United Nations ECE/TRANS/SC.3/WP.3/2020/5

Economic and Social Council

Distr.: General
4 December 2019

Original: English

Economic Commission for Europe

Inland Transport Committee

Working Party on Inland Water Transport

Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation

Fifty-sixth session
Geneva, 12–14 February 2020
Item 8 of the provisional agenda
River-sea transport in Europe

Overview of river-sea transport in Europe: the case of seagoing ships navigating on inland waterways

Transmitted by the Central Commission for the Navigation of the Rhine*

Mandate

1. This document is submitted in line with the Proposed Programme Budget for 2020. part 5, Regional cooperation for development section 20, Economic Development in Europe. Programme 17, Economic Development in Europe (A/74/6 (Sect. 20) and Supplementary).

2. At its fifty-fifth session, the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation decided to include the outcome of the workshop on river-sea transport held on 11 September 2019 in Duisburg (Germany) by the Central Commission for the Navigation of the Rhine (CCNR) and the overview of the CCNR thematic report on river-sea-transport in the agenda of its fifty-sixth session (ECE/TRANS/SC.3/WP.3/110, para. 17).

3. The annex to this document reproduces the overview of river-sea transport in Europe by seagoing ships navigating on inland waterways, transmitted by CCNR. The Working Party may wish to consider the overview by CCNR, complement with additional data as well as consider and provide recommendations for the Working Party on Inland Water Transport for the promotion and development of river-sea transport in Europe.

* This document was scheduled for publication after the standard publication date owing to circumstances beyond the submitter's control.

Annex

River-sea transport in Europe: methodology and scope; the case of seagoing ships navigating on inland waterways

A. Methodology and scope

Definitions, terminology and scope

According to the Eurostat Reference Manual of Inland Waterways Transport Statistics,[1] "fluvio-maritime transport" consists in "*a transport operation partly by inland waterways and partly by sea, without transhipment. It can be operated by inland waterway vessel or seagoing ships. Any inland waterway vessel undertaking such transport will need to have the appropriate authorisation permitting it to operate at sea.*" The same definition is proposed in the fifth edition of the Glossary for transport statistics[2], where an alternative terminology is also used: sea-river traffic. The term "river-sea traffic" is also commonly used.[3] Finally, in Sweden and Finland, this type of transport is referred to as lake-sea shipping. For the purpose of this report, the terminology "river-sea transport" will be used.

Based on this definition, two types of river-sea transport will be analysed in this report:

- River-sea transport performed by seagoing ships adapted to navigate on inland waterways (IWW) (see chapter 2)
- River-sea transport performed by an inland vessel adapted to navigate at sea up to a certain point at sea.[4] The specific case of Belgium and France is addressed below. In Belgium, the term "estuary vessels/traffic" is used to refer to this specific case.

The objective of this report will be to improve the knowledge and information about river-sea transport in Europe. It is worth noting that river-sea transport was also addressed in the 2013 annual market observation report.[5] In addition, a workshop with the main actors for the river-sea transport sector was organised in September 2019 to gain some additional insights into the river-sea market in Europe. All the presentations made during this workshop are available in English on the CCNR market observation website: https://inland-navigation-market.org/.

Methodology and data reporting at the European Union level

As there are few statistics on river-sea passenger transport in Europe, this report will focus on river-sea goods transport. There is no harmonised data reporting in place at the European Union level on this and Eurostat does not have a dedicated data collection for river-sea transport.

Therefore, data in this report were mainly gathered directly from national statistical offices, other national statistical sources and stakeholders. These national offices partly apply different methodologies for data collection, resulting in some river-sea transport that is reported in maritime statistics or in IWW statistics or both. However, given the low volumes of river-sea traffic compared to total maritime or IWW transport volumes, double counting (i.e. reporting statistics on both the maritime and IWW database) is tolerated. In addition, the

[1] Eurostat, Reference Manual of Inland Waterway transport Statistics, Version 9.1 April 2018, sections 4.1.6 and 5.2: https://circabc.europa.eu/sd/a/b1c81773-ce2b-47cd-ad43-a0fbfe395402/Reference_Manual_April_2018_.pdf.

[2] Glossary for transport statistics, 5th edition 2019: https://ec.europa.eu/eurostat/documents/3859598/10013293/KS-GQ-19-004-EN-N.pdf/b89e58d3-72ca-49e0-a353-b4ea0dc8988f.

[3] E.g. EMMA project "Strengthening inland navigation and river-sea-shipping in Europe and the Baltic sea region".

[4] Also known as fluvio-maritime or sea-river vessels in the Glossary for transport statistics 5th Edition 2019.

[5] Pages 81-93: https://ccr-zkr.org/files/documents/om/om13_en.pdf.

definition of river-sea transport from a statistical point of view may also vary between Member States.

The example of the Kiel Canal, which connects the North Sea at Brunsbüttel to the Baltic Sea at Kiel through Schleswig-Holstein in northern Germany, is relevant in that regard as it will appear in both maritime and IWW sets of statistics.

Indeed, in German statistics, the Kiel Canal is registered as an IWW and a maritime waterway. Transport from one end of the Kiel Canal (Kiel or Brunsbüttel) to a maritime port (for instance in Lithuania (Klaipeda) or in the Netherlands (Rotterdam), transit through the Kiel Canal and transport from one port on the Kiel Canal to another maritime port outside the Kiel Canal will be recorded as maritime transport. However, this last case could be considered as river-sea transport if the definition from the Eurostat Reference Manual of Inland Waterways Transport Statistics is applied.

The methodology for reporting river-sea transport statistics was discussed at several maritime and IWW working group meetings within Eurostat.

Initially, Eurostat recommended national statistical offices to report on river-sea transport according to “type of water”. In other words, if transport takes place on IWW it should be reported in the IWW statistics and if transport takes place on maritime waters it should be reported in the maritime statistics.

In the Reference Manual on Inland Waterways Transport Statistics, Eurostat recommends reporting river-sea transport depending on the “type of vessel”, in other words, if river-sea transport is performed:

(a). by an inland vessel, it should be reported in the IWW statistics and not the maritime statistics;

(b) by a seagoing ship, it should be reported in the maritime statistics and not the IWW statistics.

However, if information regarding the type of vessel is unavailable, related information (such as the port of loading/unloading) could be used to determine whether river-sea transport is likely to be carried out by IWW vessels or seagoing ships.

If necessary, and in order to compile relevant and coherent IWW statistics at national level, specific cases of river-sea transport performed by seagoing ships could be included in both the maritime and the IWW data reported to Eurostat. However, any such deviations from the main recommendations in points 1 and 2 should be clearly communicated to Eurostat in order to be specified in the metadata of the IWW statistics. Today, some objections to these proposed recommendations still exist. For instance, if this methodology was applied in France, most of river-sea transport would be recorded in the maritime statistics.

It is worth highlighting that most of the statistical data analysed in this report relate to situations where river-sea transport is performed by seagoing ships. Indeed, there is less statistical data available regarding inland vessels at sea as there are only a few places where seagoing inland vessels are in operation, which are mentioned in this report and for which available data are presented.

As consistent data is not available at the **E**uropean **U**nion level, data were collected from national statistics, and a country-by-country analysis has therefore been made in this report. The methodology applied to calculate river-sea goods transport per country is explained in each relevant chapter. The degree of comparability of the results analysed in this report might be slightly impacted by such discrepancies.

Finally, for several countries analysed in this report, statistics are derived from inland navigation databases, which shows that the practice applied in some national statistical offices include river-sea-transport as part of inland waterway transport (IWT).

B. River-sea transport in Europe: the case of seagoing ships navigating on inland waterways

Overview of river-sea transport in Europe performed by seagoing ships

River-sea shipping takes place on all major rivers in Europe that have a connection to the open sea. In the EU, this type of river-sea transport can especially be found in Sweden, Finland, the United Kingdom of Great Britain and Northern Ireland, the Netherlands, Germany, France, Belgium, Portugal and Romania. Outside the European Union, it is well developed in the Baltic Sea, the Russian Federation and Ukraine.

Key river-sea areas in Europe

Several major users of sea-river shipping in Europe are the Belgian, German and Romanian steel industries, the Swedish and Finnish timber industries, the petroleum sector in the United Kingdom of Great Britain and Northern Ireland , the agricultural sector in the Danube region and in France.

Transport of steel products takes place downstream on the river Rhine and transport of Scandinavian timber, paper products and liquefied gaseous products upstream.

One quarter of the Trollhättan Canal (Sweden) transport movements consists of oil products.

The main trading partners of German river-sea transport are found in northern Europe (the United Kingdom of Great Britain and Northern Ireland, Norway and Sweden), while for Belgium and France, there are two main trading routes: one in the north (the United Kingdom of Great Britain and Northern Ireland, Finland, the Netherlands, Norway), and another in the south (Spain, Morocco, Algeria, Turkey, Italy). France also imports ammonium nitrate exclusively from Antwerp via river-sea transport up to Rouen, on the Seine.

Trading partners of Finland are mainly Russia, the Netherlands, the Baltic states and Germany.

Romania’s river-sea-traffic is oriented towards the Mediterranean region of southern Europe.

Overall, at present, almost 64 million tonnes of goods are transported via river-sea transport in the European Union, or almost 75 million tonnes, if the data for river-sea transport in the Russian Federation is included.

Table 1: **Overview of river-sea transport in the European Union performed by seagoing ships**

Country	*Transport volume river-sea (million t)**	*Transport volumes inland waterway transport (million t)**	*Most important goods segment within river-sea transport*
UK	47.6	4.1**	Crude petroleum and petroleum products
Sweden	6.62	0	Timber and oil products
Romania	4.5	29	Agricultural products
Belgium	1.9	205	Iron and steel
Finland	1.3	0.4	Timber and raw minerals
Germany	0.76	198	Iron and steel
France	0.75	60	Ores, metallurgical scraps and metal products, agricultural products

Source: national statistical offices of the countries mentioned in the table, TrafikAnalys

* Figures for 2018 for Finland, France, Germany, Romania, figures for 2017 for Belgium and the United Kingdom of Great Britain and Northern Ireland.

** River-sea traffic in United Kingdom of Great Britain and Northern Ireland is 11.6 times higher than pure inland waterway traffic.

If river-sea transport was understood as part of the total inland waterway transport figures in the United Kingdom of Great Britain and Northern Ireland, Finland and Romania, the total transport volumes for inland waterway transport would soar. The share of river-sea transport would amount respectively to 1160%, 315% and 15% within total inland waterway transport. In Belgium, Germany and France, river-sea transport represents less than 1.5% of total inland waterway transport. In Sweden, this comparison is less relevant as no inland waterway transport is currently recorded.

Legal and economic aspects related to river-sea transport performed by seagoing ships

Seagoing ships that perform river-sea transport are intended to navigate both on inland waterways and at sea, without a transhipment in a seaport. They have an International Maritime Organisation (IMO) number. They must therefore be able to navigate in both areas and comply with specific classification rules. They must be built under the supervision of a recognised Classification Society in accordance with its classification requirements.

In addition, they must comply with regulatory requirements in force in both sea and inland waterway (IWW) areas. Technical rules related to the equipment and safety of vessels have been settled in the European Union Directive that apply to all IWWs in Europe.[6] However, seagoing ships with statutory seagoing ship certificates (technical requirements as regards the construction, equipment and environment) such as SOLAS, Load Lines, or MARPOL,[7] are allowed to operate on tidal waters or temporarily on the European Union IWW[8] without having to comply with the technical requirements prescribed in this directive. Outside the Rhine, as far as these requirements are fulfilled, a river-sea ship can therefore navigate on inland waterways up to the point where the navigation conditions simply do not allow it to navigate any further (depending on the waterways' and river-sea ships' characteristics).

[6] Directive (EU) 2016/1629 of the European Parliament and of the Council of 14 September 2016 laying down technical requirements for inland waterway vessels: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016L1629.

[7] International Convention for the Safety of Life at Sea (SOLAS), International Convention on Load Lines (LL), International Convention for the Prevention of Pollution from Ships (MARPOL).

[8] Article 2 of Directive (EU) 2016/1629.

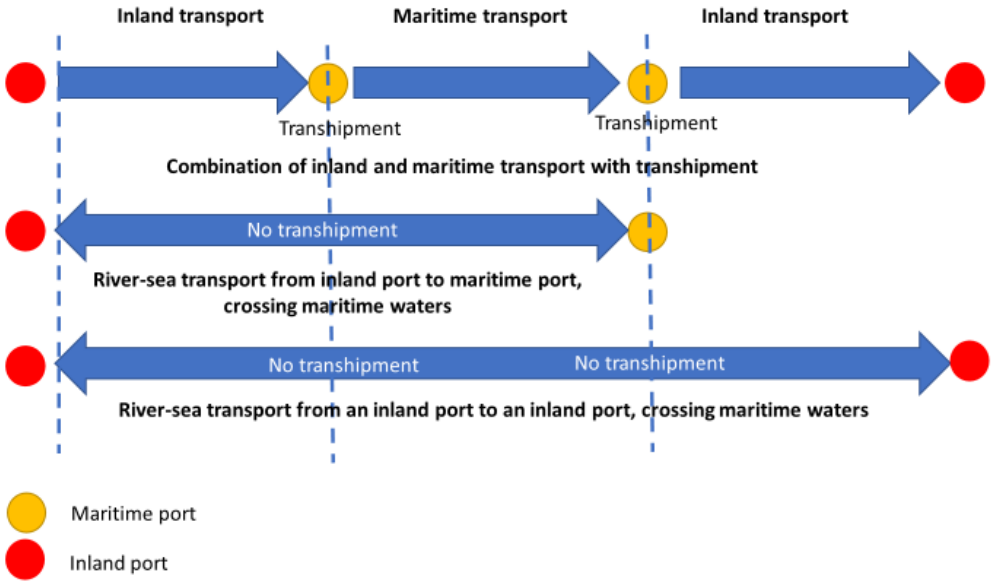
Regarding the Rhine in particular, specific technical requirements apply to vessels navigating on the Rhine. This also applies to seagoing ships on the Rhine, which, as well as a seagoing ship statutory certificate must also hold a "certificate for seagoing ships operating on the Rhine".[9] In addition, seagoing ships carrying liquid or gas dangerous goods may navigate on the European Union IWW only if they hold an ADN certificate[10].

Regarding environmental requirements, seagoing ships adapted to navigate on inland waterways must comply with environmental requirements applicable to seagoing ships, in particular, the IMO pollution and emission standards, and not with those applicable to inland vessels.

Beyond regulatory and statutory requirements, conditions for river-sea shipping also vary between countries and depend greatly on the geographical situation, the sailing area, the waterways infrastructure and weather conditions. Indeed, river-sea ships are often designed for operation in a specific sailing area and have to comply with the length and width requirements as well as the draft and height restrictions, specific to the region where they operate. For instance, seagoing ships navigating on the Saimaa inland waterways (lake system in Finland) must have an ice class.

River-sea transport performed by seagoing ships must not be confused with transport operations combining inland and maritime transport, requiring transhipment operations between the two (see fig. 1).

Figure 1: **Difference between river-sea transport and combined inland and maritime transport**



The strong advantage of river-sea shipping lies in the absence of seaport transhipment. This results in lower transport costs, time-saving (avoiding possible congestion and related delays in a seaport), and a reduced risk of damage to goods resulting from additional transhipment. River-sea shipping is therefore well adapted to carrying fragile goods (such as paper), goods which need to be transported under very strict "non-damage-conditions" (besides paper, also certain metals and metal products), as well as project cargo (oversized and heavy cargo and equipment).

[9] In compliance with Article 25.01.2 of the European Standard laying down Technical Requirements for Inland Navigation vessels, which lays down special provisions applicable to seagoing ships navigating on the Rhine: www.cesni.eu/wp-content/uploads/2018/12/ES_TRIN_2019_en.pdf.

[10] European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).

Another advantage of this type of transport is found in its unique market range, allowing seagoing ships to connect overseas destinations with locations quite far in the hinterland. Indeed, a wide range of ships of different size and capacity is available, with the newest ships often being characterised by lower draught, allowing them to navigate further in the hinterland. For instance, from the port of Duisburg, some river-sea ships are able to carry project cargo all the way to the Iberian Peninsula and Casablanca without transhipment. In addition, it is an environmentally friendly mode of transport. According to the main actors in the river-sea sector, these environmental considerations and political support towards modal shift to greener modes can therefore positively influence demand for this type of transport.

However, as explained above, river-sea ships must be adapted to navigate on IWW, and river-sea shipping is dependent on the state of inland navigation, the related infrastructure and the water levels. The proper development and maintenance of inland waterway infrastructure (in particular ageing of bridges and locks) and the waterways themselves is paramount for the well-functioning of river-sea transport. As is the case for pure inland waterway transport, the lack of predictability (e.g. variation in freight rates) and reliability (delays, variation in water level) of river-sea transport can negatively influence demand for this kind of transport. An important challenge for river-sea shipping therefore lies in its ability to provide transport services all year long and under all weather conditions. In addition, the "just-in-time principle" is hard to maintain with high variations in accessibility of river ports.

River-sea ships are also limited in their capacity when navigating on inland waterways, making it difficult for such seagoing ships to make economies of scale. Moreover, river-sea ships are constructed more heavily and have a smaller displacement volume at similar draft (i.e. a smaller block coefficient) than inland vessels. In addition, river-sea shipping often competes with a combination of maritime and inland waterway transport involving transhipment, in particular when handling rates and inland waterway freight rates are low. River-sea ships are also expensive to build and to operate. For all these reasons, river-sea shipping therefore finds its economic rationale in very specific segments and routes.

Additional challenges that river-sea transport is facing have also been identified by the main actors in this market:[11]

- Language: English not commonly accepted on all inland waterways
- Ageing fleet: about half of the river-sea fleet is more than 25 years old. About one-third of the fleet is less than 15 years old. Indeed, for companies that have not recently invested in their fleet, new fleet investment is generally considered or approved, in particular to renew an ageing fleet, to anticipate a shortage of river-sea ships in light of increasing demand, or to invest in new engines. However, the high costs related to new river-sea ships can be a barrier
- General lack of knowledge about river-sea transport.

C. River-sea transport in Europe: the case of inland navigation vessels navigating "at sea"

Introduction and general classification rules

Most river-sea traffic is operated by seagoing ships. However, some specific inland vessels can be allowed to make restricted journeys at sea between two ports of the same country provided they comply with specific requirements.

Inland vessels can never be allowed to perform international sea journeys, as they do not hold seagoing ship certificates. As most of the IMO regulations applicable to seagoing ships are not entirely appropriate to domestic trade along the coastline in restricted maritime areas, the granting of a special certificate allowing inland vessels to navigate at sea is justified.

Restricted maritime areas in which inland navigation vessels may be able to operate could be classified for the purpose of suitable requirements consistent with the risk level. This would be dependent notably on the severity of the wave and swell, the risk of shipping water, the

[11] In particular, members of the River-Sea Shipping Committee of the European Barge Union (EBU).

exposure to strong wind, the distance from shore and refuge and weather conditions. In such areas, inland vessels must be designed to withstand more severe weather conditions than do pure inland vessels. Also, access to maritime areas is given to inland vessels taking into consideration restricted routes and limitations on wave height.

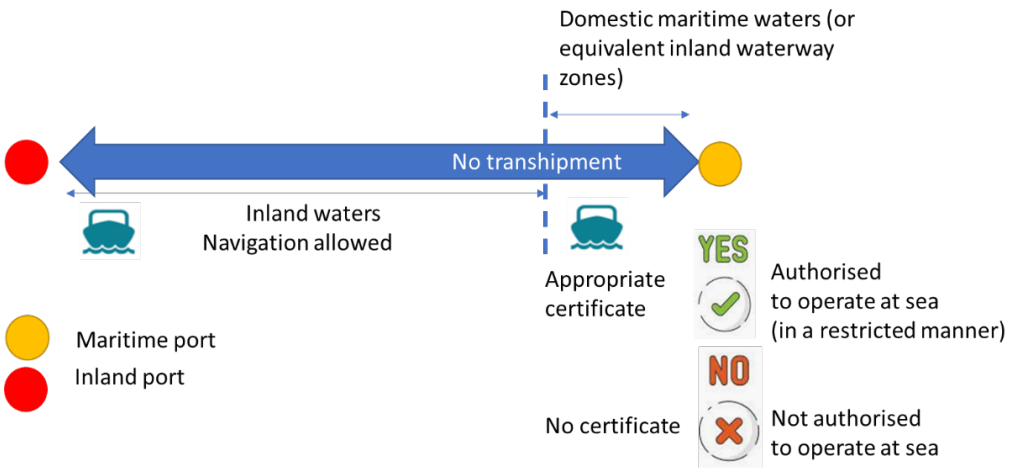
In order to be allowed to navigate at sea (in a restricted manner) and obtain the corresponding certificate, such inland vessels must prove that they comply with:

- classification requirements related mainly to ship design (hull structure, bow height, stability etc.) and equipment requirements established by classification societies and,
- regulatory requirements set by relevant state administration which may provide complementary requirements (national law, qualification of crew, radio communication, navigation lights, operational conditions etc.)

Directive (EU 2016/1629) establishes harmonised conditions for issuing technical certificates for inland waterway vessels in EU inland waterways. However, it also allows Member States to apply stricter technical requirements in certain zones of navigation, in particular zones 1 and 2 – estuaries - where inland vessels may be faced with more difficult conditions of navigation than usual. This Directive does not make it mandatory for Member States to identify such zones 1 and 2 on their territory but lists the subjects for possible additional technical requirements applicable to inland vessels in such zones (in relation to stability, equipment, water lightness etc.) In Belgium (Flanders), some inland vessels are allowed to navigate directly at sea, along the coast (estuary transport). This type of traffic is regulated by a Royal Decree, outside the scope of Directive (EU) 2016/1629, as no zones 1 or 2 have been defined in Belgium. However, Belgian estuary vessels also need to comply with Directive 2016/1629.

Drawing from the information above, a common case of river-sea transport performed by an inland navigation vessel can therefore be described as follows (see fig. II):

Figure 2: **River-sea transport performed by an inland navigation vessel**



There is currently no harmonisation in the requirements to be complied with by such inland vessels in order to navigate at sea. The possibility for inland vessels to navigate at sea is also not allowed in several EU countries. Given the differences in treatment of this type of transport in the EU, Directive 2016/1629 calls for greater harmonisation of the conditions for the issuing, by Member States, of supplementary Union inland navigation certificates for operations of inland vessels in zones 1 and 2.

For the purposes of this report, the focus will be on the cases of Belgium (Port of Zeebrugge) and France (in the Port du Havre area and Golfe de Fos), where inland vessels navigating “at sea” can be observed, always in compliance with specific national regulations. Such national regulations allowing this type of transport are also applicable in India, the Russian Federation, China and Italy.

Inland vessels at sea: estuary traffic in Belgium

Belgium is the most telling example when studying the case of inland navigation vessels that are allowed to navigate at sea, known in Belgium as estuary transport. Estuary traffic is carried out by estuary vessels, which must hold a certificate provided by a competent Belgian authority, allowing them to navigate at sea under the conditions prescribed in the national and regional regulation. The legal ground is a Royal Decree from 2007[12] which enforces the set of regulations allowing an inland vessel to navigate at sea between Belgian coastal ports. Since the last state reform, which has seen many of these responsibilities move to the regions, Flanders has issued minor changes to this Royal Decree.

According to this Decree, estuary vessels must comply with the rules applicable to inland vessels and must be designed in a way that allows them to navigate at sea (sufficient stability, safety requirements). They must, amongst other requirements, comply with MARPOL, without however holding a certificate, COLREG (preventing collisions at sea) and be equipped with sea radar (navigation equipment). Meteorological aspects must also be taken into account before the captain of such an inland vessel can decide whether or not to perform a sea voyage. The recent changes made by the Region of Flanders allow for some simplifications for this category of vessels and less administrative burden for ship owners. This evolution of the Decree also aims at reducing investment costs needed for building estuary vessels which are of lighter build and more cost-effective than seagoing ships that can also sail on the same routes from Zeebrugge to Gent and Antwerp, as well as further upstream. With the evolvement of safety technologies, it is possible that the Decree further evolves in the future.

Almost all estuary traffic in Flanders departs from or arrives at the maritime port of Zeebrugge towards or from the port of Antwerp and the North Sea Port[13] and dedicated inland container terminals.

Belgium is the country in western Europe where the highest volumes of goods are transported via estuary transport. In 2018, 2.1 million tonnes of goods were transported via estuary traffic at the port of Zeebrugge, of which 58% were liquid bulk, 41% container and 1% ro/ro. Overall, 5.2% of maritime traffic registered at the port of Zeebrugge[14] is transported via estuary traffic. Overall, 1047 estuary vessels called at the port of Zeebrugge in 2018 (+ 47 compared to 2017).

The estuary fleet in Belgium is composed of 13 vessels in total, 9 tankers, 1 Ro-Ro cargo and 3 container carriers. Some are certified according to the prescriptions of the Belgium Royal Decree of 2007, and some obtained a certificate under a previous regime. The Belgian estuary fleet is quite recent, with the majority of the fleet being 15 years old or less.

Table 2: **Belgian estuary fleet: the building date, age and type of vessels**

Vessels' name(s)[15]	*Built in*	*Age*	*Type of vessels*
Presto	2003	16	Motor tanker
Polybotes	2004	15	Ro-Ro cargo ship
Tanzanite, Texas	2004	15	Motor tanker
Breitling	2005	14	Motor tanker
New Jersey	2006	13	Motor tanker

[12] Royal Decree of 8 March 2007 concerning inland vessels that are also used for non-international sea voyages: www.etaamb.be/nl/koninklijk-besluit-van-08-maart-2007_n2007014083.html.

[13] North Sea Port is the name of the port formed by the cross-border merger between Zeeland Seaports (Flushing, Borsele and Terneuzen) in the Netherlands and Ghent Port Company in Belgium, signed on 8 December 2017.

[14] Source: 2018 annual report Port of Zeebrugge, https://portofzeebrugge.be/sites/default/files/2019-05/jaarverslag%202018.pdf.

[15] Until 12 November 2018, another motor tanker was also in operation, the Zeebrugge, built in 1971. However, its certificate was not extended after this date.

Vessels' name(s)[15]	*Built in*	*Age*	*Type of vessels*
Amberes, Deseo, Tripoli	2007	12	Container vessel
Inventory, Montana, Mozart	2011	8	Motor tanker

The Ro-Ro cargo ship "Polybotes" is generally used for the spot market. It is also able to answer to the strong market demand for "high and heavy" cargoes, as it can transport extremely heavy one-piece parts of up to 60m in length, such as wind turbines, industrial transformers, tanks for liquids and yachts. The three container estuary vessels are primarily used to facilitate the connection with Antwerp. They follow a fixed rotational scheme which takes them to Antwerp three times a week. It takes eight hours to reach Antwerp from Zeebrugge, while it would take one and a half days if a conventional inland navigation route along canals was used. These three ships together have a capacity of 800 TEU per day and carry 160,000 TEU per year. These estuary vessels also allow to connect with several shortsea routes, in particular with the Baltic network[16]. Four of these estuary vessels call at North Sea Port, making approximately 75 voyages to and from the North Sea Port each year, carrying mainly containers and cars.

Inland navigation vessels allowed to navigate at sea in France

In France, some inland navigation vessels are also allowed to operate alongside the coastline in domestic maritime areas (zone 1), beyond the "transverse limit of the sea", subject to restricted requirements prescribed by a national regulation[17], adopted in October 2018, in accordance with Directive 2016/1629. According to this national regulation, exclusive navigation on such zones 1 by inland navigation vessels is forbidden. However, there are seven different pre-identified routes where inland navigation vessels can be allowed to navigate at sea (both for goods and passenger transport). The requirements to be met by inland vessels also vary depending on the relevant route. For goods transport, this type of traffic takes place mainly in two areas: the Port du Havre area in the Seine estuary and the Golfe de Fos. This approach implies having well-defined zones of navigation and "transverse limits of the sea".

It is worth noting that before the adoption of the above-mentioned regulation, inland vessels navigating to Port 2000 (Port du Havre) were subject to a dedicated decree, outside the scope of application of Directive 2016/1629[18] (as the example of the Belgian regulation).

In France, even if inland navigation vessels comply with the necessary requirements to navigate in the identified maritime area, their ability to do so is also conditional upon meteorological and sea conditions at the time the vessels are set to navigate at sea. Other conditions that need to be met are their foreseeable evolution during the journey time, the securement of an authorisation from the competent port police authority to enter or leave a port located on one of the pre-identified routes, and compliance with applicable local pilot regulations. Finally, it is the responsibility of the inland vessel operator to ensure safe navigation.

[16] Source: Connect, Annual magazine of the port of Zeebrugge, 2019, https://portofzeebrugge.be/sites/default/files/2018-09/MBZ_Connect_2018_EN_web.pdf.

[17] Arrêté du 2 octobre 2018 relatif au classement des zones de navigation des bateaux de commerce, des bateaux de plaisance et engins flottants et aux compléments ou allégements des prescriptions techniques applicables sur certaines de ces zones de navigation : www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000037469594&fastPos=1&fastReqId=1502111262&categorieLien=cid&oldAction=rechTexte.

[18] Arrêté du 15 décembre 2014 relatif à la navigation de bateaux porte-conteneurs fluviaux en mer pour la desserte de Port 2000 et des quais en Seine à Honfleur : www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000029958156&categorieLien=id.

This solution is particularly relevant when connections between inland waterway systems and maritime ports is insufficient. However, this solution is also dependent upon meteorological conditions, which may hinder its reliability. Where no direct inland access is available, the existence of a route involving transhipment can therefore be a useful complement to connect inland waterways with such maritime ports.

Port of Le Havre

Currently, there is no direct inland access between the Seine and the Port of Le Havre (Port 2000) for inland container vessels. Inland vessels adapted to navigate at sea are therefore the only direct way (without transhipment) to reach the container terminal.

There are currently eight inland vessels allowed to navigate at sea in the port of Le Havre area:

- six container inland vessels (Oural, Bosphore, Euroports, Arc-en-Ciel, Pythagore and Smack) amounting to 137,500 TEU in 2016;
- two bunker vessels (the New-York carrying heavy fuel and the New-Jersey carrying gasoil).

A co-funding of 25 million Euros for the realisation of the project aiming at creating a direct inland access to Port 2000, and therefore allowing any type of inland vessel to access the Port, was agreed upon in March 2019. It is therefore possible that river-sea traffic in this region decreases once this project is finalised.

Golfe de Fos area

In the Golfe de Fos area, existing river routes connecting the river Rhône with Martigues and the "Etang de Berre", are currently long journeys that are only accessible by small inland vessels. However, an alternative sea trajectory through the Golfe de Fos is also possible. Given the recent modification of the French national regulation, very few vessels use the sea trajectory alternative, although it may be used more in the future if there is a sufficient business case for it.

The possibility for inland vessels to navigate at sea is also very relevant in the context of passenger transport, allowing operators to offer new cruises. This is, for instance, the case of the French company CroisiEurope which offers cruises on the Loire, where the inland cruise vessel must navigate on a short sea stretch to reach Saint-Nazaire. With the adoption of the above-mentioned new French regulation, CroisiEurope will now be able to propose new cruises on the Gironde up to Royan, crossing maritime domestic waters. Allowing inland vessels to navigate at sea can therefore represent an important business opportunity, also in the passenger transport sector.

Inland vessels "at sea": opportunities for the future?

Inland vessels at sea can become pertinent whenever a maritime/coastal port is not sufficiently connected to the inland waterway network, providing there is an underlying economic rationale (in other words, if this solution is less expensive than a multimodal option involving transhipment). Only then can this type of transport develop in a given area.

It is worth noting that pilot cases for this kind of transport have been elaborated. For instance, in **Germany**, a special solution for river-sea transport was developed to connect the Jade-Weser-Port to the river Weser. Indeed, the hinterland accessibility of this port is currently limited to trains and trucks as there is no direct access for inland vessels. Conventional sea-going inland ships are not competitive at the given bridge heights and water depths connecting the Jade-Weser-Port to the river Weser. Therefore, a need for a completely new ship design which is seaworthy and which at the same time can be used efficiently on the inland waterways was identified, leading to the German joint research project BiWi[19].

[19] "Schlussbericht zum Teilvorhaben Entwicklung und Optimierung eines seegehenden Binnenschiffsleichters" - Friedhoff, B. et al.; DST-Report 2081; Duisburg, 2016.

In this context, a solution was developed based on the pusher-barge principle with a special hydraulic coupling. At sea, suitable pushing vessels or tugs will be used to propel a sea-going barge. In inland navigation, a conventional canal pushing vessel is used and, ideally, pushes several barges at the same time. The concept was successfully tested with scale models up to significant wave heights of 2.5 metres.

Although the concept has not yet been expanded upon due to subsequent discussions about the possible creation of a direct inland access, the development of such a transport concept connecting seaports to inland waterways could be possible in other areas.

In **Sweden,** several projects involving inland vessels at sea are also in the pipeline. For instance, on the west coast of Sweden, the petroleum-company Preem would like to transport petrol and diesel on barge-vessels from their coastal refinery in Lysekil down to Gothenburg and up via the Göta Älv river to the town of Karlstad on the northern part of Lake Vänern. The company sees extensive opportunities for a sustainable transport-flow and great environmental and climate advantages. Avatar Logistics is the partner responsible for the logistical solution and the barge-vessel concept.

In May 2020, the Port of Stockholm will inaugurate its new major port Norvik outside the coastal town of Nynäshamn. The traffic between Nynäshamn and Stockholm is dense and the infrastructure with road and rail not fully adequate. A great deal of interest has been shown for a barge-container-shuttle between Norvik and the Södertälje Canal up to the Lake Mälaren and the western parts of the Stockholm area. Avatar Logistics and the four ports in the region are ready to meet the challenges and are discussing barge-logistic concepts.