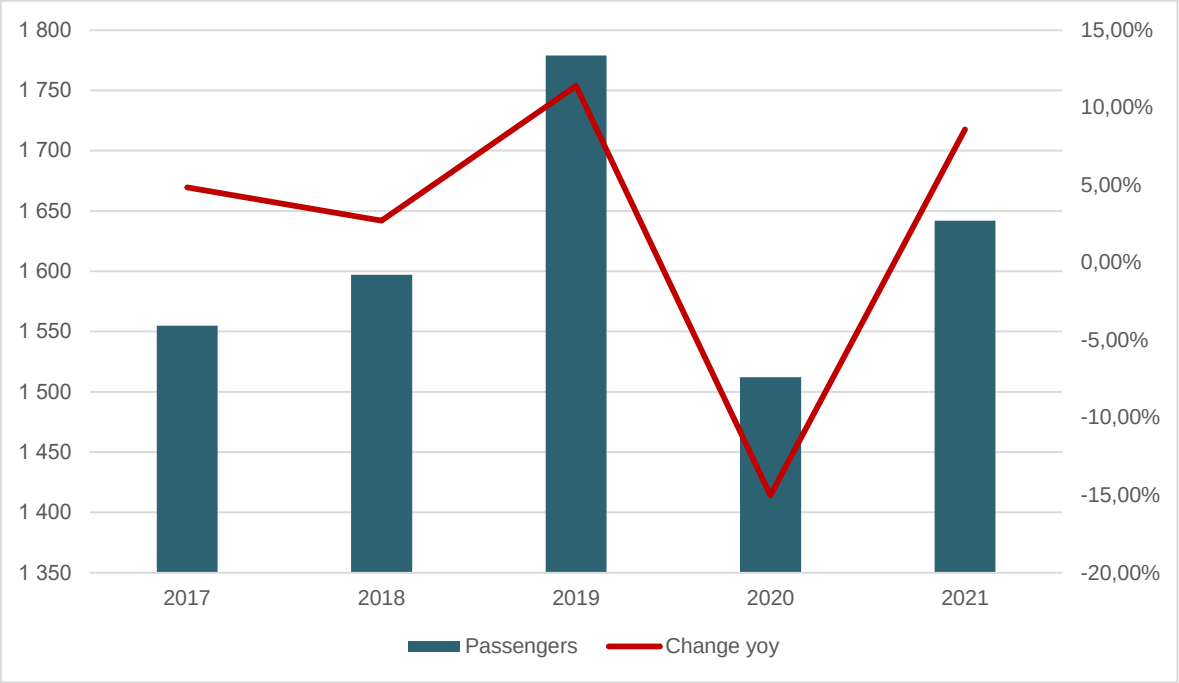

Fig. 5.14. Number of passengers in the Port of Rønne in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The vessel deployed on route Rønne-Ystad are high-speed catamarans operated by Molslinjen between Rønne and Ystad, the world's largest diesel-powered catamaran. The ship operates at BornholmerFærgen terminal. Details of the quay are presented in Tab. 5.6 and Fig. 5.15. – Fig. 5.16.

Tab. 5.6. Port of Rønne ferry facilities

Ferry terminal	Quay length (m)	Depth (m)	General remarks
BornholmerFærgen	121*	5.25*	Bornholmslinjen

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.portofroenne.com

Fig. 5.15. Ferry Terminal in Port of Rønne – Bornholmslinjen ferry on route from the port

Source: www.dr.dk

Fig. 5.16. The Port of Rønne – aerial view

Source: https://portofroenne.com/

PORT OF TRELLEBORG

The ferry traffic in Port of Trelleborg amounted 1.45 mln passengers in 2021. Among the operators which regularly use ferry facilities are TT Line and Stena Line (routes to Poland, Germany and Lithuania). It is worth noting, that Port of Trelleborg is the largest port in terms of ro-ro transport, so among the passengers on board ships on routes with Trelleborg some of the visitors are truck drivers.

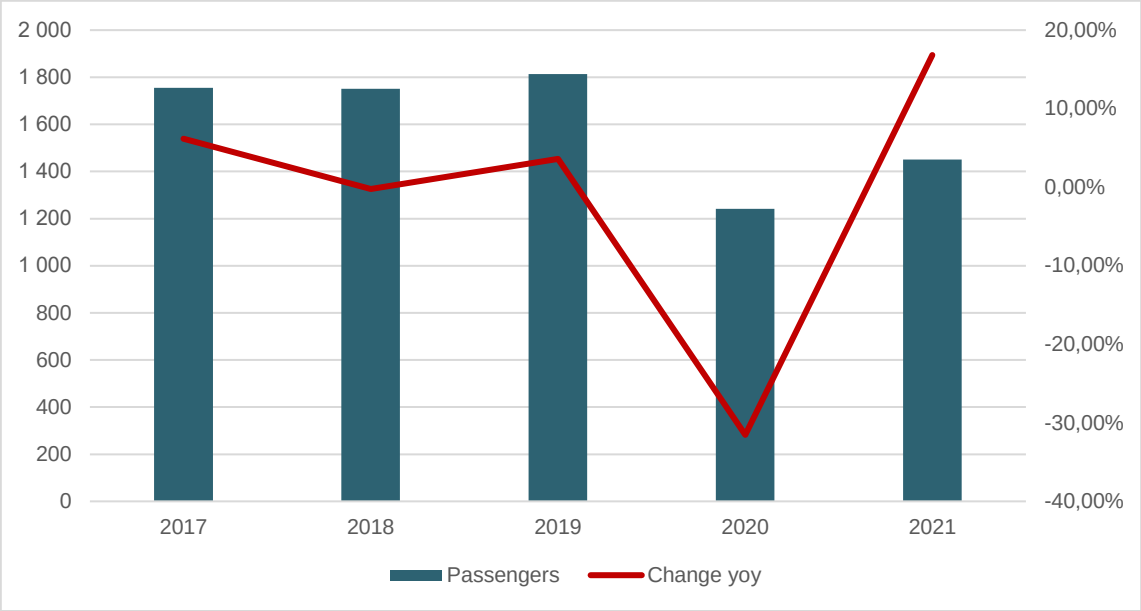

Fig. 5.17. Number of passengers in the Port of Trelleborg in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Trelleborg is Sweden's southernmost city. Smygehuk is the Swedens' southernmost point – the tourist destination. Among other facilities are Trelleborgs Museum, Trelleborgen – old viking village and water parks. The ferry terminal is located 1.5 km from the city centre, a walking distance to the Tourist Centre in Trelleborg. Details of the quays are presented in Fig. 5.18.

Tab. 5.7. Port of Trelleborg ferry facilities

Ferry terminal	Quay length (m)	Depth (m)	General remarks
Quay 1-Quay 8	200-220*	6.2*	7 berths with double ro-ro ramps, 2 directly rail-linked

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.trelleborgshamn.se

Fig. 5.18. The ferry terminal in the Port of Trelleborg – the Stena Line ferry mooring at the quay in port

Source: www.googlemaps.com

PORT OF ŚWINOUJŚCIE

The Ferry Terminal in Port of Świnoujście plays a leading role in service of ferry connections from Poland to Sweden, both in terms of the number of ferry calls and number of passengers. The destinations from Świnoujście are Ystad and Trelleborg, and among operators calling at Świnoujście are TT-Line, Unity Line and Polferries. The passenger traffic in the Port of Świnoujście amounted 1.044 mln passengers in 2021.

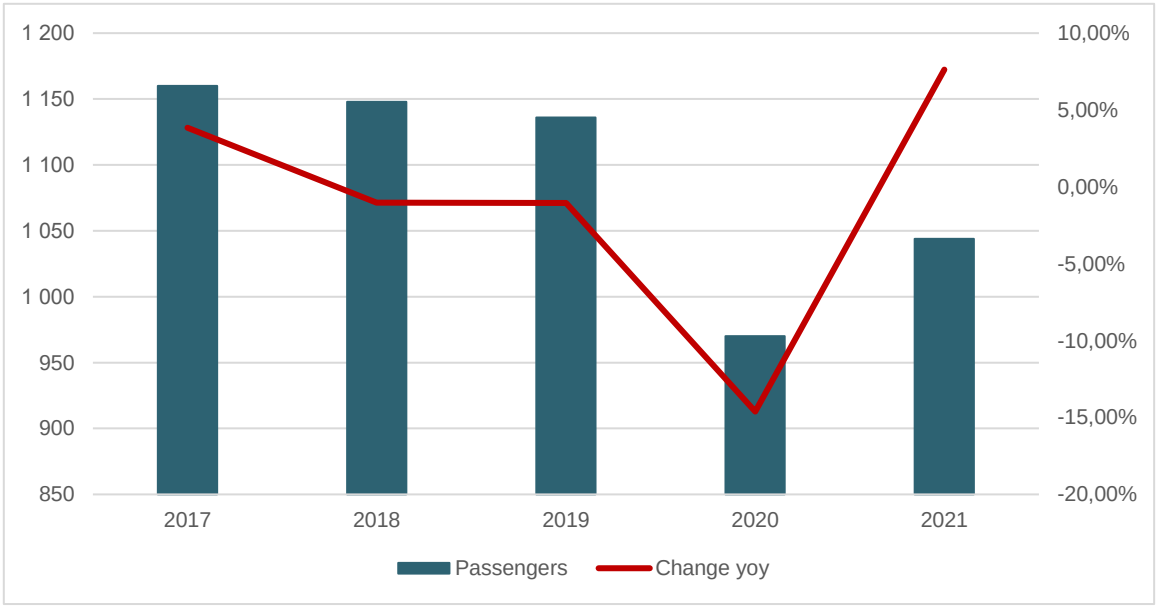

Fig. 5.19. Number of passengers in the Port of Świnoujście in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

After the modernization, the Ferry Terminal in Świnoujście will be adapted to handle intermodal transport. Owing to this investment, ferries with a length of up to 270 m, as well as passenger ships with similar parameters, will be served by the terminal. The modernization is expected to be completed in 2022.

Tab. 5.8. Port of Szczecin-Świnoujście ferry facility

Port	Ferry facilities	Quay	Quay length (m)	Max draft (m)
Świnoujście	Ferry Terminal	1	242	13
		2	193	11
		3	194	9,5
		4	204	9,5
		5	196	9,5
		6	154	9,5

Source: www.portszczecin.pl, www.portszczecin.deutschebahn.com

Fig. 5.20. Ferry Terminal in Port of Świnoujście

Source: www.eswinoujscie.pl

PORT OF TURKU

The passenger traffic in the Port of Turku exceeded 1 mln passengers in 2021. Among the port operators offering passenger services are Tallink&Silja Line and Viking Line. Ferry Terminal Turku (FTT) is a joint project of the Port of Turku and Tallink Silja and Viking Line to develop passenger traffic. The aim is to build a new common passenger terminal area for the use of shipping companies. The new terminal area is to be completed at the end of 2026/the beginning of 2027.

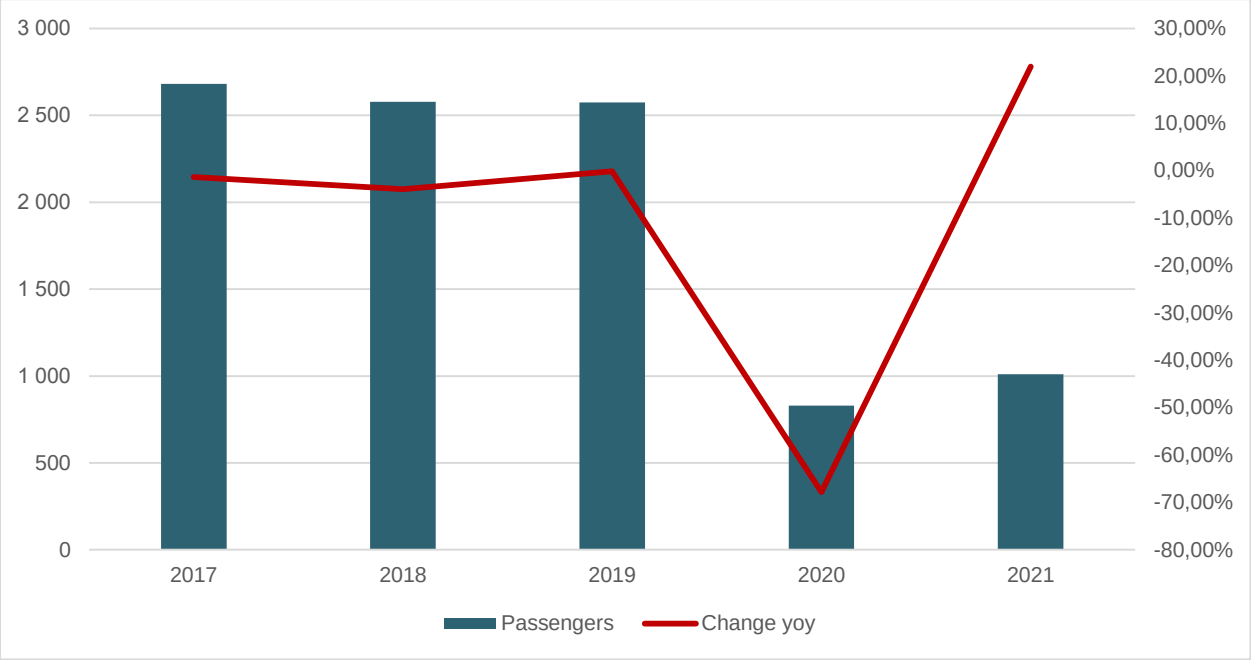

Fig. 5.21. Number of passengers in the Port of Turku in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Among tourist attractions that can be visited in Turku are Turku castle, cathedral and Kurala – a recreated 1950s village, in which actors in costume behave as they would live in the post-war era. The ferry terminal is located approx. 4 km from the city center. Details of the quays are presented in Tab. 5.9 and Fig. 5.22 – Fig. 5.23.

Tab. 5.9. Port of Turku ferry facility

Ferry facilities	Quay length (m)	Max draft (m)	General remarks
Linnasatama Terminal	218*	6.8*	Ferry terminal used by Viking Line operator
Silja Line Turku Terminal	212*	6.3*	Ferry terminal used by Tallink ferries (operated by Silja Line)

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.vikingline.fi and www.tallink.com

Fig. 5.22. Ferry Terminal in Port of Turku

Source: www.fmc-yearbook.com

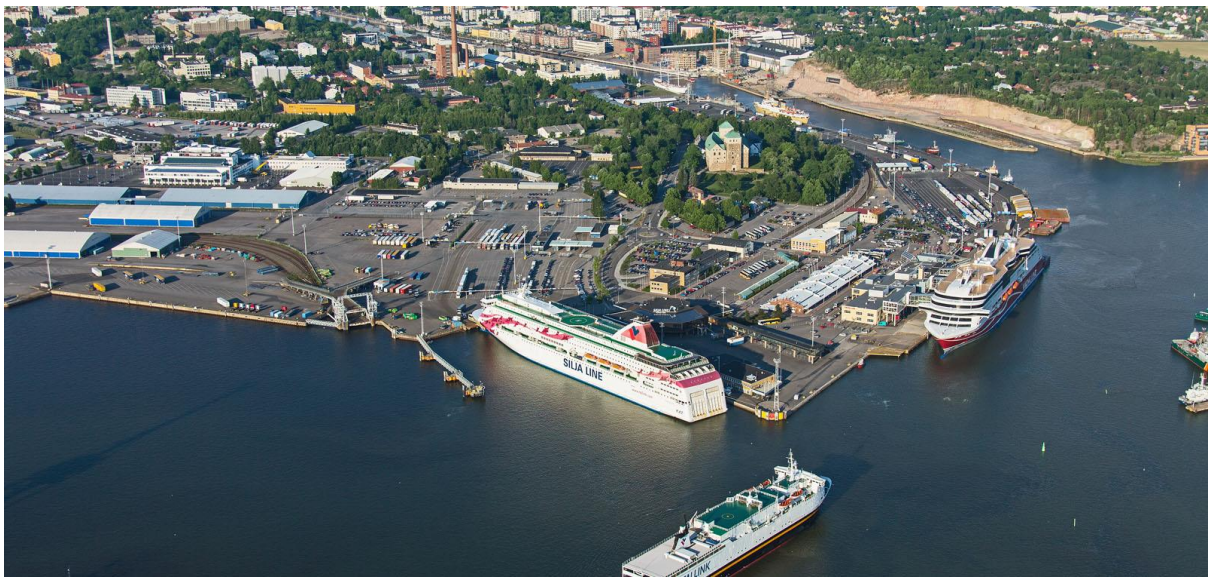

Fig. 5.23. Port of Turku – aerial view

Source: https://www.turku.fi/

PORT OF GEDSER

The passenger traffic in the Port of Gedser amounted 943 thou. passengers in 2021.The ferry terminal is used by Scandlines. The operator serves the traffic between Port of Gedser and Port of Rostock.

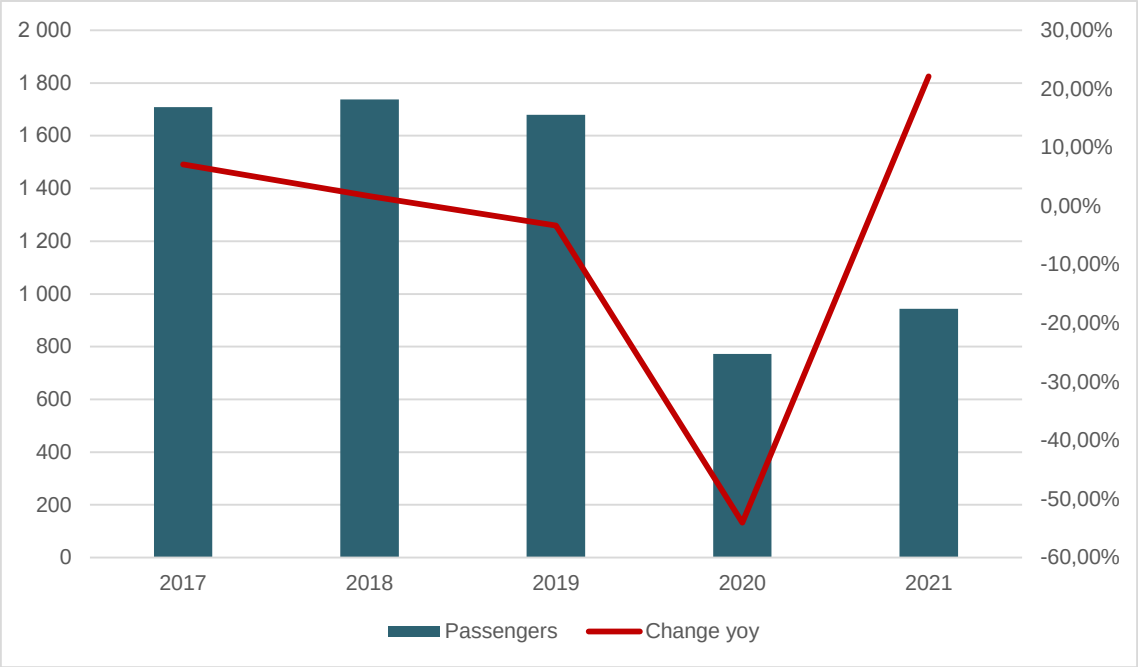

Fig. 5.24. Number of passengers in the Port of Gedser in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Among the tourist attractions in Gedser are Det Sorte Museum, Gedesby Molle (mill), the exhibition of railway carriages and engines from 1886 until the 1950 and a lot of viewpoints and sea landscapes. Details of the quays are presented in Tab. 5.10 and Fig. 5.25 - Fig. 5.26.

Tab. 5.10. Port of Gedser ferry facility

Ferry facilities	Quay length (m)	Max draft (m)	General remarks
Scandlines Deutschland GmbH Ferry Terminal	169.5*	5.5*	Ferry terminal used by Scandlines operator

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.scandlines.com

Fig. 5.25. The Port in Gedser -aerial view

Source: www.scandlines.de

Fig. 5.26. The Scandlines ferry in the Port of Gedser

Source: https://www.visitlolland-falster.com/

PORT OF HIRTSHALS

The passenger traffic in the Port of Hirtshals amounted 894 thou. passengers in 2021.The ferry terminal is used by Color Line and Fjord Line on the routes to Norway. Among ferries deployed on routes from Hirtshals are SuperSpeed1 and Super Speed2, both with passenger capacity of approx. 2 thousand passengers each.

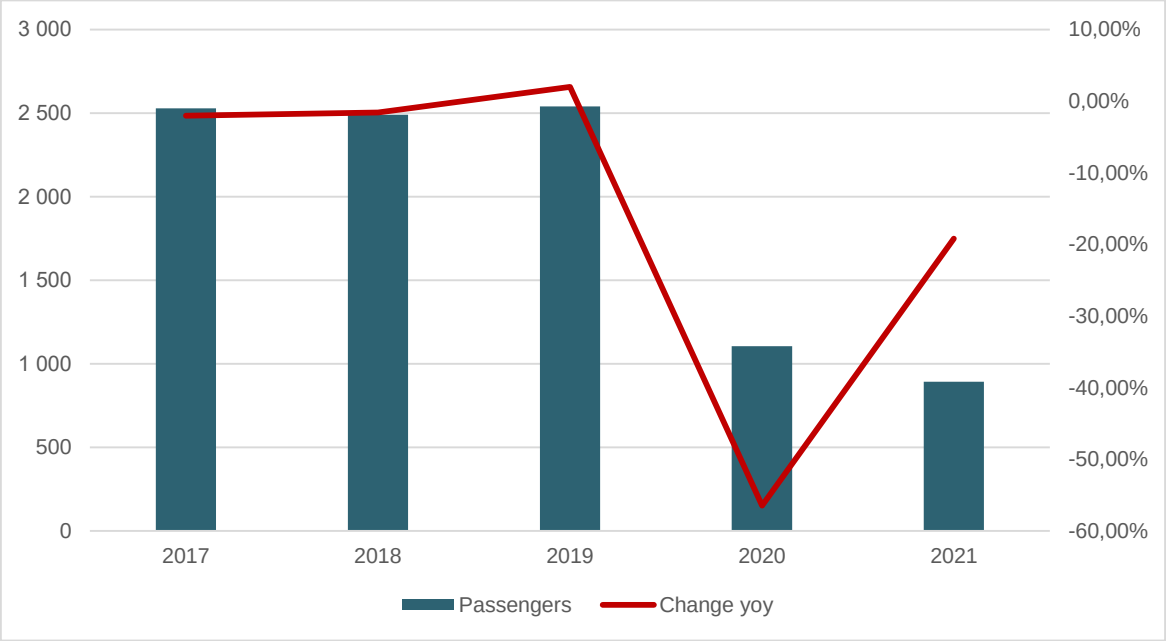

Fig. 5.27. Number of passengers in the Port of Hirtshals in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Hirtshals is known for the Hirtshals Hyn, the lighthouse which can be visited by tourists, Nordsoen Oceanarium and Fun Park Hirtshals. In the terminals vicinity is the Kjul beach. The terminal is located 3 km from the city centre. Details of the quays are presented in Tab. 5.11 and Fig. 5.28.

Tab. 5.11. Port of Hirtshals ferry facility

Ferry facilities	Quay length (m)	Max draft (m)	General remarks
North Sea Terminal in Hirtshals	170*	6.35*	Ferry terminal used by Fjord Line operator
Ferrry Terminal Color Line	211*	6.7*	Ferry terminal used by Color Line operator

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.fjordline.com, www.colorline.com

Fig. 5.28. The Ferry Terminal in the Port of Hirtshals (the Color Line ferry mooring at the quay)

Source: www.maps.google.com

PORT OF GOTHENBURG

Passenger traffic in Port of Gothenburg was at the level of 7.9 mln passengers in 2021. The Port of Gothenburg, one of the biggest ro-ro cargo seaport in the BSR, has three terminals on which they can operate wheeled cargo: Logent Ports and Terminals, and two Stena Line's Terminals. Among the operators there are: Stena Line and DFDS.

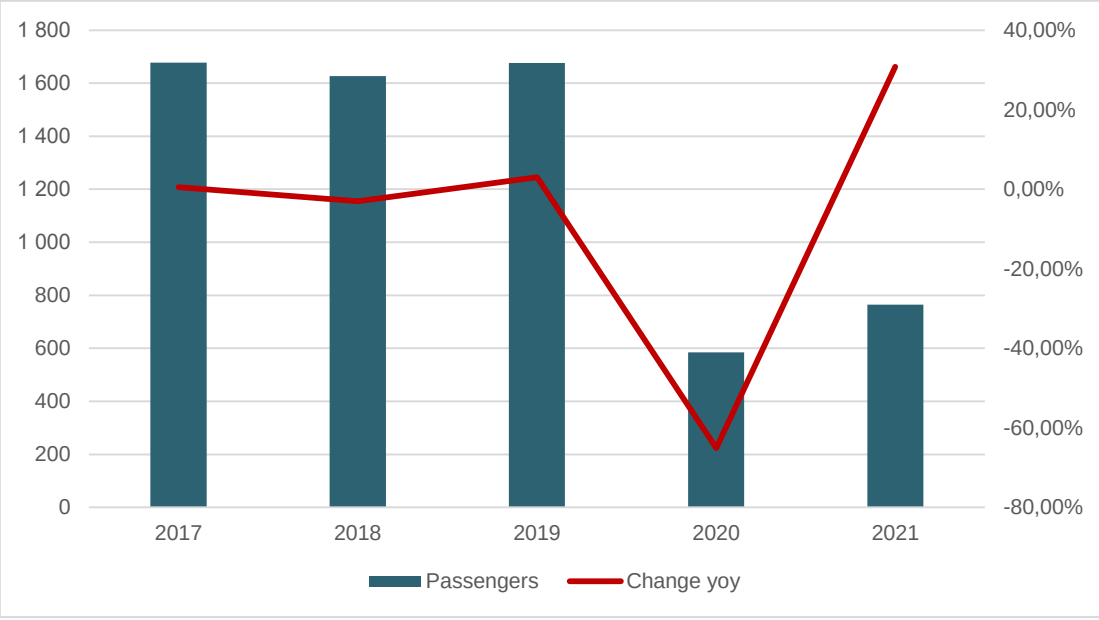

Fig. 5.29. Number of passengers in the Port of Gothenburg in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

In the city of Gothenburg tourists can enjoy a thrilling ride at Liseberg Amusement Park (roller coasters, regular concerts, and a wonderful Christmas market make this a popular attraction — the largest of its kind in Scandinavia, frequently visited by families) and also see the southern archipelago. The terminal is located 2 km from the main tourist attraction - Slottsskogen Park, which is a mini-zoo in the city centre. Details of the quays are presented in Tab. 5.12 and Fig. 5.30.

Tab. 5.12. Port of Gothenburg ferry facilities

Ferry facilities	Harbour	Quay	Max LOA	Depth (m)	Max draft
Logent Ports and Terminals	Scandia	600	170	8	7,5
		601	290	11	10,5
Stena Line-Denmark Terminal	Masthugget	1	160*	7-8*	6-7*
		2	200*	7-8*	6-7*
Stena Line-Germany Terminal	Majnabbe	1	240*	7-8*	6-7*
		2	240*	7-8*	6-7*

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.portofgothenburg.com/maritime/berth-specifications-in-the-port-of-gothenburg/

Fig. 5.30. Stena Line Denmark Terminal in Port of Gothenburg

Source: www.portofgothenburg.com

PORT OF MARIEHAMN

The passenger traffic in the Port of Mariehamn amounted 716 thou. passengers in 2021. Mariehamn is the capital city of Åland Island. The ferry terminal in Mariehamn is used by Tallink and Viking Line on the routes to Sweden. In the Mariehamn are located plenty of museums such as maritime, art and history.

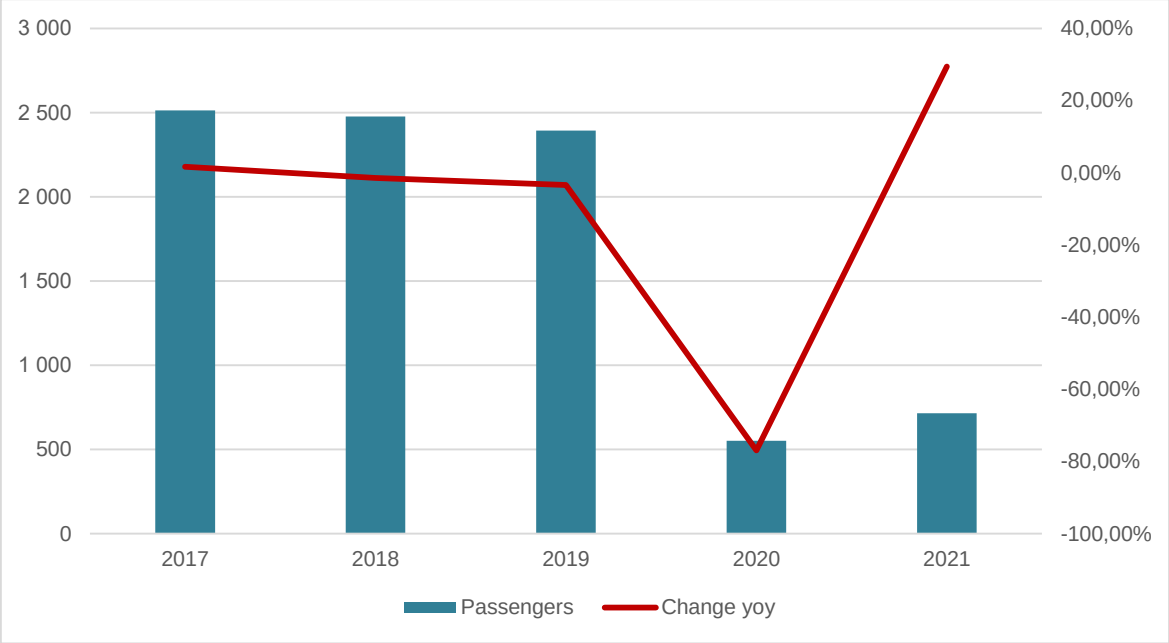

Fig. 5.31. Number of passengers in the Port of Mariehamn in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The routes to Turku and Stockholm are often from the Port of Långnäs, 30 km from the capital of Åland, Mariehamn. Details of the quays in the Port of Mariehamn and the Port of Långnäs are presented in Tab. 5.13 and Fig. 5.32, Fig. 5.33.

Tab. 5.13. Port of Mariehamn and Port of Långnäs ferry facility

Ferry facilities	Quay length (m)	Max draft (m)	General remarks
Mariehamn Ferry Terminal	203*	7.12*	Ferry terminal used by Tallink and Viking Line operators
Långnäs Ferry Terminal	203*	7.12*	Ferry terminal used by Tallink and Viking Line operators

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.tallink.com/mariehamn-terminal and www.vikingline.fi

Fig. 5.32. The Ferry Terminal in the Port of Mariehamn

Source: www.mariehamnshamn.ax/en/

Fig. 5.33. The Åland Island – localization of the Port of Mariehamn

Source: https://www.360fun.eu/

PORT OF KIEL

Passenger traffic in Port of Kiel was at the level of 594 thou. passengers in 2021. During the first half of 2022 the Port of Kiel recorded the recovery in terms of passenger traffic by 25% compared to first six months of 2021. Among the tourist attractions are military museum, botanical garden and plenty of historic places such as churches and cathedrals.

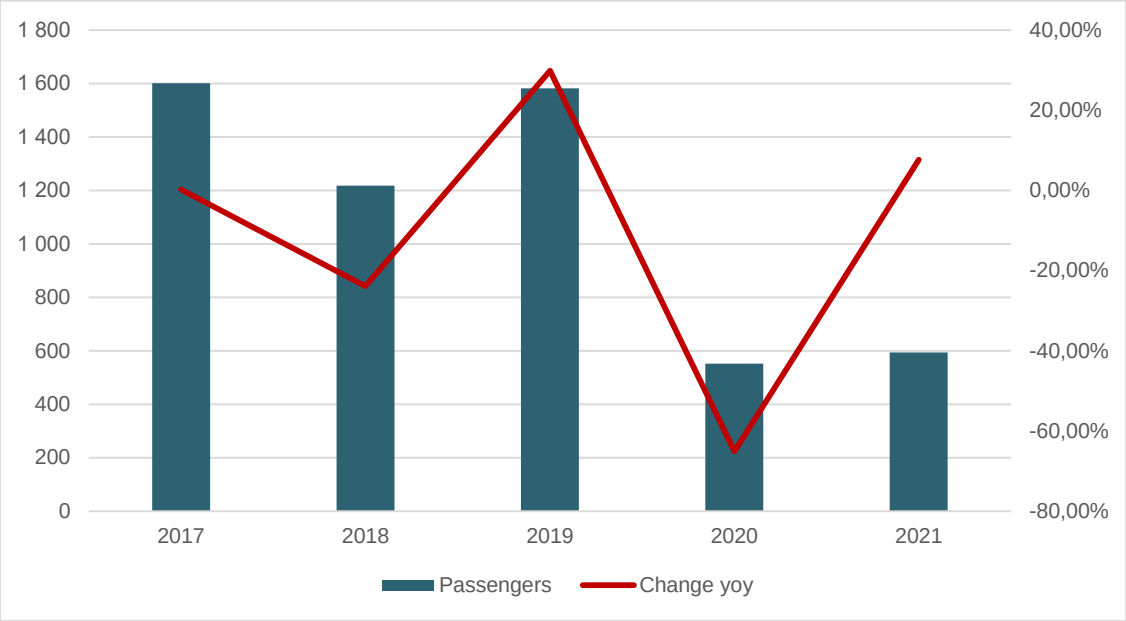

Fig. 5.34. Number of passengers in the Port of Kiel in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

In the Port of Kiel there are three quays on which the ferry operations take place. In Schwedenkai the facility is used by operator Stena Line, in Norwegenkai the facility is used by operator Color Line and in Ostuferhafen the facility is used by operator DFDS. Details of the quays are presented in Tab. 5.14 and Fig. 5.35.

Tab. 5.14. Port of Kiel ferry facilities

Ferry facilities	Quay length (m)	Berths	Max LOA (m)	Depth (m)
Schwedenkai	720	2	*230	9
Norwegenkai	175	2	*250	9
Ostuferhafen	395	6	*200	11,5

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.portofkiel.com

Fig. 5.35. Ferry terminal in Schwedenkai in Port of Kiel

Source: www.verkehrsrundschau.de

PORT OF FREDERIKSHAVN

Passenger traffic in Port of Frederikshavn was at the level of 491 thou. passengers in 2021. The port serves the ferry traffic from Oslo and Copenhagen (DFDS) and also from Gothenburg (Stena Line) on two ferry terminals: Stena Line Terminal and DFDS Terminal.

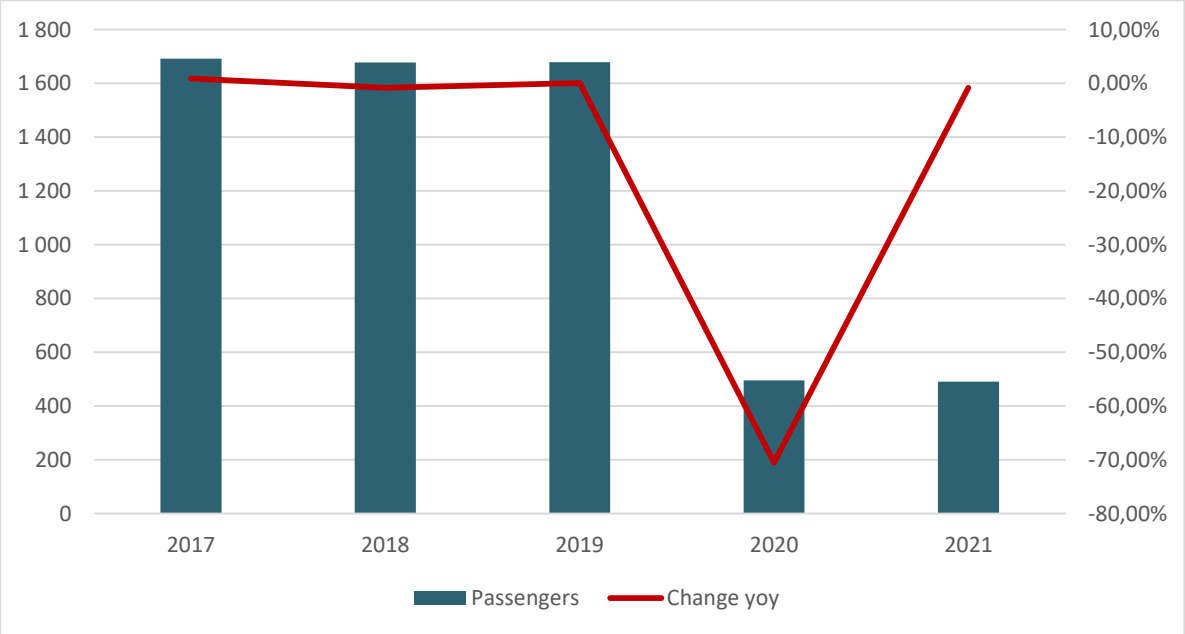

Fig. 5.36. Number of passengers in the Port of Frederikshavn in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Both ferry terminals are located closely to the city centre. Details of the quays are presented in Tab. 5.15 and Fig. 5.37.

Tab. 5.15. Port of Frederikshavn ferry facilities

Ro-Ro/ferry facility	Quay length (m)	Depth (m)
Stena Line terminal	155*	6.3*
DFDS terminal	178*	6.0*

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.dfds.com and www.stenaline.com

Fig. 5.37. Stena Line Terminal in the Port of Frederikshavn

Source: cruisemapper.com

PORT OF GRISSLEHAMN AND PORT OF ECKERÖ

Passenger traffic in Port of Grisslehamn and Port of Eckerö was at the level of 490 thou. passengers in 2021. The ports serve exclusively the route Grisslehamn-Eckerö operated by Eckerö Group. The Port of Eckerö is located on Aland Island.

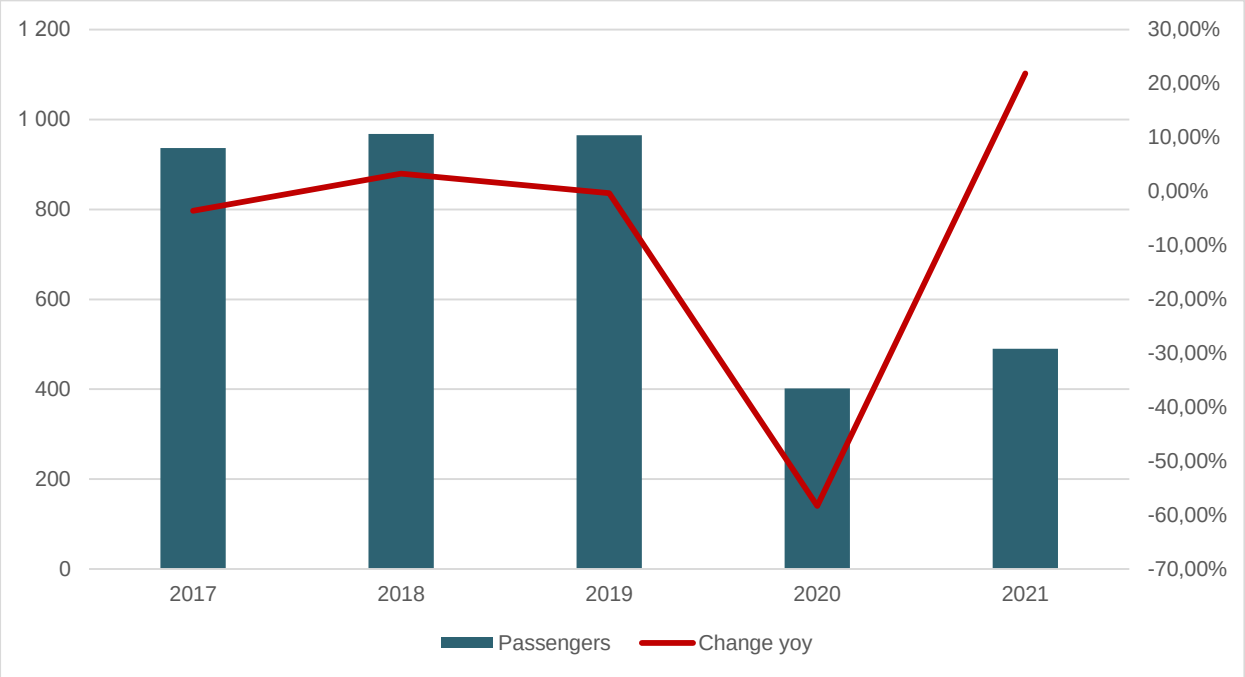

Fig. 5.38. Number of passengers in the Port of Grisslehamn and Port of Eckerö in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Eckerö Linjen began trafficking between Eckerö in Åland and Grisslehamn in Sweden in 1961. Since January 2005 the route is operated by MS Eckerö, with the second MS Roslagen used as an extra ship during the summer high season. Details of the quays in Port of Grisslehamn and Port of Eckerö are presented in Tab. 5.16 and Fig. 5.39, Fig. 5.40.

Tab. 5.16. Port of Grisslehamn and Port of Eckerö ferry facilities

Ro-Ro/ferry facility	Quay length (m)	Depth (m)
Ferry terminal	175*	7.0*

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.eckeroline.com

Fig. 5.39. Port of Grisslehamn – ferry terminal

Source: www.marinas.com/view/ferry/ndbyy_Grisslehamn_Ferry_Grisslehamn_Sweden

Fig. 5.40. Ferry terminal in the Port of Eckerö

Source: www.travel.domnik.net

PORT OF KARLSKRONA

Passenger traffic in Port of Karlskrona was at the level of 441 thou. passengers in 2021. Port of Karlskrona mainly serves ferry vessels on one quay, located at terminal Verkö. The only user of the Ferry terminal is Stena Line.

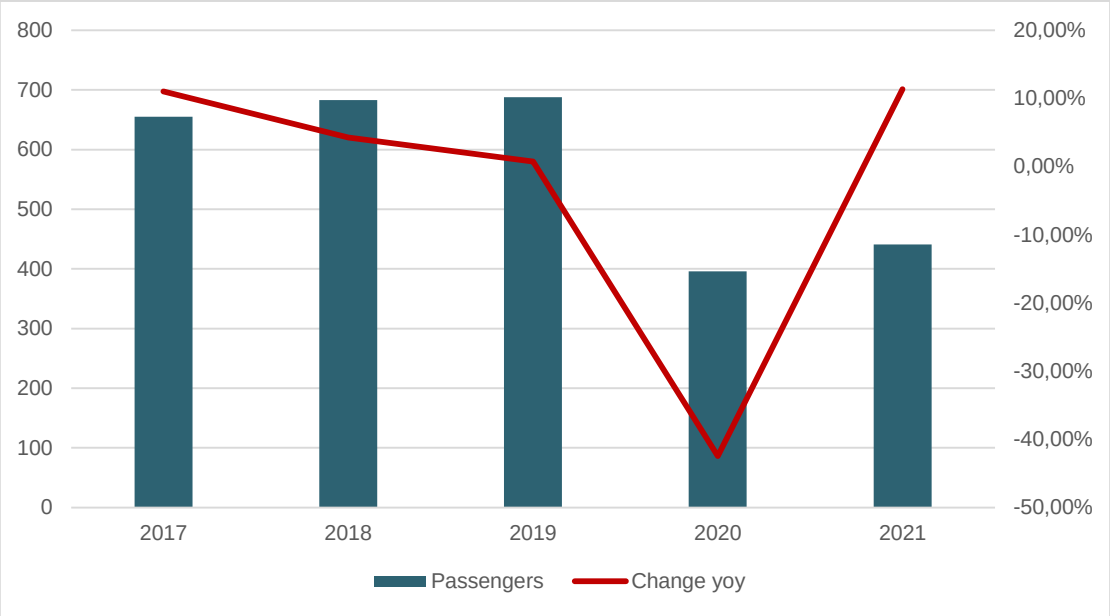

Fig. 5.41. Number of passengers in the Port of Karlskrona in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

From the 13th of August 2020, Stena Line have added a weekly port-call in Karlskrona and it is in the direction Liepaja-Travemünde on Thursday evenings. Amenities during the crossing include cabins, the self-service restaurant, and the on-board shop. Details of the quay are presented in Tab. 5.17 and Fig. 5.42.

Tab. 5.17. Port of Karlskrona ferry facilities

Port	Ro-Ro/ferry facility	Quay length (m)	Depth (m)
Terminal Verkö	Farjeterminal	240	9

Source: www.karlskrona.se/globalassets/naringsliv/karlskrona-hamn/broschyr-karlskrona-hamn-lyckat-lage-logistik.pdf

Fig. 5.42. Terminal Verkö in Port of Karlskrona

Source: www.sydostran.se

PORT OF GDYNIA

Passenger traffic in Port of Gdynia was at the level of 428 thou. passengers in 2021. The Port of Gdynia offers one ferry route to Karlskrona. Recently, the port invested in the construction of new Public Ferry Terminal. The terminal is located closer to the city centre and easily accessible from the sea and road. The Stena Spirit ferry set sail to Sweden for the first time from the New Public Terminal on Friday, 17th of June 2022.

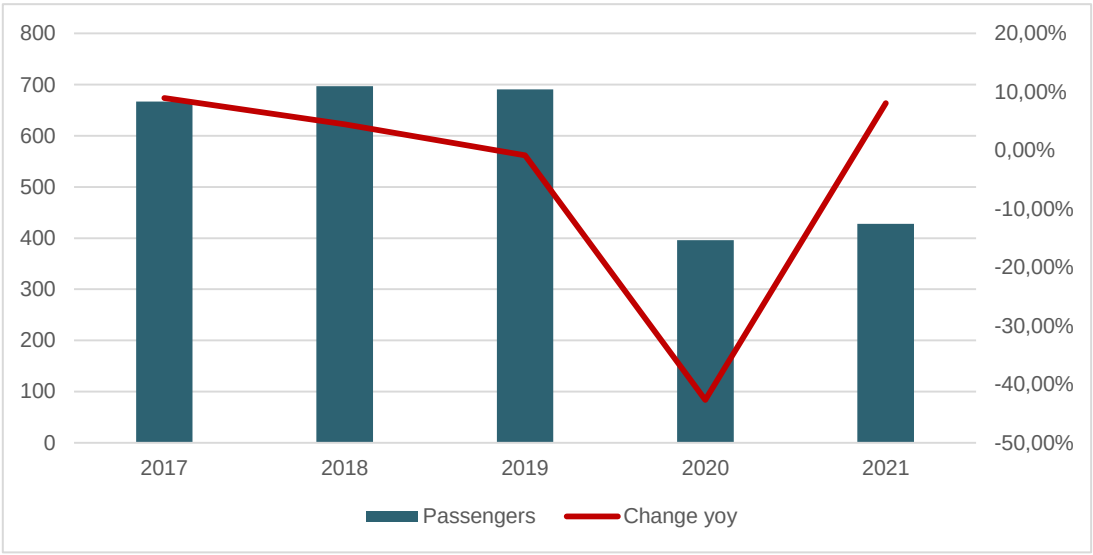

Fig. 5.43. Number of passengers in the Port of Gdynia in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

The ferry route Gdynia-Karlskrona is of great importance for tourist traffic. In September 2022 Stena Line deployed new E-Flexer ferry which allows for transport of 1,200 passengers. In December Stena Line plans to deploy sister ferry, Stena Ebba on the route. Both ferries will be operated at Public Ferry Terminal. Details of the quay are presented in Tab. 5.18 and Fig. 5.44.

Tab. 5.18. Port of Gdynia ferry facilities

Ferry facilities	Quay	Quay length (m)	Max draft (m)
Public Ferry Terminal	Polskie	240*	8

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.port.gdynia.pl/pl/o-porcie/mapa-portu

Fig. 5.44. New Public Ferry Terminal in Port of Gdynia

Source: www.infomare.pl

PORT OF STRÖMSTAD

Passenger traffic in Port of Strömstad was at the level of 366 thou. passengers in 2021. The Port of Strömstad serves traffic with Norwegian port Sandefjord (operators Color Line and Fjord Line). Color Line operates on route since 1990 and Fjord Line since 2007.

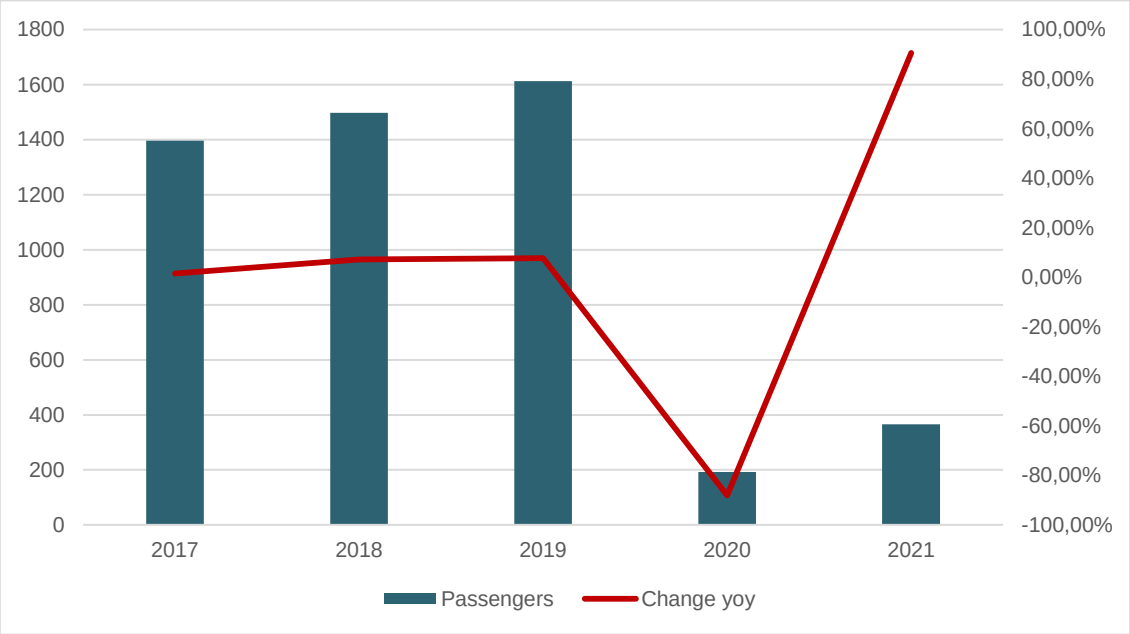

Fig. 5.45. Number of passengers in the Port of Strömstad in years 2017-2021 [thou. passengers]

Source: Actia Forum based on Eurostat

Strömstad is known for the cycling, hiking and kayak experiences in the Kosterhavet, the first national marine park in Sweden located in Strömstad municipality. Details of the quay are presented in Tab. 5.19 and Fig. 5.46, Fig. 5.47.

Tab. 5.19. Port of Strömstad ferry facilities

Ferry facilities	Quay length (m)	Max draft (m)
Strömstad ferry terminal	160*	6.0*

**data not available, approximate lengths calculated on the basis of mooring ships*
Source: www.colorline.com

Fig. 5.46. The city of Strömstad

Source: www.maps.google.com

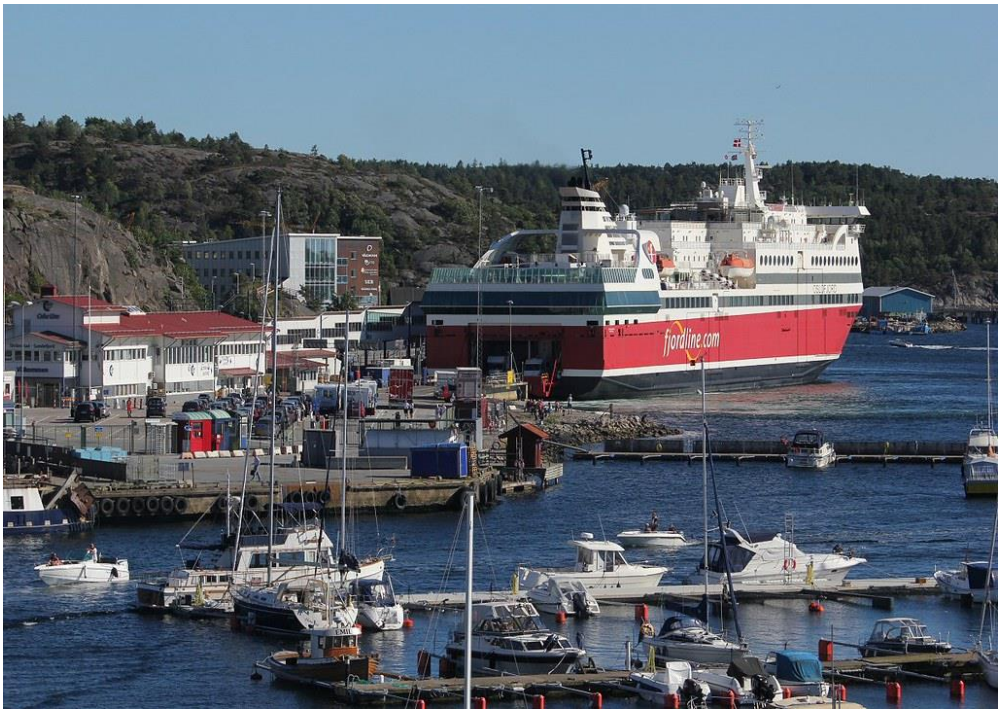

Fig. 5.47. The Port of Strömstad (Fjordline ferry in the background)

Source: https://www.flickr.com/

6. ECOLOGICAL SOLUTIONS ON FERRY MARKET

SUSTAINABLE TECHNOLOGIES IN BALTIC PORTS, CRUISE AND FERRY TERMINALS

LNG infrastructure is growing rapidly. Currently, within the Baltic Sea Region there are over 20 ports that have performed bunkering operations on LNG propelled vessels.

The most common method of **LNG bunkering for ships** in the Baltic Sea region is the method of fueling the ship via a tanker truck. An example of Truck to Ship bunkering is The Tallink's vessel Megastar, which operates on the Helsinki–Tallinn route and has refueled with LNG in the **Port of Tallinn** since 2017 and the **Port of Helsinki** since 2019.

Fig. 6.1. LNG bunkering in the Port of Helsinki (Megastar ferry)

Source: www.portofhelsinki.fi

Another example of LNG bunkering is Ship to Ship bunkering in Stockholm. The Viking Grace ferry operates on the route Stockholm–Åland–Turku on a regular basis. The Ship to Ship bunkering is also planned for the ferry that is to be operated on the route Świnoujście-Ystad. The bunkering vessel in Port of Świnoujście is a part of the upcoming investment. The Baltic ports fitted with LNG bunkering infrastructure are presented in Fig. 6.3.

Fig. 6.2. Viking Grace in the Port of Stockholm – ship to ship bunkering operation

Source: www.offshore-energy.biz

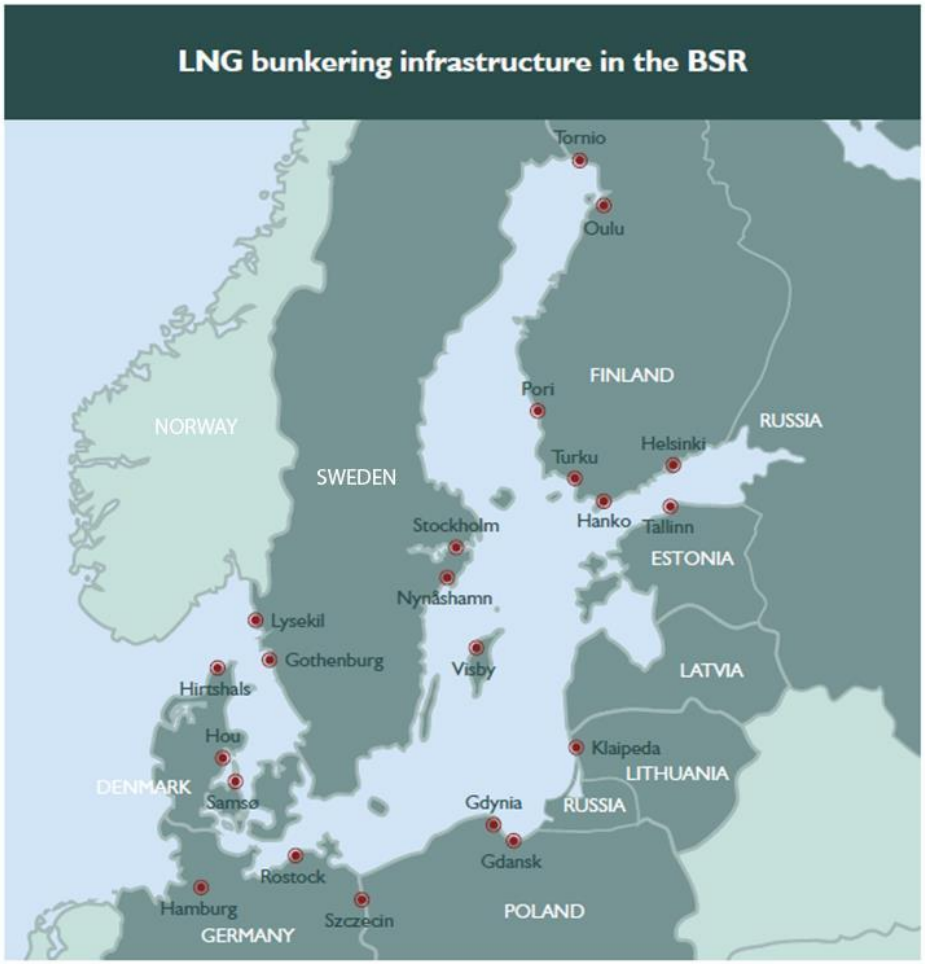

Fig. 6.3. LNG bunkering infrastructure in the BSR

Source: Baltic Sea region – a new scene for Baltic ports, Actia Forum, 2022

The properties of **methanol** imply that potential investments in methanol bunkering infrastructure are reasonably low, and retrofitting of currently functioning infrastructure is a possibility. As a consequence and based on the current knowledge, methanol bunkering operations could be easily adapted to be performed via ships, barges, terminals or trucks.

The **Port of Gothenburg** has already handled methanol in the port since 2015 when Stena Line started to bunker Stena Germanica truck to vessel. Currently, the Port of Gothenburg is ready for methanol bunkering ship-to-ship and is aiming to become the primary bunkering hub for renewable methanol in Northern Europe.

The use of **ammonia** as a marine fuel in the future requires a specific, specialized infrastructure for bunkering and ship maintenance. Present ports with ammonia terminals can become the foundation of the network for ammonia distribution as ship fuel in the future. There are eight special ammonia terminals in the Baltic Sea region that consist of two ports that export ammonia, five ports that import ammonia, and one port that both exports and imports ammonia.

Fig. 6.4. Ammonia terminals in the Baltic Sea Region

Source: Baltic Sea region – a new scene for Baltic ports, Actia Forum, 2022

Another option is **electric propulsion**. Within the Baltic Sea Region, there are some examples of hybrid and fully electric ferries already in operation. In 2013, the ferry on the route between **Puttgarden** in Germany and **Rødby** in

Denmark was converted to hybrid propulsion. The battery is used simultaneously with the diesel engines. Owing to this solution, a large amount of energy in batteries is stored on board. Also, on the **Rostock-Gedser** route, Scandlines operates two hybrid ferries. Two fully electric ferries named Aurora and Tycho Brahe are operating between **Helsingborg** (Sweden) and **Helsingor** (Denmark). The sea passage between Helsingborg and Helsingör can be reached in about 20 minutes with the ferries. The route is run every fifteen minutes, 24 hours a day.

Fig. 6.5. Scandlines hybrid ferry on the way to Rostock

Source: www.scandlines.com

Shore power supply systems for ships are indicated as the most effective methods of reducing not only exhaust emissions but also noise and vibrations generated by ships in a seaport. Powering units from the quay engage in switching off the ship's power generators when the ship is parked at the quay and connecting them to the power grid on land, which translates into virtually complete elimination of pollutant emissions from the marine power plant.

Although the technology was already appearing in **Gothenburg** in the 1990s, many years passed before it became widely used in other seaports. The total number of OPS ports in the Baltic Sea Region has tripled over the last few years. Currently, in 27 Baltic ports installations are available, and many more are planned.

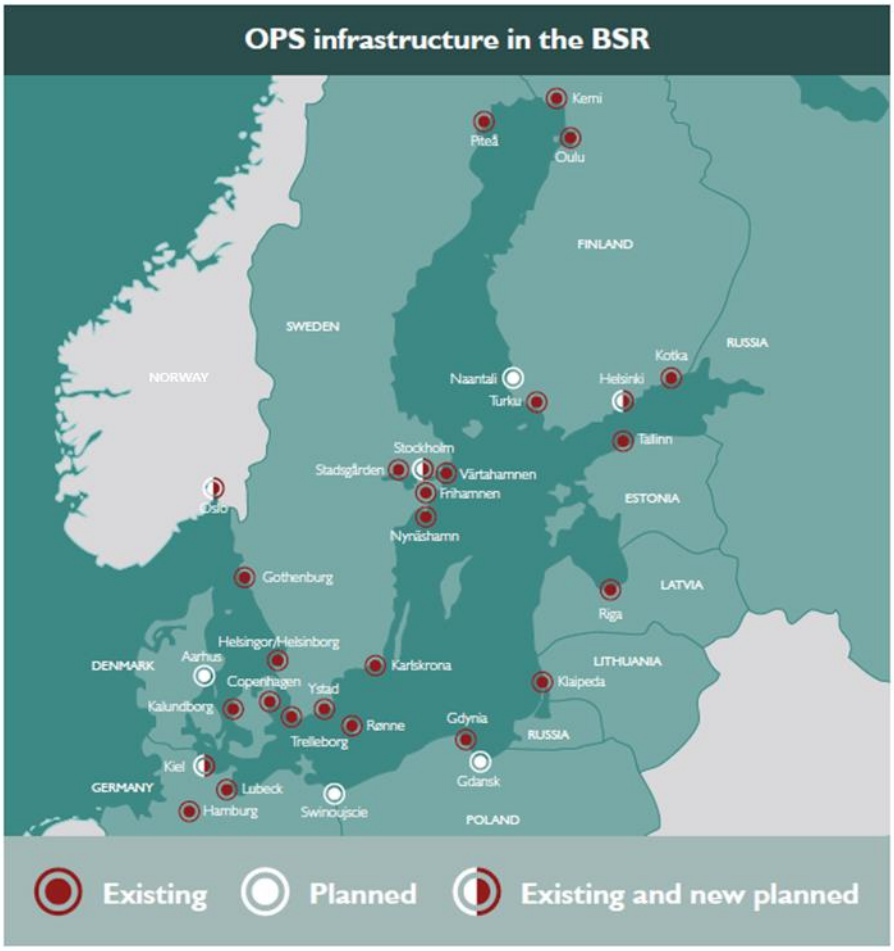

Fig. 6.6. OPS infrastructure in the Baltic Sea Region

Source: Baltic Sea region – a new scene for Baltic ports, Actia Forum, 2022

One of the flagship projects of the **Port of Gdynia** was the construction of a new public ferry terminal. The main technological innovation implemented in the new terminal is the onshore power supply technology (cold ironing), the first of this type in Polish seaports.

The power of the connection for ships is 3.5 MW, which means the ability to quickly charge the batteries of a given ferry, without the need to turn on the diesel engines. The system is designed to supply ships with an 11kV 50Hz/60Hz on-board installation from the 15kV 50Hz coastal power grid. The container device (converter), due to the optimization of land development solutions, was located just below the inrun flyover.

Another example is the **Port of Rostock**, the Warnemünde cruise harbor, located north of Rostock city center. In the shore power plant for cruise ships in the Port of Rostock, thanks to the integrated frequency converters it is possible to transform the shore electricity to accommodate all standard global shipboard power supply systems (with both 50 and 60 Hz).

The shore-side electricity supply facility was officially commissioned in May 2021. From now on, two cruise liners can receive shore power simultaneously at two berths, P7 and P8. Currently, the OPS installed in the Rostock seaport is the largest of its kind in Europe delivering up to 20 MVA of electrical energy. It is assumed that 60% of

the port calls will use OPS while at berth. This represents an annual electricity consumption of 5.7 GWh and the corresponding annual MGO consumption is 1,420 mt.

Fig. 6.7. The opening ceremony of shore power facility in the Warnemünde cruise terminal

Source: www.rostock-port.de/en/sustainability/environment/shore-power

Fig. 6.8. The shore power facility in the Warnemünde cruise terminal

Source: www.rostock-port.de/en/sustainability/environment/shore-power

SUSTAINABLE TECHNOLOGIES IN CRUISE VESSELS, FERRIES AND RO-PAX VESSELS

There is a total of 111 vessels deployed on routes with Baltic ports, with a total passenger capacity of approx. 120 thou. passengers. The ferry connections are served by 18 operators offering 56 services to/from Baltic Sea. Tallink&Silja Line offers more than 25 thou. passenger places and is the biggest operator in terms of passenger capacity.

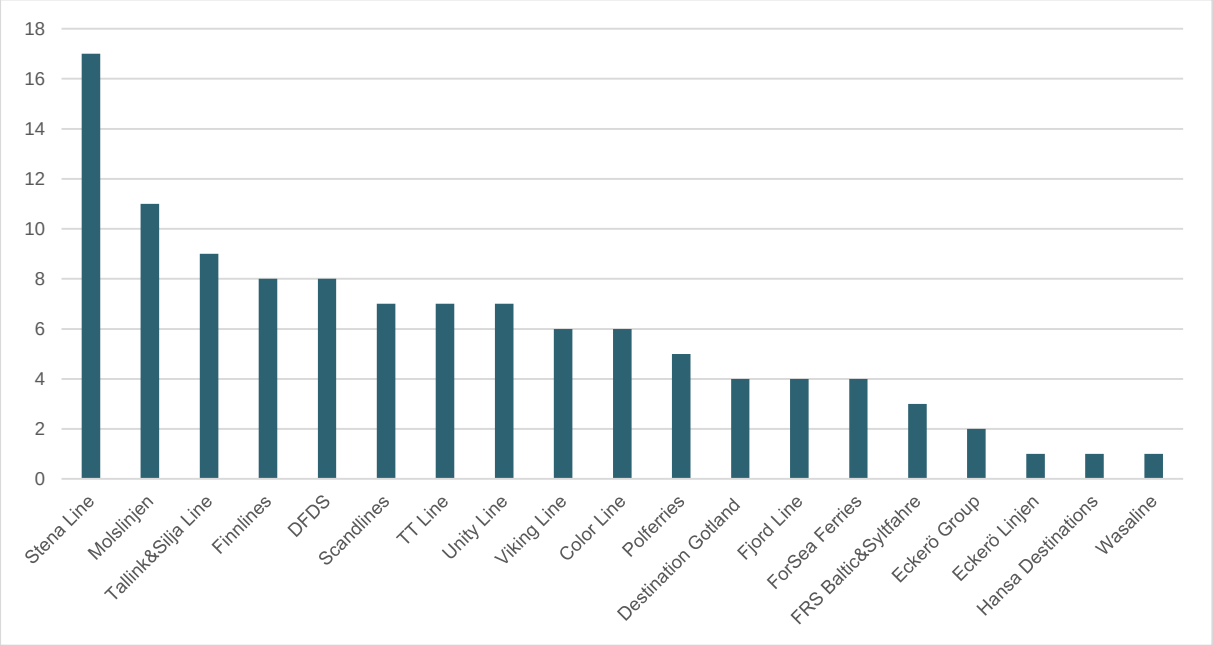

Fig. 6.9. Number of vessels deployed on routes with Baltic ports by operator

Source: Actia Forum based on operators data

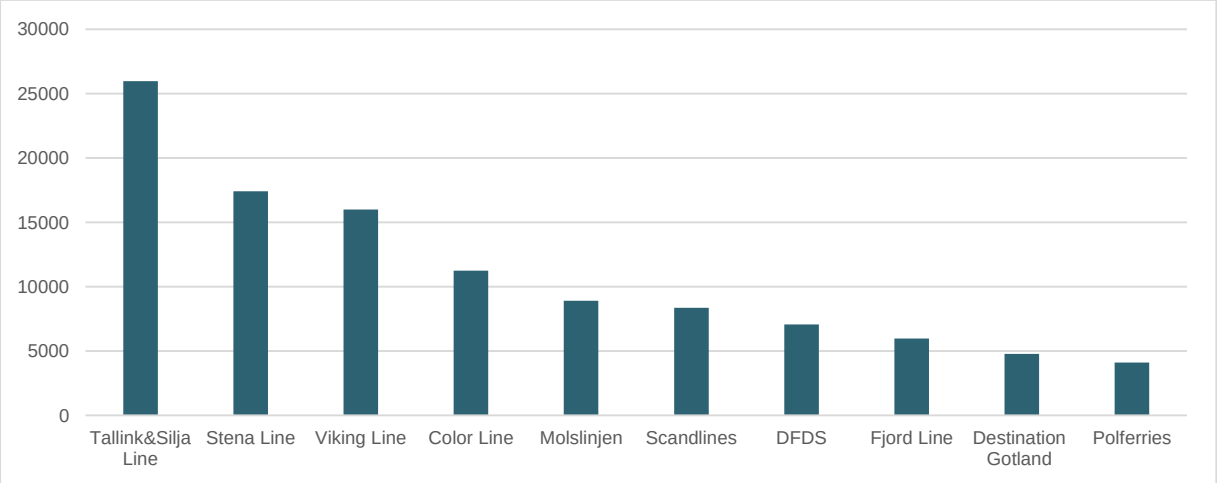

Fig. 6.10. The Top 10 ferry operators in terms of passenger capacity

Source: Actia Forum based on operators data

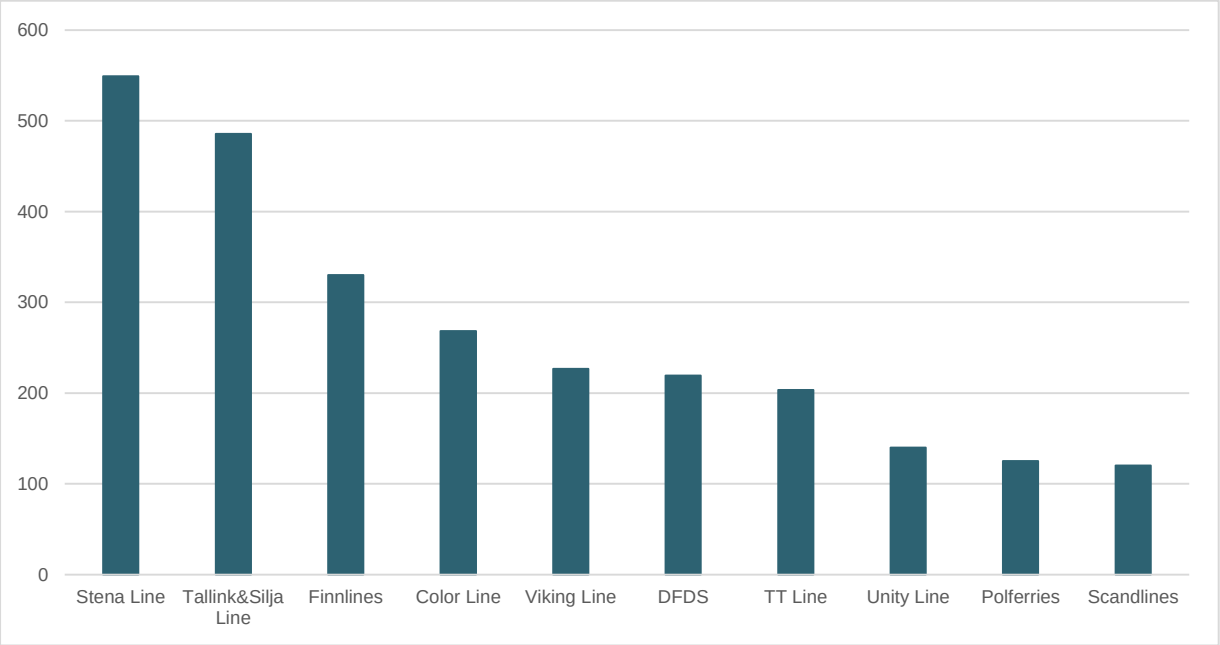

Fig. 6.11. The Top 10 ferry operators in terms of gross tonnage

Source: Actia Forum based on operators data

Among vessels operating on intrabaltic services and also routes to Norway, vast majoriy of vessel owners is planning to deploy sustainable technologies in ro-pax ferries.

Stena Line will launch two E-Flexer ferries on the route Karlskrona – Gdynia in 2022. The first E-Flexer – Stena Estelle commenced operations in September and the second is planned to strat operations in December. Both were originally planned to be deployed on the route between Nynäshamn – Ventspils, but due to a particular strong development in South Baltic, Stena Line has decided that the E-Flexers are at the moment best used there. Stena Line's position as the leader in sustainable shipping is clearly visible and the new vessels are among the most energy efficient RoPax ferries in the world:

- up to 30% more energy efficient than existing vessels, thanks to optimum design of the hulls, propellers, bulbs, and rudders;
- gas-ready to allow conversion to methanol or liquid natural gas fuel;
- Onshore Power Supply to reduce emissions and the electricity connection also enables a conversion to battery hybrid in the future. Vessels will provide efficient loading and unloading with drive-through lanes on the two levels.

Fig. 6.12. Stena Estelle – the new E-flexer ferry in Stena Line fleet

Source: www.stenaline.pl/promy/stena-estelle

Stena Line plans to launch the fossil and emission free battery powered vessels on the route between Gothenburg in Sweden and Frederikshavn in Denmark until 2030 and by 2025 the first vessel shall be ordered. **Stena Elektra** will be the world's first fossil free ro-pax vessel of its size and will measure 215 metres and combine a passenger capacity of 1,200-1,500 with 3,100 lane metres freight capacity. The vessel will be built in high tensile steel to lower the weight and increase efficiency and it is estimated the vessel will run on battery power for approximately 50 nautical miles, the distance between Gothenburg and Frederikshavn. The battery capacity will need to be about 70 MWh and the vessel will be charged in port.

Finnlines' newest ships, ro-pax Superstar, will operate between Sweden and Finland on the route Naantali – Långnäs – Kapellskär, debuting in 2023. The ships will be named **Finnsirius** and **Finncanopus**, after the brightest stars in the night sky. The passenger capacity is 1,100 passengers.

Sustainable technologies:

- Hull lines designed to optimize energy efficiency,
- Rudder bulb to increase energy efficiency,
- The vessel will comply with Ice Class 1A Super,
- Automooring at berth will ensure faster mooring and more efficient port operations,
- Use of shore-side electricity in port to reduce fuel consumption, emissions and noise,
- An innovative air lubrication system to create bubble layers which will reduce hull resistance,
- Battery banks: lithium-ion battery systems to enable clean energy to be used onboard.

Fig. 6.13. Finnsirius – new Finnlines' ferry on the Baltic

Source: www.finnlines.com/news-and-press-releases/finnlines-superstar-ro-paxes-celebrate-launching-and-keel-laying/

Aura Seaways is the first **DFDS**-certified ferry to be built since 1982. The ferry commenced operations in January 2022 and carry passengers and cargo on the route Klaipeda – Karlshamn. Luna Seaways is sister-ferry and started service on the same line in April 2022.

DFDS has set a target of reducing carbon emissions by 45% by 2030. Renewal of the fleet is an important step towards this goal.

Aura Seaways and **Luna Seaways** meet EEDI (Energy Efficiency Design Index, formulated for new ships, is an index that estimates grams of CO2 per transport work) standards. The CO2 footprint of new ships is one-fifth smaller than that of ships that have served the route so far.

Fig. 6.14. Aura Seaways – new DFDS ferry that started operations in January 2022

Source: www.dfds.com/en/passenger-ferries/aura-luna

Starting with the launch of Project Green Vessel 2025, the ferry operator will now move up ambitions for its first green vessel by 2025 – hydrogen ferry. To meet the new deadline, DFDS has formed Sustainable Fleet Projects,

a new department tasked with decarbonizing the company's vessels. As informed, the department's work this fall will revolve around three key topics:

- defining whether the vessel should be a new build or retrofit;
- defining which green fuel the ship should run on;
- deciding which route it should be deployed on.

TT-Line is the first shipping company, and a pioneer in the southern Baltic Sea, to use LNG for its new Green Ships. In April 2022, the first of two new generation ferries officially began its service – Nils Holgersson. Currently, Nils Holgersson operate on the route Travemünde – Trelleborg but in the future it will also operate on other routes from/to Trelleborg.

Energy-efficient HVAC to ensure a perfect environment for passengers, TT-line installs a highly energy efficient heating, ventilation and air conditioning system with precise temperature, ultra-low noise and minimum energy consumption. This system re-uses energy available on board for heating and cooling purposes:

- Cold Recovery re-uses the coolness of re-gasified LNG for the air-conditioning;
- Alaska-Cooler uses the coldness of the sea water to cool down the air in the air-conditioning;
- Heat Recovery System absorbs the heat from the outgoing air to warm up fresh ingoing air without maxing both.
- modern, Integrated Automation and Power Management System to optimize energy demand;
- fin stabilizer with eco-mode to save fuel;
- optimized hull lines including a specially designed bulbous bow for low fuel consumption taking into account the speed profile of the vessel;
- Airspace Seal to prevent water pollution by lubricating oil;
- separation of oil from waste water far below the legal limit value;
- central heating system with harmless steam instead of thermal oil;
- non-toxic cooling water treatment additives;
- sustainable paint with lower water resistance for the underwater Surface;
- LED lightning only to reduce the power demand for lightning by 80% and ensuring a 10 times longer lifetime of the light sources;
- low heat transmission windows. The vessel offers the possibility to charge electric cars (up to 32 charging stations).

Fig. 6.15. Green Ship Nils Holgersson – the TT-Line ferry

Source: www.ttline.com/en/ttline/ships/nils-holgersson/

VIKING LINE

Thanks to advanced, innovative technological solutions, **Viking Glory**, which joined the **Viking Line** fleet, will be one of the world's most climate-smart passenger ships. It is expected to use up to 10% less fuel than vessel Viking Grace, which was previously honored with the distinction of being the world's most environmentally-friendly passenger ship. Viking Glory started its service in March, 2022 and operate on the Turku – Åland Islands – Stockholm route.

Sustainable technologies:

- Azipod® electric propulsion, to minimize vibration, noise and save time and fuel during maneuvering (electric motor is placed in a pod, outside the vessel, and the Azipod® unit can be turned 360 degrees);
- Heat Power modules and steam turbines transforms engine waste heat into electricity. It is estimated that this will supply up to 40% of the electricity needed for passenger functions;
- adapted for automooring to save fuel and reduce emissions;
- reused cooling from LNG;
- dynamic ventilation and lighting, some areas on board the vessel will be equipped with sensors to save Energy;
- optimized hull to reduce water resistance and reduce fuel consumption.

Fig. 6.16. Viking Glory - one of the world's most climate-smart passenger ships

Source: www.sales.vikingline.com/find-trip/our-ships/viking-glory/

Completed in the end of summer 2022, **MyStar**, **Tallink**'s newest and most innovative and technologically advanced shuttle ferry will operate on the route Tallin – Helsinki. MyStar is supposed to be the most energy-efficient, environmentally friendly and most sustainable vessel on the Baltic Sea. Optimized fuel consumption and the use of LNG ensure significantly lower environmental impact in comparison to other similar ferries. Sustainable materials and environmentally friendly solutions are implemented also in the ship's interior design.

Fig. 6.17. Tallink - MyStar ferry

Source: www.en.tallink.com/tallink-shuttle-mystar-helsinki-tallinn-helsinki

Aurora Botnia is the new ro-pax of the **Wasaline** shipping company, which from the end of August 2021 serves the Vaasa – Umea route. The ferry is equipped with the latest eco-friendly technologies making it the first car and passenger ferry in the world to receive the Clean Design class certificate from the international classification society DNV.

Sustainable technologies:

- Waste heat and cool recovery to maximize energy use,
- Integrated Automation System with Smart Power Management System of engines and batteries
- Electric propulsion drive with Azimuth thruster units,
- Battery power for port entry/departure, peak shaving, hotel load and boost power,
- Ice Class 1A Super.

Fig. 6.18. Aurora Botnia -new ro-pax vessel in Wasaline fleet

Source: www.wasaline.com/en/aurora-botnia/

The **Polish Ferries Limited**, the shareholders of which are the State Treasury and Polish Maritime Shipping, signed a contract with the Remontowa Shipbuilding Yard S. A. for the construction of three ferries. Two of them will sail in the company Unity Line from the Polish Maritime Shipping Group, and the third in the Polish Baltic Shipping Company. A letter of intent was also signed for the fourth unit, which is an open option.

The vessels will operate on the Świnoujście – Ystad route. The first ferry is to be ready at the turn of 2024 and 2025. Another of them are to be put into operation at annual intervals.

After the vessels built for the company Unity Line from the Polish Maritime Shipping Group are put into service, the ferries currently operating ("Polonia", "Skania", "Wolin", "Gryf") will be gradually withdrawn.

The new units will be equipped with dual-fuel engines. They will be powered by LNG and diesel. Additionally, they are to be supported by electric batteries.

The ferries will not be equipped with a classic propeller, it will be replaced by two azimuth thrusters at the stern and two thrusters at the bow, which will facilitate the maneuvering of ships in ports.

7. MAIN CRUISE DESTINATION ON BALTIC – PORTS AND PORTS' CITIES

Baltic Sea Region has changed in recent years and become the largest segment in the Northern Europe market, generating traffic of over 6 million travelers that visited Baltic ports in 2019. In this last, pre-pandemic cruise season, the Top 20 Baltic ports accounted for 99% of all cruise ship traffic in terms of the number of passengers, and 97% in terms of the number of calls. What is also important, the top 5 ports accounted for 63% and 58% of passengers and calls, respectively. The most important destinations are presented in Fig. 7.1 and Fig. 7.2. The maps shows ports that were dominated in the cruise sector in 2019, before cruise calls have plunged due to pandemic in 2020 and 2021.

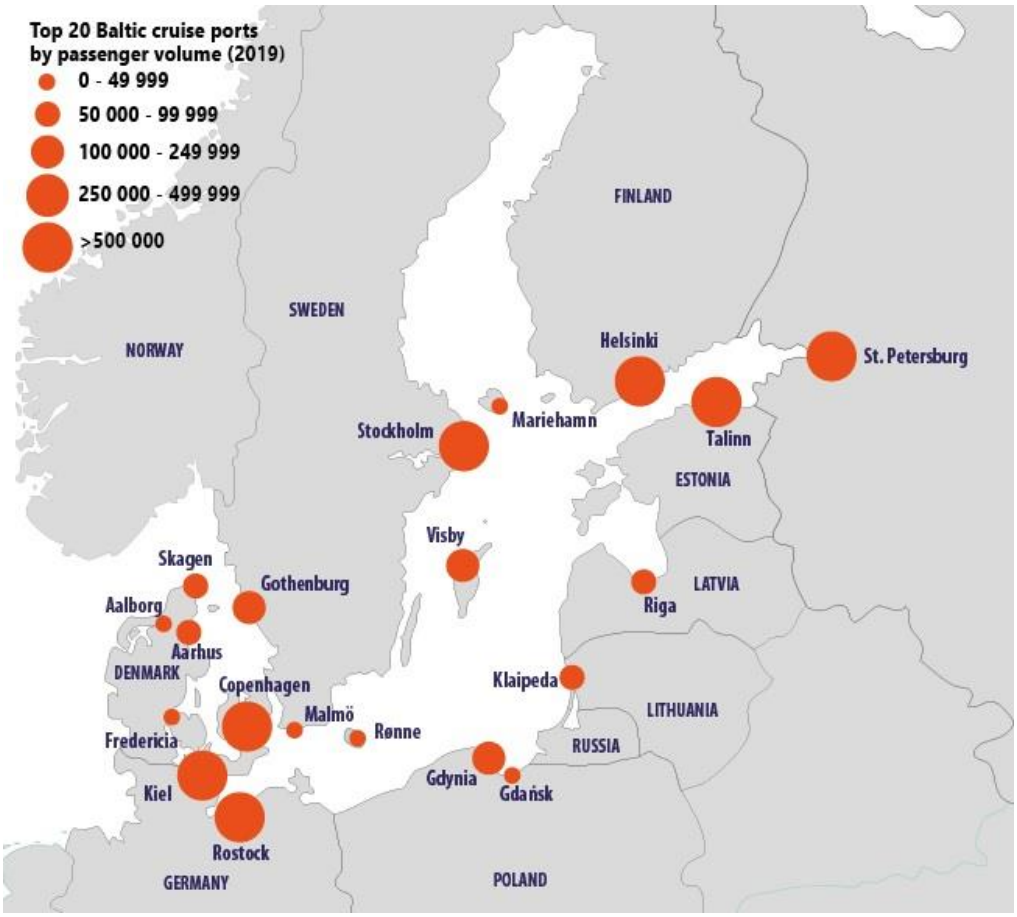

Fig. 7.1. Top 20 Baltic cruise destinations by number of passengers (2019)

Source: Actia Forum based on Cruise Baltic database

Invariably for over two decades, the most important cruise seaport in terms of the number of passengers in the Baltic Sea region is Copenhagen (940 000 pax in 2019). From 2000 to 2019, the number of passengers increased by 466%, while the number of calls only grow by 80%. The second largest cruise port was Kiel (803 000 pax in 2019), which number soared from the level of 0.5 mln passengers per year, with prognoses of a further increase in 2022. The podium closes the port of St. Petersburg (666 235 pax in 2019), which also for twenty years has been among the Top 5 unchangeably.

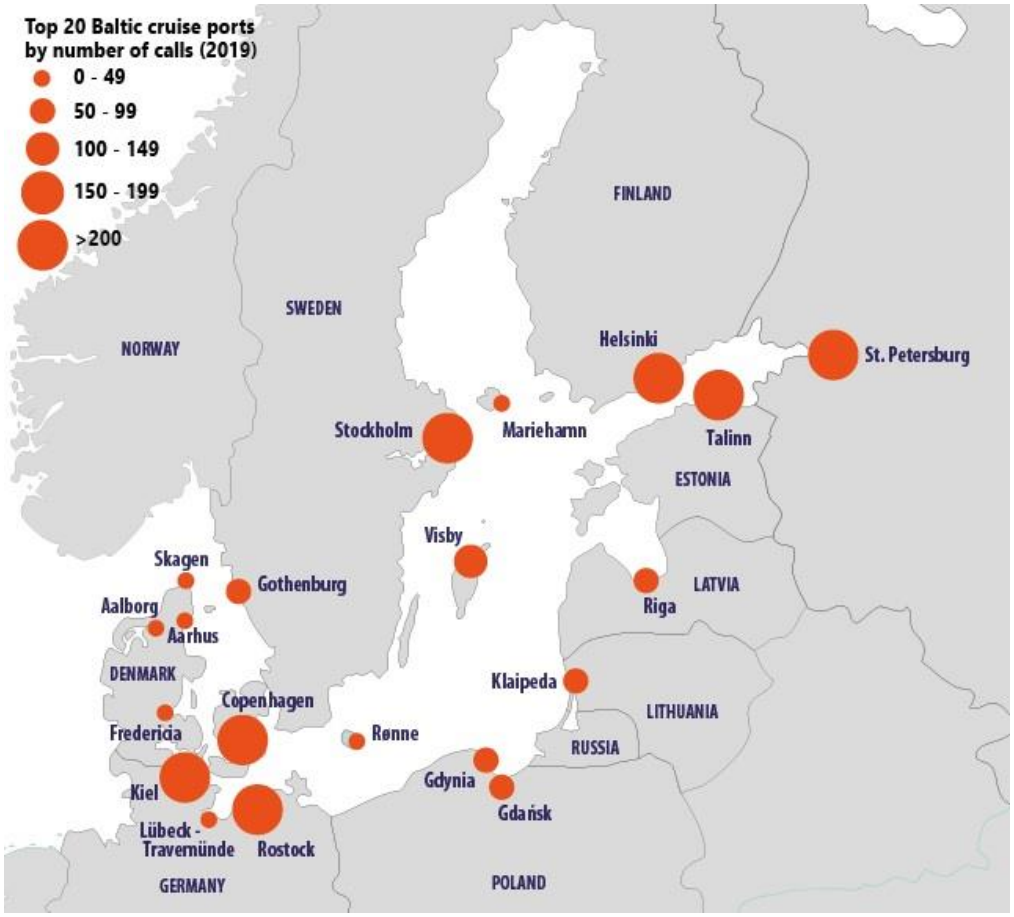

Fig. 7.2. Top 20 Baltic cruise destinations by number of calls (2019)

Source: Actia Forum based on Cruise Baltic database

In terms of the number of calls, the port of Copenhagen is also dominating the Baltic cruise market with a number of 348 yearly cruise calls in 2019. This port also holds the record for the number of calls, achieved in 2012, when 375 cruise vessels came to this Danish seaport. The second port in the list of top 20 is St. Petersburg, with its 341 calls in 2019. Until 2009, when the port of Copenhagen took the primary position, it was this seaport that held first place for years. The third one is the port of Tallinn (338 calls in 2019). In 2018 port of Tallinn break its own record

from 2013 (330 calls, 2nd position in the top list), after 5 years of big decrease to the level of under 300 calls per year.

Before the pandemic of COVID-19 started in Europe at the beginning of March, most cruise ports recorded increases in the volumes of passengers and number of calls. The top 20 cruise seaports in terms of the number of passengers have noted a 9.4 increase in 2019, compared to the year before (Fig. 7.4), and 2.3% increase in calls (Fig. 7.3). Between 2016 and 2019, these most important seaports reached a 27.2% increase in a number of calls and 37.8% increase in number of passengers, which indicates the rising popularity of cruise tourism in the region.

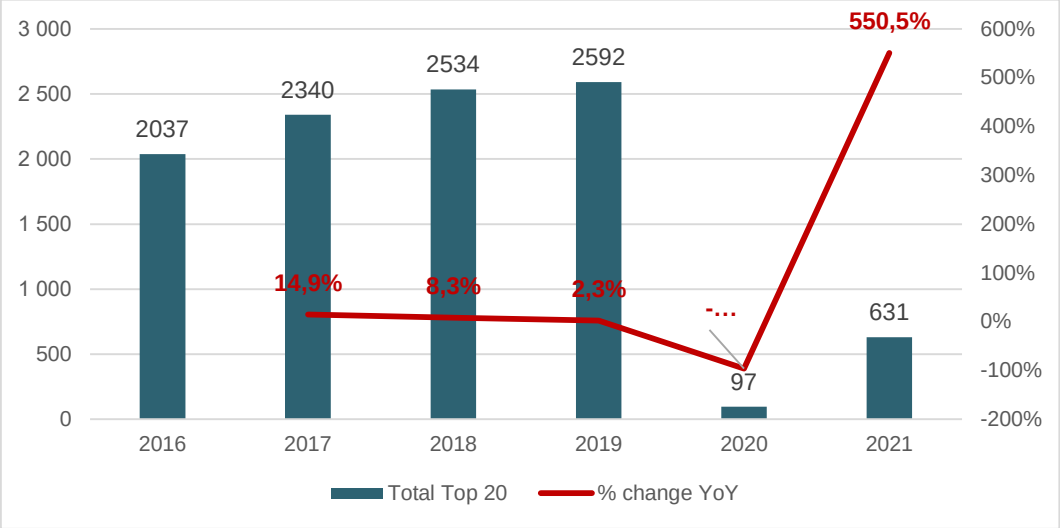

Fig. 7.3. Total number of calls in 2016-2021 in Top 20 Baltic seaports

Source: Actia Forum elaborations based on Cruise Baltic database

Due to the pandemic, ports cancelled almost every scheduled cruise vessel, and the year 2020 went down in history as the worst year for the entire cruise market. The restrictions caused by the spreading COVID-19 pandemic in 2020 and 2021 impacted on whole tourism segment and the very first year of the pandemic ended up in most Baltic seaports with almost no cruise vessel calls (-96,0%) and passengers visits (-99%). In 2020 only a few cruisers had the opportunity to enter the Baltic ports, mostly in Sweden. The first loosening of the restrictions in 2021 brought back some cruise operators to the market, but the total number of travelers didn't reach even a quarter of the total number in 2019.

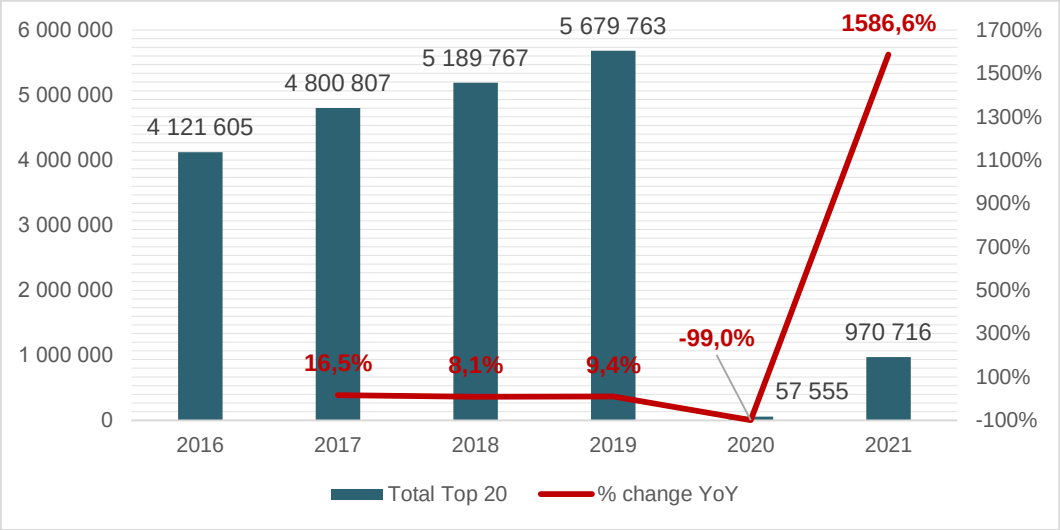

Fig. 7.4. Total passengers number in 2016-2021 in Top 20 Baltic seaports

Source: Actia Forum elaborations based on Cruise Baltic database

For the 2022 season, there are more positive prognoses, based on already realized and planned calls of cruise vessels. Prognoses from 2021 mostly predicted a few records in most visited Baltic ports, compared to 2019 levels (Fig. 7.5), but at the time these predictions were prepared, the attack of Russia on Ukraine was not foreseen. However, this war hasn't changed much in cruise schedules to ports of European Union countries but only impacted one of the biggest Baltic Russian seaports, St. Petersburg, as most of the operators rescheduled their vessels to bypass the seaport of the aggressor.

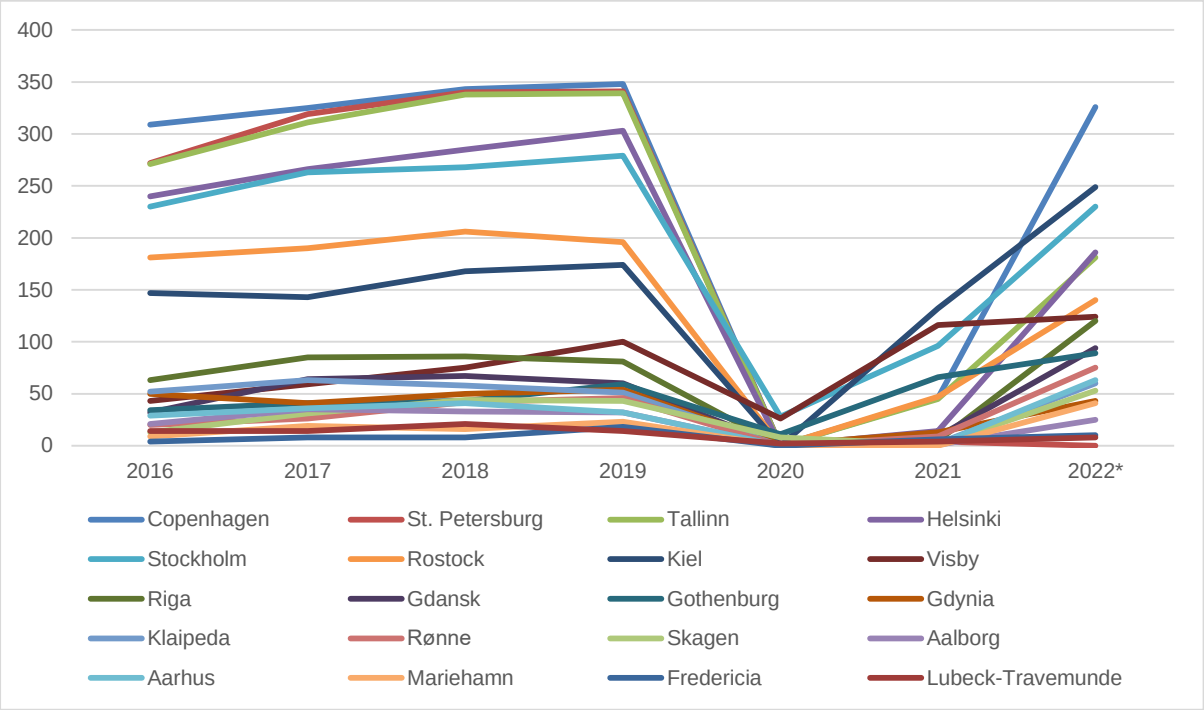

Fig. 7.5. Number of calls in Top 20 Baltic cruise ports* from 2016 to 2022**

**Top 20 Baltic cruise ports in 2019*
***estimated on port cruise calls schedules presented on ports' websites and Cruise Baltic statistics*
Source: Actia Forum elaborations based on Cruise Baltic database

COPENHAGEN

Copenhagen, the capital of Denmark, is Northern Europe's major cruise destination for over twenty years. In 2019 it achieved two records, both in number of calls and number of passengers, strengthening port's 1st position in Top 20 biggest Baltic cruise ports (Fig. 7.6).

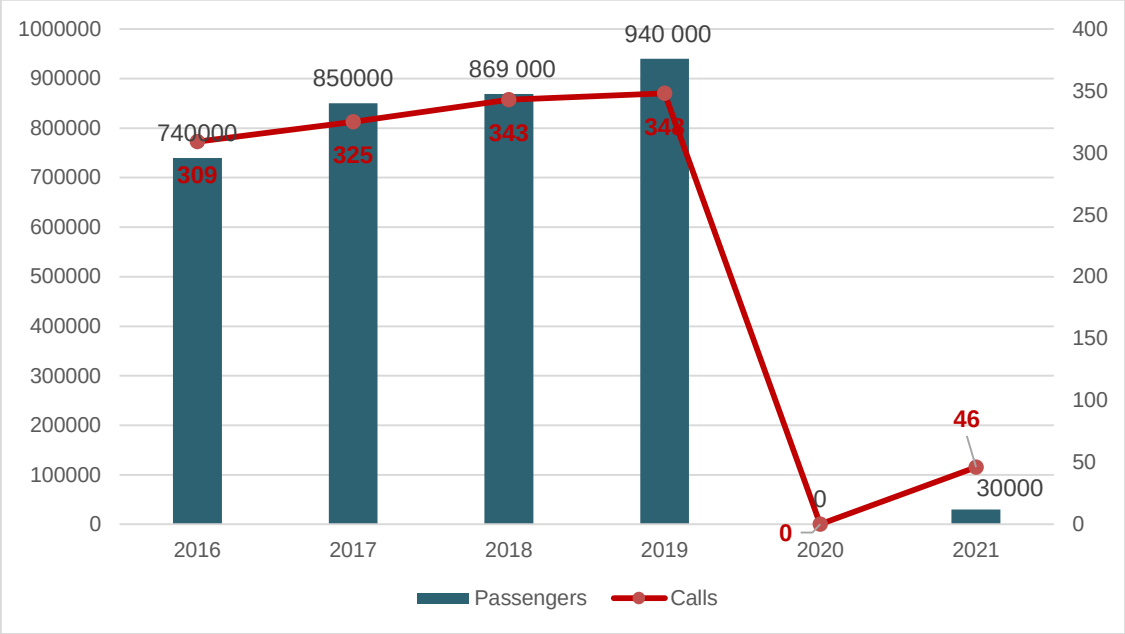

Fig. 7.6. Number of calls and number of passengers in Copenhagen 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Copenhagen the cruise terminals are located in different parts of the city and they can all be reached by public transport, either by metro, train or bus. Ocean Quay is northernmost terminal, with a distance around of 8 km to the city centre. Levantkai, Langeline and Nodre Toldbold are closer, in around 3-4 km.

Fig. 7.7. Cruise terminals in port of Copenhagen

	Ocean Quay	Langeline	Nodre Toldbold	Freeport/Levantkaj
Quays	331, 332, 333	190	177	266
Depth	10.5 m	9.1 m - 10 m	7.4 m	9.5 m
Length	1 100 m	710 m	225 m	400 m

Source: CMP

The capital of Denmark is a city with royal flair, a mix of historical and modern architecture. Among the most popular places visited by cruise passengers are:

- Christiansborg Palace, located on Slotsholmen in Copenhagen, with an 800-year-long history as Denmark's centre of power. The present palace was completed in 1928, but from this place kings and queens have ruled for centuries. Today, the palace is used by HM The Queen for official events such as gala banquets and public audiences.
- Amalienborg Palace, is a place that is famous for its royal guard - The Royal Life Guard. Every day you can watch the changing of the guards. One of its buildings is the Christian VIII's Palace (also known as Levetzau's Palace), where the Amalienborg Museum is situated.
- Rosenborg Castle, built in the 17th century features 400 years of royal treasures, and the Crown Jewels and Royal Regalia. The castle is rounded by gardens, which is the oldest and most visited park in central Copenhagen.
- Tivoli Gardens, is an amusement park in central Copenhagen that offers rides, games, musicals, ballet, and major concerts.
- The Little Mermaid sculpture, Copenhagen's most iconic tourist attraction inspired by Hans Christian Andersen's famous fairy tale.

Fig. 7.8. Cruise vessel at Langeline cruise terminal in Copenhagen

Source: www.ricksteves.com/watch-read-listen/read/articles/cruising-the-northern-seas

ST. PETERSBURG

Port in St. Petersburg in 2019 achieved the 2nd position in the Top 20 Baltic cruise ports in terms of the number of calls, and 3rd in terms of the number of passengers. Due to the COVID-19 pandemic, it almost has no cruise calls in 2020 and 2021. In 2022 the seaport will have also plenty of calls, as most of the cruise operators decided to omit the port due to the aggression of the Russian Federation on Ukraine.

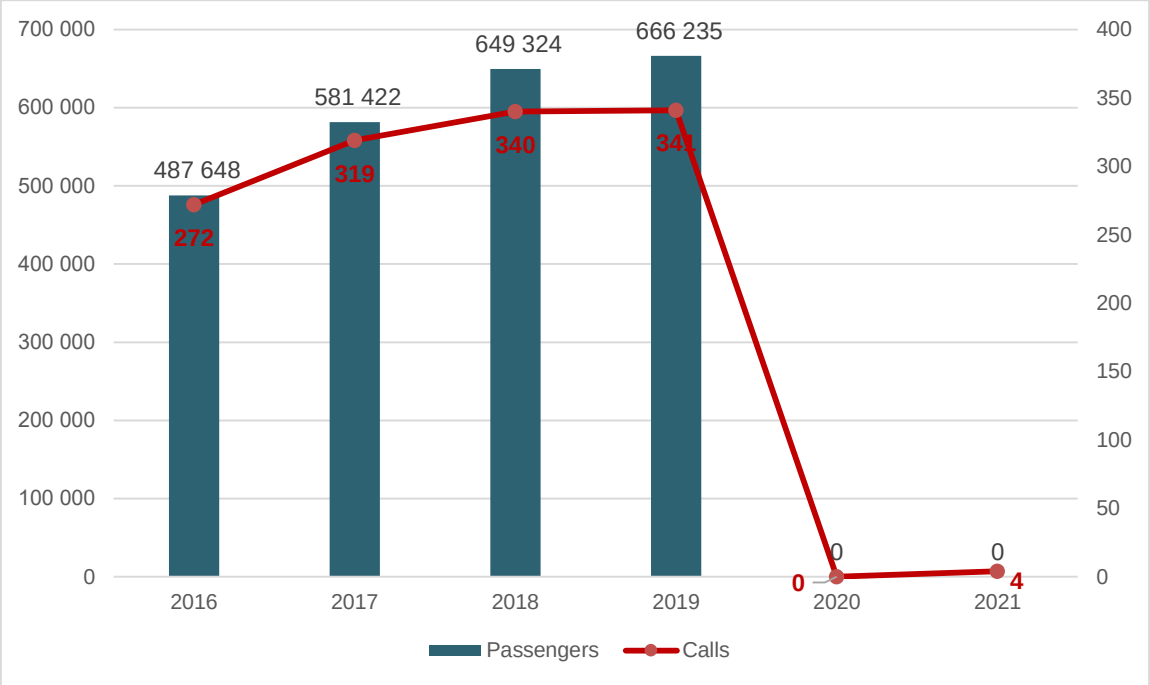

Fig. 7.9. Number of calls and number of passengers in port of St. Petersburg 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of St. Petersburg there is dedicated terminal for cruise vessel - Marine Facade. It is located outside the city with distance up to 10 km to the city centre. Marine Facade that includes 7 berths with a total length of 2 171 meters, deep of 10.7m, to accommodate ocean vessels up to 340 meters long and 8 meters deep.

Tab. 7.1. Cruise terminals in port of St. Petersburg

	Passenger Port of Saint Petersburg "Marine Facade"		
Berth	Berth 1, 2	Berth 3, 4, 5	Berth 6, 7
Depth	10.7 m	10.7 m	10.7 m
Length	~660 m	~850 m	~660 m

Source: Port of St. Petersburg, Google Maps

St. Petersburg is the second-largest city in Russia, situated at the head of the Gulf of Finland on the Baltic Sea, on the Neva River. The population of nearly 5.4 million residents makes this city a 4th largest in the Europe. As Russia's Imperial capital, and a historically strategic port, it has a multiply of attractions that are interesting cruise passengers, among others:

- The Historic Centre of Saint Petersburg and Related Groups of Monuments that constitute a UNESCO World Heritage Site.
- The Winter Palace, that served as the official residence of the Russian Emperor from 1732 to 1917. The palace and its precincts now house the Hermitage Museum. The State Hermitage Museum, a museum of art and culture, the largest art museum in the world by gallery space, one of the most visited art museums (6th). It was founded in 1764 when Empress Catherine the Great acquired an impressive collection of paintings from the Berlin merchant Johann Ernst Gotzkowsky.
- Lakhta Center is the tallest building in Russia, having 87 floors. The design of the tower contains several green and energy-saving technologies, which earned it a LEED Platinum certificate.
- The Church of the Savior on Spilled Blood, a Russian Orthodox church, constructed between 1883 and 1907 on the site where political nihilists assassinated Emperor Alexander II in March 1881. Currently functions as a secular museum and church at the same time.
- Saint Isaac's Cathedral or Isaakievskiy Sobor, cathedral that currently functions as a museum with occasional church services. It was originally built as a cathedral but was turned into a museum by the Soviet government in 1931 and has remained a museum ever since.

Fig. 7.10. Cruise vessels at Marine Facade cruise terminal in St. Petersburg

Source: www.cruiseindustrynews.com/cruise-news/21069-st-petersburg-baltic-jewel-taking-reservations-4-years-out.html

KIEL

Port of Kiel in 2019 was the 2nd largest Baltic seaport in terms of number of passengers, an 7th in terms of number of calls. As most of the Baltic ports, it has not any of cruise calls in 2020 due to pandemic, but in 2021 it effectively recovered and achieved 1st position in both categories of Top 20 Baltic cruise ports.

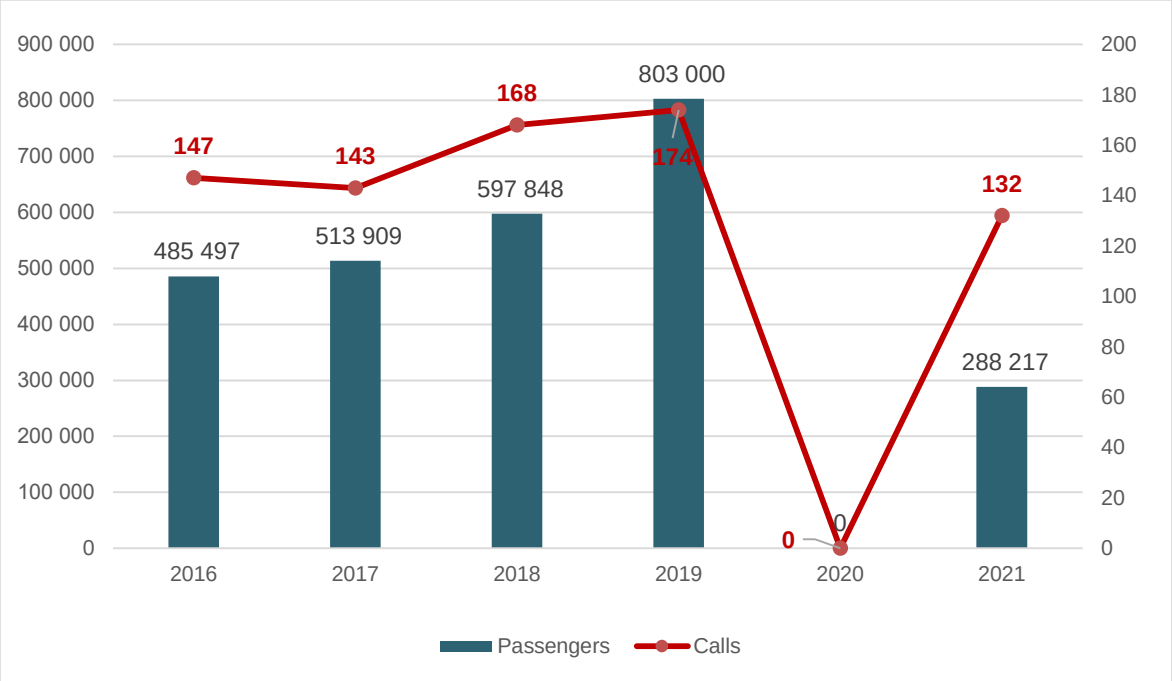

Fig. 7.11. Number of calls and number of passengers in port of Kiel 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

The mooring of cruise vessels of Port of Kiel is allowed at three terminals. The first terminal, Ostseekai, is located in the heart of the city center. It has been designed for the high requirements of today's cruise ships with its on-shore power plant, funded by the European Union. The second one, Norwegenkai, is also located closely to most of Kiel's attractions, unlike the third terminal Ostuferhafen, located around 8 km East from the city center, on the other side of the Kiel Bay.

Tab. 7.2. Cruise terminals in port of Kiel

	Ostsekaai		Norwegenkai	Ostuferhafen
Berth	Berth 27	Berth 28	Berth 1	Berth 22
Depth	9.5 m	9.5 m	9.5 m	9.0 m
Length	355 m	285 m	395 m	175 m

Source: Port of Kiel

Kiel, the capital and most populous city in the northern German state of Schleswig-Holstein, due to its geographic location in the southeast of the Jutland peninsula on the southwestern shore of the Baltic Sea, Kiel was the traditional homes of the German Navy's Baltic fleet. The cruise passengers visit the most popular attractions like:

- Town hall, located on the town hall square, was built between 1907 and 1911. The 106 metre high town hall tower, which you can ascend either on foot or by elevator. In the area surrounding a Kleiner Kiel (a small body of water), there are a great number of beautiful locations such as the Hiroshima Park or the Ratsdiener Garden.
- Aquarium and seal basin, which offers a small insight into the wonderful variety of inhabitants in the oceans, lakes, and rivers of the world and a short glance at the colorful world of tropical coral reefs.
- The Nikolai church at the Alten Markt is the most famous church in Kiel and the oldest preserved building of the city. Its construction date is estimated to be around 1242. The church was virtually completely destroyed during the Second World War. In front of the church there is a large sculpture, the „Geistkämpfer“ (Spiritual Warrior), erected by Ernst Barlach, symbolising the victory of good over evil.
- Kiel maritime museum with Museumsbrücke bridge is situated directly on the fjord. Here, in the former fish market of the city, is the ideal location for showing the maritime history of Kiel. Also worth visiting, and belonging to the museum, is the swimming section. In summer, three vintage ships can be viewed at the neighbouring Museumsbrücke bridge.

Fig. 7.12. Cruise vessel at Ostseekai cruise terminal in Kiel

Source: www.adelte.com/project/kiel-cruise-terminal-ostseekai/

TALLINN

Port of Tallinn in 2019 was 3rd most popular cruise port in the Baltic Sea region in terms of number of the calls. In turn, taking into account number of passengers, it achieved 5th position in Top 20 listing.

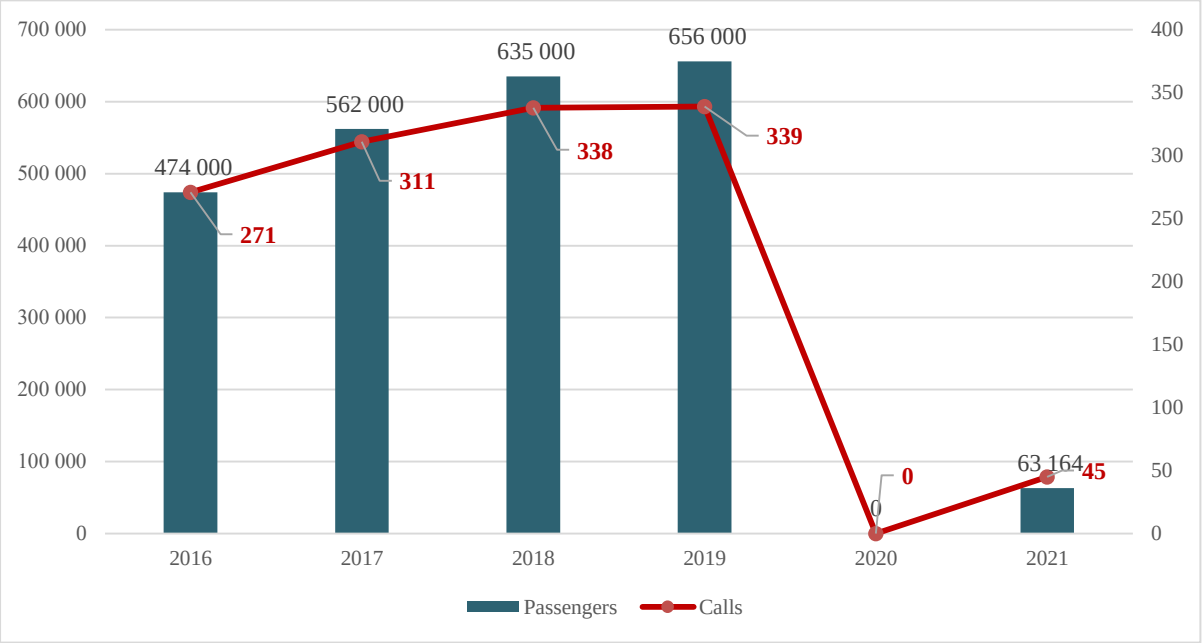

Fig. 7.13. Number of calls and number of passengers in Tallinn 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Tallinn there is a dedicated terminal, separated area in the Old City Harbour, around 1 km to the city center and old town. The terminal is powered by solar panels adapted to the Nordic climate and heated and cooled by marine energy by way of a heat pump.

Tab. 7.3. Cruise terminals in port of Tallinn

	Old City Harbour cruise area			
Berth	Quay 24	Quay 25	Quay 26	Quay 27
Depth	10.7 m	10.7 m	11 m	11 m
Length	339 m	339 m	421 m	421 m

Source: Port of Tallinn

Tallinn, the capital city of Estonia, is situated on a bay in northern Estonia. Tallinn Old Town is one of the best-preserved medieval cities in Europe and is listed as a UNESCO World Heritage Site, so numerous attractions are visited by tourists from cruise vessels, among others:

- Town Hall Square, once a market square and the center of the city's government, today main meeting spot for townspeople and a venue for a variety of events. At the other end of the square is the Raeapteek, one of the oldest pharmacies in Europe and the oldest in Tallinn.
- Kadriorg Palace which is Estonia's only Baroque Palace and park ensemble, built more than 300 years ago on the orders of Russian Tsar Peter the Great. Kadriorg Palace is home to a number of museums, including Kumu (the main building of the Estonian Art Museum), the Mikkel Museum, the Miiamilla Children's Museum, and the house museums of Peter the Great, Eduard Vilde, and Anton Hansen Tammsaare.
- Noblessner seafront quarter, with a former submarine factory named after its founders Emanuel Nobel (nephew of Alfred Nobel, founder of the Nobel Prize) and Arthur Lessner. Now there is a modern urban space with galleries, design shops, a marina, and restaurants.

Fig. 7.14. Cruise vessels at Old City Harbour cruise terminal in Tallinn

Source: www.ts.ee/en/cruise-area/

HELSINKI

Port of Helsinki in 2019 was 4th cruise port in terms of number of calls in the BSR, and 7th most popular in terms of number of passengers.

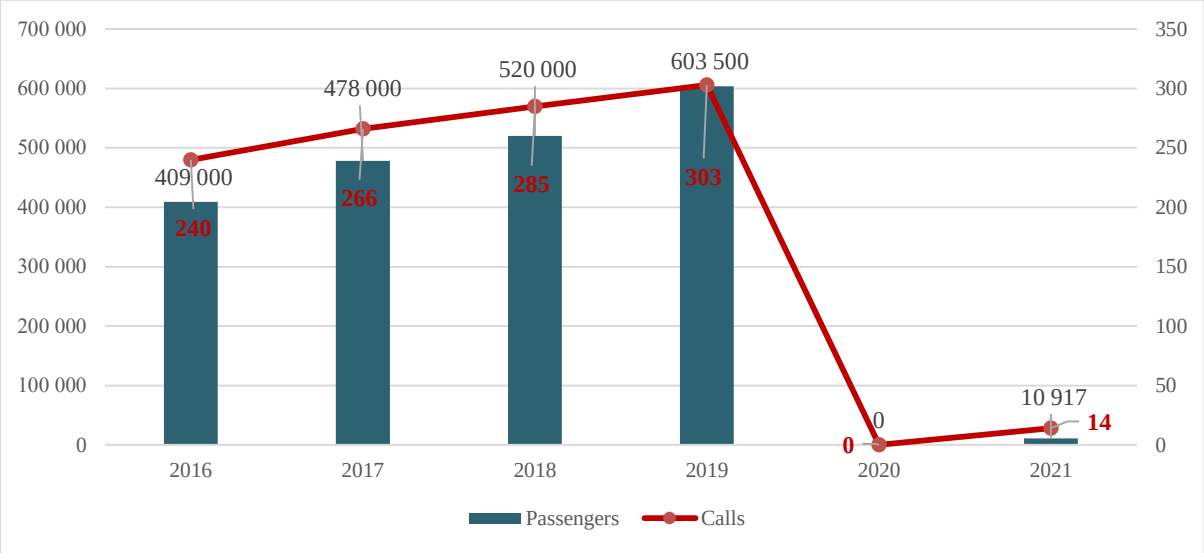

Fig. 7.15. Number of calls and number of passengers in port of Helsinki 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

Port of Helsinki is composed of the following main harbour areas with total of 7 quays for cruise ships: Hernesaari, South Harbour, and Katajanokka. Hernesaari is located around 3.5 km from the city centre, and South Harbour and Katajanokka wharfs are close to the city centre – less than 1 km.

Tab. 7.4. Cruise terminals in port of Helsinki

	West Harbour - Hernesaari			South Harbour		Katajanokka	
Berth	Munkkisaari Quay - LHB	Munkkisaari Quay - LHC	Munkkisaari Quay - LHD	Pakkahuone Quay - EPL	Pakkahuone Quay EMA	Katajanokka Quay	Cruise Quay
Depth	9.3 m	9.8 m	11.9 m	6.0 m	7.75 m	8.8 m	10.3 m
Length	330 m	370 m	313 m (+47 m)	130 m	298 m	210 m	300 m(+78 m)

Source: Port of Helsinki

Helsinki, the capital of Finland sits on a peninsula on the north coast of the Gulf of Finland. The country's largest city is filled with things to do for visitors:

- The Market Square (Kauppatori) is the main planned and paved square in central Helsinki, and is one of the best-known outdoor markets in northern Europe. Bordering the Baltic Sea at the eastern end of the Esplanadi, it is full of stands selling Finnish specialties, handicrafts, and souvenirs.
- Seurasaari Open-Air Museum offers an excellent way to learn about the way Finlanders lived in years gone by. Located on one of Helsinki's islands, 87 buildings from throughout the country have been moved here. Some of the farms and manors are as much as four centuries old, though the majority date from the 18th to 20th centuries.
- Esplanadi Park, Helsinki's best-known park, has been a good place to relax and unwind from busy Helsinki since 1812. It's a great place to see and be seen, to meet friends for a picnic or attend fashion shows and jazz concerts. For these and other reasons, the park, located in the heart of Helsinki between two busy streets, is very popular with locals.
- Helsinki Cathedral and Uspenski Cathedral. The first one is the Evangelical Lutheran cathedral located in the centre of Helsinki, originally built from 1830–1852 as a tribute to the Grand Duke of Finland, Tsar Nicholas I of Russia. It is a major landmark of the city, and possibly the most famous structure in Finland. The secon cathedral is a building where it overlooks the city. This s the largest Orthodox cathedral in Western Europe was built in the 1860s, modeled after a 16th-century church near Moscow, is filled with icons and gorgeous chandeliers.

Fig. 7.16. Cruise vessel at South Harbour and Katanajokka cruise terminals in Helsinki

Source: www.portofhelsinki.fi/sites/default/files/images/netti.jpg

STOCKHOLM

Port of Stockholm in 2019 was 5th cruise port in terms of number of calls in the BSR, and 4th most popular in terms of number of passengers.

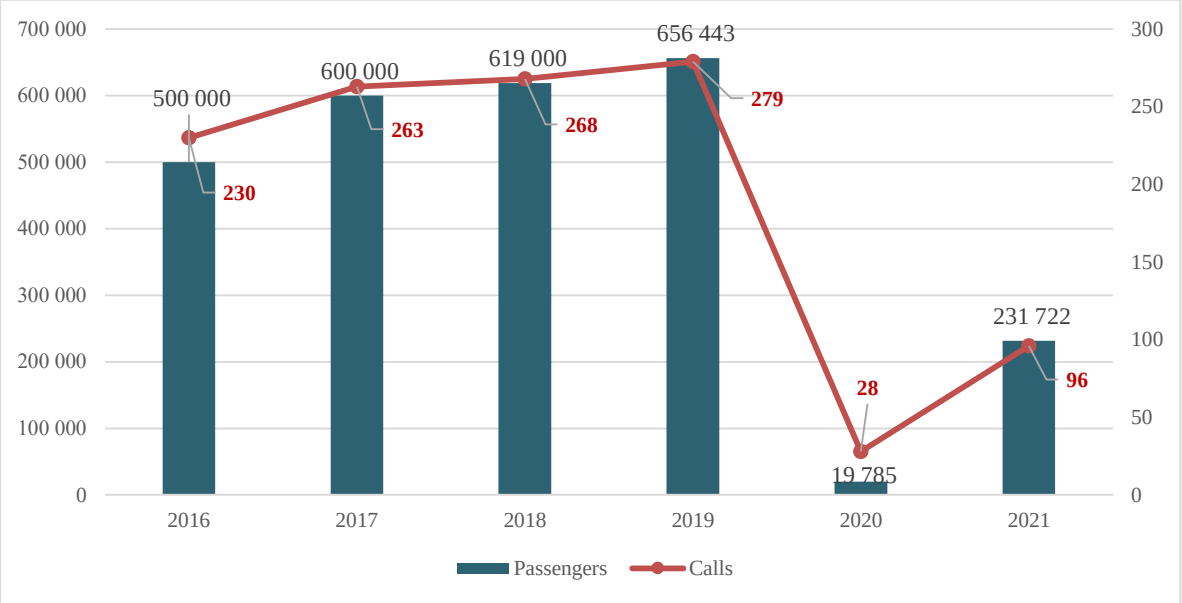

Fig. 7.17. Number of calls and number of passengers in port of Stockholm 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In the port of Stockholm, cruise vessels can be handled in a few berths located in different part of the city. There are 3-4 cruise terminals, a total of a 9 berths for cruisers. Stadsgarden, Masthamnen, and Frihamnen are located 3-4 km from the city center, and Skeppsboron is located 1,5 km. The last one is dedicated for smaller cruise vessels, due to its short length and low depth.

Tab. 7.5. Cruise terminals in port of Stockholm

	Stadsgarden and Masthamnen		Skeppsboron	Frihamnen				Vartahamnen	
Berth	**160**	**167**	105	625	638	634	655	511	515
Depth	7.3 m	9.3 m	5.9 m	8.3 m	9.9 m	8.9 m	9.1 m	9.9 m	6.9 m
Length	270 m	370 m	127 m	320 m	380 m	380 m	350 m	265 m	255 m

Source: Port of Stockholm, Cruise Baltic

Stockholm in known as the "Venice of the North" for its many waterways and lakes, Stockholm, the capital city of Sweden, lies on a number of islands and peninsulas at the outflow of Lake Mälar into the Baltic, which here forms a deep inlet. Travelers will find no end of things to do in this city:

- Stockholm Gamla Stan - Old Town is crammed with must-see sights, attractions, cafés, authentic restaurants, and boutique shops, the area of Gamla Stan (Old Town) is a living, breathing museum in its own right. Stockholm Cathedral (Storkyrkan), the Nobel Prize Museum (Nobelmuseet), and the Royal Palace are all located here.
- Th City Hall (Stockholms stadshus, or Stadshuset), is nestled at the water's edge and topped by three golden crowns, is one of Stockholm's most iconic buildings and stars in countless images and postcards of the city. The prestigious annual Nobel Banquets are held here.
- Djurgården island with its park that is a part of the Royal National City Park, is a favorable place for a stroll, exploring trails by bicycle, taking to the waterways in a canoe, as well as being home to several of Stockholm's top museums (Vasa Museum, Abba the Museum, Skansen Open-Air Museum) and other attractions.
- Vasa Museum with its main attraction is the Vasa battleship, which was intended to be the pride of the Swedish Imperial fleet before its sinking on its maiden voyage in 1628. Around 95 percent of the vessel was taken out from the seabed in 1961 and restored.
- ABBA The Museum opened in 2013 and has attracted young and old alike with its unique interactive exhibits: computerized versions of themselves not only wearing the band's most iconic outfits but can even dance and sing along with the band.

Fig. 7.18. Cruise vessels at Vartahamnen cruise terminal in Stockholm

Source: www.maritime-executive.com/article/record-cruise-passenger-numbers-at-stockholm

ROSTOCK

Port of Rostock in 2019 was 6th cruise port both in terms of number of calls, and in terms of number of passengers.

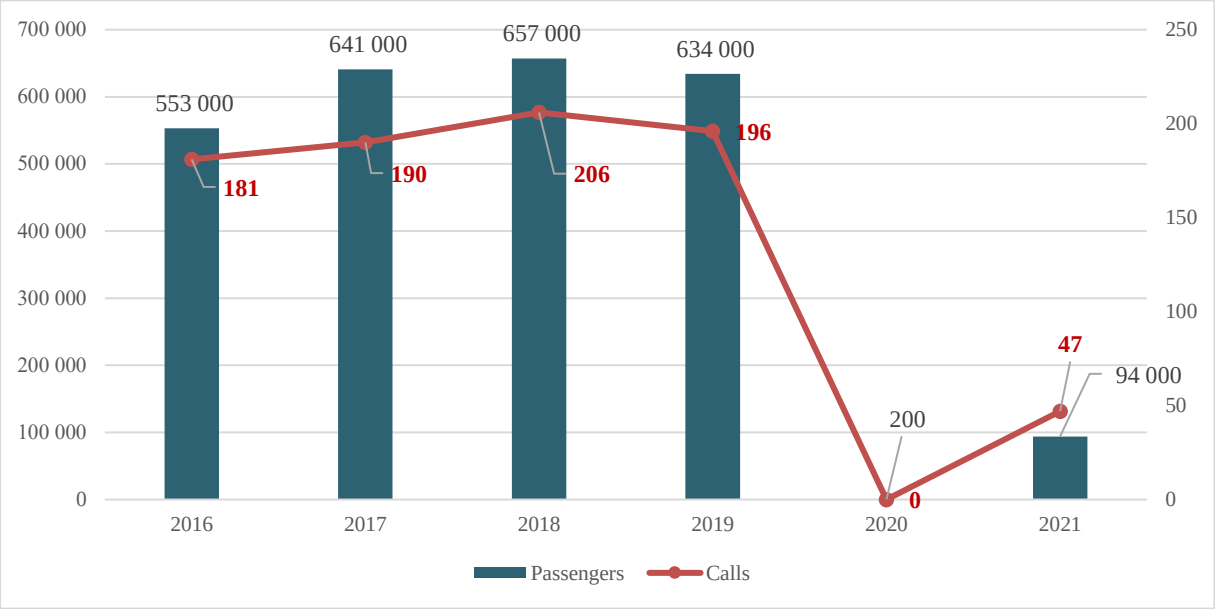

Fig. 7.19. Number of calls and number of passengers in port of Rostock 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Rostock there is a dedicated cruise terminal in a different part of the city, Warnemünde district located at the estuary of the river Warnow. The Warnemünde Cruise Center is around 13 km from the Rostock city centre.

Tab. 7.6. Cruise terminals in port of Rostock

	Warnemünde Cruise Center	
Berth	P7	P8
Depth	11 m	11 m
Length	276 m	460 m

Source: Port of Rostock

Warnemünde district is a peacefull place for a rest on a beach in contrast to a citycenter of Rostock that is preferable for sightseeing city's old churches and town gates.

- On either side of the Warnow Estuary, the perennial Blue Flag-winning Warnemünde Beach is 15 km long and widens to 100 m at points. Along the beach, there are designated areas for water

sports, naturists, beach sports like soccer and volleyball in summer, as well as places where you can have barbecues and campfires on the sand.

- Alter Strom in Warnemünde's is a channel dug in 1423. For more than five centuries this was the main channel linking Rostock's port with the Baltic, until the Neuer Strom was dredged in 1903. On the west side of the Alter Strom is a promenade edged with charming old fishermen's houses that are now shops and restaurants.
- Neuer Markt - New Market Square has been the pumping heart of Rostock since the 13th century. Featuring pastel-coloured Renaissance merchants' houses, the splendid Town Hall, St. Mary's Church and the Rostock Cultural History Museum, it also hosts a daily grocery market.
- Rostock's defensive walls were redesigned due to the expansion of the city 19th century, and only four of the original twenty medieval gates remain. The Kuhtor (Cow Gate) is said to be the oldest surviving city gate in Northern Germany and dates from the second half of the 13th century.

Fig. 7.20. Cruise vessel at Warnemünde Cruise Center in Rostock

Source: www.cruisemapper.com/ports/warnemunde-rostock-port-52

GDYNIA

Port of Gdynia in 2019 was 8th cruise port in terms of number of calls, and 12th in terms of number of passengers.

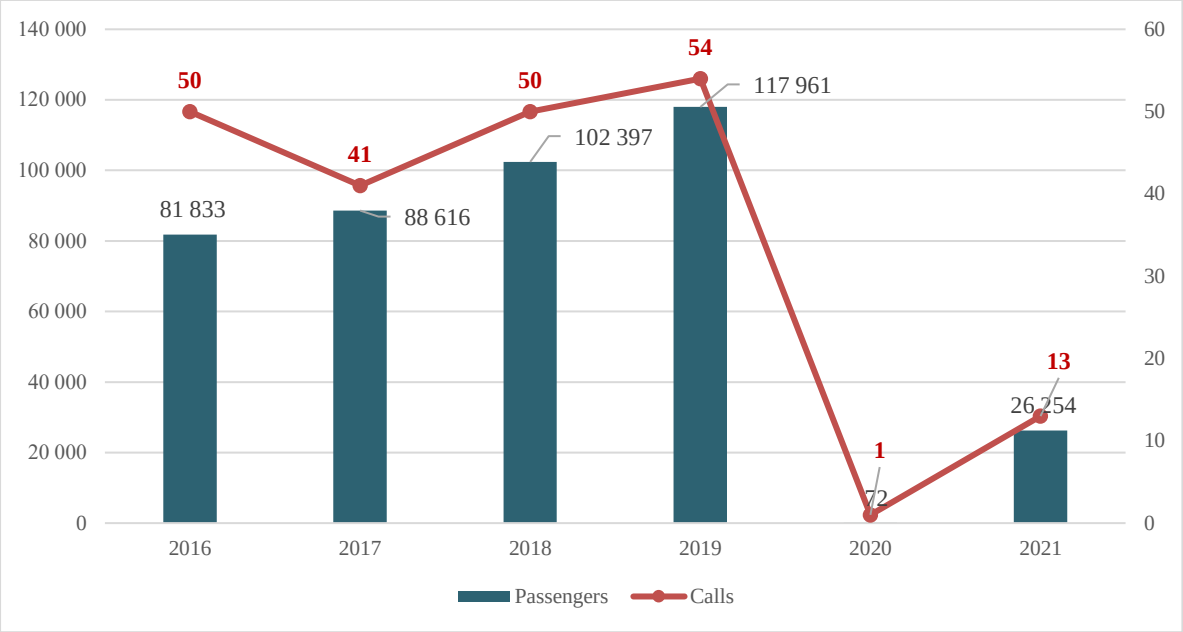

Fig. 7.21. Number of calls and number of passengers in port of Gdynia 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

There is one quay, where cruise vessels are berthed in Gdynia. French Quay is located around 2 km from the city center. Transatlantic ships such as MS Batory used to depart from this berth.

Tab. 7.7. Cruise terminals in port of Gdynia

Berth	French Quay
Depth	12 m
Length	512 m

Source: Port of Gdynia

Gdynia is situated along Gdansk Bay, a sheltered water area by the Hel peninsula. The coastline is fringed with a long, sandy beach, that is very attractive as a tourist destination. Gdynia is also suited to admirers of 1920s and '30s architecture, with its great attractions:

- Emigration Museum, located on a cruise quay which were a maritime terminal during the interwar period. It was the point of departure for thousands of poles permanently leaving their homeland. The Emigration Museum has gathered lots of archive footage and photography, as well as sound

recordings, firsthand testimony and personal items to paint a clear picture of why and how people departed for destinations like Brazil, Australia and the USA.

- Skwer Kościuszki, named for Tadeusz Kościuszko Poland's national hero who led the 1794 uprising against Russia, is a city's main square and promenade that leads onto the South Pier where the museum ships are docked.
- Two ships-museums, the frigate Dar Pomorza (The Gift of Pomerania) and the destroyer Blyskawica (The Lightning). The first one is a fully-rigged sailing ship built in 1909, and in 1935 she was the first ship to sail around the world flying Polish colours. The secon one, The Lighting, is a "Grom-class" destroyer is the oldest preserved ship of its kind in the world, having been commissioned in November 1937. This ship took part in the evacuation at Dunkirk in 1940 and various battles in Europe and in the North Atlantic.
- Observation terrace and the free funicular shuttling up and down the slope at Kamienna Góra is another new addition to the city, making its first trip in July 2015. The lower station is at the newly revitalised Plac Grunwaldzki, and both this and the upper station were designed to chime with Gdynia's Modernist architecture.
- Kępa Redłowska and Orłowo. The first is a 118-hectare nature reserve created in 1938 to protect coastal beech forest that is perfect for a walks. At the park's headland is the Orłowski Cliffs, a natural balcony for 650 metre made from glacial sediment and climb above narrow beaches clustered with rocks.

Fig. 7.22. Cruise vessel at French Quay in Gdynia

Source: www.polska-org.pl/7126033,foto.html

GDAŃSK

Port of Gdańsk in 2019 was 10th cruise port in terms of number of calls, and 17th in terms of number of passengers.

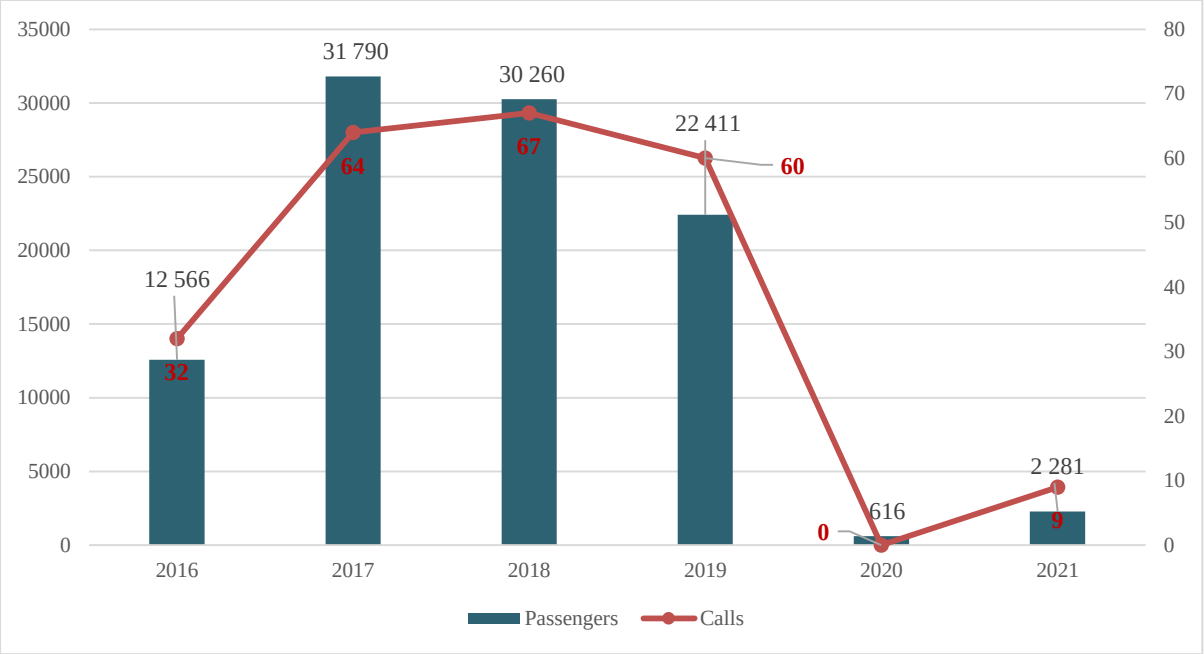

Fig. 7.23. Number of calls and number of passengers in port of Gdańsk 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

There are three cruise berths that allow cruise vessels to moore, all located in the northern part at the port exit. Westerplatte Quay is also a berth for regular ro-ro/ferry connections. WOC II is a abbreviation of a free zone in Port of Gdańsk, and on this berth, as well as on Oliwskie Quay, are also handled cargo vessels.

Tab. 7.8. Cruise terminals in port of Gdańsk

Berth	Westerplatte	WOC II	Oliwskie
Max. Draught	9.5 m	8.5 m	9.9 m
Max LOA	225 m	170 m	225 m

Source: Port of Gdańsk

Gdańsk is located in Gdansk Bay and at the mouth of the Motława River. The city's complex history, with periods of Polish, Prussian and German rule, and periods of autonomy as a free city-state, makes this city full of historical places that cruise tourist can visit:

- The Długa and Długi Targ Streets rank among the most beautiful streets in Gdańsk. The oldest preserved houses date back to the Middle Ages. The most important secular buildings - the Hall

of the Main City and the Artus Court (with Gdansk symbol - The Neptune Fountain, in front of the building) are located on Długi Targ Street.

- Main Town Hall built for over a century in the Middle Ages, the original Gothic town hall, after a fire in the mid sixteenth century, was rebuilt in Renaissance style. Today, the Main Town Hall is famous for its replica of a set of 37 wonderful concert bells.
- The Oliwa Cathedral is a church was first erected as a Cistercian shrine back in the 13th century. Reconstructed after a great fire with a Baroque fixtures. The cathedral is 107 m long, which makes it the longest church in Poland. Its splendid decorative gems include the Rococo organ, dating from the period between 1763 and 1788.
- The Church of the Blessed Virgin Mary, the largest brick church in the world. Its interior displays many exquisite pieces of Medieval and Baroque art, including the stone Pieta from about 1410, a copy of the Last Judgement by Hans Memling, the original canvas dating back to 1472, the astronomical clock built by Hans Düringer between 1464 and 1470 and the main altar put up between 1510 and 1517.
- Monument to the Fallen Shipyard Workers, three crosses with anchors – symbols of hope – have been erected to commemorate the bloody victims of the workers' strikes in December 1970. Next to the monument is a museum – European Solidarity Center.

Fig. 7.24. Cruise vessel at Westerplatte Quay in Gdańsk

Source: www.portgdansk.pl/port/terminale-i-nabrzeza/terminal-promowy-westerplatte/

GOTHENBURG

Port of Gothenburg in 2019 was 11th cruise port in terms of number of calls, and 9th in terms of number of passengers.

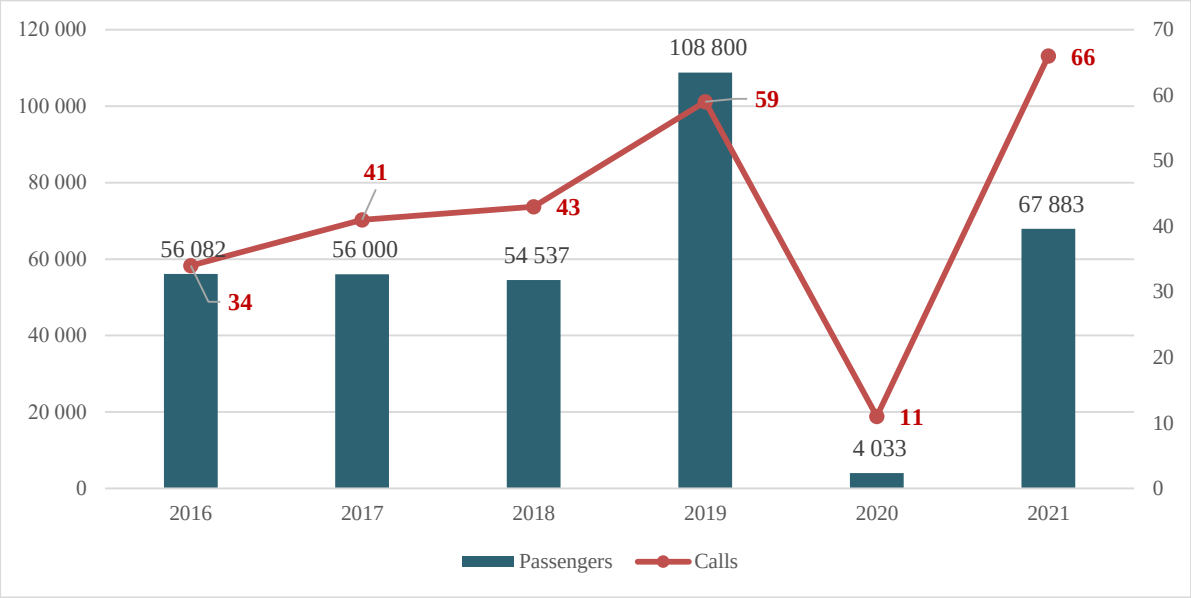

Fig. 7.25. Number of calls and number of passengers in port of Gothenburg 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

Port of Gothenburg has a four cruise terminals in different port locations. America Cruise Terminal is situated on the same side of the river as the city centre within a walking distance to most visited places and other attractions. Älvsborgs Port, Arendal Cruise Terminal and Skandia Port are located 10-12 km from the city centre.

Tab. 7.9. Cruise terminals in port of Gothenburg

	America Cruise Terminal	Arendal Cruise Terminal	Skandia Port	Älvsborgs Port
Berth	36	751	640-643 / 610-614	710-712
Depth	8 m	9.5 m	10-11 m / 10.9-14.0 m	11 m
Max LOA	225 m	300 m	330 m / 400 m	285 m

Source: Port of Gothenburg, Cruise Baltic

Gothenburg is situated by the Kattegat strait and Göta River, on the west coast of Sweden. The city was founded as a heavily fortified, primarily Dutch, trading colony. The sea, trade, and industrial history of the city are evident in the cultural life of Gothenburg, and so is in the attractions for cruise tourists:

- The Gothenburg Museum of Art hosts a collection of works that is regarded as one of the finest in Northern Europe. The collection covers artworks from the 15th century to contemporary pieces, with a special emphasis on Nordic art. Artists featured here include Carl Larsson, Edvard Munch, Anders Zorn, Picasso, Chagall, Monet, Rembrandt, and many others.
- The Volvo Museum, located in the Arendal neighborhood on Hisingen island, covers the development of Sweden's leading vehicle manufacturer Volvo, from the first ÖV 4 to the current cars, trucks, buses and other products.
- Haga district, one of the oldest neighborhoods in Gothenburg and dates from the mid-17th century which is lined with preserved timber houses, boutique shops, and pleasant cafés. A short walk from district there is a Skansen Kronan fortress offers a glimpse of Swedish history, as well as sweeping views over the city.
- Parks: Slottsskogen Park and Garden Society of Gothenburg. The first one, also known as "Castle Park", is a leafy park and mini-zoo right in the heart of the city. The second one is one of Europe's most beautifully preserved 19th-century parks. Located on the edge of the park is the Gothenburg Museum of Natural History.
- Gothenburg's Southern Archipelago offers attractions such as sea safaris, sailing, lobster fishing, sea-angling, and boat excursions. The southern islands, reached from Saltholmen ferry port, remain a car-free zone making it a perfect destination for cyclists and hikers.

Fig. 7.26. Cruise vessel at America Cruise Terminal in Gothenburg

Source: www.vartgoteborg.se/naringsliv/amerikaskjulet-gor-comeback-som-kryssningsterminal

VISBY

Port of Visby in 2019 was 8th cruise port in terms of number of calls, and 10th in terms of number of passengers.

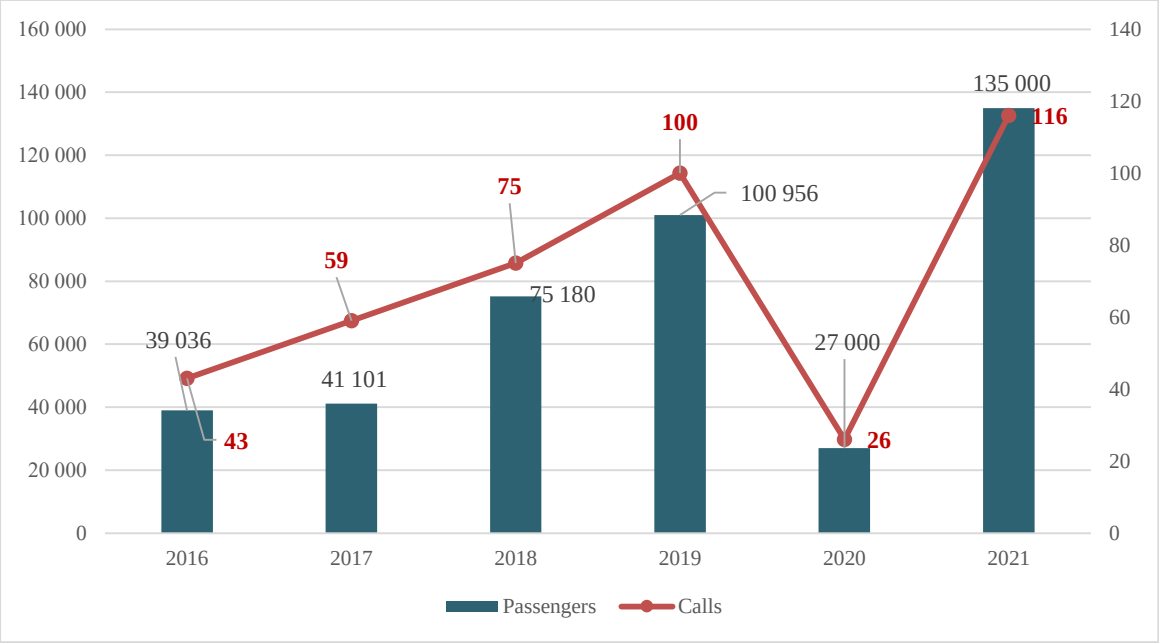

Fig. 7.27. Number of calls and number of passengers in port of Visby 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Visby there are few quays on which cruise ships can be handled. Berths 1, 2, 4 and 7 are located in the older part of the seaport within a walking distance to most attractions, and berths v14-v15 are located on a new, cruise ship pier, which is located on south part of the port.

Tab. 7.10. Cruise terminals in port of Visby

Berth	v14-v15	1-2	4	7
Max draught	11.5 m	5.5 m	6.5 m	7.5 m
Max LOA	340 m	150 m	200 m	200 m

Source: CMP

Visby is located on a island of Gotland, in the east coast of Sweden. This Hanseatic city has been on the UNESCO World Heritage Site list since 1995 due to its well-preserved medieval buildings. Among the most notable historical remains are the town wall that encircles the town center, and a number of church ruins. Among the most popular tourist attractions are:

- 13-century Visby's town walls, 3.5 kilometers long are built of limestone. Dotting these formidable medieval walls are 44 towers standing 15 to 20 meters high. Regular walking tours are available.

- St. Mary's Cathedral (Visby Domkyrka) and St. Nicholas' Church with architectural features from the 13th century
- The Gotlands Museum with the history and culture of the island. Permanent exhibitions include not only antiquities and artifacts dating back some 8,000 years from the Stone Age to Viking times, but also natural history and art. Highlights include fossils unique to the shores of the Baltic, the world's biggest hoard of Viking silver, and priceless runic stones.
- Botanical Garden (Botaniska Trädgården), established in 1855, is located on the northwest side of Visby. At the garden's south end, where the ivy-cloaked ruins of the Romanesque St. Olof's Church (ca. 1200) stand. The garden is full of rose beds for which Visby, known in Sweden as "the town of roses and ruins," is renowned.
- The ruins of St. Nicholas's Church, built around 1230 and destroyed it in 1525, were a part of a Dominican monastery. Church now makes an evocative setting for music and theater performances.

Fig. 7.28. Cruise vessel at cruise pier in Visby

Source: www.cruiseeurope.com/destinations/visby/

RIGA

Port of Riga in 2019 was 9th cruise port in terms of number of calls, and 11th in terms of number of passengers.

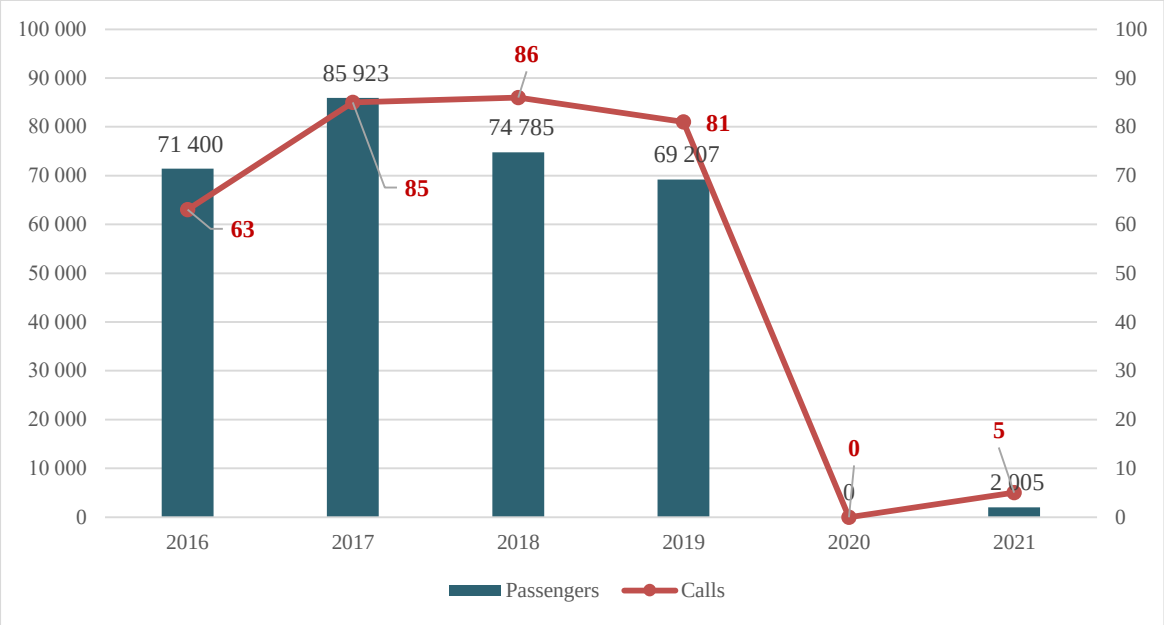

Fig. 7.29. Number of calls and number of passengers in port of Riga 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Riga there are 4 berths dedicated for cruise vessels, each located in the city centre, around 1 km from the Old Town.

Tab. 7.11. Cruise terminals in port of Riga

	Riga Passenger Port			
Berth	MK-3	MK-4	JPS-1	JPS-2
Max draught	8.6 m	8.6 m	7.6 m	7.6 m
Max LOA	300 m	300 m	110 m	280 m* (using jointly with JPS-1)

Source: Port of Riga, Riga Passenger Port

Riga, founded in 1201 and a former Hanseatic League member, lies on the Gulf of Riga at the mouth of the Daugava river. Riga's historical centre is a UNESCO World Heritage Site, noted for its Art Nouveau/Jugendstil architecture and 19th-century wooden architecture. It makes the city interesting for a tourists, which mainly visit places such as:

- Vecrīga - the old centre of Riga on the right bank of the Daugava River, with scurrying cobblestone streets and Riga's oldest houses and churches. Vecrīga is stacked with restaurants, nightspots, art galleries and museums. On Skārņu Street is the sculpture for the Brothers Grimm

fairytale, the “Town Musicians of Bremen”. The Cat House is a medieval-inspired Art Nouveau house on Meistaru Street with a story behind it.

- Art Nouveau buildings, around a third of the city’s stock, dating from the prime years of the movement at the start of the 20th century is the world’s largest collection of architecture in this style. Most of these residences lie in the newer “Centrs” district, to the north and east of Vecrīga, beyond the former walls.
- House of the Blackheads, first built for an association of unmarried merchants and ship-owners in the 1330s, is an adorned brick building. Today the House of the Blackheads is a museum. On the upper level are located grand ballrooms, where historically many luxurious events and also many cultural events happen.
- Freedom Monument is a 42-metres monument from 1935 is built from red granite and travertine, and crested by a copper sculpture of Liberty holding three golden stars. This landmark remembers the soldiers killed fighting Soviet forces during the Latvian War of Independence (1918-20).

Tab. 7.12. Cruise vessel at Passenger port in Riga

Source: www.safety4sea.com/port-of-riga-sees-four-cruise-ships-visit-at-the-same-time/

KLAIPEDA

Port of Klaipeda in 2019 was 13th cruise port in terms of number of calls, and 12th in terms of number of passengers.

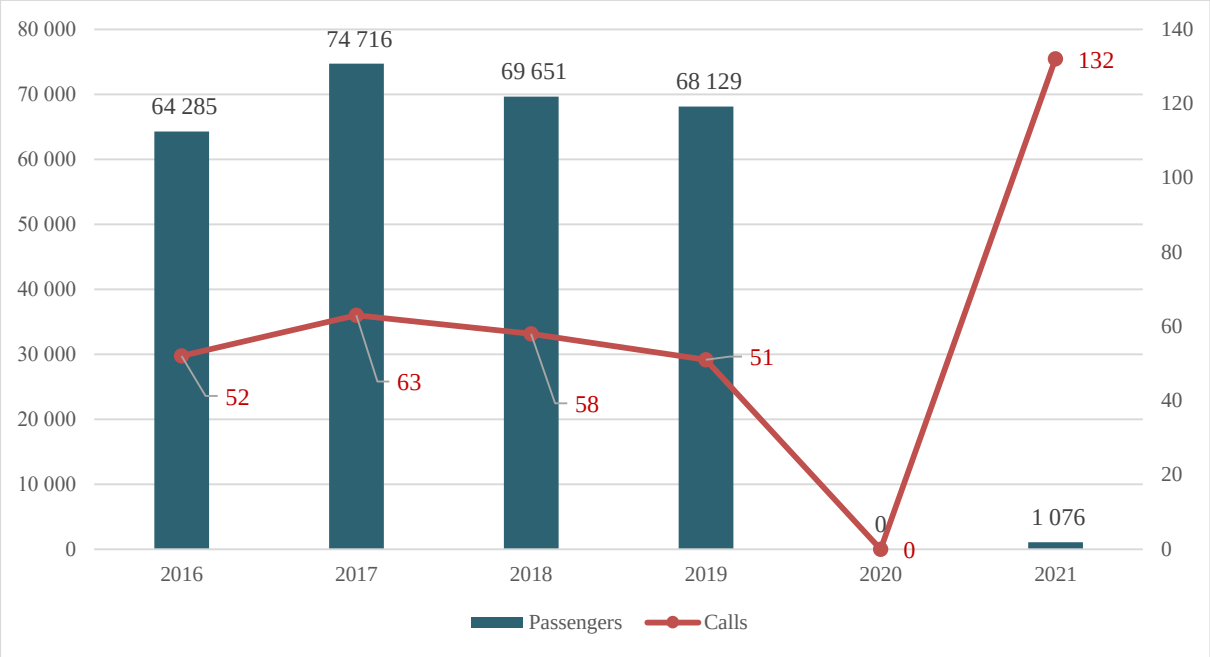

Fig. 7.30. Number of calls and number of passengers in port of Klaipeda 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In port of Klaipeda there are two cruise terminals which offer cruise ship handling. The cruise vessel quay is located near the entrance to the port, very close to city centre. In turn, CKT is a terminal is about 3-4 km from the center.

Tab. 7.13. Cruise terminals in port of Klaipeda

	Cruise vessel quay	CKT
Berth	28-33	80
Depth	8.5 m	9
Max. LOA	315 m	300 m

Source: Port of Klaipeda, Cruise Baltic

Klaipeda is situated on the Curonian Lagoon, in the western part of Lithuania. At various times, it was a part of the Polish–Lithuanian Commonwealth, Prussia and Germany until the 1919 Treaty of Versailles. Its history can be seen in a large numbers of historical places that tourists visit frequently:

- Klaipėda Castle, also known as Memelburg or Memel Castle, is an archeological site and museum housed in a castle built by the Teutonic Knights. Near the castle is located the Black

Ghost sculpture, arguably the city's most famous sculpture that present a 2.4 metres-tall ghoulish figure slithering onto the embankment from the waters below.

- Teatro aikštė (Theatre Square), Meno Kiemas (Artists' Yard), Danė Square. First one is the port city's main cultural hub and the location of most of its public events. Second one is a building complex consisting of Fachtwerkhäusen-style structures that have survived to the modern day. The third is a green space for the city's visitors looking for both rest and entertainment - there are playgrounds for children, a special BMX, skateboard and scooter park, a colourful dancing fountain, and, of course, the Danė River itself.
- Smiltynė - Curonian Spit, located on the other side of the Curonian Lagoon, is among the greenest parts of Klaipėda, and is perfect for tourists looking some peace and quiet in nature. This area is a UNESCO World Heritage site. The northern part of Smiltynė also has a permanent exhibition of veteran ships, a XIX-XX century fisherman's homestead, and the Lithuanian Sea Museum.

Fig. 7.31. Cruise vessel at quay in Klaipeda

Source:www.baltictimes.com/lithuania_s_klaipeda_expects_record_number_of_cruise_ships_next_year/

RØNNE

Port of Rønne in 2019 was 14th cruise port in terms of number of calls, and 19th in terms of number of passengers.

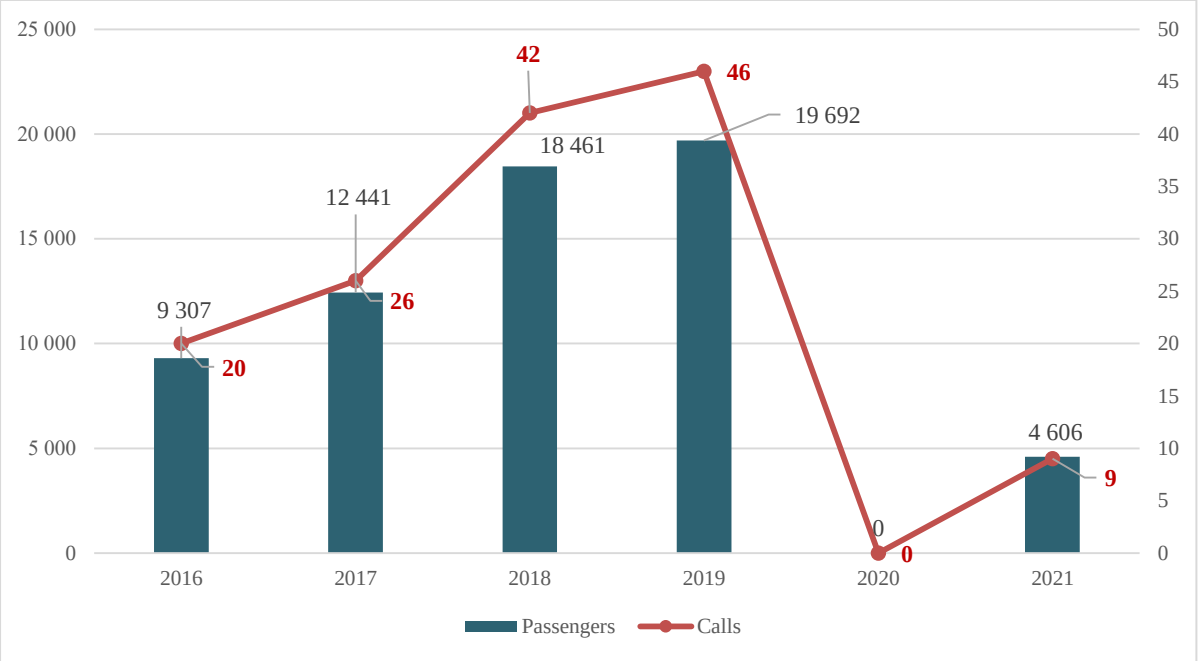

Fig. 7.32. Number of calls and number of passengers in port of Rønne 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

There are four areas for cruise vessels to moore in the port of Ronne. Every berth is around 1-2 km from the city centre. Tværmolen, Krydstogtskajen and Kulkajen are located in the old port area, and Multipier is located on the expanded, new port area on south.

Tab. 7.14. Cruise terminals in port of Rønne

	Krydstogtskajen	Tværmolen	Kulkajen	Multipier
Berth	Quay 31-32	Quay 22-23	Quay 13	Quay 34
Max. draught	9 m	7 m	7 m	11 m
Max. LOA	250 m	130 m	160 m	350 m

Source: Port of Rønne, Cruise Baltic

Rønne is the largest town on the Danish island of Bornholm, and has an interesting history coming under German and Swedish influence during its development as a herring fishing port. The town has many historic houses which were once the homes and trade buildings of merchants and noblemen. Notable landmarks include:

- St. Nicholas Church, situated on a hill just above the seaport in Rønne. It stands on the site of an earlier church or chapel from the 13th century. Some of the church's earlier artefacts can be seen in Bornholm Museum.
- The Defence Museum (Forsvarsmuseet) and Hjorts Stentøj. First one is a museum where exhibits from the Second World War can be seen. There is also a well-preserved defense tower from 1679. The second one is a ceramics museum on Krystalgade Street. Clay objects are made there and can be bought in the museum shop.
- St. Torv is the living centre of Rønne. Here, the natives of Bornholm present their own products. Near the towns' centre can be found Erichsens Gård, Rønne's best-preserved manor house and is part of the Bornholm Museum. The house has furnishings from the 19th century and there is a small garden around the house where cultural events are held during the summer season.
- Lighthouse is the characteristic white lighthouse can be seen from very far away. It was built in 1880 over the harbor basin and is a copy of the lighthouse in the port of Ystad in southern Sweden. The lighthouse was in operation until 1989.
- Three sandy beaches, called Nørrekås, Antoinette beach, and Galløkken. By Galløkken and Antoinette beaches you find two camping sites.

Fig. 7.33. Cruise vessel at cruise quay in Ronne

Source: www.cruiseeurope.com/destinations/roenne/

SKAGEN

Port of Skagen in 2019 was 15th cruise port in terms of number of calls, and 13th in terms of number of passengers.

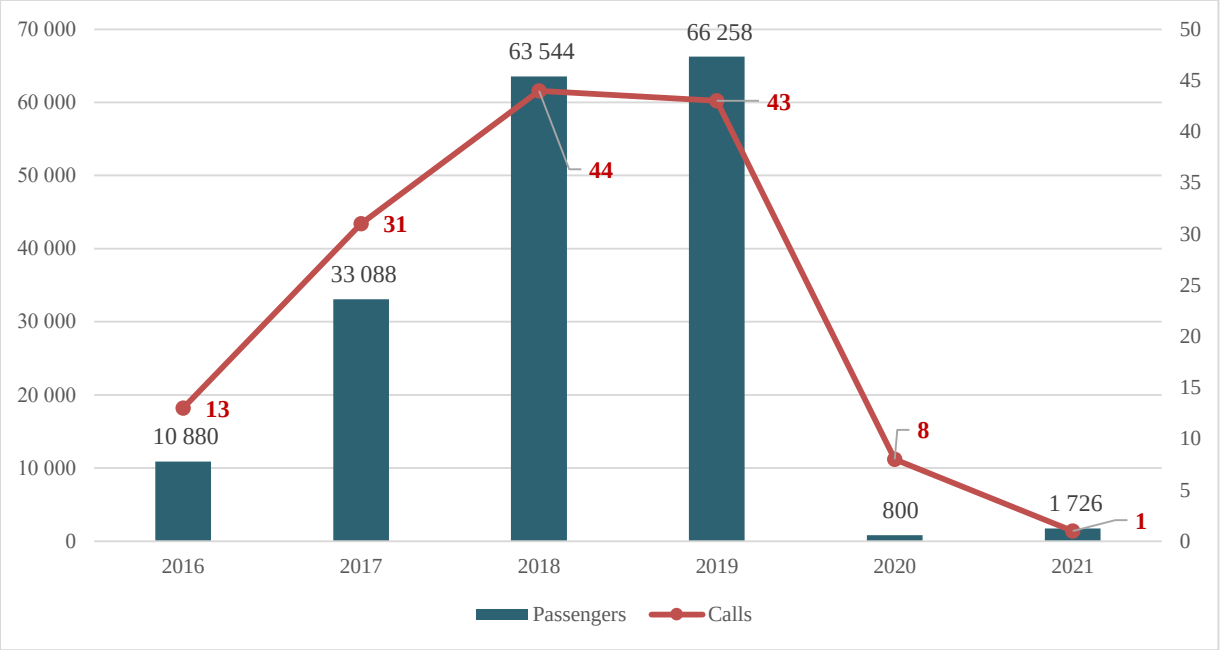

Fig. 7.34. Number of calls and number of passengers in port of Skagen 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

Port of Skagen offers new cruise facilities – 3 cruise piers. Two cruise berths – 9 and 10, are located in the old port area. The third one was opened in 2021 and is located in a new, outer part of the seaport.

Tab. 7.15. Cruise terminals in port of Skagen

Berth	Cruise Pier 9	Cruise Pier 10	Cruise Pier 41
Depth			
Length	500 m	190 m	295 m

Source: Port of Skagen, Cruise Baltic

Skagen is located in one of the world's busiest straits and an optimum location in relation to the fishing grounds in the North Sea, Skagerrak and Kattegat. The port's fishing character for years has a strong influence on the outlook of the city. So, most attractions are connected to this topics:

- Trip to Grenen, the tip of the Skagen Odde peninsula in the far north of Jutland, by car, walk or bike to the top, the distance is ca 3 km from the city center. There is situated Skagen Grey Lighthouse.

- The Skagen Museum, founded as the consequence of a stated desire to preserve as much of Skagen painters' art as possible in the city that inspired them. Their favorite motifs were the work of the fishermen, the small fishing homes and the social life of the artists themselves. Near Museum is an authentic home of the artist couple Ancher.
- Teddy bear museum, Skagen Bamsemuseum, which is the only teddy bear museum in Scandinavia. Opened in 1998, the collection contains about a thousand bears of all kinds, some of historic value. The teddy bears on display belong to the private collection of the owner Jonna Thygesen.
- Skagen Town and Regional Museum is an open-air museum, opened by the local population in 1927. The museum brings together examples of fishermen's cottages and the homes of less fortunate inhabitants of Skagen in the middle of the 19th century.
- Råbjerg Mile is Denmark's largest moving dune, located at Bunken Klitplantage between Skagen and Frederikshavn. The Råbjerg mile contains 3.5 million m³ of sand and covers an area of approx. 1 km² and has a height of about 20 m, which brings the highest point of the mile 40 m above sea level.

Fig. 7.35. Cruise vessel at Cruise pier 41 in Skagen

Source: www.cruiseeurope.com/news/news-ce-press-1658400557/

AALBORG

Port of Aalborg in 2019 was 16th cruise port in terms of number of calls, and 16th in terms of number of passengers.

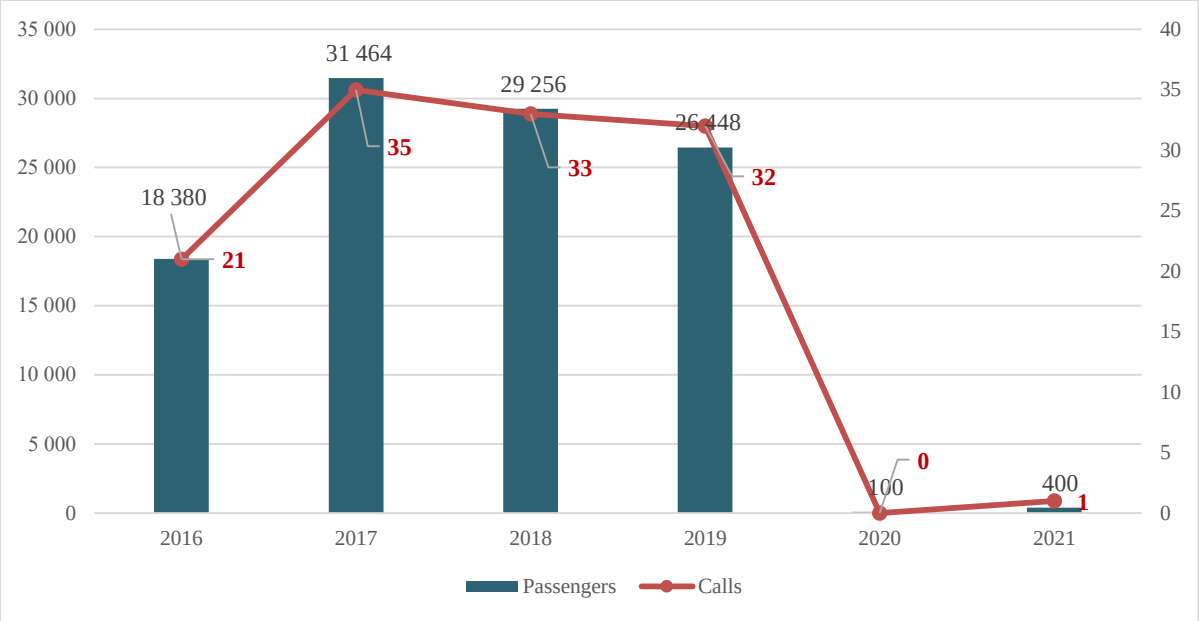

Fig. 7.36. Number of calls and number of passengers in port of Aalborg 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

Port of Aalborg is a transit cruise port and have four cruise quays, all located right in the very heart of the city, just 200 meters from the main square.

Tab. 7.16. Cruise terminals in port of Aalborg

Berth	Royal Cruise Berth	Berth 4110	Berth 4050-62	Berth 3014-152
Depth	9 m	9.3 m		
Max. LOA	250 m	250 m		

Source: Port of Aalborg, Cruise Baltic

Aalborg is the capital of the North Jutland region located right by the Limfjord, a narrow strait separating the Jutland Peninsula from Nørrejyske Ø island. The waterfront has over the past years changed from an industrial district to a relaxing oasis with great architecture, which brings more tourists year by year. Among the most visited places are:

- Utzon Centre, the last building to be designed by Jørn Utzon, the architect behind the Sydney Opera House. The centre was planned to be a place where students of architecture could meet, but now is a museum where tourists can explore works on ground-breaking Nordic architecture

and design. The Utzon Centre sits on the waterfront of the Limfjord, its contemporary architecture contrasting dramatically with the historic Aalborghus Castle next door.

- Aalborghus Castle is a half-timbered castle built by King Christian III from 1539 to around 1555 initially as a fortification. In 1808-09 a free-standing building was added. The gloom of the dungeon and the casemates, where there is also an exhibition.
- Kunsten (The Art) is Aalborg's museum to Danish and international modern art, designed by Finnish architect Alvar Aalto. Housed in a stunning white-marble building. The collection consisting of around 1,500 art objects.
- Open-air gallery of street art, with more than 65 pieces. 'Out in the Open' mural project was an idea of The KIRK Gallery, launched in 2014. For the project, a significant number of large-scale murals by highly esteemed international artists have been added to the cityscape of Aalborg. Spread around the city are more than 70 impressive murals
- Lindholm Høje is a Viking burial ground where nearly 700 graves from the Iron Age and Viking Age are strewn around a hilltop pasture ringed by a wall of beech trees. The place is situated just across the Limfjord canal.

Fig. 7.37. Cruise vessel at Royal Cruise Berth in Aalborg

Source: www.cruiseeurope.com/news/aalborg/

AARHUS

Port of Aarhus in 2019 was 17th cruise port in terms of number of calls, and 14th in terms of number of passengers.

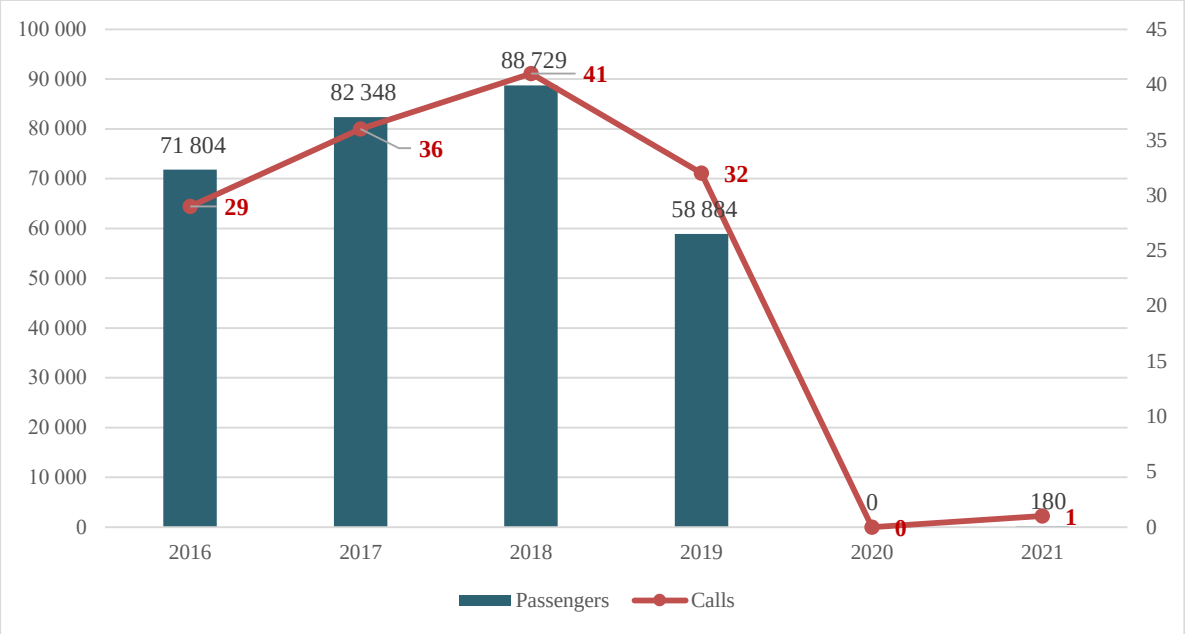

Fig. 7.38. Number of calls and number of passengers in port of Aarhus 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In Aarhus seaport there are two terminals with berths for cruise vessels. Berths on Sydhavnen harbour are situated 1 km to the city center, and Omni-terminal is 3 km away.

Tab. 7.17. Cruise terminals in port of Aarhus

	Sydhavnen	Omni-terminal
Berth	129-131	503
Depth	10 m	12.5 m
Max. LOA	320 m	430 m

Source: Port of Aarhus, Cruise Baltic

Aarhus, the second-largest city in Denmark, is located on the eastern shore of Jutland. Founded as a harbour settlement at the mouth of the Aarhus River and quickly became a trade hub. A lot of the attractions are alluding to the Viking past. As attractions for tourists we can distinguish some popular places like:

- Museums: ARoS, The Old Town Museum, Moesgaard Museum. The very first one is one of the largest art museums in Northern Europe and the most frequented art museum in Scandinavia.

The second, The Old Town, is an open-air town museum located in the Aarhus Botanical Gardens. The museum buildings are organized into a small town of structures originally erected between 1550 and the late 19th century in various parts of the country and later moved to Aarhus during the 20th century. Moesgaard Museum (MOMU) is a Danish regional museum dedicated to archaeology and ethnography, where information on the history of Vikings can be found.

- The Great Market (Store Torv) in which stands Aarhus Cathedral (Sankt Clemens Kirke) dedicated to St. Clement. Highlights of the cathedral's bright interior include the winged altar from 1497 with its rich array of figures. Also worth seeing are the beautifully carved 16th-century pulpit, two organs, and a font.
- Aarhus Botanical Garden, founded in 1875, covers an impressive 53 acres. Highlights are the large hothouses with subtropical plants from around the world. These gardens are preferred as a pleasant place for a stroll or a picnic.
- The Infinite Bridge by Varna Beach is a circle-shaped, wooden construction that spans from the surf and out into Aarhus Bay. Firstly bridge was displayed in relation to the Sculpture By The Sea event in 2015, but people took to the work of art to such an extent that the Municipality of Aarhus contributed to reconstructing the bridge as a permanent piece of art and pier.

Fig. 7.39. Cruise vessel in Sydhavnen harbour area in Aarhus

Source: www.cruiseeurope.com/destinations/aarhus/

FREDERICIA

Port of Fredericia in 2019 was 19th cruise port in terms of number of calls, and 18th in terms of number of passengers.

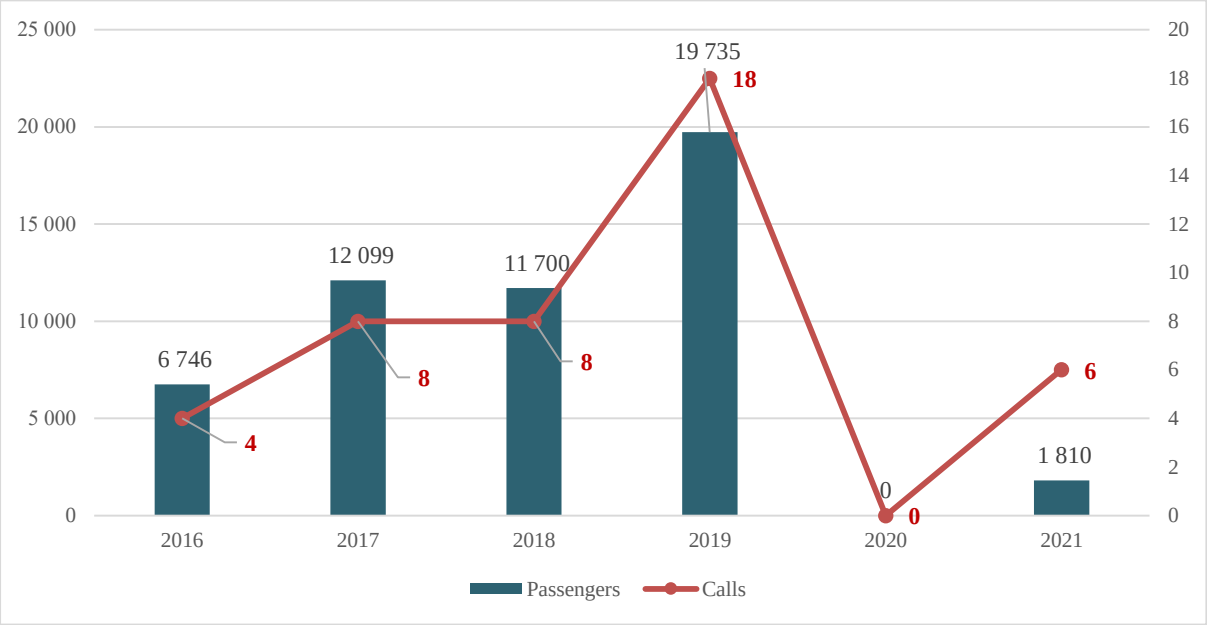

Fig. 7.40. Number of calls and number of passengers in port of Fredericia 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In Frederica there is only one berth where cruise ship can be moored. The Kastel Pier is a first berth located at the entrance to the port of Fredericia.

Tab. 7.18. Cruise terminals in port of Fredericia

Berth	Kastel Pier 1-3
Max. Draught	11.5 m
Length	370 m

Source: Port of Fredericia, Cruise Baltic

Fredericia was founded as a fortification in a time, and is a home to one of the largest and most well-preserved ramparts in Northern Europe with bastions, ravelins, moats and cannons. This fortification forms a peaceful and beautiful frame around the oldest part of Fredericia, and The Ramparts offer great nature and historical experiences for the entire family. Among all attractions some most visited could be distinguished:

- The Ramparts, one of the biggest urban parks in Denmark and now adorned by many old trees. the many old canons, which are placed on the bastions and close to The White Water Tower, or visit The Statue of The Brave Soldier, the landmark of Fredericia.
- Royal Jelling, located around 40 km from the city centre, is Denmark's largest Viking complex, established more than 1,000 years ago and featured on UNESCO's World Heritage List. The beautiful countryside around the historic site and museum invites for a walk and lunch in the open air.
- Koldinghus is a 750-year-old castle, situated around 20 km from the Fredericia, which for centuries was one of the country's most important royal castles. For more than a century, the ruin has been the object of restoration programmes and gradual conversion to a museum of cultural history and a venue for cultural activities.
- Trapholt, a museum of modern art presents a steady succession of exhibitions on art, design and crafts and also boasts its own collections, including a large collection of Danish furniture design. The museum is located in the Kolding Fjord within a large sculpture park featuring works by contemporary Danish artists.

Fig. 7.41. Cruise vessel at Kastel Pier in Frederica

Source: www.cruiseeurope.com/destinations/fredericia/

MARIEHAMN

Port of Mariehamn in 2019 was 18th cruise port in terms of number of calls, and 20th in terms of number of passengers.

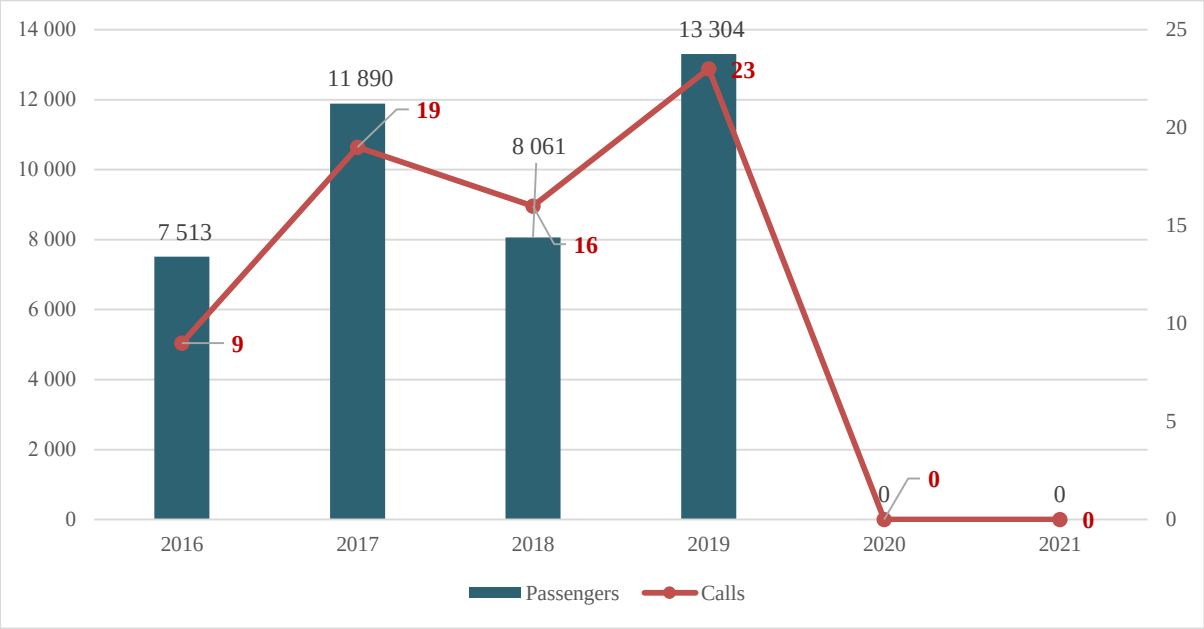

Fig. 7.42. Number of calls and number of passengers in port of Mariehamn 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In Mariehamn there is one International Cruise Line Quay, situated closely to the city's heart.

Tab. 7.19. Cruise terminals in port of Mariehamn

	International Cruise Line Quay
Berth	Quay 1-2
Depth	8.2 m
Length	250 m

Source: Port of Mariehamn

Mariehamn was founded in 1861 by Russia's Czar Alexander II, who named the town, meaning "Marie's Harbour", after his wife. Marienhamn's wooden houses and green parks provide a great setting for a small-town holiday or a starting point for a tour of the Åland islands:

- Kastelholm castle is a medieval building, dated back in 14th century. Built originally on a small island surrounded by moats filled with water and planted with several rows of poles has been of strategic importance in consolidating Swedish authority. Other attractions nearby include the

Outdoor Museum Jan Karlsgården, and the nearby ruins of Bomarsund, a huge Russian-built naval fortress.

- The Cultural History Museum of Åland and Åland Islands Art Museum are two museums under the same roof, located in the eastern part of the town. The museum traces the history of the islands from prehistoric times up until the present day while the Art Museum houses a permanent collection of local art as well as interesting temporary exhibitions. The museum plays an inspirational place for display of culture of both Finland and Sweden.
- Maritime Quarter, situated in the eastern harbour of Mariehamn, is a living marine centre with boat building activity, a smithy and other handicrafts and a marina for traditional ships and wooden boats. There are museums such as Ship and Boat building Museum and the newbuilt Museum of historical marine engines.

Fig. 7.43. Cruise vessels at International Cruise Line Quay in Mariehamn

Source: www.pinterest.com/pin/351843789608524166/

MALMÖ

Port of Malmö in 2019 was 24th cruise port in terms of number of calls, and 15th in terms of number of passengers.

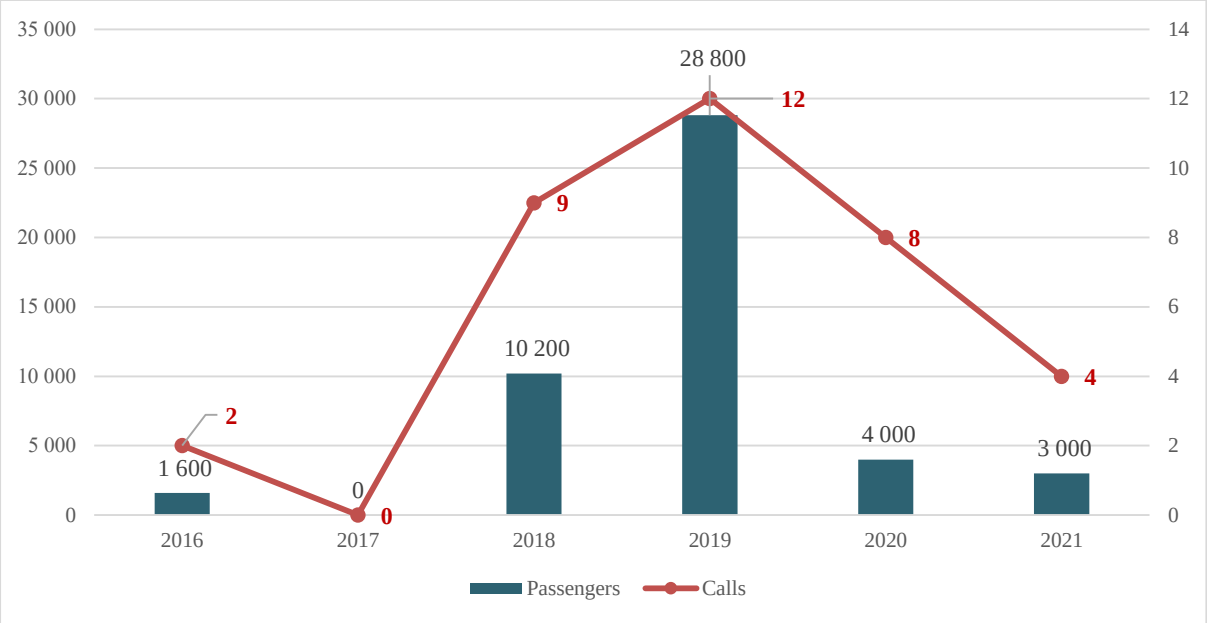

Fig. 7.44. Number of calls and number of passengers in port of Malmö 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In Malmö there is only one berth that is dedicated for cruise vessels, which is Frihamnskaj near city center.

Tab. 7.20. Cruise terminals in port of Malmö

	Frihamnskaj
Berth	602-604
Depth	9.2 m
Length	500 m

Source: CMP

- Malmö Castle is an oldest Renaissance castle in Scandinavia which is located in a leafy parkland right at the heart of Malmö. It has an aquarium/zoo inside the building as well as Malmö's art museum, the City Museum and the Museum of Natural History. The castle in its time has been a royal palace, mint and prison.
- Slottsträdgården is a relatively new park, located sest and south of the castle, bordering the moat. The park puts on season events like a harvest festival, onion festival and the high-profile Malmö

Flower Show, which happens in June. Separated from Slottsträdgården by the canal is Malmö's oldest park, created in 1869-70. This land used to be part of the fortifications until the castle became obsolete as a defence and the space was turned into a Romantic English-style garden.

- Stortorget is a Malmö's largest and oldest square with many of the city's big administrative buildings in here such as the City Hall or Skåne County governor's residence from the 1600s. In the middle of Stortorget is a horseback statue of the 17th-century King Karl X Gustav, who reclaimed this province from Denmark.
- Lilla Torg is the smaller neighbour to Stortorget, the main square, and was built a little later. Back in the 17th century this was a place for the city residents to buy groceries, with butcher shops and bakeries in temporary huts.
- Sankt Petri Church is the city's oldest building dates to the 14th century and has the Gothic lines shared by most Hanseatic churches. The high altar, the largest wooden altar in Northern Europe and finished in 1611.
- The Turning Torso is the tallest skyscraper in Sweden and a pioneer of its kind. The building is depicting a human body in a turning motion. It was designed by Spanish architect Santiago Calatrava. It reaches a height of 190 m, and ffloor 49 is home to the public observation deck.

Fig. 7.45. Cruise vessel at Frihamnskaj in Malmö

Source: www.facebook.com/copenhagenmalmoport/photos/a.224563978368389/965244507633662/?type=3

LÜBECK-TRAVEMÜNDE

Port of Lübeck-Travemünde in 2019 was 20th cruise port in terms of number of calls, and 24th in terms of number of passengers.

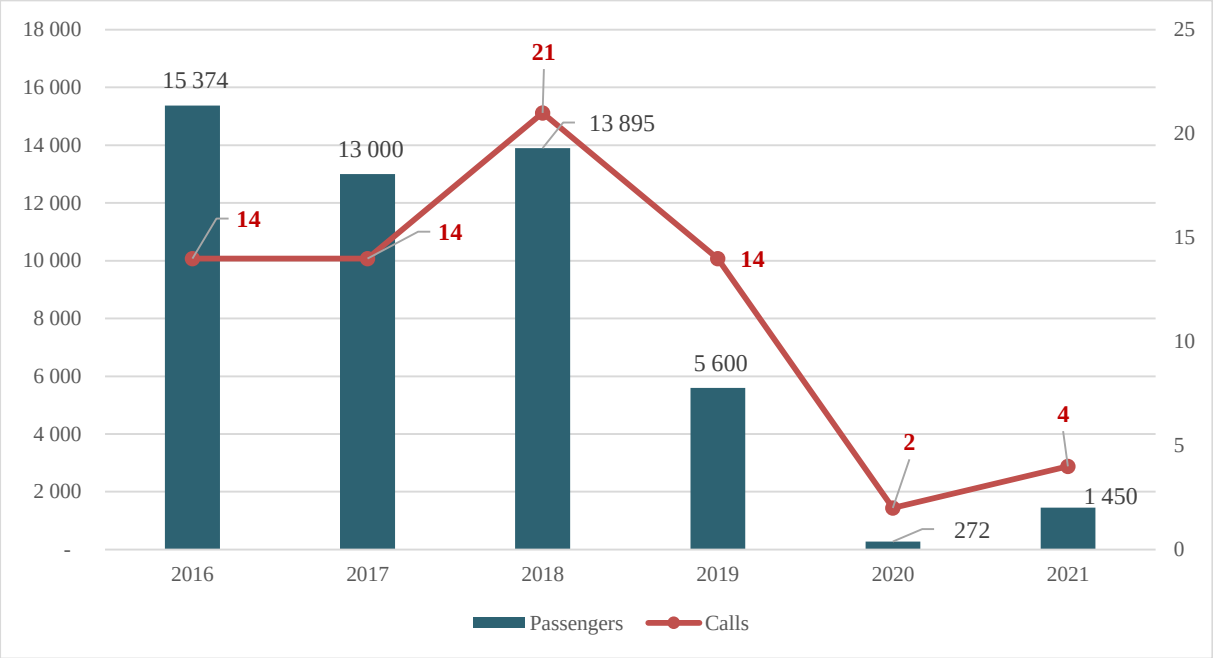

Fig. 7.46. Number of calls and number of passengers in port of Lübeck-Travemünde 2016-2021

Source: Actia Forum elaborations based on Cruise Baltic database

In Lübeck there are three port areas where cruise vessels can be moored. One of them is located in the Travemünde district, located at the mouth of the Trave river. The second one, Skandinavienkai is situated near the bay next to Priwall peninsula. The third one called Burgtorkai in central Lübeck.

Tab. 7.21. Cruise terminals in port of Lübeck-Travemünde

	Travemünde - Ostpreußenkai	Lübeck - Skandinavienkai	Lübeck - Burgtorkai
Depth	9 m	9.5 m	8 m
Max. LOA	200 m	300 m	160 m

Source: Port of Lübeck – LHG, Cruise Baltic

The city lies on the mouth of the River Trave and on the Trave's tributary Wakenitz. Lübeck is famous for having been the cradle and the de facto capital of the Hanseatic League. As a UNESCO World Heritage Site the Old Town is a great place to take a stroll, to visit the historic sites, among others:

- Holsten Gate, the city's symbol, is the most famous and as well the most important preserved medieval gate in Germany, constructed between 1464 and 1478. It is known for its two-round towers and arched entrance. Together with the old city centre (Altstadt) it has been a UNESCO World Heritage Site since 1987.
- The Old Town of Lübeck is situated on an island surrounded by the River Trave and the Elbe-Lübeck canal. It is one of the largest Gothic historic complexes in Europe. In the Old Town there is a group of churches important for the history of the city: St. Mary's church, St. Peter's church, St. Aegidien church, St Jacob church, and The Cathedral.
- The "Painters' Corner" is a small green area on the western bank of the river Trave on Wallstraße in Lübeck which offers a unique view of the beautiful Old Town. This is the ultimate place to relax after a city walk.
- Marzipan Museum is a museum where tourists can study the history of Marzipan and its evolution through the centuries. A massive map in the middle of the room traces the sugar trading route during Medieval times. There are 12 sculptures of figures, each made using the company's original 1806 recipe.
- Travemünde, is a famous seaside resort with the second-tallest lighthouse in the world. The ship 'Passat', anchored in Travemunde since 1960, is another tourist landmark for the city. The main beach and a promenade in the area are other main tourist attractions.

Fig. 7.47. Cruise vessel at Ostpreußenkai, Travemünde

Source: www.schiffsjournal.de/bau-eines-neuen-kreuzfahrtterminals-in-travemuende-gescheitert/

8. EXAMPLES OF CRUISE OPERATORS THAT ENTER THE BALTIC

The Baltic Sea is crossed by several cruise operators. Some important cruise companies are: **AIDA Cruises, MSC Cruises**, **Royal Caribbean Group, Princess Cruises, Oceania Cruises, P&O Cruises and Norwegian Cruise Line (NCL)**. They are one of the most important cruise ship operators in terms of the number of calls to the Baltic Sea and the number of passengers.

AIDA Cruises is a German cruise line founded in the early 1960s that boasts the cleanest and most modern fleet in the world. Out of concern for the environment, AIDA Cruises has become the owner of the world's first cruise ship – AIDAnova (Fig. 8.1), which is entirely powered by low-emission LPG. For the design of this ecological vessel, AIDA Cruises was awarded the Blue Angel, i.e. the ecological label, awarded by the German Ministry of the Environment. The shipowner announced that by 2023. two more innovative cruise ships will run. The ships of this shipowner are distinguished by a characteristic smile located on the bow, which means that they cannot be overlooked in the port. At the beginning of 2022, AIDA Cruises had 14 cruise ships.

Fig. 8.1. AIDAmar cruise vessel

Source: www.vesselfinder.com/

MSC Cruises is Italy's largest cruise line operating since 1988 and is part of the Mediterranean Shipping Company - one of the world's largest sea freight companies. Ships belonging to the MSC fleet are characterized by modern design and high standard, for example MSC Seaview (Fig. 8.2). They are well known for their user-friendly technology on board. The line announced that they will stop cruising to Russian ports in 2023.

Fig. 8.2. MSC Seaview cruise vessel

Source: www.sonriso.pl/rejsy-wycieczkowe-statek-msc_seaview-147-informacje27

Founded in 1985**, Royal Caribbean Group** is another significant cruise company on the international market (including Baltic). This cruise line has its headquarters in Miami, Florida (United States). The company owns a global fleet of 64 ships traveling to approximately 1,000 destinations around the world. Royal Caribbean Group fully owns for example Royal Caribbean International cruise line, which in July this year announced to cancel Baltic destinations in summer 2023 due to Russian invasion on Ukraine. As a result, some of Voyager of the Seas sailings will go to Germany and Poland instead of going to Russian ports (Fig. 8.3)[2].

Fig. 8.3. Voyager of the Seas owned by Royal Caribbean International

Source: www.royalcaribbeanblog.com/2022/04/15/voyager-of-the-seas-returns-service-first-time-two-years

Princess Cruises is American cruise line founded in 1965 and is owned by Carnival Corporation & plc. The headquarters of the company are in Santa Clarita, California. The line owns 15 cruise vessels, which are cruising

[2] *www.royalcaribbeanblog.com/2022/04/15/voyager-of-the-seas-returns-service-first-time-two-years*

on global routes. Due to the ongoing war in Ukraine, Princess Cruises canceled the 2023 Baltic program from Copenhagen on a Royal-class cruise ship - Regal Princess (Fig. 8.4.)[3].

Fig. 8.4. Regal Princess cruise vessel

Source: www.alerejsy.pl/statek/regal-princess

Another important player on the Baltic cruise market is **Oceania Cruises.** The cruise operator is owned by Norwegian Cruise Line Holdings Ltd. The operator is well known for its finest cuisine at sea and elegant accommodations. In 2023 cruise season, Oceania Cruises plans to replace Baltic destinations with sailings to the more westerly parts of Northern Europe for example: the U.K, Iceland, Greenland and Norway due to current geopolitical situation[2]. An example of one of the cruises is shown below (Fig. 8.5).

Fig. 8.5. Oceania Sirena Cruise Vessel

Source: www.ship-technology.com/projects/sirena-cruise-ship/

[3]*https://www.seatrade-cruise.com/ship-operations/princess-cancels-regals-2023-baltic-program-and-several-royal-asia-pacific-cruises*

P&O Cruises is a British cruise line with a headquarter in Southampton, United Kingdom, founded in 1977. The line is owned by Carnival Corporation & plc. This line has the oldest heritage of any cruise line in the world, dating to P&O's first passenger operations in 1837. There is no specific information about company's plans regarding cancelling cruises due to war in Ukraine.

Fig. 8.6. Aurora Cruise Vessel

Source: www.old.port.gdynia.pl/en/events/cruise-ships/831-visit-of-mv-aurora

Norwegian Cruise Line (NCL) is the next important player on Baltic cruise market founded in 1966. The also known in short as Norwegian, is an American cruise line. It is one of the largest cruise line in the world by passengers. NCL had cancelled their Northern Europe cruises in 2022 on Norwegian Getaway from middle of June to November due to Russia's invasion of Ukraine. Cruises are going ahead from mid-May to early June, but they are not stopping in St Petersburg. These cruises were planned as Northern Europe and Baltic sailings, departing from Copenhagen[4].

Norwegian Getaway combines the best amenities Norwegian has to offer with unforgettable destinations (Fig. 8.7).

[4]*https://www.cruisehive.com/norwegian-cruise-line-cancels-2023-northern-europe-sailings/71799, https://www.travelgossip.co.uk/latestnews/ncl-cancels-2023-northern-europe-and-baltic-cruises/*

Fig. 8.7. Norwegian Getaway Cruise Vessel

Source: www.ncl.com/fr/en/cruise-ship/getaway

9. EXAMPLES OF LARGEST CRUISE VESSEL THAT ENTER THE BALTIC

This chapter presents examples of the largest cruise ships that entered the Baltic Sea. The following were mainly taken into account: tonnage (as a universal measure of the size of a ship) and length of the ship.

Sky Princess cruise owned by armator Princess Cruises was built in 2019. This vessel owns 1.830 guest cabins. In 2022, this cruise ship entered the Port of Gdynia and broke the record for the largest ship entering this port (Fig. 9.1).

Tab. 9.1. The main parameters of cruise vessel Sky Princess

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
330	8.5	38	143 700

Source: Vessel Finder, Marine Traffic

Fig. 9.1. Sky Princess Cruise Vessel in Port of Gdynia

Source: www.gdynia.pl/co-nowego,2774/sky-princess-najdluzszy-wycieczkowiec-w-historii-gdyni,565548

Norwegian Getaway is a cruise vessel owned by Norwegian Cruise Line, built in 2014. This vessel was built by Meyer Werft in Papenburg, Germany. At the time of its christening it was the world's ninth-largest cruise ship with a passenger capacity of 3.969 and a crew of 1.640.

Tab. 9.2. The main parameters of cruise vessel Norwegian Gateway

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
326	8.6	44	145 655

Source: Vessel Finder, Marine Traffic

AIDAnova is a cruise ship operated by AIDA cruises and built in 2018 by Meyer Werft GmbH in Papenburg, Currently the ship is sailing under Italian flag. The ship own 20 decks, 17 restaurants and 23 bars. Events on board AIDAnova, which marks an exciting new generation of ships for AIDA Cruises, include new culinary and entertainment offerings such as the Time Machine restaurant, street food street food with culinary delights, and a floating TV studio. Guests can also enjoy the popular 360-degree theater, the Four Elements adventure terrace with three water slides and a climbing garden under a dome with a retractable glass roof, and a beach club where you can relax on board. AIDAnova also has a 3,500 m2 wellness area, an outdoor fitness studio, a top-floor apartment with two decks, individual cabins, 17 restaurants and 23 bars (Fig. 9.2).

Tab. 9.3. The main parameters of cruise vessel AIDAnova

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
337	8.8	42	183 900

Source: Vessel Finder, Marine Traffic

Fig. 9.2. AIDAnova Cruise Vessel

Source: www.cruisemapper.com/ships/AIDAnova-1854

AIDAcosma is another cruiser owned by Carnival Corporation & PLC. The ship was built in 2021 by Meyer Werft (Papenburg, Germany). AIDAcosma is the largest cruise ship in the AIDA Cruises fleet. AIDAcosma has capacity of 5,200 guests. This state-of-the-art LNG-powered mega cruise ship has 20 passenger decks and 2,600 staterooms. There are many attractions on the ship, such as: large pool area with waterslides, an indoor playground, sea-view sauna and many more. Passengers won't be able to be hungry as on the cruise is 17 restaurants and 23 bars (Fig. 9.3).

Tab. 9.4. The main parameters of cruise vessel AIDAcosma

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
337	8.6	42	183 900

Source: Vessel Finder, Marine Traffic

Fig. 9.3. AIDAcosma Cruise Vessel

Source: www.cruisemapper.com/ships/AIDAcosma-2076

MSC Virtuosa, is a Meraviglia-Plus class cruise ship owned and operated by MSC Cruises. Built by Chantiers de l'Atlantique in Saint-Nazaire, France and launched in the late 2019 (Fig. 9.4). This cruise ship is one of the two largest in MSC Cruises' fleet. MSC Virtuosa offers passengers 5 pools, thermal area, professional massages, body treatments, gym and even a LEGO club for kids. Guests who love art will be positively surprised on this ship as it has its own art gallery. You can enjoy the exhibition while having a drink in the L'Atelier Bar.

Tab. 9.5. The main parameters of cruise vessel MSC Virtuosa

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
331	8.6	50	181 541

Source: Vessel Finder, Marine Traffic

Fig. 9.4. MSC Virtuosa Cruise Vessel

Source: www.cruisemapper.com/ships/MSC-Virtuosa-1981

Britannia is a cruise ship of the P&O Cruises fleet. The ship was built by Fincantieri at its shipyard in Monfalcone, Italy and launched in 2015. Family-friendly Britannia features: eight bars and pubs, kid's clubs, dance and toga classes, theatre shows, many places to dine, countless places to undwind and many more. BRITANNIA cruise is known for its 'Oasis' spa on the ship. Their 'Oasis' spa is the most luxurious on the ocean (Fig. 9.5)

Tab.9.6. The main parameters of cruise vessel Britannia

Length [m]	Draft [m]	Beam [m]	Gross Tonnage
330	8.55	44	143 730

Source: Vessel Finder, Marine Traffic

Fig. 9.5. Britannia Cruise Vessel

Source: www.bolsovercruiseclub.com/cruise-lines/po-cruises/britannia/

10. MARITIME TOURISM IMPACT ON LOCAL LABOR MARKET AND BENEFITS FOR PORT CITIES

CRUISE TOURISTS SECTOR

Cruise passengers' expenditures in the city ports are an important economic incentive for local tourism and related industry sectors. According to the Economic Impact Study[5] commissioned by Cruise Baltic and carried out by GP Wild the cruise industry generated a total output of EUR **1.5 billion in 2018** in the Baltic region. **EUR 681 million** were directly generated by cruise guests, crew and cruise line spending. Passenger spending accounting for approximately EUR 407 million, cruise line spending for approximately EUR 249 million, and crew spending for approximately EUR 24 million. A further approx. EUR 819 million is attributable to indirect revenues such as wages and salaries for retail employees, sales to suppliers, or tax revenues for the treasury.

Cruise tourism provides work for a significant number of people in the whole region, including tour guides, transport companies, retailers, restaurants and local cultural institutions. Based on a study by Cruise Baltic, the cruise sector in the Baltic Sea region supports **directly over 5 900 jobs and indirectly nearly 12 600 jobs in related services.**

Fig. 10.1. Cruise vessel tourists coming out of the ship

Source: www.cruisebaltic.com

[5] *The Economic Impact Study is based on data collected and estimates for the 29 ports in ten countries which comprise Cruise Baltic. Three ports in Kiel, Riga and St. Petersburg, which are technically not part of Cruise Baltic, are also included in the study to provide a complete picture of the region. The Economic Impact Study was undertaken by G.P. Wild.*

Fig. 10.2. presents the average cruise passengers, crew members expenditures in the selected port cities during the cruise stay in port. The collected data comes from different sources and years and therefore should not be considered for comparative purposes. Among main expenditures categories are:

- Tours
- Food & Beverages
- Museum & Attraction
- Transport services
- Shopping
- Souvenirs

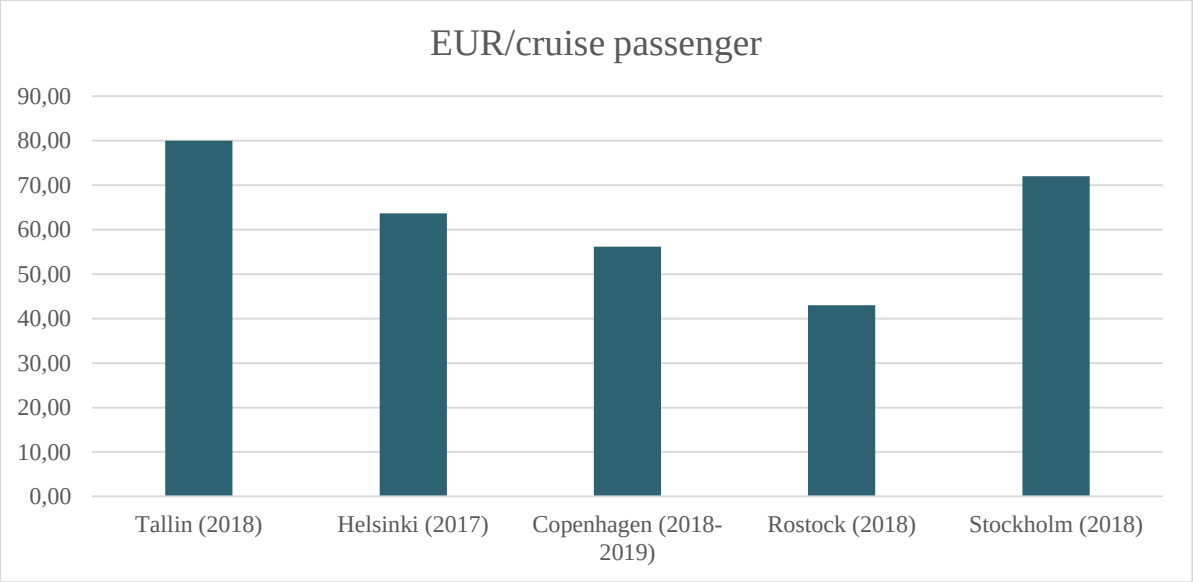

Fig. 10.2. Average cruise passengers, crew members expenditures in the port city during the cruise stay in port (EUR/cruise passenger)

Source: Economic Impact Study study carried out by GP Wild for Cruise Baltic; Port of Tallinn; Tracking cruise passengers' consumption: An analysis of the relationships between onshore mobility and expenditure, Caterina Sciortinoa,Mauro Ferranteb,Stefano De Cantisa, Szilvia Gyimóthyc, Annals of Tourism Research Empirical Insights, Volume 3, Issue 2, 2022; https://nordictravelmag.com/helsinki-expects-another-record-summer-for-cruise-visitors/; https://www.cruiseturtle.com/cruise-news/Rostock-cruise-port-an-important-economic-factor-for-town-and-country

PORT OF STOCKHOLM

According to Cruise Baltic study carried out by GP Wild, in total passengers, crew members and cruise shipping companies spent **EUR 82.6 million when visiting Stockholm in 2018.** The cruise passengers spent EUR 52.9 million (64% of total), the cruise shipping companies spent EUR 25.6 million (31% of total). The major expenditure

for the cruise shipping companies was on port dues, pilotage and fairway dues, fuel, sightseeing excursions, accommodation, food and drink. Cruise ships crew members spent EUR 4.1 million (5% of total).

Total spending of EUR 82.6 million created **563 direct jobs** and **wages corresponding to EUR 18 million**. The total economic effect was even higher and reached EUR 176.4 million and **created in total 1 160 jobs** and total wages of EUR 42.2 million. Transport and tour operators sector experienced the highest effect on total employment levels, with 324 jobs and an economic effect of EUR 12.8 million generated. The hotel and restaurant sector experienced the second highest effect on total employment levels, with 311 jobs and an economic effect of EUR 7 million generated. The wholesale and retail sector experienced the third highest effect on total employment levels, with 202 jobs and an economic effect of almost EUR 7 million generated.

Each million EUR that the cruise passengers and crew members spent ashore generated around 14 jobs in the Stockholm region. (Total spending was EUR 57 million). The transport, hotel, restaurant and retail sectors comprised 75 percent of the total employment effect.

Fig. 10.3. Cruise vessel near Port of Stockholm

Source: www.portsofstockholm.com

PORT OF TALLINN

In 2018 over 645,000 cruise passengers visited Tallinn in 2018, spending on average **80 euros per person** in the capital city of Estonia. The sum total spent by all cruise tourists combined in Tallinn was over **50 million euros**, directly contributing to the employment of hundreds of people. **In Tallinn tourism provides work for some 200 tour guides and 400 bus drivers**. Cruise passengers also visit local sights, museums and various shows, which in turn employ an estimated several hundred people.

Fig. 10.4. Cruise vessel in Port of Tallinn

Source: www.ts.ee/en/cruise-area/

DANISH STUDY

The cruise season in 2019 was Denmark's best season so far, with a record number of cruise guests visiting the Danish cruise destinations, and as a result, cruise tourism contributed significantly to the Danish economy. Denmark welcomed 534 cruise calls and 1.135.790 guests in 2019. According to Wonderful Copenhagen[6], the official tourism organization of the Capital Region of Denmark, the cruise industry in Denmark created approximately **2 400 fulltime jobs 2019**. The cruise industry generated an output of **DKK 1.25 billion (EUR 0.17 billion) to the Danish economy**.

[6] *https://www.wonderfulcopenhagen.dk/*

Fig. 10.5. Cruise vessel in Port of Copenhagen

Source: www.wonderfulcopenhagen.com

FERRY TOURISTS SECTOR

The economic effect of ferry tourists sector is much more difficult to assess. It's hard to find a study that deals with this issue. Ferry passengers are not a hegemonic group. Ferry transport is often dedicated for dual purpose: cargo transport and passenger transport. Thus among ferry passengers are also truck drivers. The ferry passengers can be divided into main five groups:

- Truck drivers
- Round trip tourists without disembarkation
- Round trip tourists spending several hours for sightseeing.
- Tourists that stay 1-2 nights in the travel destination city
- Tourists that travel with a purpose to spend vacation in the country of destination

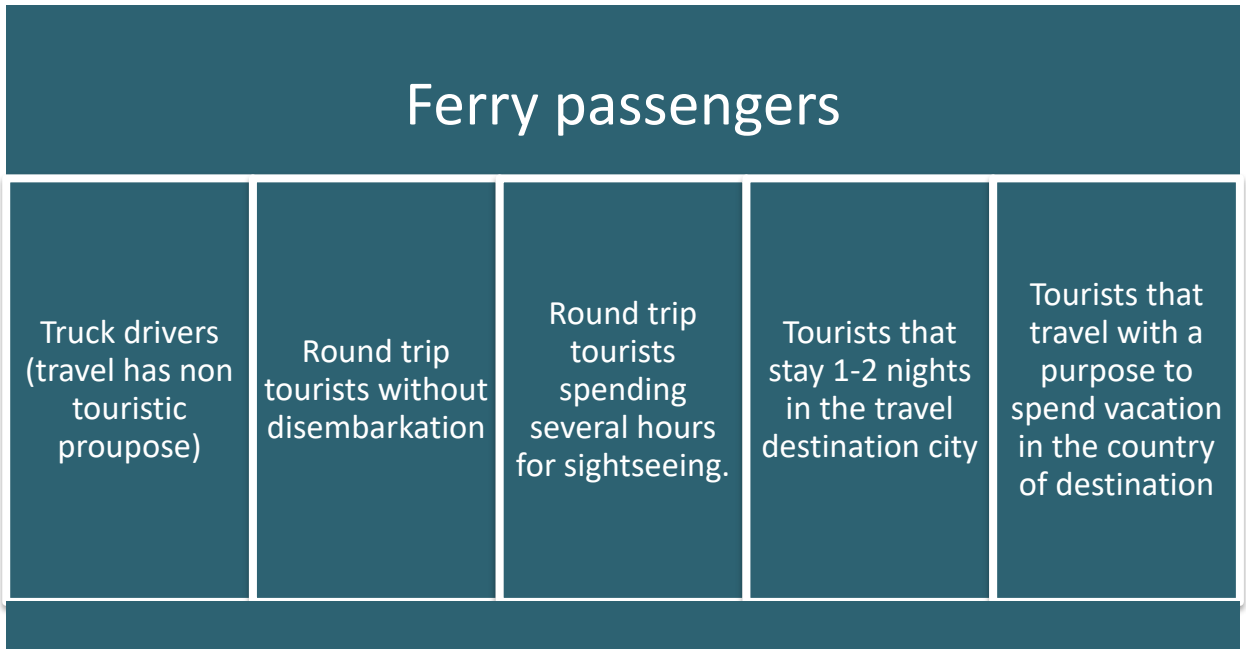

Fig. 10.6. Structure of ferry passengers on the Baltic

Source: Actia Forum

The domination of particular group of passengers differ from route to route. It depends on route characteristics. Some routes have more touristic character and some more cargo character.

Jobs that are generated by ferry market are:

- jobs on ferries (crew);
- ferry lines ashore workers (administrative);
- ferry terminals workers;
- jobs in the region (including tour guides, transport companies, retailers, restaurants and local cultural institutions, hotels).

As it has been mentioned above, it's hard to find a study that deals with this issue. So it is hard to assess how many jobs generates the ferry tourists market. Some estimation can been done for offshore jobs (i.e. crew of ferries). As ferry lines are mainly local Baltic/European lines they employ crew mainly from around the Baltic/Europe. Is this estimated that Baltic ferry market generates around **24 thou. jobs onboard** (taking into account that on one ferry there are two crews are employed that replace each other). On the other hand it must be remembered that not all passengers on ferries are tourists but many of them are also truck drivers, so jobs on board the vessels are not only generated by ferry tourists market.

Fig. 10.7. Port of Trelleborg ferry terminal

Source: www.trelleborgshamn.se

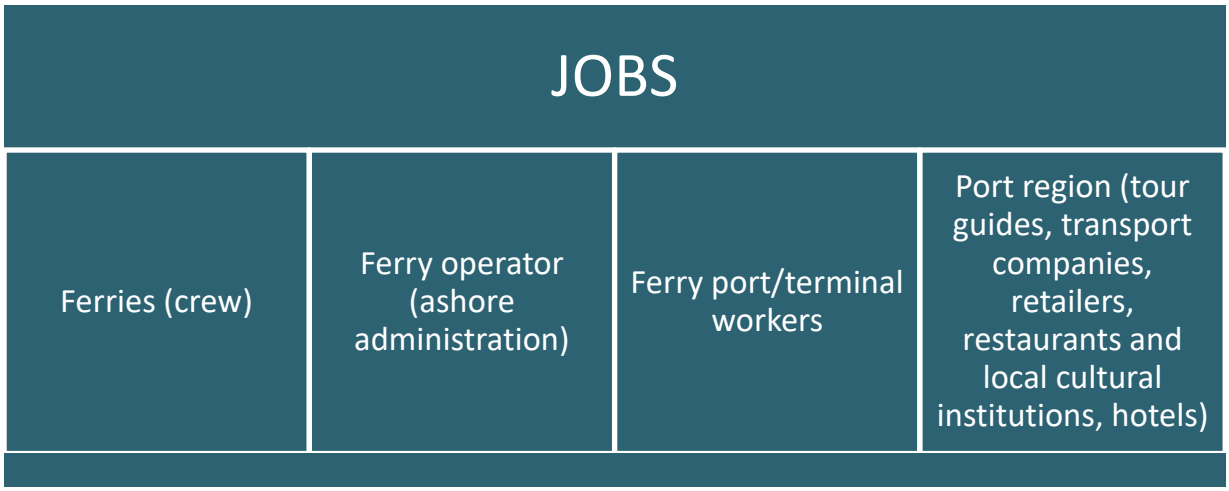

Fig. 10.8. Jobs generated by ferry market

Source: Actia Forum

Part 2

11. DIFFERENT FACTORS AND THEIR IMPACT ON MARITIME TOURISM

Social, economic and environmental factors and main trends have an influence on the future of maritime tourism in the Baltic Sea Region.

For the purpose of the study, it is essential to analyze the Baltic ferry market and the existing ro-pax and ferry connections between Baltic Ports. What is more, it is also crucial to take into account the public transport between port cities, especially in case of the absence of ferry/ro-pax connections, for example between Swinoujsce and Gdansk, Gdansk and Klaipeda, Klaipeda and Riga and other ports.

Mathematical models presented in the report are designed to evaluate time, costs and other factors of the sea tourism in BSR. The use of mathematical models is important from the perspective of finding optimal solutions and future possibilities for the development of Baltic Sea tourism. As the basis of the mathematical model it is possible to use graph theory. The models can present the tourist routes, main tourist attractions in the BSR, as well possible travel costs and travel time.

The ongoing pandemic and the war in Ukraine are two main factors that will have a strong influence on sea tourism in the nearest future. The changes in the tourism market should be presented in the short, medium and long term scenario. The forecasts should include information about attractive tourist facilities, tourist transportation modes, but also using private and public means of transport, such as ro-pax shipping lines, trains and buses linking main tourist cities in BSR.

The graph theory may be very useful in developing the network of ferry connections between tourism attractive cities in BSR. The model should help the HoReCa sector and the ferry market find the optimal organization model in sea tourism to remain stable in changing conditions.

12. ANALYSIS OF THE PORTS IN BSR, WHICH ARE INTERESTING FOR THE BALTIC SEA TOURISM

For the development of maritime tourism in the Baltic Sea region, it is important to connect the existing ro-pax lines and develop at least seasonal (May to September) tourist shipping lines based on "hop on - hop out" connections between the main tourist ports. The main ports (primary ports) that could have more connections of the seasonal nature may be: Copenhagen, Świnoujście – Szczecin, Gdansk/Gdynia, Klaipeda, Riga, Tallinn, St. Petersburg, Helsinki, Turku, Stockholm, Karlskona and Karlshamn.

The secondary sea ports (additional sea ports), which are interesting for sea tourism in BSR and can be linked with the above mentioned ports are: Ronne, Mukran, Liepāja, Ventspils and Visby.

All mentioned primary (main) and secondary ports have ro-pax lines, which link at least one or more ports The development of maritime tourism can be divided into two stages: the development of maritime tourism in the South Baltic region and the second stage - covering the largest part of the Baltic Sea.

For sea tourists, it is very important to have accurate information about attractive tourist facilities and the possibilities of enriching these facilities in various ways: for tourists on foot, using urban public transport (buses, trams, local trains, tax services), using special trips and long-distance public transport such as intercity buses, local or intercity trains, inland waterways and private cars (when traveling by own car). The main cruise ports in the Baltic Sea attract more than 300 cruise ships annually (in non-crisis years).

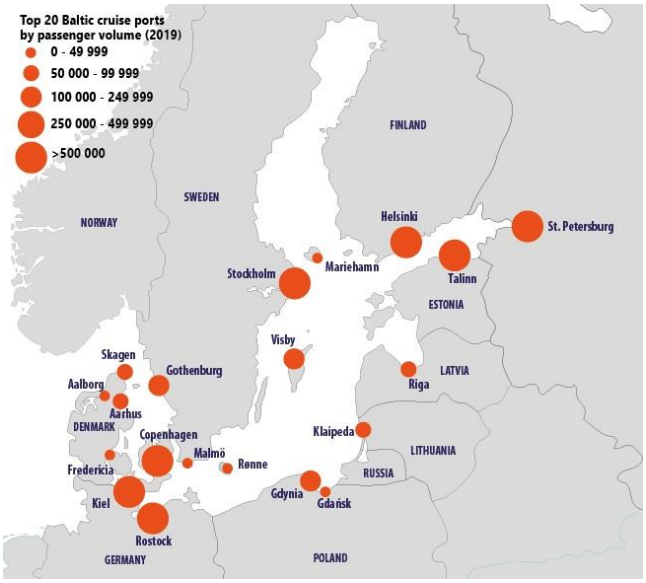

Figure 12.0.1. Top 20 Baltic cruise destinations by number of passengers (2019)

Source: Actia Forum based on Cruise Baltic database

13. POSSIBLE DEVELOPMENT OF RO-PAX LINES NETWORK, WHICH COULD BE USED FOR THE BALTIC SEA TOURISM

The maritime tourism network can be explained using graph theory which gives possibilities to include the traffic between popular tourist facilities with the port and vice-versa. It is necessary to prepare the sustainable transport system for the maritime tourism in this aspect. This problem can be solved on basis of graph theory [13.1], taking into account the development of maritime tourism through optimal means of transport that are sustainable in terms of time, cost and environment. The graph theory method is used, in which a model containing a set of vertices representing possible transport routes or corridors and a set of edges representing the distances between the nodal points of the main ports of sea tourism are modeled as a graph expressed as follows [13.1.]:

$$G = (V, E) \quad , \tag{13.1}$$

Where: *V* - the set of vertices; *E* - the set of edges.

Such graph model can be expressed, as shown on fig. 13.1.

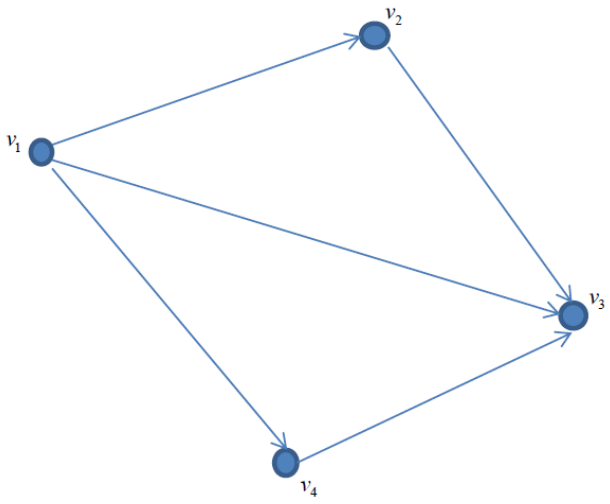

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Fig. 13.1. Maritime tourism possible ways the graph tree: v_1 – departure point; v_2, v_4 – waypoints; v_3 – destination point

Source: own elaboration

The starting point can be one of the main maritime tourism ports, for example the port of Copenhagen, and the destinations can be another main or secondary port, for example the port of Gdańsk/Gdynia. Depending on the maritime tourism network, it can be directly reached in the case of ro-pax operation, i.e. from ( ) to ( ), o different ro-pax lines between points and point-to-point can be used. Similarly, other sea connections from the seaport via lines through the site could be used and other ro-pax transport systems or other sea or land transport systems could be used.

For the graph tree, presented on figure 13.1, the sets of vertices and the set of edges can be expressed as follows [13.2.]:

$$V = \{v_1, v_2, v_3, v_4, v_5\} \tag{13.2}$$

$$E = \{(v_1, v_2)(v_2, v_3)(v_1, v_3)(v_1, v_4)(v_4, v_3)\} \tag{13.3}$$

The all-vertex incidence matrix of a non-empty and loop less directed graph for the presented graph tree *G* is [13.4]:

$$A = a_{ij}\ , \tag{13.4}$$

Where

$$a_{ij} = \begin{cases} 1 \text{ if } \mathrm{v}_i \text{ is the initial vertex of } \mathrm{e}_j \\ \text{-1 if } \mathrm{v}_i \text{ is the terminal vertex of } \mathrm{e}_j \\ 0 \text{ otherwise.} \end{cases}$$

1

In this study case (fig. 13.1) for possible ro-pax or other maritime tourism lines network adjacency matrix can be explained as follows [13.5]:

$$A = \begin{Bmatrix} v_1, v_2, v_3, v_4 \\ v_2 \\ v_3 \\ v_4 \end{Bmatrix} \tag{13.5}$$

For the graph tree covering ro-pax or other maritime tourism transport corridors network, which is explained on Figure 13.1, mentioned matrix in formula (13.5) can be computed as follows:

$$A = \begin{bmatrix} 0111 \\ 1010 \\ 1101 \\ 1010 \end{bmatrix} \qquad (13.6)$$

Matrix (13.6) could be used for the time, costs, environmental impact, etc. calculation.

Finally for the optimum distances, optimal price or minimum environmental impact in maritime tourism network could be used next optimization formula [13.7]:

$$f : E \Rightarrow R^{+} \ , \qquad (13.7)$$

And it is necessary find graph tree $T = (VE^{'})$ price, optimal distance or minimum environmental impact *F(T)* like,

$$F(T) = \sum_{xy \in E^{'}} f(xy) \ , \qquad (13.8)$$

Where: $f(xy)$ - minimum price, optimal distance or minimum environmental impact.

In mentioned tasks the edges $e = xy \in E$ as minimum price, optimal distance or minimum environmental impact could be finding as follows [13.9]:

$$f(e) = \min_{xy \in E} f(xy) \ , \qquad (13.9)$$

Based on graph theory, it can be argued that it is possible to design an optimal maritime tourism transport network based on transit time, cost and environmental impact (figure 13.2).

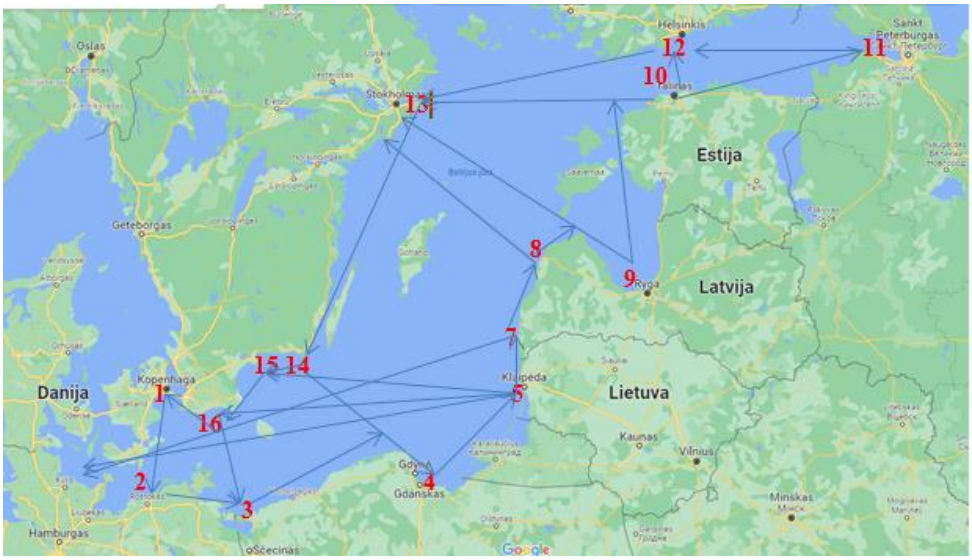

Fig. 10.2. Main and additional maritime tourism network possible ports in Baltic Sea

Source: own elaboration

For the sea tourism in Baltic Sea it is reasonable to analyze South Baltic Sea Region (SBSR) and also all the Baltic Sea Region (BSR).

14. TOURISM RINGS IN THE MAIN BALTIC SEA PORTS ATTRACTIVE FOR MARITIME TOURISM

In maritime tourism, it is very important to optimize the tourist routes depending on the interests and capabilities of the sea tourist. Tourist rings can be very useful for different categories of sea tourists. The ring system in marine tourism can be explained by the following types:

- Short size ring;
- Medium-sized ring;
- Long size ring.

A short size ring, i.e. areas located close to terminals: city centers and tourist attractive areas, which can be reached by pedestrian tourists directly from the terminal or using public transport.

Medium-sized ring, i.e. city centers or other touristic areas within cities or important for cities that can get reached by using urban public transport or taxes.

Long size ring, i.e. places and areas attractive for tourists, located outside cities or in other places attractive for tourists facilities and areas of port cities, which can be reached by using special tours, special advanced tour programs or private transport (cars).

The main ports of the Baltic Sea that are attractive to sea tourists and the distances from cruise terminals or ro-pax terminals to the city center, are presented in the example below.

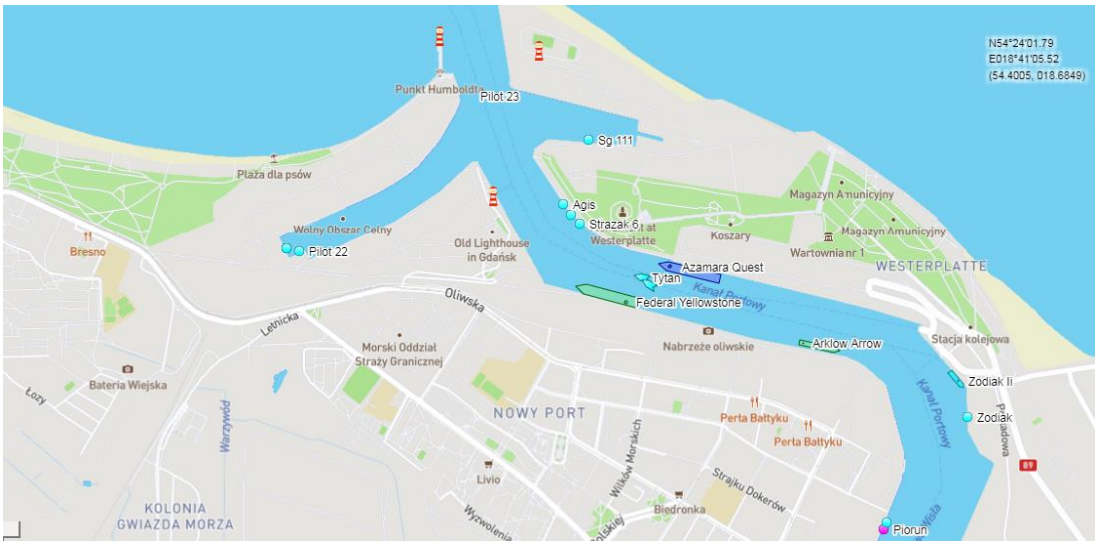

Fig. 14.1. Gdansk cruise ships mooring place in Wester place area

Source: AIS 2022

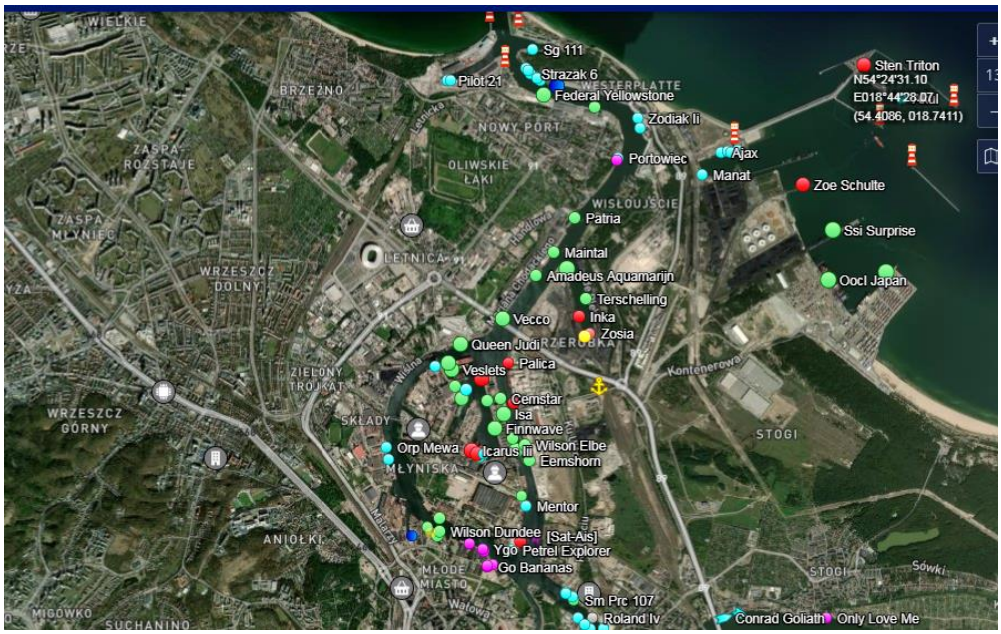

Fig. 14.2. Distance between cruise ships mooring place and Gdansk city about 10 km

Source: AIS 2022

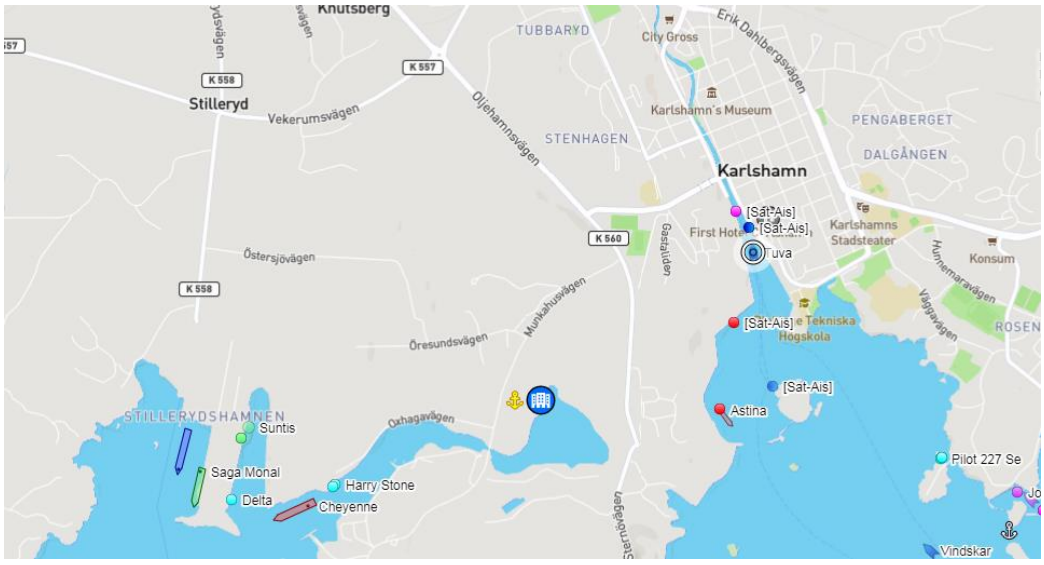

Fig. 14.3. Karlshamn ro-pax terminal. Distance between Ro-Pax mooring place and city about 10 km

Source: AIS 2022

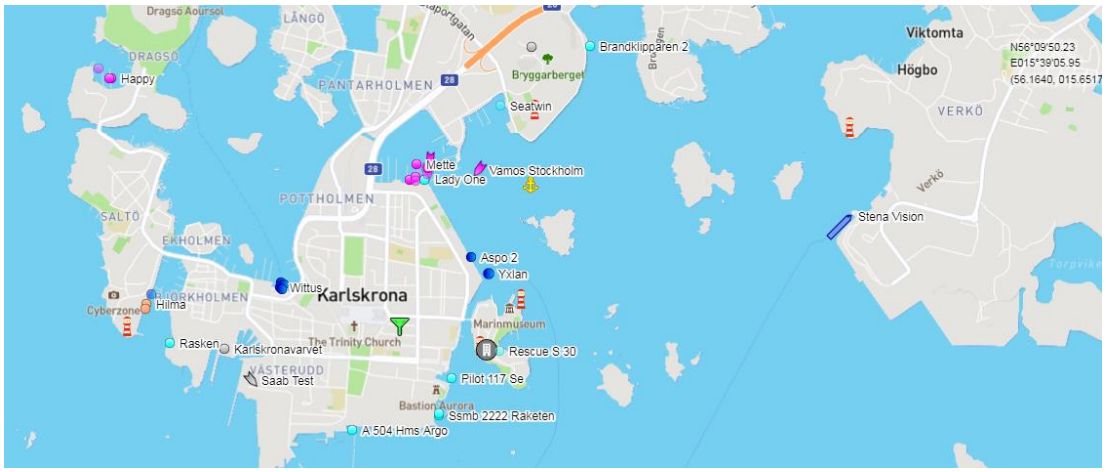

Fig. 14.4. Karlskrona Ro-Pax terminal located on distance about 15 km from city center

Source: AIS 2022

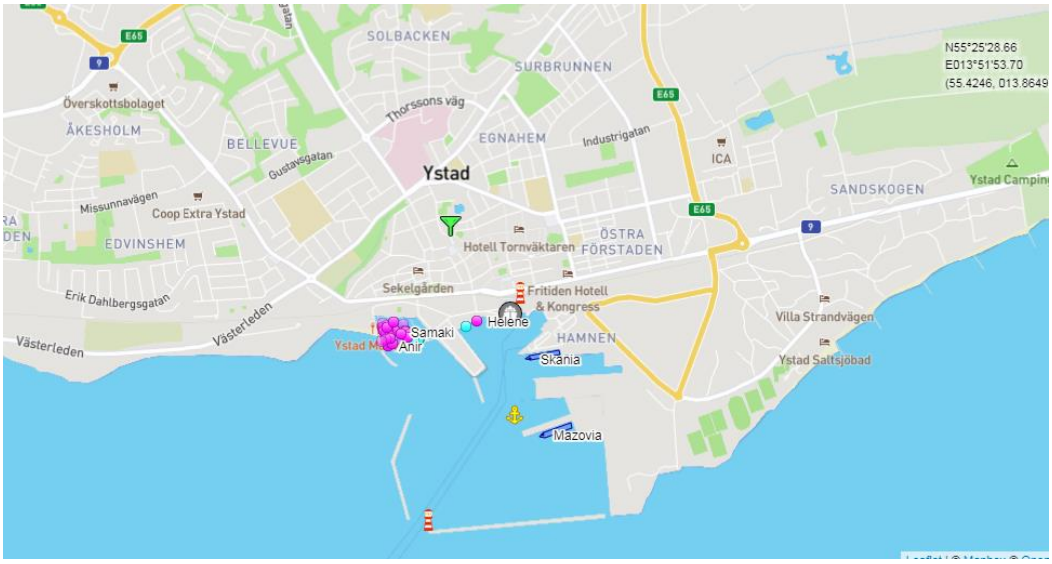

Fig. 14.5. Ystad ferry terminal located on distance about 500 m to city center

Source: AIS 2022

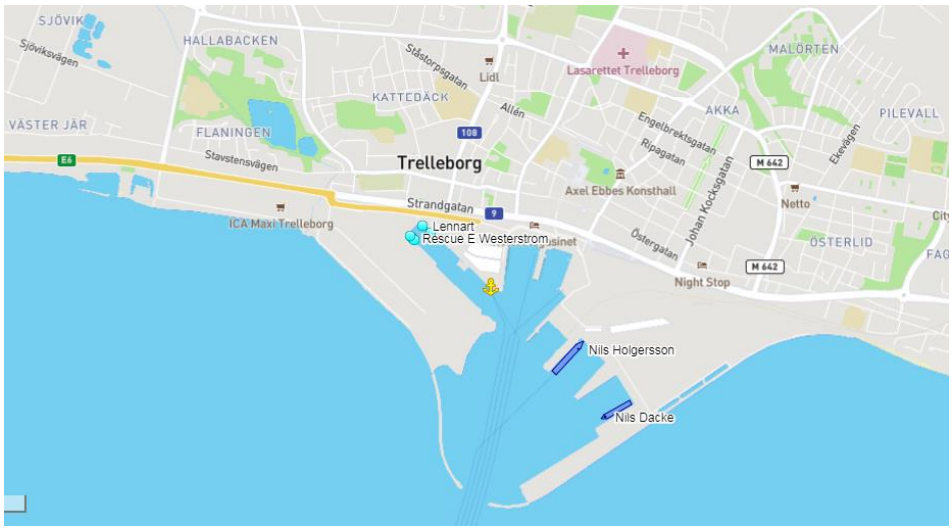

Fig. 14.6. Trelleborg ro-pax port located on distance about 500 m from city center

Source: AIS 2022

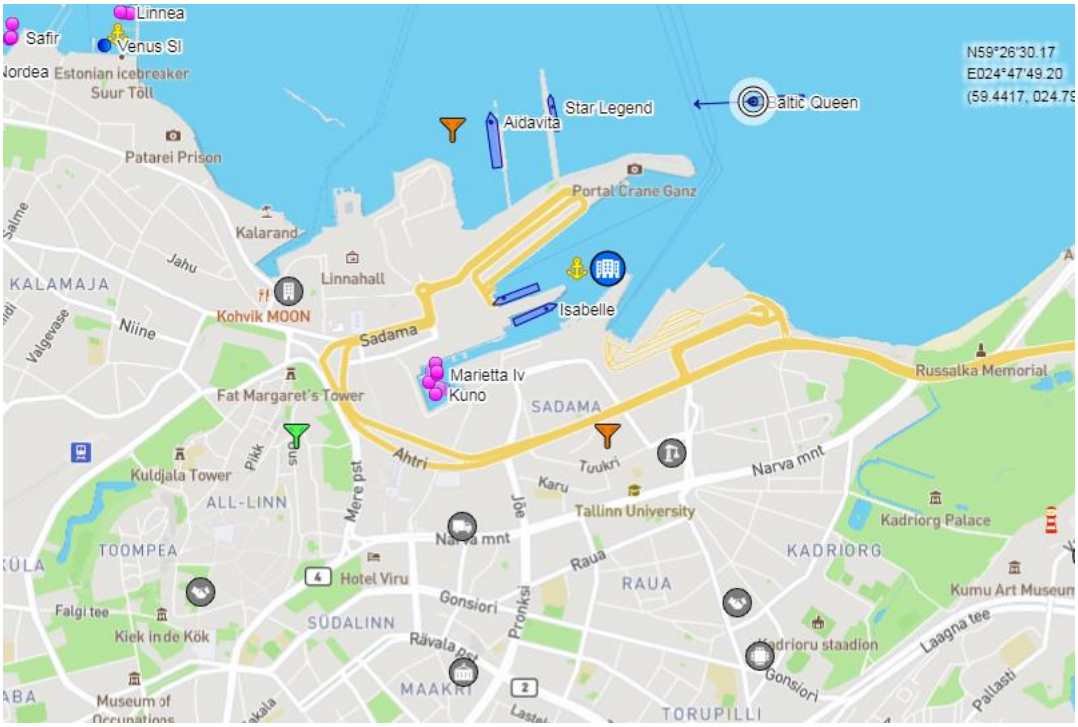

Fig. 14.7. Tallinn cruise and ro-pax terminals located about 1 km from city center

Source: AIS 2022

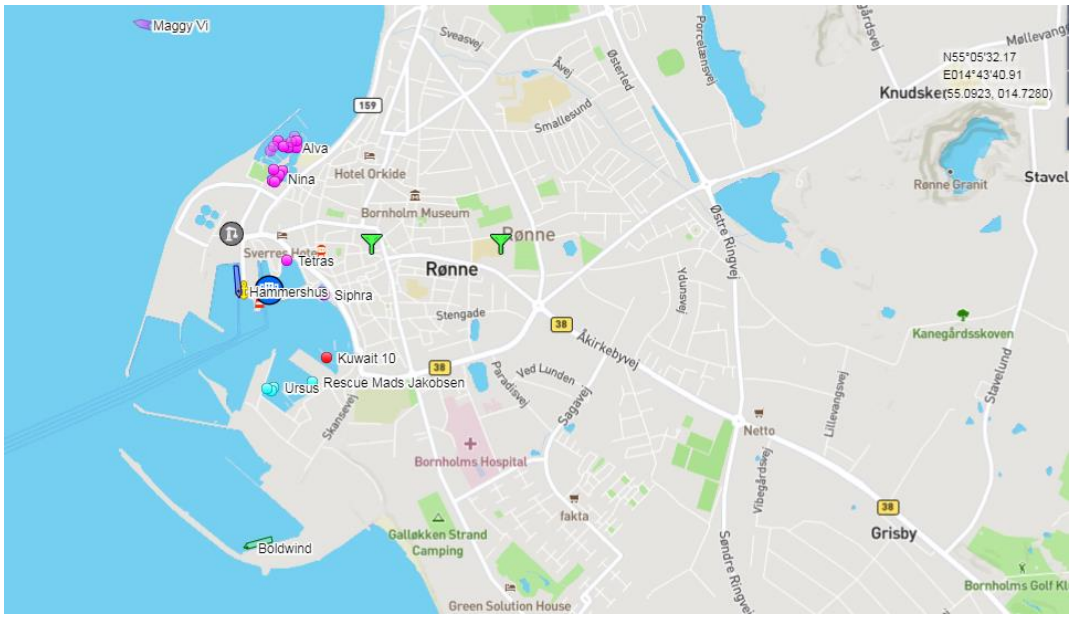

Fig. 14.8. Ronne cruise and ro-pax terminals located on distance about 500 m from city center

Source: AIS 2022

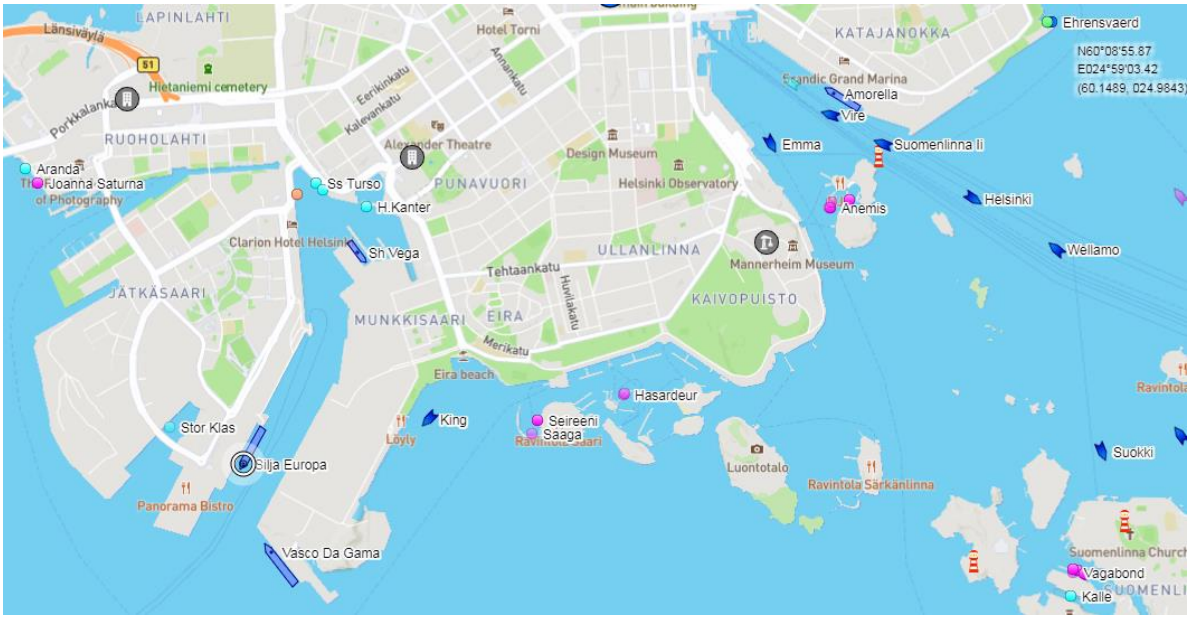

Fig. 14.9. Helsinki cruise and ro-pax terminals located from 0,5 km up to 3 km from city center

Source: AIS 2022

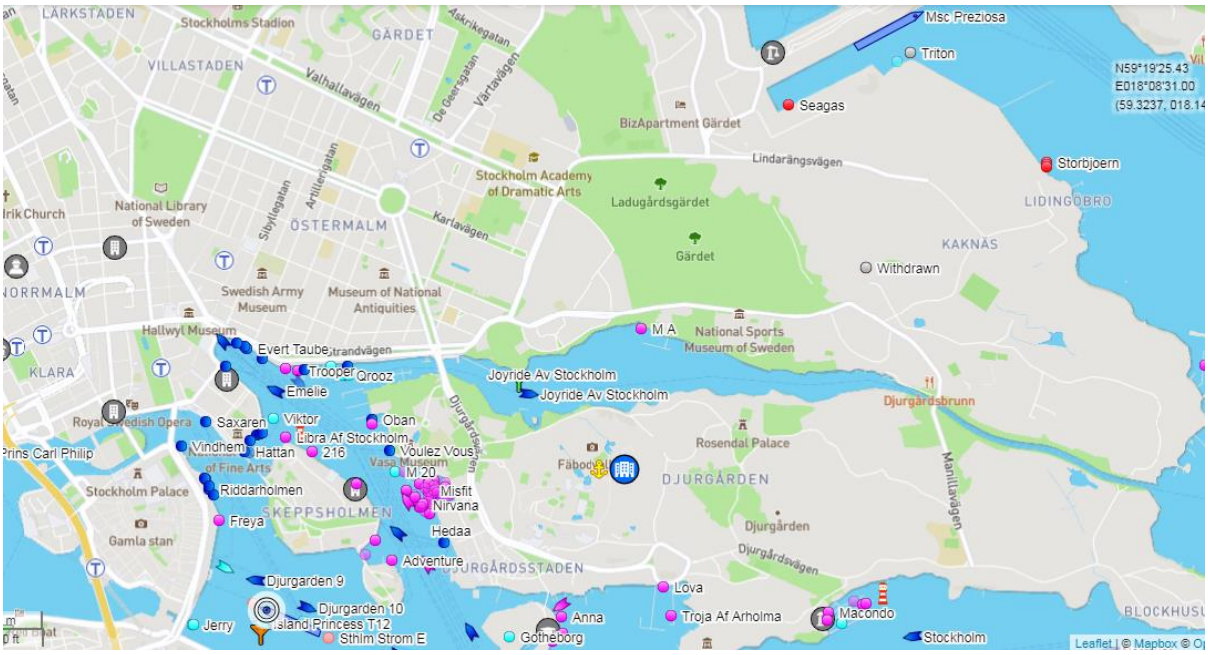

Fig. 14.10. Stockholm cruise and ro-pax terminals located between 0,5 km and 4 km from city center

Source: AIS 2022

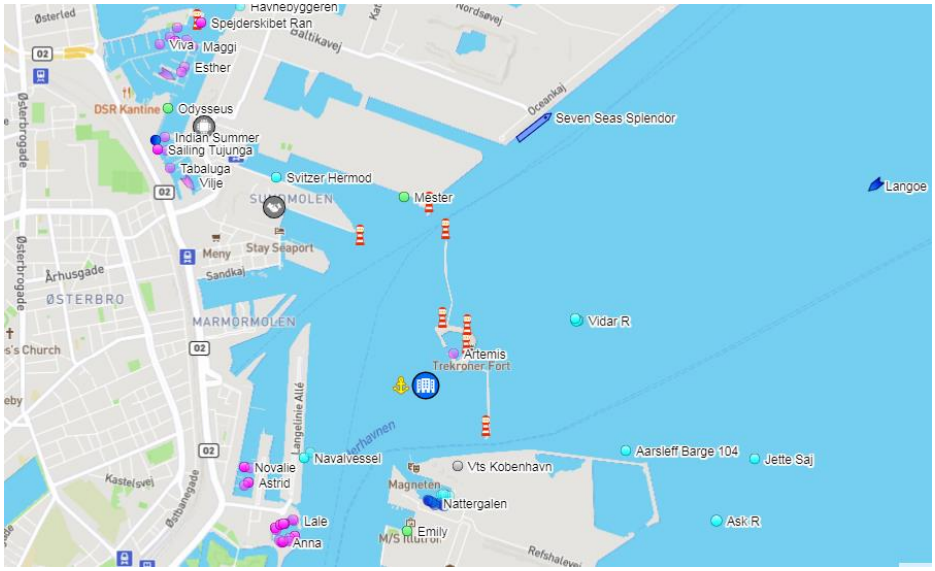

Fig. 14.11. Copenhagen cruise and ro-pax terminals located between 1 and 5 km from city center

Source AIS 2022

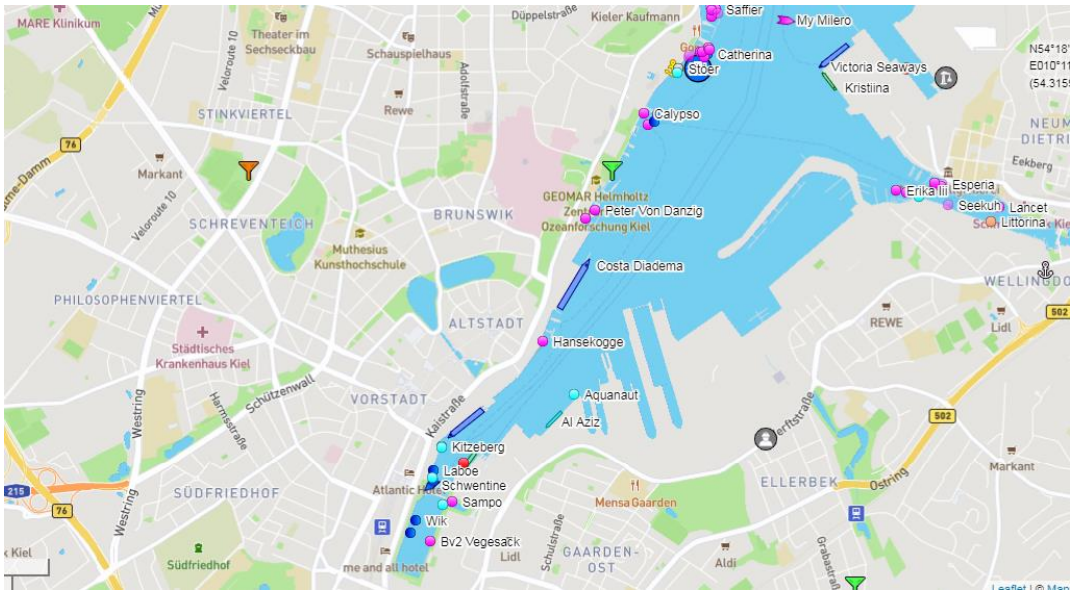

Fig. 14.12. Kiel cruise and ro-pax terminals located between 300 m and 5 km from city center

Source: AIS 2022

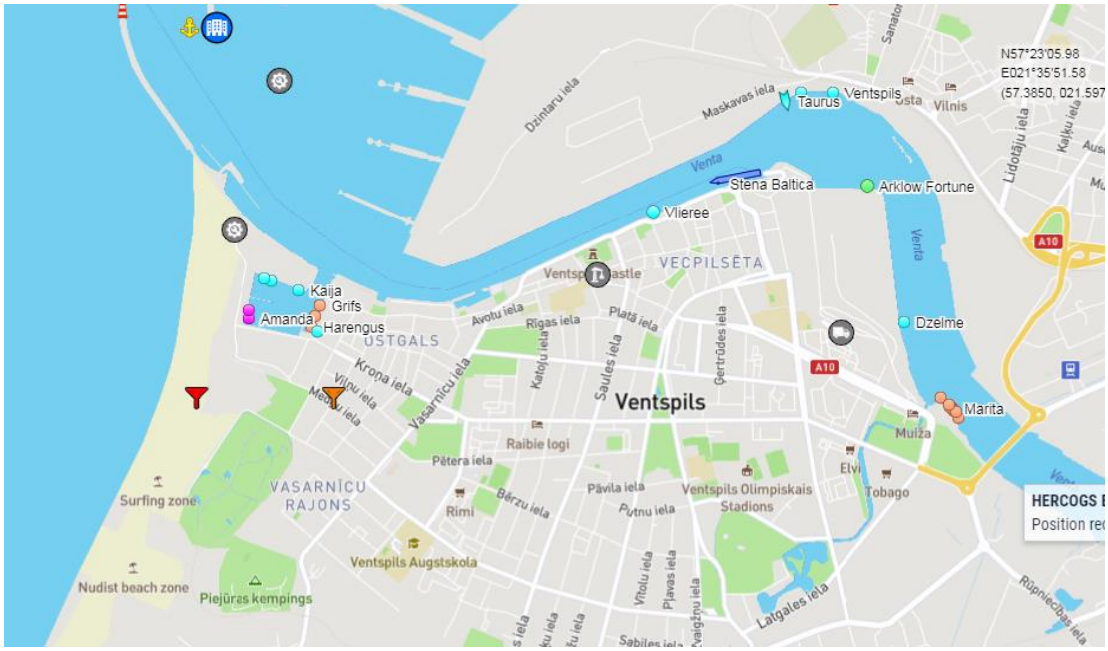

Fig. 14.13. Ventspils Ro-Pax terminal located about 400 m from city center

Source: AIS 2022

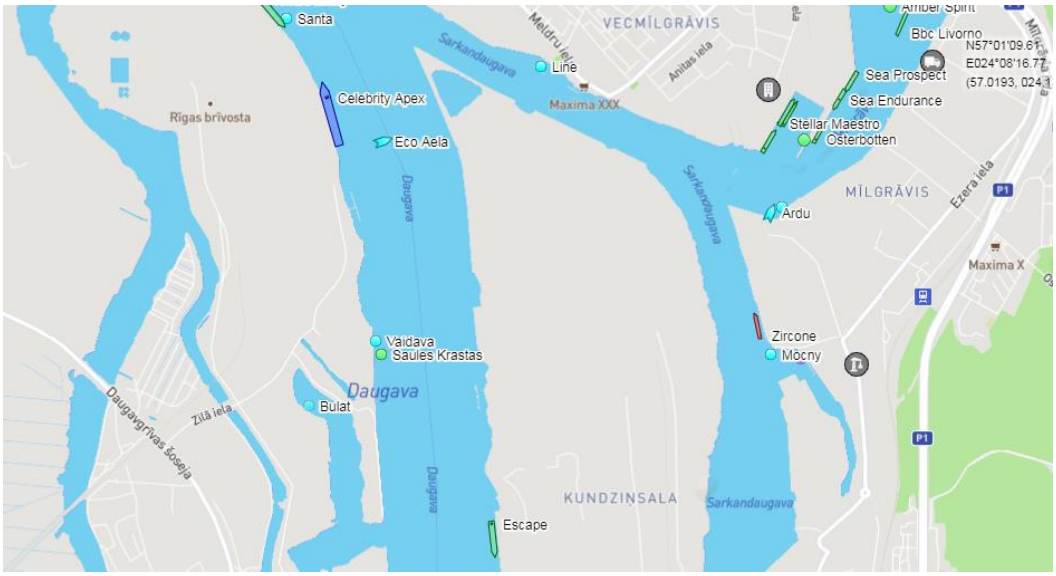

Fig. 14.14. Riga cruise terminal located about 15 km from city center

Source: AIS 2022

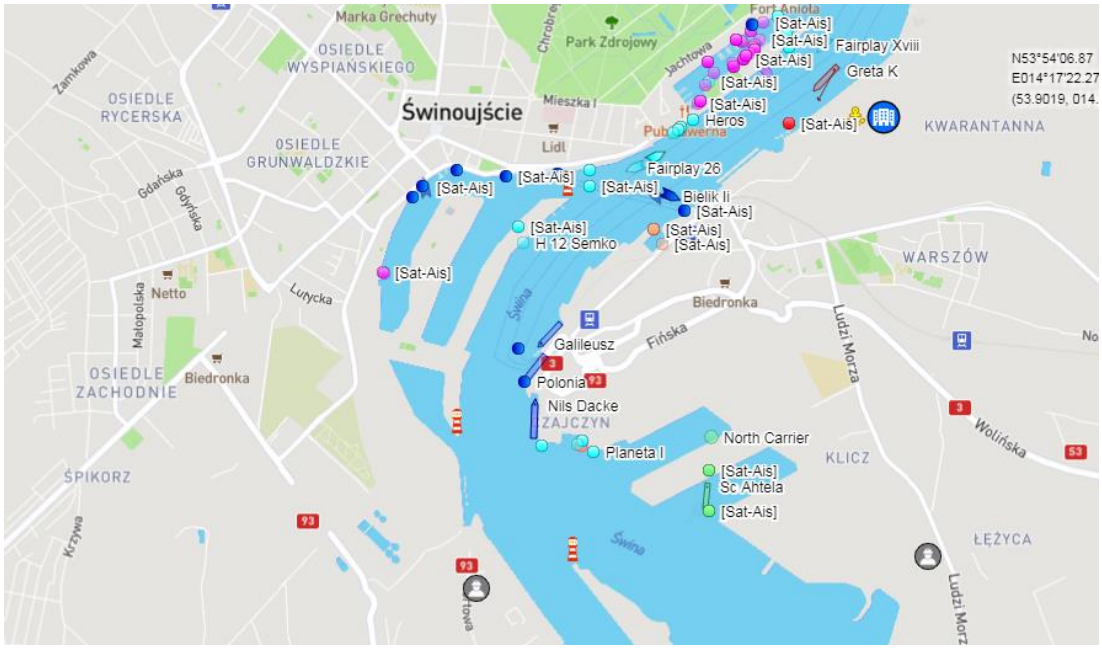

Fig. 14.15. Swinoujscie ro-pax terminal located about 2 km from city center

Source: AIS 2022

Fig. 14.16. Rostock ro-pax terminal located about 10 km from city center

Source: AIS 2022

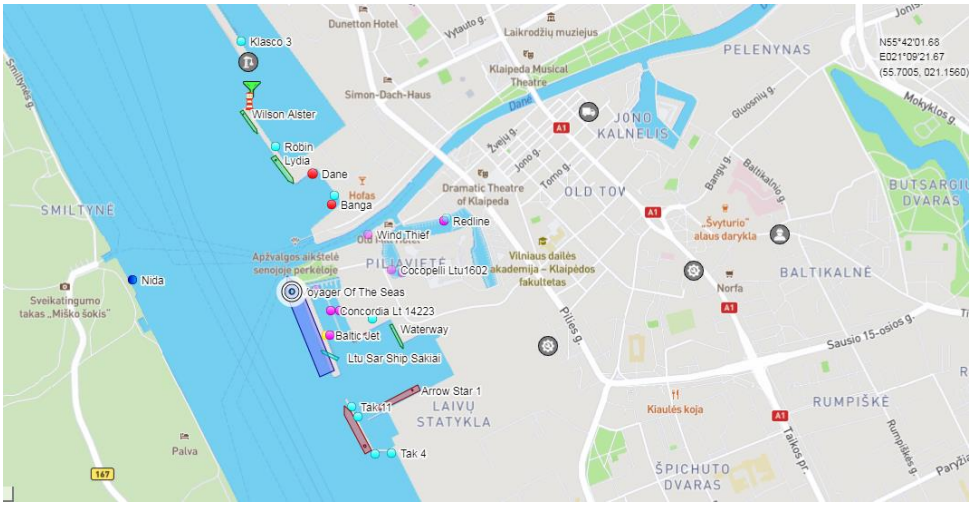

Fig. 14.17. Klaipeda cruise terminal located about 500 m from city center and Ro-Pax terminal located about 3 km from city center

Source: AIS 2022

As example, Klaipeda cruise terminal is located very close to city center and tourist facilities and events, like Sea Festival, which is organized in close vicinity to the cruise terminal every year in the end of July. About 500 m from the cruise terminal is located small ferry terminal, from which small ferries sail to Maritime museum, Kursiu Peninsula, and as well cities on Kursiu Peninsula Juodkrante, Nida and other places (Shot size ring).

Other tourists attractive places, like beaches and the biggest shopping centers are located in the distance between 3 – 8 km (Middle-sized ring), which can be reached by city public transport or by taxi.

Tourist's attractive cities like Palanga, Nida, etc. can be reached using special tours, intercity public transport or private cars, as well as taxi.

15. SOUTH BALTIC SEA REGION (SBSR): SEA TOURISM BETWEEN PORTS – LAND PROSPECTS

For the developing of maritime tourism network in South Baltic region, graph scheme can be presented as follows:

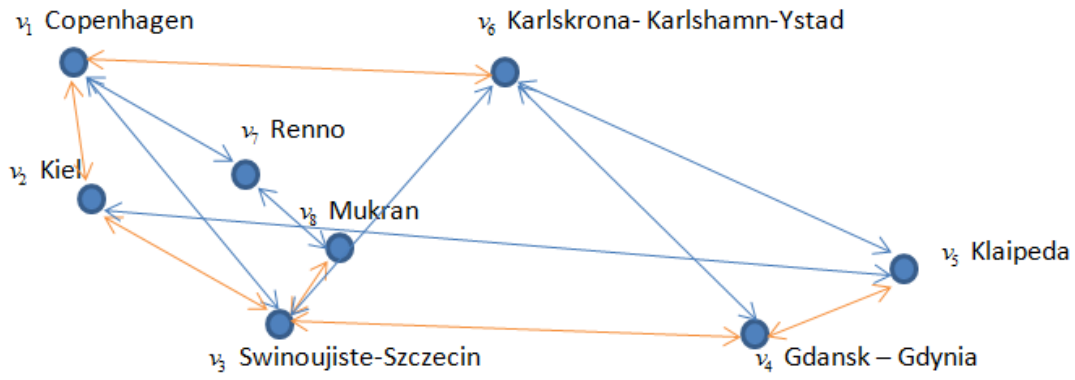

Fig. 15.1. Graph scheme of the maritime tourism network in South Baltic Sea region (blue – existing Ro-Pax lines; yellow – possible Ro-Pax or touristic hop on – hop off lines)

Source: own elaboration

For the developing of maritime tourism network in South Baltic region, based on existing ro-pax lines in South Baltic Region, adjacency matrix can be explained as follows:

$$A = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \quad (15.1)$$

For the creating Maritime tourism network in South Baltic region, based on existing ro-pax lines in South Baltic Region and possible ro-pax or touristic hop on – hop off lines, adjacency matrix can be explained as follows:

$$A = \begin{bmatrix} 0 & 1 & 1 & 0 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \quad (15.2)$$

Currently, there are no ro-pax lines between Karlskrona-Karlshamn and Copenhagen, direct ro-pax lines between Copenhagen-Koge and Kiel, no connection between Kiel and Swinoujscie-Szczecin, as well between Swinoujscie-Szczecin and Gdansk/Gdynia, between Gdansk/Gdynia and Klaipeda. First of all, there are connections which are impossible to reach by car (for tourists using private cars) or by public land transport (trains and buses).

Connections between Karlskrona-Karlshamn and Copenhagen can be reached by road and rail transport.

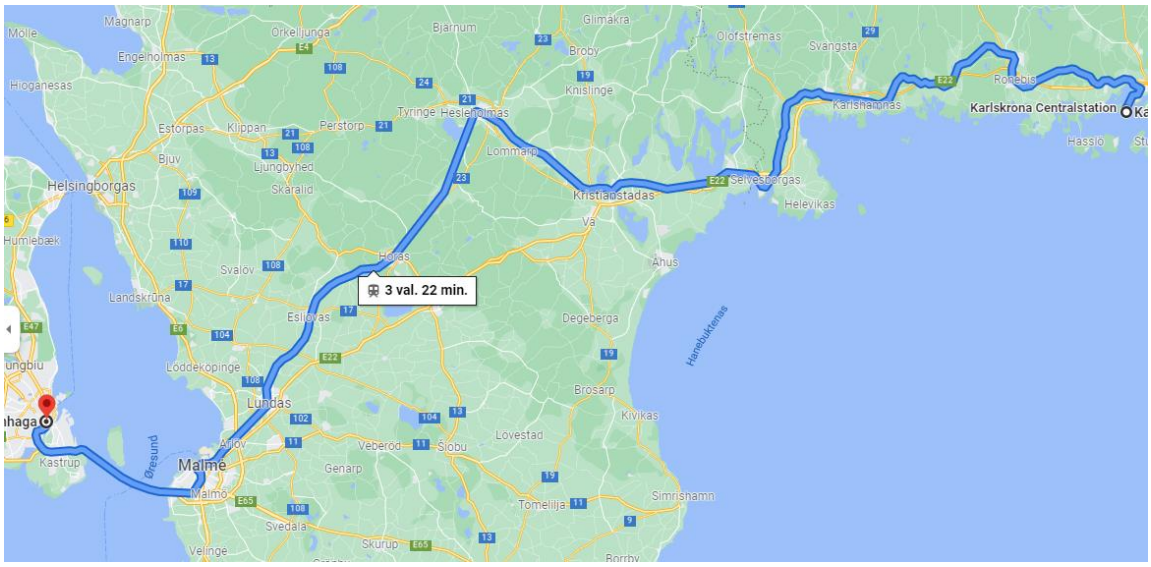

Fig. 15.2. Railway connection between Karlskrona - Karlshamn and Copenhagen: travel time by passenger train about 3,5 hours

Source: Google maps

On the road between Karlshamn and Copenhagen are located historical cities of Sweden with very interesting history and culture.

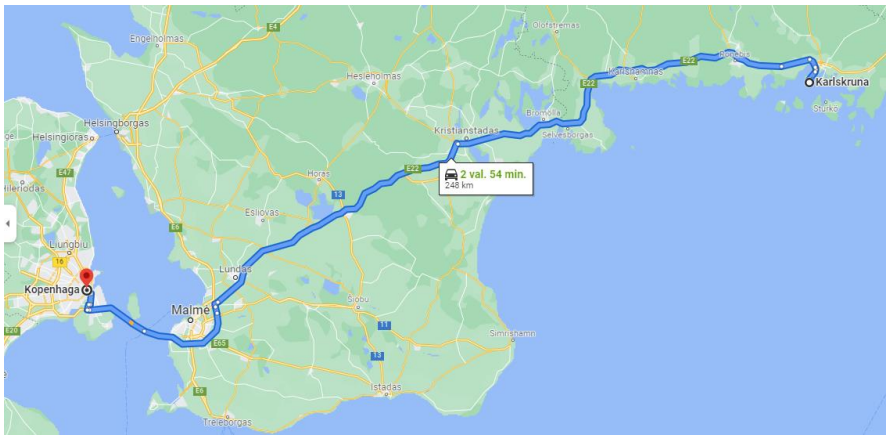

Fig. 15.3. Road connection between Karlskrona-Karlshamn and Copenhagen: travel time by car is about 3 hours, distance about 250 km

Source: Google maps

Connections between Copenhagen and Kiel can be organized for the tourists without cars by using public transport (by trains or by busses), because of the developed road and railway network.

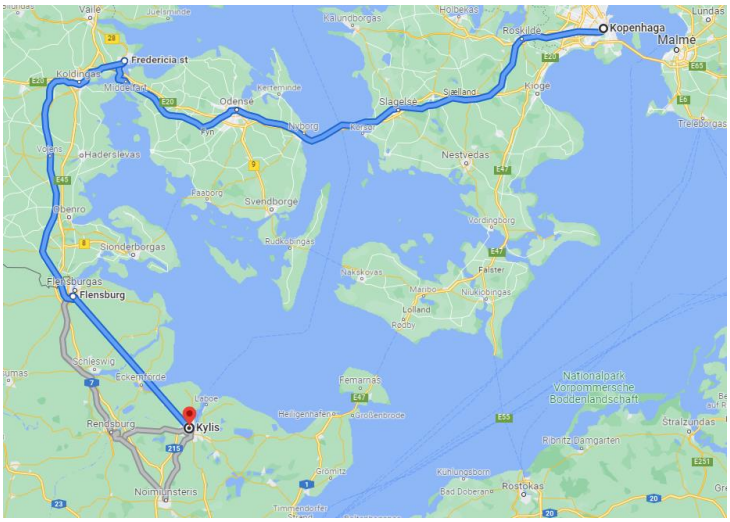

Fig. 15.4. Railway connection between Copenhagen and Kiel: travel time by passenger train about 5 hours

Source: Google maps

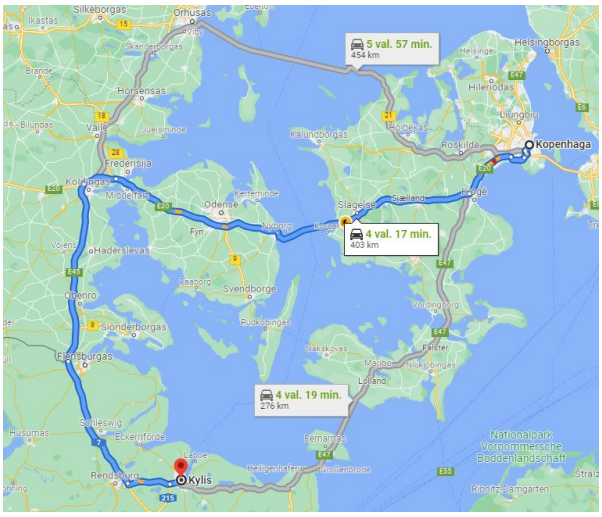

Fig. 15.5. Road connection between Copenhagen and Kiel: travel time by car is about 4 - 5 hours, shortest distance is about 280 km, using Femarn-Belt ferry or about 400 km using Belt bridge

Source: Google maps

In the area between Copenhagen and Kiel are located tourist facilities, such as historical cities, technical and culture museums and National Parks.

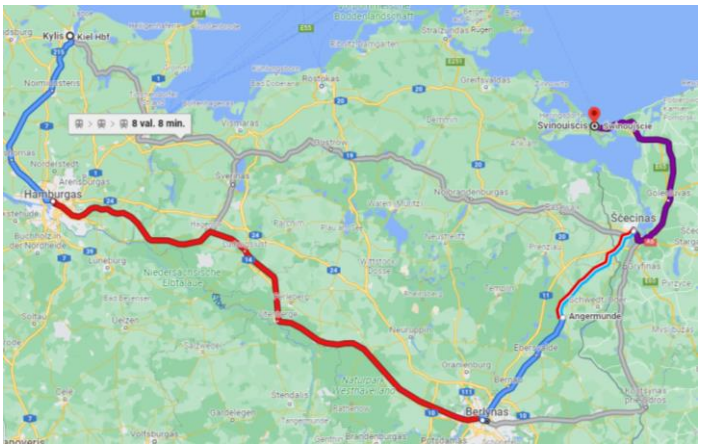

Fig. 15.6. Railway connection between Kiel and Szczecin-Swinouijsce: travel time by passenger train about 8 - 12 hours

Source: Google maps

You can take a different route between Kiel and Szczecin and the Świnouisce region with the option of visiting historical and cultural cities such as Lübeck, Schwerin and other places or visit Berlin and other interesting cities and places.

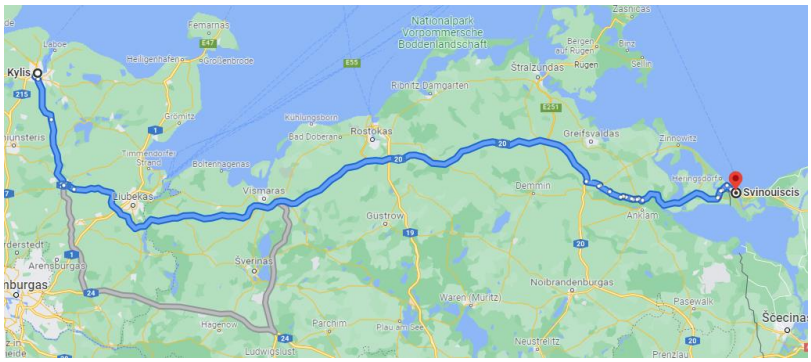

Fig. 15.7. Road connection between Kiel and Szczecin - Swinouijsce: travel time by car is about 4 hours, distance about 360 km

Source: Google maps

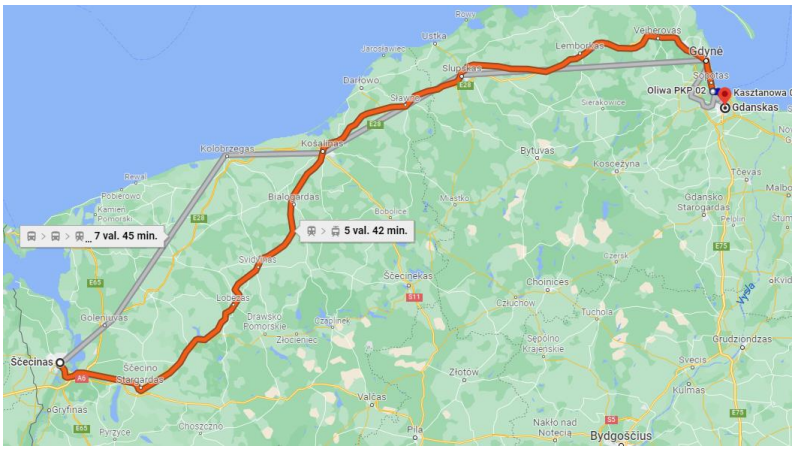

Fig. 15.8. Railway connection between Szczecin and Gdansk - Gdynia: travel time by passenger train about 6 - 8 hours

Source: Google maps

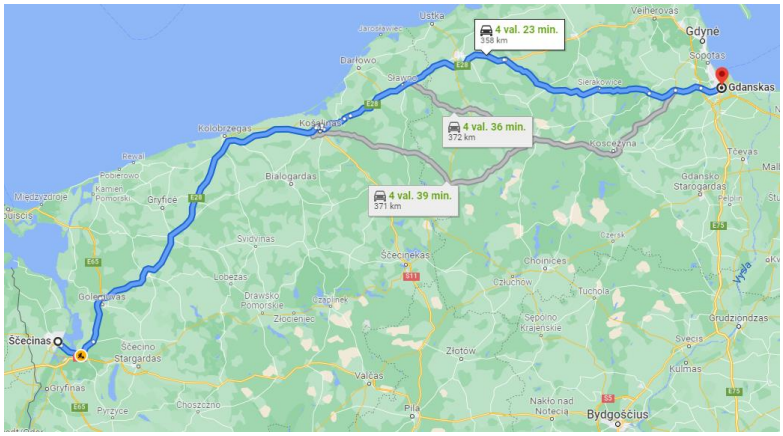

Fig. 15.9. Road connection between Szczecin and Gdansk - Gdynia: travel time by car is about 4,5 – 5,0 hours, distance about 370 km

Source: Google maps

Tourist routes between Szczecin-Świnoujście and Gdańsk-Gdynia run through interesting Polish cities and attractive tourist areas. It is possible to use the road close to the Baltic Sea coast with excellent small sea towns, as well as to visit cities such as Koszalin, Słupsk and many more.

Fig. 15.10. Railway connection between Gdansk – Gdynia and Klaipeda: travel time by passenger train about 20 hours

Source: Google maps

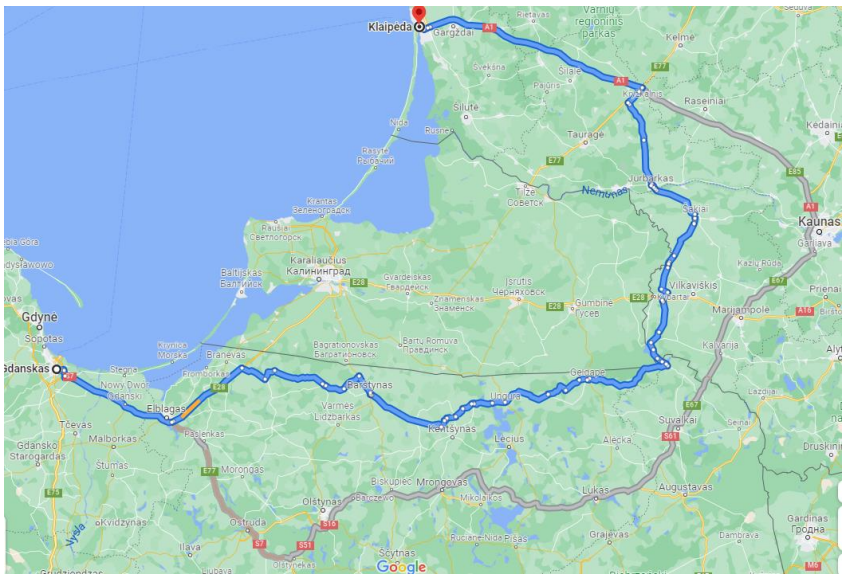

Fig. 15.11. Road connection between Gdansk – Gdynia and Klaipeda: travel time by car is about 8 – 9 hours, distance about 650 - 750 km

Source: Google maps

The roads connecting Gdańsk-Gdynia and Klaipeda lead through interesting places and historical cities, such as Malbork, Elbląg, Mikołajki, Kaunas and other attractive tourist destinations.

As shown above, land connections by rail or road are very complex and time-consuming in many places. In this case, you can use other ports that have ro-pax lines, but are not as attractive for tourists as Ystad and Trelleborg in Sweden, Getser, Rodbyhavn in Denmark, Puttgarden, Travemunde, Warnamunde in Germany, which have good ro-pax connections. By using the mentioned ports and ro-pax shipping lines between SBSR ports, sea tourist routes can be partially optimised.

The ro-pax network included these additional ports, which is very important and can at least partially optimize maritime tourism and increase maritime tourism opportunities.

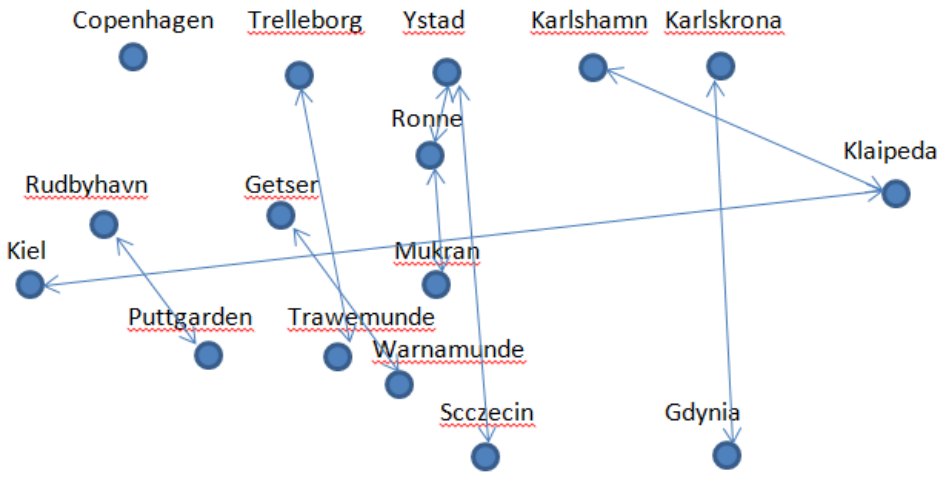

Fig. 15.12. SBSR ports linked by ro-pax shipping lines

Source: own elaboration

For the evaluation it is possible and matrix formation for the ports it is possible for port numbers, such as: 1; 2; 3, etc., or letters such as A, B, c, etc. In this case last figure could be expressed as follows:

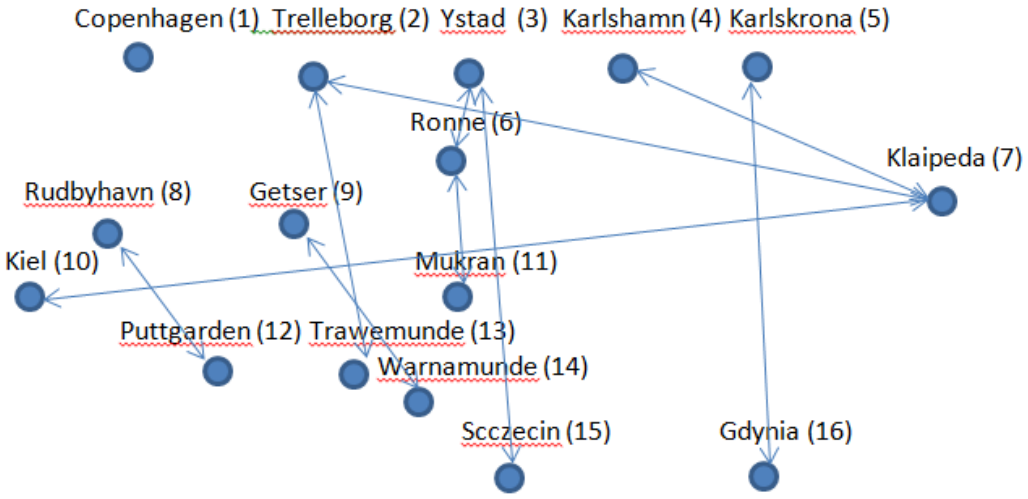

Fig. 15.13. Numbering of the SBSR ports, which have ro-pax lines

Source: own elaboration

Adjacency matrix for the SBSR ports, which have Ro-Pax shipping lines could be expressed as follows:

$$A = \begin{bmatrix}
0&0&0&0&0&0&0&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&0&1&0&0&0&0&0&1&0&0&0\\
0&0&0&0&0&1&0&0&0&0&0&0&0&0&1&0\\
0&0&0&0&0&0&1&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&0&0&0&0&0&0&0&0&0&0&1\\
0&0&1&0&0&0&0&0&0&0&1&0&0&0&0&0\\
0&1&0&1&0&0&0&0&0&1&0&0&0&0&0&0\\
0&0&0&0&0&0&0&0&0&0&0&1&0&0&0&0\\
0&0&0&0&0&0&0&0&0&0&0&0&0&1&0&0\\
0&0&0&0&0&0&1&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&1&0&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&0&0&1&0&0&0&0&0&0&0&0\\
0&1&0&0&0&0&0&0&0&0&0&0&0&0&0&0\\
0&0&0&0&0&0&0&0&1&0&0&0&0&0&0&0\\
0&0&1&0&0&0&0&0&0&0&0&0&0&0&0&0\\
0&0&0&0&1&0&0&0&0&0&0&0&0&0&0&0
\end{bmatrix} \tag{15.2}$$

From Figures 15.3 – 15.13 and the last matrix, it can be seen that in the south-western part of the SBSR, the density of ro-pax shipping lines is very high and in the absence of ro-pax lines in other ports, it is very easy to reach the destination by car or public transport (trains or buses) . At the same time, ports in the south-eastern and eastern parts of the SBSR have ro-pax connections with ports in the western and south-western parts of the SBSR, but the distances between ports that do not have ro-pax connections between these ports, like Szczecin – Świnoujście, Gdańsk/Gdynia and Klaipeda are very long, and the density and frequency of land public transport is very low.

16. BALTIC SEA REGION (BSR) - SEA TOURISM PROSPECTS

The BSR is interesting and important from the point of view of sea tourism, because around the Baltic Sea and on Baltic Sea islands are located very attractive cities and other facilities, such as environmental protection areas, bird protection areas, etc.

The main port cities (primary ports) that have ro-pax connections in the SBSR analyzed in the previous section, in the Central and North Baltic regions, are cities attractive for sea tourism. Those cities are: Riga, Ventspils (Latvia), Tallinn (Estonia), Saint Petersburg (Russia), Helsinki, Turku, Vaasa, Oulu (Finland), Stockholm, Visby (Sweden).

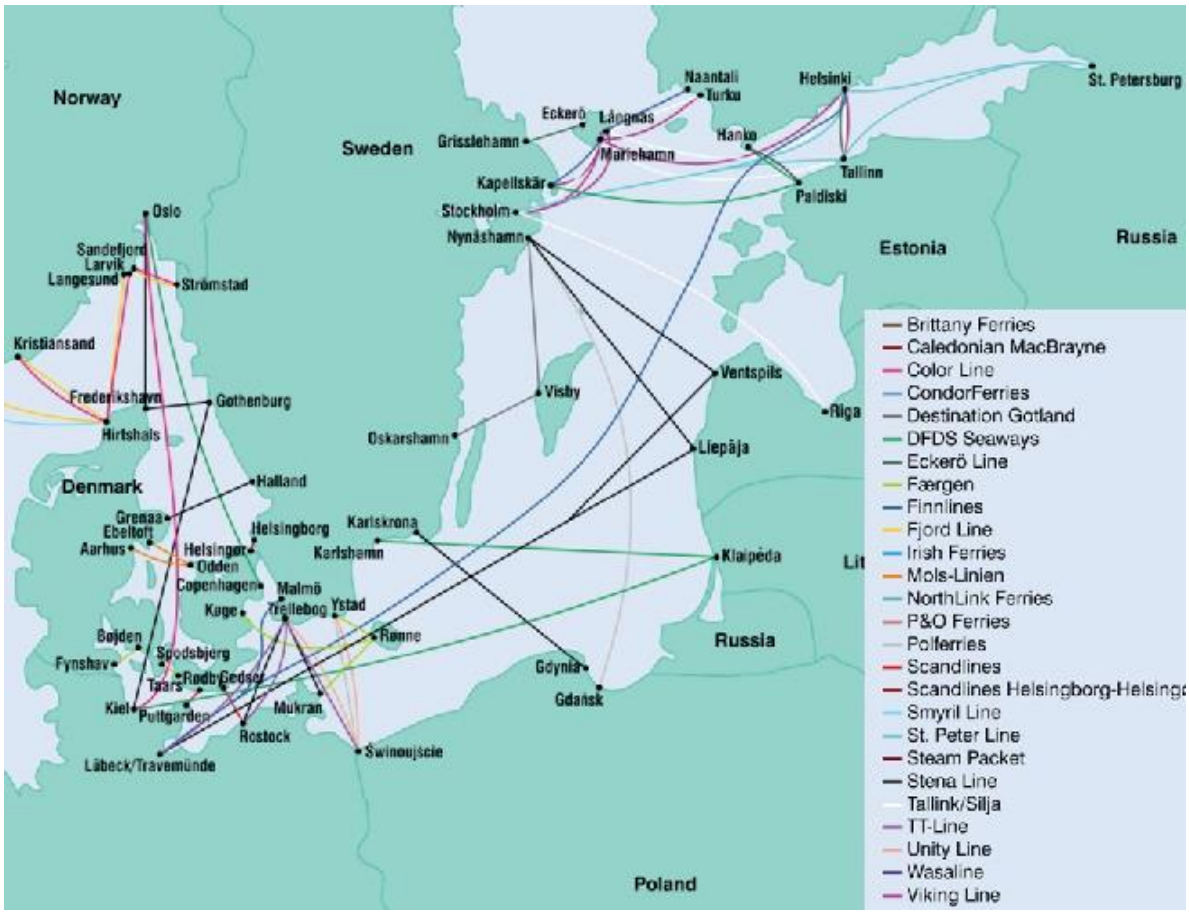

Fig. 16.1. Ro-pax shipping lines in BSR

Source: own elaboration

The following numbers of BSR ports that have ro-pax shipping lines and are attractive for tourists can be used to create the neighborhood matrix: Copenhagen-Malmo-Trelleborg (1); Ystad (2); Karlshamn (3); Karlskrona (4); Kiel (5); Lübeck-Travemunde (6); Rostock (7); Ronne (8); Mukran (9); Świnoujście (10); Gdynia-Gdansk (11); Klaipeda (12); Liepaja-Ventspils (13); Riga (14); Paldiski-Tallinn (15); St. Petersburg (16); Helsinki (17); Turku (18); Marienhaim (19); Stockholm (20); Visby (21).

The neighborhood matrix of the mentioned cities or areas and ports which are attractive for tourists and which have ro-pax shipping connections can be expressed as follows:

$$A = \begin{bmatrix}
0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0
\end{bmatrix} \quad (16.1)$$

Based on the analysis of links between attractive tourist cities and BSR ports that have ro-pax shipping lines, the formula is:

$$A_{ij} = A_{ji}\,, \quad (16.2)$$

Where:

$$A_{ij} = \begin{Bmatrix} 1, ij \exists edge \rightarrow from \rightarrow i \rightarrow to \rightarrow j \\ 0, \rightarrow otherwise \end{Bmatrix}$$

At the same time, it is possible to use the ports of the ro-pax "Hub" shipping lines. The following ports could be used as hubs: Copenhagen-Malmo-Trelleborg (1); Ystad (2); Lübeck-Travemunde (6); Ronne (8); Mukran (9); Świnoujście (10); Gdynia-Gdansk (11); Klaipeda (12); Liepaja-Ventspils (13); Paldiski-Tallinn (15); Helsinki (17); Stockholm (20). A network matrix using "Hub" ports can be expressed as follows:

$$A = \begin{bmatrix}
0 & 1 & 0 & 0 & 1 & 1^* & 1 & 1 & 1^* & 1^* & 0 & 1^* & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1^* & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 & 1^* & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
1^* & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 1^* & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1^* & 1 & 0 & 0 & 0 & 1 & 0 & 1^* & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1^* & 1^* & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1^* & 1 \\
1^* & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 1^* & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1^* & 1 & 1 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1^* & 1 & 1 & 1 & 0 \\
1 & 0 & 0 & 0 & 0 & 1^* & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1^* & 0 & 1 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 1^* & 1 & 0 & 1^* & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1^* & 0 & 1^* & 1 & 1 & 1 & 1^* & 1 & 1 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1^* & 0
\end{bmatrix} \quad (16.3)$$

In last matrix, ro-pax “Hub” port means that from hub port could be developed at least one additional ro-pax shipping line and hub ports is shown as 1*.

The presented matrix can be used for many purposes such as explaining ro-pax liner connections, port connections, travel time, costs, and other factors calculations and evaluations.

17. MAIN TASKS OF THE BALTIC SEA MARITIME TOURISM

The analysis of possible tourist routes in the Baltic Sea showed that it is necessary to connect ports suitable for ro-pax transport (without the wide range of connections) with port cities that have ro-pax connections. The main tasks of Baltic tourism can be characterized as follows:

- Find possible Ro-Pax shipping lines that can be used for sea tourism;
- Analyze transport possibilities between ports that have ro-pax shipping lines;
- Find attractive tourist facilities in port cities with ro-pax lines;
- Analyze tourist attractive places that can be visited on the routes between port cities served by ro-pax shipping lines;
- Describe the attractive tourist facilities located in port cities and on routes between port cities;
- Find optimal tourist routes on the Baltic Sea.

These are the main tasks of a possible Baltic Sea maritime tourism project, which should explore and prepare touristic routes, attractive facilities on the Baltic Sea and on land.

18. FUTURE FUNDING POSSIBILITIES

During the SusMarTour project implementation, project partners were looking for reliable funding sources for the main project development. Considering transnational character of planned actions, the main emphasis was put on INTERREG programs, which are financing i.a. methodology preparation, branch analysis, organizational assumptions or promotional campaigns. The most important advantage of INTERREG programs is preparation and implementation only one project covering the whole area of interest, with single budget, tasks and time schedule. This allows involved institutions to reach expected result quickly and more effectively in comparison to realization of alternative but individual actions from national/regional or local funding sources.

The PPs came across with some difficulties in reliable planning of future actions that might be financed form the European funds. The transition period in EU funds budget preparation and lack of available calls of proposals induces to wait with the main project implementation until the programming period 2021-2027.

The funding sources could be INTERREG Baltic Sea Region (BSR) program, because in study area are included Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden and Denmark.

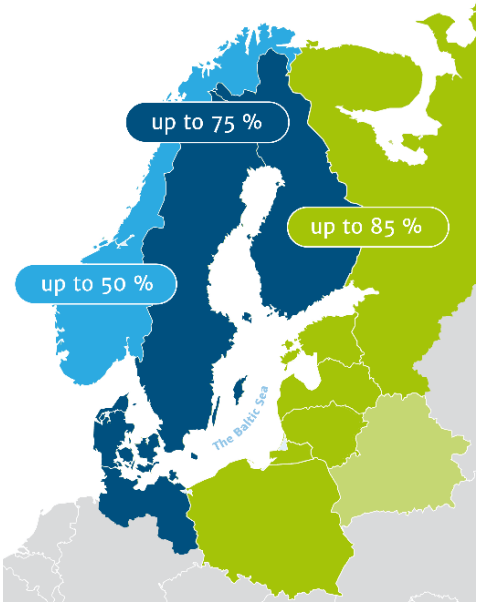

Fig. 18.1. INTERREG Baltic Sea Region program countries and financing system

Source: Interreg

INTERRG Baltic Sea Region program cover main themes: Innovation; Natural resources; Transport; EU Strategy Support that means support Developing the Baltic Sea Region and Stimulating cooperation and other.

Resilient and inclusive sustainable maritime tourism in the Baltic Sea Region could include in digitalization of the sea tourism, natural resources as blue and green growth or in Transport as Urban mobility.

Maritime tourism is an important development direction, especially in Natural resources and Transport sections..

INTERREG Baltic Sea Region Program, have four priorities: 1 - Innovative societies; 2 - Water-smart societies; 3 - Climate-neutral societies; 4 - Cooperation governance. Total budget is about 250 million EUR. Resilient and inclusive sustainable maritime tourism in the Baltic Sea Region project could be in priorities 1, 2 or 4. Maritime tourism development is important, because together with the development of other areas positively influence on the Regional development.

Regarding total funds available at the INTERREG Baltic Sea Region Program in period 2021-2027 could be concluded as:

- European Regional Development Fund (ERDF);
- European Neighborhood Instrument (ENI);
- Norwegian national funding.

At the same time South Sweden, part of Denmark, North East Germany Counties, North Poland Counties and West Lithuania Counties are in studied area, which is covered by INTERREG South Baltic Sea Region (SBSR) program.

INTERREG South Baltic Sea Region program conditions are very similar to the INTERREG Baltic Sea Region program conditions.

As in accordance with the new design of the European Cohesion Policy 2021-2027 oriented to achieve greater impact and an even more effective use of the investments. Key elements of the 2021-2027 are:

- Concentration;
- Simplification;
- Digitalization;
- Results orientation.

All four founding sources (programs) oriented on innovation and regions development, increasing mobility between countries and regions, influencing on increasing life standards. Maritime tourism is in line with mentioned EU program tasks, which are problems of the development maritime tourism on basis of existing ports infrastructure, digitalization of the small and medium-sized ports and services are object to founding by EU INTERREG, INTERREG BSR, SBSR and neighboring countries programs.

After analysis of the potential funding sources for the main project implementation, INTERREG seems to be the most adequate. The detailed specification of coming programme is not available at the moment. However, based on past experiences, the following benefits offering by the Programme can be underlined:

- the geographical area of intervention covers the project area,
- the catalogue of possible project partners suit to proposed partners in the main project work plan, in addition the associated partners can be appointed,
- network cooperation between different institutional levels,
- the potential topics (organizational innovations, digitalization, preserving natural resources, green mobility, inland shipping, accessibility) are in the line of the project
- pilot actions implementation,
- dissemination and promotional campaigns,
- common budget and time schedule,
- financing up to 85%,
- project duration up to 36 months.

The road map of the future actions could be explained as follows:

- SusMarTour summary conference with potential partners and stakeholders – December 2022;
- Completion of the data base, update of information – 2022/2023;
- Analysis of available funding sources – main topics, areas of interventions – 2022/2023;
- 1st project partner preparation meeting – the second half of 2022;
- Preparation of the application bid – 2022/2023;
- 2nd project partner preparation meeting – the second half of 2023;
- Final improvements of the application – beginning of 2023;
- Applying for funds 2023 – within the IBSR or ISBSR call for proposals.

19. CONCLUSIONS AND RECOMMENDATIONS FOR THE PROJECT IMPLEMENTATIONS

Sea tourism in the Baltic Sea Region have very good prospects. The methodology and proposed solutions presented in the report can be used to develop the network of ferry connections in the Baltic Sea.

There are some areas in the BSR which have limitations in using the maritime transport, especially between selected ports, such as Szczecin and Gdansk/Gdynia; Gdansk/Gdynia and Klaipeda; Riga and Tallinn; Tallinn and St. Petersburg. Between above mentioned ports there are no direct ro-pax connections and are long distances (more than 300 km), what make difficulties to travel between them for tourists using private cars and even more complicated for tourists without private cars due to the absence of developed public transport, for example between Gdansk and Klaipeda; Tallinn and St. Petersburg, partly between Szczecin and Gdansk-Gdynia.

Potential partners in project implementation could be ro-pax operators, such as DFDS, Stena Line, Tallink etc. and ports which have ro-pax connections.

The project recommends preparing conditions for the inter-ports ro-pax lines, especially between ports in SBSR, similar to ro-pax line Klaipeda – Trelleborg – Rostock.

Currently, based on the research, the ro-pax line Swinoujscie – Gdansk – Klaipeda – Swinoujscie could be implemented, at least for the tourist season from May until September. The route could get the support from the Authorities due to the fact that it could be the main sea tourism connection.

20. SUMMARY

In the Baltic Sea can be observed a variety of connections between ports. There are 56 services dedicated to regular passenger transport (ro-pax connections) and the Baltic Sea Region is also very popular in terms of cruise transport. The diversity of the tourist attractions and the historic character of majority of Baltic port cities make the region very interesting for tourists.

The dynamic changes in the cruise and shipping market occurred in recent years. Previously, changes on the market were predictable and not dictated by external factors. The Covid-19 pandemic and the war in Ukraine will definitely affect the transport in the BSR. Due to the restrictions in passenger transport on majority of ferry and ro-pax routes the traffic decreased by approx. 70-80%. When it comes to cruise market, there were ports with no cruise ships calls. When the situation with the Covid-19 pandemic began to stabilize, the aggression of the Russian Federation on Ukraine started on the 24th of February 2022. St. Petersburg used to be one of the busiest ports in terms of cruise traffic. After the war started, majority of cruise ships operators stopped calling at Russian ports and also due to ongoing warfare stopped calling to ports in the close vicinity of Russia. As a result, some of the ships did not call the Port of Helsinki and Port of Tallinn.

It is very difficult to forecast the passenger traffic in the Baltic Sea in the upcoming years. Due to a lot of market uncertainty regarding Covid-19 pandemic and the aggression of Russian Federation against Ukraine it is very difficult to forecast the passenger traffic in the Baltic Sea in the upcoming years.

Nevertheless, in recent years – before the pandemic - the Baltic ports have been characterized by growing number of tourists on-board ferries and cruise vessels. It is worth noting that introducing of new ferry connections between the Baltic ports would create the possibility of easier access not only to the port itself, but also to port cities. This will increase the popularity of the Baltic Sea region and promote Baltic countries and regions attractive to tourists.

Appendix 1. Fleets and services of intra-Baltic ro-pax operators

Operator	Service	Vessels	GT	Pax capacity	Lane metres
Color Line	Kiel-Oslo	Color Magic	75,156	2,6	1,27
		Color Fantasy	75,027	2,4	1,27
	Hirtshals-Larvik	SuperSpeed 2	34,231	1,929	2,036
	Hirtshals-Kristiansand	SuperSpeed1	36,822	2,315	1,99
	Strömstad-Sandefjord	Color Hybrid	27,164	2	760
		Color Viking	19,763	1,72	510
	Total		**268,163**	**12,964**	**7,836**
	Average		**44,694**	**2,249**	**1,306**
Destination Gotland	Nynäshamn-Visby	Visborg	32,447	1,65	1,745
		Gotland	32,447	1,65	1,745
		Gotlandia	5,632	700	-
		Gotlandia II	6,554	780	-
	Oskarhamn-Visby	Rp.			
	Västervik-Visby	Rp.			
	Total		**77,08**	**4,78**	**3,49**
	Average		**19,27**	**1,195**	**1,745**
Eckerö Group	Helsinki-Tallinn	Finlandia	36,365	2,08	1,95
		Finbo Cargo	22,154	366	2
	Grisslehamn-Eckerö	Eckerö	12,358	1,5	540
	Total		**70,877**	**3,946**	**4,49**
	Average		**23,626**	**1,315**	**1,497**
Finnlines	Helsinki-Travemünde	Finnstar	45,923	554	4,215
		Finnmaid	45,923	554	4,215
		Finnlady	45,923	554	4,215
	Malmö-Travemünde	Europalink	46,124	554	4,215
		Finnpartner	33,313	274	3,052
		Finntrader	33,313	274	3,052
	Naantali-Kapellskär	Finnswan	45,923	554	4,215
		Finnfellow	33,724	452	2,2

	Total		**330,166**	**3,777**	**29,379**
	Average		**41,271**	**471**	**3,672**
Fjord Line	Hirtshals-Stavanger-Bergen	Stavangerfjord	31,678	1,5	1,35
		Bergensfjord	31,678	1,5	1,35
	Hirshals-Langesund	Rp.			
	Strömstad-Sandefjord	Oslofjord	17,851	1,77	720
	Hirtshals-Kristiansand	Fjord FSTR	11,888	1,2	-
	Total		**93,095**	**5,97**	**3,42**
	Average		**23,274**	**1,493**	**1,14**
ForSea Ferries	Helsingør-Helsingborg	Tyco Brahe	11,434	1,1	539
		Hamlet	10,067	1	553
		Aurora of Helsingborg	11,046	1,25	528
		Mercandia VIII	4,296	383	560
	Total		**36,843**	**3,733**	**2,18**
	Average		**9,211**	**933**	**545**
FRS Baltic&Syltfahre	Mukran (Sassnitz)-Ystad	Skane Jet	5,619	800	-
	Havneby-List	Syltexpress	3,652	599	-
		Romoexpress	3,423	345	500
	Total		**12,649**	**1,744**	**825**
	Average		**4,231**	**581**	**413**
Hansa Destinations	Rostock-Visby-Nynäshamn	Drotten	29,746	1,5	1,65
Molslinjen	Odden-Aarhus (Molslinjen)	Express 4	11,345	1,022	610
		Express 3	10,842	1	610
		Express 2	10,501	1	567
	Odden-Ebeltoft	Rp.			
	Ystad-Rønne (Bornholmslinjen)	Express 1	10,504	1,2	567
		Max	5,617	780	-
	Køge-Rønne (Bornholmslinjen)	Hammershus	18,009	720	1,5
	Mukran (Sassnitz)-Rønne (Bornholmslinjen)	Povl Anker	12,131	1,5	515
	Spodsbjerg-Taars (Langelandslinjen)	Lolland	4,5	600	250
		Langeland	4,5	600	250

	Bøjden-Fynshav (Alslinjen)	Fynshav	3,381	300	240
		Frigg Sydfyen	1,676	200	160
	Total		**93,006**	**8,922**	**5,269**
	Average		**8,455**	**811**	**527**
Polferries	Świnoujście-Ystad	Mazovia	29,289	1	2,4
		Cracovia	25,028	650	2,196
		Baltivia	17,79	250	1,408
	Gdańsk-Nynäshamn	Wawel	25,318	1	1,49
		Nova Star	27,744	1,215	1,575
	Total		**125,169**	**4,115**	**9,069**
	Average		**25,034**	**823**	**1,814**
Scandlines	Puttgarden-Rødby	Deutschland	15,187	1,2	625
		Schleswig-Holstein	15,187	1,2	625
		Prinsesse Benedikte	14,621	1,14	580
		Prins Richard	14,621	1,14	580
	Rostock-Gedser	Berlin	22,319	1,3	1,6
		Copenhagen	22,319	1,3	1,6
		Kronprins Frederik	16,071	1,082	700
	Total		**120,325**	**8,362**	**6,31**
	Average		**17,189**	**1,195**	**901**
Tallink&Silja Line	Stockholm-Mariehamn-Helsinki	Silja Serenade	58,376	2,852	950
		Silja Symphony	58,376	2,852	950
	Stockholm-Mariehamn-Tallinn	Baltic Queen	48,915	2,8	1,13
	Stockholm-Mariehamn/Långnäs-Turku	Baltic Princess	48,915	2,8	1,13
		Galaxy	48,915	2,8	1,12
	Helsinki-Tallinn	Star	36,249	2,08	2
		Megastar	49,134	2,8	2,8
		Silja Europa	59,912	3,013	932
		Victoria I	40,975	2,5	1,03
	Total		**485,734**	**25,979**	**13,872**
	Average		**48,575**	**2,598**	**1,387**

TT-Line	Rostock-Trelleborg	Peter Pan	44,245	744	3,67
		Nils Holgersson	36,468	744	2,6
		Robin Hood	26,79	300	2,4
		Nils Dacke	26,79	300	2,4
		Huckleberry Finn	26,391	400	2,3
		Tom Sawyer	26,478	400	2,3
		Marco Polo	16,13	215	1,78
	Travemünde-Trelleborg	Rp.			
	Travemünde-Trelleborg-Klaipėda	Rp.			
	Rostock-Trelleborg-Klaipėda	Rp.			
	Świnoujście-Trelleborg	Rp.			
	Total		**203,298**	**3,103**	**17,45**
	Average		**29,043**	**443**	**2,493**
Unity Line	Świnoujście-Ystad	Polonia	29,875	918	1,716
		Skania	23,933	1,397	1,675
		Jan Śniadecki	14,417	57	1,078
	Świnoujście-Trelleborg	Wolin	22,874	370	1,72
		Gryf	18,653	180	1,88
		Galileusz	15,848	160	1,742
		Copernicus	14,398	160	1,63
	Total		**139,998**	**3,242**	**11,441**
	Average		**20**	**463**	**1,634**
Viking Line	Helsinki-Mariehamn-Stockholm	Gabriella	35,492	2,42	900
	Turku-Mariehamn/Långnäs-Stockholm	Viking Grace	57,565	2,8	1,275
		Amorella	34,384	2,48	900
	Stockholm-Mariehamn	Viking Cinderella	46,398	2,56	760
	Mariehamn-Kapellskär	Rosella	16,879	1,53	720
	Helsinki-Tallinn	Viking XPRS	35,913	2,5	1
	Total		226,631	14,29	5,555
	Average		37,772	2,382	926
Wasaline	Vaasa-Umeå	Aurora Botnia	24,036	800	1,5

		TOTAL INTRA-BALTIC	2,299,973	103,494	945,731
		AVERAGE INTRA-BALTIC	27,047	1,23	1,437

Source: Actia Forum based on Baltic Yearbook 2020/21

Appendix 2. Fleets and services of Baltic-North-Irish Seas ro-pax operators

Operator	Service	Vessels	GT	Pax capacity	Lane metres
DFDS	Copenhagen-Frederikshavn-Oslo	Pearl Seaways	40,231	2,168	1,482
		Crown Seaways	35,498	2,044	1,370
	Klaipėda-Kiel	Regina Seaways	25,666	600	2,496
		Athena Seaways	26,141	462	2,593
	Klaipėda-Karlshamn	Optima Seaways	25,263	328	2,240
		Victoria Seaways	25,675	600	2,490
	Paldiski-Kapellskär	Sirena Seaways	22,382	623	2,056
		Patria Seaways	18,332	243	1,800
	Total		**219,188**	**7,068**	**16,527**
	Average		**27,399**	**884**	**2,066**
Stena Line	Gothenburg-Kiel	Stena Germanica	51,837	1,300	3,800
		Stena Scandinavica	57,958	900	3,800
	Gothenburg-Frederikshavn	Stena Danica	28,727	2,274	1,640
		Stena Jutlandica	29,691	1,500	2,100
	Halmstad-Grenaa	Stena Nautica	19,504	900	1,265
	Karlskrona-Gdynia	Stena Spirit	39,193	2,400	2,214
		Stena Vision	39,191	2,400	2,214
		Stena Nordica	24,206	405	1,950
		Stena Estelle	48,035	1,200	3,600
	Rostock-Trelleborg	Macklenburg-Vorpommern	37,987	600	-
		Skane	42,705	600	3,295
	Travemünde-Karlskrona-Liepāja	Stena Gothica	13,294	186	1,598
		Stena Livia	26,904	800	2,255
		Urd	13,144	186	1,598

	Stockholm Norvik-Ventspils	Stena Scandica	35,456	970	2,875
		Stena Flavia	26,904	800	2,555
	Total		**534,736**	**17,421**	**36,759**
	Average		**33,421**	**1,089**	**2,451**
		TOTAL BALTIC, NORTH, IRISH SEA	**753,924**	**24,489**	**53,286**
		AVERAGE BALTIC, NORTH, IRISH SEA	**30,410**	**987**	**2,258**

Source: Actia Forum based on Baltic Yearbook 2020/21

Appendix 3. The number of passengers on individual routes to/from Baltic in years 2017-2021 in thou. passengers in international traffic

Countries	Service	2017	2018	2019	2020	2021	Change 2021/2020	Change 2021/2019
FI-EE	Helsinki-Tallinn	9007	8855	8929	4098	3200	-22%	-64%
SE-DK	Ystad-Rønne (Bornholmslinjen)	1448	1487	1637	1425	1547	9%	-5%
SE-FI/FI-FI	Stockholm-Mariehamn/Långnäs-Turku	2681	2578	2572	805	1011	26%	-61%
DE-DK	Rostock-Gedser	1709	1738	1680	772	943	22%	-44%
DE-SE	Rostock-Trelleborg	589	660	821	589	744	26%	-9%
SE-FI	Stockholm-Mariehamn	2486	2454	2367	542	703	30%	-70%
PL-SE	Świnoujście-Ystad	732	721	698	598	690	15%	-1%
SE-FI	Grisslehamn-Eckerö	932	974	963	400	490	23%	-49%
SE-DK	Gothenburg-Frederikshavn	1225	1192	1228	421	459	9%	-63%
SE-PL	Karlskrona-Gdynia	655	683	688	389	428	10%	-38%
SE-FI-FI	Stockholm-Mariehamn-Helsinki	2360	2303	2276	376	405	8%	-82%
DK-NO	Hirtshals-Kristiansand	1265	1235	1247	442	390	-12%	-69%
SE-NO	Strömstad-Sandefjord	1397	1498	1613	192	366	91%	-77%
PL-SE	Świnoujście-Trelleborg	343	336	359	359	354	-1%	-1%
DE-NO	Kiel-Oslo	1095	830	1076	344	334	-3%	-69%
FI-SE	Mariehamn-Kapellskär	716	673	747	191	271	42%	-64%
DK-NO	Hirtshals-Larvik	675	682	694	371	259	-30%	-63%
SE-FI-EE	Stockholm-Mariehamn-Tallinn	1070	1072	983	170	258	52%	-74%
DE-SE	Travemünde-Trelleborg	278	273	296	95	252	165%	-15%
SE-DE	Gothenburg-Kiel	452	436	446	165	238	44%	-47%
SE-LV	Stockholm Norvik-Ventspils	210	210	232	155	206	33%	-11%
LT-SE	Klaipėda-Karlshamn	152	171	141	168	193	15%	37%
SE-DE	Malmö-Travemünde	246	298	280	265	175	-34%	-38%
PL-SE	Gdańsk-Nynäshamn	105	117	166	149	162	9%	-2%

DK-DK-NO	Copenhagen-Frederikshavn-Oslo	1264	1223	1264	251	160	-36%	-87%
FI-SE	Naantali-Kapellskär	154	176	180	136	156	15%	-13%
EE-SE	Paldiski-Kapellskär	79	80	90	130	142	9%	58%
FI-SE	Vaasa-Umeå	200	211	207	57	107	88%	-48%
FI-DE	Helsinki-Travemünde	148	151	158	85	101	19%	-36%
DE-DK	Mukran(Sassnitz)-Rønne (Bornholmslinjen)	108	111	142	88	95	8%	-33%
LT-DE	Klaipėda-Kiel	92	77	99	81	60	-26%	-39%
DK-NO-NO	Hirtshals-Stavanger-Bergen	210	155	157	66	59	-11%	-62%
SE-DK	Halmstad-Grenaa	156	150	145	55	58	5%	-60%
DK-NO	Hirshals-Langesund	263	253	242	118	56	-53%	-77%
DE-SE-LT	Travemünde-Trelleborg-Klaipėda	0	5	12	40	52	30%	333%
DE-SE	Mukran (Sassnitz)-Ystad	303	302	278	14	17	21%	-94%
DE-SE-LV	Travemünde-Karlskrona-Liepāja*	0	0	0	7	13	86%	+/-0%
DE-SE-LT	Rostock-Trelleborg-Klaipėda	0	69	24	17	5	-71%	-79%

Source: Actia Forum based on Eurostat, national statistics and own estimations

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