Local ports and their impact on regional economy

The report was prepared within the framework of the European project
titled: INCONE60 – Inland Blue Transport Connector E 60,
no. STHB.03.01.00-11-0132/17,
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LIST OF ABBREVIATIONS

3PL	Third-Party Logistics
AGN	European Agreement on Main Inland Waterways of International Importance
AGR	European Agreement on Main International Traffic Arteries
AWT	Advanced World Transport
BMVI	Federal Ministry of Transport and Digital Infrastructure
ECSA	European Community Shipowners' Association
ERTMS	European Railway Traffic Management System
EU	European Union
FAL	Convention on Facilitation of International Maritime Traffic
GDP	Gross Domestic Product
GMP	Good Manufacturing Practices
GRT	Gross Registered Tonnage
HCV	High Capacity Vehicles
HSR	High-Speed Rail
ICE	Intercity-Express
ICT	Information and Communications Technology
IFB	Interferryboats
IMO	International Maritime Organization
ISPS	International Ship and Port Facility Security Code
IWT	International Waterway Transport
IWW	International Waterway
LHS	Broad Gauge Metallurgy Line
LNG	Liquified Natural Gas
LOA	Length Overall

LPI	Rail Performance Index
MOLC	Municipality-Owned Limited Company
MSG	Municipality Self-Governed
NGO	Non-governmental Organization
NUTS	Nomenclature of Territorial Units for Statistics
PKP	Polish National Railways
RPI	Rail Performance Index
SAR	Safe and Rescue
SKM	Suburban Train
TEN-T	Trans-European Transport Networks
TEU	Twenty-feet Equivalent Unit
TINA	Transport Infrastructure Needs Assessment
UK	United Kingdom
VAT	Value Added Tax

EXECUTIVE SUMMARY

INCONE60 – Inland Blue Transport Connector E 60 is a three-year cross-border cooperation project of the Interreg South Baltic Cross-border Cooperation Programme 2014-2020. It is part-financed by the European Union (European Regional Development Fund). The partnership is made of five project partners: three R&D institutions – the Maritime Institute of Gdynia Maritime University (Poland, Lead Partner), EUCC Baltic Office and Coastal Research and Planning Institute (both from Lithuania), as well as two local port authorities – Port of Władysławowo (Poland) and Port of Oostende (Belgium). The goal of the project is to develop a concept for the creation of an alternative transport route along the international waterway E 60 and link it to a network of the inland waterways – E 30, E 40 and E 70. The project aims to formulate a set of transport solutions to support active development of peripheral coastal regions of the South Baltic area by focusing on local ports as growth centres.

The following study purpose is to analyse the local ports on Lithuanian, Polish, German, Danish, Swedish, and Belgian coast, and their impact on regional economy. It was prepared within the framework of the European project titled: *Inland Blue Transport Connector E 60* – INCONE60, within work package 3 – Transport economics and market review, within the activity D3.1.

In the first chapter of the study, the authors try to present and analyse transport system of the South Baltic region. The subjects considered were short sea shipping, inland waterway transport, railways and road transport of individual countries. Despite the free movement of passengers, goods and services resulting from globalization and liberalization of the worldwide transport market, there are still many barriers to the implementation of transport and logistics processes. These barriers and main bottlenecks were also identified. To make the analysis of

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individual means of transport complete, an analysis of the transport costs by individual modes of transport was also undertaken.

The second chapter presents current state of IWW E 60. The precise route of IWW E 60 in the area of the South Baltic region was delimited and NUTS 3 subregions located under direct influence of IWW E 60 were also identified. The analysis of these subregions was undertaken in terms of, for example, population or gross domestic product. The conducted study made it possible to assess the impact of IWW E 60 on coastal regions in the South Baltic Sea region and the North Sea.

The third chapter focuses on the analysis of current state of local seaport located along IWW E 60. Port facilities and functions were identified. The condition of port infrastructure and types of cargo handled in individual ports were examined. Cost analysis related to the transhipment of cargo was also undertaken. Establishing the extent of cooperation with local authorities was also a very important step when examining the local seaports.

The last chapter entirely focuses on port infrastructure, both from the land side and sea side. Navigation conditions and their role for development of local seaports have been described. To that end, the case study of Vordingborg port has been conducted.

The entire study is a comprehensive analysis of the state of the South Baltic local seaports and their impact on regional economy. The whole transport system have been analysed and the possibilities of using IWW E 60 for the development of local seaports were presented.

INTRODUCTION

The study was prepared within the framework of the European project titled: INCONE60 – *Inland Blue Transport Connector E 60*, within work package 3 – Transport economics and market review, within the activity D3.1. Analysis of local ports and their impact on regional economy.

Data was collected for the majority of local ports regarding the infrastructure and current cargo structure. Longer term (5 years) cargo turnover trends were available and studied. Different sorts of bulk cargo (grain, wood, construction materials) are typical for the South Baltic local and regional ports. Yet, the passenger traffic is very volatile and in many cases irrelevant for the economic perspectives of the South Baltic local ports. In many of these ports, particularly, the lesser ones, recreational fisheries (sea angling) is becoming a more important source of income than commercial fisheries. For instance, Darłowo is turning into a Polish 'capital of recreational cod fishing'.

It is notable, that Sassnitz/Mukran is the only South Baltic local port in the energy sector. It was necessary to find out about municipal, regional and national plans for investments into the port infrastructure and dredging for 2021-2027 (currently available data was outdated). Easier task was to gain a broader overview of the current situation of NUTS 3 level road freight cargo statistics, including both the coastal and the hinterland NUTS 3 regions (beyond the scope of this study).

As a result, it turned out to be impossible to transfer the development model of the Oostende Port, which is located in a completely different socio-economic environment compared to the South Baltic area with its different challenges. It is hard to imagine Darłowo as an innovation hub creating huge Economic Value Added (EVA) and well-paid work places in the port. Many Danish and German local ports also struggle to find new niches for an innovative, post-fisheries and

post-agriculture rejuvenation. Wind energy services and aquaculture, coaster freight cargo shipment, leisure boating and sea angling are the most promising maritime sector development directions of the South Baltic local ports.

Currently, the volume of freight in the South Baltic region is rapidly increasing. Forecasts show that this trend will continue in the upcoming years. At the same time, there is an identifiable decline in the share of the railway sector in the European freight market in favour of road transport. This, in turn, causes several adverse environmental effects, among others, increased significant congestion of European road infrastructure. Therefore, the development of alternative transport solutions in the South Baltic area is urgently required.

Short sea shipping is considered as 'one of the most promising modes of freight transport'.[1] Experts define it as the movement of cargo and connection across the sea between ports located in closed waters bordering Europe. Important features supporting the development of short sea shipping include the use of international waterway E 60 (IWW E 60). This action would give a strong impulse for the development of local ports along the South Baltic coast, which in turn should stimulate the growth of the entire region.

The E 60 is a waterway route going from Gibraltar to the north along the coast of Portugal, Spain, France, Belgium, the Netherlands, Germany, Poland, Lithuania, Latvia, Estonia and Russia to the waterway St.-Petersburg-Volga-Baltic, further through the White Sea-Baltic Canal, along the White Sea to Arkhangelsk.[2]

The E 60 waterway has tremendous potential and might play an essential role in the ecological transport network of passengers and freight. Unfortunately, international inland waterway shipping and short sea shipping on the E 60 route in the southern Baltic region practically do not exist. In comparison with road

[1] Shortsea Shipping Days 2019 | EENMA. https://www.shortsea.gr/sss-days-2019/
[2] *European Agreement on Main Inland Waterways of International Importance (AGN),* United Nations Economic Commission for Europe, Geneva 1996

transport, short sea shipping faces a challenging obstacle – complex formalities. Attempts to navigate the E 60 route have never been made, or have only been made on some short sections connecting two neighbouring ports.

This report presents existing transport systems in the area of impact of the E 60. Road, rail, inland transport and short sea shipping were analysed. Authors identify and present transport systems in Poland, Lithuania, Sweden, Denmark, Germany and Belgium. The development factors and existing barriers of transport systems have also been presented.

Authors showcase the most critical regional seaports located on the E 60 route. Further, they present ports' activity profiles, the volume of transhipments and passenger transport, condition and parameters of port infrastructure as well as the type of cooperation with local authorities. Problems faced by local seaports and the opportunities to develop existing potential have been identified as well.

Taking advantage of the opportunities offered by each port requires the implementation of many investments, both in the field of port infrastructure facilities and infrastructure providing access to ports, as well as ICT infrastructure. In-depth research is needed to formulate detailed recommendations for actions that could overcome, or at least reduce, barriers for further development. It seems particularly relevant to research the place of regional ports in regional policies and the creation of regular shipping connections along the coast of the South Baltic countries, using the international waterway E 60, which will undoubtedly have a positive impact on the development of the ports and regions in which they are located.

Energy-efficient and environmentally friendly transport solutions are crucial to counteract the development of road transport in the southern Baltic region on the one hand, and to meet the growing demand for transport from business and

industry on the other. If no action is taken, achieving the principal goals of the Baltic Sea Strategy would be at risk.

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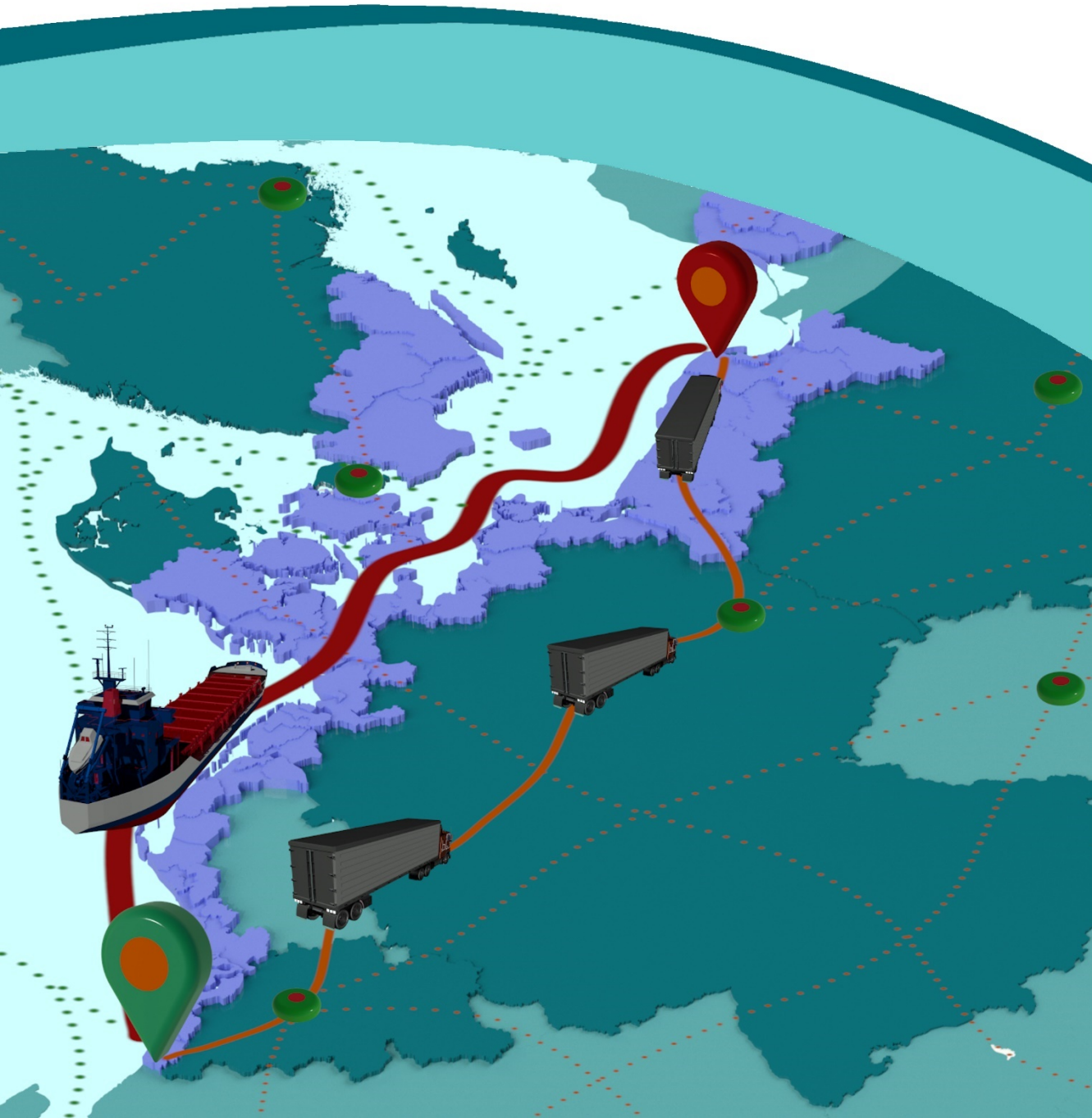
1

Transport system of the South Baltic region



1. TRANSPORT SYSTEM OF THE SOUTH BALTIC REGION

Despite the free movement of passengers, goods and services resulting from globalization and liberalization of the worldwide transport market, there are still many barriers to the implementation of transport and logistics processes. These restrictions result not only from technical and technological aspects, but also environmental ones, or national provisions. This chapter will attempt to analyse the transport systems of individual countries.

The first thing that can help compare these systems is LPI (Logistics Performance Index). It is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI 2018 allows for comparisons across 160 countries. It is based on a worldwide survey of operators on the land (global freight forwarders and express carriers), providing feedback on the logistics 'friendliness' of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries where they trade and experience of global logistics environment. Feedback from operators is supplemented with quantitative data on the performance of critical components of the logistics chain in the country of operation.[3]

The LPI consists therefore of both qualitative and quantitative indicators and helps build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a country and offers two different perspectives: international and domestic.

[3] Data | DataBank, http://databank.worldbank.org/databases/page/1/orderby/popularity/direction/desc?qterm=LPI

The logistics performance is the weighted average of the country scores in the six key dimensions:[4]

1. The efficiency of the clearance process (i.e., speed, simplicity and predictability of formalities) by border control agencies, including customs;
2. Quality of trade and transport-related infrastructure (e.g., ports, railroads, roads, information technology);
3. Ease of arranging competitively priced shipments;
4. Competence and quality of logistics services (e.g., transport operators, customs brokers);
5. Ability to track and trace consignments;
6. Timeliness of shipments in reaching the destination within the scheduled or expected delivery time.

[4] Logistics Performance Index - Wikipedia.
https://en.wikipedia.org/wiki/Logistics_Performance_Index

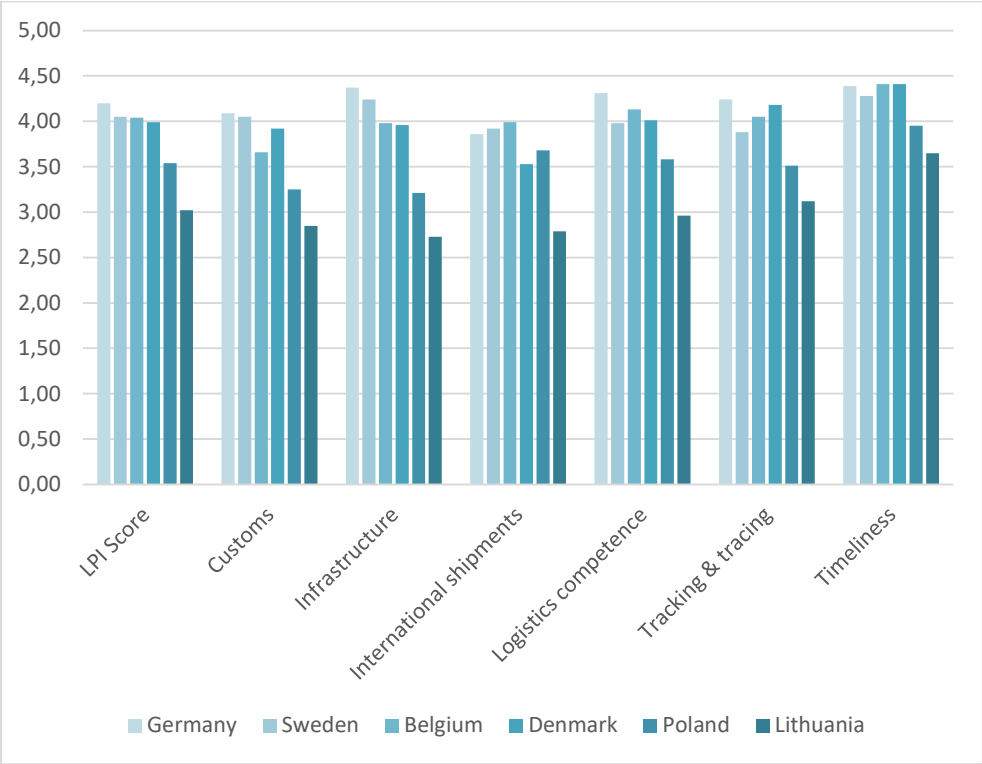


Figure 1. The Logistics Performance Index (LPI) of South Baltic countries in 2018

Source: lpi.worldbank.org/international/scorecard, accessed on 30.03.20.

The Rail Performance Index[5] (RPI) is another indicator that relates directly to the rail transport system. The RPI measures and analyses three components of railway performance:

- The intensity of use: To what extent is rail transport used by passengers and freight companies?
- Quality of Service: Are the trains punctual and fast and is rail travel affordable?
- Safety: Does the railway system adhere to the highest safety standards?[6]

[5] The 2017 European Railway Performance Index, The Boston Consulting Group, 2017.

Safety and quality of service (especially punctuality) are the most important factors underlying changes in a system's performance. Countries experiencing a decrease in overall performance typically have seen a decrease in their safety rating, while those with improving performance have usually experienced an increase in the quality of service rating.[7]

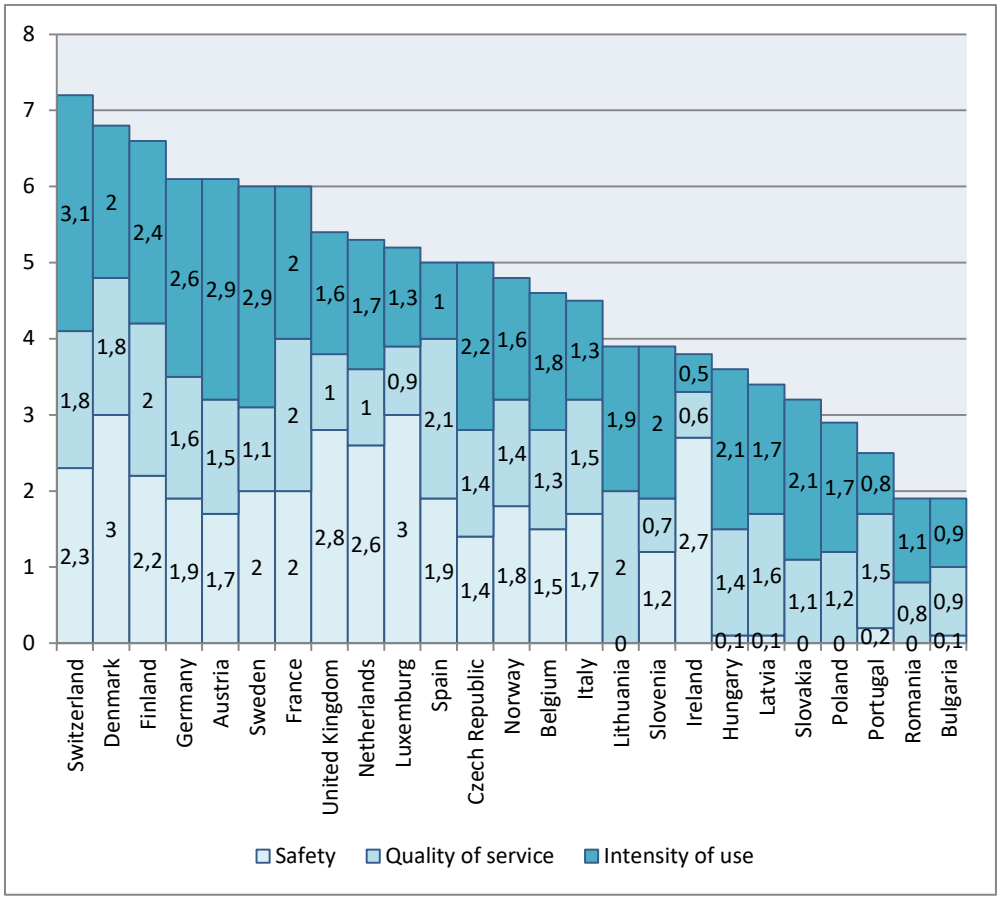


Figure 2. Ranking of European railways in 2017

Source: Own elaboration based on The 2017 European Railway Performance Index, The Boston Consulting Group, 2017.

[6] 2017 European Railway Performance Index. https://image-src.bcg.com/Images/BCG-The-2017-European-Railway-Performance-Index-Apr-2017-2_tcm9-152164.pdf
[7] Ibidem

In this chapter, along with the road and railway system, the inland waterway transport systems in Poland, Lithuania, Sweden, Denmark, Germany and Belgium are also being analysed. The existence of waterways determines whether inland navigation is a part of the country's transport system. At the same time, the dependence of waterways on natural conditions is a fundamental limitation to the possibilities of flexible adaptation to changing transport needs.

Table 1.

Inland waterway transport in analysed countries

Country	2013	2014	2015	2016	2017	2018
	1000 t					
Poland	3 185	5 899	5 036	3 911	3 604	3 126
Lithuania	36	47	68	52	15	n/d
Sweden	n/d	n/d	n/d	288	324	270
Germany	226 864	228 489	221 369	221 349	222 731	197 904
Belgium	187 404	190 303	188 158	192 938	201 129	204 782

Source: Eurostat, appsso.eurostat.ec.europa.eu, accesses on 25.06.2019.

1.1. Lithuania

Lithuania actively participates in the activities of the Transport Working Group created on the initiative of the European Commission. Therefore, the selected direction of the development of the transport system infrastructure is the reconstruction of the existing roads and railway lines engaged in international

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carriages following the development principles of the international transport corridors.[8]

Discussions on the directions of such corridors across the territory of Lithuania resulted in agreement at the Conferences of the European Ministers of Transport in 1994 and 1997. It is specified in the documents, and Mutual Memoranda of Understanding adopted at these conferences that two routes of international European transport corridors (TEN-T) cross Lithuania[9]:

- North-South direction: corridor No. I – the motorway „Via Baltica“ and the railway line „Rail Baltica“, on the route Tallinn–Riga–Saločiai–Panevėžys–Kaunas–Kalvarija–Warsaw, and its branch No. IA (Tallinn–Riga–Šiauliai–Tauragė–Kaliningrad).
- East-West direction: the branch IXB (Kyiv–Minsk–Vilnius–Klaipėda) and the branch IXD (Kaunas–Kaliningrad) of the corridor No. IX.

Table 2.

Goods carried by all modes of transport in Lithuania

Type of transport	2014	2015	2016	2017	2018
	thousand tonnes				
TOTAL	**127 147.8**	**127 106.6**	**130 957.1**	**149 790.9**	**165 175.2**
All modes of transport. excluding oil pipeline	114 121.9	113 709.9	118 027.2	136 582.3	152 849.5
Rail transport	49 000.1	48 053.2	47 650.6	52 638.2	56 775.7
Road transport	57 591.3	58 601.1	63 570.6	76 979.6	89 104.8
Water	7 529.7	7 054.8	6 805.4	6 964.0	6 968.7

[8] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1/about-the-sector
[9] Ibidem

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Type of transport	2014	2015	2016	2017	2018
	thousand tonnes				
transport					
of which:					
Sea transport	6 453.1	5 959.4	5 733.7	5 887.6	5 790.9
Inland waterway transport	1 076.7	1 095.3	1 071.7	1 076.4	1 177.8
Air transport	0.7	0.8	0.6	0.4	0.3
Oil pipeline transport	13 025.9	13 396.7	12 929.9	13 208.6	12 325.7

Source: Statistics Lithuania, osp.stat.gov.lt.

When the new European integration process started, the concept of the TINA network was elaborated at the end of 1999. Its structure is composed of the said transport corridors, and other automobile roads of international significance included into the lists of the United Nations European agreement AGR (European Agreement on Main International Traffic Arteries). All these structures, together with the international airports of Vilnius, Kaunas, and Palanga, are regarded as part of the Trans-European network in Lithuania.[10]

Table 3.

Tonne-kilometres by all modes of transport in Lithuania

Quarter	Transport of all types	All modes of transport, excluding oil pipeline	Rail transport	Road transport	Inland waterways transport	Air transport	Oil pipeline transport

[10] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1/about-the-sector

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	thousand tonne-kilometres						
2019	**69 629 280**	**69 299 296**	**161 80 599**	**5 3117 437**	**1 622**	**82**	**329 542**
2019Q4	17 020 720	16 941 691	40 71 413	1 2870 098	155	25	79 029
2019Q3	17582 817	17 510 480	41 66 908	1 3343 021	535	20	72 333
2019Q2	17 536 037	17 463 664	38 72 786	1 3590 505	793	19	71 934
2019Q1	17 489 706	17 383 461	40 69 492	1 3313 813	139	18	106 246
2018	**60 802 898**	**60 476 453**	**168 84 825**	**4 3590 351**	**1 200**	**76**	**326 443**
2018Q4	15 183 478	15 115 150	45 56 032	1 0558 941	156	20	68 328
2018Q3	15 444 067	15 377 637	42 47 191	1 1129 876	551	19	66 429
2018Q2	15 033 234	14 946 378	4 142465	1 0803 547	347	19	86 856
2018Q1	15 142 119	15 037 288	3 939 137	1 1097 987	146	18	104 830

Source: Statistics Lithuania, osp.stat.gov.lt.

1.1.1. Short sea shipping

Lithuania recorded the second largest relative increase in short sea shipping between 2017 and 2018 among all EU countries. Liquid bulk remained the dominant type of cargo in Lithuanian short sea shipping.

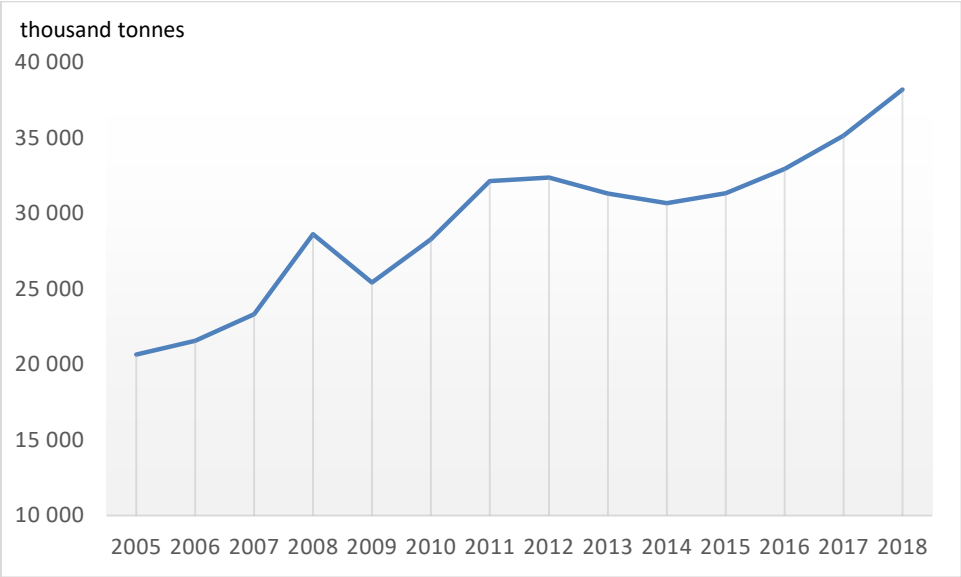

Figure 3. Short sea shipping in Lithuania

Source: Eurostat data.

The share of short sea shipping in total maritime transport has been decreasing in recent years. In 2018, however, there was an increase to the level from 2015, up to 72.8% (Figure 4). Most of the goods were transported to the ports located in the Baltic Sea basin.

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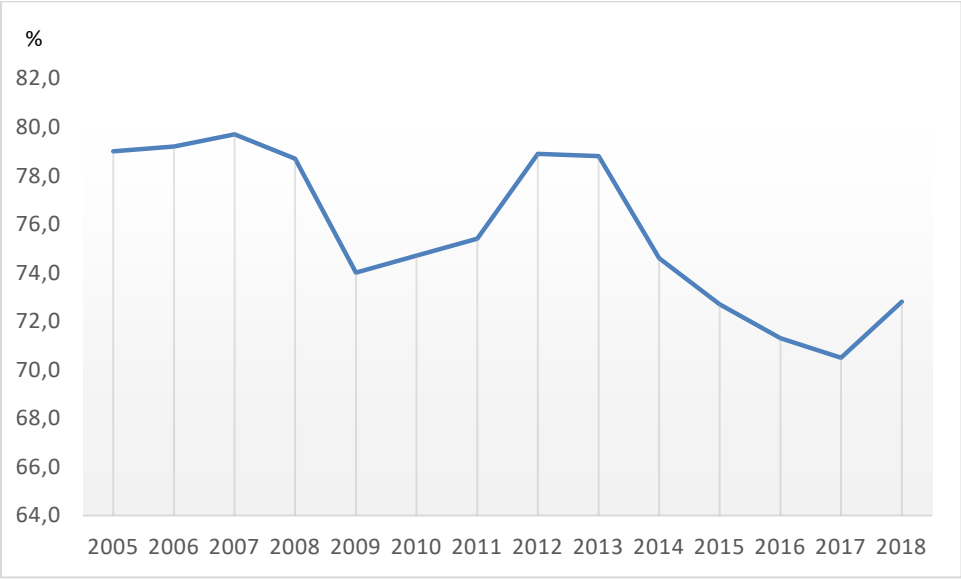

Figure 4. Share of short sea shipping in total maritime transport in Lithuania

Source: Eurostat data.

1.1.2. Inland waterway transport

SE Inland Waterways Authority (VĮ Vidaus vandens kelių direkcijahas) been appointed as manager of the inland waterways of the national importance of the Republic of Lithuania; during navigation, the Authority controls, manages, looks after and runs inland waterways of national importance and ensures that they meet the guaranteed depth. Inland waterways of local importance are run by local municipalities.[11]

[11] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/water-transport-2/about-the-sector-2

The total length of inland waterways of national importance in the Republic of Lithuania is 822 km. The total length of inland waterways of local importance is 60.3 km.[12]

In implementing the 'Assurance of Waterway Transport' programme, the Authority operated (marked the fairway, cleaned the riverbed and installed regulatory barriers, did hydrographic work) 424.7 km of inland waterways of national importance during the navigation period in 2017. In 2018 the Authority planned to operate 429.7 km of inland waterways of national importance.[13]

A total of 291.2 km of inland waterway along the Nemunas River from Kaunas to the mouth of the Atmata and in the Curonian Lagoon from the mouth of the Atmata to Nida and Klaipėda (99.9 km from Kaunas to Jurbarkas, 126 km from Jurbarkas to the mouth of the Atmata, and 65.3 km in the Curonian Lagoon) have been included, by a decision of the Inland Transport Committee of the United Nations Economic Commission for Europe, in the pan-European core inland waterways network and have been ascribed to the E 41 inland waterway of international importance. This waterway joins into the E 70 waterway in the Curonian Lagoon near Nida (a 4 km stretch from the border to Nida merges with the section of E 41 from Nida and Klaipėda); the E 70 provides access to the Western European inland waterway network via Kaliningrad Oblast (Russia).[14]

Of the inland waterways of local importance that are in operation (or used more intensively for shipping), the following are especially noteworthy: the 8.7 km stretch of the Curonian Lagoon from Juodkrantė to Dreverna (which merges with the E 41), the 5 km stretch of the Šyša River (which connects the Šilutė small ship port with the E 41), the 4.3 km stretch of the Akmena–Danė River in the city of

[12] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/water-transport-2/about-the-sector-2
[13] Ibidem
[14] Ibidem

Klaipėda, and the 4 km route of Lake Galvė in Trakai. The other inland waterways of local importance are not yet in operation.[15]

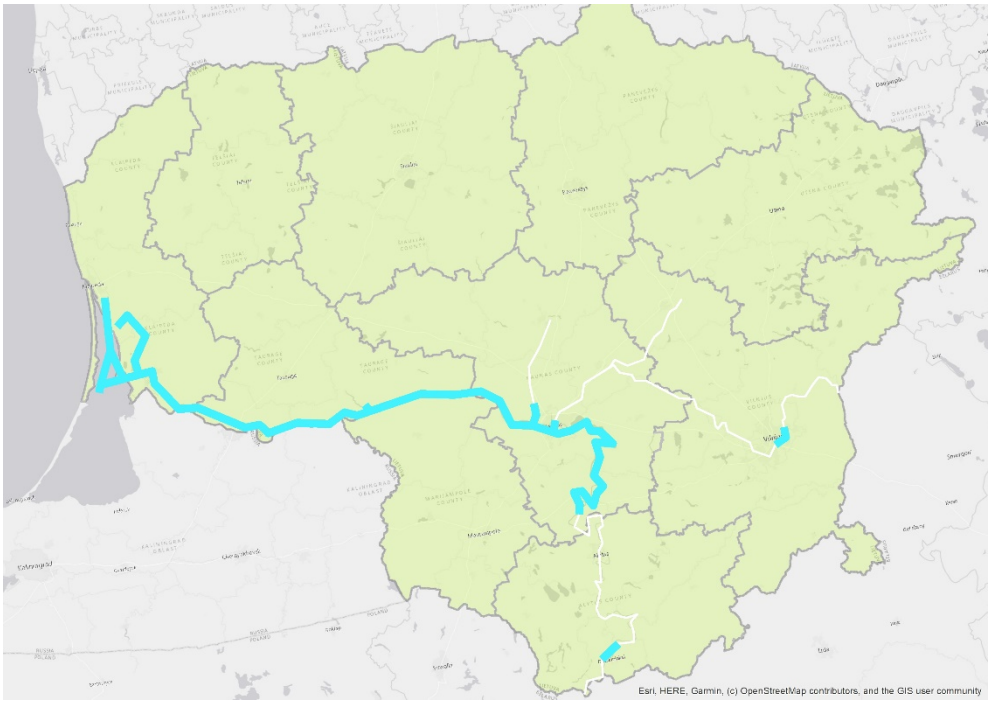

Figure 5. Operating inland waterways of national importance in Lithuania

Source: own elaboration based on The State Enterprise Inland Waterways Directorate, vvkd.lt/en/vidaus-vandenu-keliai/, accessed on 09.04.2020.

The following registered inland waterway ports are currently in operation:[16]

- Kaunas Winter Inland Waterway Port,
- Uostadvaris Inland Waterway Port,
- Nida Passenger Port,

[15] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/water-transport-2/about-the-sector-2
[16] Ibidem

- Castle Harbour (in Klaipėda).

1.1.3. Railway transport

Lithuania currently operates 1 767 km of the railway network, and its modernisation and upgrade are essential for the increase of the transport performance and the integration within the European railway system. It is because Lithuania's railway system has a unique characteristic of interconnection: two gauges into one railway network – 1 435 and 1 520 mm.

Table 4.

Lithuanian railway length at the end of the year

Type of line	2014	2015	2016	2017	2018
	kilometres				
Railway tracks	2 188.5	2 335.5	2 335.7	2 335.7	2 335.1
Operated railway lines	1 767.6	1 877.2	1 911.3	1 911.3	1 910.7
Non-electrified lines	1 645.6	1 755.2	1 789.3	1 758.9	1 758.3
Non-electrified single track	1 369.5	1 441.7	1 453.6	1 453.6	1 454.2
Non-electrified double track or more	276.1	313.5	335.7	305.3	304.1
Electrified lines	122	122	122	152.4	152.4
Electrified single track	5	5	5	5	5
Electrified double track or more	117	117	117	147.4	147.4

Source: Statistics Lithuania, osp.stat.gov.lt.

The biggest challenge Lithuania's transport system faces is a better integration into the TEN-T network, that can be achieved through technical improvements, construction of missing links and connections, as well as the increase of the transport capacity. Moreover, in this case, Lithuania relies on European co-

financing in order to reach its objectives. Currently, the railway potential is not used to its full capacity due to the lack of intermodal terminals and limited effectiveness of the interoperability.[17]

Table 5.

Tonne-kilometres of Lithuanian intermodal transport units by rail

Year	Total intermodal transport units	Containers
	thousand tonne-kilometres	
2018	530 028	530 028
2017	359 976	359 976
2016	253 731	253 731
2015	266 087	266 087
2014	332 991	332 991

Source: Statistics Lithuania, osp.stat.gov.lt.

Within Priority Axis 6, on "Supporting a multimodal Single European Transport Area by investing in the Trans-European Transport (TEN-T) Network", Lithuania's actions include the renewal, upgrading and development of railway infrastructure on transport Corridor IXB (including the construction of the second track, and the electrification of Kena-Klaipeda), the construction of the railway infrastructure with a track gauge of 1 435 mm within transport corridor I – Rail Baltica, the installation of new railway traffic management and control systems, and the deployment ERTMS on the new 1 435 mm rail and on the existing 1 520 mm. Relating to the Operational Programme for EU Structural Funds Investments for 2014-2020, Lithuania received a total EU co-financing of EUR 6.7 billion. The total OP budget is 7.9 billion EUR. A large part of the funds was allocated for

[17] Lithuania's rail development, a priority and a necessity. https://www.railwaypro.com/wp/lithuanias-rail-development-a-priority-and-a-necessity/

transport and energy networks to the projects that aim to remove barriers to the core network infrastructure through modernisation and development works.[18]

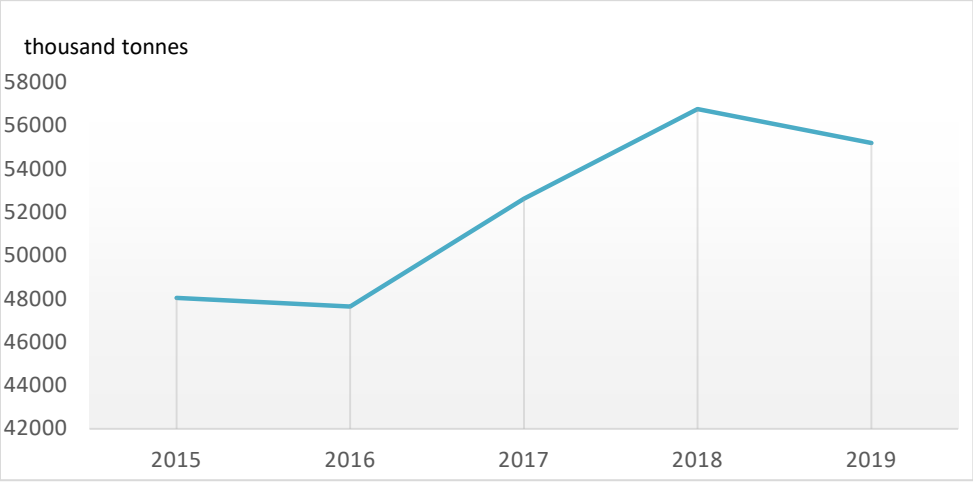

Figure 6. Transport of cargo by rail in Lithuania

Source: own elaboration based on Statistics Lithuania, osp.stat.gov.lt.

Within the multiannual financial framework 2014-2020, more than 50% of investments are provided to railway projects. Through this investment, Lithuania is encouraged to modernise and develop its railway infrastructure network and to contribute to the EU target to shift the road transport to railways. Among other rail projects, Lithuania is implementing the Rail Baltica, one of the most ambitious infrastructure project in Baltic countries. With a EUR 2.47 billion investment (only on Lithuania‘s territory), Lithuania is the leader in implementing this project. Recently, Lithuanian Railways announced the open competition on the preparation and implementation of the expropriations for European standard railway section Kaunas-Lithuanian/Latvian state border (as part of Rail Baltica), and signed the

[18] Lithuania’s rail development, a priority and a necessity.
https://www.railwaypro.com/wp/lithuanias-rail-development-a-priority-and-a-necessity/

contract on the conduction of the upgrade feasibility study for the section "Polish/Lithuanian state border–Kaunas–RRT Palemonas."[19]

1.1.4. Road transport

According to their capacity, social and economic significance, all the roads in Lithuania are divided into national, local and urban. The total length of the road network is equal to 85 000 km. National roads are divided into primary, national and regional roads. National roads based on exclusive property rights belong to the State.

Local roads are divided into public and internal roads. Public roads and streets by property right belong to municipalities, while internal roads may belong to the state, municipalities, other legal and natural persons.[20]

Table 6.

Length of Lithuanian roads

Types of roads	2014	2015	2016	2017	2018
	kilometres				
TOTAL	**85 034**	**84 933**	**84 495**	**84 317**	**85 572**
Motorways	309	309	314	324	324
E category roads	1 639	1 639	1 639	1 639	1 639
State roads	21 252	21 249	21 244	21 241	21 238
State main roads	1 746	1 750	1 751	1 751	1 751
State national roads	4 927	4 926	4 925	4 925	4 928
State regional roads	14 579	14 574	14 568	14 566	14 559

[19] Lithuania's rail development, a priority and a necessity. https://www.railwaypro.com/wp/lithuanias-rail-development-a-priority-and-a-necessity/
[20] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1/about-the-sector

Types of roads	2014	2015	2016	2017	2018
	kilometres				
Local roads	63 782	63 684	63 250	63 076	64 334

Source: Statistics Lithuania, osp.stat.gov.lt.

Notwithstanding the fact, that the former Soviet Union together with other countries signed the AGR in Geneva, as far back as on 25 November 1975, Lithuania is shown as the land with no roads on the E-network road map of Europe published in 1988.[21]

After the re-establishment of Lithuanian independence, the situation changed. Lithuania decided to join the AGR agreement by the Decree of the Government of 28 July 1993, and the agreement was signed by Lithuania on 27 August 1993.

Six main Lithuanian roads have been included into the E-network roads of Europe:[22]

- E 67 „Via Baltica“ Helsinki–Tallinn–Riga–Panevėžys–Kaunas–Warsaw–Wroclaw–Cracow–Prague;
- E 28 Berlin–Gdansk–Kaliningrad–Marijampolė–Prienai—Vilnius–Minsk;
- E 77 Pskov–Riga–Šiauliai–Kaliningrad–Warsaw–Cracow–Budapest;
- E 85 Klaipėda–Kaunas–Vilnius–Lyda–Tchernovcy–Bucuresti–Alexandropouli;
- E 262 Kaunas–Utena– Daugavpils –Rezekne–Ostrov;
- E 272 Vilnius–Panevėžys–Šiauliai–Palanga–Klaipėda.

[21] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1/about-the-sector
[22] Ibidem

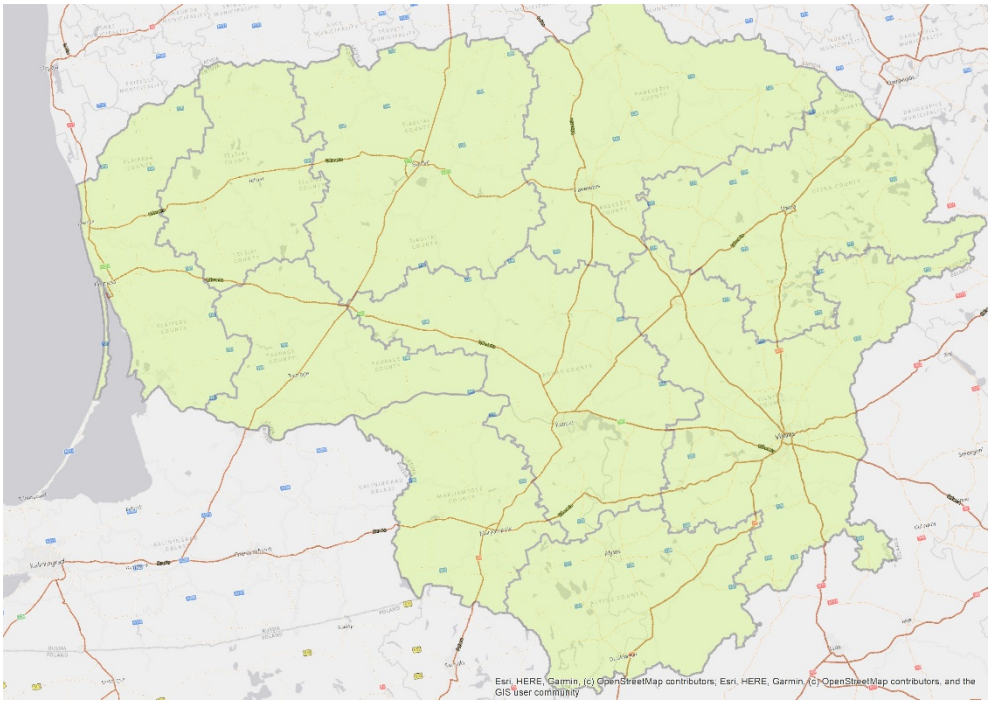

Figure 7. Main Lithuanian roads

Source: own elaboration.

Road transport is the best and most flexible Lithuanian mode of transport to deliver goods to any destination. Goods transport by road accounts for about 50% of total transported goods. Passenger transport by road accounts for about 97% of total passenger transport.[23]

In 1993, in Lithuania, there were only 88 carriers licensed to carry passengers and goods, which had only 960 licensed buses and trucks. In 2018, Lithuanian carriers had 5 742 licenses to carry passengers and goods, and a fleet of more than 49 thousands vehicles, of which more than 46 thousands were trucks.[24]

[23] About sector | Ministry of Transport and Communications. https://sumin.lrv.lt/en/sector-activities/roads-and-road-transport-1/about-the-sector
[24] Ibidem

1.1.5. Barriers and bottlenecks

One of the most significant barriers to the development of the transport system in Lithuania is its heavy reliance on road transport – goods transport by road accounts for about 50% of total goods transport.

Another crucial issue is the nature of the rail network. Lithuania has two gauges into one railway network. There is a need to unify the rail system, which will also allow the integration of rail connections with other European countries and the TEN-T network. Very high investments are needed. Within the financial framework of 2014-2020, more than 50% of investments[25] were provided to railway projects, but the needs are much higher.

The Lithuanian rail network remains among the lowest electrified rail networks in the EU. No progress has been observed throughout 2010-2014, and only 6.5% of rail tracks are electrified (2018). However, with the help of different financial and funding instruments, progress is expected over the coming years. Rail (freight) traffic is mostly dominated by East-West flows, while the North-South axis is underdeveloped.

The Lithuanian part of the TEN-T Core Network essentially still needs to be built. Only the inland waterways are fully ready, and they do not play, however, any vital role for freight transport in Lithuania.[26]

There are no local seaports on Lithuanian coast. There is only one large seaport in Klaipeda.

[25] Lithuania's rail development, a priority and a necessity. https://www.railwaypro.com/wp/lithuanias-rail-development-a-priority-and-a-necessity/
[26] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019.

1.2. Poland

The following chapter presents the state of transport infrastructure in Poland. The road, rail and inland waterway shipping were analysed.

Table 7.

Freight transport in Poland by type of transport

Year	Road transport	Rail transport	Inland waterway shipping	Short sea shipping	Total
	Million tonnes				
2005	1 079.8	232.8	9.6	9.4	1 331.6
2006	1 113.9	238.1	9.3	10.0	1 371.3
2007	1 213.2	245.3	9.8	11.4	1 479.7
2008	1 339.5	248.9	8.1	10.4	1 606.9
2009	1 424.9	222.6	5.7	9.4	1 662.6
2010	1 491.3	234.6	5.1	8.4	1 739.4
2011	1 596.2	248.6	5.1	7.7	1 857.6
2012	1 493.4	230.9	4.6	7.5	1 736.4
2013	1 553.1	232.6	5.0	7.0	1 797.7
2014	1 547.9	227.8	7.6	6.8	1 790.1
2015	1 505.7	224.3	11.9	7.0	1 748.9
2016	1 546.6	222.5	6.2	7.3	1 782.6
2017	1 747.3	239.5	5.8	8.3	2 000.9

Source: Transport – wyniki działalności w 2017 r., GUS, Warsaw, Szczecin, 2018.

In the years 2005-2017, there was an increase in the total volume of transported goods by over 50%. The vast majority of freight transport in Poland is carried out as part of road transport. Of the four systems studied, road transport in

2017 accounted for over 87% of the volume of all carriages. It is also the only means of transport which from year to year records a significant increase in the volume of transport. In the case of rail transport, the volume of transport remains at a similar level over the past ten years. One of the most significant increases occurred in 2017 (an increase of 7.6% compared to 2016). Inland waterway shipping and short sea shipping, on the other hand, constitute a marginal share in transport in Poland (in 2017 0.3% for inland waterway shipping and 0.4% for short sea shipping).

1.2.1. Short sea shipping

Poland recorded the largest relative increase in short sea shipping between 2017 and 2018 (20%). The volume of goods transported by short sea shipping in 2018 amounted to 66 211 thousand tonnes.

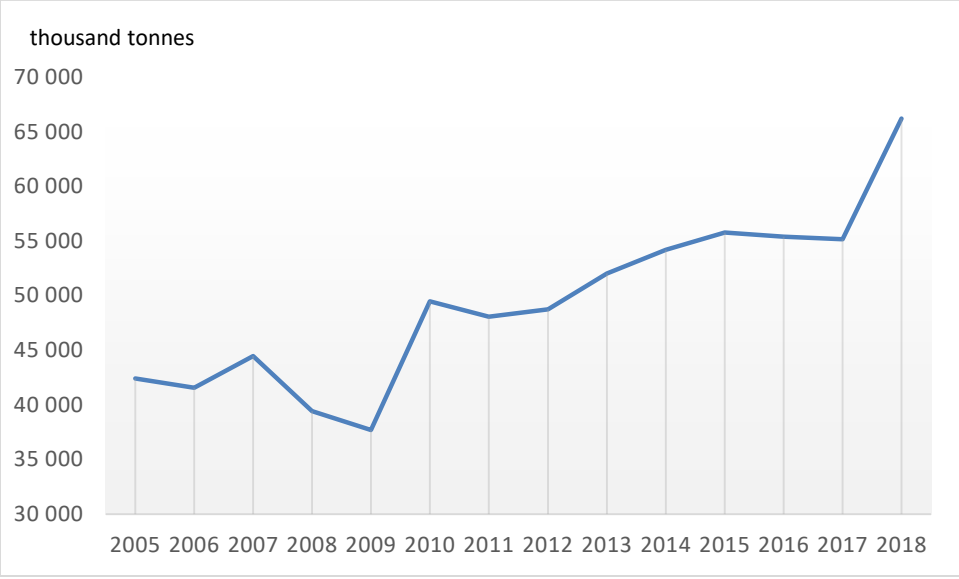

Figure 8. Short sea shipping in Poland

Source: Eurostat data.

The share of short sea shipping in total maritime transport in Poland, however, has been decreasing in recent years. There was a slight increase in 2018 up to the level of 73.3% (Figure 8). Similarly to Lithuanian case, most of the goods were transported to the ports located in the Baltic Sea basin, but the share of cargo transported to the North Sea ports was also significant.

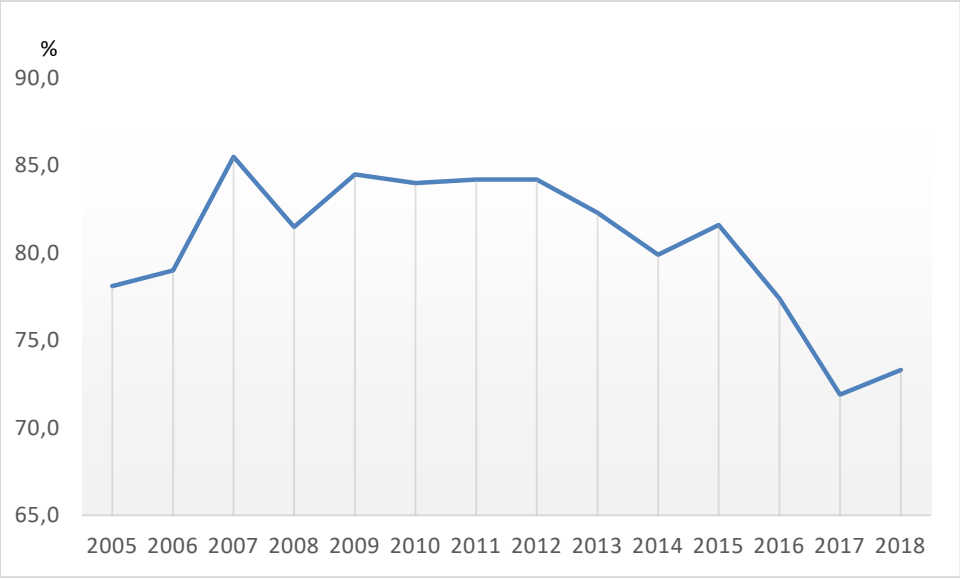

Figure 9. Share of short sea shipping in total maritime transport in Lithuania

Source: Eurostat data.

The increase in the volume of cargo transported by short sea shipping may also be positively affected by the investment consisting in building a waterway through the Vistula Spit.

INCONE 60 – Inland Blue Transport Connector E 60
nr STHB.03.01.00-22-0132/17
Report elaborated within Interreg South Baltic Programme 2014-2020
Co-financed by European Regional Development Fund

Waterway through the Vistula Spit[27]

The construction of the channel may have a positive impact on the connection of the Polish ports of the Lagoon with Baltiysk and Kaliningrad. If the channel is established, the ban on sailing through the Russian part of the Lagoon loses its restrictive sense. In this case, navigation in Elbląg – Baltiysk and Elbląg – Kaliningrad relations become possible. Of course, the route will be slightly longer, but this drawback may be limited by the use of larger and faster ships. This possibility is due to the fact that the international navigation of the Strait of Piławska is opened, which means that not only Polish ships will be able to operate these services. For this reason, the channel is the basic condition for maintaining sea connections with the ports of the region, in which the local economic spheres as well as local authorities of the region and port cities are also vitally interested.

The construction of the channel is not only the creation of a new transport route, but also an important factor in the economic activation of the lagoon communes, which (apart from the Krynica Morska commune on the Vistula Spit) are among the poorest in the country. It provides, because it integrates the Gulf of Gdańsk with the Vistula Lagoon. This applies to both passenger shipping in relation to and from Gdańsk and Gdynia, as well as sailing. It will allow better use of the marinas existing on the Lagoon and will become an impulse to create new ones. Therefore, an increase in employment in new specialties should be expected, which is particularly desirable in the context of limiting fisheries in the Vistula Lagoon. Only then will the waterfront villages be able to take full advantage of the seaside location. It is clear that the basic requisite for the development of each area is its accessibility.

The parameters of the shipping channel refer to the depth and width of the fairways in the Vistula Lagoon after their planned modernization and to the

[27] *Analysis of the possibilities of shifting the cargo stream to the Port of Elbląg,* K2 Solutions on behalf of the Elbląg Seaport Authority within South Baltic Transport Loops project, Elbląg 2020.

technical parameters of port infrastructure in existing ports, such as the width of port entrances, depths in ports, and size of turntables. The planned parameters are adjusted primarily to the size of the envisaged vessels that will flow through the shipping channel connecting the Lagoon with the Baltic Sea.

Figure 10. Channel design by the Vistula Spit

Source: Website of the Maritime Office in Gdynia, www.umgdy.gov.pl, accessed on 02.06.2020.

The construction of the waterway through the Vistula Spit will not only give the port of Elbląg the opportunity to exchange cargo with the Tri-City and other ports of the South Baltic region. The opening of the lagoon to the Baltic Sea will create direct access to IWW E 60, i.e. the coastal route running along the European coast from Gibraltar to Arkhangelsk. Thanks to this waterway, the port will be able to cooperate internationally with North Sea ports, such as Port Oostende.

The planned channel will meet the following tasks:

- an international sea route connecting Elbląg and the Polish ports of the Vistula Lagoon with the Baltic Sea,
- increasing the accessibility and competitiveness of the port of Elbląg on the Baltic market.

In addition, during the construction of the canal, sand will be obtained from dredging works, which will be a valuable raw material for creating new beaches and expanding the coast of the Vistula Lagoon on neighbouring sections. It will contribute to the creation of attractive and ecological water and land areas for leisure and water sports. Taking into account works aimed at progressively improving the clarity of the Lagoon waters and increasing the attractiveness of the shore and beaches from the Lagoon side, it can be assumed that the communes of Sztutowo and Krynica Morska will have attractive beaches and bathing areas.

1.2.2. Inland waterway transport

Poland is a country with relatively small water resources. The average annual surface water outflow in Poland is about 62 billion m^3, which, when calculated per capita, gives an annual resource of 1 600 m^3 of water, i.e. almost three times less than the European average. One of the primary ways to increase the possibility of using water resources is their retention. The total capacity of all retention reservoirs in Poland amounts to 2.75 billion m^3 of water, which is only about 6% of the average annual outflow, while in other European countries this indicator ranges from a dozen to several dozen per cent.[28]

Despite the not very favourable state of water resources and the high variability of the river outflow caused by far insufficient reservoir retention, the total length of inland waterways in Poland in 2017 was 3 653.5 km.

[28] Resolution No. 79 of the Council of Ministers of June 14, 2016 regarding the adoption of "Assumptions for the plans for the development of inland waterways in Poland for 2016-2020 with a perspective by 2030", M.P. of 2016 item 711

Unfortunately, both the length and setting of inland waterways in Poland has remained at a similar level for many years. The condition of waterways affects the dynamics of freight transport in inland shipping. Navigation conditions directly translate into the basic design parameters of rolling stock used for inland waterway transport, including the relatively low loading capacity of barges, as well as the volume of transport. In 2017, compared to the previous year, there was a 5.4% increase in transport performance. However, the number of cargo transported by Polish shipowners by inland waterway decreased; this decrease mainly concerned domestic transport.[29]

[29] Inland waterway transport in Poland in 2017, Central Statistical Office of Poland, 2018.

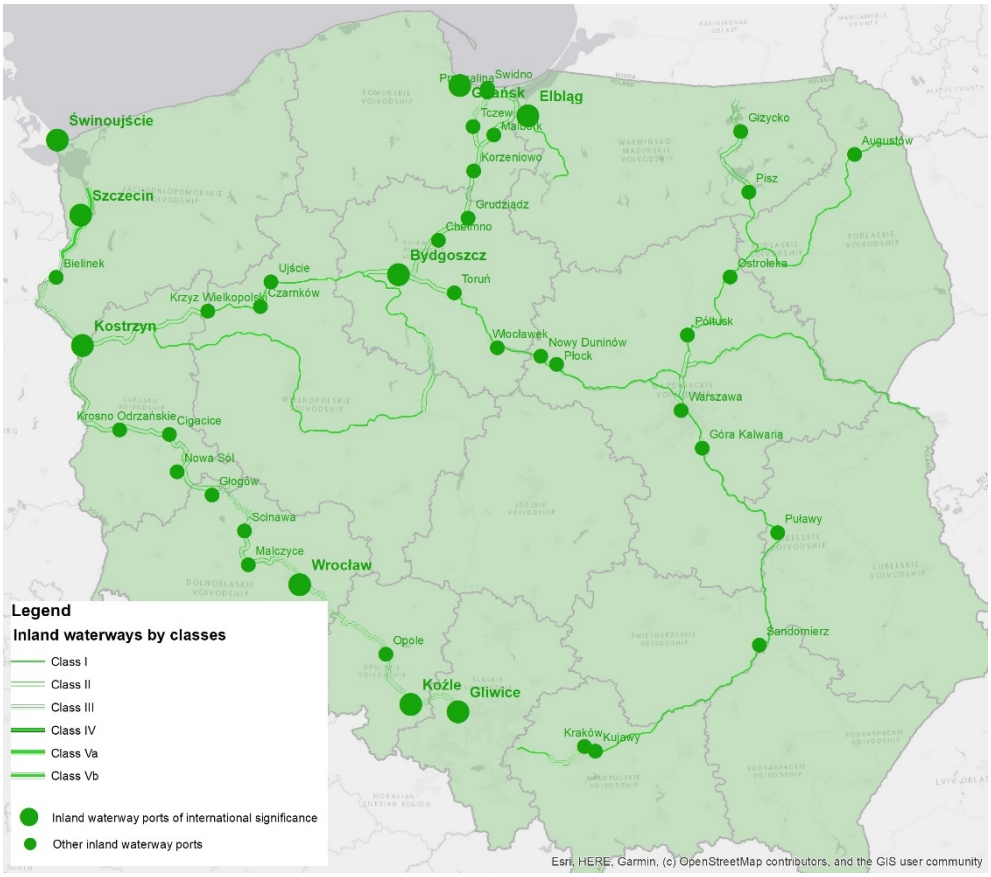

Figure 11. Inland waterways divided into classes

Source: own elaboration based on Forecast of Environmental Impact of Transport Development Strategy, Warsaw, 2011.

Inland roads are classified. The Regulation of the Council of Ministers of May 7[30], 2002, on the classification of inland waterways, lists the indicators based on which the classification of inland waterways takes place, i.e. the minimum clearance under bridges, pipelines and other installations crossing the waterway, and maximum parameters of vessels that may be permitted to navigate. Waterways

[30] documents.worldbank.org. http://documents.worldbank.org/curated/en/101161512766012660/text/SFG3321-V1-EA-P147460-Box405316B-PUBLIC-Disclosed-12-8-2017.txt

adapted for a sailing amount to 1 681 km (starting from class II). Class V includes only 4.8% of the entire length, class IV – 1%, class III – 11%, class II – 29%, class Ia and Ib – almost 54%. It means that in practice these are routes only available for small recreational vessels such as yachts and kayaks.

Table 8.

Inland waterways in Poland in 2017

Specification	Total		Waterways by classes of importance							Exploited waterways	
			regional				international				
			Ia	Ib	II	III	IV	Va	Vb		
	in km	*in %*	*kilometres*								*in % to total*
Total	**3 653.5**	**100.0**	**1 079.9**	**892.9**	**1 070.0**	**396.6**	**37.5**	**55.0**	**121.6**	**3 363.4**	**92.1**
Regulated navigable rivers	2 416.6	66.1	757.8	755.6	691.4	115.1	–	–	96.7	2 151.9	89.0
Canalized sections of rivers	643.6	17.6	100.8	137.3	105.8	207.2	37.5	55.0	–	620.1	96.3
Canals	334.7	9.2	167.7	–	104.8	46.8	–	–	15.4	332.8	99.4
Navigable lakes	258.6	7.1	53.6	–	168.0	27.5	–	–	9.5	258.6	100.0

Source: Transport - results of operations in 2017, Central Statistical Office, Warsaw, Szczecin, 2018.

The above list clearly shows that at the present operation of scheduled and regular freight shipping in Poland is practically impossible. Besides, waterways are subject to systematic degradation due to: the lack of a strategy for the development of inland navigation in Poland, the lack of maintenance of the navigable route and hydro-technical constructions, as well as continually changing development concepts for the main navigable routes in Poland. The geographical layout of the two main rivers of the country, i.e. the Vistula and Odra rivers, is favourable from the transport point of view because it coincides with the national directions of enormous flows of cargo mass and through latitudinal waterways, creates the

possibility of convenient connections with the water systems of neighbouring countries.

Table 9.

Inland waterways cargo transport in 2017 by coastal regions and directions

Region / Country		Tonnes	Tonne-kilometres
From	To	*in thousands*	
Domestic transport [a)]			
West Pomeranian	West Pomeranian	777.1	48 371.4
International transport – export			
Warmian-Masurian	Russia	54.9	5 504.3
West Pomeranian	Belgium	1.4	1 599.2
West Pomeranian	Germany	672.0	141 529.6
International transport – import			
Netherlands	West Pomeranian	0.5	462.8
Germany	West Pomeranian	135.6	30 848.2
Russia	Warmian-Masurian	5.9	589.0

a) Units in which transports amounted to at least 4 thousand tonnes were listed.

Source: Transport – results of operations in 2017, GUS, Warsaw Szczecin, 2018.

The share of inland waterway transport in total cargo in 2000-2017 decreased from 0.8% to 0.3%.[31] 90% of domestic inland waterway transport is carried out on local sections of the Odra river. In 2017, transport took place in West Pomeranian and Warmian-Masurian regions. However, the volume of this transportation is small. Goods from West Pomeranian Province were exported to Belgium and Germany, while another cargo was imported from the Netherlands and Germany.

[31] Data of the Central Statistical Office.

Domestic transport also took place within the voivodship. Trade exchange with Russia took place thanks to inland navigation in the Warmian-Masurian region.

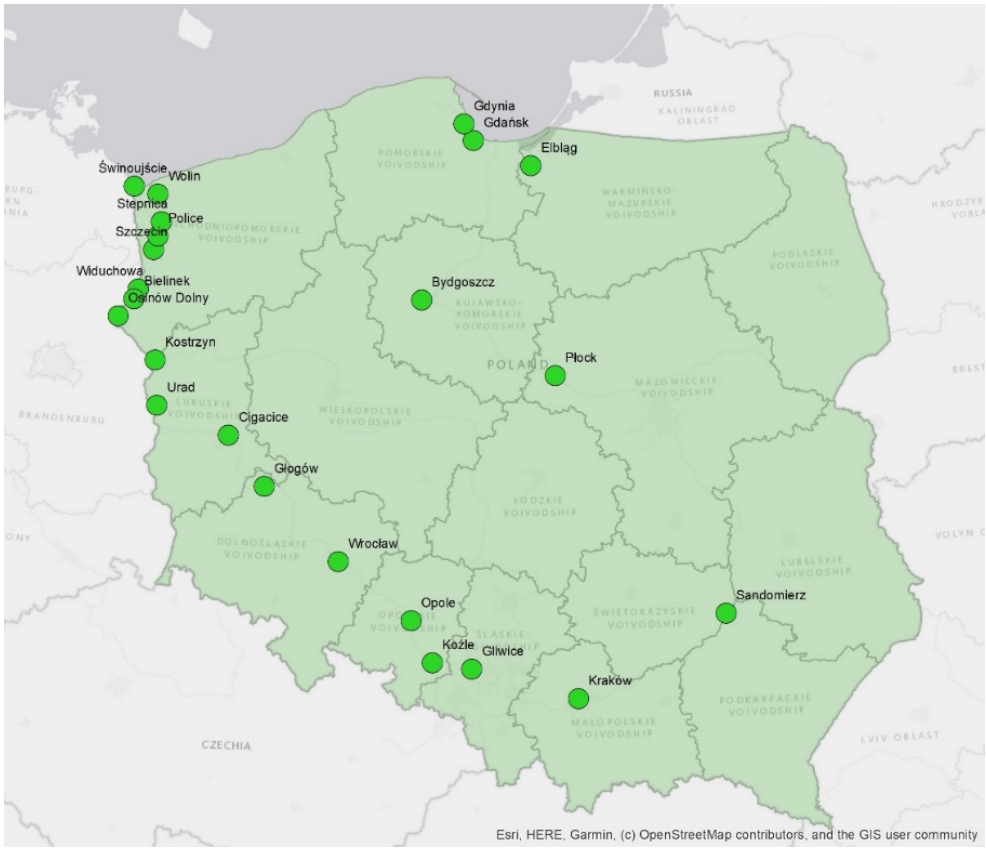

Figure 12. Inland waterway ports in Poland in 2017

Source: own elaboration based on Inland Navigation in Poland in 2014-2017, GUS, Warsaw, Szczecin, 2018.

The above map shows inland river ports in Poland in which transhipments took place in 2014-2017. The vast majority of them are located in the West Pomeranian region. They lie along the Odra waterway with a length of 693.1 km, which consists of: the Gliwice Canal (41.2 km), the Kędzierzyński Canal (5.9 km), a section of the canalised Odra from Koźle to Brzeg Dolny (187 km) and Odra

flowing freely from Brzeg Dolny to Szczecin, together with the Western Odra (459km). In the Pomeranian region, inland waterway ports are located only in Gdańsk and Gdynia, while in the Warmian-Masurian region only in Elbląg.

Over 85% of the rolling stock in Poland are units without self-propulsion, including almost half of them were produced in 1949-1979. The group of rolling stock is dominated by vessels with smaller construction parameters, requiring lower technical standards of infrastructure.

Table 10.

Inland waterway transport in Poland

Specification	2016	2017
Number of passenger seats	9 528	10 322
Number of passengers	1 277 619	1 262 084
Number of passenger-kilometres	16 651 693	17 765 327
The average transport distance of 1 passenger in km	13	14

Source: Inland waterway transport in Poland in 2017 r., Central Statistical Office, 2018.

In 2017, 117 inland waterway passenger ships carried a total of 1 262.1 thousand people, i.e. by 1.2% less than in the previous year. However, the average transport distance of 1 passenger compared to 2016 increased to 14 km.[32]

Tourism/leisure transport with the use of inland waterways has been observed for a long time. However, a new phenomenon is the wide variety of offerings, including new forms of water tourism adapted to modern expectations. The development of tourist navigation means that many local roads that do not meet the requirements of international or even local navigation are increasingly used for

[32] Transport wodny śródlądowy w Polsce w 2017 r., GUS, 2018.

recreational navigation, contributing to the socio-economic development of Polish regions.[33]

In 2017, Poland signed the AGN Convention (European Agreement on Main Inland Waterways of International Importance adopted in 1996 by the Inland Transportation Committee of the United Nations Economic Commission for Europe), according to which three international waterways pass through our territory:[34]

- **E 30** – connecting the Baltic Sea with the Danube in Bratislava, covering the Odra River in Poland, from Świnoujście to the Czech border,
- **E 40** – connecting the Baltic Sea in Gdańsk with the Dnieper in the Chernobyl region and further through Kyiv, Nowa Kachovka and Kherson with the Black Sea, covering the Vistula River from Gdańsk to Warsaw, the Narew River and the Bug River to Brest,
- **E 70** – connecting the Netherlands with Russia and Lithuania, and in Poland covering the Oder from the mouth of the Odra – Havel canal to the mouth of the Warta in Kostrzyn, the Vistula – Odra waterway and from Bydgoszcz the lower Vistula and Szkarpawa or the Vistula Gdańska.

[33] Żegluga śródlądowa w Polsce w latach 2014–2017, GUS, Warszawa, Szczecin, 2018
[34] Uchwała nr 79 Rady Ministrów z dnia 14 czerwca 2016 r. w sprawie przyjęcia „Założeń do planów rozwoju śródlądowych dróg wodnych w Polsce na lata 2016–2020 z perspektywą do roku 2030", M.P. z 2016 r. poz. 711

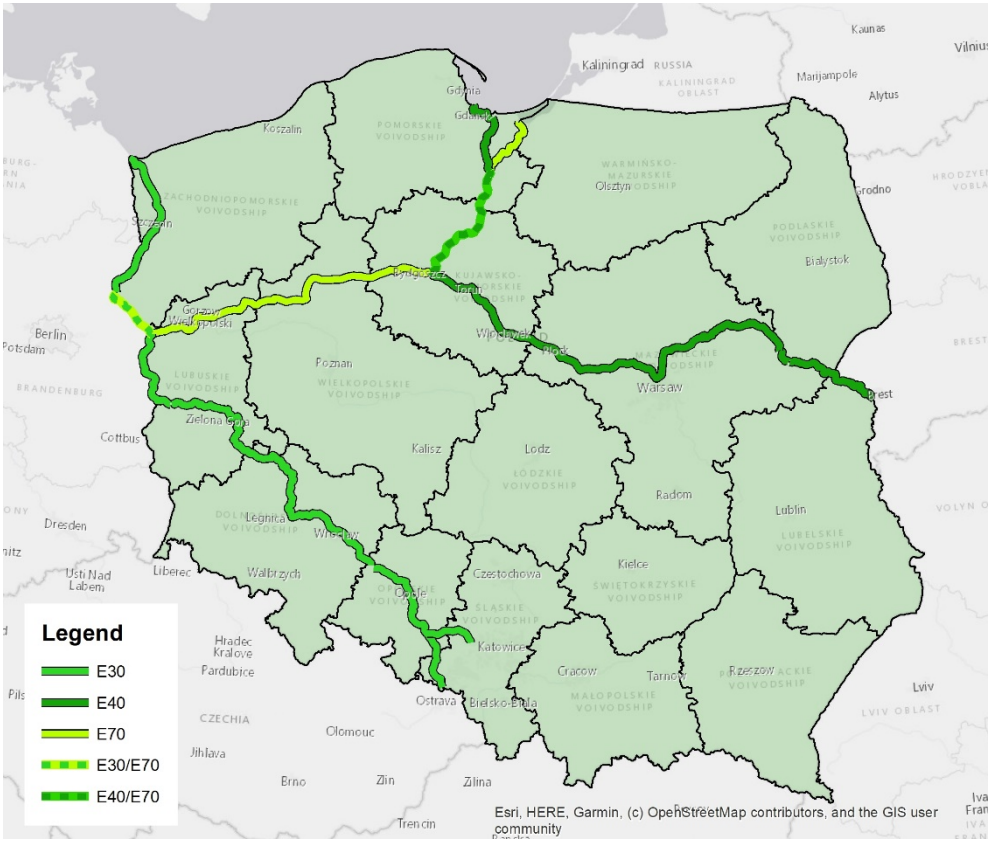

Figure 13. Inland waterways in Poland of international importance according to the AGN Convention

Source: Own elaboration based on Polska Mapa ogólnogeograficzna, Główny Urząd Geodezji i Kartografii.

The signing of the AGN Convention makes it possible to adapt navigation conditions of inland waterways to those appropriate for international parameters (corresponding to at least IV navigability class) and meet the requirements of the inland waterway transport infrastructure for the TEN-T network by creating a legal framework to facilitate coordination of development plans and inland investments of international importance. It is to increase the efficiency of inland waterway transport as well as to increase attractiveness for users. AGN not only describes

international inland waterways but also defines the technical parameters that they should meet.

1.2.3. Railway transport

Railway infrastructure is a fundamental factor limiting the development of transport. Rail transport is also a significant factor in the development of the E 60 waterway. Freight transport using this route should be based on local seaports. The possibility of their use depends mainly on ports' connection with their hinterland. Railway is the most advantageous solution for transporting cargoes from ports to the final destination.

The volume of expenditure on railway infrastructure in recent years has increased significantly. However, tangible effects have not been achieved in the form of ensuring possible high average commercial speeds on the entire network, including the lines with the most extensive traffic flows. Moreover, the accumulation of a large number of investments carried out on the entire network required the closure of many sections, which resulted in longer train travel time and negatively affected the offer of carriers, especially in passenger transport.

Even railways of international importance do not meet European standards. Only a small part of the basic layout of the PKP network allows the operation of passenger trains at speeds above 120 km / h and freight above 70 km / h (in Western Europe, passenger trains run at 160 km / h, on average and the tracks are adapted to a pressure of 22.5 kN per axle). There is a lack of high-speed rail – in 2015, only 0.7% of the length of railway lines was adapted to the speed of 200 km / h.[35]

[35] PKP PLK based on: Wojewódzka-Król, K. (2017). Nowe koncepcje złagodzenia problemów rozwoju infrastruktury transportu w Polsce. Problemy Transportu i Logistyki.

The poor condition of the infrastructure and its modernization, carried out in a troublesome way for passengers (which is often also associated with the need to choose a longer road, stoppages, lower frequency of connections), often result in several times longer travel time concerning the possibility of taking it on an analogous section, but modern infrastructure. As a result, rail transport in Poland ranked 22nd in 2017 in the European railways ranking[36] (Figure 2).

Most important rail connections for international traffic include:

- E 30: the border with Germany - Legnica - Wroclaw - Katowice - Cracow - border with Ukraine,
- E 20: the border with Germany - Poznan - Warsaw - border with Belarus,
- E 65: the border with the Czech Republic - Katowice - Warsaw - Gdynia.

In 2013, the PKP Group, apart from the parent company, consisted of 11 other subsidiaries, including companies providing transport services on the railway market (PKP Intercity SA, PKP SKM in the Tri-City sp. z o.o, PKP CARGO SA, PKP LHS sp. z o. o.), a railway infrastructure management company (PKP PLK SA), companies that also provide services on the energy and ICT market (PKP Energetyka sp. z o. o., TK Telekom sp. z o. o., PKP Informatyka sp. z o.o.), as well as companies operating in areas not related to rail transport. In 2010, the PKP CARGO Logistics group was created, which in addition to the parent company PKP CARGO, includes 30 subsidiaries, of which ten direct subsidiaries and fourteen indirect subsidiaries that deal with forwarding, logistics, transhipment services, and rolling stock repair of rolling stock and overhead line systems as well as railway sidings services. The remaining 6 are companies controlled by AWT from the PKP CARGO Group.[37]

[36] Wojewódzka-Król, K. (2017). Nowe koncepcje złagodzenia problemów rozwoju infrastruktury transportu w Polsce. Problemy Transportu i Logistyki.
[37] www.pkpcargo.com, accessed on 17.01.2019.

PKP Cargo is the second-largest freight carrier in the EU and owns[38]:

- Twenty-five transhipment terminals at significant points in Poland – six of them are located near the eastern border.
- Two logistics centres,
  - PKP Cargo Małaszewicze currently has four fully functional terminals that enable handling of all bulk and general cargo goods.
  - Medyka-Żurawica – a logistics centre on the border with Ukraine,
- Five container terminals.

The data of the Office of Rail Transport shows that the total mass of cargo transported in 2017 was 17.6 million tonnes bigger than in 2016 (an increase of 7.9%). The increase occurred in all segments of transported goods, except for solid fuels.

[38] Polish Investment & Trade Agency, www.paih.gov.pl, accessed on 14.01.2019.

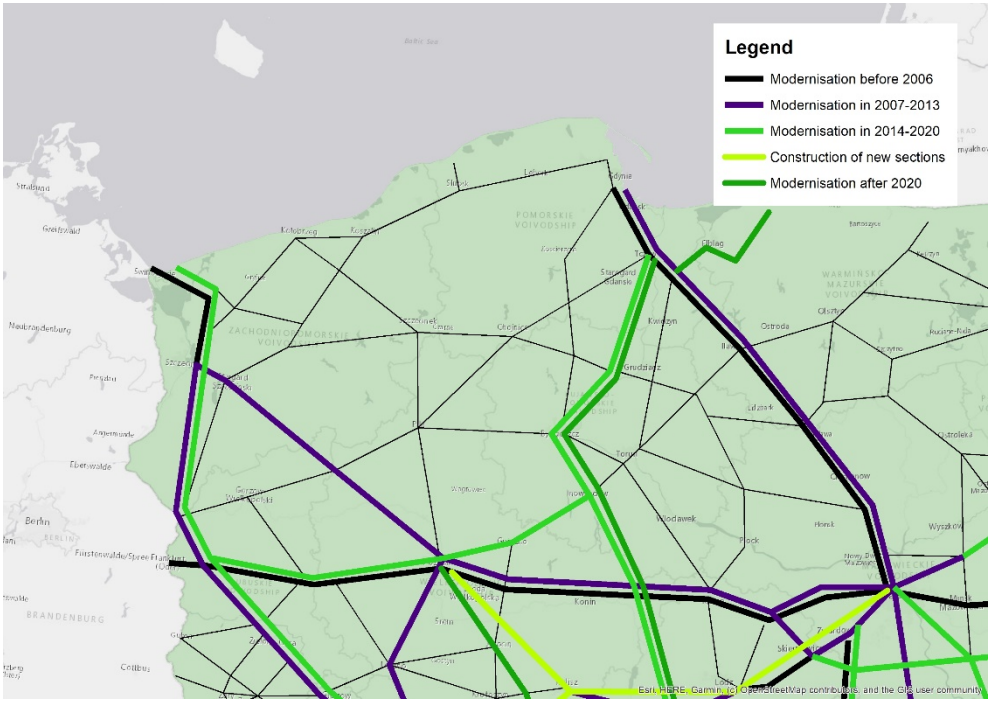

Figure 14. Railway infrastructure in Poland

Source: own elaboration based on Polish Investment & Trade Agency, www.paih.gov.pl, accessed on 14.01.2019.

The amount of freight transported via intermodal modes in 2017 was 14.7 million tonnes, which means an annual increase of almost 15% - 1.9 million tonnes. The share of intermodal transport measured by the volume of transported cargo reached a level of over 6% and was higher by nearly 0.4% than in 2016.[39]

Table 11.

Operated [a)] railway lines in the regions of local seaports

Region	Total [b)]		Including	
	In absolute	On 100	Electrified	of total numbers

[39] I N B A P I N T E R M O D A L. http://inbapintermodal.com/wp-content/uploads/2020/02/INBAP-INTERMODAL-EN.pdf

		numbers	km^2		One track	Two- and more tracks
		kilometres				
POLAND	**2016**	**19 132**	**6.1**	**11 874**	**10 401**	**8 731**
	2017	**19 209**	**6.1**	**11 854**	**10 490**	**8 719**
Pomeranian		1 275	7.0	464	883	392
Warmian-Masurian		1 084	4.5	505	783	301
West Pomeranian		1 166	5.1	737	744	422

a) The PKP network and other railway network management applications used. These entities owned the entire 271 km of standard gauge lines (275 km in 2016), including 50 km of electrified lines (55 km in 2016) b) Including broad gauge lines. which length in 2017 was 537 km (in 2016 - 537 km); without narrow gauge railways lines.

Source: Transport - activity results in 2017, GUS, Warsaw Szczecin, 2018.

The highest density of railway lines in use in voivodships with local seaports is located in the Pomeranian region. The indicator of the length of railway lines per 100 km^2 is higher than the national indicator. The longest two and more track lines are located in the West Pomeranian region. The low density of the railways' network in the West Pomeranian and Warmian-Masurian regions can be explained by the extensive area of the region as well as the lower population density and the nature of the settlement network.

1.2.4. Road transport

In 2017, the length of all highways amounted to 1 627.3 km. It is 5.2 km per 1 000 km^2 of the country's area and 4.2 km per 100 000 population of the country. Despite the significant increase in the length of motorways in recent years, which has contributed to improving the country's possibility, Poland is still characterized

by one of the lowest highway density indicators in the European Union (the average for the 27 EU countries in 2012 was 17 km and 14 km respectively).

In the same year, the length of expressways (both single and dual carriageways) was 1 533.7 km. Thus, the length of expressways (motorways and expressways combined) reached 3 161 km. It is a density of 10.1 km per 1 000 km^2 of the country's area and 8.2 km per 100 000 population.[40]

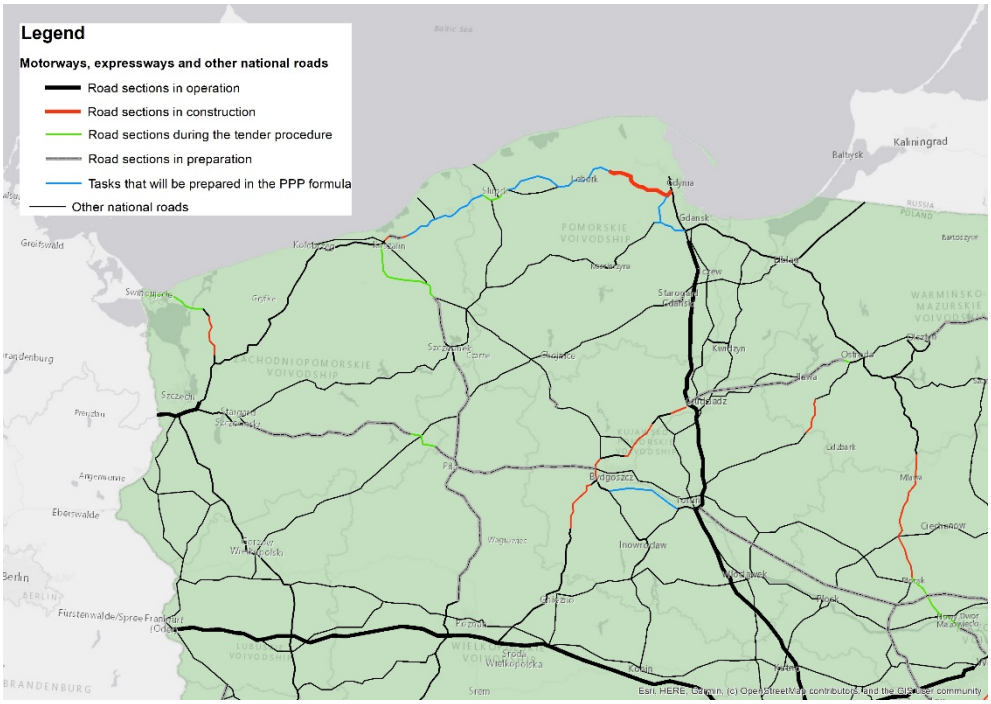

Figure 15. Road infrastructure in Poland (as of 10.01.2020)

Source: own elaboration based on Program budowy dróg krajowych na lata 2014-2023 (z perspektywą do 2025r), stan realizacyjny i planowany, GDDKiA, 2020.

[40] Kurowski, J. (2017). System transportowy i jego uwarunkowania: aspekty gospodarczo-obronne. Zeszyty Naukowe Akademii Sztuki Wojennej.

As part of the Commune and Municipality Road Infrastructure Development Program for 2016-2019, the 850 tasks were carried out as part of those built (expanded), rebuilt and renovated municipality and commune roads with a length of 2 055 km. [41]

Transit traffic runs through Poland between Western and Southern Europe and the countries of the eastern part of the continent (including Estonia, Belarus, Lithuania, Latvia, Russia, Ukraine and Kazakhstan). Several international routes pass through Poland, with a total length of approximately 5 thousand km.

[41] "Reconstruction Of The Municipal Road No. 105949 L In Garbw - Bogucin On The Section From Km 0,000 To Km 2 549. 50 Km. As Part Of The Commune And Poviat Road Infrastructure Development Program For 201." MENA Report, Albawaba (London) Ltd., June 2019.

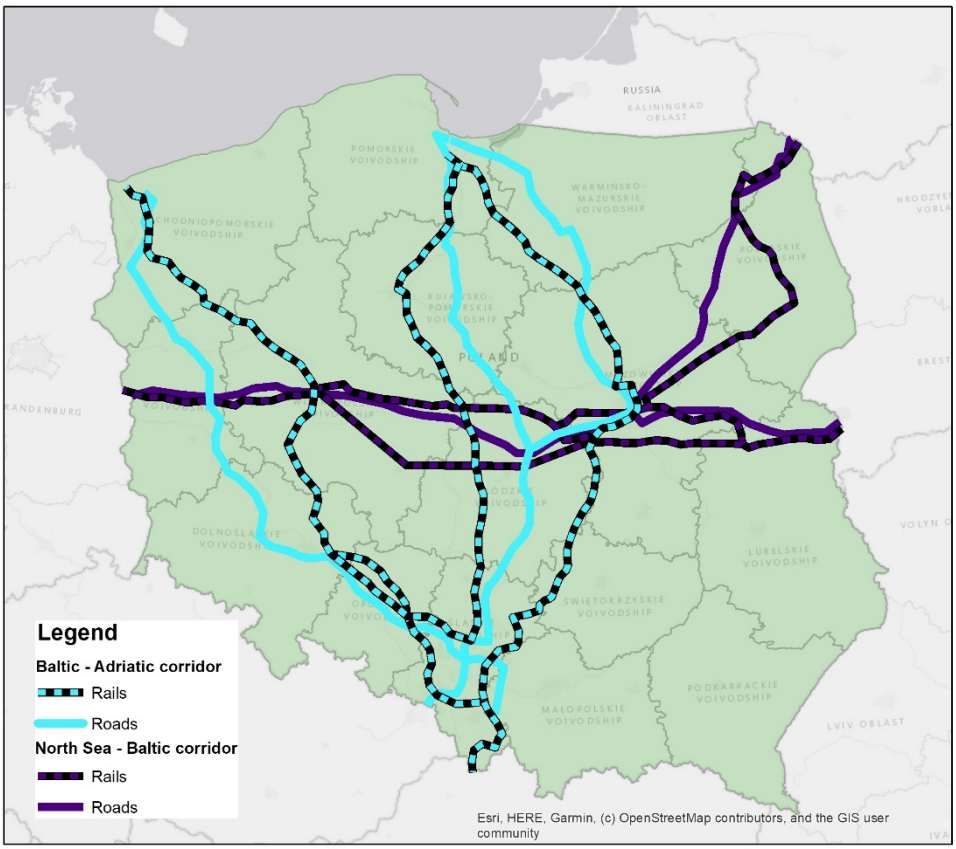

Figure 16. TEN corridors in Poland

Source: own elaboration based on web portal of European Commission, Mobility and Transport, TENtec Interactive Map Viewer, access of the day: 04.10.2019.

Poland has been a member state of the European Union since 2004, and its communication network is part of the trans-European transport network. Currently, the painstaking and lengthy process of adapting it to the requirements set out in EU guidelines is still ongoing.

1.2.5. Barriers and bottlenecks

One of the most significant barriers to the development of coastal areas is the state of road and rail infrastructure. Many cost-intensive investments are required to improve the region's transport accessibility. Currently, road infrastructure is insufficient, and some of the routes serving international transit traffic do not meet EU guidelines. The same situation applies to railway infrastructure. Also, there is a lack of long-term and coherent policy at the national level regarding the maintenance of railway infrastructure and the setting access fees. That is why, despite the numerous investments that have taken place in recent years, the condition of the railway networks is systematically deteriorating. The situation is not improved by the dissipation of the most significant urban centres, which affects the time distances between urbanized centres and some areas of the region.

An alternative to road or railway transport could be inland navigation. Unfortunately, the current state of inland waterways practically prevents handling of cargo. As a result of many years of investment neglect, which did not guarantee the proper maintenance of inland waterways or, even more so, their development, Polish inland waterway transport mainly operates on local sections of the Odra (90% of national transport) and the Vistula rivers.

In 2017, Poland signed the AGN Convention. Its signing makes it possible to navigate the main waterways and adapt their navigation conditions to appropriate for waterways of international importance. The recommendations arising from the AGN Agreement to Polish waterways qualify them as:

- strategic bottlenecks – to the Odra river, on the section from Widuchowa to Szczecin,
    - primary bottlenecks – to the following sections:

- Odra River, on the section from Koźle to Widuchowa and the Gliwicki Channel,
- Vistula River, on the section from Warsaw to Płock and from Włocławek to Gdańsk,
- Bug River, on the section from Brest to Zegrzyński Lake,
- Żerański Canal, from the Zegrzyński Lake to the Vistula,
- Vistula – Odra waterway (i.e. the Warta, Noteć, Bydgoszcz Canal and Brda),

- missing connections - to the Odra - Danube - Elbe connection.

Another way to relieve road or railway infrastructure could be to use short sea shipping. In 2017, the share of European Union countries in Poland's exports was 79.7%, while in imports 60.1%.[42] It means that short sea shipping could be responsible for a significant share of the country's trade. In Poland, there is a growing trend in the volume of cargo transported as part of short sea shipping. However, its potential is used only to a small extent. One of the reasons is, among others, the lack of regular cabotage navigation as part of the E 60 waterway running along the Polish coast. E 60 revitalization would have a positive impact not only on ports of primary importance for the Polish economy but also on local seaports. In ports with appropriate infrastructure (e.g. Kołobrzeg or Darłowo) this would increase the volume of transhipments, while in other ports where transhipment is not possible for technical reasons, it would be possible to revive the local economy through recreational navigation. Therefore, comprehensive actions are needed to make the E 60 waterway navigable and to improve the infrastructure of inland waterways, which would allow connection of sea routes with inland routes, while increasing the development potential of inland ports and enabling the handling of new cargo and freight services.

[42] Data of Central Statistical Office

Many factors are stopping the development of coastal areas. One of the most important is the transport accessibility. To overcome development barriers, not only financial resources are needed, but also international cooperation and the establishment of consistent infrastructure development strategies for all transport modes.

1.3. Sweden

The quality of Swedish transport infrastructure ranks 22nd worldwide in the Global Competitiveness Report (World Economic Forum, 2018). However, railroad infrastructure scores much lower than road infrastructure.[43]

The completion of the TEN-T Core Network in Sweden seems to be making good progress. However, high-speed rail infrastructure is still missing in Sweden.

Table 12.

Completion of TEN-T Core Network 2016 in Sweden

Road	Conventional Rail	High-Speed Rail	Inland Waterways
77%	51%	0%	100%

Source: DG MOVE TENTec, Annex I of Regulation (EU) No 1315/2013.

Swedish transport policy, in contrast to EU policy, focuses on an efficient transport system as a whole, utilising all modes of transport and avoids specific goals for certain modes of transport.

[43] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019.

1.3.1. Short sea shipping

Sweden also is one of the countries where the predominance of short sea shipping of goods over deep-sea shipping was particularly pronounced. The volume of cargo transported within short sea shipping has been increasing since 2012 and in 2018 amounted to 156 128 thousand tonnes.

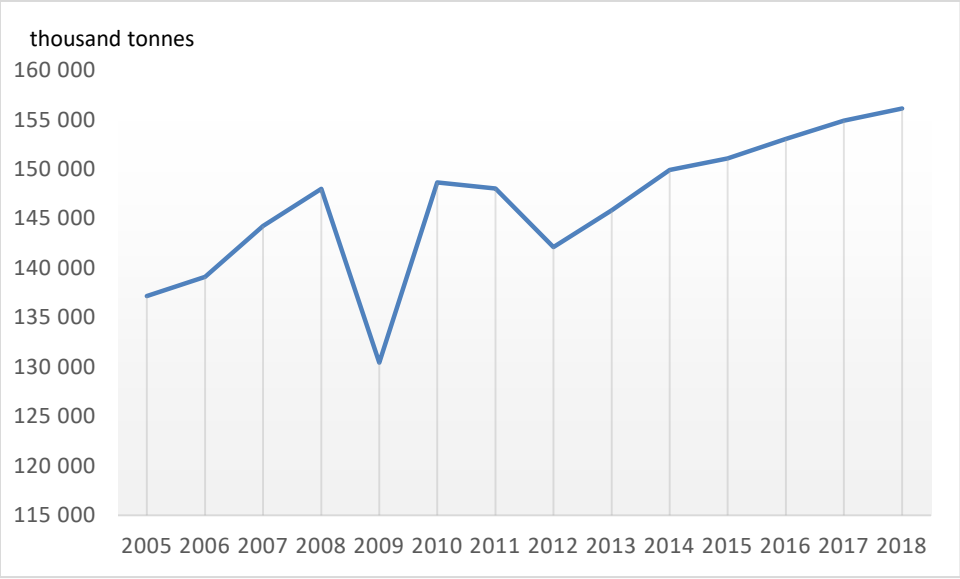

Figure 17. Short sea shipping in Sweden

Source: Eurostat data.

Despite the large share of short sea shipping in total maritime transport, it has been decreasing in recent years, from 93.1% in 2011 to 89.1% in 2018 (Figure 18).

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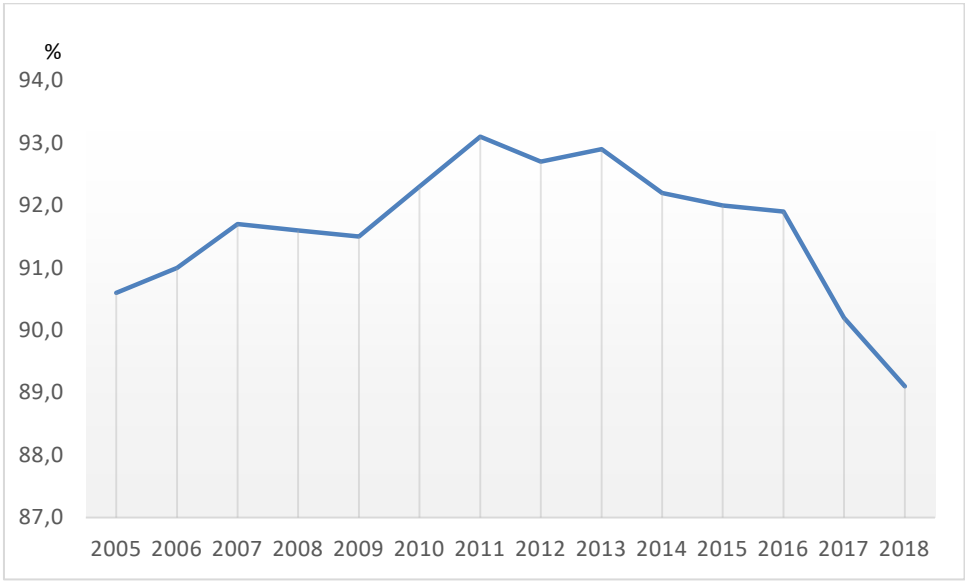

Figure 18. Share of short sea shipping in total maritime transport in Sweden

Source: Eurostat data.

1.3.2. Inland waterway transport

The use of inland waterway transport in Sweden differs from Continental Europe in the sense that IWW connects the sea with two large lakes with ice conditions and rather high waves. Lake Vänern, the largest lake in the EU, is connected to the sea and Port of Gothenburg via the River Göta and Lake Mälaren via locks in Stockholm and Södertälje. With container transport on IWW being rare in Sweden, ports along the inland waterways do not operate services for container shipping and equipment, such as proper container cranes, are missing. Container transport may differ from other types of IWW transport (mainly bulk) in the type, volume and value of goods. Also, the distance to the quay is often close in industries traditionally using the waterways. Container transportation makes it

possible, though to consolidate goods of different types and from different goods owners.[44]

The share of inland waterway transport in Sweden is low even though there is potential to increase the use of existing inland waterways. Out of all national transports during 2014, the share of maritime transports was only 3%, compared to 88% for road transports with heavy-duty trucks and 9% for rail. The types of cargo mainly transported by IWT are liquid fuels, forestry and mining goods. The Swedish shipping fleet was in 2016 the smallest it had been since 1970. However, the Swedish government has started to take action towards increasing the share of IWT. These actions include dialogues with municipalities, ports and other actors that might become involved and the objective is to find incentives and opportunities to find a collaborative way of integrating IWT in the transport chains instead of land transports. The efforts are also aimed towards informing and motivating single actors to take more responsibility for their climate effects as well as evaluate how they could increase their share of sea transports. Furthermore, the government has instituted the Transport Board of Directors to examine if more water areas could be used for transportation. Also, Sjöfartsverket has been given the task to identify both obstacles and opportunities of IWT in Sweden and analyse the potential development and improvement areas.[45]

1.3.3. Railway transport

The railroad system, which comprises just over 11 000 km of track, is mostly state-owned. To this can be added just over 220 km of streetcar and subway tracks. One key developmental issue for the railroads pertains to the implementation of the

[44] Rogerson, S., Santén, V., Svanberg, M., Williamsson, J., & Woxenius, J. (2019). Modal shift to inland waterways: dealing with barriers in two Swedish cases. International Journal of Logistics Research and Applications, 1-16.
[45] Garberg, B. (2016) Regeringsuppdrag: Analys av utvecklingspotentialen för inlands- och kustsjöfart i Sverige. Norrköping: Sjöfartsverket.

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ERTMS international signal standard. The railroads are also grappling with deficient capacity and neglected maintenance.[46]

Sweden is one of the countries with a share of railways in the modal split that is significantly above the EU average. It is mainly the case for freight transport, but to a lesser degree also for passenger transport.

The number of kilometres of track with speed reduction due to sparse track or inadequate rails showed a steep increase in the period up to 2017. It was mostly due to ever-faster degradation of the so-called VSP rails – rails that were manufactured until the beginning of the 80s which had manufacturing defects. In other words, a decreasing trend since 2017 results from the replacement of these and other rails.

The railway infrastructure is privatised for both passengers and freight traffic with around 40 operators so far. Sweden currently does not have a high-speed rail network.

The use of rail transport has increased significantly over the last 26 years – passenger-km nearly doubled and freight traffic increased by 12%. It has put a specific strain on the network, which experiences massively increased congestion.[47]

[46] The Swedish Freight Transport System: Summary Current .... https://www.trafa.se/globalassets/rapporter/summary-report/2011-2015/2014/summary-report-2014_17-the-swedish-freight-transport-system---current-status-and-historical-trends.pdf

[47] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019

Figure 19. Railway infrastructure in Sweden

Source: own elaboration based on Transportsystemets tillstånd, utmaningar och möjligheter – en nulägesanalys, Rapport 2011:10.

1.3.4. Road transport

Sweden has a robust forest industry, which needs a transport system to serve the paper- and sawmills. Traditionally transport was done on rivers but today only road transport by heavy lorry combinations is used. These heavy lorry combinations are 25 metres long and the design of the lorry and the trailer are the concept for almost all Swedish lorry transportation. This also influences the rural road design. EU membership resulted in an increase of foreign lorry-trailers. The energy policy in Sweden has also changed as the nuclear phase-out is, to some extent, replaced by thermal power stations based on burning waste products from households and forest. This also created a lot of long-distance transport by lorry combinations. The high-quality roads are mainly European roads of 4 900 kilometres length, of which 1 510 kilometres is (mainly two-lane) motorway. They connect most big cities and take 23% of the motor vehicle kilometres, including nearly 14% on motorways. 277 communities represent the local authorities. About 39% of the traffic is concentrated on the national roads and the length is 14 700 kilometres. The total length of the publicly used private roads is about 210 000 kilometres.[48]

[48] Koornstra, M., Lynam, D., & Nilsson, G. (2002). SUNflower: a comparative study of the development of road. Leidschendam: SWOV Institute for Road Safety Research.

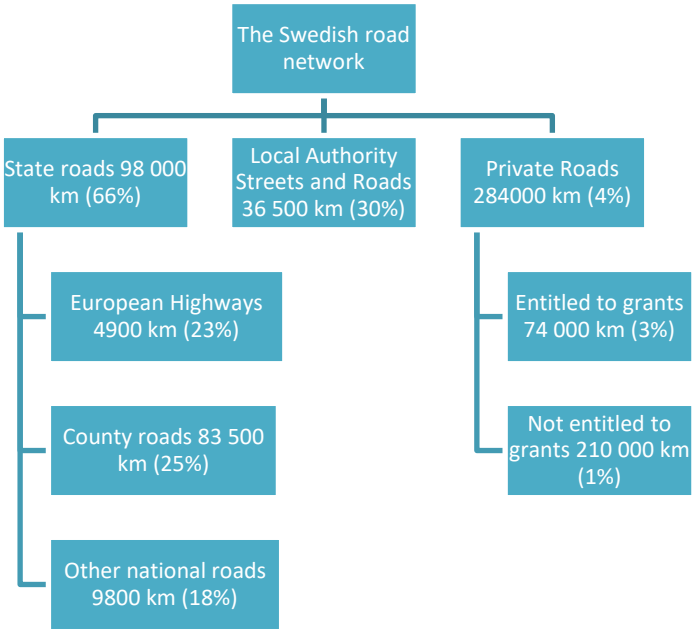

Figure 20. The road lenghts in the Swedish road network and their percentage of traffic

Source: Koornstra, M., Lynam, D., & Nilsson, G. (2002). SUNflower: a comparative study of the development of road. Leidschendam: SWOV Institute for Road Safety Research.

The most common speed limit in Sweden is 70 km/h. Apart from these roads, the Swedish road network also includes 16 018 bridges, about 20 tunnels, and 37 ferry routes. In terms of types of tunnels in Sweden, there are about 14% concrete tunnels and 86% rock tunnels. In terms of the type of pavement, flexible (asphalt) pavement roads are the most common in Sweden, making up about 80- 90% of all paved roads in the country.[49]

[49] Miliutenko, S. (2016). Consideration of life cycle energy use and greenhouse gas emissions for improved road infrastructure planning (Doctoral dissertation, KTH Royal Institute of Technology).

Currently, ongoing road projects usually concern efforts to reduce congestion, improve safety, or provide better accessibility.[50]

1.3.5. Barriers and bottlenecks

Despite an excellent overall macroeconomic performance, Sweden's infrastructure investment situation appears unfavourable, particularly concerning the railway system. Rail infrastructure is at much lower score than road infrastructure. The railway system could benefit from increased investment in network maintenance and connections for cross-border traffic.

The Government aims to increasingly shift traffic from road to rail and maritime modes, thereby decreasing the environmental impact of transport. Currently, roughly 90% of all goods are transported by road domestically. A transition to other modes would require significant investments.

The completion of the TEN-T Core Network in Sweden seems to be making good progress. However, high-speed rail infrastructure is still missing in Sweden.[51]

There are regulatory issues, specific to the Swedish setting, which create barriers: regulatory, financial, service and market-related. First of all, there is uncertainty regarding regulation which by itself causes the problem. The background is that the regulation of IWW vessels is relatively new and has not been tested in Sweden. It creates uncertainty regarding, for example, cabotage or requirements on personnel. Moreover, regulations regarding piloting fees and fairway dues are set by authorities and are highlighted as influencing the costs to a large extent.

[50] The Swedish Freight Transport System: Summary Current .... https://www.trafa.se/globalassets/rapporter/summary-report/2011-2015/2014/summary-report-2014_17-the-swedish-freight-transport-system---current-status-and-historical-trends.pdf
[51] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019.

The various costs also influence the competitiveness compared to other modes of transport, not least due to the large trucks (25.25 m and 64 tonnes – 74 tonnes on some main roads – allowed in Sweden) and well-developed rail freight system. The cost of pre/post-haulage, the additional handling costs, port charges, fairway dues, and pilot fees. Fee structures of other modes also affect the competitive situation. There is also uncertainty regarding some of the costs, making it difficult for an entrepreneur calculating a business case.

Long transport time is highlighted as severe in the competition against road transport, mainly due to the time for loading and unloading barges. In ports, temporary quay stacking and additional handling are likely needed, and time schedules of vessels need to be matched with crane availability. Various systems have to be integrated for IWW transport to function smoothly, such as aligning lock planning and quay handling.

Vessels must be adapted to the waterways' conditions and the weather, including the height of waves and the ice conditions on the Swedish lakes. It is also a concern that specialised vessels are not flexible regarding the type of goods that can be transported and that IWW vessels cannot sail on alternative routes. It has also been identified that potential locations of inland ports may vanish, as land is used for other purposes.[52]

1.4. Denmark

1.4.3. Shortsea shipping

The volume of cargo transported by short sea shipping in Denmark has been fluctuating over the last few years. Some of the lowest values were recorded during

[52] Rogerson, S., Santén, V., Svanberg, M., Williamsson, J., & Woxenius, J. (2019). Modal shift to inland waterways: dealing with barriers in two Swedish cases. International Journal of Logistics Research and Applications, 1-16.

the economic crisis; in 2008 the volume of cargo amounted to 76 684 thousand tonnes, one year later the volume only reached 65 156 thousand tonnes. Short sea shipping has been recovering in the following years and amounted to 72 539 thousand tonnes in 2018.

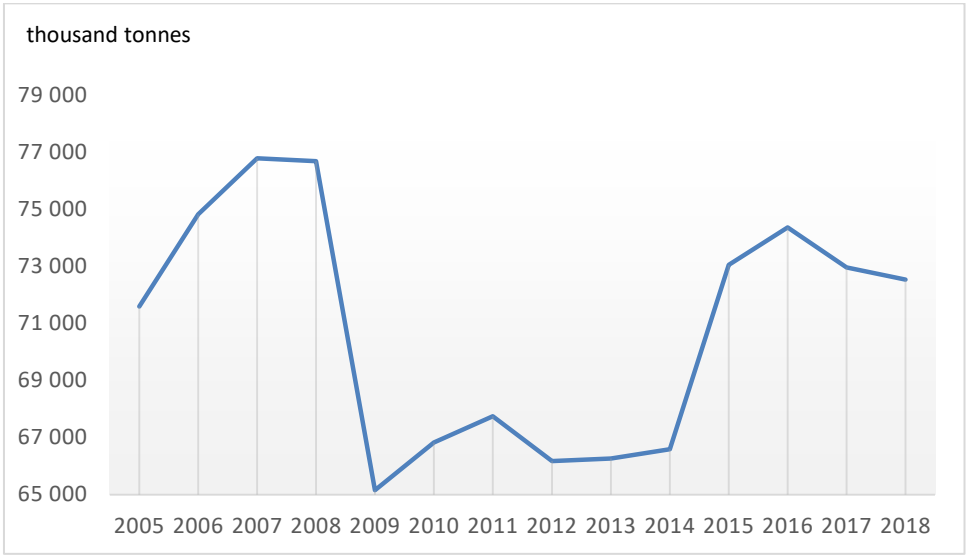

Figure 21. Short sea shipping in Denmark

Source: Eurostat data.

Around 90% of the goods, in comparable proportions, were transported to the ports located in the North Sea and Baltic Sea basins. The economic crisis has affected the entire transport market, thanks to which the short sea shipping share in total maritime transport remains stable at around 90%.

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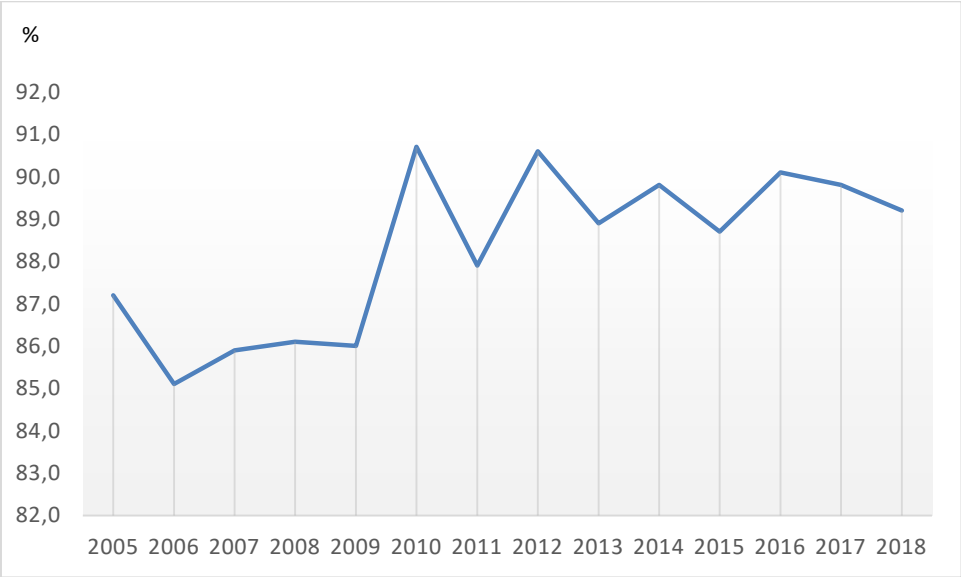

Figure 22. Share of short sea shipping in total maritime transport in Denmark

Source: Eurostat data.

1.4.4. Inland waterway transport

Inland waterway transport, other than by ferry, is of no importance, as few Danish rivers are navigable only to a negligible extent. However, shipping between the different parts of the country plays a critical role in the Danish transport system.[53]

1.4.5. Railway transport

The length of the entire railway network was 2 508 km on 1 January 2018, a decrease of 128 km since the previous year. Concerning the total area of Denmark, there is 62 km of railway per 1 000 km^2. The central part of the rail network is operated by the state-owned Banedanmark.

[53] International Reference Service, Vol. VII, No. 70, U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce, 1950.

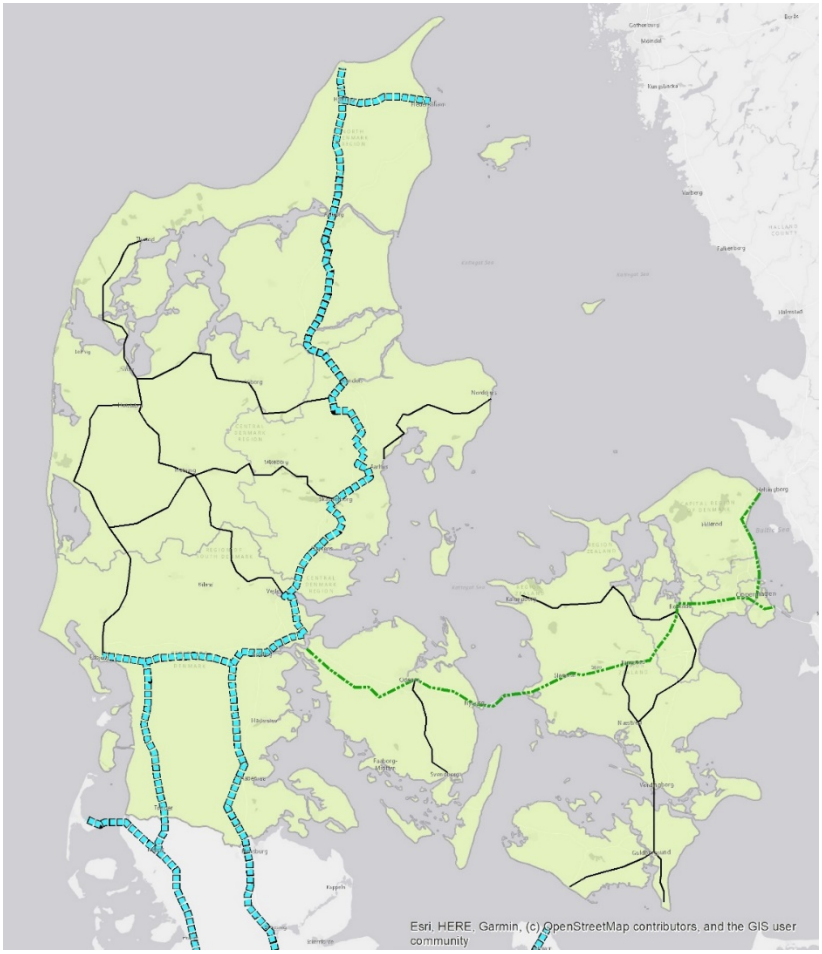

Figure 23. Railway network in the Jutland Corridor

Source: Transport infrastructure in the Jutland Corridor, The Danish-German Transport Commission, The Danish Ministry of Transport and Building, Copenhagen, November 2015.

The regional railways are responsible for operating 521 km of the rail network and 21 km of Copenhagen Metro. Since 1990, the rail network has decreased by 300 km, mainly due to closure, by Banedanmark, of sections carrying goods. At the beginning of 2018, a quarter of the rail network was electrified.[54]

[54] Statistical Yearbook 2017, 121th edition, Statistics Denmark, June 2017

Table 13.

Railway network in Denmark

Railway system	2007			2013			2018		
	Total	Electri-cified	%	Total	Electri-cified	%	Total	Electri-cified	%
	km	*km*		*km*	*km*		*km*	*km*	
Railway network, total	2 663	636	23.88	2 636	642	24.36	2 508	653	26.04
Main arterias	673	364	54.09	673	366	54.38	665	367	55.19
Regional lines	591	86	14.55	591	86	14.55	594	87	14.65
Goods lines	112	..	..	72	..	..	30	0	0.00
.. - the observation is missing or fall under the limit of discretion/uncertainty.									

Source: Statistics Denmark, www.statbank.dk, accessed on 02.07.19.

Table 14.

Rail transport of goods in Denmark

		2015	2016	2017
Thousand tonnes	ALL TYPES OF TRANSPORT	8 652	9 382	9 314
	National transport	1 111	1 015	934
	International transport	1 376	1 714	1 527
	Transit Denmark	6 165	6 653	6 853
Million tonne-km	ALL TYPES OF TRANSPORT	2 603	2 616	2 653
	National transport	203	185	163
	International transport	242	325	290
	Transit Denmark	2 158	2 106	2 201

Statistics Denmark, www.statbank.dk, accessed on 03.07.19.

1.4.6. Road transport

A forecast till 2030 indicates a 16% overall growth in the national passenger car use compared to 2015, while the growth for road freight is expected to be about 12%. The increased amount of traffic generates increased pressure on existing and planned road capacity. In the same period, congestion will increase by two-thirds, which is far more than the growth in traffic. The growth of traffic and congestion will have significant geographical variations. The growth will be higher in and around the largest cities and on the main roads between the cities. It is also where the problems of congestion already are most severe. The parts of the railway network that have the highest utilisation today will also experience increased pressure on its capacity.[55]

There was 74 728 km of public roads in Denmark on 1 January 2018. The state road network comprises 5% of the public road network. The other 95% is administered by the municipalities. The majority of the public road network (65%) is in Jutland, while the rest is distributed between the Copenhagen region (9%) and the remaining part of the islands (26%). The public road network has increased by 2 135 km over the past ten years, mainly because of more municipal roads.[56]

Table 15.

Road network in Denmark by type of road and part of the country

Type of road	Part of the country	2007	2012	2018
		km	*km*	*km*
Motorways	**All Denmark**	**1 071**	**1 143**	**1 308**
	Province Byen København	25	24	24
	Province Københavns omegn	97	100	105

[55] Mobility for the Future - Summary of expert group report, Ministry for Transport, Building, and Housing, Copenhagen, December 2018
[56] Statistical Yearbook 2017, 121th edition, Statistics Denmark, June 2017

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Type of road	Part of the country	2007	2012	2018
		km	*km*	*km*
	Province Nordsjælland	35	35	38
	Province Bornholm	..	..	..
	Province Østsjælland	72	72	75
	Province Vest- og Sydsjælland	173	188	195
	Province Fyn	104	120	120
	Province Sydjylland	204	216	259
	Province Østjylland	141	153	205
	Province Vestjylland	33	47	101
	Province Nordjylland	187	187	186
Dual carriageways	**All Denmark**	**381**	**379**	**390**
	Province Byen København	2	2	2
	Province Københavns omegn	4	4	4
	Province Nordsjælland	37	37	34
	Province Bornholm	..	..	..
	Province Østsjælland	..	..	..
	Province Vest- og Sydsjælland	67	52	72
	Province Fyn	5	5	4
	Province Sydjylland	130	139	133
	Province Østjylland	50	50	59
	Province Vestjylland	47	50	36
	Province Nordjylland	40	40	46
Other roads	**All Denmark**	**70 960**	**72 408**	**73 030**
	Province Byen København	614	674	725
	Province Københavns omegn	1 602	1 634	1 625

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Type of road	Part of the country	2007	2012	2018
		km	*km*	*km*
	Province Nordsjælland	2 790	2 910	2 925
	Province Bornholm	1 108	1 146	1 110
	Province Østsjælland	1 677	1 665	1 725
	Province Vest- og Sydsjælland	10 289	10 465	10 605
	Province Fyn	6 737	7 023	7 042
	Province Sydjylland	14 524	14 782	14 948
	Province Østjylland	10 031	10 389	10 196
	Province Vestjylland	9 957	10 105	10 125
	Province Nordjylland	11 632	11 616	12 003
.. - the observation is missing or fall under the limit of discretion/uncertainty.				

Source: The Road Directorate.

Over the past 40 years, the motorway E 45 in Eastern Jutland has produced a high level of mobility and economic development in entire Jutland, as the road connects Jutland from north to south. Moreover, road users can access the E 45 from Central and Western Jutland via the Central Jutland crossroads, and thus connected to Funen, Zealand and the rest of Europe. The motorway serves the large cities in Jutland, such as Aalborg, Aarhus, Randers, Vejle and Kolding and creates coherence not only in East Jutland – but also between the other parts of the country.

Figure 24. Jutland Corridor in the Scandinavian-Mediterranean Corridor

Source: own elaboration based on Transport infrastructure in the Jutland Corridor, The Danish-German Transport Commission, The Danish Ministry of Transport and Building, Copenhagen, November 2015.

The Jutland Corridor serves as a link between Scandinavia and Central Europe with motorway E 45/A7 as the main transport corridor. The Jutland Corridor is one of the most important corridors for the transport of goods through Denmark. At the

same time, the corridor plays a vital role as export corridor, mainly to Germany, which is Denmark's largest export market.[57]

Today the overall motorway system serves several types of traffic – which are all growing in volume. It goes for local commuter traffic, traffic within and between the regions and international traffic flow towards Germany and Europe. Due to the increasing traffic volume, the overall infrastructure has faced increasing pressure the recent years and congestion poses a strain on commuters as well as businesses.

With the recent years' agreements in the transport sector, the capacity will be expanded on the E 45 at Vejle Fjord. Simultaneously, the connections between Central and Western Jutland has enhanced via the construction of new motorways from Vejle and Århus towards Herning and on to Holstebro.

In the long term the traffic growth, however, will engender a need for additional capacity on the E 45 from Northern Jutland to the German border. As part of the strategic analyses, two main development strategies for north/southbound road capacity in Jutland have been identified:[58]

- Further development of the motorway capacity in the E 45 corridor
- Different models for the establishment of a new motorway corridor in Central Jutland

On most of the E 45, traffic is between 40 000 and 80 000 vehicles per annual average daily (Figure 25). Parts of the motorway are congested during rush hours. It is especially the case around Aalborg, the Triangle Region and on the section between Aarhus and Vejle where there is a risk of speed reduction and queues.

[57] Cross-border Traffic in the Jutland Corridor - Strategic Analysis, Report nr. 586, Ministry for Transport, Building, and Housing, Copenhagen, 2018
[58] The Overall Road System in Jutland, Ministry for Transport, Building, and Housing, Copenhagen website, www.trm.dk/en, accessed on 02.07.19

To be able to handle the increasing traffic on the E 45, many extensions have been carried out in recent years, i.e. the E 45 has been expanded at Aalborg, Vejle and Kolding. The latter was done by including the emergency lane for regular traffic on a short section.

In the western part of Jutland, traffic is generally lower. Route 11 between Esbjerg and Tønder, for example, has 20 000 vehicles per average day. Indeed, in this area, infrastructure is less developed.

At the Danish-German border, the E 45 becomes A7 which is the longest motorway in Germany. Motorway A7 starts in Schleswig Holstein and ends on the Austrian border.

Apart from being a key motorway in Germany, the A7 is the main corridor in North Germany concerning international trade and tourism. Moreover, it is an essential corridor for the local population of Schleswig-Holstein and the numerous commuters travelling to and from Hamburg every day.[59]

[59] Cross-border Traffic in the Jutland Corridor - Strategic Analysis, Report nr. 586, Ministry for Transport, Building, and Housing, Copenhagen, 2018

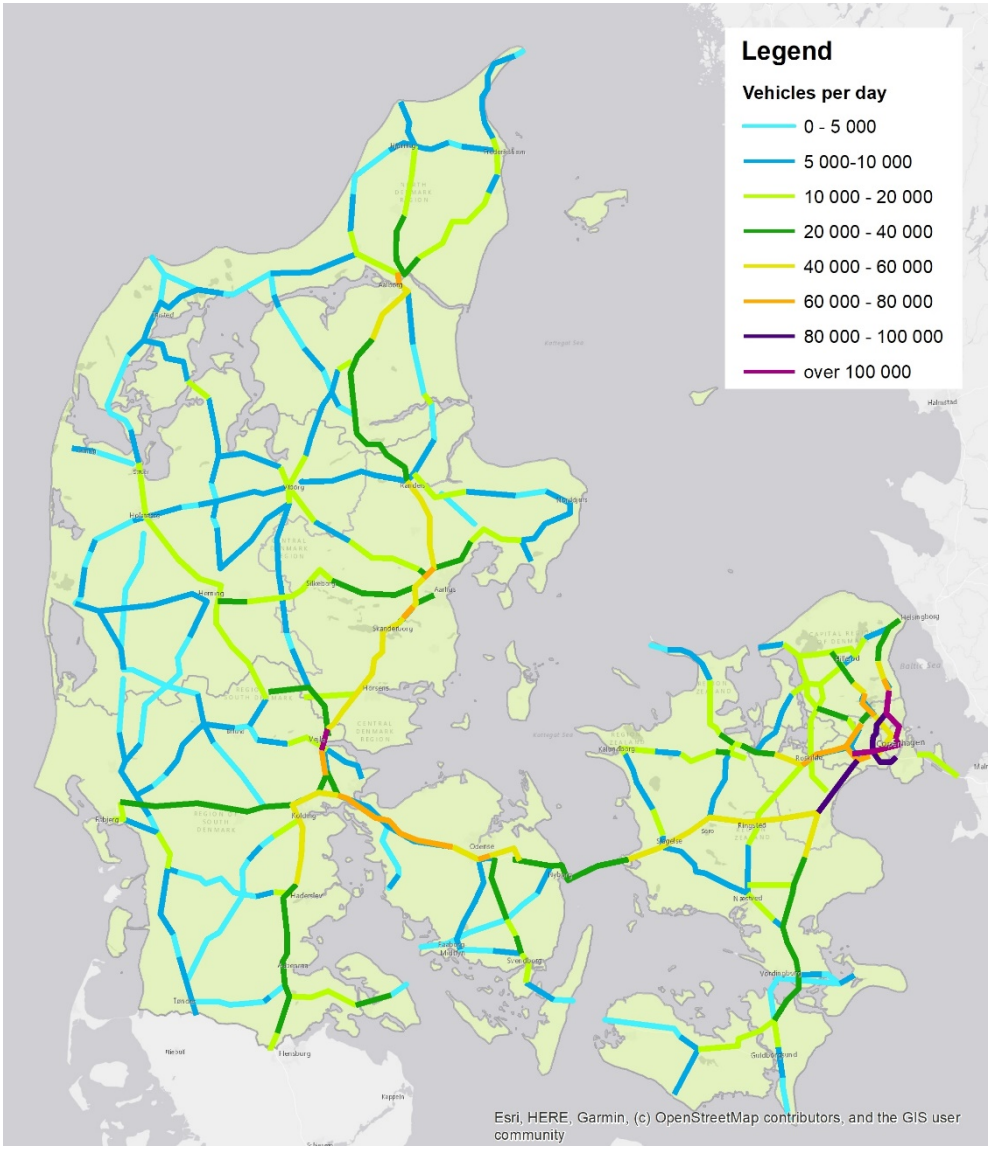

Figure 25. The annual average daily traffic in 2016 on the leading road network in Denmark

Source: own elaboration based on Cross-border Traffic in the Jutland Corridor - Strategic Analysis, Report nr. 586, Ministry for Transport, Building, and Housing, Copenhagen, 2018.

Since the financial crisis in 2008/2009, the increase in truck traffic transporting goods across the Danish borders could be observed. It is illustrated in Figure 25, showing the number of trucks across the borders towards Denmark.

Figures from ITD (Business association for Danish goods transport) show that most trucks cross the border in South Jutland, which in 2016 accounted for 57% of total truck traffic, whereas Øresund accounted for 20%.

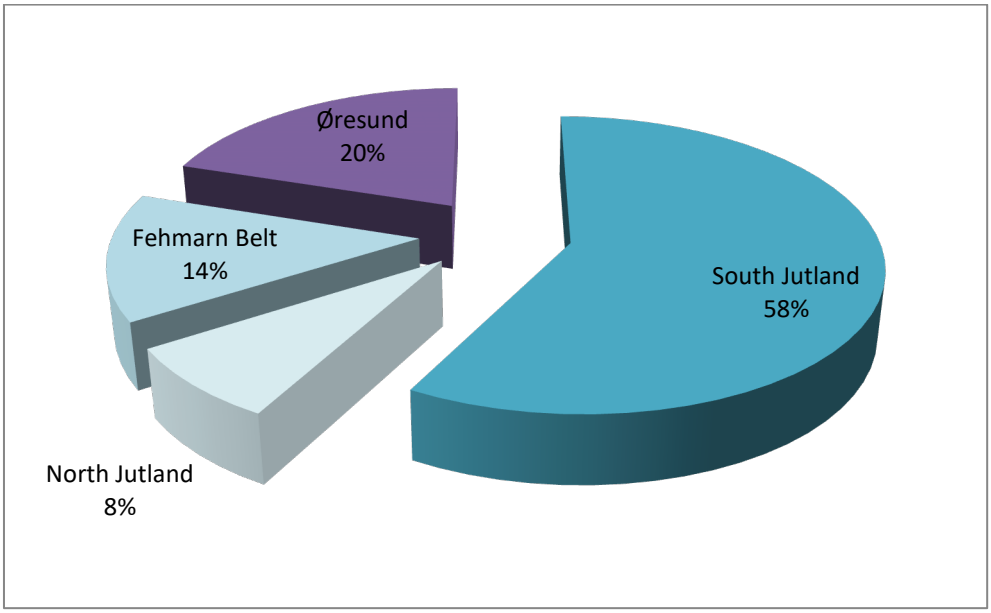

Figure 26. Percentage distribution of truck traffic in and out of Denmark in 2016

Source: Cross-border Traffic in the Jutland Corridor - Strategic Analysis, Report nr. 586, Ministry for Transport, Building, and Housing, Copenhagen, 2018.

The volume of transported goods has been decreasing after the crisis in 2008. From 2012 it has been multiplying to almost 24 000 tonnes of goods transported by foreign vehicles.

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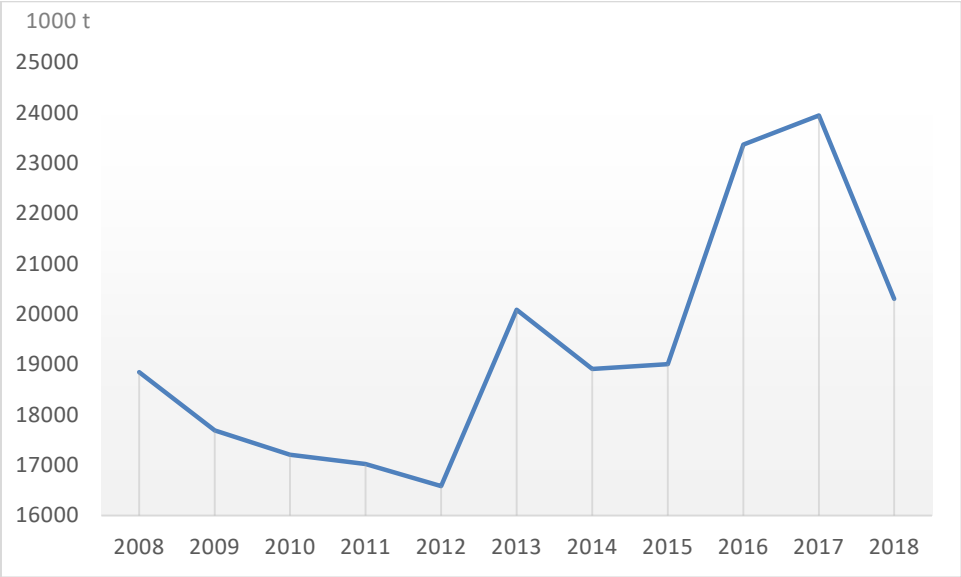

Figure 27. Road transport of cargo by foreign road vehicles in Denmark

Source: Statistics Denmark

1.4.7. Barriers and bottlenecks

Denmark is an essential transit country. Due to the increasing traffic volumes, the overall infrastructure has faced increasing pressure in the recent years and congestion poses a strain on commuters as well as businesses. Projections from the Ministry of Transport, Building and Housing (2018) suggest that in ten years' time car commuters will spend 150% more time each year in congestion than they did in 2018.

Freight transport in Denmark relies to a more considerable extent on road transport than the EU average. Correspondingly, the share of railways is lower. Inland waterways do not play any role in freight transport in Denmark. The completion of the TEN-T Core Network in Denmark is relatively advanced for the road part, but on the rail part, there is still room for further development.

In railways, the share of electrified lines was 24.5% in 2016 compared an EU average 53.7%. As a consequence, the vast majority of Danish locomotives are diesel-driven, which is adversely affecting the environment. In June 2018, the Danish railway operator announced plans to electrify the national railway network, with broad support from parliament. According to the plan, the new electrified trains on the national network will be up and running in 2022.[60]

One of the most important investments for Danish road and rail transport is the construction of The Fehmarn belt tunnel between Rødbyhavn on Lolland and the German island of Fehmarn. It is expected to open in 2028. With the length of 18 km it will be the world's longest of its type for both road and rail. The tunnel will comprise a four-lane motorway and two electrified rail tracks. Thanks to the investment it will take ten minutes to travel from Denmark to Germany by car and seven minutes by train. The Fehmarn belt link means that motorists will save one hour and will be able to travel when they want. Rail passengers will benefit from more and faster trains and this will also apply to domestic Danish routes. On Zealand and on Lolland-Falster, many commuters will enjoy shorter inter-city rail journeys, including to and from Copenhagen. Commuters between East and West Denmark will also notice a positive difference because the many freight trains that previously ran from Zealand, Sweden and Norway across Funen and Jutland will be able to take the direct route under the Fehmarn belt. When the Fehmarn belt link opens, it will also contribute to a greener transport system. The Fehmarn belt tunnel will enable more freight to be transported by rail and both cars and trains will save on distance and time, which will benefit the environment[61].

[60] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019.
[61] Fermen A/S – The tunnel across Fehmarnbelt, https://femern.com/, accessed on 19.05.2020

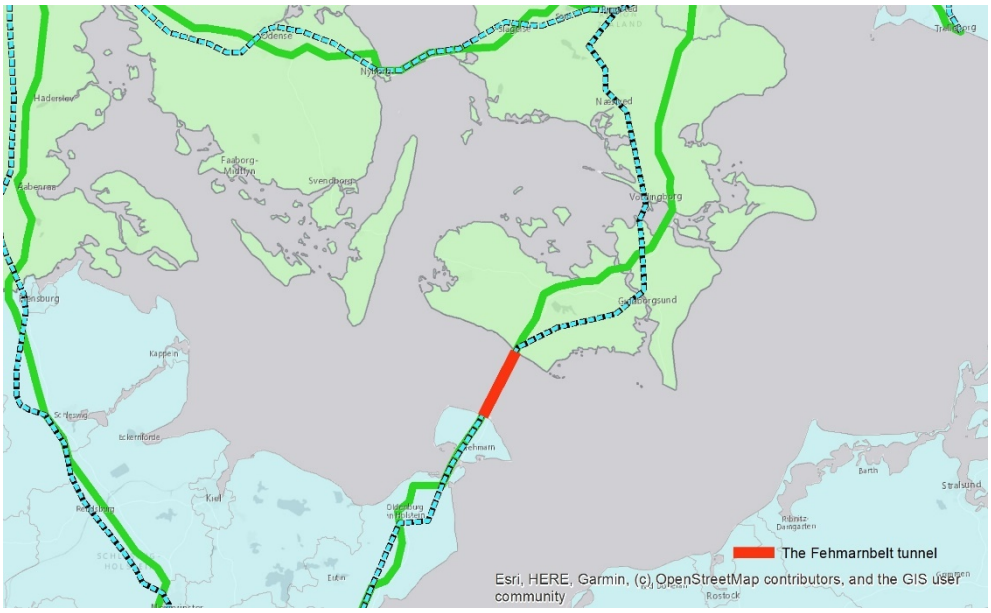

Figure 28. Planned Fehmarn Belt Fixed Link

Source: own elaboration.

Work on the Fehmarn belt tunnel between Rødby Harbour and Puttgarden is progressing well. All necessary permits for the Danish side are in place. The general contractors have been appointed and the economy has been thoroughly scrutinised. The only thing missing is the administrative building permission from the authorities in Schleswig-Holstein.

1.5. Germany

Germany's financial turnover from logistics is almost more than half of the EU and far more than the most prominent competitors, France and the UK. Of ten significant logistics sub-market segments in the EU 29, German companies lead in

seven. Germany's leading global logistic players include the Deutsche Bahn Group, which ranks no.1 in bulk logistics and also holds first place in Europe's general truckload segment.[62]

The reasoning behind Germany's logistics performance is to be the product of extraordinarily rational and strategic planning. Germany has been executing the construction of necessary infrastructure since World War II.

Thanks to the perfect location, Germany is the continent's commercial hub at the core of the European Union, bordering nine countries. That is why more goods pass through Germany than through any other country in Europe. In the north, Germany's seaports are a vital conduit for trade with the UK, Scandinavia and the Baltic States. Besides, road and rail links through the Jutland Peninsula provide easy access to Denmark and the rest of Scandinavia. In the west, an extensive network of roads, rail links and inland waterways feeds into France and the Benelux countries of Belgium, the Netherlands and Luxemburg. Again in the south, Germany has strong commercial ties with Switzerland and Austria and direct road, rail and water links with the Balkan states. These neighbouring countries and economic relations with them dominate the freight villages locations as well.[63]

The importance of Germany's central geographic location in an expanded European market is not only a significant benefit for logistic service providers, but is also a driving force of the nation's logistics market. As a result, Germany's logistics industry accounts for 8.8% of its GDP, which is significantly higher than the European average of 7.1%.[64]

There are approximately 60 000 companies in Germany's logistics sector, employing almost 2.7 million individuals or roughly 7% of the total workforce.

[62] The Comparison of Basic Transportation Infrastructure and ....
https://www.davidpublisher.org/Public/uploads/Contribute/591d3f637b062.pdf
[63] Ibidem
[64] Ibidem

The country's workforce is geographically concentrated along the Rhineland, through the industrial heartland of the Ruhr, to the North Sea and Baltic Ports. It matches the high volume of traffic to and from the Benelux countries and the west UK, Scandinavia and the Baltic States in the north. Finally, the EU's eastern expansion has given logistics in the eastern state of Brandenburg a significant economic boost.[65]

The probable growth rate in freight traffic will be even more pronounced. Freight moved (i.e. the mass of the goods transported multiplied by the distance they cover) on German transport infrastructure is set to rise by 38% by 2030. The main driver of this trend is a significant increase in the volume of international transport. All modes of transport will likely be confronted by a high rate of growth. The railways, in particular, face significant challenges in the form of a forecast growth rate of 42.9%. At many places on the networks, there is thus a need for upgrading and new construction projects.[66]

For building new infrastructure, Germany has rather strict regulations regarding environmental protection. Furthermore, the participation of citizens as well as of many non-governmental organizations (NGOs) in the planning process is required. It typically leads to a rather long duration of the planning process as well as the relatively high costs of providing infrastructure. Within the framework of European climate policy, Germany has set targets for reducing CO_2 emissions which are above the European average. Since the transport sector is one of the largest sources of CO_2 emissions, this political aim also affects transport policy.[67]

[65] The Comparison of Basic Transportation Infrastructure and https://www.davidpublisher.org/Public/uploads/Contribute/591d3f637b062.pdf
[66] The 2030 Federal Transport Infrastructure Plan. https://www.bmvi.de/SharedDocs/EN/publications/2030-federal-transport-infrastructure-plan.pdf?__blob=publicationFile
[67] Fichert, F. (2017). Transport policy planning in Germany - An analysis of political programs and investment masterplans. European Transport Research Review, 9(2), 28.

Transport infrastructure funding, especially of Federal Government projects, is supplemented by EU funds for the trans-European networks (TENs). In the ongoing programming period from 2014 to 2020, Germany has so far received around €1.6 billion, predominantly for investment in railway and waterway projects.[68]

Over the last 60 years, there has been a significant shift in the breakdown of overall freight volume across the individual modes of transport in Germany: the road segment has steadily increased at the expense of rail and inland waterways. In 1950 the share for rail was 56%, and for the inland waterway, it was nearly 24%, whereas the road share came to only around 20%. As per 2013, based on Eurostat Statistics data the road share of the modal split is 70.7%, whereas rail (nearly 19.1%) and inland waterway (about 10.2%) trail a long way behind. The main reasons for the gains made by road transport are the flexibility and speed of trucks compared to other modes of transport. The ongoing shift in the production structure of the economy away from traditional bulk goods to high-quality products, the growing logistics demands of customers as well as the increase in small consignments (heavily associated with the rise of e-commerce) were also pivotal to the success of road transport. Besides, the road infrastructure was expanded quickly and extensively following World War II.[69]

The policy areas for Germany are generally environment and cost efficiency-oriented. Five essential topic titles are taken into account in the master plan:

1. Strengthen Germany as a logistics centre,
2. Enhancing the efficiency of all modes of transport,
3. Exploiting the strengths of all modes of transport by interlinking transport infrastructure in an optimum manner,

[68] The 2030 Federal Transport Infrastructure Plan, Federal Ministry of Transport and Digital Infrastructure, Berlin, 2016
[69] Hamamcioglu, C., & Oguztimur, S. (2015). The comparison of basic transportation indicators and freight villages' locations between Germany and Turkey.

4. Promoting the compatibility of transport growth with environmental protection and climate change mitigation and
5. Supporting the right conditions of working and training in the freight transport industry.

1.5.1. Short sea shipping

European Short Sea Network made an evaluation of German market to show the importance of container transport in short sea shipping among the North Range ports of Antwerp, Le Havre, Rotterdam, Zeebrügge, Bremerhaven, and Hamburg. Short sea shipping accounts for 14.7 million TEU and a 34% share of the total throughput, meaning it is highly important for the North Range seaports. Analysis of data on the volume of feeder and shortsea shipping showed that feeder shipping carries 7.8 million TEU and the shortsea-land market accounts for 5.3 million TEU. 1.6 million TEU were handled in so-called interlining traffic. Feeder shipping is a part of short sea shipping[70].

As in Denmark, the volume of freight transported by short sea shipping fell during the economic crisis in 2009. Since then, short sea shipping volume has increased, but has still not reached the high level of 2007 (192 845 thousand tonnes in 2007, 175 323 thousand tonnes in 2018) (Figure 29).

[70] Annual Report 2017-2018, European Shortsea Network, www.shortsea.gr/wp-content/uploads/2019/08/ESN-annual-report-2017-2018.pdf, accessed on 02.06.2020.

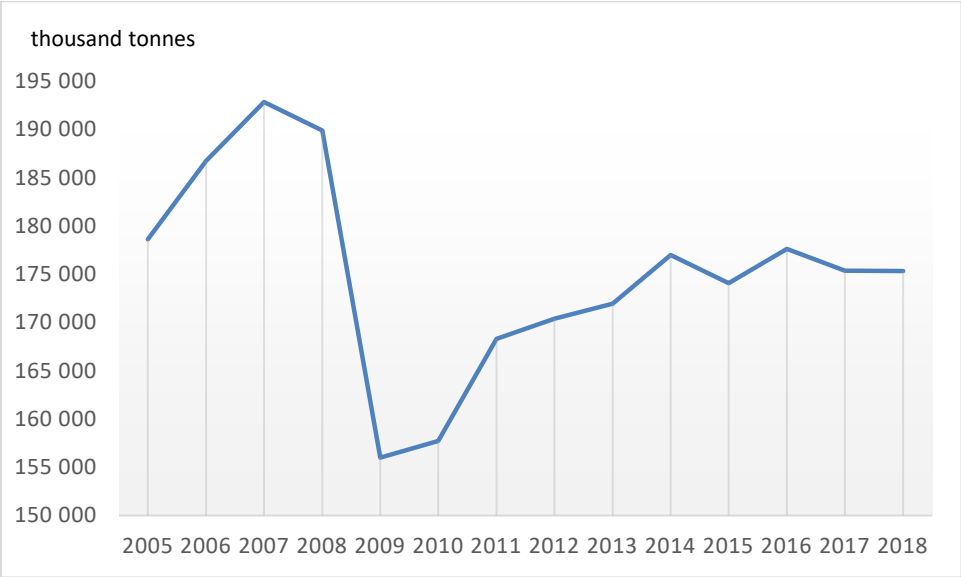

Figure 29. Short sea shipping in Germany

Source: Eurostat data.

Compared to the Scandinavian countries, Lithuania and Poland, the share of short sea shipping transhipments in total maritime transport in Germany is relatively low. In addition, its size has been gradually decreasing over the last years. One of the lowest indicators was recorded in 2013 - 58.4%. Since then, the share has slightly increased, reaching 59.9% in 2018 (Figure 30).

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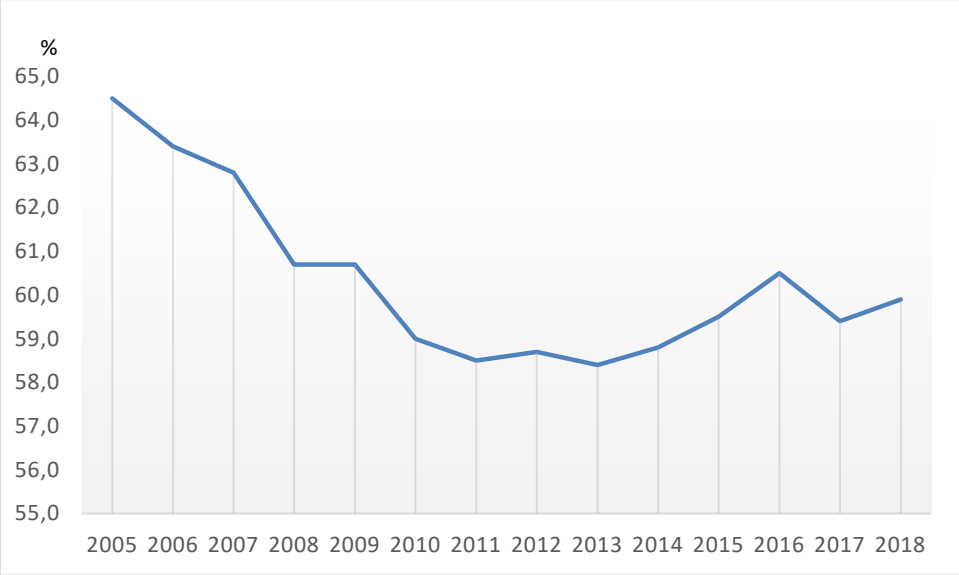

Figure 30. Share of short sea shipping in total maritime transport in Germany

Source: Eurostat data.

1.5.2. Inland waterway transport

The most substantial part of the infrastructure for inland navigation has to be provided and maintained by the federal government.

With a total length of 7 350 km, more than 300 weirs and 450 lock chambers Germany has the largest inland waterway network in Western Europe. The Federal waterways also include some 23 000 square kilometres of lakes.[71] Every year up to 240 million tonnes of cargo is transported on these waterways, and about 400 000 jobs depend directly or indirectly on the inland navigation.

Table 16.

[71] BMVI - Waterways as transport routes.
https://www.bmvi.de/SharedDocs/EN/Articles/WS/waterways-as-transport-routes.html

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Length of navigable inland waterways (*thousands of kilometres*)	7.7
Cargo transportation IWT (*billion tkm*)	59.1
IWT share in total freight turnover of transport	9.6

Source: Miloslavskaya, S., & Plotnikova, E. (2018). Current situation and optimization of inland waterway Infrastructure financing. Transport Problems, 13.

The inland waterways can roughly be divided into two categories: on the one hand the so-called core network including the rivers Rhine, Moselle or the Middleland canal with a significant amount of cargo (about 4 000 km waterways) and on the other hand second-grade rivers and channels like the Ilmenau River or the Finow Canal with negligible commercial navigation. Most of them are nowadays used only for recreational purposes with pleasure boats. Until today there are roughly 100 weirs in operation to satisfy existing water level requirements. A major part has to be replaced within the next years.[72]

The leading freight inland waterway network forms an essential component of the "wet" TEN-T and, accordingly, must be maintained and upgraded in an effective and efficient condition. In particular in inland waterway traffic, bottlenecks in the network must be eliminated to increase its capacity. The North Sea and the Baltic Sea are accessible via 757 kilometres of waterways navigable by sea-going ships. These waterways form the connection to and from the German seaports to ensure maritime transport operations. The countries between the Black Sea and the North Sea can be reached by vessels via the Danube, the Main-Danube Canal, the Main, and the Rhine. The wet East-West thoroughfare is formed by the canal network linking the Rhine and the Oder. There are more than 100 modern

[72] Belzner, F., Merkel, J., Gebhardt, M., & Thorenz, C. (2017). Piano key and labyrinth weirs at German waterways: Recent and future research of the BAW. Labyrinth and Piano Key Weirs III: PKW, 167-174.

public sea and inland ports in this country. 56 of the 74 metropolitan areas in Germany are linked via waterways.[73]

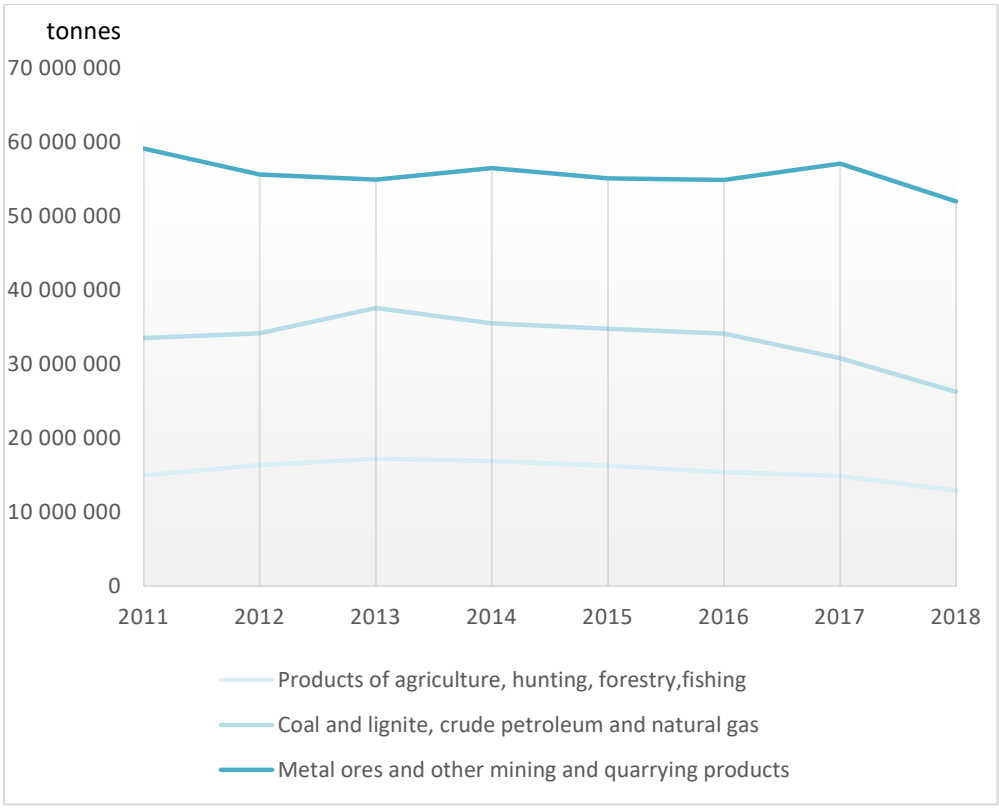

Figure 31. Goods transported on inland waterways in Germany

Source: Statistisches Bundesamt DUSTATIS, www-genesis.destatis.de, access on 24.06.2019.

According to Eurostat, Germany is the biggest inland shipping market in the EU with a share of 40% of freight traffic. Duisburg is home to Europe's largest inland port. Port authorities of Antwerp, Amsterdam and Rotterdam view the port in Duisburg as key to their plans to boost the share of inland shipping and rail in

[73] BMVI - Waterways as transport routes.
https://www.bmvi.de/SharedDocs/EN/Articles/WS/waterways-as-transport-routes.html

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hinterland transport which currently is dominated by trucking. In Germany, most inland ports are well connected with other modes of transport. In the seaport hinterland transport segment as well as inland shipping performs a small but significant function as a feeder and forwarder of goods to their final destination. Overall, inland shipping has nevertheless registered the lowest growth of all modes of transport in Germany in recent years. The main reasons for this are the goods mentioned above structure and logistics effects along with other factors. Domestic shipping is particularly susceptible to external factors such as extremes of weather.[74]

Up to 240 million tonnes of bulk goods are transported per year via the German Federal waterways, which amounts to around 65 billion tonne-kilometres. It equals almost 75% of the goods transport by railway in this country or about 14 million lorry journeys. Moreover, some 1.5 million twenty-foot equivalent units (TEUs) of containers are carried via inland waterways, which corresponds to another 700 000 lorry journeys. This way, inland shipping makes a significant contribution to satisfying the industry's demand for transport services, which are delivered on schedule and in a cost-effective and environmentally compatible manner. German inland shipping and inland ports keep around 400 000 people in work. Besides, inland passenger vessels, including river cruise ships, are also growing in economic significance. Many millions of tourists travel in them each year, enjoying the delightful waterside landscapes.[75]

1.5.3. Railway transport

The German railway system has experienced significant legislative and organizational changes in the past years: state control with a single, hierarchically structured organization owning and operating both infrastructure and rail traffic

[74] Hamamcioglu, C., & Oguztimur, S. (2015). The comparison of basic transportation indicators and freight villages' locations between Germany and Turkey.
[75] Federal Ministry of Transport and Digital Infrastructure, www.bmvi.de, access on 24.06.2019.

was replaced by a market regulation regime with multiple actors and diverse roles and responsibilities in the early 1990s. These reforms were mainly driven by the needed integration of the two railway systems after German reunification and further influenced by a European directive demanding non-discriminatory track access as a result of liberalization processes within the European Union.

This reform had two overall objectives: increasing railroad traffic and easing constraints on the national budget. In 1994, the state-owned railways of former West and East Germany, Deutsche Bundesbahn and Deutsche Reichsbahn, were merged and transformed into Deutsche Bahn AG (DB).[76] DB was founded as a private corporation (public limited company) according to the German Stock Corporation Act, but all shares remained state property. Shareholder rights and duties of the Federal Government are carried out by the Federal Ministry of Transport and Digital Infrastructure (BMVI). DB operates in a complex holding structure, where infrastructure and rail traffic are organizationally unbundled, the latter competing with other private rail companies. Responsible for railway infrastructure is DB Netze, which includes the business units DB Netze Track, DB Netze Energy and DB Netze Stations.[77]

The German railway network, with its length of about 42 000 km (as of 31 December 2017), is the largest in Europe and among the ten most significant in the world.[78] Due to its central position in Europe, it is highly relevant for transnational traffic.

The HSR-network in Germany was opened in 1991 after two decades of publicly funded research into tracks and propulsion technology. As shown in Figure 32, the high-speed rail era started with one major track running from Hamburg via Mannheim and Frankfurt to Munich, serving a total of ten stations. The network

[76] DB is the dominant player and operates about 90% of the rail network
[77] Rotter, M., Hoffmann, E., Pechan, A., & Stecker, R. (2016). Competing priorities: how actors and institutions influence adaptation of the German railway system. Climatic change, 137(3-4), 609-623.
[78] Statistisches Bundesamt DUSTATIS, www-genesis.destatis.de, access on 24.06.2019

has since then been enlarged in two major waves. The first north-south axis was in the following years complemented by an east-west connection from Berlin to Cologne, covering several large cities in the Rhine-Ruhr area, and a diagonal line from Cologne to Munich via Stuttgart, Augsburg, and Ulm. In addition, the branches to Kiel, Bremen and Freiburg were added to the network. In 1998, a total of 46 ICE-stops were in operation. At this point, all major cities in Germany were connected to the ICE-network, and the number of direct connections amounted to 318.

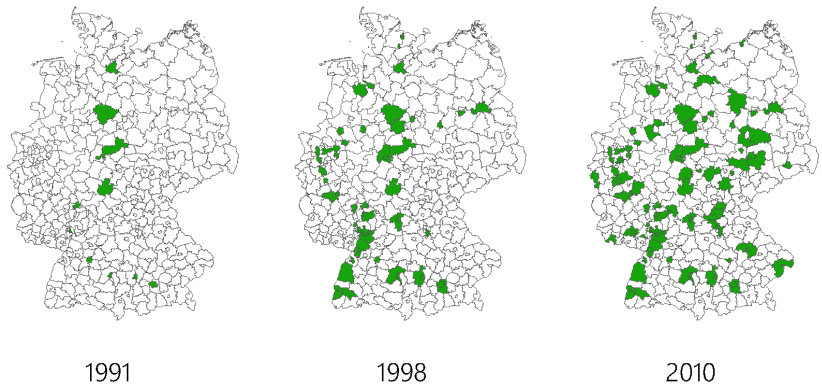

Figure 32. The high-speed rail network in Germany

Source: Heuermann, D. F., & Schmieder, J. F. (2018). The effect of infrastructure on worker mobility: evidence from high-speed rail expansion in Germany. Journal of Economic Geography, 19(2), 335-372.

The second wave started with the opening of the Berlin-Munich line in 1999, when many smaller cities in Eastern Germany and Bavaria, including Naumburg, Saalfeld, and Lichtenfels, were connected to the network. In 2002, the towns of Montabaur, Limburg, and Siegburg, which are located on route between Cologne and Frankfurt, gained access to the new HSR-line built between the Rhine-Main and the Rhine-Ruhr area. During this period, the network was extended to cover 34 additional small and medium-sized cities. In 2010, 80 counties were served by 260

high-speed trains in at least four-hour intervals, in most cases every one or two hours. As a result of these extensions, the number of direct ICE-connections rose by 582 to a total of 900 in 2010.[79]

The European Commission defines the rail freight corridors as the lifeblood of the activities to shift significant amounts of freight traffic to the railways in the long term, as envisaged in the Commission‘s Transport White Paper. Regulation (EU) No 913/2010 concerning a European rail network for competitive freight entered into force on 9 November 2010.

Today, the following six corridors pass through Germany:[80]

- „Rhine-Alpine“ (NL, BE, DE, IT, CH), in operation since 10 November 2013; this corridor is considered to be a model for the other corridors, both in terms of the lessons already learned on it and since it is already operational;
- „North Sea-Baltic“ (DE, NL, BE, PL, LT, LV, EE), in operation since 10 November 2015;
- „ScanMed“ (SE, NO, DK, DE, AT, IT), in operation since 10 November 2015;
- „Atlantic“ (PT, ES, FR, DE), in operation since 10 November 2016;
- „Orient/East-Med“ (CZ, AT, SK, HU, RO, BG, EL, DE), to commence operation on 10 November 2018;
- „Rhine-Danube“ (FR, DE, AT, SK, HU, RO), to commence operation on 10 November 2020.

[79] Heuermann, D. F., & Schmieder, J. F. (2018). The effect of infrastructure on worker mobility: evidence from high-speed rail expansion in Germany. Journal of Economic Geography, 19(2), 335-372.
[80] Freight Transport and Logistics Action Plan - Towards a Sustainable and Efficient Future, Federal Ministry of Transport and Digital Infrastructure,

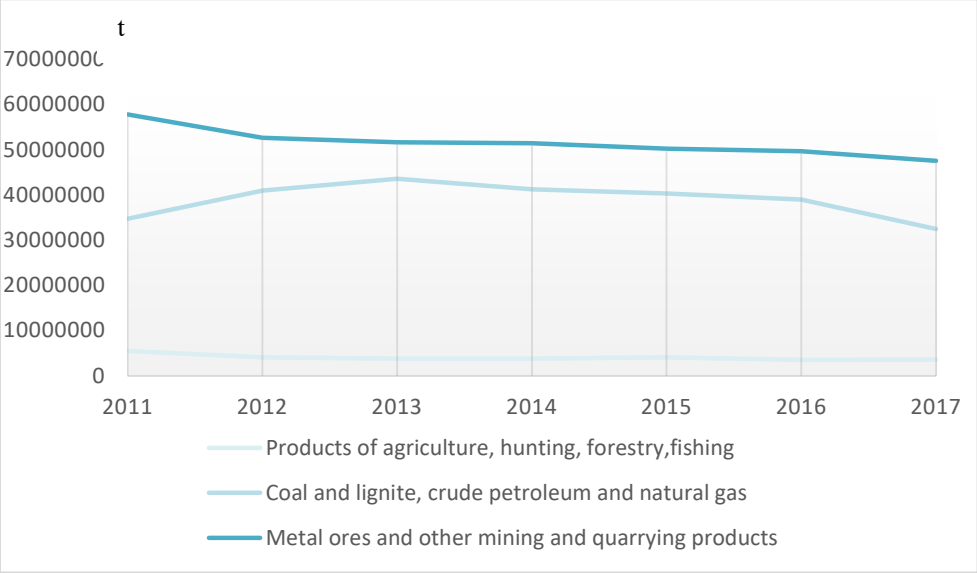

Figure 33. Goods carried by rail in Germany

Source: Statistisches Bundesamt DUSTATIS, www-genesis.destatis.de, accessed on 24.06.2019.

In recent years, rail freight volumes in Germany grew at an average of 8% per year. It was mostly due to private rail companies, which increased their traffic by an average of 40% per year. This success of private rail operators in Germany shows that competition in the rail sector can positively impact the entire transport sector. At the same time, rails play a hugely important role in the seaport hinterland transport segment, which is increasingly developing into a bottleneck at many major German ports.[81]

1.5.4. Road transport

In 2015, the entire road network's length in Germany was more than 680 000 km. The share of the federal highways was 1.9%, the share of federal expressways

[81] Hamamcioglu, C., & Oguztimur, S. (2015). The comparison of basic transportation indicators and freight villages' locations between Germany and Turkey.

5.8%, and the share of the state roads 12.7%. The network length of federal highways increased by 20% since reunification, whereas the network length of the federal expressways decreased by 10%. Since the expressway network is significantly more extensive than the highway network, the length of the entire federal road network decreased by 3.3%. One reason is the downgrading from federal expressways to state roads, especially after the construction of new highways running parallel to existing expressways.[82]

As many motorways were built in the 1970s, today's traffic volume exceeds by far the numbers which have been forecasted in that period, significant parts of the infrastructure are 'worn out'. Almost 5 million trucks (light as well as bulky goods vehicles) are registered in Germany. A high and increasing share of trucks on German motorways is operated by foreign companies (40% of total mileage in 2015), especially transporting goods between eastern and western Europe, as well as between northern and southern Europe. Therefore, an increasing share of infrastructure funding has to be allocated to repairing and replacing infrastructure rather than expanding it. The 'level of modernity' for the entire road infrastructure (defined as the relation between the current asset value and the acquisition values) decreased from 0.70 in 1991 to 0.66 in 2015.[83]

[82] Transport policy planning in Germany - An analysis of https://link.springer.com/article/10.1007%2Fs12544-017-0247-7
[83] Fichert, F. (2017). Transport policy planning in Germany - An analysis of political programs and investment masterplans. European Transport Research Review, 9(2), 28.

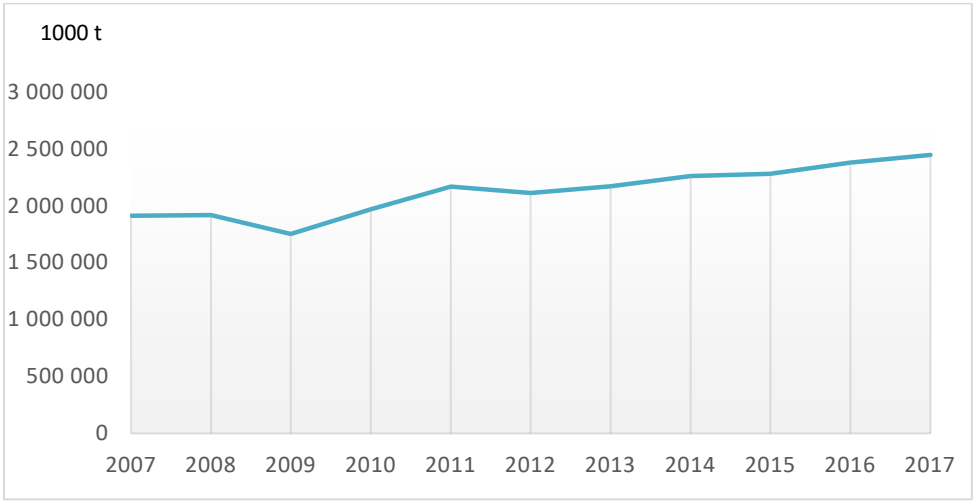

Figure 34. Quantity of goods transported by road in Germany

Source: Statistisches Bundesamt DUSTATIS, www.genesis.destatis.de, access on 24.06.2019.

Almost one-fifth of the country's freeways ("Autobahnen") have already exceeded the critical warning threshold used to assess the condition of road surfaces. For its highways ("Bundesstraßen"), the figure is nearly 40%. Moreover, virtually half of the bridges along Germany's long-distance roads have exceeded the warning threshold. The tracks and switches that make up the German rail network are around 20 years old on average, while the country's railway bridges have an average age of 55 years. In the years ahead, there will, therefore, be a substantial need to invest in a replacement. It represents a particularly severe challenge since bridges act as natural bottlenecks: if they become overloaded or are out of service, this can significantly impair the operation of the entire network.[84]

[84] Berger, R. (2013). Planning and Financing Transportation Infrastructures in the EU, a Best Practice Study. Study commissioned by Bundesverband der Deutschen Industrie e. V.(BDI) et al. Roland Berger Strategy Consultants. Berlin.

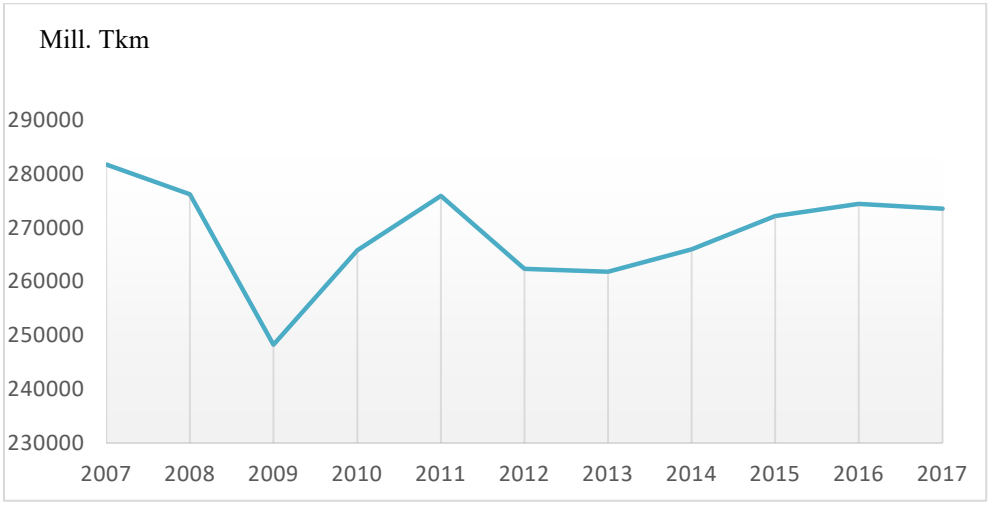

Figure 35. Road transport performance in Germany

Source: Statistisches Bundesamt DUSTATIS, www-genesis.destatis.de, access on 24.06.2019.

The responsibilities for infrastructure provision depend on the mode of transport. Every road in Germany is classified according to its user structure. The federal level is in charge of roads which are predominantly used for interstate traffic, with a further differentiation between federal motorways (Bundesautobahnen) and federal highways (Bundesstraßen). Whereas all expenses for those federal roads are financed through the federal budget, the tasks of planning, building and maintaining those roads are assigned to the states, leading to some principal-agent problems.[85]

1.5.5. Barriers and bottlenecks

Germany has one of the most modern transport infrastructures in the world, with a dense and efficient network of roads, railways, waterways, ports and airports. The logistics systems have been developed to a very high standard. The

[85] Fichert, F. (2017). Transport policy planning in Germany - An analysis of political programs and investment masterplans. European Transport Research Review, 9(2), 28.

Federal Government's objective is to lastingly secure the leading position that Germany enjoys in freight transport and logistics and transport infrastructure.[86] However, as many motorways were built in the 1970s and today's traffic volume exceeds by far the forecasts, significant parts of the infrastructure are 'worn out'. The 'level of modernity' for the entire road infrastructure (defined as the relation between the current asset value and the acquisition values) decreased from 0.70 in 1991 to 0.66 in 2015.[87]

It is why the first, at the same time, the key challenge to which will have to face is even more drastic rise in the level of freight traffic that is likely as a result of globalization and increasing division of labour in the economy. Increasing specialization and division of labour will lead to a further rise in international trade. The result will be that more and more goods are transported over increasingly long distances. It means there is likely to be a sharp increase in the demand for logistics and freight transport services. No reaction to this situation will increase tonne-kilometres in Germany are likely to rise by 71% between 2004 and 2025. In the road haulage sector, this increase will be higher (79%), and in long-distance road haulage, it will be as high as 84% moreover, since this rise will differ from one region to the next, itis likely that freight traffic levels will almost double on some trunk roads. If this forecast rise were to become a reality, it would mean that incased that where today one lane of a motorway is used by heavy goods vehicles, in just under twenty years two lanes would be necessary to cope with the increased volume of freight traffic. Also, passenger traffic will increase, although at a much lower rate (19%).[88]

[86] Freight Transport and Logistics Masterplan, The Federal Government, Germany, www.bmvi.de/, accessed on 10.04.2020
[87] Fichert, F. (2017). Transport policy planning in Germany - An analysis of political programs and investment masterplans. European Transport Research Review, 9(2), 28.
[88] Freight Transport and Logistics Masterplan, The Federal Government, Germany, www.bmvi.de/, accessed on 10.04.2020

Regarding inland waterway transport, the recommendations arising from the AGN Agreement concerning German waterways qualify them as:[89]

- Primary bottlenecks:
  - Saale (E 20–04) from Calbe to Elbe – upgrading to class IV is underway.
  - Mittellandkanal (E 70) – sections which have not yet been modernized are being upgraded to class Vb. The project is underway.
  - Elbe – Havel – Kanal (E 70) – upgrading from class IV to class Vb is underway.
  - Untere Havel – Wasserstraße (E 70) from Plauen to Spree – upgrading from class IV to class Vb is underway.
  - Berlin region waterways (various sections) upgrading to classes IV and Va is underway.
  - Havel – Oder – Wasserstraße (E 70) – upgrading from class IV to class Va is underway to enable navigation of vessels with two layers of containers.
- Strategic bottlenecks:
  - Rhine (E 10) – low fairway depth during dry seasons: downstream from Duisburg (2.50 m), from St. Goar to Mainz (1.90 m) and low height under bridges at Kehl/Strasbourg (6.75 m).
  - Elbe (E 20) lower Elbe – need for lifting of bridges for container transport with three layers of containers; the middle Elbe from

[89] Inventory of Most Important Bottlenecks and Missing Links in the E Waterway Network, Resolution No. 49, Revision 1, Economic Commission for Europe, Inland Transport Committee, United Nations, New York and Geneva, 2013.

Lauenburg upstream to the border between Germany and the Czech Republic – low fairway depth during dry seasons (1.40 m).

- Moselle (E 80) – construction of 10-second lock chambers is underway.
- Main (E 80) upstream from Würzburg – low fairway depth (2.50 m).
- Danube (E 80) from Straubing to Vilshofen – low fairway depth (1.55 m).
- Danube (E 80) – low height (4.70 m) under the railway bridge in Deggendorf (km 2 285.87) – upgrading to 7.00 m is underway.
- Danube (E 80) – low height under bridges at Bogen (km 2 311.27) – 5.00 m; at Passau (km 2 225.75) – 5.15 m and (km 2 230.28) – 6.30 m – upgrading to 7.00 m is necessary.

Little attention has been paid to the restructuring of river ports, which are considered to be late-comers to the restructuring process. Municipal governments in river ports have been directly influenced by what has happened in seaports. In most cases, a river port is closer to a city, both in a geographical and political sense, as port management generally remains in the hands of the municipalities. Unlike seaports, which simply withdrew from obsolete installations and built new terminals further away on unused land partly reclaimed from the sea, river ports do not have the same opportunities for expansion and have much more of a struggle to avoid losing land. Along the Rhine River, the trend towards port regeneration is characterised by its rapidity and scale. Almost every large and medium-sized city has a regeneration programme that is accelerating a continuous functional disconnection between the city and its port activities.[90]

[90] Beyer, A. (2018). Inland waterways, transport corridors and urban waterfronts. International Transport Forum Discussion Paper.

1.6. Belgium (North Sea region)

Belgium has a strategic location in Europe. Being part of Benelux and lying halfway between Paris and the industrial Ruhr area, the country is located at the heart of the European production system and has one of the densest road and railway networks in the world. Its freight transportation system heavily relies on the Port of Antwerp, the second-largest container port in Europe, right behind the Port of Rotterdam. Belgium also has two smaller container ports, those of Zeebrugge and Ghent.

The potential markets for intermodal transport are large-flow routes over a long distance. Small as they are, Belgium and the Netherlands still feature amongst the countries having the highest share of intermodal freight transport in Europe. Despite a visible improvement in Belgium, there remains ample spare capacity for these so-called alternative transport modes.[91]

1.6.1. Short sea shipping

The volume of transport using short sea shipping in Belgium has fluctuated in recent years, however the overall trend is growing. The only major drop in cargo volume was recorded during the economic crisis in 2009. Currently, transhipments remain at around 135 thousand tonnes.

[91] Santos, B. F., Limbourg, S., & Carreira, J. S. (2015). The impact of transport policies on railroad intermodal freight competitiveness–The case of Belgium. Transportation Research Part D: Transport and Environment, 34, 230-244.

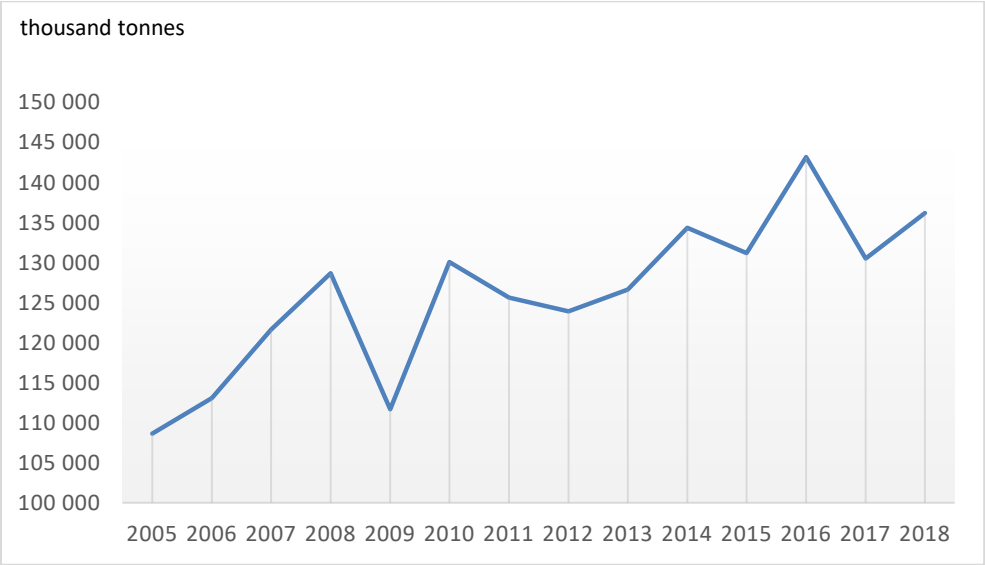

Figure 36. Short sea shipping in Belgium

Source: Eurostat data.

On the other hand, one can notice a significant decrease in the share of short sea shipping in total maritime transport in Belgium. The share fell from 57.5% in 2010 to 50.4% in 2018.

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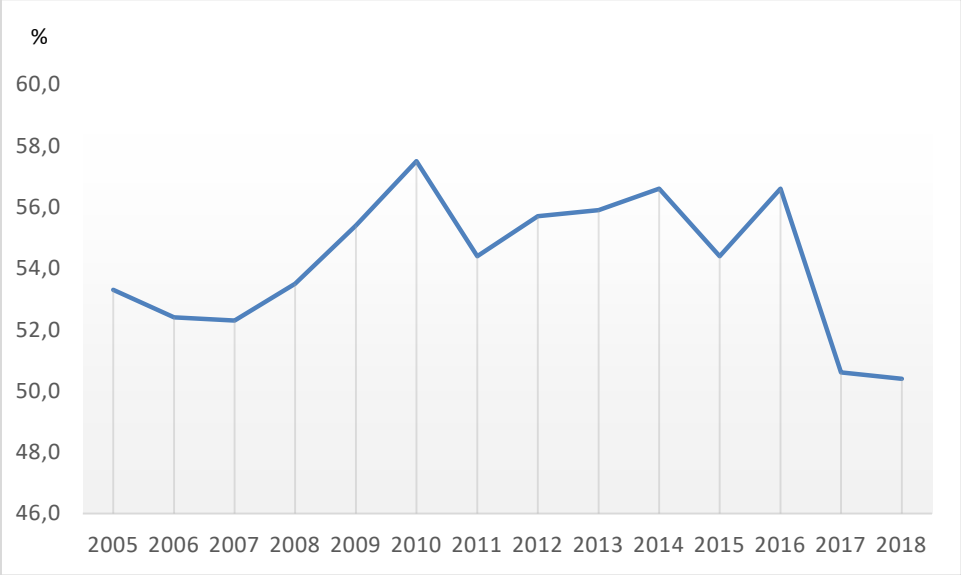

Figure 37. Share of short sea shipping in total maritime transport in Belgium

Source: Eurostat data.

1.6.2. Inland waterway transport

Maritime navigation remains an essential sector in Belgium and also reflects the state of the Belgian economy. In 2009, the economic crisis hit this sector hard but then gave way to a recovery in 2010 and 2011. After a more difficult period in 2012, volumes have started to rise again so far.

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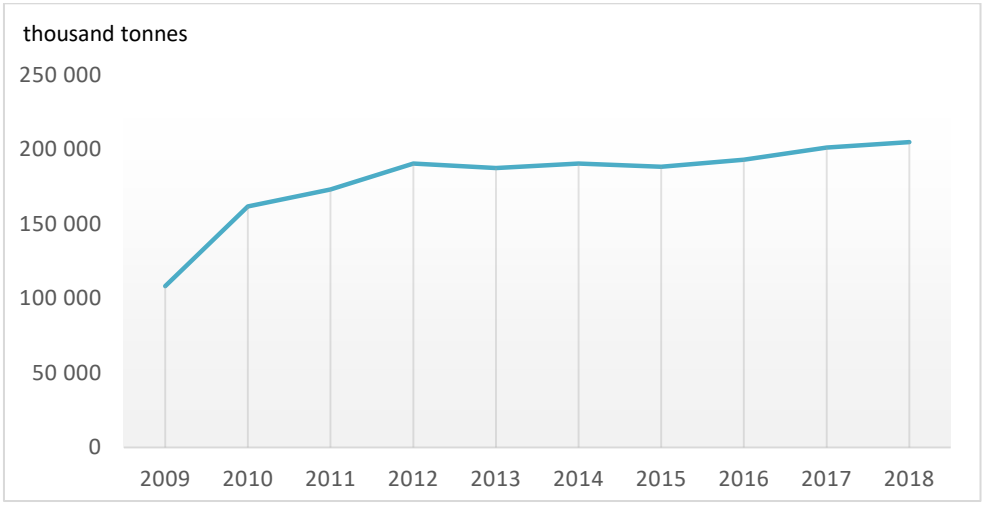

Figure 38. Transport of goods by inland waterways in Belgium

Source: Eurostat, appsso.eurostat.ec.europa.eu, accesses on 30.03.2020.

In 2018, inland waterway vessels transported almost 205 million tonnes of goods on Belgian inland waterways. That is 3 million tonnes more than in 2017 and 12 million tonnes more than in 2016. The trend is slightly upward. The container transport by inland waterway vessels has fluctuated between 34 and 36 million tonnes these past few years.

In close co-operation with all stakeholders, the Port of Antwerp is continuously looking for solutions to optimize barge transport further. More regular services, faster turnaround time in the port and adapted infrastructure to cope with future growth, just to name a few. In this manner, the Port of Antwerp sets the tone in inland navigation – as the best inland shipping port in Europe.

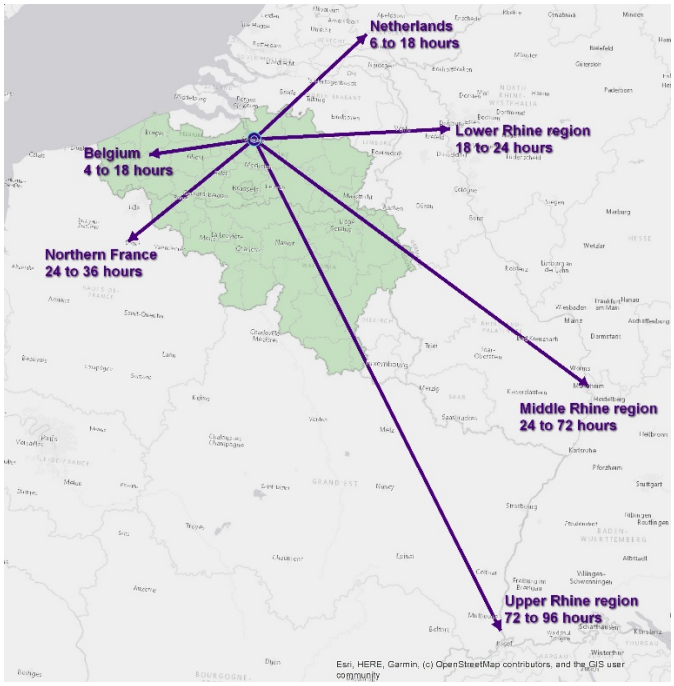

Figure 39. Time travel from Port of Antwerp

Source: The Port of Antwerp website, www.portofantwerp.com/en/inlandshipping, 01.04.2020.

The Connectivity Platform lists all 240 weekly services between Antwerp and 90 key destinations in Europe. Thanks to its inland location, in the middle of the Scheldt-Maas-Rhine-delta, the port is directly connected with the pan-European barge network.[92]

Because it's connected to Europe's most important markets, Flanders is the starting point for major freight transport via inland waterways. The river and canal network of Flanders is one of the densest in the world, extending over 1 357 kilometres.[93] One of the most important inland waterway hub is Ghent. Ghent-

[92] The Port of Antwerp website, www.portofantwerp.com/en/inlandshipping, 01.04.2020.
[93] The inland waterway network of Flanders, www.flandersinvestmentandtrade.com/invest/en/investing-in-flanders/infrastructure/inland-waterway-network-flanders, accessed on 19.05.2020.

Terneuzen Canal is running 31 km from south to north between Ghent and the Western Schelde estuary at Terneuzen, Netherlands. The canal is about 150 metres wide in the Netherlands but broadens to 200 metres in Belgium, with the depth being 13.5 metres. Dredging of the canal entrance was undertaken in the early 1990s to enable the canal to take 125 000-tonne ships.[94]

A large EU project called Seine Nord is also underway. The Seine-Nord Europe Canal will link the Oise to the Dunkerque-Escaut canal, from Compiègne to Aubencheul-au-Bac, near Cambrai. The works will allow the realization of large European Vb-class canal, which will be able to service boats with a length up to 185 metres and up to 11.40 metres wide. That means it will be able to contain 4 400 tonnes of goods, which is the equivalent of 220 trucks. The Seine-Nord Europe Canal will have a length of 107 km between Compiègne and Aubencheul-au-Bac. It will have a water depth of 4.5 m and a surface width of 54 m. The canal will create a competitive offer to heavy goods vehicles on the North-South axis, where goods are transported almost exclusively by road. The Seine-Nord Europe Canal is the missing link between Antwerp logistic basin and the logistic basin of Paris.[95]

1.6.3. Railway transport

Freight and passenger operations are typically controlled by separate companies. There are currently three international passenger rail undertakings and 12 freight operators, with no overlap between the two types of operators.

Each rail operator needs to possess a rail license and a safety certificate. The request for the rail license needs to take place in the Member State where the transporter is located, but it is valid in all EU Member States. The safety certificate

[94] Ghent-Terneuzen Canal, www.britannica.com/topic/Ghent-Terneuzen-Canal, accessed on 19.05.2020.
[95] Canal Seine Nord Europe, www.canal-seine-nord-europe.fr, accessed on 19.05.2020.

is being issued per Member State. In Belgium, those are being issued independently by DVIS (Service Safety and Interoperability of the Railways). DVIS belongs to the Federal Public Service Mobility and Transport administration and allocates a certificate as soon as the required safety limits of the country where the operator wants to be active are met.

Within SNCB (independent public company), freight transport is being executed by SNCB Logistics, which is since 2011 an independent company and freight transporter. The commercial freight activities of SNCB Logistics were divided into two groups: IFB (Interferryboats), which mainly works in the intermodal market and maritime container transport, and Xpedys, which provides logistics solutions, mainly for transporting bulk, raw materials, agricultural and steel products. Since July 2011, Rail Force, part of Xpedys, operates in the transport of consumer goods and freight for the chemical sector and the car industry. Co-operation agreements with Italy and Germany are named Sibelit and Cobra respectively. In Northern France, SNCB Logistics operates under the name OSR. Traction is mainly performed in-house, although on some international trajectories there is co-operation with both incumbents and private operators.[96]

1.6.4. Road transport

Belgium has a highly developed transport infrastructure. Road transportation, air, rail and water networks are well-developed, and the country has approximately 118 414 kilometres of roads, which divide roughly between 13 892 km main roads 1 747 km of motorways, and 102 775 km of other paved roads.

Regional authorities manage the road network in Belgium. The Flemish Region, the Walloon Region and the Brussels-Capital Region each manage their

[96] Van de Voorde, E., & Vanelslander, T. (2014). Development of rail freight in Europe: what regulation can and cannot do: Belgium case study.

respective road network. As a consequence, road signs in Flanders and Walloon are written in Dutch. Those in the Brussels Region are written in French.[97]

The road network in Belgium consists of:[98]

- highways;
- national and regional roads;
- communal roads (streets).

Belgium has around 30 highways, and some of them represent a link between various areas of the country and neighbouring countries such as the Netherlands, Germany, Luxembourg and France. There are ten main inner and outer ring roads connecting different regions in Belgium. Secondary ring ways are numerous in all of the three regions in Belgium. National roads are identified with the letter `N` and a number. Around nine main national roads start from Brussels and are intersected by numerous secondary national roads.[99] Communal roads are managed at a municipal level.

Because Belgium provides easy access to essential markets, its roads are essential for European and international import and export. Belgium is an important starting point not only towards England (via the tunnel under the English Channel) and further towards the Scandinavian Peninsula but also the rest of Europe.[100]

1.6.5. Barriers and bottlenecks

Because Belgium provides easy access to essential markets, its roads are crucial for European and international import and export. The Belgian motorway

[97] Road Transportation in Belgium. https://www.lawyersbelgium.com/road-transportation-in-belgium
[98] LawyersBelgium, www.lawyersbelgium.com, 01.04.2020.
[99] Road Transportation in Belgium. https://www.lawyersbelgium.com/road-transportation-in-belgium
[100] Ibidem.

network is dense and well developed. The same applies to the rail network. Also, as many as 12 operators deal with freight transport.

Growing passenger traffic and freight volumes are putting them under increasing pressure, leading to congestion and declining air quality in inner cities. Increasing the size of infrastructure, however, could be only part of the answer. Another approach to alleviating pressure on the transport system would be to target investments in bottlenecks and alternative transport modes. While the everyday use of the road network is relatively low, transport tends to be concentrated around Brussels and Antwerp. Investments in inland waterway infrastructures have aimed at shifting freight transport from roads and rail. Nevertheless, road freight transport is contributing to congestion, and an ambitious road-pricing scheme for trucks seems necessary.[101]

The inland waterway transport remains at a high level. This mode of transport is also used to connect the port of Antwerp with its hinterland. However, the recommendations arising from the AGN Agreement concerning Belgian waterways qualify them as:[102]

- missing links:
  - Meuse – Rhine link.1,
  - Maldegem – Zeebrugge (E 07),
- basic bottlenecks:
  - Bocholt – Herentals Canal (E 01–01), Bocholt – Dessel section.
  - Zuid – Willemsvaart (E 01–01), section Bocholt – Belgium/Netherlands border,
  - Gent – Oostende Canal (E 02), Brugge – Beernem section,

[101] Transport in the European Union - Current Trends and Issues, Mobility and Transport, European Commission, March 2019.
[102] Inventory of Most Important Bottlenecks and Missing Links in the E Waterway Network, Resolution No. 49, Revision 1, Economic Commission for Europe, Inland Transport Committee, United Nations, New York and Geneva, 2013.

- Charleroi-Bruxelles Canal (E 04), Lembeek – Bruxelles section – upgrading the height under bridges and improvement of the waterway is required. Project is under study,
- Bossuet – Kortrijk Canal (E 05–01), Zwevegem – Kortrijk section – upgrading class from I to Va. Project is under study,
- Dender (E 05–04), Aalst – Dendermonde section – upgrading from class II to class IV. Project is under study,
- Beneden-Nete (E 05–06) upgrading the height under bridges. Project is underway.

- strategic bottlenecks:
  - Meuse (E 01) from Pont d'Ougrée to Liège – upgrading from class Vb to class VIb is envisaged,
  - Lys Mitoyenne – Lys (Menin – Deinze section) and Lys Derivation Canal up to Schipdonk (E 02) – upgrading from class IV to class Vb is envisaged within the Seine – Escaut link project. Project is underway,
  - Sea Canal Bruxelles – Schelde (E 04) – improvement of section Wintam – Willebroek. Project is underway,
  - Albertkanaal (E 05), Wijnegem passage and section Kanne – Liège – upgrading from class Vb to class VIb is envisaged.

1.7. Transport costs of all modes of transport

In the realities of the European economy, road transport is the most competitive mode. The availability of services and the price level have a decisive impact on this situation. However, if all impacts were taken into account, including

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impact on the natural environment, human health or generating congestion, road transport loses its competitive advantage.

In addition to a clean profitability bill, there is also a fundamental issue regarding external costs. Estimating them is unfortunately extremely difficult. These costs include:[103]

- water, soil and air pollution,
- greenhouse gas emissions,
- noise emissions,
- accidents,
- congestion,
- land occupation and impact on changes in the landscape, including the occupation of valuable natural areas and cutting off their continuity (fragmentation) with newly built technical infrastructure routes, which contributes to the loss of biodiversity as well as difficulties in the functioning of the affected communities.

Reducing the use of road transport and shifting transport to rail or sea and inland waterway can significantly reduce the negative impact of cargo transport on the environment.

Table 17.

Global costs generated by various transport modes

Specification	Road transport	Railway transport	Inland transport	Short sea shipping
	EURO/1000 tkm			
Accidents	4.30	0.26	0.00	0.00
Noise level	2.23	1.55	0.00	0.00

[103] Merkisz-Guranowska, A., Zmuda-Trzebiatowski, P. (2015). Koszty zewnętrzne w transporcie szynowym. *Pojazdy szynowe*.

Pollution	9.20	3.31	6.15	4.81
Greenhouse gas emissions	5.16	1.43	0.86	0.92
Infrastructure	3.88	4.00	0.90	1.00
Congestion costs	4.92	0.38	0.00	0.00
Total	29.69	10.93	7.91	6.71

Source: European Commission, Commission calculation of the external cost savings according to Article 5 (3) of the draft Regulation, 2002 after Merkisz-Guranowska, A., Zmuda-Trzebiatowski, P. (2015). Koszty zewnętrzne w transporcie szynowym. Pojazdy szynowe.

Considering profitability and external costs can be seen that road transport is more than 100% more expensive than rail transport. On the other hand, the costs of inland waterway transport and short sea shipping are incomparably lower. It is due to, among others no external costs incurred due to accidents, noise levels, greenhouse gas emissions or congestion.

The internalisation of external costs, stipulated for many years, maybe of particular importance here. Proponents of this concept are counting on a change in the structure of the branched transport, especially increasing the share of rail in the transport market. The internalization of external costs may, however, have a significant impact on the prices of transport services and, consequently, lead to a deterioration in the competitiveness of the EU economy.[104]

[104] Dyr, T. (2010). Kierunki rozwoju transportu w Unii Europejskiej w drugiej dekadzie XXI w. TTS Technika Transportu Szynowego, 16, 20-26.

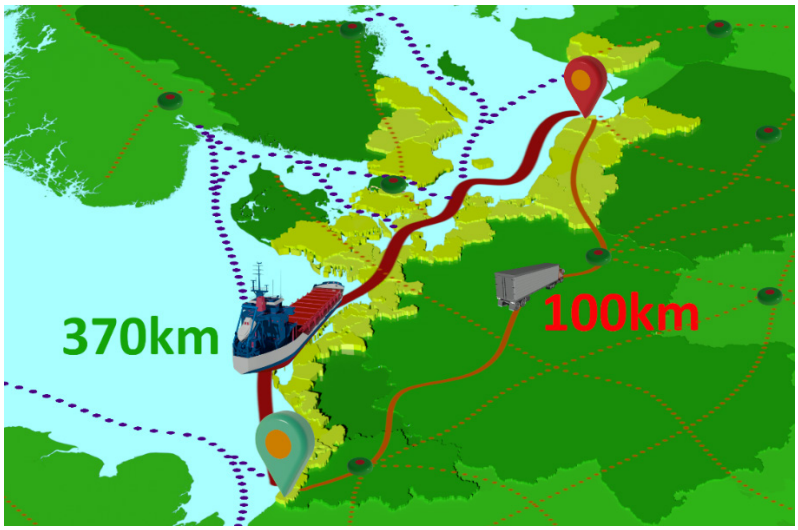


Figure 40. Energy expenditure on the transport of cargo by various modes of transport

Source: Own elaboration based on Resolution No. 79 of the Council of Ministers of June 14, 2016, regarding the adoption of "Assumptions for the plans for the development of inland waterways in Poland for 2016-2020 with a perspective by 2030", M.P. of 2016 item 71.

With the same amount of energy, one tonne of cargo can be transported by rail three times further and inland waterways almost four times further than by road. It demonstrates the great advantage of other modes of transport over road transport.

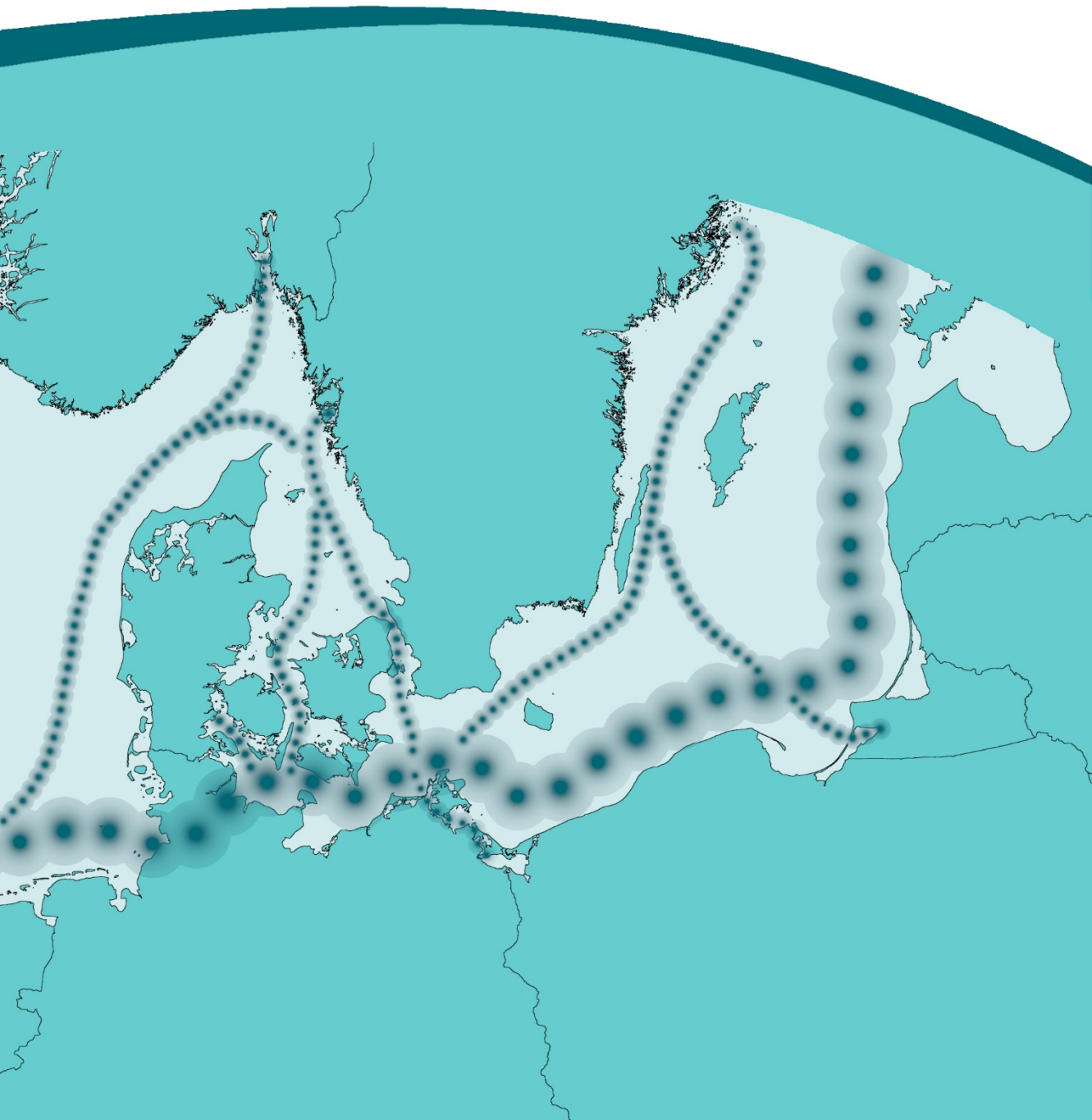
In 2010, the European Community Shipowners' Associations (ECSA) conducted a study that looked at transport costs on Europe's major trade routes. The costs of freight transportation within short sea shipping combined with road transport were compared as well as the costs of only road transport. The analysis shows that in some cases road transport is more economically viable. An example would be the transport of goods on the trade route connecting Germany / Denmark with Sweden, where the sea section is relatively short. Despite the small difference in costs incurred, this may induce carriers to choose land transport. However, the

competitiveness of road transport has significantly decreased with the rise in the share of the maritime section.[105]

[105] Donner, P., Johansson, T. (2018). Sulphur Directive, Short Sea Shipping and Corporate Social Responsibility in a EU Context. In Corporate Social Responsibility in the Maritime Industry (pp. 149-166). Springer, Cham.

2

Analysis of current state of the IWW E 60



2. ANALYSIS OF CURRENT STATE OF IWW E 60

European transport policy emphasizes the essential role of seaports as logistics centres, the development of which is necessary to handle the ever-increasing volumes of short sea cargo in the European Union. European transport policy documents call for the creation of a 'blue belt' around Europe's seas that would simplify the formalities for ships travelling between European ports.[106]

Despite the efforts promoting European policies that encourage short sea shipping based on such advantages as intermodality and environmental aspects, this mode of transport has not yet reached a significant market share in comparison to land transport.[107] One of the ways to make transport and infrastructure more efficient in Europe is to remove barriers to short sea shipping. The deteriorating situation on land roads due to the increasing congestion and the relatively high negative impact of road transport to the natural environment designates short sea shipping as an alternative mode of transport. There are well-founded fears that the entire continental road system will be blocked in the coming years.[108]

There is still no consensus among experts on the definition of short sea shipping. It is usually defined as the movement of cargo and passengers across the sea between ports located within closed water areas bordering Europe. This shipping includes national and international transport along the coast, to and from the islands, as well as through rivers and lakes.[109]

[106] White Paper. Roadmap to a single European transport area towards competitive and resource-efficient transport system, European Commission, 2011, ec.europa.eu, accessed on 24.01.2019.
[107] Suárez-Alemán, A., Trujillo, L., & Medda, F. (2015). Short sea shipping as intermodal competitor: a theoretical analysis of European transport policies. Maritime Policy & Management, 42(4), 317-334.
[108] Short Sea Shipping Promotion Office, shortsea.pl, accessed on 23.01.2019.
[109] European Shortsea Network, www.shortsea.info, accessed on 23.01.2019.

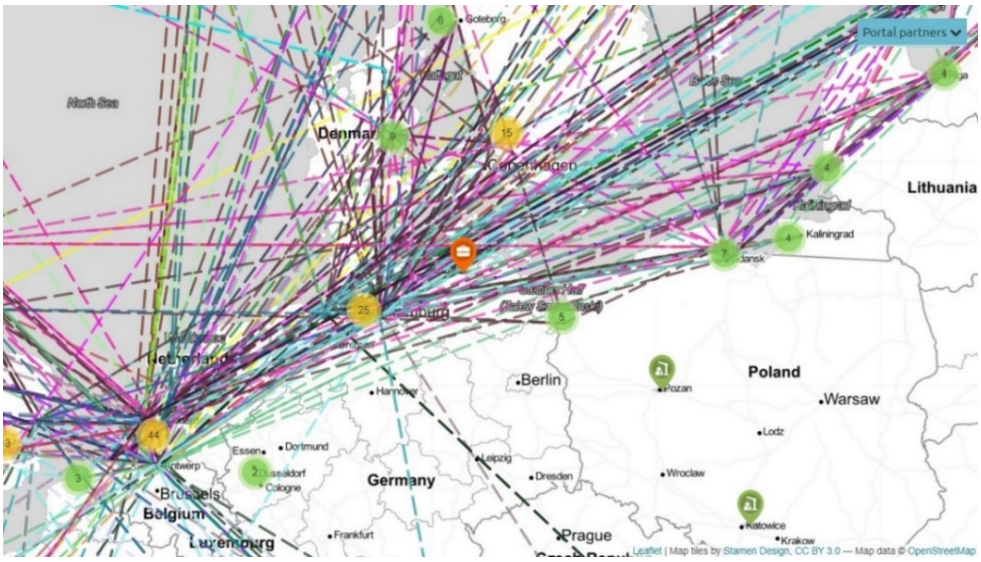


Figure 41. Container connections in the short sea shipping

Source: www.europeantransportmaps.com, accessed on 01.04.2020.

In 2015, the volume of goods transhipped between EU countries reached 1.8 billion tonnes thanks to short sea shipping. It represents as much as 59% of all maritime transport within EU countries.[110] The volume of cargo transported within the Baltic basin accounted to 413 211 thousand tonnes in 2018[111]. However, the potential for this type of transport is much higher.

Some of those ports also provide ferry and ro-ro connections for short sea shipping. They are shown on the map below:

[110] A. Xerri, Annual Report 2016 – 2017, European Shortsea Network, Brussels 2017.
[111] Eurostat data.

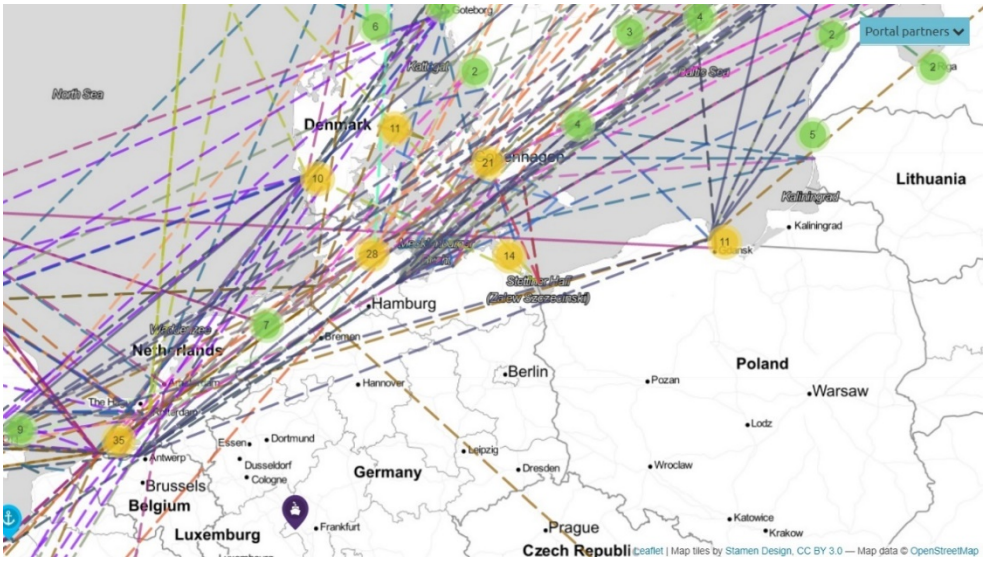


Figure 42. Ferry and ro-ro connections in the short sea shipping

Source: www.europeantransportmaps.com, accessed on 01.04.2020.

Short sea shipping is also a vital element in creating sustainable transport development. It is a link in organizing multimodal connections in the home-home system. Shipping lines do not significantly determine land transport planning but are only an equivalent element in the entire transport process. However, the development of short sea shipping is hampered by many factors. One of the most important is not including short sea shipping in the multimodal supply chain on a door-to-door basis. It also requires increased port efficiency and better access to port facilities.[112]

Unfortunately, there are also barriers related to bureaucracy or rules of documents archiving. The trouble in taking integrated actions is also caused by various legal solutions in different countries.

[112] Kuciaba, E. (2017). Rola transportu morsko-rzecznego w europejskim systemie transportowym. Problemy Transportu i Logistyki, (2 (38)), 39-46.

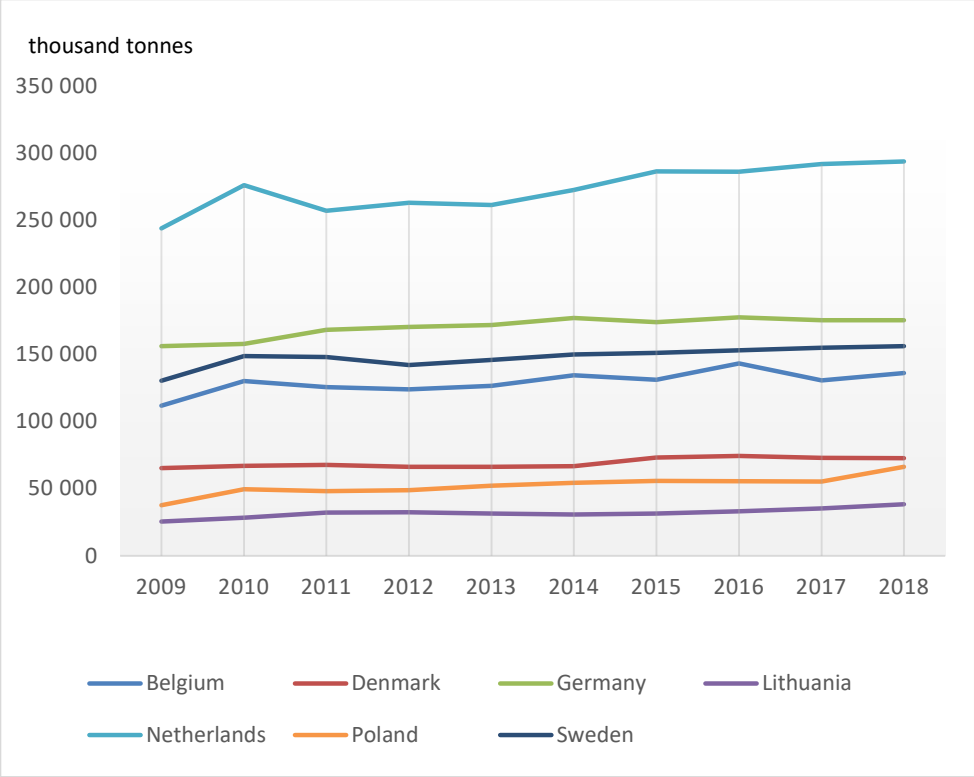


Figure 43. Transhipments by short sea shipping

Source: Own elaboration based on EUROSTAT data.

In almost every European country, there is a noticeable growing trend of transhipments carried out under short sea shipping. In Poland, for example, the volume of transhipped goods has exceeded 50 million tonnes since 2013. It represents about 80%[113] of the volume of all maritime transport. Such a high share of short sea shipping in Poland is caused by the fact that Polish imports and exports are based mainly on EU member states.

The international waterway E 60 is a maritime coastal route which the main route runs from Gibraltar to the north along the coasts of Portugal, Spain, France,

[113] Eurostat data.

Belgium, the Netherlands, Germany, Poland, Lithuania, Latvia, Estonia, Russia to the Saint-Petersburg-Volga-Baltic waterway, then through the Baltic-Białomorski Canal, then along the White Sea coast to Arkhangelsk.[114] The waterway has been marked in the European Agreement on Main Inland Waterways of International Importance (AGN). In addition to the main route of E 60, thirteen branches have also been differentiated.

In the analysed area, IWW E 60 has four additional branches. The first one, designated E 60-03, heads north at the height of Belgium and Dutch border, along eastern coast of the United Kingdom. The second one, E 60-05, turns north along western Denmark, up to Sweden. Next branch with the designation E 60-07 turns north and runs along the west coast of Zealand (Denmark) and further along the west coast of Sweden. The last branch at the height of the Słupski subregion reflects north and runs along the east coast of Sweden.[115]

The E 60 route in the analysed area runs along with seven European Union countries and the Kaliningrad District. The EU countries include Belgium, Netherlands, Denmark, Germany, Sweden, Poland and Lithuania. Under the direct impact of IWW E 60, there are coastal regions that are characterized by varying levels of economic and social development.

[114] *European Agreement on Main Inland Waterways of International Importance (AGN),* United Nations Economic Commission for Europe, Geneva 1996, p. 14.
[115] Ibidem

Figure 44. The route of the E 60 waterway in the South Baltic region and the North Sea

Source: Own elaboration based on shipping density and spatial regulations of individual countries.

Energy-efficient and environmentally friendly transport solutions are crucial to counteract the development of road transport in the southern Baltic region on the one hand, and to meet the growing demand for transport from business and industry on the other. If no action is taken, achieving the core goals of the Baltic Sea Strategy will be at risk.

IWW E 60 is characterized by high potential and can play an essential role in the ecological transport network of goods and passengers. On the area identified as part of this report, there is a need to improve the transport system, which is currently based mainly on road and railway transport modes.

Attempts to navigate the E 60 route have never been made, or have only been made on short sections, usually between two neighbouring ports. Despite the significant cross-border importance of this connection, no solution seems to have been found. Apart from marking and locating this waterway on the AGN map, it does not exist, or exists only on short sections. Therefore, steps should be taken to investigate the problem and create an effective shipping plan thoroughly.

The INCONE60 project – Inland Blue Transport Connector E 60 is oriented towards improving access of local and regional areas to European and transnational waterways. INCONE60 activities focus on innovative transport solutions to achieve innovative and eco-friendly transport services for citizens and business stakeholders. The project aims to formulate a set of transport solutions to support the active development of peripheral coastal regions of South Baltic area by focusing on local ports as growth pools. By doing this, it helps to boost the competitiveness of the entire Baltic Sea Region and increase its accessibility and attractiveness.

The project activities are in line with provisions of the EUSBSR Strategy and target the international waterways development (E 30, E 40, E 60 and E 70) by capitalising on the TEN-T core network corridors for better connectivity and accessibility of Baltic Sea Regions. It also addresses objectives of the EUSBSR Action Plan to Connect the Region. In particular, the project will contribute to Action no. 11 ‘To improve internal and external transport links.’

One of the main solutions formulated in the project includes an open cargo flow model in the South Baltic and the North Sea areas. It is addressed primarily to the business sector – cargo handlers, logistic forwarders and other transport entities operating in this area. The most important part of IWW E 60 for INCONE60 project is located between Belgium and Lithuania.

Model users will be able to choose the start point and destination point of the cargo transport route themselves. After completing the form regarding information such as the volume of cargo or vehicle or ship parameters, the model will estimate transport costs for the land route and the alternative route using IWW E 60. In addition, CO_2 emissions will also be estimated for both routes. All these model options are designed to help the user make the most-favourable decision by comparing estimated transport costs and the environmental impact of chosen mode of transport.

2.1. Transport of cargo and passengers along the IWW E 60 in the South Baltic region and the North Sea

Vessel traffic (both cargo and passenger) along the Polish and Lithuanian coast is relatively low. It also applies to the entire South Baltic area. Trade and passenger routes are concentrated mainly around the largest ports of the region – Gdansk and Gdynia and Klaipeda. The more favourable situation defines North Sea region countries, where vessel traffic along the coast is much denser.

There are about 60 local seaports in the analysed area. They are characterised by different business profiles. Such number of local seaports means there is a large potential for short sea shipping development and activation of ports that struggle to find new activities.

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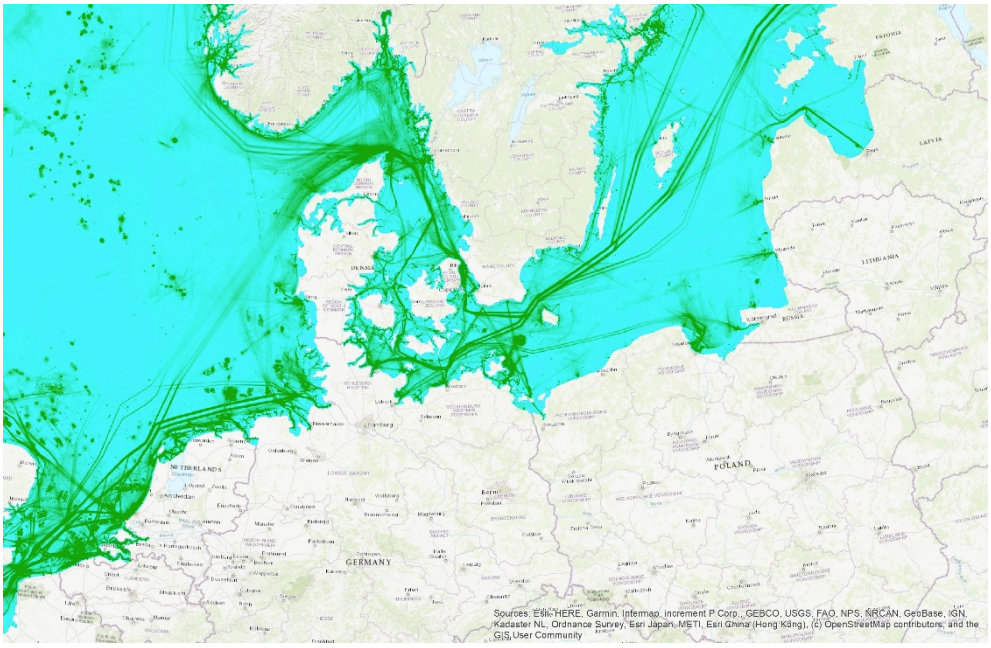

Figure 45. Traffic density of all kinds of vessels in 2018

Source: own elaboration based on EMODnet Human Activities: Vessel Density Map, www.emodnet-humanactivities.eu, accessed on 01.04.2020.

Vessel traffic on the E 60 waterway in the Baltic Region exists, but it is directed to major ports in Poland, completely bypassing the local and regional ports of the Polish and Lithuanian coast. When examining the traffic of all types of ships, one can notice the activities of ports located on the Hel Spit and in the port of Kołobrzeg. However, taking into account the movement of merchant ships (Figure 46), any actions are visible only in Kołobrzeg. It shows how much the potential of the E 60 waterway in this area is unused. Short sea shipping is virtually non-existent in the South Baltic region. Navigating this section of the E 60 waterway would positively affect the activation of local seaports along the Polish coast, and thus the activation of neighbouring areas. The situation seems more favourable in

the case of the southern coast of Sweden, where a significant movement of ships can be seen.

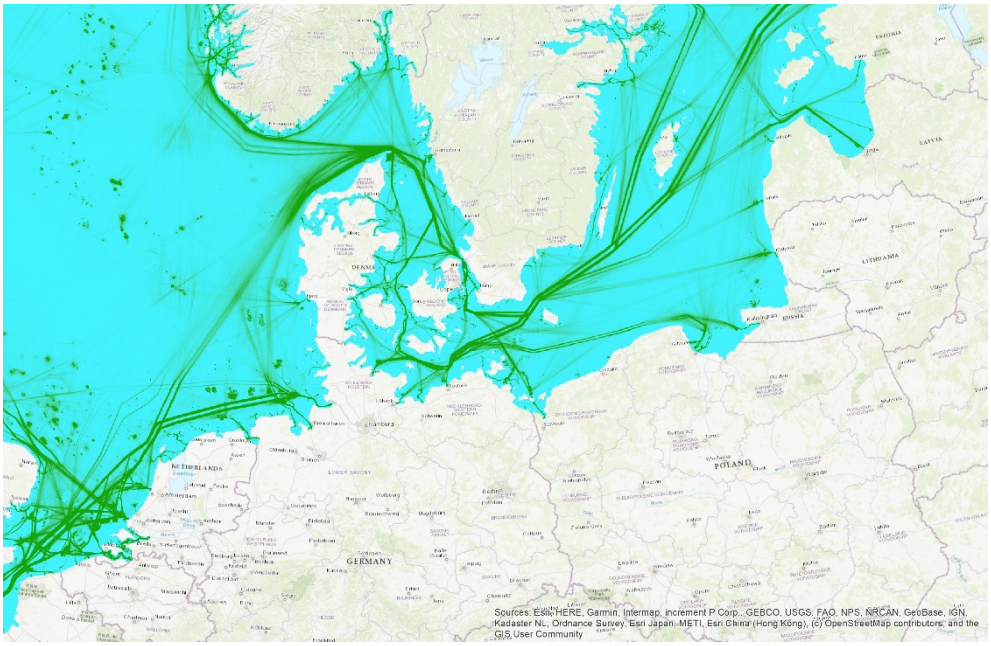

Figure 46. Traffic density of merchant ships in 2018

Source: own elaboration based on EMODnet Human Activities: Vessel Density Map, www.emodnet-humanactivities.eu, accessed on 01.04.2020.

Shipping density is visibly higher in the area of the North Sea. It is also crucial that it does not concentrate only around the most important ports, but also affects regional and local ports.

In the case of passenger ship traffic (Figure 47), the situation is similar. Vessels call only to the most important South Baltic ports. The low traffic of ships is also visible around the port in Kołobrzeg.

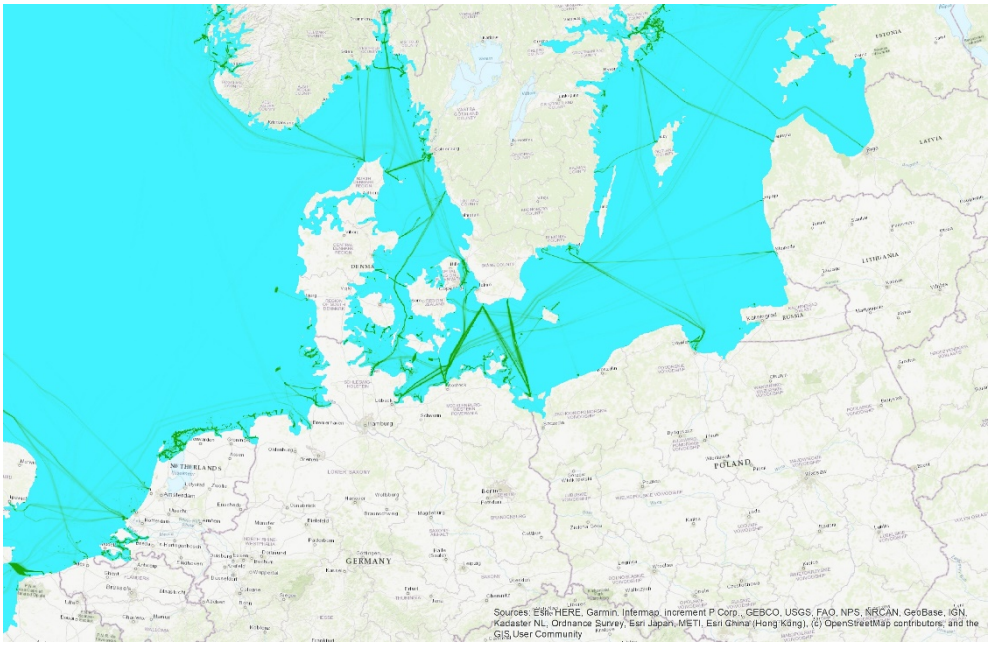

Figure 47. Traffic density of passenger's vessels in 2018

Source: own elaboration based on EMODnet Human Activities: Vessel Density Map, www.emodnet-humanactivities.eu, accessed on 01.04.2020.

2.2. Impact of IWW E 60 on coastal regions on the South Baltic Sea Region and North Sea Region

The division into NUTS 3 units was taken into account for the analysis.[116] It was assumed that the E 60 waterway affects all coastal regions located in seven analysed countries.

[116] NUTS - the classification of territorial units for statistical purposes (from the French: Nomenclature des Unites territoriales statistique) is a geographic nomenclature dividing the territory of the European Union into regions of three different levels (NUTS 1, 2 and 3). NUTS 3 are regions and municipalities.

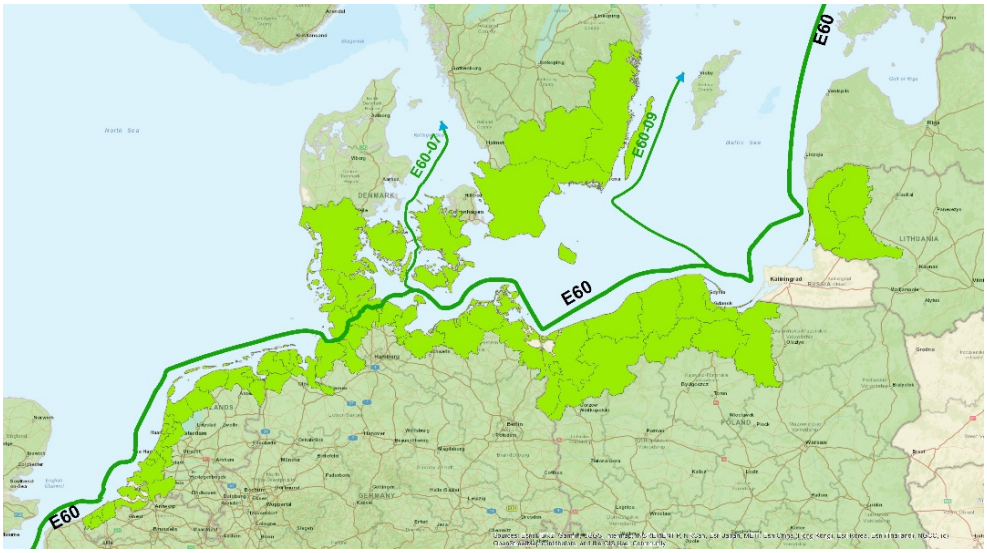

Figure 48. An overview map of the investigated area

Source: Own elaboration.

The local seaports that are the subject of this report are located in seven countries and seventy different NUTS 3 regions.

Table 18.

Location of investigated local seaports

Country	Ordinal	NUTS 3 region
Belgium	1	Arr. Brugge
	2	Arr. Diksmuide
	3	Arr. Oostende
	4	Arr. Veurne
Denmark	5	Bornholm
	6	Fyn
	7	Østsjælland
	8	Sydjylland

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Country	Ordinal	NUTS 3 region
	9	Vest- og Sydsjælland
Germany	10	Aurich
	11	Bremen, Kreisfreie Stadt
	12	Bremerhaven, Kreisfreie Stadt
	13	Cuxhaven
	14	Dithmarschen
	15	Emden, Kreisfreie Stadt
	16	Flensburg, Kreisfreie Stadt
	17	Friesland (DE)
	18	Kiel, Kreisfreie Stadt
	19	Landkreis Rostock
	20	Leer
	21	Lübeck, Kreisfreie Stadt
	22	Nordfriesland
	23	Nordwestmecklenburg
	24	Ostholstein
	25	Plön
	26	Rendsburg-Eckernförde
	27	Rostock, Kreisfreie Stadt
	28	Schleswig-Flensburg
	29	Stade
	30	Steinburg
	31	Vorpommern-Greifswald
	32	Vorpommern-Rügen
	33	Wesermarsch
	34	Wilhelmshaven, Kreisfreie Stadt
	35	Wittmund

Country	Ordinal	NUTS 3 region
Lithuania	36	Klaipėdos apskritis
	37	Tauragės apskritis
	38	Telšių apskritis
Netherland	39	Agglomeratie Haarlem
	40	Agglomeratie Leiden en Bollenstreek
	41	Agglomeratie's-Gravenhage
	42	Alkmaar en omgeving
	43	Delft en Westland
	44	Delfzijl en omgeving
	45	Groot-Amsterdam
	46	Groot-Rijnmond
	47	IJmond
	48	Kop van Noord-Holland
	49	Noord-Friesland
	50	Oost-Groningen
	51	Oost-Zuid-Holland
	52	Overig Groningen
	53	Overig Zeeland
	54	West-Noord-Brabant
	55	Zaanstreek
	56	Zeeuwsch-Vlaanderen
Poland	57	Chojnicki
	58	Elbląski
	59	Gdański
	60	Koszaliński
	61	Miasto Szczecin
	62	Słupski

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Country	Ordinal	NUTS 3 region
	63	Starogardzki
	64	Szczecinecko-pyżycki
	65	Szczeciński
	66	Trójmiejski
Sweden	67	Blekinge län
	68	Kalmar län
	69	Kronobergs län
	70	Skåne län

Source: Own elaboration.

The studied countries are diverse in terms of economic development. Their GDP per capita (in 2019) ranges in Poland between about 13 879 EUR to as much as almost 53 491 EUR in Denmark. Despite such variation, an increasing trend can be seen in all countries surveyed, which was initiated after the 2008 crisis.

GDP per capita in individual regions is even more diverse. The most favourable situation concerns Western European countries. Much lower revenues in the economy are recorded in Poland and Lithuania.

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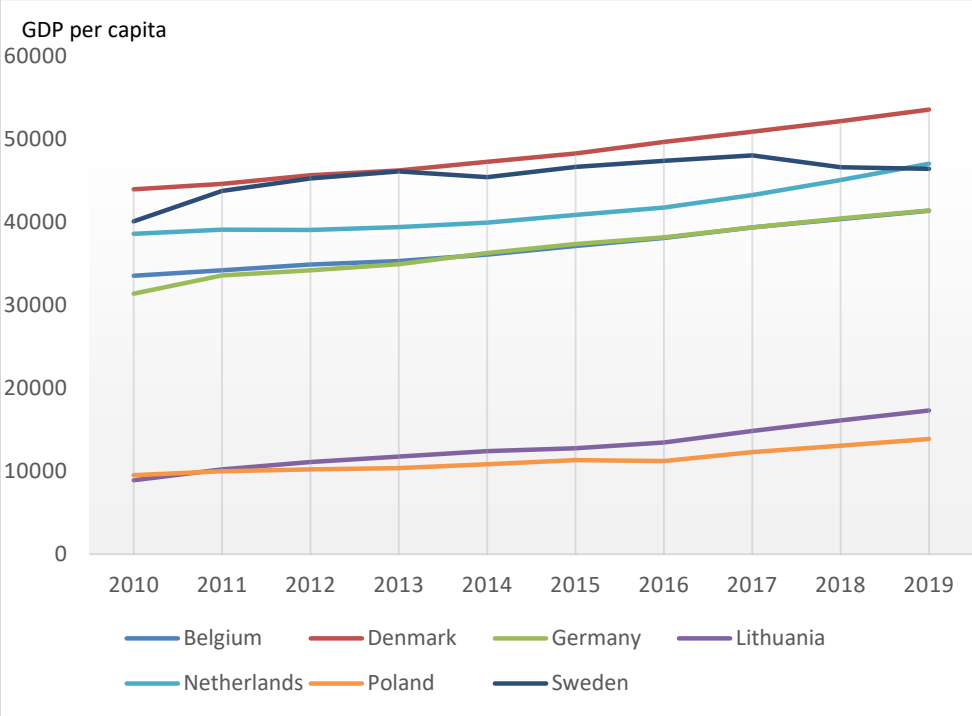

Figure 49. Gross Domestic Product (current prices in Euro) per capita in the countries of the investigated area in 2019

Source: Own elaboration based on EUROSTAT data, appsso.eurostat.ec.europa.eu, accessed on 01.04.2020.

The highest value of GDP per capita occurred in the city of Amsterdam – 78 622 EUR. Other productive areas are also Emden and Bremen in Germany and Sydjylland in Denmark.

The worst situation concerns the Polish and Lithuanian regions. An unusually low GDP per capita ratio was recorded in three Polish regions: Szczecinecko-Pyrzycki (6 880 EUR), Chojnicki (7 327 EUR) and Elbląski (7 721 EUR). The most impoverished region in Lithuania was the Tauragės region, where 7 764 EUR per capita was recorded. The spatial differentiation of this indicator in all analysed countries is presented below:

Figure 50. Gross Domestic Product per capita in 2016

Source: Own elaboration based on EUROSTAT data, appsso.eurostat.ec.europa.eu.

The level of population density of the developed areas should also be noted. It is higher in the regions of Belgium and the Netherlands. In the remaining part of the analysed area, high population density is characterized mainly by large urban centres such as the Tri-City and Kiel, where the density is 1 853 and 2 117 people per square kilometre, respectively. Areas with a lower population density are the regions of Kalmar in Sweden and Tauragės in Lithuania – 21.8 and 22.6 respectively. The spatial differentiation of this indicator in all analysed countries is presented below:

Figure 51. The population density in 2017

Source: Own elaboration based on EUROSTAT data, appsso.eurostat.ec.europa.eu.

According to databases, it is evident that the western part of the area, i.e., in Lower Saxony and Schleswig Holstein federal states of the Federal Republic of Germany and the Kingdom of Denmark feature the majority of the local ports along the northern sub-routes of the IWW E 60. The density of local ports is very high there since the population density is also higher compared to the eastern and northern parts of the South Baltic area.

Meanwhile, going northwards and eastwards along the IWW E 60 the density of local ports declines along with the overall decline of population density in Poland, Lithuania and Sweden. However, also in both Denmark and Germany, this geographical feature is noticeable. The density of local ports in the south of Denmark is much higher than in the north. Meanwhile, in the west of Germany, it is much higher than in the east of the country. Skagen in the Northern Jutland

region of Denmark is the most remote Danish local port located on the confluence of Skagerrak and Kattegat straits. Similarly, there are only two ports classified as local ones in the northeast federal state of Mecklenburg – Western Pomerania in Germany.

Figure 52 is presenting the spatial differentiation of the share of people of productive age with all people living in a given region is entirely different. An obvious border separating Eastern Europe with Western Europe is visible, but this time the more favourable situation concerns the eastern part of the continent. The exceptions are, however, two Western European cities – Amsterdam and Kiel, in which the share of people of productive age is the highest among all regions surveyed (almost 65%). Outside these cities, the share of people of productive age is higher in Poland and Lithuania. In Poland, this ratio ranges between 61% and 64%, while in Lithuania around 59%. On the other hand, the smallest share of people of productive age concerns regions such as Dutch Bornholm (52%), Belgian Veurne (52%) or Swedish Kalmar (53%).

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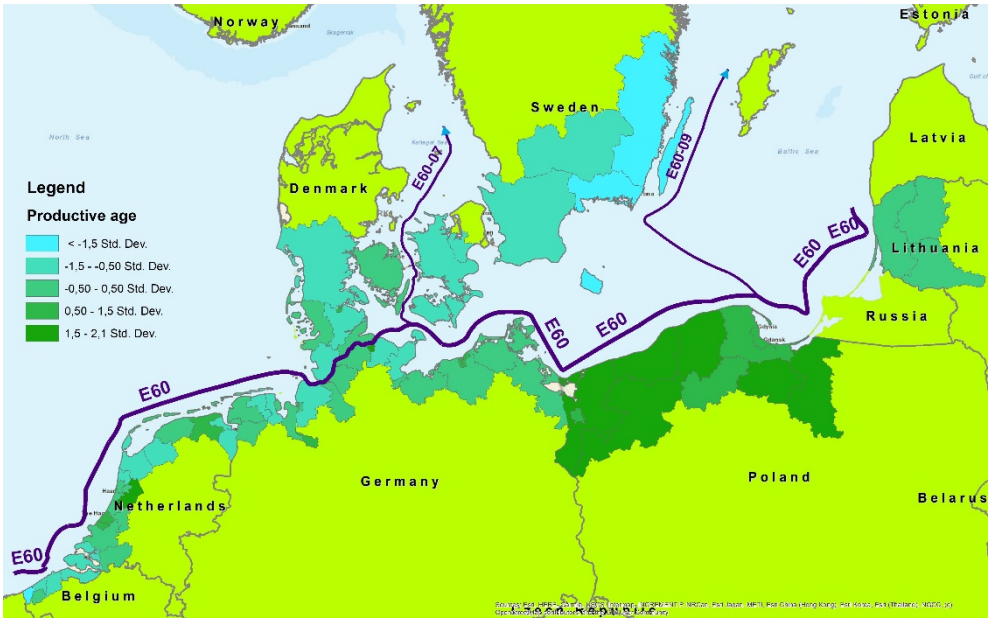

Figure 52. The share of people of productive age in 2018

Source: Own elaboration based on EUROSTAT data, appsso.eurostat.ec.europa.eu.

2.3. Barriers and bottlenecks

International inland navigation and short sea shipping on the Southern Baltic E 60 route is practically non-functional. Regular lines in Poland, for example, connect only Kołobrzeg and Bornholm. Tourism between Polish local ports and foreign ports does not function due to legal and administrative restrictions, complicated border crossing procedures, military zones closed for traffic and marine areas of landscape parks. The E 60 waterway has enormous tourist potential, but as it might be seen, many barriers prevent its use.

In comparison with road transport, short sea shipping faces a tough obstacle – formalities. In 2016, ECSA presented in its report[117] an example of container transport from Nijmegen in the Netherlands to Borås in Sweden. Differences in the size of documentation necessary to transport such cargo by road and sea transport have been demonstrated:

Road transport:

- the driver receives an international CMR waybill,

Short sea shipping:

- transport to the port of loading – the driver issues a note,
- the sender declares the status of the cargo,
- the forwarder introduces the container to the Port Community System in the loading port,
- the forwarder forwards the waybill to the terminal and declares the status of the cargo
- the terminal operator checks the cargo documentation in the system,
- the transport company updates the cargo manifest (detailed list of shipments),
- before departure, the ship forwards the required IMO FAL forms to the appropriate Dutch authorities and the port of Rotterdam,
- the ship forwards cargo information to its destination in Gothenburg before and after arriving in port,
- the transport company enters the container into the Swedish customs system, by handing over the cargo manifest,
- the transport company declares the status of the cargo in the port system in Gothenburg,

[117] *Short Sea Shipping. The full potential yet to be unleashed*, European Community Shipowners' Associations, February 2016, 8.

- the terminal operator checks the cargo documentation,
- transport from the port of unloading – the driver issues a note.

While it is possible, although very difficult and time-consuming, to overcome barriers on the side of EU countries, the section along the coast of the Kaliningrad Region remains problematic. In the territorial waters in this section, there are Russian military areas that completely exclude any movement of tourist's vessels, as well as the area of the Curonian Spit landscape park, which is also a significant obstacle. Therefore, the E 60 route in its current form will be able to function only if close cooperation is established with the Kaliningrad Rand with local ports lying on its coast.

In case of lack cooperation with the Kaliningrad Region in this matter, it is possible to correct the route E 60 so that it bypasses the territorial waters of Russia. This solution is not desirable, although possible if necessary.

3

Analysis of current state of the local seaports along IWW E 60

3. ANALYSIS OF CURRENT STATE OF THE LOCAL SEAPORTS ALONG IWW E 60

The concept of local and regional ports is comprehensive and vague. Besides, it seems that it is understood differently by different countries or entities. As a result, local seaports in Eastern Europe differ significantly in terms of size or scope of activity from Western European ports.

Polish law defines ports of fundamental importance for the economy, listing four of them: Gdańsk, Gdynia, Szczecin and Świnoujście. Other ports are not of primary importance for the Polish national economy and can be divided into two groups in order to highlight their diversity: these are regional and local ports. Regional ports are characterized by a supra-local (beyond the commune) range of impact, as well as significant economic potential. These factors determine the regional status of some port structures. Regional ports include ports such as Darłowo, Elbląg, Hel, Kołobrzeg, Łeba, Police, Stepnica, Ustka and Władysławowo. Other ports are considered as local.[118]

Such a division makes local seaports' activities and operations are mainly related to fisheries. Tourist and recreational traffic services are carried out to a small extent, although in recent years there has been a noticeable development in this aspect. Few of the local ports create small, though multifunctional economic and spatial structures of both local and regional significance, which are capable of operating typical of the nodal points of transport infrastructure. However, the transport function of local ports in Poland is underdeveloped. Only three of them

[118] Program for the development of Polish seaports until 2020 (with a perspective until 2030), Ministry of Maritime Economy and Inland Navigation, Warsaw, 2018

reload over 100 000 tonnes per year: Kołobrzeg, Elbląg.[119] Moreover, since 2012, transhipments over 100 thousand tonnes also take place at the Port of Darłowo.

On the Polish coast, including the Szczecin Lagoon and the Vistula Lagoon, there are 26 local seaports and over 40 seaports. Given the geographical location – they can be divided into:

- ports and harbours located on the seashore (12 ports and over 20 harbours),
- ports and harbours located on the shores of internal sea waters – the Vistula Lagoon and the Szczecin Lagoon, as well as waterways, are having the status of internal sea waters (14 ports and several harbours).

Due to their local nature, local ports must function like a system of complementary elements to efficiently and effectively use development opportunities. A solution for the network integration of local seaports could be launching cabotage services along the coast with short stops at subsequent ports, using the international waterway E 60. It should also be noted that the planned investment consisting in cutting the Vistula Spit will facilitate the access of the Port of Elbląg to the Baltic Sea, which may also make this port a beneficiary of launching cabotage shipping in this area.

Local seaports in Poland are currently undergoing several changes. A decrease in the importance of the fishing function of these ports can be observed. The reasons for these changes will be presented later in this report. To illustrate the current changes, the table below summarizes the cutter fleet stationed at local seaports over the past four years:

Table 19.

The cutter fleet of local seaports in Poland in the years 2014-2017

PORTS	2014	2015	2016	2017

[119] Development strategy for the Kołobrzeg seaport. Board of the Kołobrzeg Sea Port, 2010.

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	Number of cutters	Average age	Number of cutters	Average age	Number of cutters	Average age	Number of cutters	Average age
Total	**153**	**41.4**	**153**	**42.4**	**134**	**42.5**	**130**	**42.9**
Darłowo	13	52.2	13	53.2	6	49.5	4	46.3
Hel	8	39.4	8	40.4	9	40.9	9	41.9
Jastarnia	15	54.5	15	55.5	13	55.7	13	56.7
Kołobrzeg	41	23.5	41	24.5	38	26.0	34	28.2
Ustka	33	41.2	33	42.2	26	43.0	26	43.7
Władysławowo	43	37.7	43	38.7	42	39.7	44	40.8

Source: Maritime economy. Statistical review 2018, Maritime Institute in Gdańsk, 2018.

In most of the local seaports of the Polish coast, there is a decrease in the number of fishing boats. The most drastic decline in recent years has been recorded in Darłowo. The number of cutters fell from 13 in 2014 to only 4 in 2017 (a decrease of 69%).

There is only one port on the Lithuanian coast – the port of Klaipeda. Since it is the only operating port in this country, it has been included in the analysis for this report.

Many of the Swedish ports, like in Poland, also deal mainly with the transhipment of fish. However, they often operate on a much larger scale and are also thriving tourist resorts.

The profile of local seaports in Western Europe is often quite different. Despite the small structure, these are ports where transhipments often reach even one million tonnes per year. Also, these ports can have many other functions. Some of them are also research centres or invest in the development of aquaculture. Some of them are also tasked with servicing offshore wind farms.

Local ports usually have entirely different functions in different parts of Europe, which is why their comparison is often impossible. This chapter, however, has the task of analysing their status, infrastructure and transhipment capacity.

3.1. The current state of local seaports located along IWW E 60 in the Baltic Sea Region and the North Sea Region

3.1.1. Local ports classification

Three groups of local ports should be distinguished:

- Large local ports (> 1 million t annual cargo turnover or 1 million passengers per year) – Oostende (1.4 million t cargo in 2017)
- Medium-size local ports (0.5 – 1 million t annual cargo turnover or 0.5 – 1 million passengers per year) – Vordingborg (~0.5 million t in 2019)
- Small-size local ports (0.1 – 0.5 million t annual cargo turnover or 0.1 – 0.5 million passengers per year) – Kołobrzeg (~0.3 million t in 2018).

IWW E 60 in the South Baltic region runs along 25 subregions (NUTS 3). The length of the IWW E 60 measured from Germany's Northwest Mecklenburg subregion, along its course up to the Lithuanian Klaipeda subregion is about 900 km. These subregions cover an area of 132 359.6 km^2, and in 2017, they were inhabited by 9 962 269 people. Such population means noteworthy social potential that has a significant impact on the economies of individual countries in the whole South Baltic Region.

According to the INCONE60 project Application Form and WP3 tasks, this study presents only the situation along the northern sub-routes of the IWW E 60,

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which stretches from the North Sea ports of Germany to Russia's Kaliningrad region border as Kaliningrad region does not belong to the European Union. There are no local seaports in Lithuania, only a large seaport of Klaipeda, while Latvia is not part of the South Baltic area. Therefore, considering the local ports of the IWW E 60, the study focuses on the part of the route which starts in the south from Papenburg and Oldenburg coastal towns of the North Sea in the federal state of Lower Saxony in Germany which is adjacent to the Wadden Sea.

The study also covers the entire system of local seaports in the German region of Schleswig – Holstein, which covers both the North Sea and the Baltic Sea. Further east, the whole German region of Mecklenburg – Western Pomerania (Vorpommern) has only two local ports, namely Stralsund and Sassnitz, whereas Rostock and Wismar belong to the class of the seaports of an international tier. Our investigation also covers the entire Polish coast and the local ports of both the North Sea and the Baltic Sea in Denmark. Finally, to the north, a chain of different local ports in southwest, south and southeast Sweden is investigated from Lysekil and Uddevalla in the west to Kalmar in the east.

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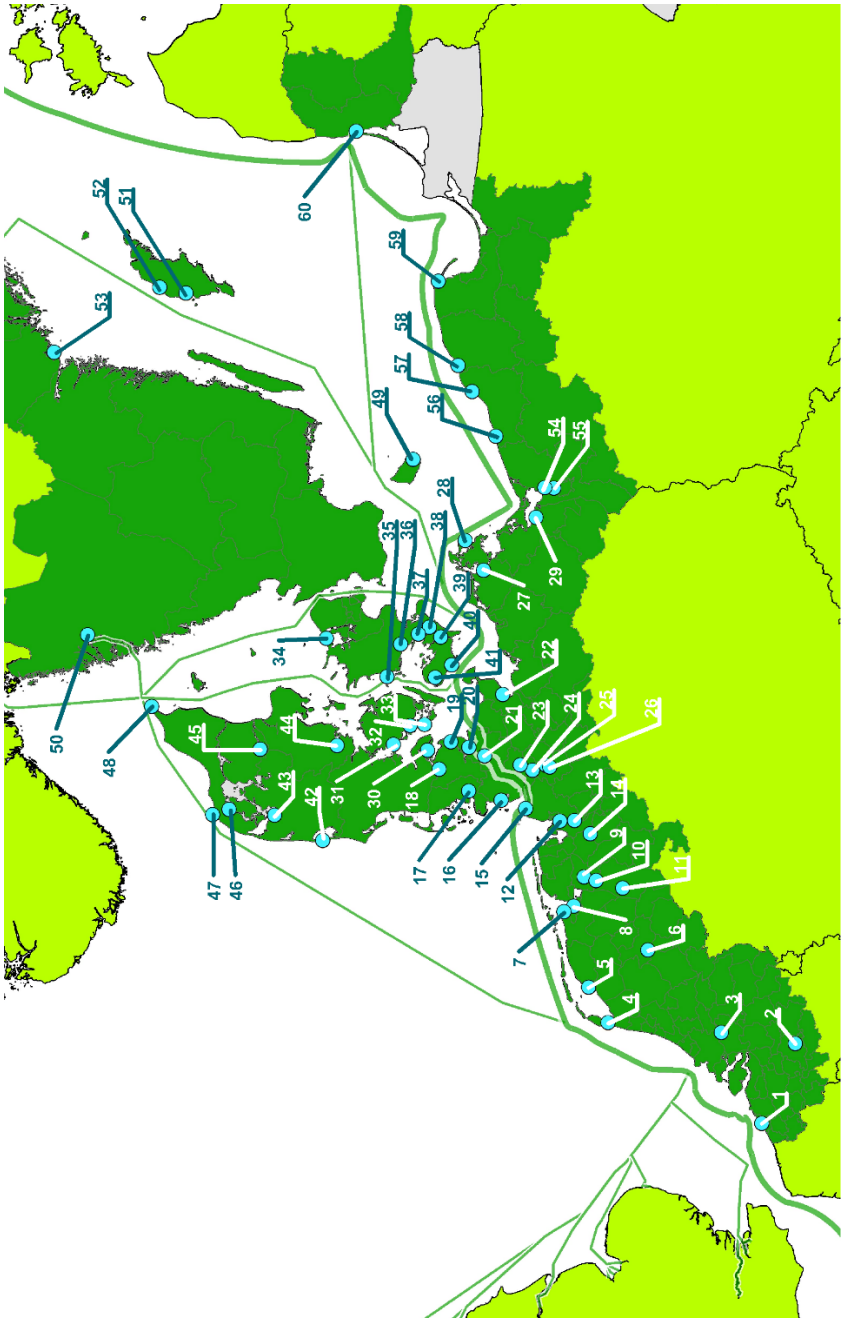

Figure 53. Distribution of local ports along the northern routes of the IWW E 60

Source: own elaboration.

Legend:

Belgium
1 Oostende
2 Brussels
Netherlands
3 Moerdijk
4 Den Helder
5 Harlingen
6 Zwolle
7 Eemshaven
8 Delfzijl
Germany
9 Leer
10 Papenburg
11 Haren
12 Nordenham
13 Brake
14 Oldenburg
15 Cuxhaven
16 Büsum
17 Husum
18 Flensburg
19 Kappeln
20 Eckernfoerde
21 Rendsburg
22 Neustadt
23 Itzehoe
24 Glückstadt
25 Butzfleth
26 Stade
27 Stralsund
28 Sassnitz-Mukran
29 Ueckermunde

Denmark
30 Sonderborg
31 Assens
32 Faaborg
33 Soby
34 Hundested
35 Korsor
36 Naestved
37 Vordingborg
38 Stubbekobing
39 Nykobing Falster
40 Rodbyhavn
41 Nakskov
42 Hvide Sande
43 Holstebro-Struer
44 Horsens
45 Hobro
46 Thisted
47 Hanstholm
48 Skagen
49 Nexo
Sweden
50 Uddevalla
51 Klintehamn
52 Visby
53 Oxelosund
Poland
54 Stepnica
55 Police
56 Kołobrzeg
57 Darłowo
58 Ustka
59 Władysławowo
Lithuania
60 Klaipeda

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3.1.2. Local port facilities and functions in the South Baltic area

Poland

Many local ports in Poland are currently specializing in the transhipment of mineral fertilizers and the export of Polish agricultural and forestry products, i.e., they follow the same functional model like the majority of local ports in Denmark. However, Ustka and Kołobrzeg may be considered as two exceptions. Ustka is the location of Mowi Poland S.A., which is the largest fish processing factory in the Baltic Sea Region, and therefore the port of Ustka might profile itself as an 'outport' (import and export terminal serving the needs of the factory).

Kolobrzeg is a more diverse city compared to the neighbouring local ports of Poland. It has many features, facilities and functions of a large-scale seaside resort town. Therefore, it does not depend too much on the port economy. On the other hand, due to a rather advantageous geographical position, the port of Kołobrzeg is the only one among the Polish local ports, which can in the future reach the rank of a port of regional significance. However, it requires the introduction of significant changes in the business environment in the port and the city. It also needs a significant improvement of access from both the waterside and from the landside. Last but not least, it critically needs the development of the loading capacities in the seaport.

In general, according to the classification of seaports and their urban areas, proposed by Ducruet and Lee[120], Kołobrzeg is the only local port in Poland, which has many features of an 'urban port'. As mentioned above, it shows a low intermediator's function of the seaport in the overall economic structure of the town and the surrounding urban area. In contrast, the town itself is categorised by a medium centrality as an urban functional measure, i.e., the urban port has some

[120] Ducruet, C., Lee. S.W. (2006). Frontline soldiers of globalisation: port-city evolution and regional competition. GeoJournal 67

importance in the urban system but with a limited seaport economic role compared to other sectors of the urban economy.

Police is another local port, besides Kołobrzeg, which differs from other local ports in Poland (Figure 54). Police is a satellite seaport of Szczecin, the biggest economic centre of north-west Poland. Police seaport is the fourth busiest one in Poland with the fertilizers and petrochemicals as its commercial profile. The state-controlled Grupa Azoty, a major Polish producer of nitrogen fertilizers, uses the Police port for product export and raw material import purposes. A 90% stake in the seaport owner and operator, Port Morski Police, is held by Grupa Azoty Police, the local subsidiary of Grupa Azoty. It will further benefit from a direct rail connection with the loading and unloading zone of the main port in Police, which will further strengthen the 'out-port' profile of Police.

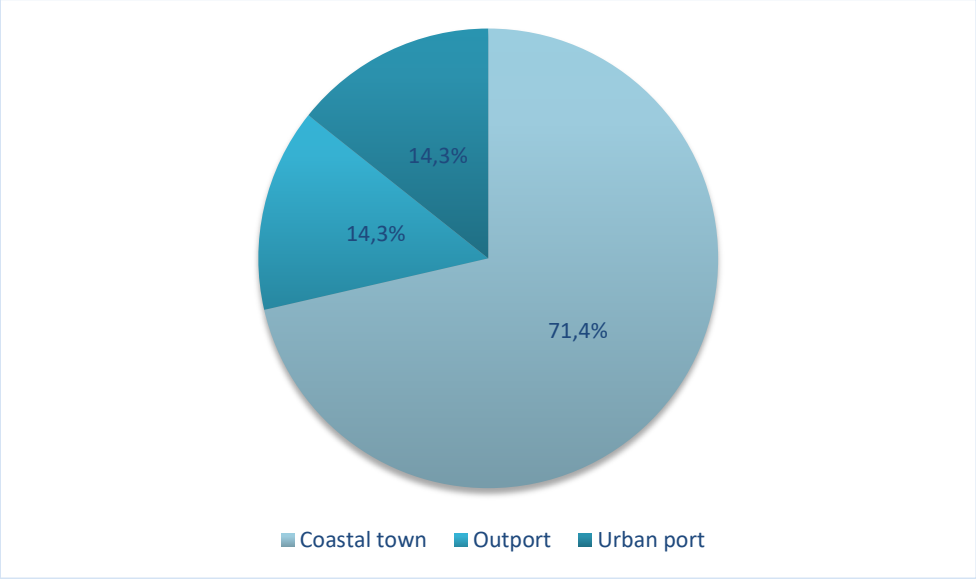

Figure 54. Types of local ports in Poland

Source: own elaboration.

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The remaining five out of seven (71.4%) local ports in Poland (including Ustka, but except Police and Kołobrzeg) are typical coastal towns according to the classification of seaports and their urban areas, proposed by Ducruet and Lee (2006). For these coastal towns to acquire and activate functions that could contribute to the development of the harbour and the town into a real city-port, the management approach is very important in the process of their development. It is considered that ports that are in the hands of local authorities or are privately owned are developing faster as we will further see from the example of Vordingborg in Denmark.

Sweden

Meanwhile, for example, in Sweden, out of the nine investigated local seaports, four ones (44.4%) are city-ports (Figure 55), i.e., belong to the most sustainable type of seaports which are characterised by a dynamic balance between the seaport and the adjacent urban area. This result came at a high cost. Both the Baltic seacoast and the Western seacoast of Sweden became almost void of small fishing harbours as local development hubs. However, such a strategy of allowing the smallest and the best-positioned local ports to survive and flourish, whether it was a deliberate seaport system planning approach or not, enabled the remaining Swedish local ports to become very robust and competitive on the regional scale.

Just 22.2% of the local seaports in Sweden are small coastal towns without any significant port economy, and another 22.2% are out-ports serving, like Police in Poland, as large import and export terminals. Falkenberg is one of the good examples in Sweden how a coastal town may develop into a city-port due to an advantageous position and excellent facilities. Falkenberg harbour hosts a small shipyard, a marina and commercial harbour facilities. The facilities are owned by

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the local municipal company Falkenbergs Hamn AB, which rents them out to the privately owned Falkenbergs Terminal AB.

Last but not least, there is just one local port of the IWW E 60 in Sweden, which functions as an urban port, i.e. with the port economy outweighed by other economic sectors. As mentioned, Simrishamn is the one only large surviving fishing port in southern Sweden located in Scania County. It is sufficient to cater to the needs of the entire commercial fishing industry of south Sweden. There are three ports in Simrishamn: the marina in the furthest northern corner between the bay and the fishing harbour. The fishing port is the furthest south in the industrial area. The third harbour is a commercial one.

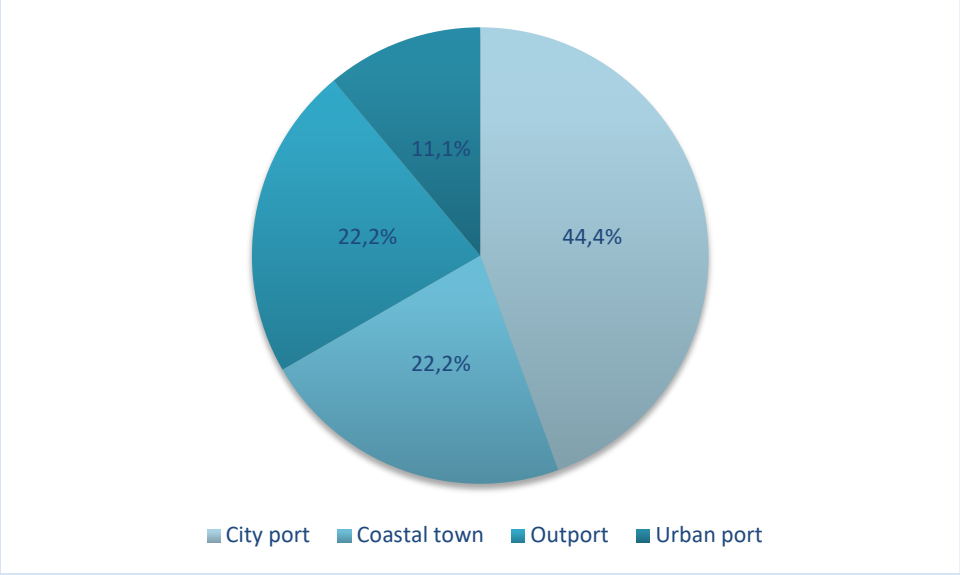

Figure 55. Types of local ports in Sweden

Source: own elaboration.

Germany

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Falkenberg in southwestern Sweden and Vordingborg in Denmark are two local ports that have a chance to become sustainable port cities. Also, in Germany, there are some local ports that, like Falkenberg or Vordingborg, are evolving from modest coastal towns into urban ports or port cities (Figure 56). One of the examples is Rendsburg in Schleswig – Holstein. Conveniently located on the Kiel Canal, it is gradually evolving into the port city, a category, which is more optimal for its position. Rendsburg municipality owns a district harbour with a 900 metres-long quay at the Kiel Canal for seagoing vessels as well as a shipyard. The shipyard also has a quay. The Rendsburg Port specializes in transhipment of bulk cargo and wind turbine components, with two berths for seagoing vessels since 2011.

Altogether, twelve out of twenty (60%) seaports in Lower Saxony, Schleswig – Holstein and Mecklenburg – Western Pomerania are urban ports, which means that the port economy plays a minor role in the urban area. First of all, it is notable that all these local ports are in two 'old' federal states of Germany – Lower Saxony and Schleswig – Holstein, in the vicinity of three largest German port metropolises – Hamburg, Bremen / Bremerhaven and Wilhelmshaven. Therefore, the coastal towns and cities in Lower Saxony, and Schleswig – Holstein, have to find some other niches for the sustainable blue growth.

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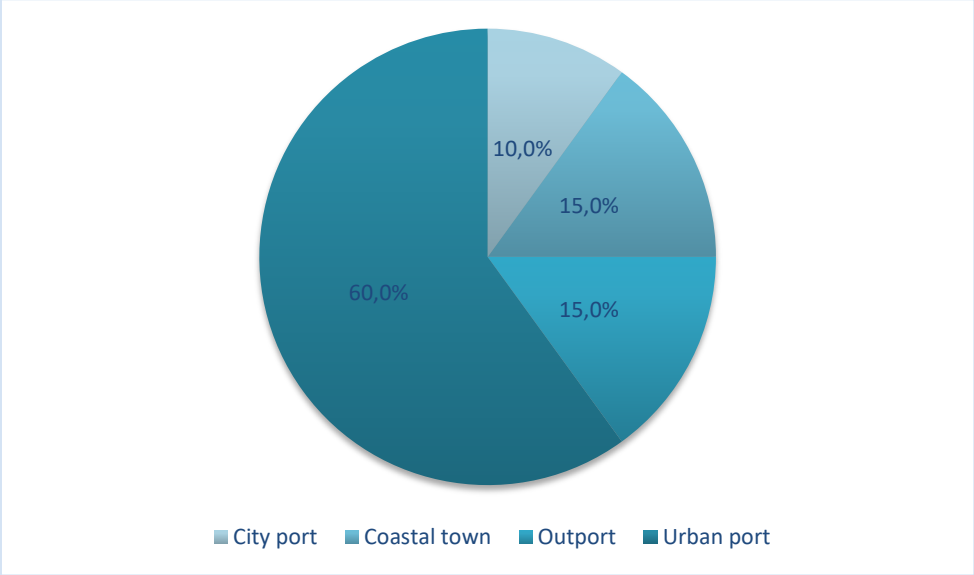

Figure 56. Types of local ports in Germany

Source: own elaboration.

Furthermore, three local German ports on the North Sea (Brake, Büsum and Glückstadt) belong to the most modest category of coastal towns. In contrast, three other seaports (Nordenham, Sassnitz / Mukran and Stade) are outports with the blue economy sectors playing an essential role in the urban area development and the regional economy. The primary role for all these three ports is to cater to the needs of the offshore wind energy sector, transportation of bulk cargo, raw and chemical industry materials, as well as petroleum products.

The Port of Mukran (an industrial hub of the Sassnitz seaside resort) is the easternmost German port for large-scale shipping. This location allows the shortest sea links from Germany to Sweden, Denmark (Bornholm), Finland, Russia and the Baltic countries. The Port of Mukran is in a relatively open Prora Bay where navigation conditions and access to the high seas are not complicated. Direct access to the high seas allows unhindered navigation without mandatory piloting.

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The 10.5-metre deep port is accessible to all classes of ships currently operating in the Baltic Sea.

Last but not least, two local seaports (10%) in Germany have achieved a dynamic balance regarding the role of the Blue Economy in the overall urban area development. These two local seaports classified as 'city-ports' are Cuxhaven in Lower Saxony and Stralsund in Mecklenburg – Western Pomerania. According to Ducruet and Lee (2006), the coastal town, the city-port and the port metropolis share the same logic of port-city relationships, though they differ in terms of sheer size. It is difficult to identify in absolute terms, when does the coastal town turn into the city-port, but both Cuxhaven and Stralsund are good examples of the 'city-port' type of local ports.

Cuxhaven is located in Lower Saxony, at the mouth of the Elbe River. Thirty-five fish processing companies with around 1 000 employees are in Cuxhaven. The deep-water port of Cuxport opened in 1997. It is very important for the further economic development of the city of Cuxhaven and the surrounding area. The site of the new port belonged to the Free and Hanseatic City of Hamburg until 1993 and acquired by Lower Saxony after a lengthy bargain. Cuxport GmbH operates the Cuxhaven multi-purpose terminal. The primary sectors are ro-ro traffic, new vehicle shipping, handling of containers and plant components for offshore wind farms.

The Hanseatic City of Stralsund is at the Strelasund Sound and Greifswald Bodden in the federal state of Mecklenburg – Western Pomerania. It has a municipal port which has several marinas suited for yachts, river cruise ships and fishing boats. In the summer months, the port is a berth for river cruise ships. There is also a large seaport for cargo ships with 25 cargo loading berths in the Stralsund Maritime Port. The significant share of goods handled at the municipal seaport Stralsund are bulk goods (including gypsum and fertilizers), the rest being general

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cargo. The seaport of Stralsund is widely considered to be the best local port on the German Baltic seacoast and may play the key role for the revival of the IWW E 60.

Denmark

Looking superficially, the geography and the typology of many local ports in Denmark is similar to that of Poland. The proportions of various local port types in Denmark is almost identical to the Polish one. As mentioned above, most of them play a simple function of a terminal for bringing in fertilizers and other materials necessary for agriculture in the region and exporting agricultural commodities and products. Therefore, out of twenty-four local ports of Denmark, just one (4.2%) has many features of the city-port type (Figure 57). It is Vordingborg Port, and this case study will be highlighted more in subchapter 4.2.2. We can classify the majority of the local ports in Denmark (54.2%) as coastal towns.

However, unlike in Poland, the multitude of local ports in Denmark that can be classified as coastal towns (with a small population and small cargo turnover) is not a sign of structural weakness. Virtually all residents in that country live within a 30-kilometres distance from the coast. Therefore, port customers have an extensive range of opportunities to choose which port to use for their import and export needs. In such case, the criterion of 'the last mile from the ship to the customer' may become decisive, and this is where small coastal towns and their tiny harbours can find a lucrative niche in Denmark.

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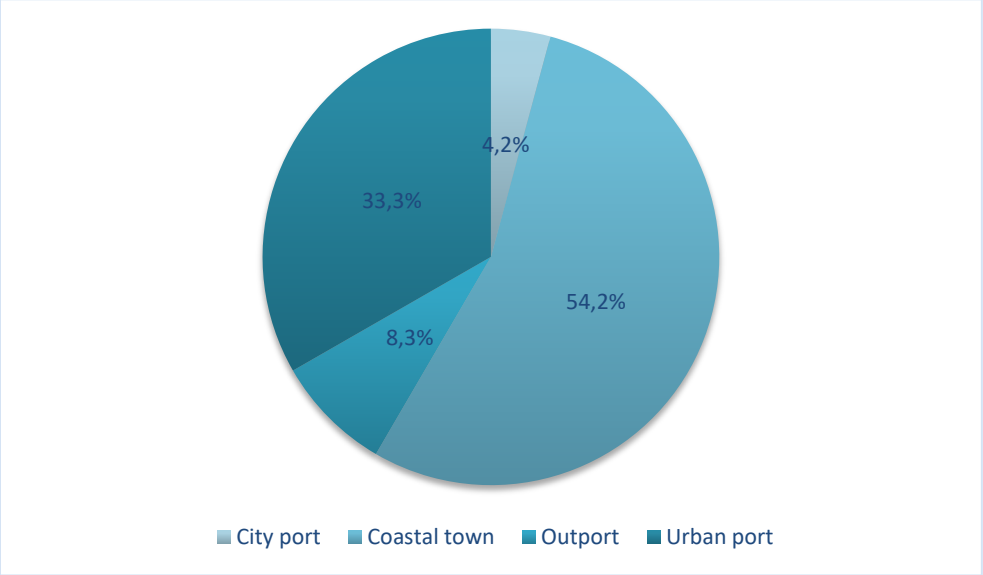

Figure 57. Types of local ports in Denmark

Source: own elaboration.

Since the urban structure of the Kingdom of Denmark is centralized with the Capital Region of Copenhagen, together with the neighbouring city of Malmö in Sweden, playing the central role for the economic development of the entire south Scandinavia, other urban areas have to survive never exceeding the status of a small coastal town or a small city. In this respect, the situation in Denmark is similar to that of other south Baltic local ports, but, particularly the ones of the North Sea in Lower Saxony. Actually, despite a difference in population density, the situation of Oostende isn't any better. It fades in the shadow of the port megapolises of Antwerp and Rotterdam.

The same reasoning of 'the last mile' criterion combined with the hyper-centrality of the economic development in the country may explain the fact, that a third (33.3%) of local ports in Denmark belong to the category of urban ports, i.e., medium-sized towns with relatively small ports. These medium-sized towns do not

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have to allocate substantial resources into the development of their local ports which can be used better for other purposes and finding other niches for sustainable Blue Growth. It could be, e.g., aquaculture, offshore (and onshore) wind energy farms, small-scale innovative production enterprises with high added value.

The local ports of Denmark, which are plenty indeed, in many cases consider their niches regarding rapid development, market volatility and need for massive investments in the maritime industry and the port economy, which has high requirements for managing and hedging investment risks impossible to meet by small municipalities. The division of labour in Blue Economy in such a small, yet dynamic and highly competitive country like Denmark transgresses the municipal boundaries. It opens up to global market forces and new structures in the international R & D and priority investments, like rapid development of offshore wind farms, decommissioning of ships, other offshore installations and maritime tourism.

Even the fish processing is no longer local in local ports of Denmark. The fish for processing is coming from other maritime territories (e.g., Poland, Baltic countries and Germany), on which local Danish ports are heavily dependent, for Denmark to maintain the leaders' position in the fishing and fish processing industry of the EU and to be able to return the significant infrastructure investment. Hence such a peculiar structure of the local port typology with a few competitive facilities of a medium-scale and plenty of coastal towns and cities 'ignoring' their port development opportunities.

It is more difficult to explain the apparent disbalance in the geographical distribution of local ports over the territory of Denmark. The overwhelming majority of the local ports are in the south-east of the country. Meanwhile, the western coast of Jutland is almost void of any local ports. Such a distribution pattern seems to be mostly coherent with an overall pattern of population density in

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Denmark and with the presence of Denmark's second largest Esbjerg Port on the Western coast. On the other hand, the apparent lack of local ports somehow compromises the criterion of 'the last mile from the ship to the customer' mentioned above.

3.2. Cargo and passenger transport in the local seaports

The transhipment capacity of local seaports is very often limited by inadequate or decapitalised port infrastructure. It reduces the capacity of ports and prevents transhipment of individual types of cargo. The maximum permissible draft of cargo ships and availability of transhipment facilities have the most significant impact on the port capabilities.

The 60 main local ports lying in the impact zone of the E 60 waterway are analysed below:

Table 20.

Types of cargo handled in main local ports located in the analysed area

Country	Port	Type of cargo					
		General cargo	Dry bulk	Liquid bulk	Project cargo	Containers	Ro-ro
		0 = NO 1 = YES					
Belgium	Oostende	1	1	1	1	0	1
	Brussels	1	1	1	0	1	0
TOTAL	**2**	**2**	**2**	**2**	**1**	**1**	**1**
Netherlands	Delfzijl	1	1	1	0	1	0
	Den Helder	1	1	1	0	0	1
	Eemshaven	1	1	1	0	1	1
	Harlingen	1	1	0	0	1	1
	Moerdijk	1	1	1	0	1	1

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Country	Port	Type of cargo					
		General cargo	Dry bulk	Liquid bulk	Project cargo	Containers	Ro-ro
		0 = NO 1 = YES					
	Zwolle	1	1	1	1	0	0
TOTAL	**6**	**6**	**6**	**5**	**1**	**4**	**4**
Germany	Brake	1	1	1	1	1	1
	Büsum	1	1	0	1	0	1
	Butzfleth	1	1	1	0	0	0
	Cuxhaven	1	1	1	1	1	1
	Eckernfoerde	1	1	0	0	0	0
	Flensburg	1	1	0	1	1	0
	Glückstadt	1	1	0	1	0	0
	Haren	1	1	0	0	0	0
	Husum	1	1	0	1	0	0
	Itzehoe	1	1	0	0	0	0
	Kappeln	1	1	0	0	0	0
	Leer	1	1	0	0	0	0
	Neustadt	1	1	1	0	1	1
	Nordenham	1	1	1	1	1	1
	Oldenburg	1	1	0	1	0	1
	Papenburg	1	1	0	1	0	0
	Rendsburg	1	1	1	1	1	1
	Sassnitz-Mukran	1	1	0	1	0	1
	Stade	1	1	1	1	1	1
	Stralsund	1	1	0	1	1	1
	Ueckermunde	1	1	0	0	0	0
TOTAL	**21**	**21**	**21**	**7**	**13**	**8**	**10**
Denmark	Assens	0	1	1	0	0	0
	Faaborg	1	1	1	0	0	1
	Hanstholm	1	1	1	1	0	1
	Hobro	1	1	0	0	0	0
	Horsens	1	1	1	1	0	1
	Hundested	1	1	0	0	1	1

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Country	Port	Type of cargo					
		General cargo	Dry bulk	Liquid bulk	Project cargo	Containers	Ro-ro
		0 = NO 1 = YES					
	Hvide Sande	1	1	0	1	0	0
	Korsor	1	1	0	0	0	1
	Nakskov	1	1	1	0	0	1
	Naestved	1	1	0	0	1	0
	Nexo	1	1	0	0	1	0
	Nykobing Falster	1	1	1	0	0	1
	Rodbyhavn	1	1	1	0	0	0
	Skagen	1	1	1	0	1	0
	Soby	1	1	0	0	0	1
	Sonderborg	1	1	0	0	1	0
	Holstebro-Struer	1	1	1	0	1	1
	Stubbekobing	1	1	0	0	0	0
	Thisted	1	1	0	0	0	0
	Vordingborg	1	1	0	1	0	0
TOTAL	**20**	**19**	**20**	**9**	**4**	**6**	**9**
Sweden	Klintehamn	1	1	0	0	0	0
	Oxelosund	1	1	1	0	1	1
	Uddevalla	1	1	0	1	1	1
	Visby	1	1	1	0	0	1
TOTAL	**4**	**4**	**4**	**2**	**1**	**2**	**3**
Poland	Darłowo	1	1	0	0	0	0
	Kołobrzeg	1	1	0	0	0	0
	Police	1	1	1	0	0	0
	Stepnica	1	1	0	1	0	1
	Ustka	1	1	0	0	0	0
	Władysławowo	1	1	0	0	0	0
TOTAL	**6**	**6**	**6**	**1**	**1**	**0**	**1**
Lithuania	Klaipeda	1	1	1	0	1	1

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Country	Port	Type of cargo					
		General cargo	Dry bulk	Liquid bulk	Project cargo	Containers	Ro-ro
		0 = NO 1 = YES					
ALL COUNTRIES	60	59	60	27	21	22	29

Source: own elaboration.

The above analysis shows that less-developed ports mainly focus on general cargo and dry bulk cargo handling. The higher the co-financing of ports, the greater the diversity of cargo handled.

The ports of Western Europe are much more diverse in terms of the cargo they are handling. A lot of them operate offshore wind farms or other offshore constructions, which meant that they had to invest in the development of project cargo transhipment. Many of these ports also handle containerised cargo, which is not the case in Eastern European local seaports. Most Western ports have found their concept of development, so they are an integral complement to the activities and services of the largest seaports and transhipment terminals of the South Baltic and the North Sea.

Sweden currently has some 120 seaports, which can be classed as either industrial or commercial. Sweden ranks high in terms of the quality of its port infrastructure (17th in the world). Maritime transport continues to be a robust complimentary transport mode in Sweden.[121]

The Swedish economy is very heavily oriented toward international trade. Sweden's export-oriented economy is founded primarily on a natural resource base revolving around timber, hydropower and iron ore. Within Sweden's most

[121] The Swedish Freight Transport System: Current Status and Historical Trends. Summary. Report 2014:17, Transport Analysis, 2014-12-19

important regional trading partner, the EU, its most significant trading relations are with Germany, Norway, Denmark, Finland, the Netherlands and the UK.

More than 90% of Sweden's foreign trade is transported through a port. In 2015, the whole of the Swedish port sector handled approximately 170 million tonnes of cargo over the quay, requiring 76 085 vessel calls.[122]

The polycentric structure of the economy means that it comes as no surprise that many logistics facilities with differing specialities have managed to develop. The two seaports in Hamburg and Bremen (i.e. Bremerhaven) are Germany's Gateways to the World, and with their links to other modes of transport, they are the most critical logistics locations in the north of the country. Smaller seaports of the North Sea and Baltic Sea are also becoming more critical, since short-haul maritime traffic in the EU, for example, has been rising for many years.[123]

As part of the analysis of cargo transport in local seaports in the area of study, it was established what types of goods were transhipped in these ports in recent years. The results of this analysis are summarized in the table below. Several factors determine the demand for seaports' transhipment services. The type of these goods is strongly related to the demand of the ports' hinterland, business type, as well as access to ports from the land side.

Table 21.

Goods handled in main local ports located in the analysed area

Country	Port	Goods handled in the port
Belgium	Oostende	Sand, gravel, chemicals, water glass, sepiolite, bricks, wood, pellets and project cargo.
	Brussels	Cement, petroleum products, agricultural products (grains), containers,

[122] Bergqvist, R., & Cullinane, K. (2017). Port privatisation in Sweden: Domestic realism in the face of global hype. Research in Transportation Business & Management, 22, 224-231.
[123] Hamamcioglu, C., & Oguztimur, S. (2015). The comparison of basic transportation indicators and freight villages' locations between Germany and Turkey.

Country	Port	Goods handled in the port
		pallets, excavated soil, glass, etc.
Netherlands	Delfzijl	Agricultural products, food, solid fuel, petroleum, ores, metals, raw minerals, fertiliser and chemical products or raw materials for the chemical industry.
	Den Helder	Construction material, fuel, wood products and fish.
	Eemshaven	General cargo, bulk and also the loading and discharging of edible products, reefer cargoes and unitised traffic.
	Harlingen	Agricultural implements, forage, timber and fertilisers. Exports include: Dairy products, meat, vegetables and flour.
	Moerdijk	Mainly oil and chemical products.
	Zwolle	Grain and fertilizers, animal feeds.
Germany	Brake	Mainly grain and feedstuffs, break bulk, iron/steel, forest products, containers, project and general cargo. There is also a sulphur terminal to the N of the quay.
	Büsum	Important port for the handling of bulk goods, general cargo and project cargo – gravel, feed, fertilizer and grain
	Butzfleth	Bauxite, aluminium oxide, petcoke, ethylene, propylene and carbon tetrachloride.
	Cuxhaven	Steel products, lumber, paper, building materials – regardless of whether it is steel girders, sheet metal, wood products or paper.
	Eckernfoerde	n.d.
	Flensburg	Feedstuffs, coal, fuel oil, stone chips, fertiliser, grain and general cargo.
	Glückstadt	Various industries like i.e. paper, cement and wood as well as power stations are serviced via Glückstadt port. Also the supply of fertilizers, feedstock and grain is handled at Glückstadt port.
	Haren	Feed, building materials, fertilizers and heavy goods are mainly handled in the Eurohafen Emsland.
	Husum	The main imports are agricultural produce and timber with the main exports being timber, feeding stuffs and manufactured goods.
	Itzehoe	The port imports coal, timber and grain and exports manufactured goods, cement and fertiliser.
	Kappeln	The main cargoes exported are grain, rape seed, with grain, fertiliser and

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Country	Port	Goods handled in the port
		feed pellets imported..
	Leer	Transhipment of dry bulk and general cargo between sea going and inland waterway vessels.
	Neustadt	Exports: Grain, used cars, containers and general cargo. Imports: Building materials, general cargo, sheet metal, stone, gravel, timber, grain, salt, artificial and natural fertilisers.
	Nordenham	Handling and storage of bulk cargo such as ore, coal, coke, fertilisers and building materials. Handling, stevedoring and storage of general cargo, especially logs and sawn timber. Handling and storage of mineral oil products, liquid fertiliser and molasses.
	Oldenburg	The port handles mainly imports (97%) consisting of agricultural goods such as grain, feed and construction materials such as sand and gravel. Exports (3%) consist of grain and scrap iron.
	Papenburg	The main cargoes handled are timber, dung, stone, peat moss and fodder.
	Rendsburg	Imports: coal, iron, timber, grain, stone, phosphates and fertilisers. Exports: include iron, grain, cement and fertilisers
	Sassnitz-Mukran	Containers, general cargo, timber, gravel, mineral mixtures and grain.
	Stade	The main imports are coal, timber, building materials, fertilisers and grain. Exports include salt.
	Stralsund	Construction materials, cement, fertiliser, grain, chemical products, special bulk handling installation for unloading of goods waggons, chalk, project cargo, refrigerated goods, timber, steel plates section, steel coils and wires.
	Ueckermunde	The port handles bulk cargo, including iron and forest product.
Denmark	Assens	Agricultural products, feeding stuffs, boulders, sand and gravel, lime, cement, plaster etc.
	Faaborg	Well-equipped and able to handle most dry cargoes, ferries and midsized cruise ships.
	Hanstholm	Handle many types of goods and has experience in transporting raw materials, large wind turbine parts as well the shipment of wood to different destinations around the world.
	Hobro	Boulders, sand and gravel, lime, cement, plaster, ores and metal waste

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Country	Port	Goods handled in the port
	Horsens	The principal exports are agricultural products, grain, malt and dairy produce, the main imports are coal, coke, iron, timber, fertilisers and feed stuffs.
	Hundested	Two Ro-Ro berths, two ferry berths and a general cargo/bulk berth.
	Hvide Sande	Efficient solutions for loading of bulk wares and project goods when cargo ships visit the port.
	Korsor	The port handles general cargo and also has cruise ship facilities.
	Nakskov	Facilities are available for dry/bulk cargoes, general cargoes, Ro-Ro passenger/car ferries and liquid cargoes.
	Naestved	Exports handled include feed stuff and grain, imports include cement, cellulose, coal, fertilisers, general cargo, kaolin, timber and wood pulp.
	Nexo	Nekso is primarily a fishing port with a separate basin for general cargo.
	Nykobing Falster	From fish to grain and feed products, lime, coal, stones and gravel, even tree trunks and oil.
	Rodbyhavn	Cargoes handled consist of bulk grain, gravel and oil.
	Skagen	Feed and mineral oil products from industrial fish production, liquid bulk in general, as well as stone, sand and gravel.
	Soby	Wood and wood chips, sand and gravel.
	Sonderborg	The principal exports are grain, butter, bacon and agricultural machinery. Imports include coal, building materials, grain, iron, fertilisers, wood, logs and wool. No tankers handled. The port was reported to be closing to cargo vessels by the end of 2011
	Holstebro-Struer	Feeding stuffs, agricultural products, boulders, sand and gravel.
	Stubbekobing	n.a.
	Thisted	Imports consist of foodstuffs, fertilisers, timber, iron and steel. Exports are mainly road material, grain, lumber and malt.
	Vordingborg	Handles bulk cargoes like grain, feed, fertilizers, sand, gravel, stone. Furthermore wood products and project cargoes.
Sweden	Klintehamn	It is principally concerned with loading limestone.
	Oxelosund	The deep water commercial port handles large tankers, bulk carriers, containers, Ro-Ro and general cargo vessels. Exports: include steel products, coal, coke, grain and oil products. Imports: scrap iron, coal,

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Country	Port	Goods handled in the port
		coke, iron ore, oil, steel products, fuel chips and limestone.
	Uddevalla	Exports: chemical products, paper, piece goods and timber goods. Imports: coal, ore, salt, clay and piece goods.
	Visby	Cargo handled: export: grain, pulpwood, sugar and timber. Imports: gravel, fertiliser and oil.
Poland	Darłowo	Mainly handling and storage of cereals, fertilizers, wood, aggregates, coal, steel and palletized goods.
	Kołobrzeg	Berths handling dry bulk cargo, grain, feed stuff, timber and general cargo.
	Police	Main cargoes handled are rock phosphate, fertilisers, ammonia and sulphuric acid, phosphoric acid, urea apatite, ammoniac and titanium white.
	Stepnica	Grain, seeds.
	Ustka	Aggregate, grain, other loose materials or packed in big-bags.
	Władysławowo	Aggregate.
Lithuania	Klaipeda	Bulk liquids, bulk raw products, containers and general cargo. The port is ice free and open all year round and can handle fully loaded Panamax tankers. The principal imports are sugar, frozen cargo, containers, machinery. Exports include grain, metals, fertilisers, timber, cement, peat, oil products and containers.

Source: own elaboration.

In recent years in Eastern Europe, the most crucial factor determining a demand for seaports' transhipment services was economic activity in ports' hinterland. It was related to the implementation of several initiatives co-financed from EU funds. They included, e.g. investments in wind farms or road infrastructure. It resulted in increased demand for construction materials imported by sea.[124]

[124] Zieziula, J., & Nowaczyk, P. (2015). Tendencje i czynniki zmian w działalności małych portów morskich w Polsce w latach 2009-2014. Marketing i Zarządzania, 1(42), 217-228.

Depending on the country, the share of local seaports in total port handling is also different. In Western European countries, there are more local and regional seaports, and their transhipments significantly outweigh those in Eastern European countries. In Poland ca. 90% of cargo is transhipped in the four significant seaports: in Gdańsk, Gdynia, Szczecin and Świnoujście. Reloading is also carried out in four of the local seaports: Kołobrzeg, Darłowo, Ustka and Władysławowo. The volume of these transhipments fluctuates, however, it shows an upward trend. By far the largest transhipments took place in the Port of Kołobrzeg and Port Darłowo, while the transhipments in Ustka and Władysławowo are of marginal importance.[125]

Passenger transport in local ports is relatively small. The table below summarizes the number of journeys on exemplification routes of local ports in Denmark in 2019. Most local and regional ports serving passengers focus on domestic transport.

Table 22.

International and domestic ferry transport at local seaports in Denmark in 2019

Route	Journeys to and from
International ferry transport	
Nexø-Polen	80
Rødby Færgehavn-Puttgarden	17 381
Domestic ferry transport	
Stigsnæs-Agersø	5 171
Stigsnæs-Omø	2 679
Næssund overfart	9 513
Stigsnæs-Agersø	111

[125] Zieziula, J., & Nowaczyk, P. (2015). Tendencje i czynniki zmian w działalności małych portów morskich w Polsce w latach 2009-2014. Marketing i Zarządzania, 1(42), 217-228.

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Route	Journeys to and from
Stigsnæs-Omø	50
Næssund overfart	46

Source: Statistics Denmark, www.statbank.dk, accessed on 06.04.2020.

In Poland international passenger traffic in 2017 took place only at the ports of Międzyzdroje and Kołobrzeg. However, the number of passengers served at these ports decreased compared to 2016 (by 7.6 and 8.6%, respectively). At the port of Kołobrzeg, six-passenger ships moor and operate permanently, including one on the international route Kołobrzeg – Bornholm. In Międzyzdroje, in the Summer season, there are cruises to Ahlbeck, Heringsdorf and Bansin (Germany). There was no passenger transport in international traffic at the port of Darłowo in 2017.

Table 23.

Passenger traffic in local seaports in Poland

Port	Year	Type of traffic					
		international			Domestic		
		arrivals	departures	total	arrivals	departures	Total
Krynica Morska	2014	0	0	0	28 495	28 044	56 539
	2015				27 957	28 269	56 226
	2016				24 439	24 560	48 999
	2017				22 710	21 924	44 634
Hel	2014	0	0	0	78 518	68 721	147 239
	2015				95 686	88 288	183 974
	2016				117 451	109 784	227 235
	2017				91 952	84 957	176 909
Władysławowo	2014	0	0	0	478	363	841

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Port	Year	Type of traffic					
		international			Domestic		
		arrivals	departures	total	arrivals	departures	Total
	2015				390	320	710
	2016				565	411	976
	2017				553	216	769
Ustka	2014	0	2	2	0	0	0
	2015		0	0			
	2016						
	2017						
Frombork	2014	0	0	0	28 044	28 495	56 539
	2015				28 269	27 957	56 226
	2016				24 560	24 439	48 999
	2017				21 924	22 710	44 634
Międzyzdroje	2014	29 911	29 859	59 770	292	34	326
	2015	31 236	31 231	62 467	577	50	627
	2016	34 199	32 526	66 725	195	71	266
	2017	30 522	30 915	61 437	85	23	108
Kołobrzeg	2014	13 411	13 761	27 172	0	0	0
	2015	13 508	13 609	27 117			
	2016	16 220	16 260	32 480			
	2017	14 798	14 892	29 690			
Darłowo	2014	1 373	1 347	2 720	0	0	0
	2015	512	512	1 024			
	2016	0	0	0			
	2017	0	0	0			

Source: Central Statistical Office, stat.gov.pl, accessed on 04.02.2019.

In the other ports, only domestic transport is carried out. In 2017 all of them noted a decrease in the number of passengers served. Most arrivals and departures took place at the Port of Hel. It is connected with the existence of a passenger connection connecting Hel and the Tri-City and the Hel-Jastarnia connection operating in the summer season for two years. In other ports, the number of people served is much lower.

3.3. Cost of handling cargo and passengers

There are many different fees for servicing a ship in a seaport. The methods of calculating them often differ in different ports. The components of port fees may include:[126]

- Port Dues/Harbour Fee.
- Pilotage – it involves the use of a fixed visual reference on the ground or sea using sight or radar to guide vessels from the seaway to the river estuary and finally to the berthing area. Pilotage charges can be based on a vessel's gross registered tonnage (GRT) or the vessel's dimensions, or be assessed on a per-call basis.
- Harbour Tug or Towing Services – they are assessed based on either the characteristics of the ship or the tugs operating. The charges are commonly assessed based on the size of the tugboat in addition to an hourly usage charge.
- Berth/Dockage Charges – dockage is the charge assessed a vessel for berthing at a wharf, pier, bulkhead structure, or bank, or for mooring to a vessel so berthed.

[126] Seedah, D., Harrison, R., Boske, L., & Kruse, J. (2013). Container Terminal and Cargo-Handling Cost Analysis Toolkit (No. 0-6690-CTR-P2).

- Loading, Unloading, and Wharfage Charges – a wharfage charge is assessed against the cargo, empty containers, and bunker fuel passing or conveyed over, onto, or under wharves or between vessels (to or from a barge, lighter, or water) when berthed at a wharf or when moored in a slip adjacent to a wharf. Wharfage is solely the charge for the use of wharf and does not include charges for any other service.

In order to analyse the data needed to develop the INCONE60 transport model, ways of charging fees at local seaports and their amount were examined. Examples of selected ports are summarized in the table below:

Table 24.

Cost of cargo handling in selected local seaports

Country	Port	Cost of handling
Denmark	Assens	Ship Charge for each call – 4.24 DKK Prepaid monthly tax with the right to an unlimited number of calls per day – 23.69 DKK The ship's charter fee – 1 090.00 DKK per call Daily dock fee per vessel length: 15-27 m – 528 DKK; >27 m – 843 DKK Ships above 500 GT pay Ship Charge necessary amount of 1 090.00 & DKK 0.60. per. GT / day Fishing vessels pay a fee of 2.45% of the value of the cargo, however a minimum of 8 298.00 DKK per year 691.50 DKK per month Picking up / putting in ships from the quay costs 160 DKK Weighing of cargo 3.00 DKK per day, per tonne Commercial or non-commercial vessels pay a fee of DKK 23.64 per vessel. m^2 per month, calculated by the largest length and width of the ship. However, a minimum of DKK 8 427 is paid annually Cargo Charges Stone, plaster, shards, lime, etc. 6.21 DKK per tonne Salt, cement, fertilizer, wood, tile, etc. 9.28 DKK per tonne Processed wood, iron, steel, coal, etc. 11.80 DKK per tonne Oil, gasoline, molasses, etc. 11.80 DKK per tonne Other products. 14.90 DKK per share, tonne Tariffs for machinery:

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Country	Port	Cost of handling
		Loading / unloading of ships with a grab 1 356.00 DKK per hour Quay waiting time 476.00 DKK per hour Access, preparation and cleaning 9 000.00 DKK per task Mini loader rental incl. leads 1 000.00 DKK per hour Tractor 657.00 DKK per hour Staff costs Operating and service employees 415.00 DKK per hour Managers and skilled workers 717.00 DKK per hour Waiting 415.00 DKK per hour Overtime supplement (outside normal working hours) 363.00 DKK per hour Land lease Temporary land lease for goods after 7 days, per. per week 4.24 DKK per week, per m^2, or per month 14.92 DKK per m^2 Long term land lease Rate Zone I 25.92 DKK per m^2, Rate Zone II 22.37 DKK per m^2
	Hanstholm	The shipping fee for single calls amounts to 2.55 DKR per tonne For ships and vessels using the ISPS facilities at the Port of Hanstholm, a fee is payable on: a) For vessels under 2 999 tonne, 600 DKK is payable per. call b) For vessels over 2 999 tonne, 1 100 DKK is payable per call Quay tax For ships, vessels and floating equipment that are in port for more than 14 calendar days, payable berth charge for each 14-day period started, but at least 500 DKK for each period: Second 14-day period 1.65 DKK tonnes For the subsequent periods, the quay tax is increased by DKK 1.65 / tonne per each 14-day period until the maximum tax of 24.75 DKK / tonne is reached Tariffs Hire of vessels: 3 000 DKK per hour Crew on weekdays from 7 p.m. 7am to 7pm. 16.00: 700 DKK person per hour and for a minimum of 2 hours. Crew outside normal working hours on weekdays 4 pm to 4 pm 07.00: DKK 1 000 per person per hour and for a minimum of 3 hours. Crew weekend and holidays: DKK 1 400 per person per hour and for a minimum of 3 hours. Goods fee The minimum payment for goods tax is 2 500 DKK. Potatoes, beets, feed peas, cereals, etc. 9.10 DKK per tonne

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<table>
<tr><th>Country</th><th>Port</th><th>Cost of handling</th></tr>
<tr><td></td><td></td><td>Non-edible products of animal origin 4.05 DKK per tonne
Animal fodder, fishmeal, oilcakes, oily seeds, vegetable products, 9.10 DKK per tonne
Fish Oil Products 9.10 DKK per tonne
Salt, fertilizer, cement 9.55 DKK per tonne
Cuttings, sand and south valley 4.05 DKK per tonne
Wood (unprocessed and roughly processed), concrete products, clinker 9.55 DKK per tonne
Unprocessed metals and scrap 9.55 DKK per tonne
Oil (ship deliveries), gas 15.60 DKK per tonne
Wood pellets, tile, 9.55 DKK per tonne
Coal, coke 10.85 DKK per tonne
Wind turbines, transformer stations, etc. 40.30 DKK per tonne
Private and unregistered passenger cars 10.10 DKK per unit
Motorhomes, caravans (incl. car) 20.15 DKK per unit
Truck, loose trailer (max. 18.25 metres) 161.25 DKK. per unit
Other ferry and container goods 14.85 DKK per unit
5.3.8 Other product groups 14.30 DKK per tonne
Land is leased on contract according to the standard conditions of the port. The area rent is determined as follows
Area 1 (Area to the west) 12.82 DKK / m2
Area 2 (The actual port) 23.08 DKK / m2
Area 3 (Steel Ship Bed) 16.41 DKK / m2
Area 4 (The areas between "Kuttergade" and "Stamvej") DKR 20.00 / m2
Area 5 (The areas between “Stamvej” and “Molevej”) 16.41 DKK / m2
Area 6 (The areas around the fishmeal factory and to the west) 12.82 DKK / m2
Area 7 (Aquaculture Area) 14.36 DKK / m2</td></tr>
<tr><td></td><td>Vordingborg</td><td>SHIPS
Section | Performance | Description | Qty | Price DKK/ unit | Unit
3.1 | Ship tax | Single calls | <8 days | 4.19 | GT
3.1 | Ship tax | Monthly calls | > 8 calls per month | 23.44 | GT
3.1 | Ship tax | Monthly calls | Per month | 23.44 | GT</td></tr>
</table>

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Country	Port	Cost of handling					
		3.3	Passenger tax	Tax	Per person	6.36	Person
				PRODUCTS			
		4.2	Goods tax	General goods	Tonne	15.91	Tonne
		4.3	Goods tax	Steel and iron scrap	Tonne	9.60	Tonne
		4.2	Goods tax	Sand, stone, gravel	Tonne	4.66	Tonne
		4.2	Goods tax	Soil, slag and ash	Tonne	4.66	Tonne
		4.2	Goods tax	Salt	Tonne	6.03	Tonne
		4.2	Goods tax	Cement, mortar and bricks	Tonne	10.78	Tonne
		4.2	Goods tax	Wood chips and wood pellets	Tonne	10.78	Tonne
		4.2	Goods tax	Wood (un)processed	Tonne	10.78	Tonne
		4.2	Goods tax	Biomass and sphagnum	Tonne	10.78	Tonne
		4.2	Goods tax	Waste for incineration	Tonne	10.78	Tonne
		4.2	Goods tax	Oil and its products	Tonne	15.91	Tonne
		4.2	Goods tax	Cereals and animal fodder	Tonne	10.78	Tonne
		4.2	Goods tax	Fertilizer	Tonne	10.78	Tonne
		4.2	Goods tax	Seeds and fruits	Tonne	10.78	Tonne
		4.2	Goods tax	Steel and rolled products	Tonne	12.68	Tonne
		4.2	Goods tax	Products of cement and concrete	Tonne	10.78	Tonne
		4.2	Goods tax	RDF / SRF	Tonne	10.78	Tonne

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Country	Port	Cost of handling					
				bales			
		4.2	Goods tax	Project goods ≥75 tonnes per unit	Tonne	17.92	Tonne
		4.2	ISPS tax	ISPS	Tonne	0.09	Tonne
				Area leasing			
		6.1	Area leasing	Area	m^2	25.37	m^2
		6.2	Area leasing	Quay	> 5 days <2 weeks	4.16	m^2
		6.2	Area leasing	Quay	> 5 days +2 weeks	6.24	m^2
				MACHINERY			
		7.3	Machine rental	Start-up fee	Per task	395.35	Piece
		7.3	Machine rental	Port crane Liebherr 944 A	Per task	781.16	Hours
		7.3	Machine rental	Port crane Sennebogen 870	Per task	1 009.19	Hours
		7.3	Machine rental	Port crane with a grab	Per task	6.00	Tonnes
		7.3	Machine rental	Tractor with equipment	Per task	530.15	Hours
		7.3	Machine rental	Mini loader with equipment	Per task	530.15	Hours
		7.3	Machine rental	Brine	Per task	0.25	m^2
		7.3	Machine rental	Crane basket	Per task	500.00	Day
		7.4	Crew rental	Port Assistant	Normal hours	395.35	Hours
		7.4	Crew rental	Port Assistant	Overtime 50%	593.03	Hours
		7.4	Crew rental	Port Assistant	Overtime 100%	790.70	Hours
		8.1	Machine	External crane	Per crane	1 600.00	Day

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Country	Port	Cost of handling
		rental
Sweden	Klintenhamn	Dues are calculated according to the gross weight of the cargo and they depends on the type of cargo (dues per 1000 kg): Frozen fish, steel and concrete elements, and goods that are not specified below – 23.30 SEK Hay/straw - 4.00 SEK Cereals, fodder peas and other peas. Products of the milling industry: malt, flour, grains, etc. Oil seeds, oleaginous fruits and molasses. Residues and waste from the foodstuffs industry and prepared fodder - 9.30 SEK Sand, gravel, clay, marble, granite, limestone, lime, cement etc., shingle and rubble - 6.10 SEK Crude oil - 9.10 SEK Light oils (petrol/gasoline) - 24.30 SEK Medium oils (kerosene), gas oils, fuel oils, lubricating oils and tall oil - 16.40 SEK Fertilizers - 10.60 SEK Fuel wood, wood waste, bark and wood chips, forest wastes and fuel pellets, solid volume m3 - 7.45 SEK Pulpwood, solid volume m3 - 5.10 SEK Saw logs, solid volume m3 - 5.30 SEK Pig iron, scrap iron, etc. - 7.45 SEK
Poland	Hel	For fishing vessels: Vessels above 30 m – 130 PLN net per day Vessels above 40 m – 170 PLN net per day For other vessels: Vessels up to 20 m – 105.00 PLN gross per day Vessels above 20 m to 25 m – 185.00 PLN gross per day

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Country	Port	Cost of handling
		Vessels above 25 m to 40 m – 345.00 PLN gross per day Vessels above 40 m to 60 m – 480.00 PLN gross per day Vessels above 60 m – 680.00 PLN gross per day

Source: own elaboration.

Port fees are based on various criteria: the size of the ship, its gross tonnage, and the type of cargo being handled. The amount of fees also depends on whether it is a one-time service or cyclically implemented in the long term.

3.4. Infrastructure and technical parameters

This section presents technical parameters and the existing infrastructure of local seaports. Example ports from individual countries were analysed.

Poland

Local seaports of the Polish coast perform various economic functions. It depends mainly on the existing port infrastructure.

Table 25.

Length of quays (in metres) in local seaports in 2017

Seaports	Total		Adjusted for handling operations	
		Incl. reloading		Incl. reloading
Darlowo	5 734	452	5 734	452
Kolobrzeg	3 136	719	3 085	719
Ustka	2 936	815	2 312	815
Władysławowo	2 167	349	2 167	349

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Source: Transport - results of operations in 2017, Central Statistical Office, Warsaw, Szczecin, 2018.

In the local ports of the Polish coast, there is no infrastructure related to blue and green growth. Local ports are small structures whose activities are focused on maintaining profitability and investment attractiveness and do not focus on the studies mentioned above. They do not have other means, and it is also not their responsibility. However, local seaports can be an excellent headquarters for many companies involved in research into blue growth in the Baltic Sea. Their location and existing infrastructure can create favourable conditions for the work of highly qualified employees in these growing sectors of the economy. However, for this to happen, a well-functioning private-public partnership and support from the government and the European Union are necessary to adapt the infrastructure and working conditions to high requirements. Local ports should not be overlooked in the process of creating research centres, and the research function should be their natural function.

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Port of Kołobrzeg

Vessels not exceeding 85 m in length and 4.7 m in the draft may call at the port of Kołobrzeg. Depending on the length of vessels and hydrometeorological conditions, those vessels can perform turning manoeuvres at the elevator (turntable diameter 95 m) or the bifurcation of the channels (turntable diameter 140 m).[127]

The total capacity of the storage area at the commercial port in Kołobrzeg is approx. 50 000 m^2 with 5 000 m^2 warehouse space and ca. 2 000 m^2 office space. The infrastructure enabling the operation of vessels with a total load capacity of up to 3 000 DWT includes the following devices and structure: railway sidings, mobile cranes 5 – 10 tonnes, two turntables for vessels, groupage with a usable area of 4 901m², grain elevators with a capacity of 5 905 tonnes, storage yards with an area of 20,650m², storage yards with an unpaved surface of 17 316m².[128]

Moreover, six basins, a yacht marina, a repair shipyard, an ice factory and a fish processing plant with a capacity of 230 tonnes per day ensure the proper functioning of the Fisheries and Yacht Port.

Port infrastructure includes following quays with total 4 500 m length: Bosmańskie, Pilotowe, Zbożowe, Słupskie, Przy zjazdach, Szkutnicze, Pirs, Turystyczne, Jachtowe, Manewrowe, Szkolne, Łodziowe, Promowe, Żeglarskie, Remontowe-harcerskie, Pomost Rybacki, Skarpowe, Postojowe, Barkowskie, Rybackie, Północne, Wschodnie, Południowe, Zachodnie, Kamienne, Złomowe, Techniczne, Warsztatowe, Remontowe, Stoczniowe, Bunkrowe, Zachodnie żelbetowe, Sportowe, Wydmowe.[129]

The Passenger Port is located at Towarowa Street. Its area consists of headquarters of the port authority (Zarząd Portu Morskiego Kołobrzeg Sp. z o.o.)

[127] Port of Kołobrzeg development strategy, Kołobrzeg. Zarząd Portu Morskiego Kołobrzeg, 2010.
[128] Ibidem.
[129] Ibidem.

with approx. 100 m² of the office space, approx. 5 000 m² square intended for trade and gastronomy, and 210 m² waterfronts. In Fisherman's part, the port also administers facilities for warehouses, commercial and office purposes. There are commercial premises, restaurant rooms with catering facilities, office rooms with a conference room, social and office rooms, warehouses and openwork boxes. Over 200 entrepreneurs from various branches of the economy operate in those managed properties. On the area of the Fisherman's Port, there are public parking lots for cars and trucks, transhipment yards and manoeuvring plus storage area, which can be used to set up warehouse halls or workshops. The port infrastructure includes a stationary crane for lifting vessels, energy-saving lighting, high power supply with its energy source and a monitoring system. The marina at the yacht port has a full infrastructure for yachts, each station has its water and electricity connection, and a yacht service operates in the hall located in the marina. This facility is growing every year, further investments are being made to increase the number of parking spaces and to improve infrastructure.[130]

Port of Władysławowo

Commercial vessels up to 70 m long and 4 m draft may enter the port. The port captain may allow the entry of vessels up to 4,5 m draft. The fishing port in Władysławowo has a safety certificate issued by the Maritime Office in Gdynia, which means that it meets the requirements of the Solas Convention and the ISPS Code.

The port has the following quays and piers:

- Postojowe Wschodnie quay 185 m
- Stoczniowe quay 105 m
- repair deck 52 m
- slip platform 106.5 m

[130] zpm.portkolobrzeg.pl, accessed on 07.01.2019

- Passenger pier 135 m
- 340 m unloading Quay
- Paliwowe quay 120 m
- Yacht Quay 90 m
- Danish pier 185 m
- Robocze Quay 61 m
- Postojowe Połnocne quay 150 + 250 m
- platform 1 - 101 m
- bridge 2 - 101 m
- bridge 3 - 86 m

The entrance to the port is covered by two breakwaters: North with a length of 620 m and East with a length of 340 m. Inside, the port consists of three basins: Entrance, Internal and Shipyard ones. Inside the port, there is a pier to separate the shipbuilding part from the fishing and transport parts and protect against waves. The depths in the port is between 4 -6 m. A repair shipyard and a fish processing plant also operate in the port. There is a lift in the shipyard for vessels up to 30 m in length, and load capacity up to 220 tonnes (slip) with 14 repair stands. Shipyard facilities occupy an area of approximately 3.3 ha and are located in the eastern part of the port. The port has storage yards, a railway siding, a mobile crane (18 tonnes) and a ramp for yachts up to 12 m long. Sports and tourist units moor at the 90 m long yacht quay equipped with floating platforms Y-booms. In the port, are such facilities as sanitary, electricity on the waterfront, refuel diesel, and pass garbage and oily water.

In Władysławowo there is also a SAR shore rescue station and a sea border crossing with a customs office. An approach tray with a length of 700 m and a depth of 7.0 m leads to the port in Władysławowo. Strong currents along the shore

cause the phenomenon of shallowing the entrance to the port, which requires regular dredging works.[131]

Denmark

Local Danish ports are much more adapted to perform transhipment functions than Polish ports. Often they also carry out other activities that also require investment in appropriate infrastructure.

There are 52 seaports only in the analysed NUTS 3 regions which transported up to 600 000 tonnes of cargo:

Table 26.

Danish local ports of the analysed area in 2018

Port	1 000 t		Port	1 000 t
Bogø Havn	1		Fejø Havn	32
Stubbekøbing Havn	1		Fåborg Havn	39
Marstal Havn	1		Kragenæs Havn	41
Barsø Landing	1		Fynshav Havn	44
Barsø	1		Rødby Havn	51
Omø Havn	2		Søby Havn	56
Drejø, Skarø havne	2		Sjællands Odde Havn	68
Holbæk Havn	3		Ballebro Havn	89
Orø Havn	3		Hardeshøj Havn	89
Baagø Havn	3		Bandholm-Maribo Havn	92
Strynø Havn	3		Havneby Havn	93
Aarø Havn	4		Asnæs Inter Terminals	133
Aarøsund Havn	4		Ærøskøbing Havn	133

[131] Development Strategy of the Puck Region for 2016-2025, Association North Kashubian Local Gruba Rybacka, April 2016.

Port	1 000 t		Port	1 000 t
Agersø Havn	6		Svendborg Havn	150
Askø Havn	8		Faxe Havn	193
Stigsnæs Havn	8		Stevns Pier	205
Avernakø, Lyø havne	8		Skærbækværkets Havn	310
Femø Havn	9		Tårs Havn	359
Havnsø Havn	9		Spodsbjerg Havn	359
Rørvig Havn	9		Gulf-havnen Inter Terminals	379
Sejerø Havn	9		Korsør Havn	415
Masnedø Gødningshavn	10		Nakskov Havn	423
Nexø Havn	11		Guldborgsund Havne	461
Rudkøbing Havn	11		Vordingborg Havn	530
Assens Havn	29		Stigsnæsværkets Havn	568
Bøjden Havn	31		Næstved Havn	595

Source: Statistics Denmark, www.statbank.dk, accessed on 03.07.19.

Denmark also had historical conditions at the beginning of the 20th century for the development of local seaports. The grain and foodstuff companies with grain silos, the coal yards with cranes, the smaller shipyards for building and reparation and the smaller storage areas for oil and petrol, were to be found on almost every port of the Danish regional towns.[132]

Port of Stigsnæs

Port of Stigsnæs is located on the southwest coast of Sjaelland, approximately 60 nm from Copenhagen. The port serves the power station and is one of Denmark's main coal import ports. The port can handle bulk coal carriers and oil

[132] Pedersen, M. (2014). Industrial Heritage in Denmark: Landscapes, Environments and Historical Archaeology. Aarhus Universitetsforlag.

tankers throughout the year as the harbour is kept free of ice during the winter. Stignaes Ferry Harbour is situated close north, used only for ferry traffic to Agerso and Omo. Stigsnaes Oilpier is operated by Energi E2, together with nearby Gulfhavn, also known as Gulf Oil Pier.

Table 27.

Technical parameters in the port of Stigsnæs

Mooring	Unit	Unloading of coal	Loading of coal	Ash
Water depth	M	17,0	9,0	8,0
Tide	M	+/-0,3	+/-0,3	+/-0,5
LOA	M	290	150	60
Bream	M	45	19	6
Max. drought	M	16,5	8,5	7,5
Pan max	M	16,5	-	-
Cape size	M	16,5	-	-
Air draft	M	21,0	9,5	7,5
Crane	T	2x40	-	-
Unloading/loading capacity	t/h max	2x1750	1800	600

Source: Port information for Stigsnæs Transit Harbour, February 2018, orstedcdn.azureedge.net, accessed on 09.07.19.

Port of Vordingborg

Vordingborg industrial port is located on the north side of Masnedø, west from the Masnedø Bridge. The port covers an area of in total 133 000 m^2 and is geographically situated centrally in the South of Zealand, Møn and Lolland-Falster. Vordingborg Port is not far away from the international fairways like, for example, the T-route. Vordingborg Shipping was established in 1948, and its head office is located directly at the Port of Vordingborg. Vordingborg Shipping is part of the

Krinak A/S Group and by this represented in all ports on Lolland Falster and southern part of Zealand.[133]

The main business in Port of Vordingborg is grain, but there is continuing growth in raw materials for feed production, materials for the upcoming Storstrøm Bridge and the extension of the railway line between Ringsted and Rødby.

The current water depth in the channel and harbour is -10.4 metre. The port of Vordingborg built a new basin with a quay in 2015.

Table 28.

Facilities at Port of Vordingborg

Port area	500.000 m^2
Quay length	1.645 metres
Depth	10.40 metres
Port approach	50-70 metres wide
Cargo volumes	1 million tonnes annually

Source: Information about ports in the area, Storstrøm Bride Partnership, www.partnerskabstorstroemsbroen.dk, accessed on 17.07.19.

There is a full modern park of all stevedore equipment among this several wheel loaders, conveyor belts as well as two mobile cranes, respectively a Sennebogen 850 and a Liebherr 944. Port of Vordingborg offers chartering, door-to-door solutions, forwarding, workforce, weighing and more.[134] Other facilities at Vordingborg port:[135]

- Two weighbridges up to 60 tonnes,

[133] Vordingborg Port. The central port in conjunction with the construction of a new Storstrøm Bridge. Vordingborg Havn, 2016.
[134] Nakskov webpage, www.krinak.dk/ports/naestved-karrebaeksminde, accessed on 09.07.19
[135] Vordingborg Port. The central port in conjunction with the construction of a new Storstrøm Bridge. Vordingborg Havn, 2016.

- Sweeper,
- Tractor,
- Tugboat.

Sweden

Sweden's port sector is characterised by the presence of numerous local ports and harbours, many of which are already owned and operated by the private sector, mainly for the handling of bulk cargoes. It is also worth noting that many ports are multiuser in a type where containers (LoLo) and trailers (RoRo) constitute the most common segments.

Port of Solvesborg

The port of Solvesborg is strategically located on the Swedish east coast, just hours from the ports of the expanding eastern side of the Baltic Sea. Port of Solvesborg (Sölvesborgs Stuveri & Hamn AB) was founded in 1990 and is currently responsible for all the port operations in Solvesborg. The logistics company offers complete logistics solutions including 3PL, rail and truck transport, chartering, storing, forwarding and traditional port operations.

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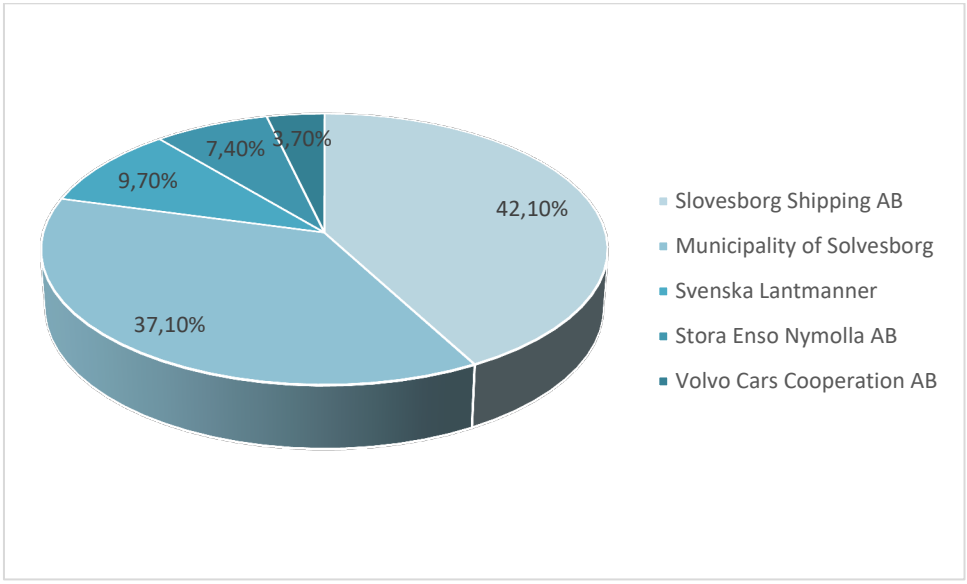

Figure 58. Owners in the port of Solvesborg

Source: Sölvesborgs Stuveri & Hamn AB, www.sbgport.com, accessed on 09.08.19.

The land area of the port is 205 000 m^2. Warehouses consist of 45 000 m^2.

Table 29.

Port of Solvesborg infrastructure

Land area	205 000 m^2
Length of Quays	400 m
Ro-ro ramp max draught	6.5 m
Portal crane	40 tonnes with container capacity
Mobile cranes	15-24 tonnes
Front-loaders	2-22 tonnes
Roll trailers	40-100 tonnes
Timber grabs trucks	12-15 tonnes
Forklifts	3-32 tonnes

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Source: Sölvesborgs Stuveri & Hamn AB, www.sbgport.com, accessed on 09.08.19.

The energy that the port buys is 100% green and eco-labelled. It means that it exclusively originate from fossil-free and renewable sources such as water, wind and solar power, some of the cleanest energy sources available.

Table 30.

Water depth in Port of Solvesborg

Channel	26 - 30 feet 7.1 - 9.1 metres
Cargo Pier	26 - 30 feet 7.1 - 9.1 metres
Mean Tide	1 foot
Anchorage	21 - 25 feet 6.4 - 7.6 metres
Oil Terminal	26 - 30 feet 7.1 - 9.1 metres

Source: SEARATES, www.searates.com, accessed on 09.08.19.

The Port of Sölvesborg is part of a supply chain of salt for feed and food purposes. This chain begins with the supplier's GMP + certified operations where the salt stock is sent to the Port of Sölvesborg for transhipment and packing before distribution to the customer. The company caters to customers in Sweden with safe products in the form of salt.

Port of Åhus

The Port of Åhus is one of the essential bulk harbours in Southern Sweden and the largest container harbour in South-East Sweden. The main business areas of the port are bulk and container handling as well as store leasing. Bulk handling accounts for around 70 % of the total volume handled.[136]

[136] The Port of Åhus today – Åhus Hamn & Stuveri AB. http://www.ahushamn.se/en/the-port-of-ahus-today/

The harbour area is the seat of operations for companies including The Absolut Company, the Swedish Farmers' Supply and Crop Marketing Association, Knauf Danogips GmbH, Svenska Foder AB, Yara AB, Akzo Nobel Chemicals AB and KLF.[137]

Thanks to the geographical situation of the harbour, it is easy for vessels to put in at Åhus, and with store buildings and container terminals right nearby, cargoes can be loaded and unloaded quickly and efficiently.[138]

Also, there is a deep and well-developed working relationship between the various transport systems.

With a regular route as feeder lines for Bremerhaven and Hamburg enjoys a strategic location concerning Europe.[139]

Quay:[140]

Total length: 1 595 m.

- Max. draught:
- 7.6 m approx. 455 m (bollard 28 – 41)
- Vessel length Max. LOA 145 m
- 6.5 m approx. 700 m (bollard 28 – 1)
- Vessel length Max. LOA 130 m
- 5.9 m approx. 260 m (bollard A-H)
- Vessel length Max. LOA 85 m
- Vessels with LOA 130-145 m,
- Wind limit for vessels with LOA over 130 m
- and for barges max 10 m/s

[137] The Port of Åhus today – Åhus Hamn & Stuveri AB. http://www.ahushamn.se/en/the-port-of-ahus-today/
[138] Ibidem
[139] Åhus Hamn & Stuveri AB, www.ahushamn.se/en, accessed on 20.08.19
[140] Ibidem

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Container terminal

- Stacking area: 22 000 m^2
- Storage Capacity: 3 000 TEUs
- Maximum lifting capacity, cranes: 45 tonnes

Bulk terminal

- Quay length: 1 100 m^3 cable cranes on rails.
- Max. lifting capacity of 25 tonnes
- 1 Siwertell screw-type unloader

Storage area:

- Total storage surface: 56 000 m^2
- Uninsulated: 51 800 m^2
- Insulated: 4 200 m^2

Navigable dredged channel:

- Length: 1.2 nautical miles
- Width: 70 m
- Depth: 8.9 m

Landskrona Port

Landskrona Hamn AB is a modern port and storage company. It provides port and storage services to customers inside and outside of the port area.

The main focus is on the efficient and rational handling of bulk products in particular. In addition to unloading and loading of vessels, the company also offers warehousing and terminal operations.

One of the biggest advantages of the port is a strategic location in southern Sweden where the port is ice-free and close to other infrastructures like highway (E4/E6) and rail.

The company have three mobile folding arm cranes that can operate along our 1 100 metres quay, belt conveyor for dust-free unloading to silos and ship unloaders.

The port also has good possibilities for expansion.[141]

General information about the port:[142]

- Max depth of 10.1 m
- Max LOA 190 m
- Max width 30 m

Skeppsbrokajen quay:

- Max depth: 8.5 m
- The total length of the quay is 347 m

Fosfatkajen quay:

- Max depth of 10.1 m
- The total length of the quay is 454 m

Bruuns kaj quay:

- Max depth of 7.0 m
- The total length of the quay is 82 m

Södra kajen quay:

- Max depth of 6.2 m

[141] Landskrona Hamn AB, www.landskrona-hamn.se, accessed on 20.08.19
[142] Ibidem.

- The total length of the quay is 190 + 270 m

Germany

Port of Mukran[143]

Mukran Port located on Germany's largest island, Rügen, benefits in many aspects from its excellent position. The easternmost deep seaport is ideally situated for short-distance freight and passenger traffic to and from Sweden; Denmark (the Danish island Bornholm), Finland, Russia and the Baltic states. The direct access to the open sea allows unhindered navigational approach without compulsory pilotage.[144]

Furthermore, excellent nautical and geographic sea features make Mukran Port an attractive site to the offshore wind industry.

Mukran Port is the only port in central Europe which provides in addition to standard gauges, rails and transhipment terminals which are suitable for Russian and Finish broad gauges.

Since 15 February 2011, Fährhafen Sassnitz GmbH and Deutsche Eisenbahn Service AG (DESAG) have been jointly operating the company Baltic Port Rail Mukran GmbH to provide the proper execution of shunting operations and broad gauge services. The Baltic Port Rail Mukran GmbH provides:

- Shunting operations on standard and broad gauge,
- Technical inspections of freight wagons,
- Clearance of documents.

The partnership with the Buss Group GmbH & Co. KG Hamburg strengthens the position of the port in the following fields:

[143] Mukran Port, www.mukran-port.de, accessed on 5.09.2019.
[144] Home - Mukran Port EN. https://www.mukran-port.de/home.html

- Handling of conventional short-sea transportation,
- Transhipment and storage of bulk and general cargo,
- Handling of contract logistics.

The Baltic Port Services GmbH, which is an entity of Fährhafen Sassnitz GmbH and Deutsche Eisenbahn Service AG (DESAG), has been offering mechanical services in the port in Mukran since 10 June 2014. The following services are included in the portfolio of the Baltic Port Services GmbH:

- Maintenance and repair of wagons and locomotives,
- Changing axles of wagons for standard / broad gauge v.v.,
- Maintenance and repair of port handling equipment.

In addition to seaside transhipments, Mukran Port also commends itself for the landside handling of all kinds of goods and perfect logistics and warehouse services.

The economic prospects for the maritime and trade business of the industrial site Mukran Port have been based upon a thoroughly elaborated and future-oriented land and infrastructure development plan. In cooperation with its partners, Deutsche Bahn AG, Landgesellschaft Mecklenburg-Vorpommern mbH, City of Sassnitz and the local community Lietzow, Mukran Port has drawn up a sustainable land use planning to ensure further economic growth.[145]

As the only port in Western Europe, Mukran Port has in addition to tracks of European standard gauge also tracks and terminals for the Russian broad gauge. There are altogether 18 km broad gauge and 60 km standard gauge for use within the port and railway area of which 23 km belong to the company Fährhafen Sassnitz GmbH (ca. 8 km standard gauge and ca. 15 km broad gauge).[146]

[145] Dry Port Industry - Mukran Port EN. https://www.mukran-port.de/services/dry-port-industry.html
[146] Rail Port - Mukran Port EN. https://www.mukran-port.de/services/rail-port.html

3.5. Cooperation with local authorities

Research studies of Polish seaports expert Piotr Nowaczyk (2013) have shown that the quality of provided port services depends on the type and form of ownership. The most favourable conditions for conducting business activities are created by municipal entities. Ownership changes taking place in local seaports since the beginning of the 1990s were possible due to new legal solutions:

- The Act of July 13, 1990, on the privatization of state-owned enterprises [Journal Of Laws No. 51, item 298, with later amendments], which allowed the privatization of enterprises,
- The Act of 8 March 1990 on local government [Journal Of Laws No. 16, item 95, with later amendments] and the provisions of 10 May 1990 introducing the act on local self-government and the act on self-government employees [Journal Of Laws No. 32, item 191, as amended changes], which allowed the communalization of enterprises.

Due to the legislative chaos caused by the lack of uniformed legal acts regulating the port operations, only the municipality of Stępnica decided to communalize the port. Further communalization steps began after 1996 when Act on Sea Ports and Harbours came into force. Port authorities also decided to communalize ports of Kołobrzeg and Darłowo. Other municipalities were too afraid of the high costs of maintaining local ports. The communalization of ports of Władysławowo and Hel, managed by port enterprises, was possible only after the amendment of the Act of August 30, 1996, on commercialization and privatization of state-owned enterprises [Journal Of Laws of 1996 No. 118, item 561].[147] The acceleration of the communalization processes took place after Polish access to the EU, which allowed to finance port investments from EU funds.

[147] Nowaczyk, P. (2013). Warunki prowadzenia działalności gospodarczej w małych portach morskich w Polsce. Zarządzanie i Finanse, 11(1, cz. 4), 347-361.

Unlike the ports of fundamental importance for the national economy (Szczecin, Świnoujście, Gdynia and Gdańsk) managed by commercial law companies with a statutory guaranteed dominant share of the Treasury represented by the minister responsible for the maritime economy, regional and local ports are mostly managed by managing entities established by municipalities, or have no managing entities at all.

Table 31.

Managing entities in Polish seaports

Port	Managing entity	Port	Managing entity
Darłowo	ZMP Darłowo	**Nowa Paslęka**	none
Dziwnów	ZPM Dziwnów	**Nowe Warpno**	none
Dźwirzyno	none	**Police**	ZMP Police
Elbląg	ZPM Elbląg	**Przytór**	none
Frombork	none	**Puck**	Gmina Miasto Puck (MOKSiR Puck)
Hel	ZPM Hel Koga	**Rowy**	none
Jastarnia	none	**Sierosław**	none
Kamień Pomorski	Marina Kamień Pomorski Sp. z o.o.	**Stepnica**	none
Kąty Rybackie	none	**Tolkmicko**	none
Kołobrzeg	ZPM Kołobrzeg	**Trzebież**	none
Krynica Morska	none	**Ustka**	ZPM in Ustka
Lubin	none	**Wapnica**	Marina Międzyzdroje-Wapnica Sp. z o.o.
Łeba	none	**Władysławowo**	Szkuner Sp. z o. o. [a)]
Mrzeżyno	ZPM Mrzeżyno	**Wolin**	none

a) 100% shares owned by Puck Municipality

Source: Program for the development of Polish seaports until 2020 (with a perspective until 2030), Ministry of Maritime Economy and Inland Navigation, Warsaw, 2018.

Following applicable regulations, the tasks of the managing entity include, among others real estate and port infrastructure management, forecasting, programming and planning of port development, construction, extension,

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maintenance and modernization of port infrastructure, as well as the acquisition of real estate for port development.

If the managing entity of the port or marina is not appointed, part of the management body's tasks and rights, including forecasting, programming and planning of port development and acquisition of real estate for its development, is carried out directly by the commune.[148]

After many years of experience of the ports in Kołobrzeg and Darłowo, it can be assessed that the process of taking over ports by municipalities is long and burdensome. In the vicinity of ports, there is a lack of economic base that generates transhipments, there are difficulties in taking over by the municipalities of the Treasury, which are located in the Agricultural Real Estate Agency or the Military Property Agency, and many port areas were sold into private hands after the bankruptcy of companies. An additional problem is the degradation of port infrastructure, especially the quays and the uncertain fate of Polish fishing.

In local ports, the task of financing many areas of municipal ports operations falls on territorial self-governments and development of coastal zones is their responsibility. It causes severe financial constraints on the implementation of local port strategies. Ambitious development and investment plans primarily face a financial barrier (small resources of the commune, colossal dependence on the state budget).

However, ports dependent on city authorities such as Kołobrzeg and Darłowo obtained EU funds for various types of investments improving their operation and access to them, such as investments in roads, squares, quays, facilities for fishers and construction of tourist infrastructure in ports. More and more municipalities see the benefits of taking over ports.

[148] Program for the development of Polish seaports until 2020 (with a perspective until 2030), Ministry of Maritime Economy and Inland Navigation, Warsaw, 2018

Care in strategic programming and the operational and implementation layer resulted from the regional policy pursued in Poland, based on maximizing the use of European Union funds and their redistribution to regional centres. Poland's regional policy, adopted by the government in July 2010, creates fundamentally different conditions and opportunities for regional (territorial) development. The strategic goal of the new regional policy is the effective use of specific local potentials and resources to achieve socio-economic development, employment growth and cohesion in the long-term horizon in the regions. It means that regional policy has been focused on the possible widespread use of endogenous factors for the development of regions and focuses on local opportunities (resources, potentials) for increasing the competitiveness of territories and on unblocking their growth processes.

The basic principles of the new policy include the coordination of activities between public entities at various levels at the stage of planning and implementing the regional development policy, while the importance of local self-governments in the regional development strategies developed by the region self-government increases. The new regional policy, based on the local resource, which is a local port, creates better conditions for using their potential and greater opportunities for the activation of coastal regions.

The approach of the commune self-government – the port city – is of key importance for the development of strong ties between the local port and its surroundings. It is this entity that must assess the importance of the port and outline its perspectives. However, building an effective local port development strategy requires constant cooperation between the different levels of public authorities.

The perspective goal is to take over all ports and harbours by local governments. However, this process should not be accelerated by administrative decisions. The most effective way to this end is the improvement of the technical

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condition of port facilities by the current state management. Further development of local ports will depend on the extent to which local government authorities want to see it as a factor in improving the lives of their community. On the other hand, taking into account existing restrictions, the government should present and consult the program of intentions in its area of responsibility, i.e. mainly regarding the development of infrastructure providing access to local ports.

Before the passing of the Danish Port Law in 1999, Danish ports were regulated by an older piece of legislature called the Commercial Ports Law. In 1990, the law was amended, and the centralized pricing and investment scheme was removed. The intention of this amendment was to de-bureaucratize port management and promoted competition between ports. They continued efforts to commercialize ports resulted in the adoption of the Port Law in 1999. Under this law, which was subsequently amended in 2003, 2005, 2007 and 2012, ports were allowed to choose organizational form. This reform intended to allow ports differentiated degrees of freedom in carrying out business activities, where more freedom would be given to ports whose organizational structure permitted more independence from their public owners. The law allowed ports to be organized according to one of the following five classifications: state port, municipal port, municipal self-governed port, fully or partially municipally-owned limited company or privately organized port. Out of the 60 publicly open ports, 20 of these are organized as municipal, 30 as municipal self-governed and ten as fully or partially municipally-owned limited companies. Besides, there are around 30 examples of privately organized ports.

The two principally essential forms of organization in the Port Law are the municipally self-governed (henceforth MSG) ports and fully or partially municipally-owned limited company (henceforth MOLC) ports. They are important in the sense that most large and vital Danish ports are organized as either of these. MSG ports differ from municipal ports in that they are managed by a

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separate port board, appointed by the municipal council. The port is run independently from the municipality, in that day-to-day management and accounts are kept separate. Like municipal ports, MSG ports can provide and manage infrastructure, as well as supply operators with cranes, warehouses and other equipment. MSG ports are not ordinarily allowed to perform port-related or ship-related services, but under special circumstances where no private actor has been identified to take on these tasks, this is allowed.[149]

The majority of the larger Swedish ports tend to be owned and operated by regional municipalities. The industry association, 'Ports of Sweden', is an employers' organisation comprising a membership of 60 ports which together employ more than 4 000 employees.

Within the context of port privatisation, it is essential to recognise that Sweden has a relatively long tradition of possessing many private ports which usually exclusively serve the needs of the owner. Many of these ports are specifically for moving bulk cargoes, around which much of Sweden's economy revolves. There are only three crucial container ports in Sweden that have been privatised and those by means of concessions; Gothenburg, Stockholm and Gävle.

Although the issue of port privatisation in Sweden does have a national context in that the government of Sweden must facilitate compliance with EU directives in this arena, more importantly, the issue has a very distinct regional context, since many of the ports are owned by regional entities such as cities or municipalities. It, together with the already high private sector participation rate, has rendered port privatisation in Sweden less harmonised from a national perspective. Hence, the ultimate rationale for adopting a policy of port privatisation is very dependent on the characteristics of a region and of the individual ports within that region. Ultimately, port privatisation in all regions of Sweden has a stable and individual

[149] Merkel, A., & Sløk-Madsen, S. K. (2019). Lessons from port sector regulatory reforms in Denmark: An analysis of port governance and institutional structure outcomes. Transport Policy.

political context; the close political link between port operations and ownership, the power and influence of the labour unions across Sweden and the strong local identity of many ports are probably the primary explanations for the late adoption and patchy implementation of port privatisation in Sweden.[150]

[150] Bergqvist, R., & Cullinane, K. (2017). Port privatisation in Sweden: Domestic realism in the face of global hype. Research in Transportation Business & Management, 22, 224-231.

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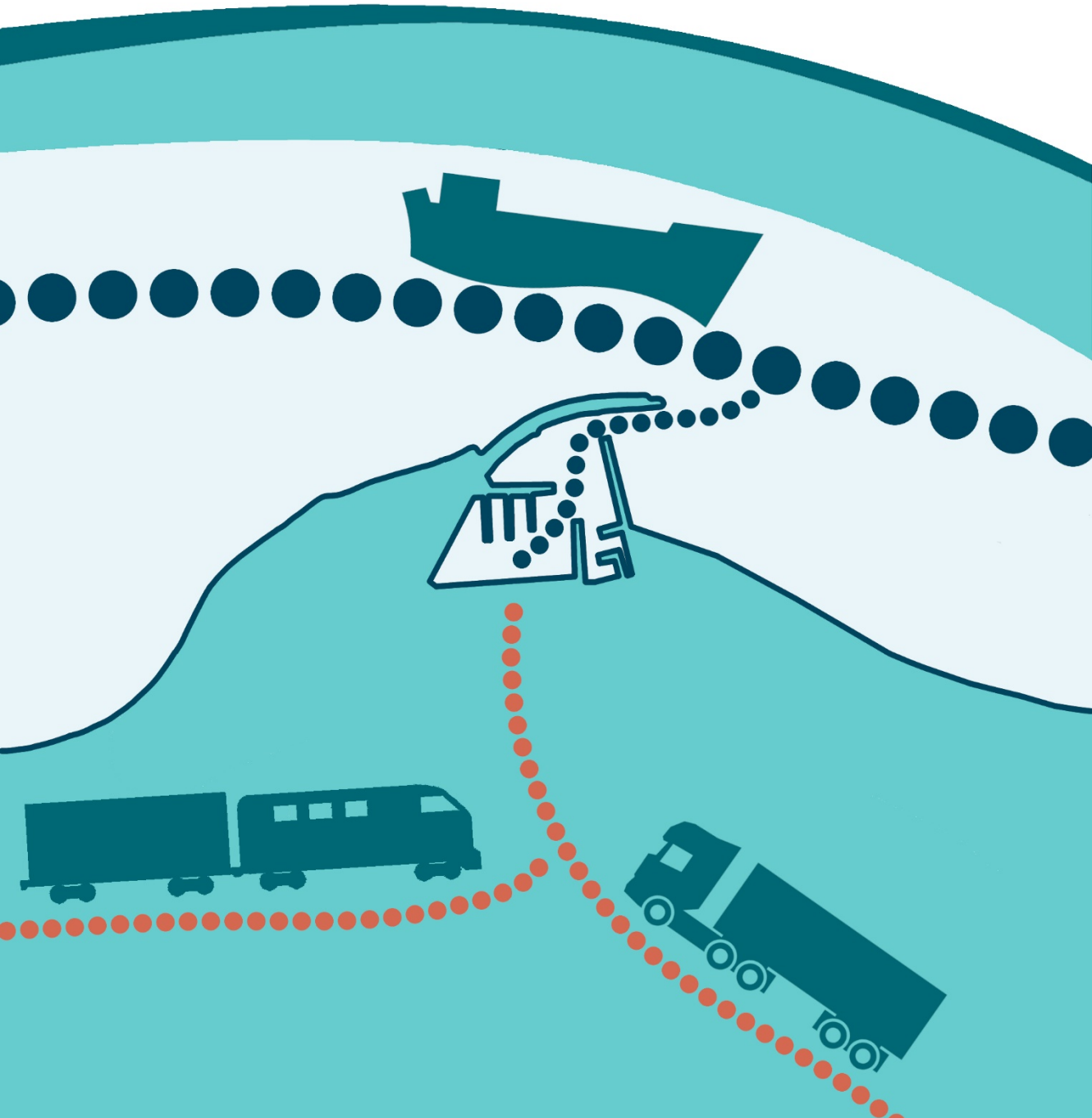
4

Analysis of access infrastructure to the local seaports along IWW E 60



4. ANALYSIS OF ACCESS INFRASTRUCTURE TO THE LOCAL SEAPORTS ALONG IWW E 60

The competitive position of seaports includes several factors, both internal and external. It should be emphasized that while one can speak of a particular group of factors affecting the competitiveness of modern seaports, factors related to the parameters (quality) of access infrastructure to seaports from the sea and land have become particularly important in recent years. Port infrastructure, both land and hydro-technical, is an indispensable element of every seaport's equipment. Access infrastructure to ports from the sea and landside is closely connected with the port infrastructure.

4.1. Transport infrastructure from the land side

The necessary condition for the implementation of any coastal development strategy is the improvement of the transport accessibility through comprehensive modernization of transport infrastructure.

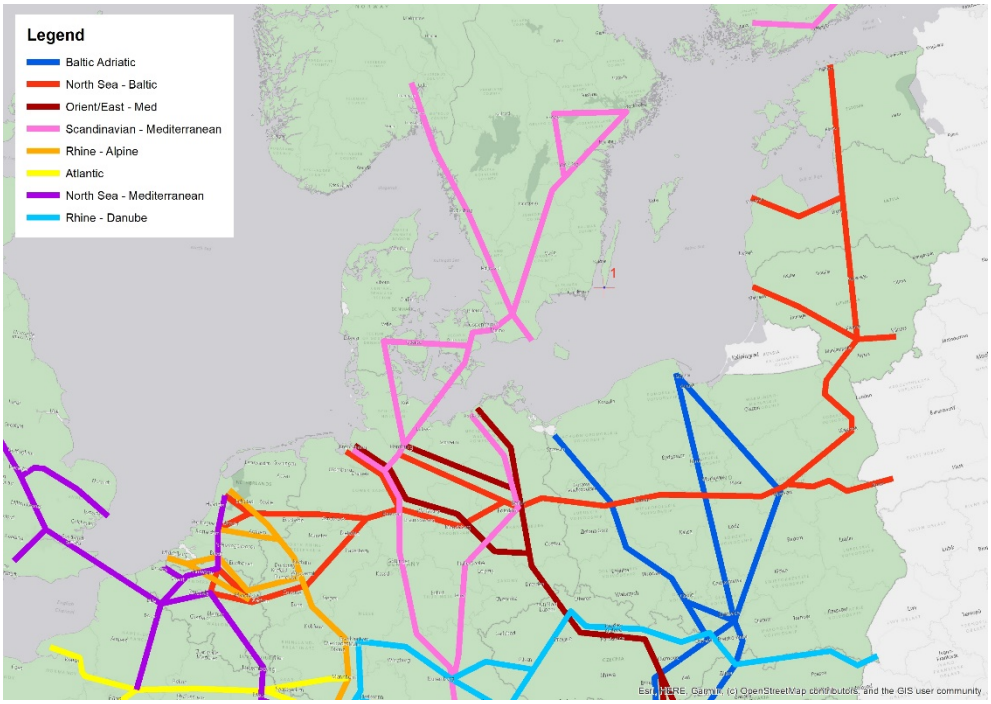


Figure 59. TENT corridors along E 60 waterway

Source: Web portal of European Commission, Mobility and Transport, TENtec Interactive Map Viewer, accessed on 08.04.2020.

TENT corridors that are located in the coastal regions along E 60 waterway are:

- Baltic Adriatic,
- North Sea-Baltic,
- Orient/East – Mediterranean,
- Scandinavian – Mediterranean,
- Rhine – Alpine,
- North Sea – Mediterranean.

The primary transport network in the coastal area is created by east-west and north-south band systems. The density of the road and rail network corresponds to

its settlement structure, while the functional and technical parameters of these networks in Eastern Europe are not adapted to the qualitative and quantitative transport needs.

Entities managing the ports do not finance the infrastructure providing access to the port, which, following the Act, means the fairways leading to the port or marina and the fairways located within the port or marina, together with facilities, devices and institutions related to their operation. These facilities are financed from the state budget within limits provided for in the Budget Act. According to other provisions, entities other than those managing ports have responsibility for the construction, extension, modernization and maintenance of infrastructure facilities ensuring access to the port from the land, such as roads, railways, waterways. It is a state of affairs typical of European ports and can be treated as one of the forms of public aid for ports.[151]

Poland

The road transport subsystem is currently the most crucial subsystem of Pomeranian freight transport because in the transport of goods other than port road transport satisfies as much as 95% of the demand for land transport work (in tkm). In road port cargo service, road transport participates to a much smaller extent – in about 35% (after 1/3 of this service is provided by rail and pipeline transport), but in the years 2000–2012 the share of road transport increased steadily (from about 24% in 2000).[152]

[151] Zieziula, J., & Nowaczyk, P. (2018). Znaczenie turystyki żeglarskiej w rozwoju lokalnej gospodarki na przykładzie gminy Darłowo. Ekonomiczne Problemy Turystyki, 2 (42), 241-249.
[152] Regional Strategic Program in the area of transport Mobilne Pomorze. Board of the Pomeranian Voivodeship, Gdańsk 2013.

While road connections of Northern Poland with the centre of the country are gradually modernized, the low quality of railway lines does not change, which is mostly due to the low population and the related seasonal traffic.[153]

The weakness of economic functions significant for the position of the port, mainly transport as well as industrial and commercial, is mainly due to external conditions, especially the underdevelopment of the transport network limiting the port's availability and the lack of funds for investment. These deficiencies are the main barrier to the possibility of activating ports that also prevent more dynamic development of their surroundings, city, region.

The most important for local ports are road and rail connections, especially in the meridional direction. Therefore, for the active role of ports, it is necessary to improve road and rail connections.

Due to the difficult accessibility of the communication facilities, the local ports have limited capacity to acquire loads. The poor condition of the roads connecting local ports with potential facilities as well as the limited possibilities of using rail transport cause a troublesome extension of transport time. In this situation, loads naturally gravitate to large ports with far more efficient communication links with the environment. TEN corridors against the background of the Polish transport network indicate a shortage of transport infrastructure connecting local ports with facilities and metropolitan areas.[154]

Of particular importance are the roads connecting local ports with the not-too-distant larger cities constituting their direct facilities, e.g. Wejherowo, Lębork, Słupsk, Sławno, Koszalin, Gryfice.

[153] Luks, K. (2017). Port Elbląg na tle polskich portów lokalnych. Problemy Transportu i Logistyki, (1 (37)), 203-210.
[154] Development strategy of the Kołobrzeg seaport. Board of the Kołobrzeg Sea Port, 2010.

Leading in the group of regional ports are those located in Elbląg, Kołobrzeg, Police and Ustka. They should be seen as essential links in the country's transport system and strive to integrate them as soon as possible due to high-quality road and rail infrastructure. It is indicated that these ports should be developed for inclusion in the TEN-T network. These ports have a vast supralocal significance for socio-economic activation. Even though regional ports, in the light of the provisions of the Act of 20 December 1996 on ports and harbours (Journal of Laws of 2017, item 1933, i.e.), are not ports of primary importance for the national economy, they are many of them, in some respects, are not inferior to them, and are even leading in specific categories.[155]

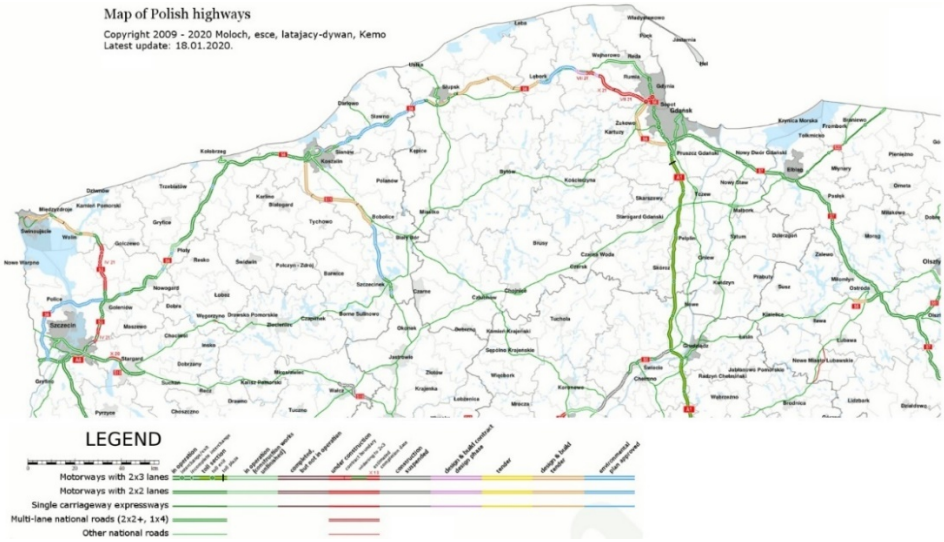


Figure 60. System of national roads, expressways and highways in the northern part of Poland (as of 18.01.2020)

Source: SISKOM & SSC.

[155] Program for the development of Polish seaports until 2020 (with a perspective until 2030), Ministry of Maritime Economy and Inland Navigation, Warsaw, 2018

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The quality and type of coastal transport routes and their course should be adapted to the assumed functional structure of local ports and the economy of coastal municipalities, taking into account their natural values.

Accessibility of local ports from the seaside is to be provided by law by maritime administration, so its scale and duration depend on the state budget. It creates the need to harmonize intentions in ports with these possibilities. It is, therefore, necessary to specify the order of actions, both on the part of municipalities and port cities, and the government. It may not mean, for example, "stiffening" budget expenditure on the development of infrastructure providing access to ports, but the need for cooperation in long-term planning.

Ports of Puck Bay

From the area of the Puck Municipality (ports of Władysławowo, Jastarnia and Hel) there is currently one railway line: No. 213. Line No. 263 was demolished in 2005 (both lines crossed in Swarzewo). An open line beginning in Reda (where it branches off from line 202 Gdańsk Główny – Stargard Szczeciński) ends at the Hel station and measures 62.827 km. It is the only standard gauge railway line built on the spit in Poland – but it has not been electrified yet. Increased train traffic takes place here in the summer season, when also long-distance trains, both express trains TLK11 and express. Freight traffic is of marginal importance due to the lack of industry. Coastal shipping is currently not a significant element of the public transport system. However, it occupies a rather prominent place in servicing sea tourist transport, primarily between the cities of the Tri-City agglomeration and the Hel Peninsula and in the area of the Vistula Lagoon.[156]

There is a provincial road (No. 216) leading to Hel (and thus through Jastarnie) from Reda-Władysławowo-Hel, which in Reda connects to the Gdańsk-Szczecin

[156] Regional Strategic Program in the field of transport Mobilne Pomorze, Board of the Pomorskie Voivodeship, Gdańsk, 2013

national road (No. 6). It is the only road connecting Hel with the rest of the country, and due to the peninsula's touristic attraction, a significant problem during the season is its crowding. Two voivodship roads lead to Władysławowo:

- the coastal road between Sławoszyno − Karwia − Jastrzębia Góra and Władysławowo (No. 215),
- the Reda – Władysławowo – Hel route (No. 216), which in Reda connects to the Gdańsk-Szczecin National Road (No. 6).

A significant communication problem during the Summer season is congestion on the Reda-Hel road, which prevents regular use of road transport.

Railway connections in the Reda-Hel route take place on one non-electrified track. The passing of trains is only possible at stations. The track connects in Reda with the two-track electrified route line Gdańsk-Wejherowo.

Port of Ustka

The provincial road Darłowo-Ustka leads to Ustka and the provincial road Słupsk-Ustka, which is connected to the national road No. 6 on the Gdańsk-Szczecin route.

Transport between Ustka and Słupsk is operated basically via bus and bus connections. Thanks to the service by several transport companies, a high frequency of connections are guaranteed. Ustka also has bus connections with Darłowo.

Railway communication with Słupsk is via a single-track electrified line. The route is threatened with closure. Currently, there are two connections per day. Słupsk lies on a single-electrified Gdańsk-Szczecin route and has a single-track connection with Szczecinek.

Port of Kołobrzeg

The port is located about 150 km from Szczecin and about 45 km from Koszalin. It has road connections: Kołobrzeg – Koszalin – Poznań (national one-way road), Karlino – Kołobrzeg (voivodship road), Drawsko Pomorskie – Kołobrzeg (voivodship road) leading to National Road No. 6 (Gdańsk - Szczecin) and the connection Międzyzdroje – Dziwnów – Trzebiatów – Kołobrzeg (provincial road). Railway connections with Koszalin, Białogard and Gryfice take place via one track.

In recent years, due to numerous road investments, access to the Port of Kołobrzeg from its hinterland has significantly improved. Therefore one of the most important factors limiting transhipments in the port has been eliminated.[157]

Port of Darłowo

In recent years, road infrastructure parameters enabling access to the port of Darłowo have significantly improved. There are also possibilities of further improvement, like, e.g. the extension of voivodship road No. Thirty-seven running from the direction of Karwice and connecting to the national road in the vicinity of Sławno. Increasing the capacity of road infrastructure would undoubtedly translate into an increase in the volume of transhipments.

Darłowo has a connection with Koszalin via the provincial road Koszalin-Darłowo-Ustka, which connects with the national road No. 6 on the Gdańsk-Szczecin route. The seaside part, Darłówko is connected by the Sławno-Darłówko provincial road, which in Sławno connects with the national road No. 6.

Darłowo also has a railway connection with Sławno – a non-electrified monorail line. After the closure of the connections for several years, it has been reopened since 2005 and offers five connections a day. Sławno is located on the electrified Gdynia-Szczecin route.

[157] Nowaczyk, P. (2016). Próba określenia znaczenia portu morskiego w Kołobrzegu dla lokalnego rynku pracy. Studia Ekonomiczne, 286, 107-119.

The port of Darłowo can be served by rail transport. However, significant investments in the railway network leading to port are needed in order to ensure constant cargo turnover. The national rail carrier – PKP Cargo does not consider local seaports' cargo services as necessary, due to small and unstable number of transhipment level. However, the prospect of a significant increase in the port of Darłowo could change the attitude of the railways. Alternatively, the port operator could take responsibility for the railway infrastructure. However, this variant is unlikely due to high investment costs and the risk of total investment failure.[158]

Lithuania

Port of Klaipeda[159]

In line with increasing passenger and cargo flows, the intensity of transport traffic has been continuously growing. While developing the Seaport transport system, considerable attention has been paid to the safe and efficient transportation of cargoes and passengers to multimodal terminals, concentrated in the Southern part of the Seaport. In order to improve the traffic safety and security, to decrease operational costs, travelling costs, pollution and noise Perkelos and Kairiu streets were reconstructed within the period from 2009 till 2014.[160]

The total investment amount was 10.97 mln EUR (37.9 mln LT) excluding VAT, including 7.0 mln EUR (24.18 mln LT) received from EU assistance funds.[161]

On reconstructing the access road by Perkelos street from the entrance to SC The Western Shipyard till JSC Klaipedos Container Terminal and the bridge over Klaipeda channel the vehicle throughput efficiency of this part of the road has

[158] Zieziula, J., & Nowaczyk, P. (2018). Znaczenie turystyki żeglarskiej w rozwoju lokalnej gospodarki na przykładzie gminy Darłowo. Ekonomiczne Problemy Turystyki, 2 (42), 241-249.
[159] The TOP list of implemented investments, www.portofklaipeda.lt/the-top-list-of-implemented-investments, accessed on 08.04.2020.
[160] Ibidem
[161] Ibidem

increased significantly. Due to this, the flow of transported cargoes has increased in line with decreased transportation time, cargo transportation costs and operational costs of transport modes. The overall length of the reconstructed street was 1.62 kilometres.[162]

The number of investments constituted 1.9 mln EUR (6.5 mln LT) excluding VAT, including 1.38 mln EUE (4.76 mln LT) allotted from EU assistant funds (72.8%).

Other two investments were the reconstruction of Kairiu str. from the grade crossing, Taikos avenue with Kairių street up, to Klaipeda Channel (with cabling of 110kV aerial line). Reconstruction of Kairių street vehicle bridge over Klaipeda Channel and reconstruction of Kairiu street (the Western road) from Klaipeda Channel to the railway crossing. The object was financed from EU funds according to instrument No. VP2-5.2-SM-01-V „Development of Cargo and Passenger Service Infrastructure in Klaipeda State Seaport“, approved by the 23 July 2008 Resolution Nr. 788 of the Government of the Republic of Lithuania „ On Approval of Annex of Operational Program for Economic Growth“, of Priority 5 „Development of Trans-European Transport Network“ of Operational Programme for Economic Growth for 2007-2013 approved by the 30 July 2007 Resolution No. K(2007) 3740 of the European Commission. During the project implementation, the following works have been performed:[163]

- 2.57 kilometres of a roadway covering have been widened and reinforced,
- pedestrian – cycle paths have been constructed, sewage networks have been laid, the street lighting has been installed, and bus stop stations have been constructed,
- the bridge has been reconstructed,

[162] The TOP list of implemented investments, www.portofklaipeda.lt/the-top-list-of-implemented-investments, accessed on 08.04.2020
[163] Ibidem

- the railway crossing has been constructed,
- engineering networks have been reconstructed.

The overall length of the reconstructed street was 2.57 km. The vehicle road to Kairiu street has become shorter by approx. 3.5 kilometres with the construction of the new railway crossing across the railway track No.54. The number of investments constituted 9.1 mln Eur (31.3 mln Lt) excluding VAT, including 5.62 mln Eur (19.42 mln Lt) allotted from EU assistant funds (62%).[164]

Denmark

Port of Vordingborg[165]

Vordingborg industrial port is located on the north side of Masnedø, west from the Masnedø Bridge. The port covers an area of in total 133 000 m^2 and is geographically situated centrally in the South of Zealand, Møn and Lolland - Falster. Vordingborg Port is not far away from the international fairways like, for example, the T-route.[166]

There is a good infrastructure at Vordingborg Port and the back area, both onshore and from the seaside. Access for cars and lorries is good by national roads and motorways (E 47). The distance from the motorway (E 47, junction 41) is 9 kilometres. The entire harbour area and road connections to the motorway are approved for long combination vehicles. All traffic to and from the harbour areas is outside the city limits. The work areas are located close to Vordingborg railway station where it is possible to load and unload, to and from freight trains.

Germany

[164] The TOP list of implemented investments. https://studylib.net/doc/6779048/the-top-list-of-implemented-investments
[165] Vordingborg Port The central port in conjunction with the construction of a new Storstrøm Bridge. Vordingborg Port, 2016, vordingborg.dk/media/8096368/vordingborg-havn-2016.pdf, accessed on 80.04.2020
[166] Vordingborg Havn – stsg.dk. https://stsg.dk/vordingborg-havn/

Port of Mukran[167]

Mukran Port has purposefully used well-established transport connections to the hinterland and the proximity to Scandinavia, Russia, Finland and the Baltic states for developing the site as a major hub for international passenger and freight traffic.

In addition to seaside transhipments, the port also commends itself for the landside handling of all kinds of goods and perfect logistics and warehouse services.

As the only port in Western Europe, Mukran Port has in addition to tracks of European standard gauge also tracks and terminals for the Russian broad gauge. It is therefore often called "the westernmost cargo station of the Trans-Siberian Railway".[168]

There are altogether 18 km broad gauge and 60 km standard gauge for use within the port and railway area of which 23 km belong to the company Fährhafen Sassnitz GmbH (ca. 8 km standard gauge and ca. 15 km broad gauge).[169]

Transport links of the Mukran Port:[170]

- Road transport links:
  - A20, A11, A14, A19, A24 motorways connect southern, western and eastern regions,
  - Direct connection from Stralsund to the island of Rügen over the new Rügen suspension bridge.
- Rail transport links:
  - Broad and standard gauge connection direct to the loading ramp,
  - Transhipment from standard gauge to broad gauge and vice versa,

[167] Port of Mukran, www.mukran-port.de/services/rail-port.html, accessed on 08.04.2020.
[168] Rail Port - Mukran Port EN. https://www.mukran-port.de/services/rail-port.html
[169] Ibidem
[170] Transport links - Mukran Port EN. https://www.mukran-port.de/company/site/transport-links.html

- The company-owned rail network in the seaport and rail port area,
- Transregional rail connection via the hubs Seddin and Maschen.

Belgium

Port of Oostende

The port is characterised by and easy access by:

road

- direct connection to the highway (A10/E 40)
- 110 km from Brussels
- no traffic jams

railway

- railway to terminal

airplane/helicopter

- 8 km from Oostende – Bruges International Airport

inland waterways

- connection with waterway Oostende – Brugge Canal (up to 1 350 tonnes)

4.2. Transport infrastructure from the seaside

Poland

The fundamental elements and devices included in the access infrastructure from the sea are approach trays, permanent breakwaters, and floating navigation signs. The relevant maritime offices are responsible for maintaining appropriate access infrastructure parameters.

Access infrastructure from the seaside of the ports of the Bay of Puck

Port	Approach tray			Breakwaters [m.]	Permanent navigational signs [pcs.]	Floating navigational signs [szt.]
	length	width	depth			
Władysławowo	700	60	7	829.8	5	2
Hel	370	60	7	795.0	2	1
Jastarnia	980	50	5	172.0	6	7

Source: Strategy for the Development of the Puck Region for 2016-2025, Association North Kashubian Local Fisheries Group, April 2016.

Port of Hel

The entrance to the port is located on the side of the Puck Bay and protected by two outer breakwaters – West with a length of 615 m and South with a length of 180 m. The port consists of three basins (Wewnętrzny, Jachtowy and Zewnętrzny) and can take units with a draft of up to 5.5 m (depths in the port are from 4 to 8 m).

Port of Władysławowo

The harbour is covered by two breakwaters: the eastern one, 340 m long and the northern one, 620 m long. They form two basins: the entrance one and the much larger one. The primary and internal entrances have a width of about 60 m. The permissible draft of the incoming units must not exceed 4 m. The depth of 5 m on the approach tray is artificially maintained. Changes after each storm and the depths in the port vary from 4 to 6 m. Port requires continuous dredging work.

Port of Darłowo

The entrance to the port is protected by two over 400-metre breakwaters (eastern – length 415 m and head 21.5 m, western – length 464.6 m and head 20 m

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and Western Spur 60.1 m). In the heads, the entrance is 38 metres wide and 7 metres deep, in the avant-garde, the depth is about 6 m, while the port channel is 4-5 m deep and 23 m wide. Entering the port is difficult in bad weather. Units up to 75 metres long and with a maximum draft of 4 metres may call at the port. The possibility of calling larger vessels exists with the permission of the Harbor Master in Darłowo.

Port of Kołobrzeg

The port can service ships up to 85 m in length and draft up to 4.7 m. The reconstruction implemented for several years will ultimately allow the entry of the port to vessels of 95 m in length. Eastern Breakwater, acting as a city pier after prolongation is to maintain this function.

The entrance to the port is covered by two breakwaters: East and West. It is dangerous, especially in strong western winds. For this reason, it was rebuilt in 2000, which aims to increase security and allow larger vessels to call the port. Existing breakwaters have been partially demolished, elongated and routed differently.

Lithuania

Port of Klaipeda

In order to increase the safety of sailing and manoeuvrability of gross-tonnage vessels in the Port in line with competitiveness and cargo handling capacity of the Seaport concerning other seaports Klaipeda State Seaport navigation channel capital dredging up to 14.5 metres and widening up to 150 metres works were performed between 2012 and 2013.[171]

[171] The TOP list of implemented investments. https://studylib.net/doc/6779048/the-top-list-of-implemented-investments

On execution of these works, the depth of the Seaport increased up to 14.5 metres. The width increased up to 150 metres within the territory of the Malku Bay. Vessel turning circles were arranged: Pk 47+80 – Pk 53+30 and Pk 73 – Pk 76+50 and the entrance to the Malkų Bay and the waters‘ territories alongside the quays No. 66 and No. 67, No. 101-104, and No. 79-80 were deepened supplementary. All works performed resulted in the favourable conditions to render services to vessels with draught up to 13,2 metres within the waters‘ territory of the quay No. 105 of the Malku Bay. It positively affected possibilities to render services to Panamax-type vessels (310 metres in length and 40 metres in the beam) and entering and mooring of the Floating Storage and Regasification Unit rendering service to LNG terminal (the capacity of a vessel is 170 000 $m^3$of liquefied gas, the length is 294 metres, the width is 46 metres, and the draught is 11.6 (12.6) metres). Altogether these performed works increased the safety of sailing and manoeuvrability of gross-tonnage vessels in line with competitiveness and cargo handling capacity of the Seaport.[172]

Capital dredging works of inner navigation channel from PK(-5,5) to PK (21) (the I stage) were completed in 2015. The depth up to 15 metres was reached in the inner navigation channel. This depth allowed to enhance the throughput and competitiveness of Klaipeda State Seaport in line with navigational safety of large size vessels.

The object was financed from EU funds according to the Operational Programme for Economic Growth.

Capital dredging works of the outer navigation channel from PK (-17) to PK(-5,5) (the II stage of capital dredging works) were completed on the 29th of April 2016. Due to the implementation of this Project, navigational safety parameters in the outer navigation channel were improved. The increased depth of the channel

[172] The TOP list of implemented investments. https://studylib.net/doc/6779048/the-top-list-of-implemented-investments

will allow the deeper draught vessels to maintain the higher speed under complicated weather conditions and to reach the Port entrance and Seaport waters' territory safely.[173]

Denmark

As a rule, all Danish ports must accept all vessels insofar as the port has adequate space to accommodate such vessels and assuming it is acceptable from a security perspective. The exception to this general rule is ports that, following the granted permissions of the port, are only allowed to be used for limited purposes. For example, the ferry ports of Odden and Ebeltoft are only allowed to be used by Mols-Linien for ferry services on the route between Sjaellands Odde and the Ebeltoft peninsula. Another example is ports established to service power plants and refineries.[174]

Belgium

Port of Oostende

The port is situated in Europe's busiest maritime area 51°14' N - 2° 56' E, is a versatile short seaport and accommodates all types of coastal maritime traffic:

- offshore installation & service vessels,
- cruises,
- RORO,
- Bulk,
- project cargo.

Table 33.

[173] The TOP list of implemented investments. https://studylib.net/doc/6779048/the-top-list-of-implemented-investments
[174] Lexology, www.lexology.com/gtdt/tool/workareas/report/ports-and-terminals/chapter/denmark, accessed on 08.04.2020.

Berths in Oostende Port

BERTH	RORO				PROJECT CARGO AND BULK				
	105	501 & 502	404	201	202-205	301-324	503	607-609	700-795
depth	7 m	8 m	8 m	8 m	7 m	6 m	7 m	6 m	5.1 m
length	170 m	180 m	180 m	160 m					
width	6.5 m	7.05 m	9 m	7.05 m					
loading capacity	270 t	180 t	180 t	140 t			20 t/m^2		
linkspan	double deck	2	1	double deck					
pontoons	1	2	1	1					
side-loader	1								
max. length of vessel	170 m	180 m	200 m	190 m	180 m	120 m	100 m	180 m	110 m

Source: Folder Port of Oostende 2019-05, www.portofoostende.be/about, accessed on 08.04.2020.

Maximum draft at Oostende Port is 8 m. It should be noted that there is a tidal difference of 5 metres between high tide and low tide, contrary to the Baltic Sea. By consequence, at high tide, the port can take in ships with a draft of 12 metres.

Approach from the open sea to port by leading lights:[175]

- alignment 143° indicated by leading lights,
- access for vessels up to 200 m length, entrance = 130 m wide at -8.4 m LAT,
- turning basin with a diameter of 300 m.

[175] Where maritime industry meets research & development.
https://www.portofoostende.be/sites/default/files/about/folderPortofOostende_2019-05-20_web.pdf

Figure 61. Access to Port of Oostende from the seaside

Source: www.portofoostende.be/about, accessed on 08.04.2020.

Transhipment facilities:

- every project/terminal operator brings its cranes – the port does not invest in buying and operating cranes,
- heavyweight terminal: project cargo up till 20 tonnes per m² can be handled,
- heavyweight pontoon: any project cargo up till 650 tonnes can be handled (normal ponton up to 250 tonnes).

4.2.1. Navigation conditions and their role in the development of local ports

While analysing the navigation conditions of the entire cluster of the South Baltic local ports (Table 34, Figure 62), it can be noticed, that particularly the

Polish local ports suffer from the least permissible ship draft: except Police with the maximum permissible draft of 9.2 metres, the other local Polish ports have an average maximum permissible draft of 4.9 metres. As mentioned above, Police constitutes a particular case, but this is due to a specific profile of the Police seaport that serves as a large outer port being a mono-profile nitrogen fertiliser export terminal.

Even more so, only the port of Hel, which also constitutes a particular case in the shadow of the Gdańsk / Gdynia port megapolis, has the maximum permissible draft of 6 metres while the maximum permissible draft of other local Polish ports ranges between 3.0 m in Dziwnów and 4.3 m Ustka. The original fishing port with the possibility of servicing small commercial vessels in Hel has significantly reduced its fishing activity in recent years and transformed into a seasonal passenger port. It is probably a good pattern for the reprofiling perspectives of other local Polish ports, as a new pier and a berth for passenger ships (water trams) were built recently in Hel to strengthen its recreational competitiveness.

Table 34.

Navigation parameters of the target ports along the IWW E 60

Port	Country	Maximum permissible draft, m	Maximum permissible ship length, m	Port type
Uetersen	Germany	2.2	60	UP
Büsum	Germany	3.0	152	CT
Itzehoe	Germany	3.0	152	UP
Kappeln	Germany	3.0	152	UP
Dziwnów	Poland	3.0	60	CT
Heiligenhafen	Germany	4.0	100	UP
Oldenburg	Germany	4.0	86	UP
Darłowo	Poland	4.0	75	CT
Kołobrzeg	Poland	4.0	100	UP
Władysławowo	Poland	4.0	70	CT
Nykøbing M	Denmark	4.3	125	UP
Thisted	Denmark	4.3	125	CT
Ustka	Poland	4.3	80	CT

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Port	Country	Maximum permissible draft, m	Maximum permissible ship length, m	Port type
Nexø	Denmark	4.5	78	UP
Rødbyhavn	Denmark	4.5	80	CT
Elsfleth	Germany	4.6	120	UP
Husum	Germany	4.6	152	UP
Hobro	Denmark	5.0	130	CT
Stubbekøbing	Denmark	5.0	120	UP
Papenburg	Germany	5.5	145	UP
Simrishamn	Sweden	5.5	110	UP
Næstved	Denmark	5.6	119	UP
Nykøbing F	Denmark	5.8	129	CT
Assens	Denmark	6.0	130	CT
Hvide Sande	Denmark	6.0	140	CT
Orehoved	Denmark	6.0	150	OP
Skagen	Denmark	6.0	130	CT
Skive	Denmark	6.0	130	UP
Struer	Denmark	6.0	130	CT
Årøsund	Denmark	6.0	120	CT
Hel	Poland	6.0	80	CT
Eckernförde	Germany	6.1	152	UP
Flensburg	Germany	6.1	152	UP
Neustadt	Germany	6.1	152	UP
Søby	Denmark	6.2	120	CT
Horsens	Denmark	6.5	160	UP
Sölvesborg	Sweden	6.5	160	OP
Stralsund	Germany	6.6	200	CP
Fåborg	Denmark	7.0	190	UP
Falkenberg	Sweden	7.0	145	CT
Kalmar	Sweden	7.0	185	CP
Ostend	Belgium	7.0	200	CP
Hanstholm	Denmark	7.5	135	OP
Korsør	Denmark	7.5	200	CT
Cuxhaven	Germany	7.6	200	CP
Glückstadt	Germany	7.6	200	CT
Åhus	Sweden	7.6	145	OP
Hundested	Denmark	7.9	200	CT
Nakskov	Denmark	8.0	183	CT
Police	Poland	9.2	160	OP
Vordingborg	Denmark	9.4	200	CP

Port	Country	Maximum permissible draft, m	Maximum permissible ship length, m	Port type
Sønderborg	Denmark	9.5	200	UP
Rendsburg	Germany	9.5	235	UP
Landskrona	Sweden	10.1	190	CP
Sassnitz	Germany	10.5	300	OP
Lysekil	Sweden	11.0	200	CT
Uddevalla	Sweden	11.0	200	CP
Varberg	Sweden	11.0	240	CP
Brake	Germany	12.1	220	CT
Nordenham	Germany	13.1	270	OP
Stade	Germany	14.5	260	OP

Source: own elaboration based on ports' webpages.

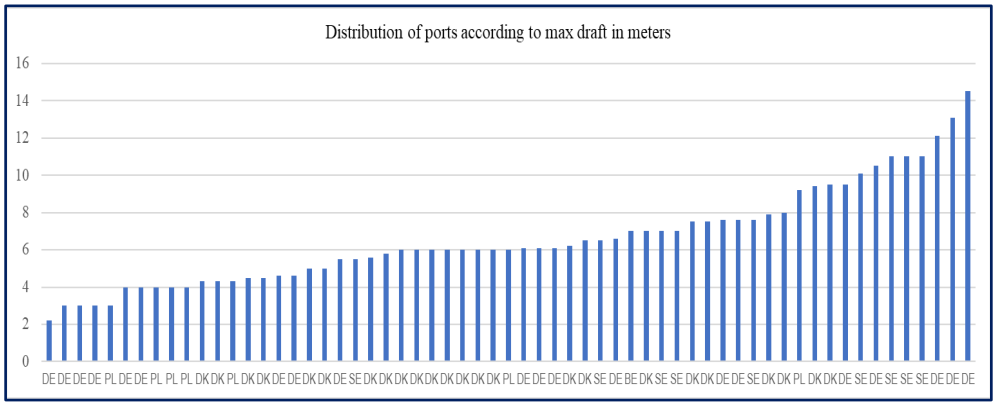

Figure 62. Distribution of South Baltic local ports according to the maximum draft (m)

Source: own elaboration based on ports' webpages.

Meanwhile, the local ports of southern and western Sweden are on the opposite side of this graph. Simrishamn is the shallowest local Swedish port with the maximum permissible draft of 5.5 m. However, this is not an obstacle for the sustainable functioning and competitiveness of Simrishamn because, as mentioned above, it is quite competitive as one of the leading port for commercial fisheries in Sweden. Indeed, Simrishamn is the third-largest harbour in Sweden for the landing

of commercial fish. Despite its small size, the fishery harbour of Simrishamn has all necessary facilities: ice production unit, electricity and potable water access in all quays, vacuum suction for emptying septic tanks and a slip.

All other local Swedish ports have an average maximum permissible draft of 8.9 metres which makes them very competitive not only as local but also as regional Blue Growth centres and international shipping hubs. For instance, the port of Landskrona in Scania enjoys a 10.1 m maximum permissible draft, and the port of Lysekil has a 11.0 m maximum permissible draft. However, the case of Lysekil is a rather special one since, as mentioned, there is also a large petrochemical product import terminal catering to the needs of Preemraff Lysekil, the largest oil refinery in Sweden in that area with the Uddevalla bulk cargo port in the vicinity.

Naturally, since the local German and Danish ports are plenty, their maximum permissible draft is spread all over the spectrum from as shallow as the 2.2 m one in Uetersen, which is the shallowest local port in Germany suffering from enduring siltation, to other local German ports. Stade, for instance, has the largest maximum permissible draft among the local ports in the region of 14.5 m. Similarly, the local Danish ports also vary in terms of maximum permissible draft from 4.3 m in the case of the local ports on the Northern Jutland coast of the North Sea (Nykøbing in Mors and Thisted) up to 9.5 m in the case of Sønderborg and Vordingborg.

The median maximum permissible depth of the entire cluster of the 61 South Baltic local ports is 6 metres and, indeed, this is the most popular maximum permissible draft of the local ports, especially in Denmark. However, as mentioned before, in the case of Poland, only the ports of Hel and Police can enjoy this has this maximum permissible draft. Meanwhile, in Denmark, eight of 24 ports have the maximum permissible draft exactly 6 metres which makes this again an

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indicator of an optimal depth for a seaport which is local in its functions, be it a coastal town or an urban port type of a port in an urban area.

Skagen, which is Denmark's northernmost local port located on the Skaw Spit in North Jutland, presents a typical example. The port of Skagen shapes the overall economic profile of the area. It is a coastal town rather than an urban port or even less the city port or a hub. However, with its 6.0 m maximum permissible draft, the port of Skagen, nevertheless, enjoys quite a healthy competitiveness. Like Simrishamn in Sweden, Skagen is Denmark's largest fishing port and Europe's largest pelagic fisheries centre. However, Skagen takes efforts to make the port not only centred on fishing and fish processing but also on maritime service, freight and bunkering as well as on cruise and experience economics.

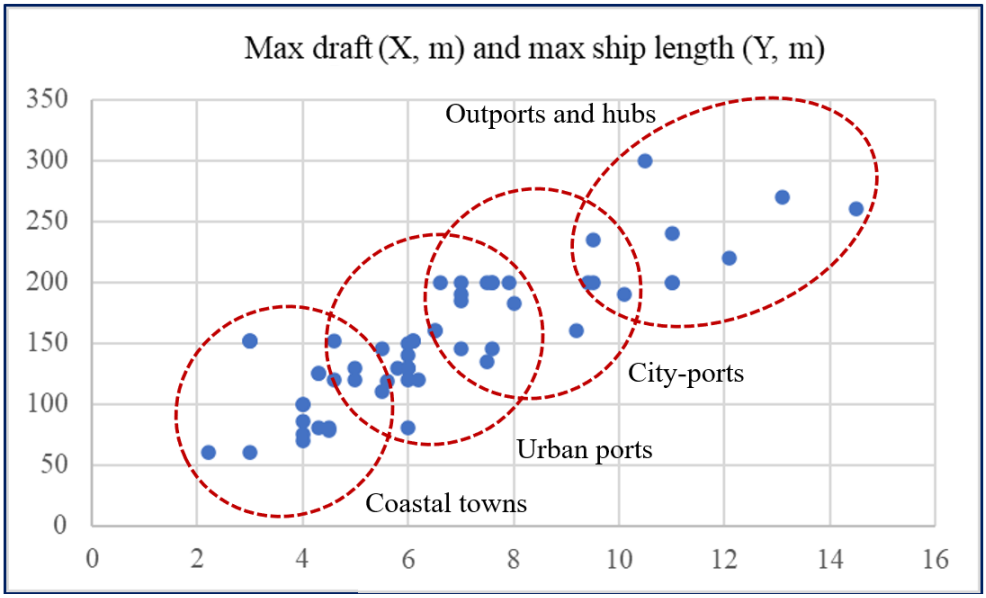

Figure 63. Ratio between the maximum permissible draft and the maximum permissible ship length of the local ports in the South Baltic area

Source: own elaboration based on ports' webpages.

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Considering the ratio between the maximum permissible draft and the maximum permissible ship length of the local ports in the South Baltic Area (Figure 63), it can be, naturally, expected and observed, that the maximum permissible draft and the maximum permissible depth are closely correlated. More loosely, but yet we still can find a correlation between the maximum permissible draft and the type of the interrelations between the port and its urban area. For instance, the ports in coastal towns tend to have somewhat lesser maximum draft depth and can accept shorter ships while outports and hubs, naturally, have the most profound maximum permissible draft depth and accept largest ships, Sassnitz (Germany), Nordenham (Germany) and Varberg (Sweden) being the best examples of this kind of ports.

On the other hand, both urban ports and city ports quite confuse the causal relationship between both classifications, and we cannot say very firmly or can we judge about the port and the town type from the maximum permissible draft and the maximum permissible ship length. Many different options are depending on the port capacity, its economic specialisation and development plans. It is because, as mentioned many times before, any substantial improvement of the navigation conditions requires enormous investments and might imply a substantial financial risk for the investor.

This peculiarity is especially seen in Denmark, or in two western German federal states (Lower Saxony and Schleswig – Holstein) where huge port metropolises pose a challenge for local ports to find a suitable niche for investments to improve the competitiveness of local ports by improving navigation conditions. For small local port municipalities, it can be a precarious business indeed. On the other hand, as given below in the case study of Vordingborg, without a substantial investment into the improvement of navigation conditions, one cannot expect a truly sustainable long-term development of local ports. Without carefully planned and implemented investments into the improvement of

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navigation conditions, the port would always lag behind its more competitive and larger neighbours.

Basically, like in other market segments, where the economy of size tends to prevail, there is a tendency towards larger ship units for the effectiveness of shipping. The ship's dimensions have multiplied both in length, width, draft and in terms of load capacity. This means that the cargo ship market that is eligible for regional supply will become smaller due to the draft restrictions for ports with a shallow maximum water depth, since small, suitable ship units will be less available. Although the ports can be supplied with larger ship units by only partially loading in the port, this in turn reduces the cost-effectiveness of transhipment.

In the case of general cargo and bulk carriers for regional supply, the draft generally represents the decisive restriction of the usable ship units for the port. The draft of the reference fleet of the 'General Cargo Ship' type, which is suitable for the ports and regional supply, was an average of 5.60 metres, significantly more than is capacitively possible in most ports. Apart from the aforementioned cases of the local Polish ports, the problem of too small maximum permissible draft also exists in the federal state of Schleswig – Holstein (Table 34, Figure 62). For instance, the maximum draft in the port of Husum is 4.2 m, in Hörnum 3.2 m and in Dagebüll, just 2.0 m. These ports are currently being approached by smaller ships.

Due to the nautical conditions, the Baltic seaports of Schleswig – Holstein are equipped with lower drafts, which limit the possible handling of large containers and larger feeder ships. The same applies to the seaports of Mecklenburg – Western Pomerania. The local Baltic port system in the Federal Republic of Germany is also limited with regard to the berth width. Thus, as it can be seen, except of Sweden and, to a lesser extent, Denmark, the remaining South Baltic

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local ports suffer from poor navigation conditions limiting their development potential. In spite of regional economic development specialisation, the rule is ubiquitous: if the ports do not invest in the expansion of land area, ensure the right depth of water or the right facilities, port companies will be disadvantaged in international competition.

Therefore, the optimal maximum permissible depth of a local port, which is aiming to be competitive not only on the local but also on regional shipping market, must be between 7 m and 10 m, judging from the good examples of Oostende in Flanders (Belgium) and Vordingborg in Zealand (Denmark). Remarkably, in both cases, the maximum permissible ship length is the same (200 m). These two seaports can serve as benchmarks for other local ports in the South Baltic Area willing to become truly sustainable and competitive city-ports. The example of Vordingborg is very relevant for the local Polish ports, which struggle to convince the National Government to invest in the substantial improvement of the navigation conditions there.

4.2.2. Case study: Port of Vordingborg (Denmark)

Port of Vordingborg is an examples of suitable selection of development directions and carrying out proper investments allowing to increase the cargo handling capacity. Previously, Vordingborg was a typical coastal town with several marinas for leisure boats and a small commercial harbour. A large-scale seaport expansion started in 2015. The use of innovative solutions in line with the circular economy principle has also allowed for a significant reduction in the cost of those investments. Therefore, effective planning and rapid port development have become the subject of in-depth analysis for the needs of this study.

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Vordingborg is an urban area in southern Zealand and the central town of Vordingborg Municipality, which belongs to the Region of Zealand. The town is located at the Masnedsund sound and is connected via a bridge to Masnedø island and further over the Storstrøm bridge to Falster island. Vordingborg has 17 973 inhabitants (2019) including the satellite settlements. It is a privileged ferry-town with a rich history – the ruins of the 14th c. Medieval royal castle, which was the birthplace and residence of many Danish kings and Queen Margaret I, are the town's foremost attraction. It's the only fully preserved part, the Goose Tower, is the town's landmark. The Gothic church of Our Lady dates from 1388.

Vordingborg is conveniently and equidistantly located between Copenhagen and Fehmarn island in Germany with ca. 100 km from each. It is currently linked to the island of Falster by the Farø Bridges (two highway bridges) and the Storstrøm Bridge (a highway and a railway bridge connecting Copenhagen with Hamburg). The advantage of the port of Vordingborg is that ships do not have to pass bridges. It is also close to the Great Belt and the Baltic Sea. The geographical position of Vordingborg as a multi-modal transport hub will become even more essential after the completion of a new double-track fast-speed railway bridge over Storstrøm and the Fehmarn Belt Fixed Link.

Vordingborg Port is not far away from the international fairways, for example, the T-route, which is a maritime transit route in Denmark. T-route runs through Kattegat and the Great Belt. The route has a minimum water depth of 17 m and must ensure the sailing of large ships through Danish waters. The route is well-marked and the vessels can use a Danish pilot and free icebreaker assistance. Access for cars and lorries to Vordingborg Port is provided by national roads and motorways (E47). The entire port area and road connections to the motorway is suitable for long trucks. All traffic to and from the port areas is outside the city limits.

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Despite its favourable geographical situation, Vordingborg was a typical coastal town with several marinas for leisure boats and a small commercial harbour with the maximum permissible draft of 6.0 m to 7.0 m serving mainly for the import of mineral fertilizers and the export of agricultural commodities and products from the adjacent region. Vordingborg Shipping A/S established in 1948 has its head office located directly at the Port of Vordingborg. The modest economic role of the Port of Vordingborg in the early 2000s is best illustrated by the size of ships visiting the port from 2001 to 2006 (Table 35).

Table 35.

Call of ships to the port of Vordingborg in 2001-2006

	2001	2002	2003	2004	2005	2006
250–499 BT	91	39	42	91	48	63
500–1499 BT	45	46	65	47	27	25
1500–4999 BT	42	36	33	32	31	42
Total	**2179**	**2123**	**2143**	**2174**	**2111**	**2136**

Source: Statistics Denmark, www.statbank.dk.

In 2015, the Council of Vordingborg Municipality voted in favour of a large-scale seaport expansion in Vordingborg. The highest costs (ca. 40 million €) were related to the dredging of the entry fairway to the port up to 10.4 m and ensuring the maximum permissible draft of 9.4 m at the quays of the port. The expansion of the land area didn't cost much since slag, and fly-ash from the nearby decommissioned coal-fired power plant and recycled products from other construction projects were used as the primary material for filling-in (Figure 64).

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Figure 64. Initial expansion stages of Vordingborg Port using recycled materials

Source: Film & Mediekompagniet, www.mediekompagniet.dk.

Such a recovery project means that these residual products are recovered and recycled for, among other things, filling a new quay area instead of taking up space and posing a financial burden to the companies producing the waste. Thus, it is a win-win solution enabling the saving economy operation for 10%, due to the focus on recycling and 20% less CO_2 emissions due to a more environmentally friendly conversion. The land is reclaimed and subsequently filled up with recycled products from other construction projects around the country.

Despite this optimal, resource-saving seaport expansion approach following the principles of the circular economy, the kick-start project phase had a significant impact on the municipality's finances. However, the Municipal Council have voted favourably for the allocation of 40 million € to the seaport expansion firmly believing in the long-term positive development of the port of Vordingborg. The expansion was accomplished in four stages and a in a short period of time. It

includes a vast expansion of the land area and the berths and the deepening of the fairway to 10.4 metres.

With the transformation, the port of Vordingborg is becoming one of the largest commercial seaports in Zealand. The expansion was significant for both the port, the town, and the Vordingborg Municipality. The resulting social effect of the project was estimated to reach 234 full-time equivalents with private investments providing up to 909 local and regional jobs. The expansion of the port and the deepening of the fairway was to give the port of Vordingborg new development opportunities, attract substantial private investments from larger companies and start the development of a maritime cluster and a logistics centre on Masnedø island.

A critically necessary precondition was to secure that from the very start, private companies were willing to invest and use the expanded port area for their facilities. The key argument for the favourable decision by the Municipal Council of Vordingborg was that the leading Norwegian fertilizer production and trading company Yara and Copenhagen Merchants Group have decided to establish their facilities in Vordingborg and invest ca. 67 million € there. The attractive development plans of the port have resulted in DLG (Danske landbrugsselsgab) – a Danish agricultural company owned by farmers entering into a joint venture with Copenhagen Merchants Group under the name Masnedø Bulk Terminal (MBT) with an ambition to establish Denmark's biggest grain silo and export terminal in the port of Vordingborg.

This first phase of the port expansion was completed in the spring of 2017. Yara Danmark A/S, embarked on the first phase of the development already, which added another 102 metres of the quay and 80 000 square metres of the harbour area. This first expansion has proved to be a significant asset for the port, which has resulted in a significant increase in both freight revenue and crane revenue. At

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the same time, it has allowed the port to run several ships at a time, which has meant better service for the port's customers. The realization of the first stage has created the basis for a further development potential with the anticipation to complete the entire four-stage port expansion project till 2020.

In 2017, the extension of the Vordingborg port in two further stages was approved by the Municipal Council. The dredging work started in early 2018. Already in mid-2019, both stages have been delivered. The dredging was completed by April 2019. As new areas are continually handed over to the port's customers, area leases have already been generated in 2018 for the newly established areas. The area rent has become a significant part of the port's revenue base. Leases with customers are typically long-term. On Stage 2, for example, a lease agreement of 50 years has entered into force. By 2019, the area rent has increased further (Figure 65).

Figure 65. Vordingborg Port after the Stage 3 expansion

Source: Vordingborg Port.

Inspired by the successful and fast completing of the first three expansion phases, the Municipal Council has further decided to support the wish of the Port Board for another Stage of port expansion. Therefore, the port expansion shall be completed after the completion of the Stage 4 expansion project. This latest stage caused the selection of Vordingborg as the site for the new double-track fast-speed railway bridge over the Storstrøm sound. Therefore, Stage 4 is an extension of the Vordingborg port area allocating it for the construction site of the new railway bridge on the southwest side of Masnedø towards Falster. The bridge is to be completed by 2023, and afterwards, another 200 000 m^2 shall be given away to the Port of Vordingborg for commercial use.

Stage 2 was an extension of the port to the northwest, which added another 40 000 m^2 of the area and ca. 400 m of the quay. In the next phase, the quay area was expanded by another 600 m of the quay length. Thus, in a couple of years, the quay area was expanded considerably, and at the same time quay areas have been expanded to a total length of ca. 1 030 m. This expansion provided higher capacity and flexibility to dispose of the rising shipping traffic in the port quickly. After completing Stage 3, Vordingborg Port has ca. 210 000 m^2 of land area for lease (Figure 66). It resulted in more than doubling the existing port area between 2015 and 2018.

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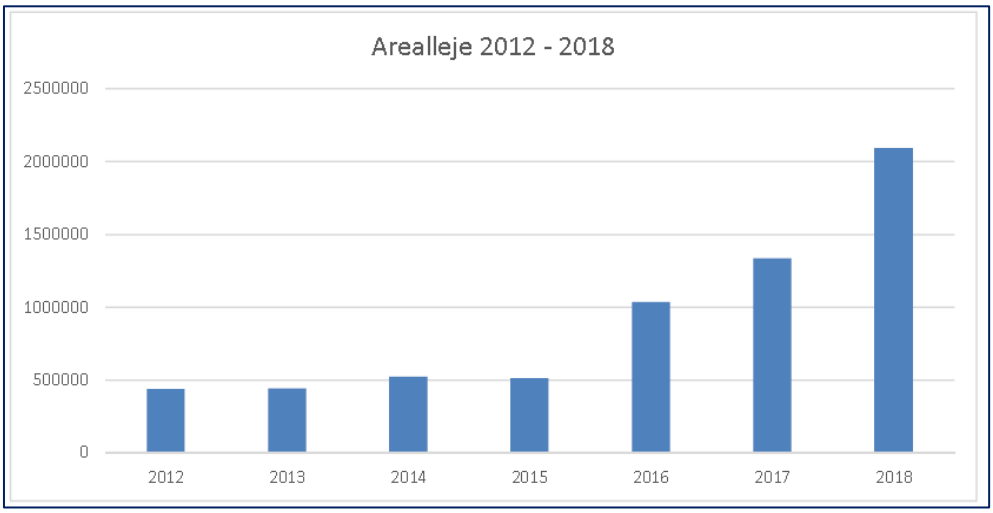

Figure 66. Land area for lease in the port of Vordingborg

Source: Vordingborg Port.

As a result of the port expansion, the fairwater was deepened to 10.4 m with its width expanded to 70 m, and the maximum permissible draft increased to 9.40 m against the former 7.40 m. It now enables massive cargo vessels to call the port. Increasing the depth of water in the fairwater to 10.40 m allows vessels of up to 200 m in length to enter the port. In comparison, the previous maximum permissible draft of 7.40 m has put a restriction on a ship length of up to ca. 120 m. It caused a more than a threefold increase in cargo handled in the port of Vordingborg between 2008 and 2018 (Figure 67).

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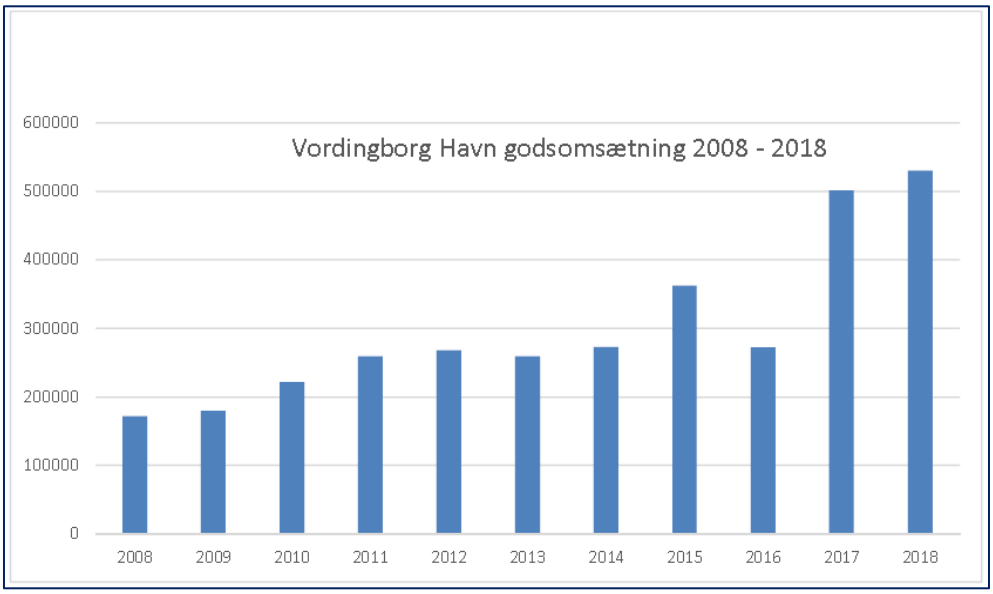

Figure 67. Cargo turnover in the port of Vordingborg

Source: Vordingborg Port.

After Vordingborg Port has been working intensively on a large-scale expansion for more than four years, the work now bears fruit. On Friday, December 13, 2019, at 11 am, the first large ship Reunion Bay has entered the port of Vordingborg. It was a 177 m long and 28 m wide bulk carrier. The ship is of a so-called handy-size, and it is the largest ship to date that has called into the port of Vordingborg. The arrival of Reunion Bay has brought the port into a higher league of the Danish and Baltic maritime economy (Figure 68, Figure 69).

Figure 68. Reunion Bay, the largest ship at Vordingborg Port is towed to the port

Source: TV2 Øst, www.tv2east.dk.

Figure 69. Reunion Bay, the largest ship at Vordingborg Port is moored in the port

Source: TV2 Øst, www.tv2east.dk.

Reunion Bay was loaded with 29 000 tonnes of grain by the Masnedø Bulk Terminal A/S in collaboration with Vordingborg Shipping A/S, the leading stevedoring company in the port of Vordingborg. It was the first sign that the expansion of the port has contributed to its progress to become one of the largest grain exporting ports in Northern Europe catering to the needs not only of southern Zealand but also the more extensive area comprising the entire Region of Zealand, including the islands of Zealand, Lolland, Falster and Møn.

The expansion and favourable location of the port mean that ever more long-term leases become the fact. The entire port area has been leased out, and there is already a demand for the land in the remaining development areas facilitated by a robust infrastructure and technical equipment (Table 36.). For the port's customers, the increased maximum permissible draft is particularly attractive, opening up new opportunities. Several companies have already expressed interest in leasing the future port areas. The main business in the port is grain export, but there is continuing growth in the shipping of raw materials for feed production, as well as construction materials for the Storstrøm Bridge and the extension of the railway line between Ringsted and Rødby.

Table 36.

Factsheet of Vordingborg Port

Port area	220 000 m^2
Quay length	Ca. 2 000 m
Depth	10.4 metres
Port approach	70 m
Cargo volumes	1 million t annually (bulk products, mainly cereals, feed, fertilizers, gravel, crushed stone, dredged materials and forestry products)

Other facilities	3 weigh bridges up to 60 tonnes, 2 mobile harbour cranes (Liebherr 944 and Sennebogen 870), conveyor belts, wheel loader, sweeper, tractor, 2 tug-boats, free Wi-Fi, flexible manpower

Source: Vordingborg Port.

The companies interested in using Vordingborg Port include both traditional shipping companies, contractors, transporters and ground handling firms. Yara Danmark A / S is expanding its use of the port for storage and distribution of mineral fertilizers for agriculture in Zealand and Lolland – Falster. Yara expects to distribute ca. 120 000 tonnes of fertilizer on an annual basis via Vordingborg Port. The same applies to the increased activity of the port's current large customer DC Raw Materials – which is a sub-division of a Belgian group owning Masnedø Stenindustri. The company has increased its storage area to approximately 16 000 m^2. The company supplies sand, stone and gravel in a wide variety of grades and has a high-quality sorting machine on Masnedø island.

Currently, all port development efforts are focusing on Stage 4, which is part of the original master plan and is, therefore, a natural extension of the port into the southwest (Figure 70). Stage 4 is a land reclamation project in a foreshore area of ca. 200 000 m^2. Also, a quay facility of ca. 150 m is constructed and used exclusively by the bridge-building companies. However, as earlier mentioned, the entire land area and the quay developed in Stage 4 shall be given away to Vordingborg Port, as expected, in 2023. After some delays, the construction of the Storstrøm Bridge has started in early 2019.

Figure 70. The southwest area of Vordingborg Port allocated for the Stage 4 expansion

Source: Vordingborg Port.

Since the costs for Stage 4 are covered through the fee for the recycled material receipt, neither Vordingborg Port nor Vordingborg Municipality have to raise loans. Both Danish and foreign development companies have expressed an interest in such a deal. Not only is the project a financially sound business, but from an environmental perspective, it also makes a sense to expand this way. During the construction of the Storstrøm Bridge, materials also have to be shipped, which means an increased freight turnover of the port. It is also expected that Stage 4 expansion produces some other positive effects.

After the completing of the new Storstrøm Bridge, Vordingborg Port should play an essential role as a service harbour. Last but not least, completing Stage 4

means that Vordingborg Port should become an even stronger and visible player in the industry, thereby helping to attract future business-promoting companies to a maritime cluster. The port has good chances to evolve into a regional maritime hub. It is on a positive development trend and has the potential to remain a growth engine for Vordingborg Municipality and the entire Zealand Region.

When the Stage 4 expansion is complete, Vordingborg Port should stand out as a reliable and attractive partner for both current and future customers. In this connection, a master plan for the port has been drawn up in recent years. The purpose of the master plan, accompanied by the strategic plan, is to describe focus areas for the next 5 years to maintain the positive development and further develop the potential. The strategy forms the basis for the direction of Vordingborg Port in the coming years and serves as a working tool for the Port Authority and the Port Administration. Furthermore, the strategy should make the port's vision visible to the port's customers, the Municipality of Vordingborg and the local community.

Already in 2017, the port authorities have acknowledged the importance of communication and increasing visibility of the port. Hiring a new employee responsible for communication was a significant step of the port authorities towards professionalising efforts regarding external communication and increasing visibility of the port. These efforts are focusing on both the traditional media, but also the social networks. Communication efforts have also meant that citizens of Vordingborg Municipality can now better follow the development of the port and what it means to them.

The essential notions of the strategy rely on the fact that the geographical location of Vordingborg Port is an advantage for the companies and customers who are currently experiencing traffic difficulties around the Copenhagen area when goods have to reach a port. Therefore, it is developing into one of Zealand's largest and most attractive ports. Furthermore, unlike many nearby ports, Vordingborg

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Port is located outside the protected Natura 2000 areas, which would require special consideration for vulnerable wildlife species and habitats. It means that it might be less complicated to implement local development plans for future port expansion.

However, despite dedicated communication efforts, the kick-start of the planning process for the anticipated Stage 5 expansion of the Vordingborg port westwards was abruptly stopped due to protests from the local population. The inhabitants of Ore neighbourhood located on the northern shore of the Masnedøsund sound have actively expressed their discontent with the imminent threat of increasing visual pollution and noise from ship handling operations in the port located on the other side of the sound just 500 m away.

4.3. Analysis of the possibilities of using inland waterways to transport cargo to and from local seaports

In Western European countries, seaports use the opportunities related to inland waterway transport much more often. Many of the ports have access to inland waterways, making this type of transport one of several connections of the port with its facilities. In these countries (especially in Germany) many river ports have access to seaports and the open sea through inland waterways.

In Eastern Europe, far fewer ports have access to inland waterways, and these waterways are usually not adapted for navigation.

Poland

Even though the existence of inland waterways (E 40 and E 70) in the Pomeranian region, inland water transport does not play a significant role. The lack

of comprehensive state policy (including the late ratification of the AGN) contributes to this situation. Nevertheless, there is a noticeable development perspective in inland and sea transport in relation: ports of the Tri-City and Elbląg with the Kaliningrad Region of the Russian Federation.[176]

Freight transport by inland waterway in the West Pomeranian region is the largest in Poland and remains stable (slightly over 0.5 million tonnes per year), but it slowly starts to show decreasing tendency.

The region has the most convenient system of inland waterways in Poland connecting the ports of the Oder estuary with European Union countries, especially with Germany. However, the current state of hydro-technical buildings, as well as the infrastructure crossing the Odra Waterway (road and rail bridges) does not allow the full use of the Odra's transport capabilities for transport to the south of the country.

Polish-German cooperation in the field of industrial and touristic use of the Oder, cooperation of rescue services, cooperation in the field of spatial planning and environmental protection, development of communication infrastructure is of particular importance.[177]

In the case of the port of Ustka, inland waterway transport is of little importance for the port's connections with the surroundings. The Słupia River is not a navigable river with transport significance. It is practically not used at all as a communication route, but only for canoe tourism.[178]

[176] Regional Strategic Program in the area of transport Mobilne Pomorze. Board of the Pomeranian Voivodeship, Gdańsk 2013.
[177] Development Strategy of the West Pomeranian Voivodeship until 2030 - project, Department of Strategic Management of the Marshal's Office of the West Pomeranian Voivodeship, Szczecin, April 2017.
[178] Ustka City Development Strategy until 2020, Department of Local Development and European Integration of the Ustka City Hall, Ustka, 2011

Lithuania

The Lithuanian inland waterway network that is already used and could be further developed for freight transport is from the Curonian Lagoon and though the Nemunas river. The cities of Kaunas, Jurbarkas and Klaipeda are in close distance to these waterways. In Jurbarkas are located big construction materials plants (sand, gravel). Construction materials are already traditionally transported from Jurbarkas to the Port of Klaipeda by inland waterways and Curonian Lagoon.

Germany

Germany is one of the countries that recognize the benefits of using inland waterways. The National Strategy for Sea and Inland Ports 2015[179] explains that the objective of interlinking sea and inland ports is to develop them into a combined transport system. This can:

- relieve the seaports of functions that can be performed at inland ports and freight distribution centres;
- boost the competitive position of the inland ports in logistics;
- optimize and accelerate freight transport;
- generate synergies and widen the range of services provided by ports.

Transferring some of the functions performed by seaports to inland ports can address capacity constraints that are likely in the future. Collaboration between the seaports and inland ports creates an opportunity to make transport operations less expensive, thereby expanding the hinterland catchment areas of the seaports. The development of a network of inland port locations can significantly augment and support the function of the seaports as essential links of external trade.

[179] The National Strategy for Sea and Inland Ports 2015, Federal Ministry of Transport and Digital Infrastructure, 2015.

The German sea and inland ports can compete very successfully, because, among other things, they have useful seaward approaches, inland waterways and hinterland connections that make it possible to move goods quickly to and from the ports. If the seaports and inland ports are to continue to perform and further expand their function – a function that is of outstanding importance to the national economy – priority must be given to removing the bottlenecks in the seaward approaches, inland waterways and landside connections to and from sea and inland ports of national and international significance.

Sweden

Lake Vänern, the largest lake in the EU, is connected to the sea and Port of Gothenburg via the River Göta and Lake Mälaren via locks in Stockholm and Södertälje. With container transport on IWW being rare in Sweden, ports along the inland waterways do not operate services for container shipping and equipment, such as proper container cranes, are missing. Container transport may differ from other types of IWW transport (mainly bulk) in the type, volume and value of goods.[180]

Denmark

Inland waterway transport, other than by ferry, is of no importance, as the few Danish rivers are navigable only to a negligible extent. However, shipping between

[180] Rogerson, S., Santén, V., Svanberg, M., Williamsson, J., & Woxenius, J. (2019). Modal shift to inland waterways: dealing with barriers in two Swedish cases. International Journal of Logistics Research and Applications, 1-16.

the different parts of the country plays a vital role in the Danish transport system[181].

Belgium

The Oostende Port is at the end of an important canal, Oostende-Bruges-Ghent, which provides inland waterway connection to the European waterways network. In the port of Oostende, several industrial sites have been developed along the quays that provide industries with direct access to the inland waterway connections. The future development plan also includes modernising the canal and the docks to accommodate bigger inland waterway barges.[182]

4.4. Identification of necessary investments

Practice shows that port operators are faced with the need to adapt their offer to the expectations of service recipients, which sometimes requires material investments, organizational changes, flexibility, and especially taking care of comprehensive service ensuring the satisfaction of clients. However, unfortunately, not everyone can meet this need.

In recent years, there have also been significant changes in the business profile of most local seaports. The decline in fishing activities was accompanied by an increase in the importance of recreational and sporting and transhipment activities. Such changes also require appropriate investments. Despite the unstable situation of Polish fisheries, the process of modernizing ports should be continued. New investments in this aspect should be aimed at increasing the scope of services

[181] International Reference Service, Vol. VII, No. 70, U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce, 1950.
[182] Williams, A. M. (Ed.). (2012). Human Mobility in Coastal Regions: The Impact of Migration and Temporary Mobilities on Urbanization (Vol. 2). Sapienza Università Editrice.

provided and improving their quality, rather than building a new fishing infrastructure. Further infrastructure creation, especially new fish auctions, as is currently the case, does not seem justified.

Recent changes and improvement of the economic situation of the population cause further development of recreational and sporting activities. Construction, extension and modernization of the existing infrastructure of harbours or harbours are needed. Local seaports often lack parking spaces, especially during the tourist season. Many ports also lack associated infrastructure.

The development of transhipment activities will also require infrastructure improvements. There is a shortage of storage yards and warehouses in ports. The needs for servicing the vessels are also indirectly linked to port access. Access from the waterside was most often described as good, emphasizing the need to deepen the approach trays. No such need was found only in Hel. In Władysławowo, there is a need to conduct cyclical works to clear the approach trays and port basins. In Ustka, it is necessary to widen the turntable radius. Carrying out the above investments would undoubtedly contribute to an increase in transhipments at these ports.

The benefits associated with high parameters of port infrastructure and access to seaports from the sea will not be used if the inland port access infrastructure is a bottleneck. Access to most ports and harbours requires the construction, extension or repair of access roads – local roads connecting the port with the main road and roads leading directly to the sweat from the local road running through the town.

Also, the ports indicate the need to carry out repairs of pavements, platforms equipped with quays and buildings in which chain stores are located. Briefs also need renovation. It is also necessary to modernize the installation for collecting oily water from ships or buying a unit adapted to collect oily water.

Conducting the investments mentioned above would help local ports on the Polish coast to become more attractive among carriers. Improvement in infrastructure would undoubtedly affect the volume of transhipments and the speed of service for incoming vessels, but there are also many other factors affecting port activity. Even the most modern infrastructure will not help significantly increase transhipments without business activities of entities located in the hinterland of seaports and generating demand for sea transport.

The same applies to Swedish ports to a large extent. Most often, these local ports provide services related mainly to fisheries. They also attract local tourist traffic, but investment in transhipment infrastructure is needed, which would allow ports to increase transhipment and ensure the multifunctional nature of the port.

Another problem that local seaports struggle with is poor transport accessibility from the land side. This issue also applies mainly to structures located in Eastern Europe. Many ports do not have access to the rail network, and the road infrastructure is highly decapitalized. The modernization of the transport network is an essential condition for achieving the objectives of coastal strategies, but not the only one. It is also necessary to adapt the energy and water supply networks and wastewater treatment to new needs, as well as to solve the problems of waste utilization. In other words: a breakthrough in the state of technical infrastructure understood as all devices used for moving goods and persons, energy, water and information.[183]

[183] Program for the development of Polish seaports until 2020 (with a perspective until 2030), Ministry of Maritime Economy and Inland Navigation, Warsaw, 2018

Summary and recommendations

SUMMARY AND RECOMMENDATIONS

Local ports in the South Baltic Region are currently undergoing many substantial changes. Almost all the local ports of the Polish coast can observe a decline in the importance of the fishing function. It is influenced by many factors, but the most important is the increasingly restrictive limits on fishing for Baltic fish. On the other hand, the recreational and sport function of ports is gaining in importance. During the season they are often also a tourist attraction.

Many factors influence the development of local seaports. One of them is the state of the entire transport system of the analysed countries. These ports can be transhipment centres in the intermodal transport network. The vast majority of cargo transported in European countries is carried out by the road. The availability of services, as well as the price level, have a decisive impact on this. Transit traffic runs through Poland, Germany and Denmark to a vast extent. Road infrastructure in Western European countries is at a high level. In Poland and Lithuania, however, a long-term process of adjusting the quality of roads to European standards is underway. The volume of rail transport is also strongly limited in these countries by existing infrastructure. Despite the increase in expenditure in recent years, its modernization has not achieved measurable effects in the form of ensuring the highest possible average commercial speeds on the entire network, or even on lines with the most substantial traffic flows. Inland waterway transport is practically impossible in countries like Denmark, where there are no geographical conditions. Cargo transportation by inland waterways in Poland and Lithuania is currently practically impossible. Besides, waterways are systematically degraded for many reasons (e.g., no inland navigation development strategy). Despite the convenient geographical layout of the main rivers in the countries, cargo is transported by this means of transport only on local sections of the Oder. In Germany and Belgium, on

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the other hand, inland waterway transport is a critical connection between ports and their hinterland. Cargo transport with this mode of transport remains at a very high level. Short sea shipping is a crucial element in creating sustainable transport development. However, the development of short sea shipping is hampered by many factors, such as not including it in the multimodal supply chain on a door-to-door basis. Short sea shipping also requires increased port efficiency and better access to port facilities.

Despite the changes taking place in local seaports in Poland or Sweden, their activities and exploitation are mainly related to fisheries. Tourist and recreational traffic services are still carried out to a small extent, although in recent years there has been a noticeable development in this aspect. Few of the local ports create small, though multifunctional economic and spatial structures of both local and regional significance, which are capable of operating typical for the nodal points of transport infrastructure. However, the transport function of local ports in Poland is underdeveloped.

The Port of Klaipeda is the only operating seaport in Lithuania. It is one of the largest ports in the South Baltic. Reloading activities are carried out only in four of the local seaports in Poland: Kołobrzeg, Darłów, Ustka and Władysławowo. The volume of these transhipments fluctuates, however, it shows an upward trend. By far the largest transhipments are currently taking place in the Port of Kołobrzeg and Port Darłowo, while the transhipments in Ustka and Władysławowo are of marginal importance.

It should also be remembered that over 90% of cargo is handled in the four largest Polish ports of primary importance for the economy: in Gdańsk, Gdynia, Szczecin and Świnoujście. The situation is completely different in countries like Germany, Denmark or Belgium. There are many local seaports on the coast of these countries which develop in very different directions. They often specialize in

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transhipment of a particular type of cargo, and besides, they invest in scientific research or take part in many European initiatives.

One of the most important factors hampering the development of the transport function of local seaports is the outdated port infrastructure. It limits the size of accepted trade units and harms their reloading speed. Despite numerous infrastructure investments that have taken place in recent years, mainly thanks to European Union funds, a lot remains to be done. In the local ports of the Polish coast, there is no infrastructure related to blue and green growth. Local ports are small structures whose activities are focused on maintaining profitability and investment attractiveness and do not focus on the studies mentioned above.

Access infrastructure to ports from the sea and landside is closely connected with the port infrastructure. Port infrastructure, both land and hydro-technical, is an indispensable element of every seaport's equipment.

Another development barrier for local ports on the Polish coast is economic activity on the so-called port hinterland which generates supply for transport and transhipment services, as these ports are located in an area with very low population density and small economic activity. Local seaports also affect the economy in the micro- and macroeconomic sphere. This impact is complex and multidirectional, related to various types of economic activity, including fisheries, transport, tourism, trade and industry.

The current potential of local seaports is not fully utilized. The implementation of many investments would contribute to an increase in transhipments in ports where the transport function is present and would help other ports to change the direction of development from fishing ports to more promising functions. Actions to increase the attractiveness and use of the economic potential of maritime cities and municipalities are particularly important given the

persistently high unemployment rate in coastal regions compared to other regions of the country.

One of the factors that could have a positive impact on the local seaports in the South Baltic region and become an impulse for development is the launch of regular cabotage navigation along the E 60 waterway. This route in the area of the South Baltic Sea runs along with five countries of the European Union and the Kaliningrad District. The launch of short sea shipping in this area can be an alternative to road transport while reviving local seaports. In addition to transporting loads, it would also be possible to transport passengers. Unfortunately, ship traffic currently exists in the area of the E 60 waterway, but it is directed to the main ports in the North Sea and Baltic Sea regions, completely bypassing the local and regional ports. Compared to road transport, short sea shipping faces another difficult obstacle – formalities. Tourism between local foreign ports does not function due to legal and administrative restrictions, difficult border crossing procedures, closed for military traffic zones and marine areas of landscape parks.

While overcoming barriers on the side of EU countries is possible. However, very difficult and time-consuming, the section along the coast of the Kaliningrad Region remains problematic, where there are both Russian military areas that completely exclude any movement of tourist ships, as well as the landscape park of the Curonian Spit in Lithuania, which is also a significant impediment. Therefore, the E 60 route in its current form will be able to function only if close cooperation is established with the Kaliningrad Region and with local ports lying on its coast. Actions undertaken would allow the development of local ports located along the E 60 waterway and thus coastal regions within their impact range.

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