ANNUAL REPORT 2022

INLAND NAVIGATION IN EUROPE
MARKET OBSERVATION

CCNR
CENTRAL COMMISSION
FOR THE NAVIGATION OF THE RHINE

European Commission

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September 2022

FOREWORD

Lucia Luijten
Secretary General
Central Commission for the Navigation of the Rhine (CCNR)

It is an honour for me to introduce for the first time the Annual Market Observation report of the Central Commission for the Navigation of the Rhine (CCNR). Building on several years of fruitful cooperation, this latest edition published in 2022 is again the result of close collaboration with the European Commission.

The CCNR Market Observation reports enable the monitoring on a yearly basis of the European inland navigation market situation as well as its evolution and structural development. They also provide an important basis for decision-making at various levels, for the benefit of European inland waterway transport (IWT). This report includes information regarding macroeconomic conditions, commodity prices, trend developments related to goods segments and river basins, IWT in ports, operating conditions related to water levels and freight rates, the fleet of inland vessels, employment, passenger transport and an outlook for main inland navigation market segments.

This year's report also includes a new chapter on national investments in inland waterway transport infrastructure. Indeed, to ensure a year-round navigability, the state of the IWT network must enable efficient, reliable and safe navigation for users by ensuring minimum waterway parameters and levels of service. Available yearly data relating to investment and maintenance spending for Rhine and Danube countries will from now on be reported in this annual report. It should however be highlighted that the data presented do not allow the comparison of trends in maintenance and investment spendings between different countries due to several factors. For instance, infrastructure spending can vary greatly from one country to another depending on the length and nature of the waterways as well as the number of constructions on these waterways.

I would also like to take this opportunity to thank all those who have contributed to this report and for their relentless cooperation: the Danube, Moselle and Sava Commissions, Eurostat and national statistical offices, ports, national and regional waterway administrations as well as professional organisations, in particular the European Barge Union (EBU), the European Skippers' Organisation (ESO) and the Corporation of Inland Tanker Barge Owners (CITBO). I am also very pleased to share the foreword with Mr Godfried Smit, Secretary General of the European Shippers' Council (ESC).

Unfortunately, and for the second year in a row, this year's report points to the impact of the Covid-19 pandemic. Indeed, while the inland navigation freight transport experienced a growth in 2021 compared to 2020 in almost all its market segments, transport performance did not reach the pre-pandemic value. The passenger transport sector is also still suffering from the aftermath of the pandemic characterised by a rather low activity on the demand side and a low occupancy rate of vessels, which also slowed down the shipbuilding activity for river cruises. Even though a certain recovery of cruise vessel movements in 2021 can be observed, river cruise transit figures remain far below the pre-pandemic level of 2019.

Last but not least, I would like to express my sincere support to Ukraine and its citizens, as well as those working in the inland navigation sector who demonstrate their resilience and courage. The Russian war of aggression towards Ukraine is not without consequences for our sector, both on the freight and passenger market segments.

In spite of these difficult circumstances, I would like to wish you a pleasant read.

Godfried Smit
Secretary General
European Shippers' Council (ESC)

This report formally looks back over 2021, but it would not be appropriate to avoid mentioning the fact that, for the first time, this millennium has been confronted with war. This war is a tragedy for many innocent people who are faced with its devastating consequences. For this reason, writing this foreword is not *business as usual*. If we look at the economic consequences of the war, inland shipping has an important role to play in transporting liquid gas.

Supply chains in general have already been confronted with many challenges over the last years. These have been most visible in the deep-sea maritime sector but have not affected the entire supply chain. The changing behaviour of customers during the Covid pandemic caused serious problems for carriers. Consequently, service levels decreased, and the lead times increased considerably. Ports were and still are confronted with considerable congestion. However, all parties involved in logistics are trying to find solutions to diminish the impact.

What does this mean for inland shipping? Is the present situation only a challenge or are there also opportunities? From a shipper's perspective, I see substantial opportunities for co-modality and the barging industry in general. Inland shipping is probably the most reliable modality. Additionally, it is one of the cleanest modes of transport in terms of emissions per tonne-kilometre which is a significant asset, taking into consideration the high ambition of the European Commission in its "Fit for 55" package.

If I try to summarise in one word logistics over the coming years, that word would be *capacity*. This capacity is reflected, for instance, in the room for emissions, in the labour market, and in infrastructure. In the framework of sustainability in inland shipping, it will be a challenge to move from good to excellent. Small and Medium Enterprises play a crucial role in the barging industry. Investments in new ships are sometimes not very easy, especially if a ship has not reached the end of its economic lifetime. The banking industry plays a major role here and we will have to investigate whether shippers could also play their part. From the perspective of the European Shippers Council's members, it is clear that they will not sign a blank cheque. For the coming times, I strongly believe that we should intensify our dialogue and find room for manoeuvre. Also, important stakeholders such as the European Commission should take a pragmatic approach as well as support the sector.

Looking at the labour market, one can see that the sector has the advantage of being far less labour intensive than the road haulage industry. At the same time, we should not close our eyes to the lack of personnel. All logistics stakeholders should work together in their efforts to make logistics more attractive and inclusive.

As regards hard infrastructure, inland shipping still has room for growth. There is a clear advantage for the inland shipping industry compared to other green modes, such as the rail industry. However, the sector should continue to prepare for the consequences of climate change, one of which is, for example, low water. Also, the role of small ships should not be neglected.

All in all, we can face the future with confidence. At the same time, we should be aware that other sectors are also moving in a more sustainable direction. Electricity and hydrogen will be introduced in road transport. Autonomous driving will extend the capacity in infrastructure. It is therefore now that inland shipping should take its market share and prove this mode's advantages over others. When shippers are "in", I am sure most of them will stay as users of barges.

To conclude, inland shipping is a sector to be proud of. At the same time, you should be more confident in yourselves and proclaim your message even louder to the outside world!

ESC


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Constanța

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SUMMARY

The year 2021 was marked by a robust recovery, resulting in different cargo segments of IWT reaching and sometimes exceeding pre-pandemic throughput and transport levels. In the wake of the economic recovery, commodity prices were already on a rising trend throughout the second half of the year. The rapidly increasing demand, however, also induced disruptions in trade for industrial components.

The economic recovery has been particularly pronounced for the inland navigation freight transport sector, which experienced a growth in 2021 compared to 2020 in almost all its market segments. Cargo transport on the traditional Rhine increased by 5.4%, although it remained 3.2% lower than in 2019. Similarly, transport performance in 2021 increased by 4.5% compared to 2020 but did not reach the pre-pandemic value.

The increased steel production and the high gas prices led to a sharp rise in coal demand and, thus, coal transport on the Rhine, which increased by 28.5% in 2021. The surge in coal transport on the Rhine corresponded to the surge in maritime coal transport. The Port of Amsterdam is a clear example of this trend, as in 2021 the seaborne handling of coal rose by 41%. Because of a recovery in steel production, the transport of iron ore and metals grew consistently by 15.7% and 11.2% respectively. Other cargo segments, namely containers, agribulk and foodstuff, sand, stones and gravel as well as mineral oil products and chemicals, remained moderately stable.

The economic upturn recorded in 2021 is well marked by the trends in transshipment of goods in main European seaports. Indeed, but for the Port of Hamburg, which sustained a strong decrease in inland waterway goods transport (-16%), an increase was observed in main European seaports (+6% for the Port of Rotterdam, +9.7% for the Port of Constanța, +9% for the North Sea Port, +7.5% for the Port of Antwerp).

Overall, the recovery in cargo transport was reinforced by water level conditions. On the Rhine, the number of critical low water days was somewhat limited in 2021. As an example, for the gauge station of Kaub at the Middle Rhine, the number of days below a critical low water level (equivalent water level) was 10 in 2021, compared to 107 in the low water year 2018. An analysis of water level data for the Danube indicates a slightly higher number of low water days in 2021, and also in the time frame from 2015 to 2021.

Although the overall hydraulicity conditions were rather positive, there was nevertheless a deterioration of these conditions at the end of the year (Q4 2021). This drop in water levels led to an increase in transport prices or freight rates in Q4 2021, in particular for dry cargo available on the spot market. Freight rates for liquid cargo have shown a slightly negative trend in the last two years, which was only interrupted in Q4 2021 due to low water levels. The reasons for the more negative trend lay in less transport demand for liquid cargo due to the Covid pandemic.

For cargo transport, the outlook is overall orientated towards recovery for 2022-2024. However, there are considerable downside risks that stem from the Russian war of aggression against Ukraine and its impact on the economy. These economic impacts mainly consist in increased commodity prices and supply disruptions.

Grain transport is expected to be affected by the war in Ukraine, as this invasion has led to strong bottlenecks in grain export from the Black Sea Region to many grain-consumer markets. Therefore, alternative grain export regions gain in importance. It is expected that harvesting regions in France and related inland waterway hinterland transport on French waterways will benefit from this situation. The river-seaport of Rouen is a major grain export hub, and inland vessels in the hinterland transport grain to the port.

With the revival of trade patterns between the Port of Rouen and countries in North Africa, inland waterway transport of grain in northern France is expected to benefit. Countries in North Africa are large importers of grain and need to secure their grain provisions.

In 2021, the number of inland vessels in Europe comprised more than 10,000 vessels registered in Rhine countries, 3,500 in Danube countries and 2,300 in other European countries. The newbuilding rate for dry cargo vessels decreased by eight units, from 26 in 2020 to 18 in 2021. The number of newly built tanker vessels increased by 4 units, from 40 units in 2019 to 54 in 2020 and 58 in 2021. The majority of the new liquid cargo vessels are dedicated to the capacity categories of 3,000-4,000 tonnes and 2,000-3,000 tonnes.

The development of employment in goods and passenger transport in the IWW transport sector in Europe shows a changing pattern from 2019 to 2020. The consequences of the pandemic have been particularly severe for passenger transport. Indeed, reports for this category show an increasing trend from 17,895 employees in 2010 to 23,100 in 2019, whilst in 2020 the employment decreased to 21,023 employed persons. The number of employed persons in the transport of goods sector counted 23,170 persons, mildly above the employment in passenger transport.

The measures adopted to contain the virus during the pandemic severely affected the passenger transport sector in 2020 and 2021. Even though in 2021 it is possible to observe a recovery of cruise vessel movements due to the easing of prevention measures, river cruise vessel movements on the Rhine are still 55% below the pre-pandemic level of 2019.

The number of cruise vessel transits at the lock of Iffezheim on the Rhine grew from 534 in 2020 to 1,315 in 2021, although it remained far below the 2,929 transits in 2019. Comparable trends are registered for the Danube and the Moselle. For the Danube at the German-Austrian border, figures increased from 324 cruise vessel transits to 1,255, even if still below the 3,668 in 2019. For the Moselle, the number of transits fell from 1,536 to 469 between 2019 and 2020 but grew to 1,000 in 2021. Not only did the vessel movements fail to reach pre-pandemic levels, but the occupancy rate of the vessels was far below the values known for the year 2019.

Even if the river cruise market seems to be improving, some sources of uncertainty for the outlook on the passenger transport sector for 2022 could ensue from the ongoing war in Ukraine as well as the increased prices of raw materials such as steel, necessary for building new vessels.

Many countries opened their borders to travellers in spring 2022 and new orders for river cruise vessels are once more starting to be placed. Nevertheless, the war in Ukraine is causing some difficulties for the European river cruise market. Firstly, the attractiveness of the lower Danube might significantly decrease due to the potential risk of sailing in the area. Secondly, passenger demand might also be affected on other European rivers. The reason is that US-American tourists will perceive the war in Ukraine as a phenomenon linked to Europe in general. Moreover, the war has caused a significant reduction of Ukrainian personnel working in the river cruise market. Furthermore, the rise in fuel prices may lead to surcharges on the travel fares, thereby impacting tourism as well.


MAERSK
HYUNDAI
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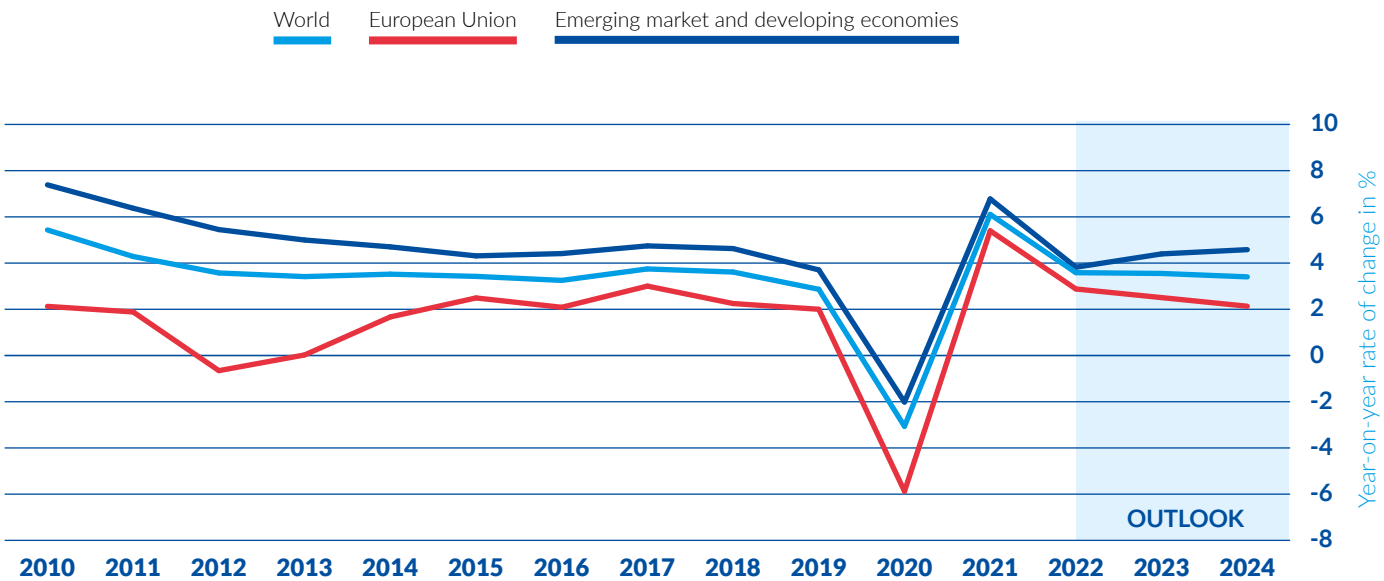
01

MACROECONOMIC CONTEXT AND OUTLOOK

- **The economic recovery that started in 2021 and continued throughout the first months of 2022 caused, together with supply-side restrictions in the transport sector, an increasing trend in freight rates of seaborne trade and consequently raised inflation.**
- **The Russian war of aggression against Ukraine led to a further increase in commodity prices and uncertainty on future economic growth. Oil and gas prices are projected to increase by 55% and 147%, respectively, in 2022. Coal demand, and hence coal prices, register a strong upwards movement in 2022 due to the European embargo on Russian coal.**
- **Euro area GDP is expected to decrease by 2.8% in 2022, assuming that the war remains confined to Ukraine.**

- The year 2021 and the beginning of 2022 showed a stable global economic recovery from the pandemic. Nevertheless, the Russian war of aggression against Ukraine[1] has resulted in a significant slowdown in expected growth and a costly humanitarian crisis.
- Already in 2021, supply side restrictions appeared in the transport sector, in the form of congested seaports and maritime shipping lanes. Together with the rapid recovery in 2021, these factors increased freight rates in seaborne trade, thereby raising inflation rates further[2].
- Due to the war, Ukrainian seaports were closed, and exports of Ukrainian grain and other commodities were thereby blocked. Also trade and commodity flows (for example coal) from Russia were strongly reduced.
- Trade and financial sanctions imposed on Russia caused restrictions in energy provisions of countries in central and western Europe, through which the rising trend in inflation became even more pronounced. Commodity prices, especially for the food and energy market, are soaring.
- Global growth (GDP) is projected to slow down from an estimated 6.1% in 2021 to 3.6% in 2022 and 2023. This forecast assumes that the war remains confined to Ukraine. Global trade growth is expected to slow down in particular in 2022, from an estimated rate of 10.1% in 2021 down to 5.0% in 2022 and a further 4.4% in 2023.
- Euro area Gross Domestic Product (GDP) growth is revised downwards to 2.8%, which is a 1.1 percentage point lower than the projection made in January 2022. Economic and monetary policy is facing a difficult trade-off between fighting inflation and enhancing economic growth. Fighting inflation requires an increase in interest rates, while this would imply higher financing costs and therefore lower private investment and lower growth.

FIGURE 1: **PERCENTAGE CHANGE IN GDP, CONSTANT PRICES**



Source: IMF World Economic Outlook Database, Outlook from April 2022

[1] This term is based on a publication of the EU Commission, see the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2022), An action plan for EU-Ukraine Solidarity Lanes to facilitate Ukraine's agricultural export and bilateral trade with the EU (12.5.2022).
[2] OECD (2021), OECD Economic Outlook, Interim Report September 2021: Keeping the Recovery on Track, OECD Publishing, Paris, https://doi.org/10.1787/490d4832-en. The report contains a study which demonstrates that rising commodity prices and increasing freight rates explain about three quarters of the two-percentage point change in G20 consumer price inflation since the second half of 2020.

Trade

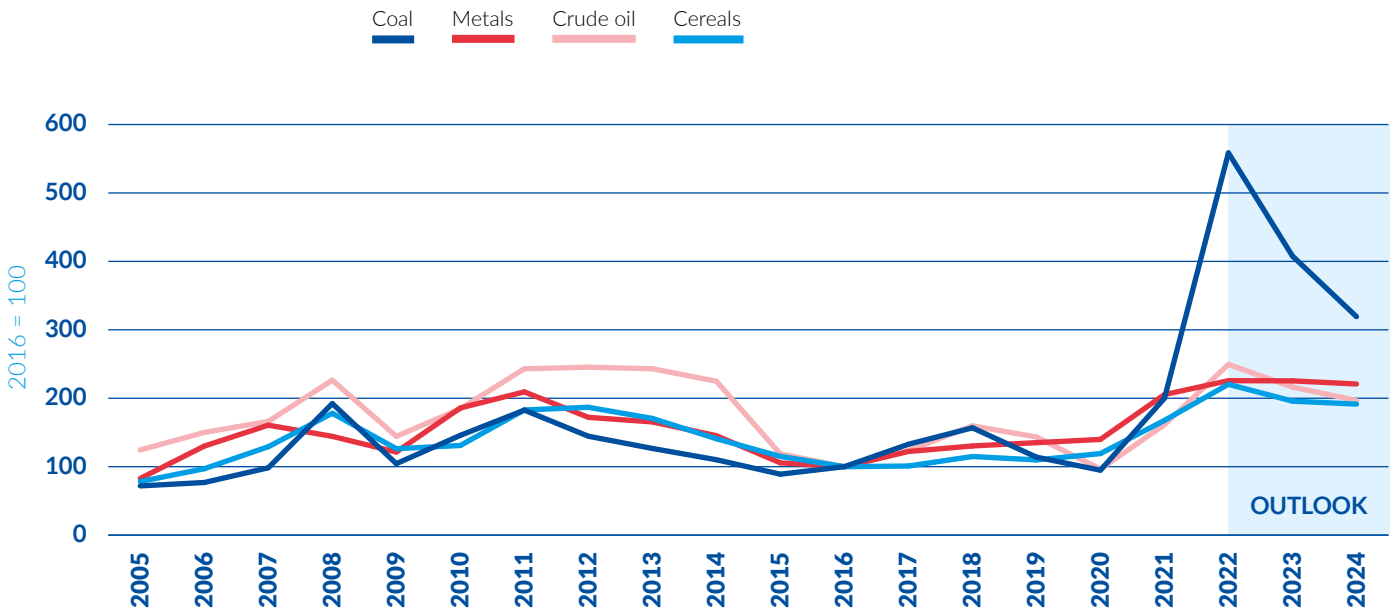
- With the war in Ukraine, trade flows are increasingly disrupted. Supply chain disruptions and a shortage of components for industrial production were already present before the war in Ukraine. This is harmful to some industries, including the automobile industry.
- This disruption goes beyond commodities: one example is the production of neon gas, which is concentrated in Russia and Ukraine. Neon gas is needed for producing semiconductors out of silicon and is therefore essential for the automobile, electronics, and IT industries. Additionally, the global car production is highly dependent on an electronic wiring system produced in Ukraine and metals such as palladium and nickel produced in Russia.
- One major economic consequence of the disruption of trade flows is that prices for almost all kinds of commodities are on a rising path. This concerns not only grain (Russia and Ukraine account for around 30% of global wheat exports), but also coal, crude oil, minerals and metals.

Commodity prices and their impact on inland waterway transport (IWT)

Crude oil

- Futures markets indicate a rapid growth for oil and gas prices in 2022 (55% and 147% respectively) and then a decline in 2023 as the supplies adjust. For inland navigation, high oil prices have a double effect. On the demand side, they lead to lower transport demand for oil products, whereas on the supply side, high oil prices imply higher fuel costs, which represent at least a quarter of the total operational costs in IWT.

FIGURE 2: **COMMODITY PRICE INDICES** (2016 = 100) *



Source: IMF (April 2022)

** Coal includes South African and Australian coal. Cereals include wheat, maize (corn), rice and barley. Metals include copper, aluminium, iron ore, tin, nickel, zinc, lead, and uranium. Crude oil: Simple average of three spot prices (Dated Brent, West Texas Intermediate, Dubai Fateh).*

Coal

- The surge in coal prices in 2022 reflects a strong upward movement in coal demand due to tight demand-supply relationships and the shunning of Russian coal. Already in 2021, coal transport on the Rhine picked up by almost 29% (see Chapter 2), because of high gas prices.
- In 2020, Russia provided 55% of the European Union's coal imports and 16% of the world's coal needs.[3] In the case of a persistently high coal demand and a blockade of Russian coal in the coming years, coal demand could be covered by importing it from other coal supplying countries, such as Australia, the United States, Canada and South Africa.
- Coal transport on the Danube also partly relied on coal from Russia. This was also the case of the steel industry in Hungary. However, the logistical chain that brought Russian coal via seaborne trade and the Port of Constanța to Hungary was abandoned in 2022 and substituted by a transport chain involving the seaport of Koper in Slovenia and hinterland transport by rail.

Grain

- According to IMF data on commodity prices,[4] prices for all kinds of cereals increased by around 85% between 2020 and 2022, which has been caused by rising food demand during the Covid crisis, and the war in Ukraine.
- Ukraine is one of the world's most important exporters of cereals and oilseeds. According to Eurostat figures[5] the EU-27 imported 8.0 million tonnes of grain from Ukraine in 2021 and 1.1 million tonnes from Russia. Grain exports via Ukrainian and Romanian seaports and river-sea ports are essential for food security in North Africa, Asia and the Middle East.
- The war in Ukraine negatively impacts harvest and export volumes for grain from Russia and Ukraine. Grain export via the seaports at the Black Sea accounted for 98% of all Ukrainian grain exports. Alternative exporting routes need to be identified to export the grain from Ukraine. One such route is the railway line to Romania. However, the capacity of the railway line cannot cover the large volumes exported via seaports.[6]
- Solutions for exporting grain from Ukraine include its transportation via rail and road to the Ukrainian river-seaports of Reni and Izmaïl, to the Moldavian river-seaport of Giurgiulești and to Romanian river-seaports such as Brăila or Galați. In these ports, the grain can then be loaded on river barges or on small seagoing vessels. In the first case, river barges can transport the grain to the seaport of Constanța, where it is loaded on seagoing vessels with large capacities. In the second case, small seagoing vessels can transport the grain between the river-seaports and the destinations in North Africa with or without further transshipment in Constanța.
- Regarding the rail transport of grain to the above-mentioned ports, it should be mentioned that differences in the rail gauge between Ukraine and most parts of the EU-27[7] exist. However, this does not consider the Ukrainian ports of Reni and Izmaïl[8], nor the Port of Galați in Romania, which is equipped with the same wide gauge as exists in Ukraine.

[3] Source: German Association of Coal Importers (VDKI)
[4] https://www.imf.org/en/Publications/WEO/weo-database/2022/April (last consulted 7 June 2022)
[5] Data series: Eurostat [DS-018995]. Reporting entity: EU-27. 'Grain' includes "Cereals and cereal preparations".
[6] Le Journal de la Marine Marchande, 27 April 2022, Ukraine : 80.000 t de céréales ont pu être expédiées. Available at https://www.journalmarinemarchande.eu/filinfo/ukraine-80-000-t-de-cereales-ont-pu-etre-expediees (last consulted 28 April 2022)
[7] Ukraine uses a rail gauge of 1.520 mm width (broad gauge), while the EU standard gauge is 1.435 mm.
[8] According to the newspaper De Volkskrant from 9 June 2022, Ukrainian grain was indeed delivered to the Ukrainian ports of Reni and Izmaïl at the border with Romania (in May and June 2022). In these ports, the grain was loaded on inland barges and delivered to the Port of Constanța.

- Grain imports towards North African countries are also covered by exports from Middle Danube countries (Hungary, Serbia) via waterway transport on the Danube and maritime transport between Constanța and North Africa. However, as a reaction to rising grain prices and less imports from Ukraine, Hungary imposed export controls on wheat in March 2022. In Serbia, an export control scheme including quotas was introduced in the same month. This scheme involves export controls for wheat, corn, flour and refined sunflower oil. This can be seen as a reaction to an expected shortage of sunflower oil due to less imports from Ukraine.

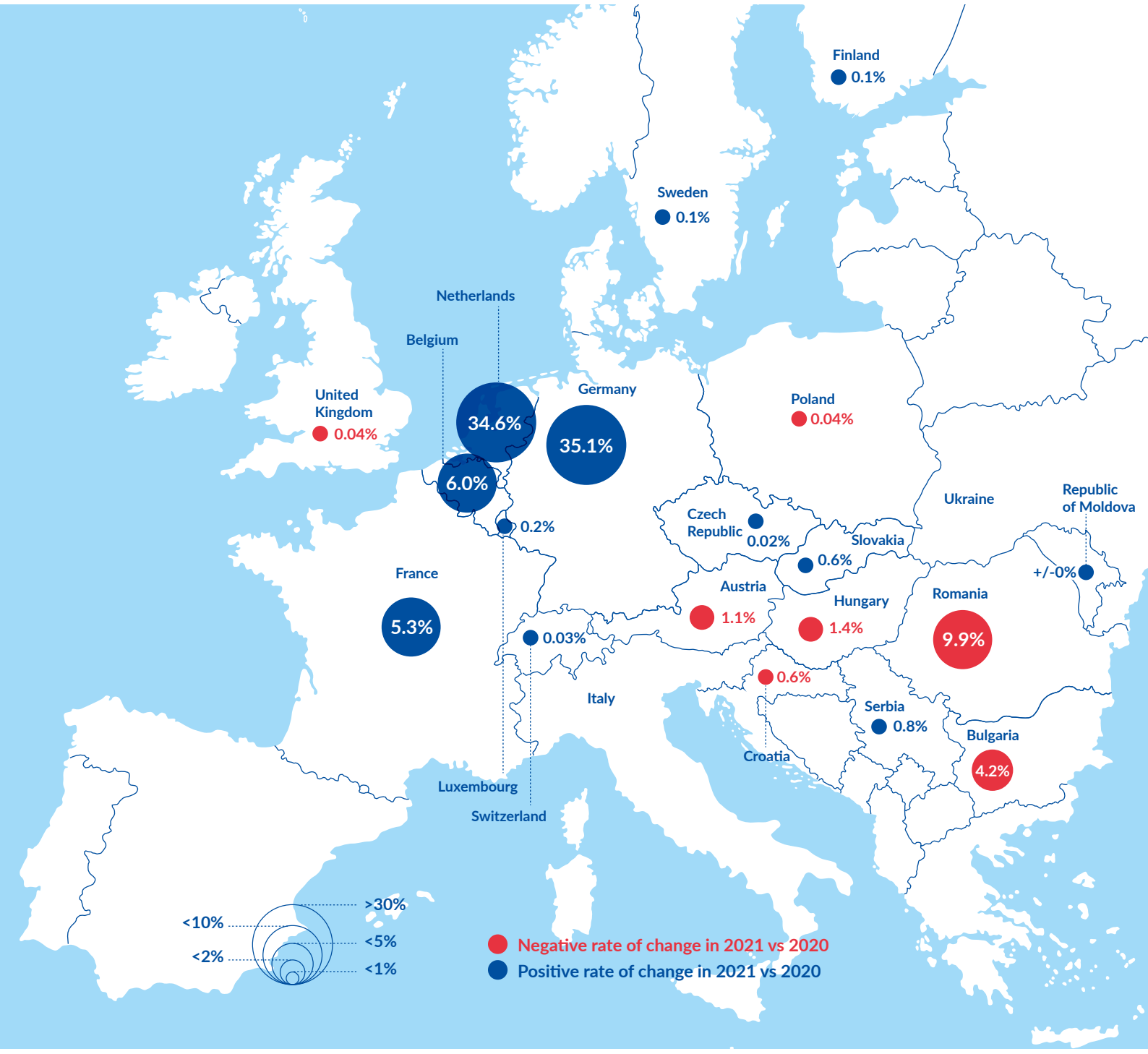
02

FREIGHT TRANSPORT ON INLAND WATERWAYS

- **Transport volume on the traditional Rhine increased by 5.4% in 2021, and transport performance by 4.5%, compared to 2020. Coal (+28.5%), Iron ore (+15.4%) and metals (+11.9%) registered higher percentage growth rates.**
- **For container transport on the traditional Rhine, 1.99 million TEU were recorded in 2021. In general, container transport on the Rhine has weakened in recent years due to a combination of macroeconomic, natural and port related factors (slowdown in world trade, low water periods, congestion in seaports).**
- **On the Upper and Middle Danube, transport volumes were on average lower in 2021 than in 2020. An important exception was the Austrian Danube around Vienna, where considerable growth was observed. The Lower Danube region, in particular the canals connecting the Danube to the Black Sea, recorded a clear upward trend in goods transport.**

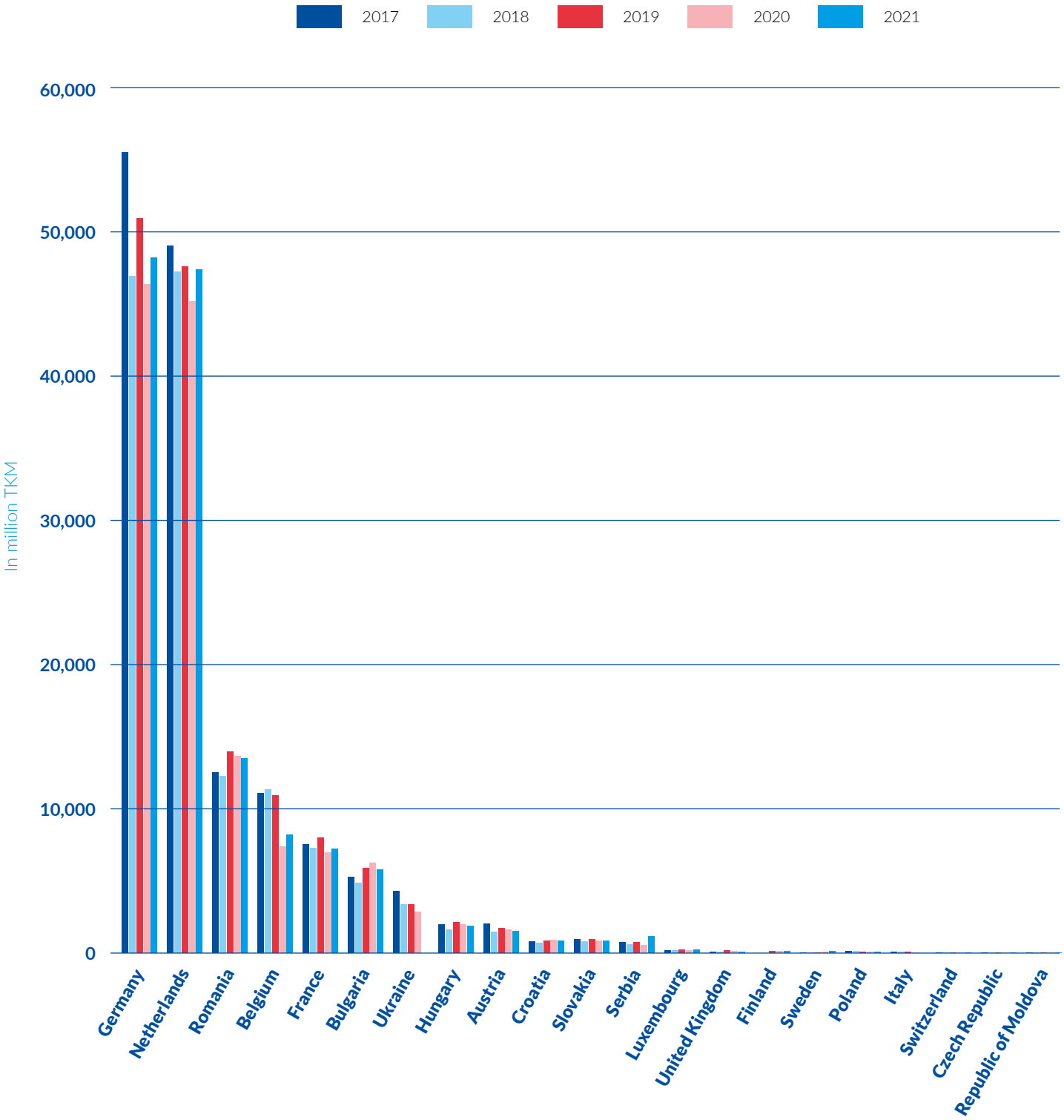
TRANSPORT IN EUROPE
AND BY COUNTRY

SHARE OF THE COUNTRIES' TONNES-KM (TKM) **IN TOTAL TRANSPORT PERFORMANCE IN EUROPE** (IN %)



Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland and the Republic of Moldova).
The share of IWT performance in Europe in 2021 for Ukraine and Italy is not available due to a delay in the publication of the data.

FIGURE 1: **IWT TRANSPORT PERFORMANCE IN 2017, 2018, 2019, 2020 AND 2021 IN MAIN EUROPEAN IWT COUNTRIES** (IN MILLION TKM)

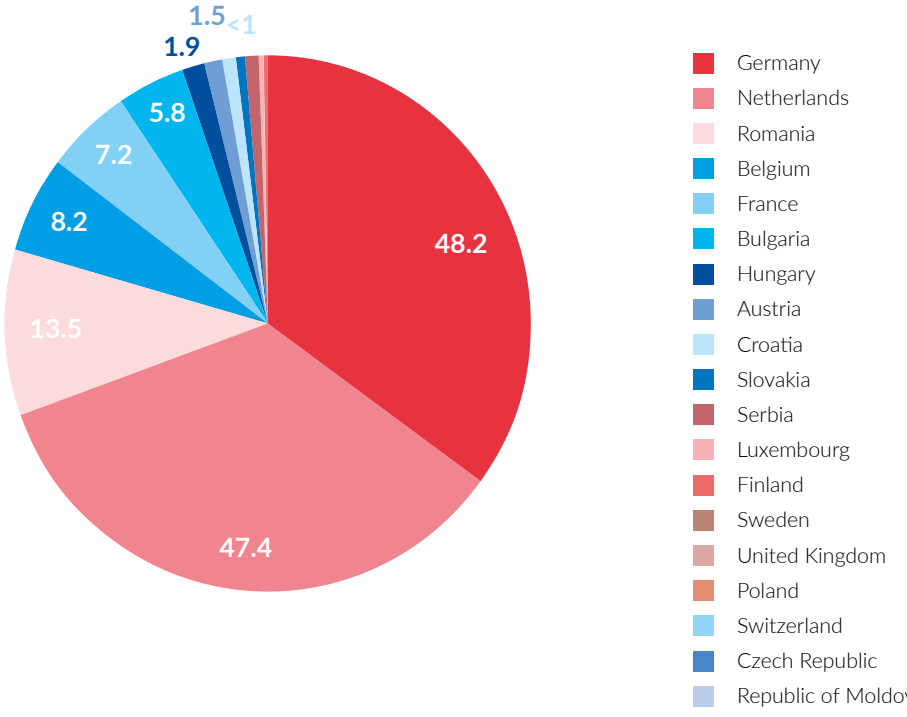


Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland and the Republic of Moldova)
The 2021 values for Ukraine and Italy are not available due to a delay in the publication of the data.
Note: for UK, IWT consists in non-seagoing traffic which is taking place wholly within inland waters and seagoing traffic which crosses into inland waterways from the sea. In this figure, for the sake of consistency with the methodology used by Eurostat, only the transport performance related to the traffic taking place wholly within inland waters is reported (amounting to 56 million TKM). However, it is worth noting that most of IWT in the UK consist in seagoing traffic which crosses into inland waterways (amounting to more than 1.3 billion TKM). Overall, the IWT performance in the UK is reported to reach almost 1.4 billion TKM.

Data for Ukraine have been incorporated into the 2021 annual report. The main navigable rivers of Ukraine are the Dnieper, the Southern Bug and the Danube. From the perspective of the main territory of Ukraine, the Danube forms a border with Romania along a rather short stretch in the most south-western part of the country. The Dnieper and the Southern Bug flow through the heartland of Ukraine. All three rivers flow in the north-south direction and empty their waters into the Black Sea. However, in the current publication the IWT data for Ukraine are not available due to the consequences of the war.

Taking into consideration total transport performance, Rhine countries (Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland) accounted for 81.1% of total inland waterway transport performance in the EU-27, plus Switzerland, Serbia and the Republic of Moldova. The share for Danube countries was 18.6% (excluding Ukraine).

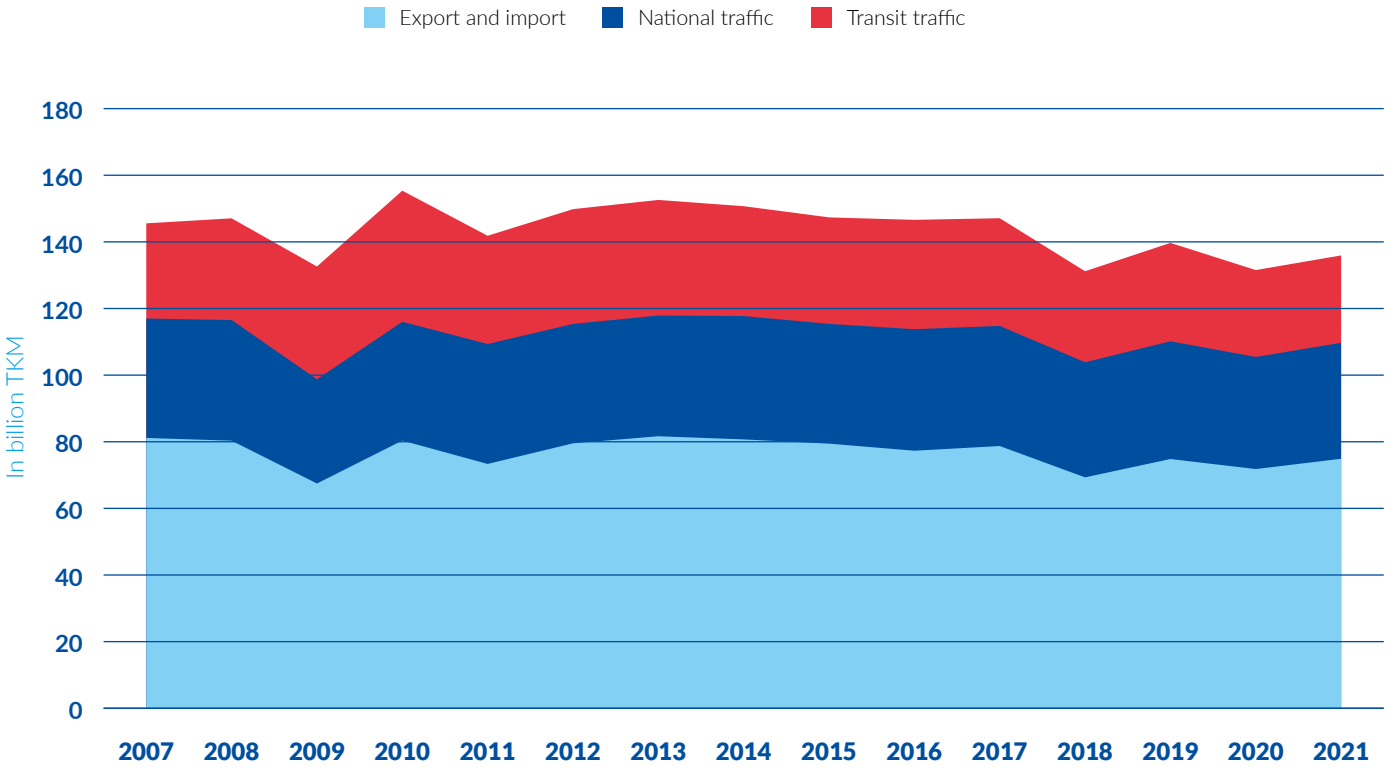
FIGURE 2: **YEARLY INLAND WATERWAY TRANSPORT PERFORMANCE IN EUROPEAN COUNTRIES** (IN BILLION TKM IN 2021) *****



Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland and the Republic of Moldova)
** Data for Ukraine and Italy not available for 2021*

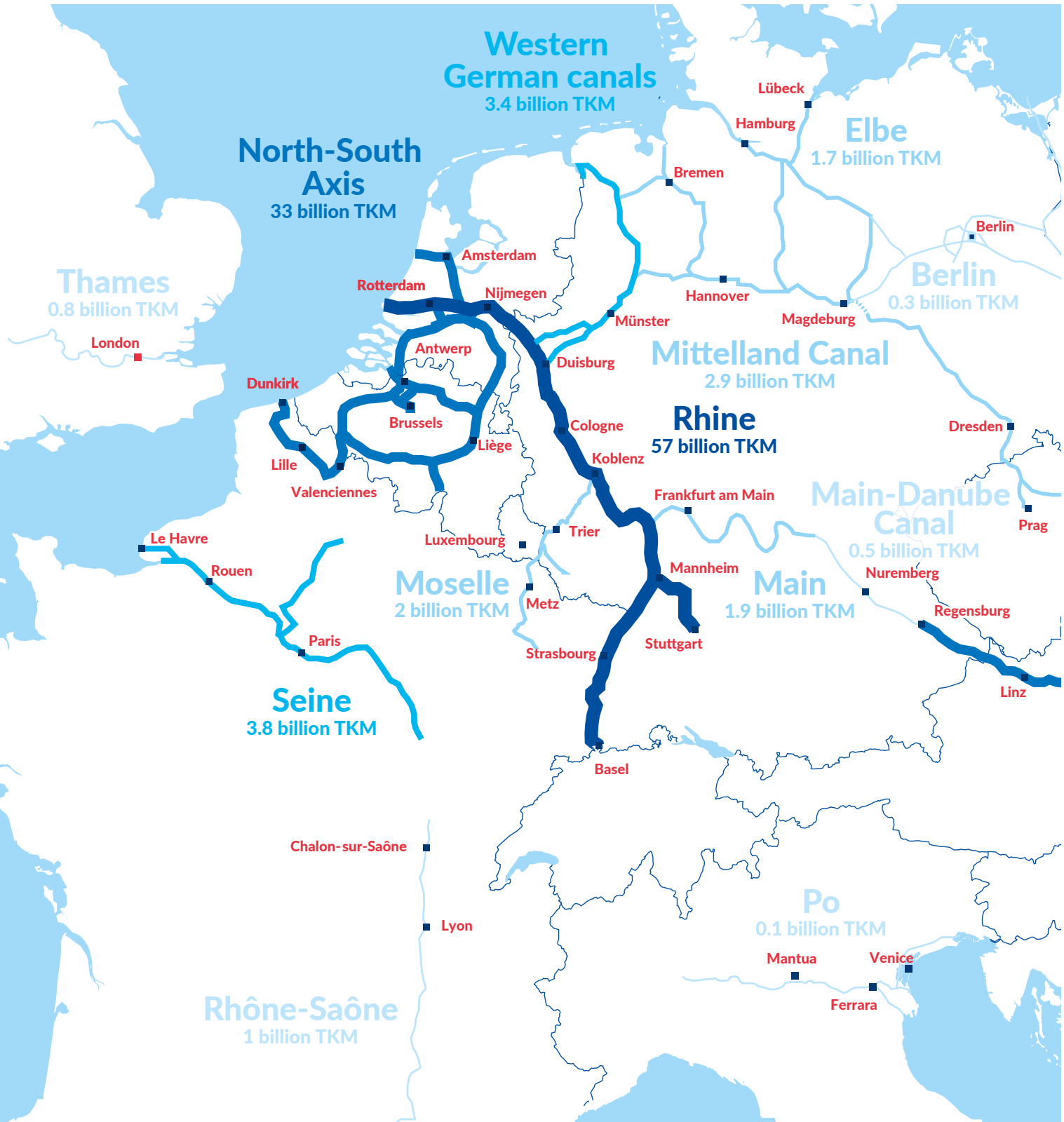
From the total inland waterway transport performance in Europe in 2021, which amounts to around 137 billion TKM (without Ukraine), 74.4% represented transport that crossed a border in one way or another – whether it be in the form of export, import or transit traffic. Transit traffic taken separately had a share of 19.3% in 2021, and export and import traffic had a share of 27.8% and 27.3%, respectively.

FIGURE 3: **YEARLY INLAND WATERWAY TRANSPORT PERFORMANCE IN THE EU-27 ***
(IN BILLION TKM)



Source: Eurostat [iww_go_atygo]
** EU-27 according to member countries in 2021*

I TRANSPORT
BY MAIN EUROPEAN RIVER BASINS



TRANSPORT PERFORMANCE IN MAIN EUROPEAN RIVER BASINS (IN BILLION TKM)

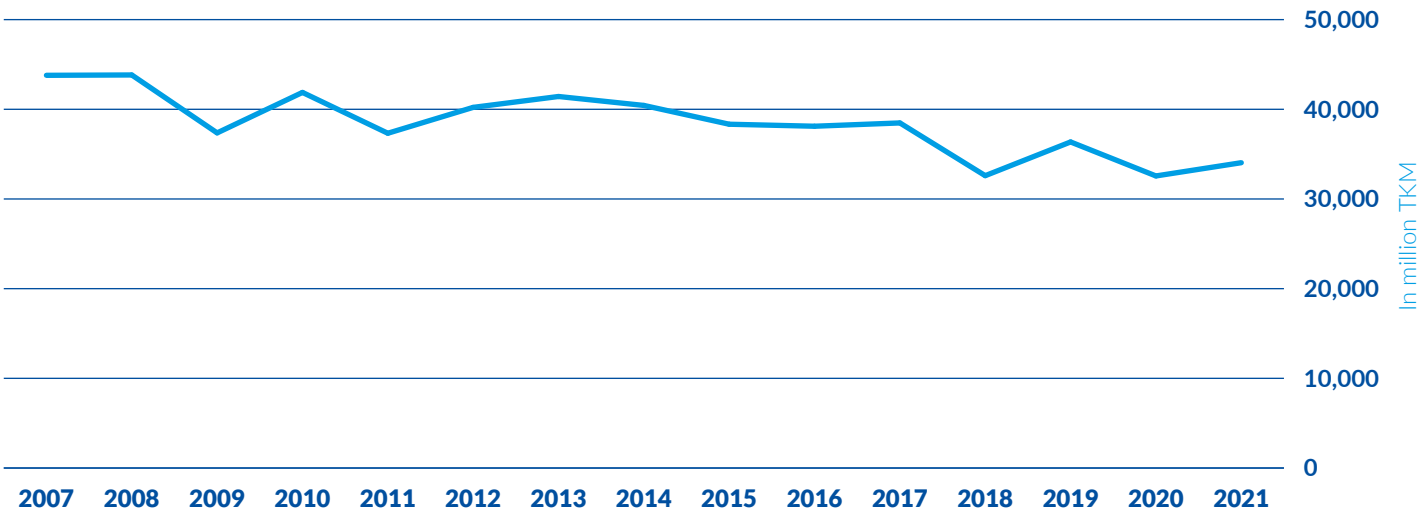
Sources: CCNR analysis based on Destatis, VNF, Eurostat [IWW_GO_ATYGO], UK Department of Transport

RHINE BASIN

Transport volume and transport performance on the traditional Rhine

Cargo transport on the traditional Rhine (from Basel to the German-Dutch border) amounted to 168.6 million tonnes in 2021, compared to 160.0 million tonnes in 2020, which represented an increase of 5.4%. The result in 2021 is still 3.2% lower than in 2019. The unfinished recovery from the Covid pandemic is also reflected in the value for transport performance in 2021, which was 6.4% lower than in 2019 (and 4.5% higher than in 2020).

FIGURE 4: **TRANSPORT PERFORMANCE ON THE TRADITIONAL RHINE** (IN MILLION TKM)



Source: CCNR analysis based on Destatis

Transport activity at different Rhine stretches, on Rhine affluents and on canals linked to the Rhine

Along with the overall cargo transport on the traditional Rhine, cargo transport and vessel movements are registered at specific measurement points (locks or border points). The relevant volumes represent the transport activity only at these points and do not represent total Rhine transport. However, this approach reveals existing differences in transport intensity between different Rhine stretches, for example between the Lower and the Upper Rhine.

TABLE 1: **MEASUREMENT POINTS FOR FREIGHT TRANSPORT IN THE RHINE BASIN**

Rhine stretch or affluent	Measurement point	Name	Volume of transport (in million tonnes)			Number of cargo vessels passing		
			2019	2020	2021	2019	2020	2021
Lower Rhine	Border DE/NL	Emmerich	141.1	130.0	138.1	103,624	102,555	107,712
Upper Rhine	Border DE/FR	Iffezheim	21.3	16.9	19.1	21,236	21,121	23,631
Wesel-Datteln Canal *	Junction with Rhine	Wesel-Friedrichsfeld	16.9	17.0	19.1	15,752	18,085	20,065
Rhein-Herne Canal *	Junction with Rhine	Duisburg-Meiderich	14.5	13.2	13.6	14,848	10,650	11,935
Main	Junction with Rhine	Mainz-Kostheim	13.2	13.5	12.1	15,519	16,333	15,213
Moselle	Junction with Rhine	Koblenz	9.4	8.1	9.2	8,868	7,055	8,459
Neckar	Junction with Rhine	Mannheim-Feudenheim	5.4	5.1	5.0	5,753	6,564	5,661

Sources: German Waterway and Shipping Administration, Destatis, Mosel Commission
** For these two canals, the source for cargo volumes is the German Statistical Office (Destatis), while for all other data in the table, the source is the German Waterway Administration.*

The West German Canal network (Wesel-Datteln Canal, Rhine-Herne Canal) embraces a high volume of liquid cargo and coal transport. The chemical industry alongside the Wesel-Datteln Canal relies on its logistics intensively on this waterway, as does the energy sector (coal fired power plants). Goods transport increased by 12% on the Wesel-Datteln Canal and by 3% on the Rhine-Herne Canal.

The river Main relies largely on materials related to the construction sector (sands, stones, building materials) with a share of 30% in 2021. However, transport volumes on this eastern Rhine affluent decreased by 10% in 2021.

On the river Moselle, iron ore, coal and agribulk play a large role due to the steel production in the Saar region in Germany and the agricultural production in the region of Lorraine in France. In 2021, a strong increase in the transport of iron ore (+46%) and coal (+42%) was recorded at the lock of Koblenz, mirroring similar figures observed for the Rhine. For agribulk, the development was negative (-8%). Overall, transport of goods increased by 13% at the lock of Koblenz at the junction of the Moselle with the Rhine and by 15% at the lock of Apach (border DE/FR).[9]

While container transport has followed a growth trend on the Moselle in the last ten years, this trend weakened slightly in 2021, when 24,438 TEU were recorded at the lock of Koblenz, compared to 25,521 TEU in 2020. However, it should be noted that container transport was around 30% lower only six years before: in 2015, 16,896 TEU had been transported on the Moselle.

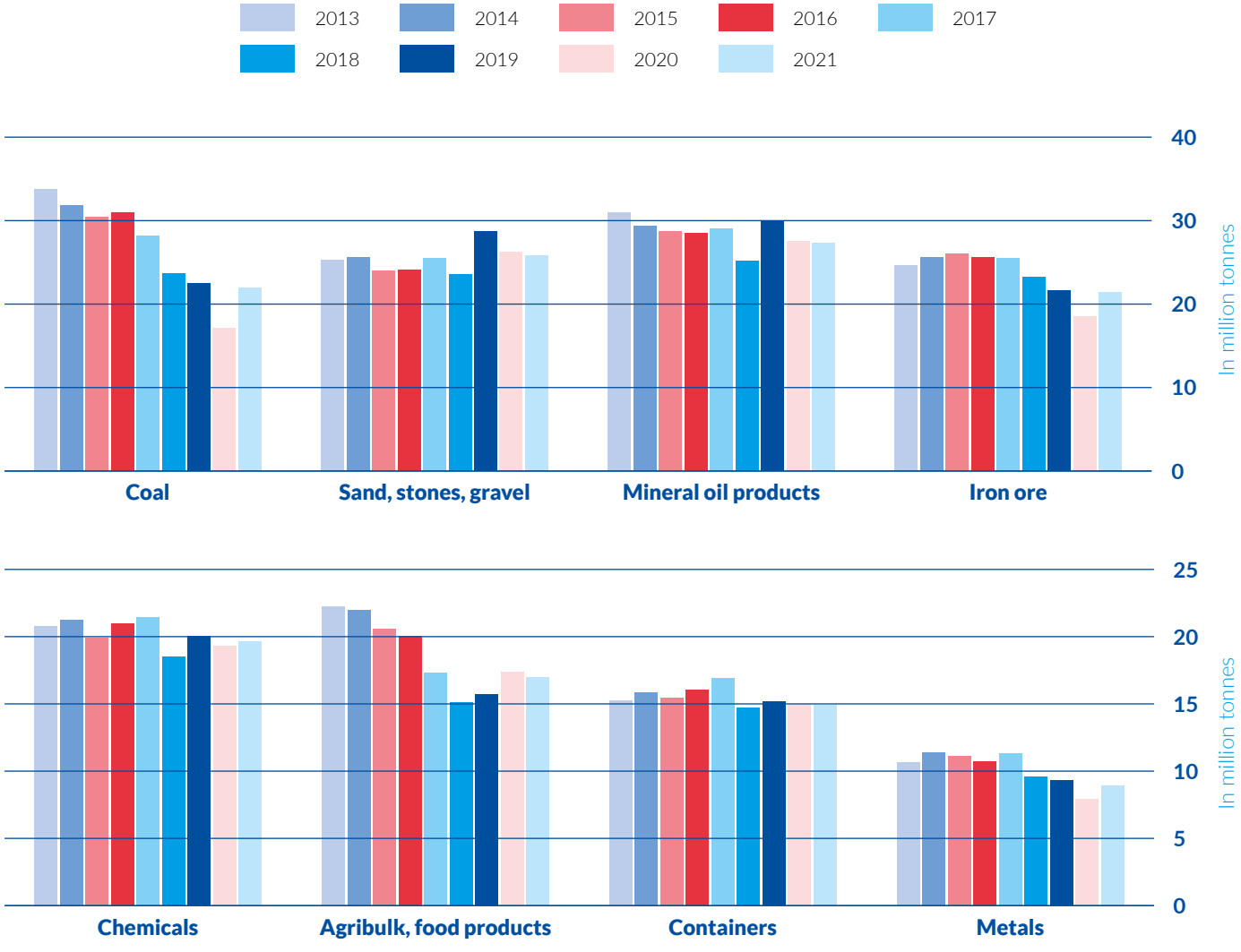
[9] *Source: Moselle Commission (2022), report "Verkehrszahlen Mosel 2021"*

Rhine transport by cargo segment

Whereas a phasing out of coal was mentioned in the annual reports of previous years and shown by the data for the time span between 2013-2020, the year 2021 saw a reversal of this trend where coal transport on the Rhine increased by 28.5% in 2021. This sharp rise stems from the high coal demand of the energy sector due to high gas prices as well as from the increased steel production. Since March 2022, the demand for steam coal (which is used in the energy sector[10]) is furthermore fuelled by ever rising gas prices, due to the war in Ukraine. An example for the linkages between seaborne trade and inland waterway transport is seen by the development in the Port of Amsterdam: seaborne handling of coal increased by 41% in 2021 to reach 10.4 million tonnes in 2021. The port explains this development by strongly increasing gas prices.

Iron ore and metals are also in recovery mode compared to 2020 and the impact of Covid. Containers, agribulk and food products, sand, stones and gravel, as well as mineral oil products and chemicals, remained at a rather stable level. Mineral oil products faced difficult framework conditions, due to the pandemic and the related reduction in mobility and demand for gasoline, diesel and kerosene.

FIGURES 5 AND 6: **GOODS TRANSPORTED ON THE TRADITIONAL RHINE BY TYPE OF GOODS** (IN MILLION TONNES) *



Source: CCNR analysis based on Destatis
** For containers: net-weight*

[10] Around half of the coal that is imported by Germany and transported on the Rhine is used for producing electricity and heating energy. The other half is used for producing steel.

TABLE 2: **GOODS TRANSPORT ON THE TRADITIONAL RHINE IN TOTAL AND BY LARGEST GOODS SEGMENTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020**

Goods segment	2019	2020	2021	2021/2020 in %
Traditional Rhine in total	**174.1**	**160.0**	**168.6**	**+5.4**
Mineral oil products	30.0	27.6	27.3	-1.1
Sands, stones, gravel	28.6	26.2	25.8	-1.5
Chemicals	20.1	19.3	19.6	+1.6
Iron ore	21.6	18.5	21.4	+15.7
Agribulk, food products	15.7	17.4	17.0	-2.3
Coal	22.4	17.1	22.0	+28.6
Goods in containers	15.2	15.0	14.9	-0.6
Metals	9.3	8.0	8.9	+11.2

Source: CCNR analysis based on Destatis

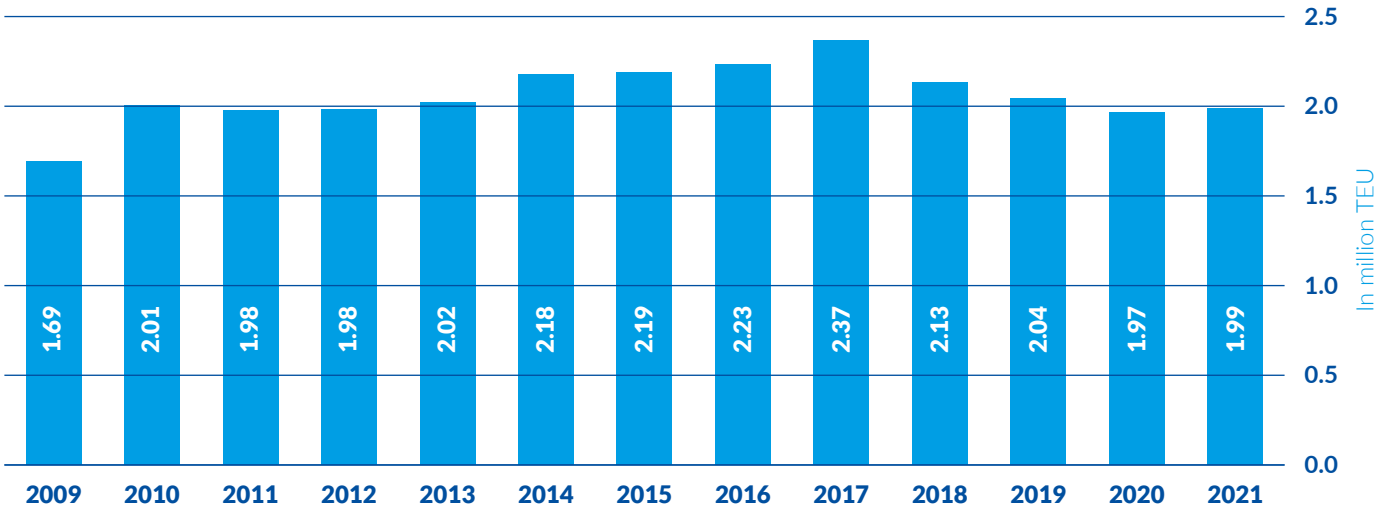
Container transport on the Rhine

Container transport on the traditional Rhine reached 1.99 million TEU in 2021, which was 0.9% higher than in 2020. Compared to 2019 – the pre-Covid year – the result was still 2.8% lower. When comparing data for the period between 2014 and 2017 with data for the period 2018-2021, it becomes obvious that TEU volumes in the more recent period settled on a lower average level. This is due to several reasons:[11]

- World trade and exports of goods from Europe to overseas were upward orientated until 2017, but stagnated in 2018 and 2019, before decreasing abruptly in 2020 due to the pandemic.
- The low water year of 2018 inflicted losses of cargo and provoked a modal shift from Rhine to railway transport.
- Inland container barging suffered also under congestion in seaports and related delays.

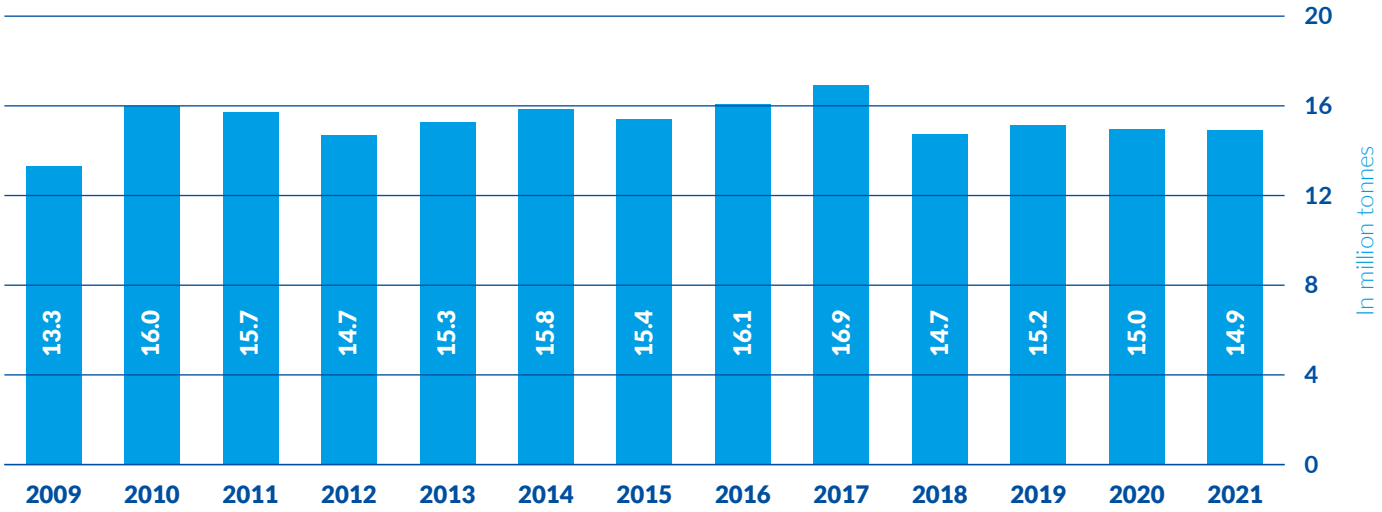
[11] For a short history of the economic development between 2005 and 2020, see: IWD (2020), IW-Konjunkturprognose: Wirtschaft erholt sich langsam, https://www.iwd.de/artikel/iw-konjunkturprognose-wirtschaft-erholt-sich-langsam-484045/ (last consulted 25 May 2022)

FIGURE 7: **CONTAINER TRANSPORT ON THE TRADITIONAL RHINE** (IN MILLION TEU), **2009-2021**



Source: Destatis

FIGURE 8: **CONTAINER TRANSPORT ON THE TRADITIONAL RHINE** (IN MILLION TONNES, NET WEIGHT OF GOODS IN CONTAINERS), **2009-2021**

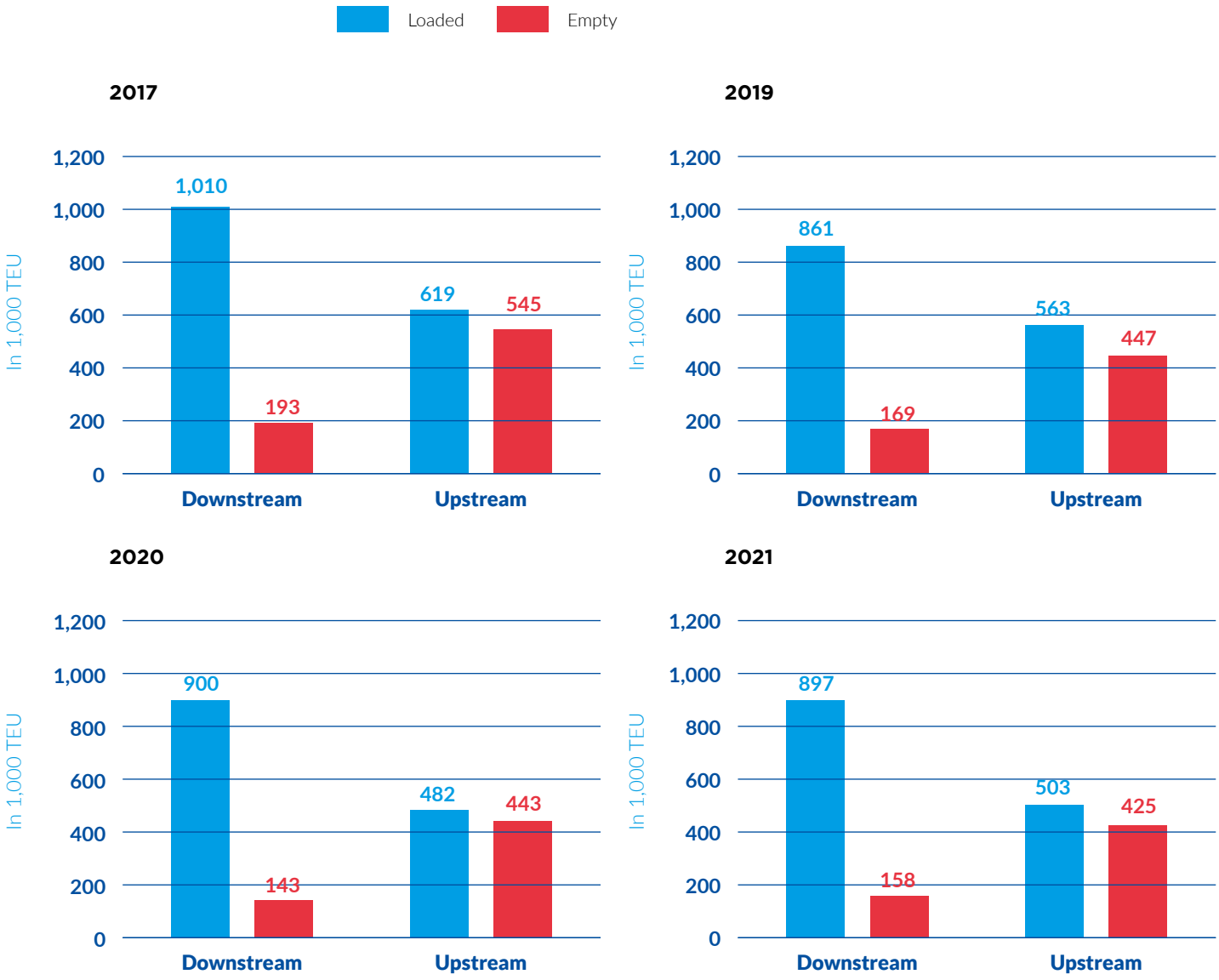


Source: Destatis

The downstream direction (from south to north) shows a higher share of containers that are loaded with cargo than the upstream direction. This reflects the export of goods from the Rhine hinterland (in France, Germany, Switzerland) towards ARA seaports in Belgium and in the Netherlands, and further to world markets overseas. Containers transported upstream are more often empty. The reason is that empty containers need to be delivered back to the hinterland in order to be re-filled with goods for export.

The comparison between 2017, 2019, 2020 and 2021 reveals the reduction in the export of goods via the Rhine, visualised by a decrease from 1.010 million TEU (see the bar "Downstream/Loaded") in 2017 down to 0.897 million TEU in 2021. The reasons are the above-mentioned factors (impact of low waters in 2018, slowdown in the economy, reversed modal shift from Rhine to rail).

FIGURES 9, 10, 11, 12: **CONTAINER TRANSPORT ON THE TRADITIONAL RHINE, DOWNSTREAM VERSUS UPSTREAM TRAFFIC AND LOADED VERSUS EMPTY CONTAINERS** (IN 1,000 TEU)



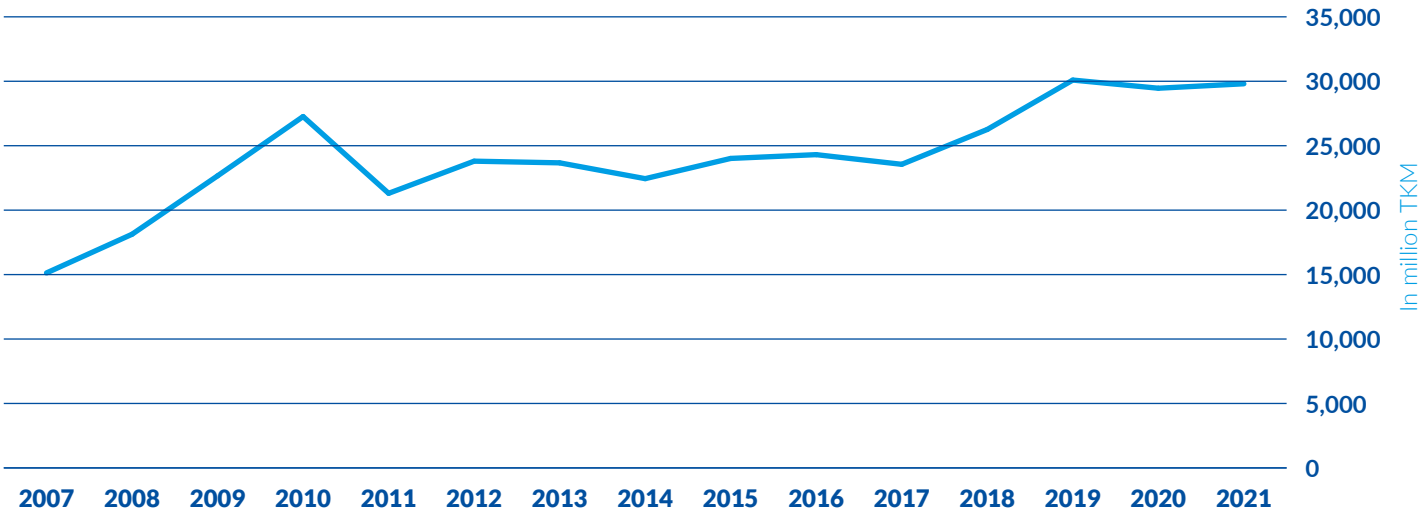
Source: CCNR analysis based on Destatis

DANUBE BASIN

Transport volume and transport performance on the Danube

Cargo transport on the entire navigable Danube between Kelheim (Germany) and the Black Sea via the Danube-Black Sea Canal and the Sulina Canal) lies in the range between 36 and 40 million tonnes per year.[12] Transport performance on the Danube (EU Danube countries plus Serbia) reached 29.8 billion TKM in 2021, which was at the same level as in 2020.

FIGURE 13: **TRANSPORT PERFORMANCE IN FREIGHT TRANSPORT ON THE DANUBE ***



Sources: Eurostat [IWW_GO_ATYGO] and [IWW_GO_QNAVE] (Serbia)
** Transport performance in IWT in all EU Danube countries plus Serbia. Data for Serbia available since 2018.*

Danube transport at specific measurement points

The market observation system used for observing Danube cargo transport at certain measurement points is similar to the system in the Rhine basin. The waterway administrations register data at certain borders or measurement points which are described for the Danube in the table below.

[12] *Source: viadonau, several annual reports available at https://www.viadonau.org/newsroom/publikationen/broschueren (last consulted 22 July 2022)*

TABLE 3: **MEASUREMENT POINTS FOR DANUBE FREIGHT TRANSPORT**

Danube stretch or affluent	Measurement point	Name	Volume of transport (in million tonnes)		
			2019	2020	2021
Upper Danube	Border Germany/Austria	Lock of Jochenstein	3.3	2.3	2.2
Upper Danube	Vienna	Lock of Wien-Freudenau	6.9	6.2	7.1
Upper Danube	Border Slovakia/Hungary	Lock of Gabčíkovo	5.8	5.0	4.9
Middle Danube	Border Hungary/Croatia/Serbia	Mohács	5.6	6.1	5.8
Danube-Black Sea Canal	No specific point, total volumes on the canal are taken into account	Canal authority CAN[13]	16.7	16.5	17.3
Sulina Canal	No specific point, total volumes on the canal are taken into account	Waterway Administration AFDJ[14]	5.5	4.5	5.1

Source: Danube Commission market observation

On the Danube, and in particular on the Lower and Middle Danube, transport by pushed convoys accounts for high shares within total goods transport. At the measurement point of Mohács on the Middle Danube, pushed convoys transported 78.0% of all cargo in 2021, compared to 75.7% in 2020, 79.5% in 2019 and 78.7% in 2018.

Due to the high water depths in the lower Danube section, in particular in the Danube delta region (also known as "maritime Danube"), cargo transport in the lower Danube area attains much higher values than on river sections further upstream.

This is notably the case for the Danube-Black Sea Canal, running from Cernavodă on the Danube River to Constanța at the Black Sea (southern arm) and to Năvodari (northern arm) at the Black Sea. In 2021, this canal had a transport volume of 17.3 million tonnes (an increase of 4.7% compared to 2020). Another estuary arm is the Sulina Canal, which flows into the Black Sea in the Danube delta region near the Romanian-Ukrainian border.

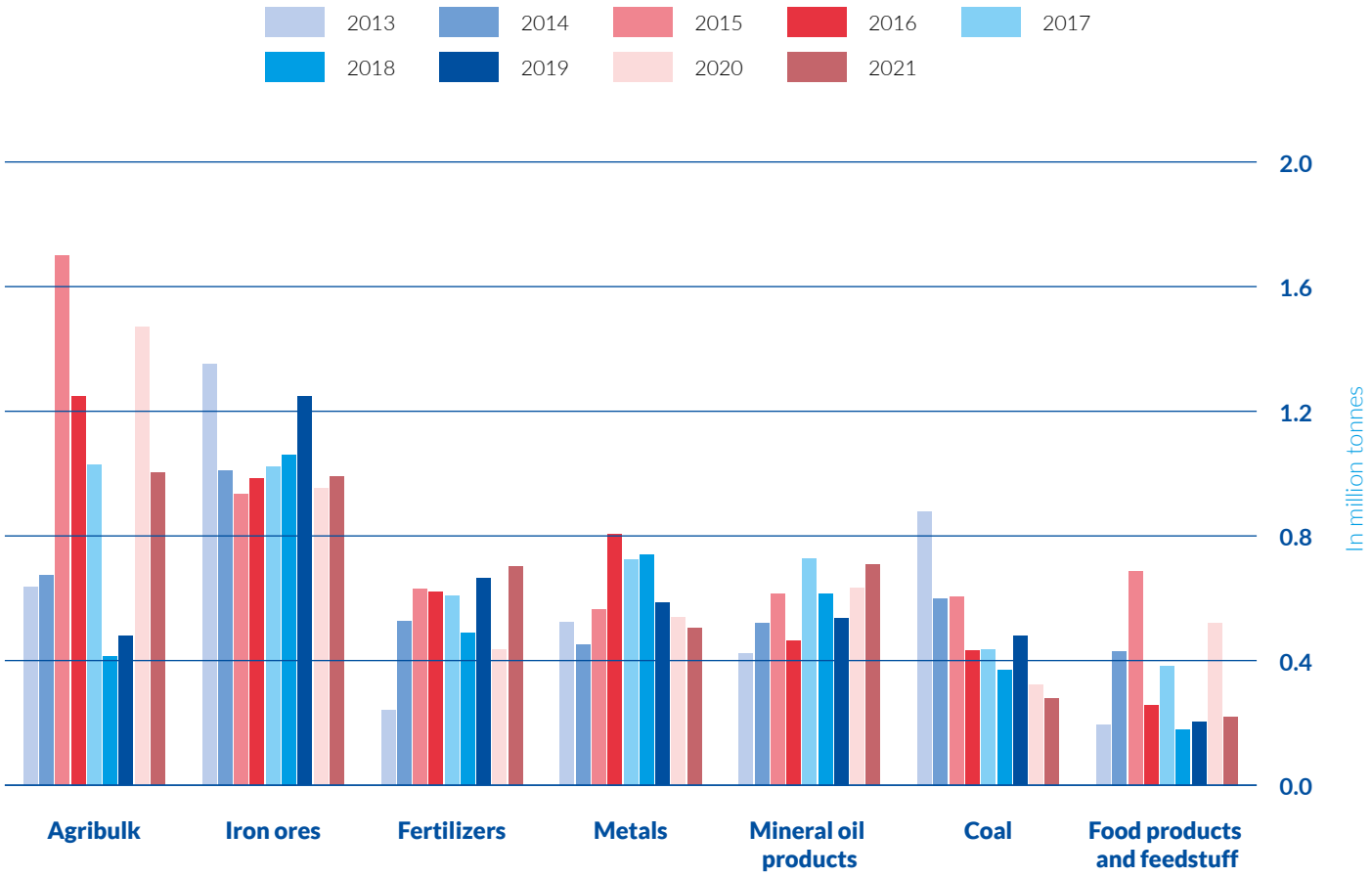
Danube transport by cargo segment

In 2021, iron ores accounted for the highest transport volume on the Middle Danube, before agribulk. Compared to the year 2020, steel production in the Danube region recovered in 2021 from the Covid pandemic (see Chapter 9). However, iron ore transport did not reach the transport volumes that were observed in 2019, which is explained by a low water situation in the last quarter of 2021.

[13] *https://www.acn.ro/index.php/de/*
[14] *https://www.afdj.ro/en*

The agricultural segment stands on the second rank behind iron ore. Its transport demand is quite volatile, due to variations in harvest volumes from one year to another, but also due to the competition between different harvesting regions (Middle Danube region versus Black Sea region). This competition is often related to prices. In the third quarter of 2021, the Black Sea region gained market shares in the export of grain to North Africa and other parts of the world, to the detriment of the Middle Danube region. This led to a lower transport volume of grain on the Danube, between the Middle Danube region and the seaport of Constanța. In 2022, due to the war in Ukraine, the situation is expected to be different (see Chapter 9).

FIGURE 14: **GOODS TRANSPORT ON THE MIDDLE DANUBE** (IN MILLION TONNES) *



Source: Danube Commission market observation
** At Mohács (southern Hungary - border area with Croatia and Serbia)*

On the Upper and Middle Danube, iron ore is entirely transported upstream, while grain, food products and foodstuff are entirely transported downstream. The first point reflects the provision of the steel industry in Austria, Hungary and Serbia with raw materials, while the second point reflects the export of agricultural products from Hungary and Serbia downstream to the seaports, mainly to Constanța.

CONTAINER TRANSPORT
PER COUNTRY IN EUROPE

THE WHOLE EUROPE AND GEOGRAPHICAL STRUCTURE

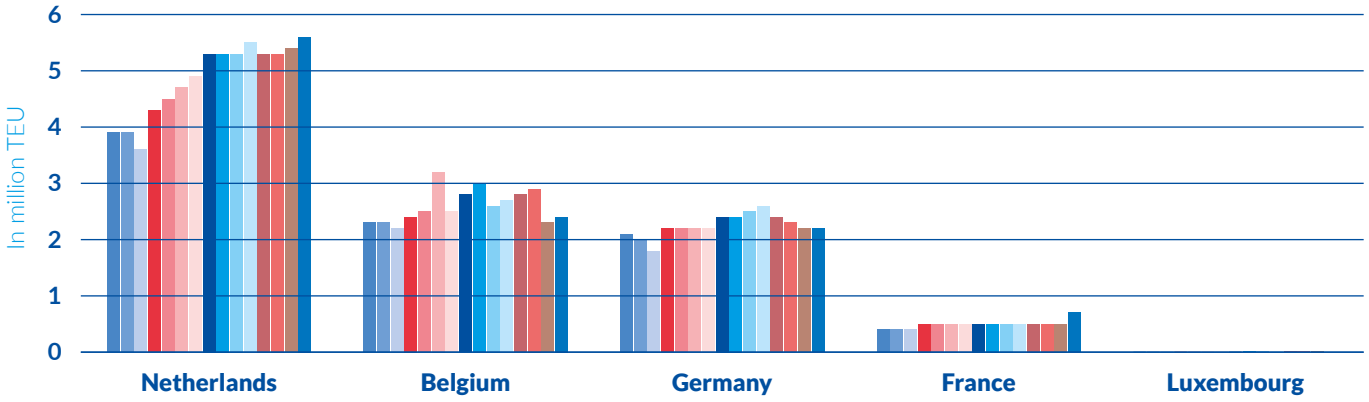
With 13 billion TKM, more than 7 million TEU and more than 62 million tonnes of cargo in containers, container transport on EU inland waterways represents 9.6% of the total IWW transport performance of 136 billion TKM in the EU. Moreover, 99.95% of the container transport performance (TKM) takes place in Rhine countries (the Netherlands, Belgium, Germany, France, Switzerland, Luxembourg). Container transport on the Danube accounts for the remaining 0.05%.

RHINE COUNTRIES

In 2021, container transport measured in TEU progressed by 4.8% in the Netherlands, by 2.4% in Germany, by 1.5% in Belgium and by 31.1% in France. In the Netherlands, 53.1 million tonnes of cargo were transported in containers (+2.2% compared to 2021), making this country the frontrunner in inland waterway container transport in Europe.

Container transport by inland navigation is expanding in the Netherlands due to an intensification of container traffic on existing routes, for example between the ports of Rotterdam and Antwerp. Secondly, the establishment of new container ports and new terminals, such as in Bergen op Zoom in the Netherlands, also fuels this growth.[15]

FIGURE 15: **IWW CONTAINER TRANSPORT PER RHINE COUNTRY** (IN MILLION TEU) *



Source: Eurostat [iww_go_actygo]
** In Luxembourg, 17,436 TEU were recorded for 2020, but 2021 data were not yet available due to delays in data dissemination.*

[15] *Source: Weekblad Schuttevaer (14 July 2021), ING: 'Vervoer grondstoffen over de Rijn trekt aan door grotere vraag'*

DANUBE COUNTRIES

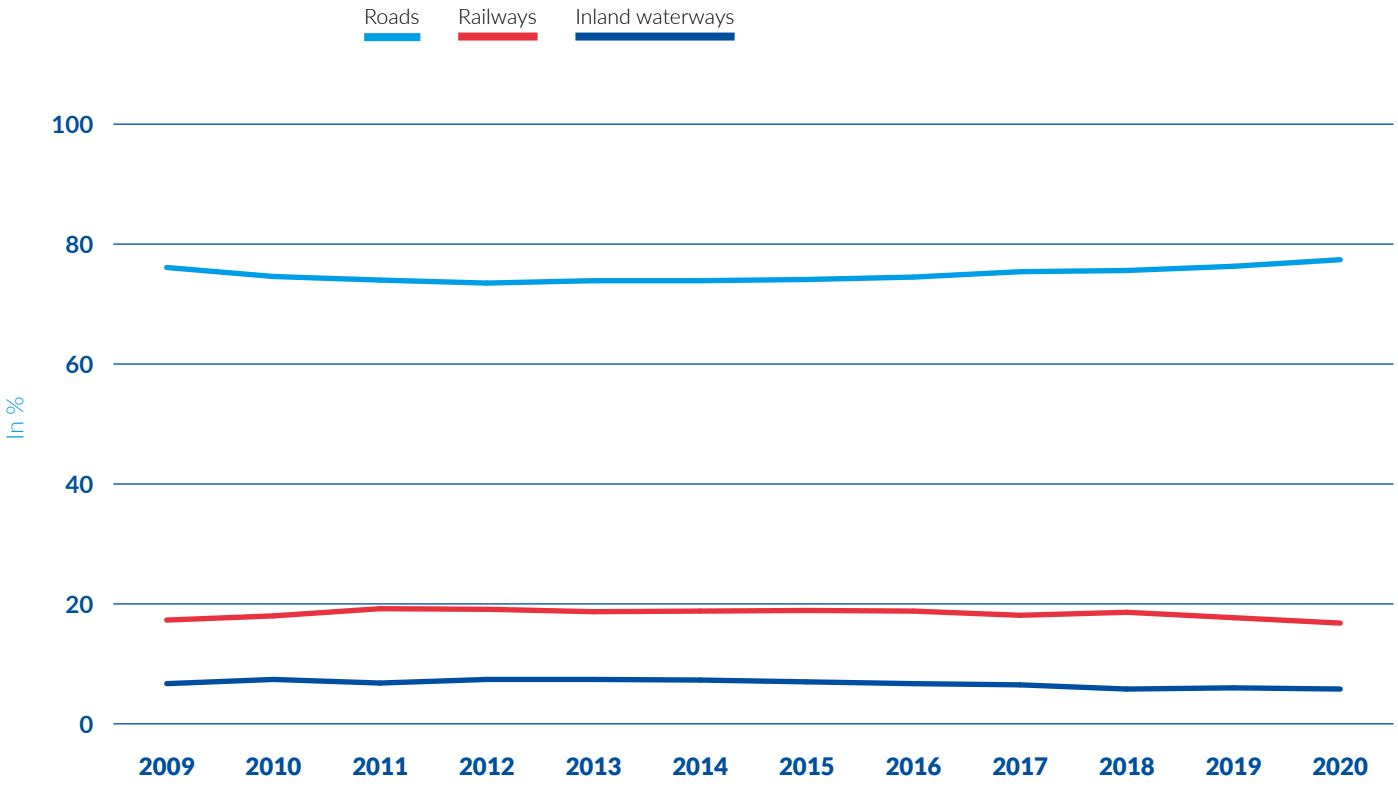
The two Danube countries with the highest container transport are currently Hungary and Austria. In 2021, 7,297 TEU were transported on Hungarian inland waterways, which was the second highest value in the period between 2007 and 2021. In Austria, container transported amounted to 5,226 TEU in 2021, which was also an increase compared to 2018, 2019 and 2020.

Considering the weight of cargo, container transport on Hungarian waterways represented 14 thousand tonnes in 2021. In Austria, 9 thousand tonnes of cargo were transported in containers. These values illustrate the immense gap for Rhine countries. In the Netherlands, 53.1 million tonnes were transported in containers on inland waterways in 2021, 22.4 million tonnes in Belgium, 20.9 million tonnes in Germany and 3.3 million tonnes in France.

Container transport in Romania reached 1,714 TEU in 2021. Over the last 15 years, no upward movement has been observed, and with a strong decline in 2013, this has more or less remained at a low level since then.

INLAND NAVIGATION
AND OTHER MODES OF TRANSPORT

FIGURE 16: **MODAL SPLIT SHARE OF INLAND TRANSPORT MODES IN THE EU-27** (IN %) **2009-2020**

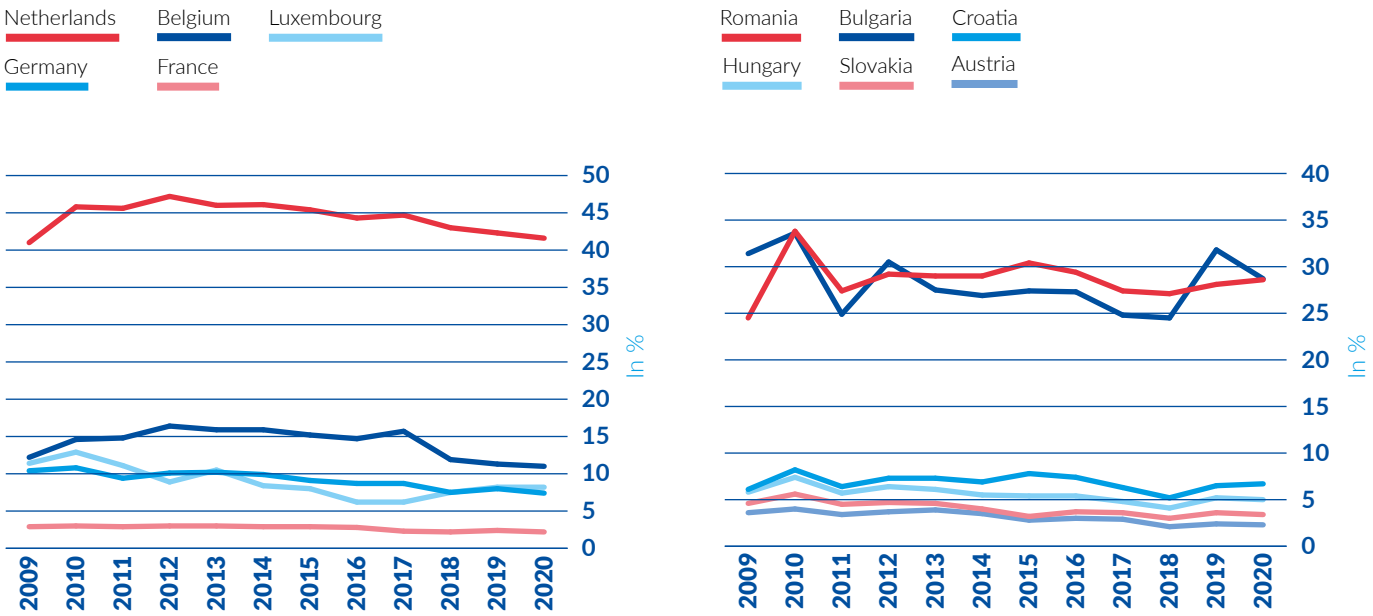


Source: Eurostat [tran_hv_frmod]

Over the last decade, modal split shares have remained rather stable. The modal split of IWT at the level of the EU-27 was 5.8% in 2020 and thus behind road transport (77.4%) and rail transport (16.8%). Both rail and inland waterway transport lost shares for the benefit of road transport in 2020. The share of rail transport decreased by almost 1 percentage point. As many EU countries do not have inland waterways, the overall modal split of IWT at the EU level should not be used as a performance indicator for the success of inland waterway transport in the EU.

In order to measure the success of IWT in the transport market, it is better to look at the modal split evolution of IWT in countries where there is a sufficiently dense inland waterway network, such as in the Netherlands, Belgium or Germany, or where inland navigation has traditionally been important for goods transport, as in many Danube countries.

FIGURES 17 AND 18: **IWW MODAL SPLIT EVOLUTION IN RHINE AND DANUBE COUNTRIES** (IN %, BASED ON TONNE-KILOMETRES) *



Source: Eurostat [tran_hv_frmod]

** Share of inland waterway transport performance in total (IWT + Road + Rail) transport performance. 2018 data for Belgium are estimated.*

The IWW modal split in EU countries shows varying trends. In the Netherlands, the IWW modal split increased between 2009 and 2012, to reach a peak at 47.2%. It decreased in the years thereafter, reaching 41.6% in 2020. The reduction in coal transport, which began in 2015, and the low water periods in 2015, 2017 and 2018, can explain the main parts of this downward trend.[16] Such a downward trend is also visible in Belgium, Germany and France. In Luxembourg, the modal split of IWT has increased in recent years and remained the same in 2019 and 2020 (8.2%). Within Danube countries, Romania and Bulgaria record high IWT modal shares, in 2020 reaching respectively 28.6% and 28.7%. For the latter, a decrease of 3 percentage points between 2019 and 2020 is however observed.

[16] Next to these two factors, the economic crisis in steel production, that started in 2018, played another role.

03

NATIONAL INVESTMENTS IN IWT INFRASTRUCTURE

- **Infrastructure represents a basic need for reliable inland waterway transport. Yearly data for infrastructure maintenance, as well as infrastructure investments, are reported for Rhine and Danube countries.**
- **Shortfalls in data arise due to varying methodologies in data collection. For instance, whereas one source accounts for both waterside and landside infrastructural activities, other sources only consider waterside infrastructure measures.**
- **The data presented allow for an analysis per country but do not allow the comparison of trends in maintenance and investment spendings between different countries. For instance maintenance spending can vary greatly between countries due to the length and nature of the waterway as well as the number of constructions on this waterway.**

II INTRODUCTION

In order to ensure a year-round navigability, the state of the inland navigation transport network must enable efficient, reliable and safe navigation for users by ensuring minimum waterway parameters and levels of service (Good Navigation Status). To achieve this goal, IWT infrastructure needs to be constructed, maintained and upgraded through investments within a coherent corridor vision. It must also consider the growing demand for fast, reliable, high-quality, seamless movement of goods and persons. In this regard, monitoring national investments in IWT infrastructure is essential.

Maintenance, rehabilitation and regeneration are key actions towards inland navigation reliability and performance. Any financial support ensuring more efficient maintenance, rehabilitation and regeneration activities positively impact infrastructure. However, one should bear in mind that these are long-run activities, part of an investment life cycle approach.[17]

Infrastructure spending can be broken down into two main categories: investment and maintenance spending.

Maintenance spending focuses on already existing infrastructure and its upkeep. Maintenance spending, such as that related to dredging campaigns to maintain guaranteed navigable channel depth, are however, as of today, not eligible for EU co-funding in the context of the Connecting Europe Facility II programme (CEF II). Today, it is the responsibility of Member States to maintain their inland navigation networks, core and comprehensive, which is crucial for the development of the sector. Nevertheless, it is important to note that maintenance spending can vary greatly from one country to another, depending on:

- the length of the navigable waterway,
- its nature (free-flowing or not) and,
- the number of constructions on this waterway (locks and dams generally represent the most important expenditure items).

Investment spending embraces a new spending in new projects such as the enlargement or upgrading of waterways. In legal understanding, an investment must undergo an environmental impact assessment whereas maintenance spending is usually not tied to such legal requirements. Such investments are also eligible for co-funding at EU level, for instance via CEF II.

Investments in port infrastructure are not within the scope of this chapter. Investments in port infrastructure are generally private investments.

[17] *Draft recommendations for the development of common, harmonised guidelines/standards for Good Navigation Status*

SHORTCOMINGS
RELATING TO DATA COLLECTION ON INFRASTRUCTURE SPENDINGS

One might be tempted to compare data between countries, but there are some important shortcomings to be discussed to allow for reasonable conclusions. Such shortcomings arise from differing methodologies of data collection and the definitions behind these, but also in differences regarding the types of waterways present in the particular countries. For example, countries with a high share of free-flowing rivers need a higher amount of maintenance activities than countries with a lower share in this regard.

Regarding differing methodologies, infrastructure maintenance equipment is included for one country under infrastructure maintenance spending but might not be included in another. This could also partly explain possible discrepancies that may exist between one data source and another. Due to these different methodologies and different types of waterways, it is more advantageous to shed light on the trend for each country. In addition, the differentiation between investment spending and maintenance spending is sometimes not available.

Another important aspect lies in the competent authorities for data collection. For instance, whereas in Croatia the hydrological institute is responsible for the data collection, in most parts of the Rhine and Danube countries it is the waterway administrations that are responsible.

Last but not least, it should be mentioned that depending on the inland water CEMT[18] class, the entity responsible for managing infrastructure investment might vary, for instance, be either the national authority or the regional authorities. The infrastructure spending related to inland waterways falling under the responsibility of regional authorities, generally regional waterways of CEMT class III or below, might therefore not be reported in the national infrastructure spending data. For those countries that count numerous regional navigable waterways of CEMT class III or below, it is likely that the total amount of infrastructure spending reported in this chapter is underestimated. This would be the case in particular for the Netherlands, Belgium and Poland.

[18] *European Conference of Ministers of Transport*

OVERVIEW
PER COUNTRY

RHINE COUNTRIES

For the Rhine countries, relevant data regarding infrastructure maintenance and investment spending can be retrieved from the International Transport Forum (ITF)[19], except for the Netherlands, for which specific figures are available in a separate chapter. These data as indicated by the title provide an overview for the countries. Due to the shortcomings explained in the above section no country comparisons shall be made. It serves for a country trend analysis in the two given indicator variables.

The ITF databases encompass both land and waterside infrastructures. Indeed, it is based on the OECD definition of inland waterway infrastructure (and related costs) which includes both landside and waterway-related components: "Infrastructure includes land, channels and permanent way constructions, buildings, navigation locks, mooring equipment, toll collection installations, as well as immovable fixtures, fittings and installations connected with them (signalisation, telecommunications, etc.) as opposed to IWT vessels".[20]

Regarding infrastructure maintenance spending data, no data for Germany are available in the ITF database. National data on maintenance spending in waterway transport do not in most cases distinguish between inland and maritime waterways, which makes an analysis quite impossible. For the river Rhine, the German Ministry of Transport reported the following maintenance spending data for the year 2021: operation and maintenance (8.79 million euro), traffic maintenance measures (14.44 million euro), operational replacement purchases (11.02 million euro). Altogether this adds up to 34.2 million euro, but personnel and material costs incurred in the Waterways and Shipping Administration are not included in this expenditure overview.

TABLE 1: **INLAND WATERWAY INFRASTRUCTURE MAINTENANCE SPENDING** (IN MILLION EURO)

Year / Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Belgium	65.0	58.0	71.0	66.0	27.0	82.0	103.0	87.5	60.0	61.0	n.a
France	60.0	61.0	61.0	61.0	60.0	59.8	59.6	62.2	59.8	59.2	60.1
Luxembourg	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.1

Source: ITF

[19] *International Transport Forum is an intergovernmental organisation within the OECD system.*
[20] *https://stats.oecd.org/glossary/detail.asp?ID=3957*

TABLE 2: **INLAND WATERWAY INFRASTRUCTURE INVESTMENT** (IN MILLION EURO)

Year / Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Belgium	154.0	152.0	152.0	167.0	103.0	291.0	225.0	237.5	197.0	197.0	n.a
France	253.2	264.3	236.0	224.4	180.0	164.1	192.3	35.1	226.3	163.0	306.6
Germany	1,100.0	1,070.0	780.0	740.0	780.0	730.0	780.0	720.0	760.0	1,000.0	1,220.0
Luxembourg	1.0	1.3	0.7	0.1	0.3	0.0	0.1	0.0	0.1	0.1	0.1

Source: ITF

DANUBE COUNTRIES

For the Danube countries, relevant data regarding infrastructure maintenance and investment spending in general can also be retrieved from the ITF.

TABLE 3: **INLAND WATERWAY INFRASTRUCTURE MAINTENANCE SPENDING** (IN MILLION EURO)

Year / Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	n.a	11.0	12.0	17.0	19.0	14.0	12.0	13.0	12.0	13.1	13.4
Serbia	13.3	23.0	17.6	16.5	17.3	29.8	28.7	32.9	35.3	43.3	n.a
Slovakia	2.0	2.0	3.0	4.0	9.0	3.7	0.3	7.1	1.8	n.a	2.0
Republic of Moldova	0.0	n.a	n.a	n.a	n.a	0.1	0.1	0.1	0.1	n.a	n.a
Hungary	3.2	1.6	0.8	0.8	1.3	1.4	2.7	2.2	2.1	2.2	2.0
Bulgaria	1.0	1.5	1.0	1.0	1.0	1.0	1.3	1.4	3.4	3.6	3.6
Croatia	1.5	1.8	2.9	4.6	4.5	7.5	6.2	6.5	7.5	12.2	5.3
Czech Republic	1.5	1.8	2.9	4.6	4.5	7.5	6.2	6.5	7.5	12.2	5.3

Source: ITF

TABLE 4: **INLAND WATERWAY INFRASTRUCTURE INVESTMENT** (IN MILLION EURO)

Year / Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	11.0	2.0	3.0	11.0	10.0	2.0	2.0	3.0	3.0	4.5	3.7
Serbia	21.2	25.8	24.7	15.5	17.7	22.3	40.7	34.3	45.9	49.1	n.a
Slovakia	3.0	1.0	1.0	1.0	0.0	0.1	0.1	1.1	1.5	n.a	1.1
Republic of Moldova	0.0	0.7	0.2	0.1	0.1	0.1	0.1	0.1	n.a	n.a	n.a
Hungary	0.8	0.2	0.01	0.1	0.02	0.0	10.3	0.2	1.1	0.9	3.1
Bulgaria	0.0	0.0	0.0	0.0	0.5	1.3	0.0	0.2	0.0	0.0	1.0
Croatia	2.6	3.5	3.3	1.7	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Czech Republic	57.8	22.3	17.2	7.2	9.6	15.1	9.8	7.2	2.8	51.1	55.5
Romania	423.5	519.0	279.5	268.1	314.1	505.9	236.9	105.1	189.7	n.a	n.a

Source: ITF

In addition to the ITF data, more detailed data stemming from the FAIRway[21] project are also available, covering waterside infrastructure only (no landside infrastructure). As explained before, discrepancies between the ITF data and the data stemming from the FAIRway project exist mainly because of differences in the methodology, scope and definition.

A comparison between Table 5, which summarises the infrastructure maintenance spending for the period 2017 to 2020 for Danube countries (Source: FAIRway) and Table 3 (Source: ITF) shows that for Austria, for example, there is somehow a large discrepancy between the value reported in the two different databases. More precisely, this discrepancy lies in the definition of measures included. Landside investments and maintenance efforts make up the larger part of Austria's inland waterway infrastructure expenditures.

The FRMMP[22] reporting is solely focused on waterway-related infrastructure and includes themes such as waterway dredging, fairway marking and fairway surveying. Land-side expenditures such as mooring places, tow paths, etc. are not included in the FRMMP reporting. Moreover, structural infrastructure investments are not reported in the framework of the FRMMP, as the focus is on maintenance activities only.

This example confirms that data regarding investment spending should be interpreted with caution. It also calls for improvement in the data collection process for such investment, perhaps through the development of harmonised criteria for reporting such infrastructure spending investments at European level.
Table 5 summarises the infrastructure maintenance spending for the period 2017 to 2020 for Danube countries according to the FRMMP.

[21] *Danube Region Strategy: National Action Plans. Available at: https://navigation.danube-region.eu/documents/ (last consulted 2.06.2022)*
[22] *FRMMP stands for Fairway Rehabilitation and Maintenance Master Plan.*

TABLE 5: **NATIONAL ACTION PLANS IN DANUBE COUNTRIES – INFRASTRUCTURE MAINTENANCE SPENDING** (IN MILLION EURO)

Year / Country	2017	2018	2019	2020	Change 2019/2020	Change 2018/2017
Austria	4.5	5.2	4.6	4.8	+4.8%	-7.4%
Bulgaria	0.4	2.4	2.9	2.9	+/-0.0%	+21.1%
Romania	15.3	13.6	13.2	16.0	+21.1%	+17.9%
Hungary	n.a	0.9	0.2	n.a	n.a	n.a
Croatia	0.5	1.1	1.1	1.1	+/-0.0%	+/-0.0
Slovakia	2.6	2.3	1.8	2.6	+46.6%	+12.7%
Serbia	n.a	0.4	n.a	n.a	n.a	n.a

Source: FAIRway: National Action Plans, May 2021. Missing values are tied to no reporting by the countries.

The difference between free-flowing and not free-flowing rivers such as in the Upper Danube also contributes to the various need areas of infrastructure spending. The Iron Gates located at the Serbian/Romanian border set the border between the downstream free-flowing part of the Danube and the upstream part which counts many locks. This difference weighs on the specific need areas described in Tables 6.1 and 6.2. Indeed, a free-flowing river requires more maintenance activities.

Tables 6.1 and 6.2 capture the secured infrastructure investments[23] in inland waterways for the period 2014 to 2020 for Danube countries. Despite possible discrepancies in the data reported for infrastructure investment between the two databases (ITF and FAIRway), the FAIRway database has the merit of providing a more detailed repartition according to need areas and allows a more complete picture of the amount of money dedicated to each need area.

[23] *Secured infrastructure investment refers to the amount received/spent.*

TABLE 6.1: **NATIONAL ACTION PLANS IN DANUBE COUNTRIES – INFRASTRUCTURE INVESTMENTS IN INLAND WATERWAYS 2014-2020**

Country	Austria		Bulgaria		Romania		Hungary	
Need area	Investment secured 2014-2020 (in million €)	% of EU co-financed	Investment secured 2014-2020 (in million €)	% of EU co-financed	Investment secured 2014-2020 (in million €)	% of EU co-financed	Investment secured 2014-2020 (in million €)	% of EU co-financed
Minimum fairway parameters (width/depth)	n.a	n.a	10.6[24]	85.0	23.5	32.6	6.2	85.0
Surveying of the riverbed	n.a	n.a	3.8	85.0	0.4	85.0	1.7	59.0
Water level gauges	n.a	n.a	0.4	85.0	0.3	79.3	6.7	50.0
Marking of the fairway	1.2	20.4	4.1	85.0	3.8	85.0	8.7	85.0
Availability of locks/lock chambers	n.a	n.a	n.a	n.a	0.2	85.0	n.a	n.a
Information on water levels and forecasts	n.a	n.a	0.1	85.0	0.2	85.0	0.01	85.0
Information on fairway depths	n.a	n.a	0.3	85.0	0.4	85.0	0.02	85.0
Information on marking plans	n.a	n.a	0	n.a	0.1	85.0	0.3	85.0
Meteorological information	n.a	n.a	0	n.a	0.4	56.1	0.8	50.0
Other needs	n.a	n.a	0.2[25]	85.0	0.1	54.4	0.6	85.0
Total	**1.2**	**20.4**	**19.4**	**85.0**	**29.3**	**41.8**	**25.0**	**72.7**

Source: FAIRway: National Action Plans, May 2021

[24] *The investment concerns the dredging equipment (pipeline, manoeuvring vessel, pontoon and barge) to be purchased via the OPTTI 2014-2020.*
[25] *The investment concerns the recalculation of the Low Navigable Water Level.*

TABLE 6.2: **NATIONAL ACTION PLANS IN DANUBE COUNTRIES – INFRASTRUCTURE INVESTMENTS IN INLAND WATERWAYS 2014-2020**

Country	Croatia		Slovakia		Serbia	
Need area	Investment secured 2014-2020 (in million €)	% of EU co-financed	Investment secured 2014-2020 (in million €)	% of EU co-financed	Investment secured 2014-2020 (in million €)	% of EU co-financed
Minimum fairway parameters (width/depth)	1.0	n.a	n.a	n.a	n.a	n.a
Surveying of the riverbed	0.4	85.0	0.6	85.0	n.a	n.a
Water level gauges	0.1	85.0	n.a	n.a	n.a	n.a
Marking of the fairway	1.1	85.0	1.4	85.0	0.7	85.0
Availability of locks/lock chambers	n.a	n.a	n.a	n.a	n.a	n.a
Information on water levels and forecasts	0.2	85.0	n.a	n.a	n.a	n.a
Information on fairway depths	0.1	0.0	0.02	0.0	n.a	n.a
Information on marking plans	n.a	n.a	n.a	n.a	n.a	n.a
Meteorological information	n.a	n.a	n.a	n.a	n.a	n.a
Other needs	n.a	n.a	n.a	n.a	n.a	n.a
Total	**2.8**	**53.4**	**2.0**	**84.1**	**0.7**	**85.0**

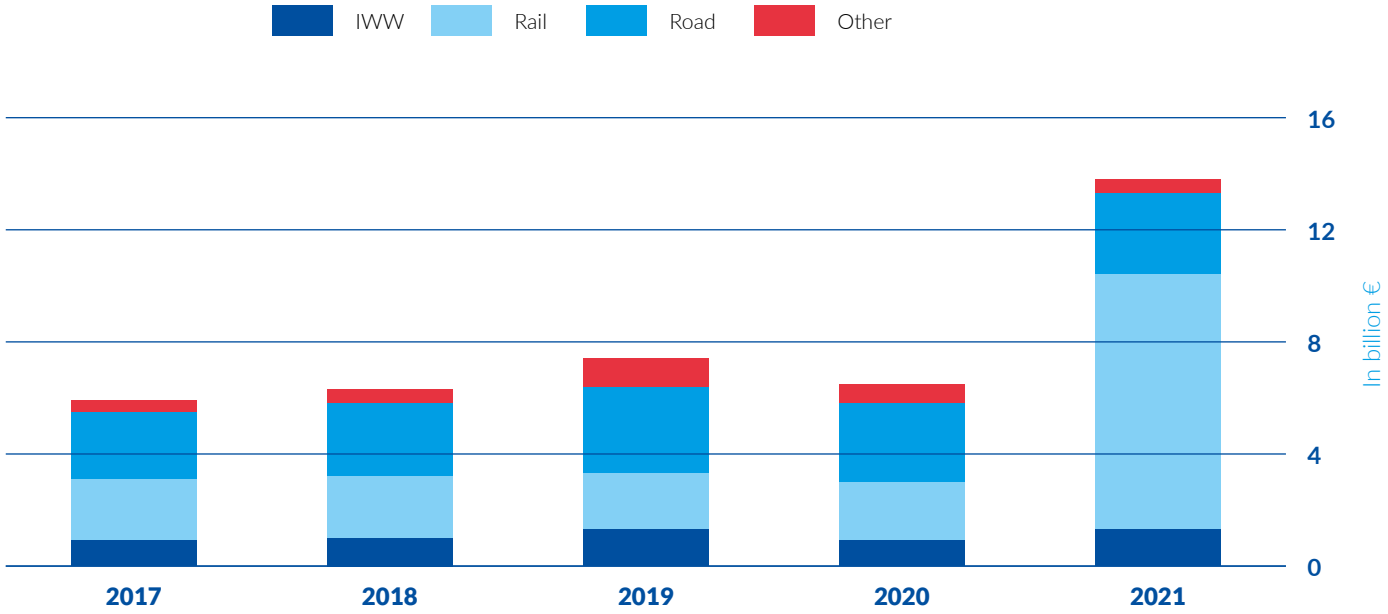
Source: FAIRway: National Action Plans, May 2021

THE NETHERLANDS

Data regarding transport infrastructure spending and maintenance in the Netherlands can be derived from the infrastructure fund.[26] This fund is part of the complete national budget for the Netherlands and next to rail, road and main waterways, comprises three[27] further categories. Since 2017, an increase in the overall infrastructure fund is observed. The value of the fund reached 14 billion euro in the year 2021 (Figure 1). For smaller waterways in provinces, the regional authorities are responsible for the budget allocation. Hence, they are not part of these figures.

[26] *Dutch Finance Ministry. Infrastructure fund. Available at: https://www.rijksfinancien.nl/visuals/2021/begroting/uitgaven/A (last consulted 2.06.2022)*
[27] *The three other categories are: 1) explorations, reservations and investment space, 2) traffic and transport mega projects, 3) regional and local infrastructure.*

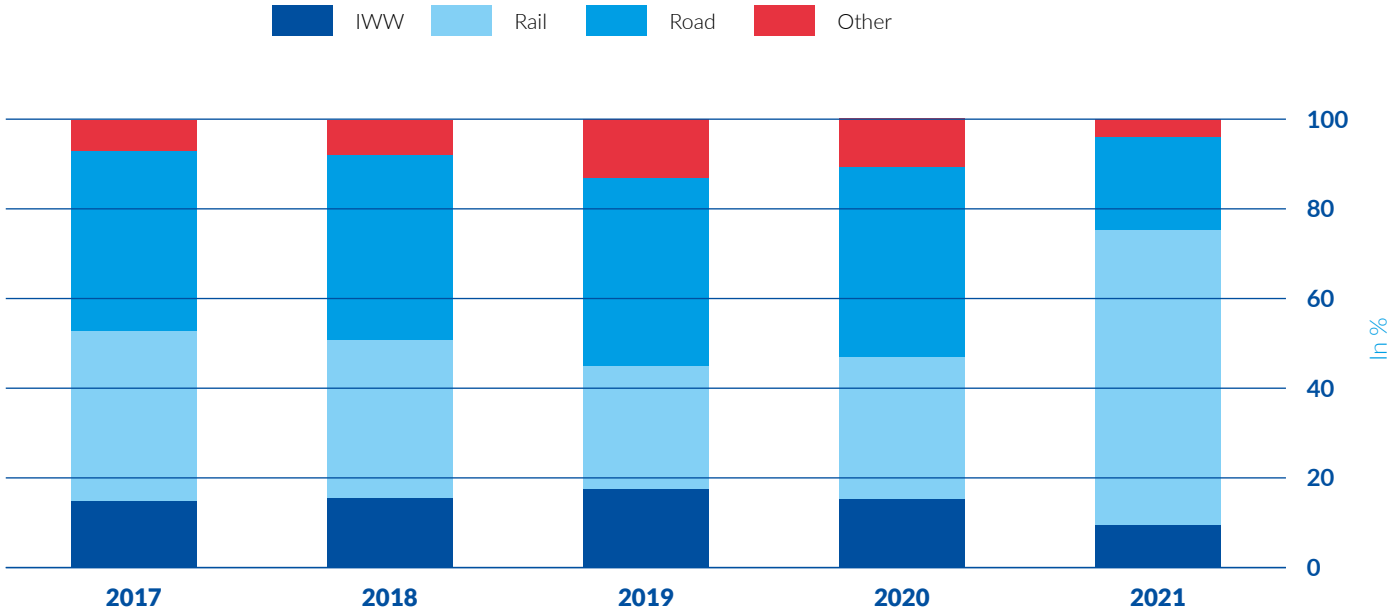
FIGURE 1: **INFRASTRUCTURE FUND BROKEN DOWN BY AMOUNT DEDICATED TO DIFFERENT TRANSPORT MODES BY YEAR** (ABSOLUTE VALUES)



Source: Dutch Finance Ministry

Figure 2 captures the infrastructure fund split into the shares dedicated to the different transport modes. The highest share of the infrastructure fund in 2021 was dedicated to rail with 65.7%.

FIGURE 2: **INFRASTRUCTURE FUND BROKEN DOWN BY SHARE DEDICATED TO DIFFERENT TRANSPORT MODES BY YEAR** (IN %)



Source: Dutch Finance Ministry

SHIPPIN


490
480
470
460

04

WATER LEVELS AND FREIGHT RATES

- Compared to 2015, 2016 and 2018, fewer days of critical navigating conditions were recorded for the years 2019, 2020 and 2021 on the Rhine. Nevertheless, water levels and navigating conditions deteriorated in late 2021, thereby inflicting temporary losses for cargo transport on the Rhine. On average, days with critical low water conditions are slightly more frequent on the Danube than on the Rhine.
- For 2021, the dry bulk spot market index and container freight rate index remained on a recovery trend. The liquid bulk freight index has not shown such a positive trend in the last two years due to the weak transport demand for liquid bulk caused by the pandemic.
- Spot market data for liquid cargo in the FARAG region confirm the difficult market environment for liquid bulk in 2020 and 2021. The calculated freight rate indices for gasoil and biodiesel show a downward trend for the most part of these two years.

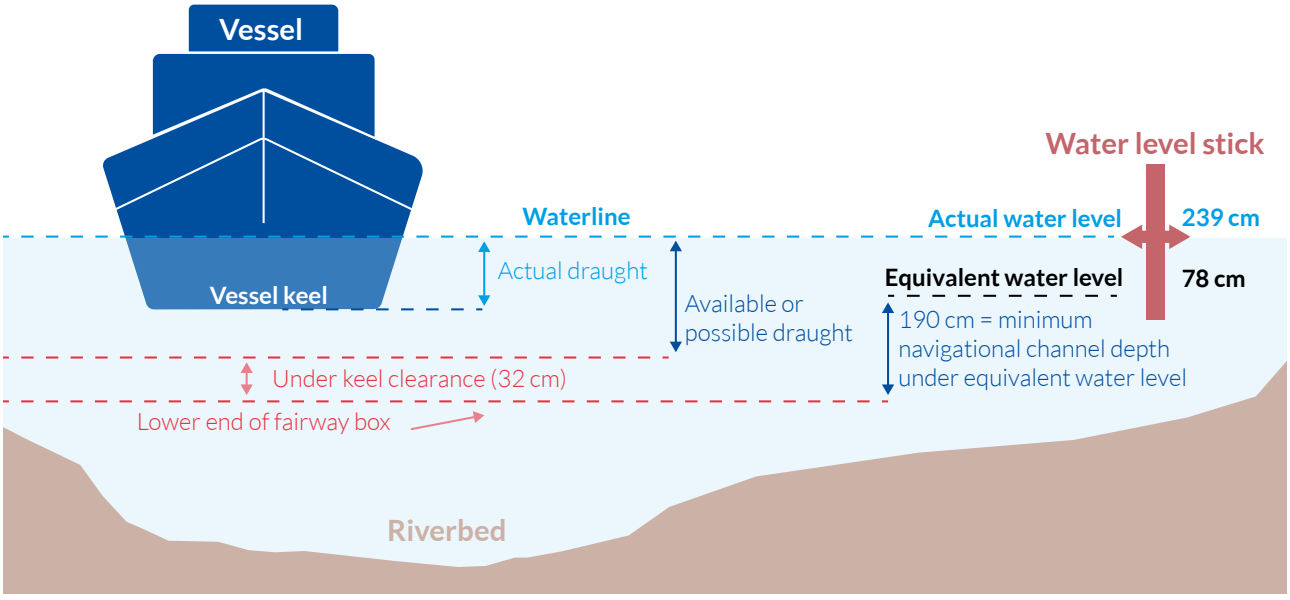
WATER LEVELS
AND AVAILABLE DRAUGHTS

The overall performance of inland waterway transport is essentially linked to water levels, which determine the amount of cargo that a vessel can load and transport under safe navigation conditions. The load factor (ratio of cargo loaded to loading capacity of the vessel) influences the profitability of inland waterway transport. A high load factor means a high volume of cargo transported per trip, and therefore a high level of revenues for a vessel, for any level of fixed costs.

Although the reduction of the load factor could be compensated by putting more vessels into operation, there are obvious limitations to this.[28] Low water periods therefore reduce the overall cargo transport on inland waterways. An example is the low water period in autumn 2018.

The amount of cargo that a vessel is able to load at a certain water level, while keeping safe navigation conditions, is determined by the available draught. Draught hereby means the distance between the waterline (or the intersection of the water level with the vessel hull) and the keel or bottom part of the vessel, as can be seen in the figure below. The total vertical distance, by which a sailing vessel sinks into the water also comprises the 'squat'. The latter results from hydrodynamic effects and leads to a higher draught of a sailing vessel compared to a vessel at rest. The squat effect is stronger the less water there is under the vessel, and the faster it is sailing.

FIGURE 1: **ACTUAL WATER LEVEL, ACTUAL DRAUGHT, EQUIVALENT WATER LEVEL, MINIMUM NAVIGATION CHANNEL DEPTH AND POSSIBLE OR AVAILABLE DRAUGHT AT KAUB/MIDDLE RHINE ***



Source: CCNR based on German Federal Institute of Hydrology (BfG) (2015)
** The distances in this drawing are not at scale. In this illustration, the date chosen to determine the available or possible draught is 3 September 2020, when the actual water level was 239 cm on average. The actual draught contains also the squat effect.*

[28] *The fleet of inland vessels is limited in size. It is also not possible to keep a large number of vessels "on hold", as this would incur fixed costs (insurance, maintenance, etc.), while there would be no revenues at all from the particular vessel.*

The waterway administrations recommend calculating the available draught on the basis of the actual water level and certain waterway parameters, in the following way:[29]

Actual water level
- Equivalent water level
+ Minimum navigational channel depth
= Actual fairway depth
- Under keel clearance
= Available or possible draught of vessel

For the Rhine in Germany, the equivalent water level is a low water level under which, on a 100-year average, the water levels do not fall below more than 20 ice free days per year. The minimum navigational channel depth corresponds to the minimum depth that should be present in the area of the fairway (depth of the fairway box below the equivalent water level). This minimum depth is related to the equivalent water level, as it is the channel depth, that waterway managers aim to achieve even under critical low water situations.

If water levels drop below the equivalent water level, the minimum navigation channel depth can no longer be achieved. In order to assess the stability of navigating conditions for a particular year, it is therefore straightforward to determine the number of days per year on which the actual water levels fell below the equivalent water level.

[29] See: Article 'Verwirrung um Pegel. Welche Abladetiefe gilt?", in: SVS Aktuell, Dec. 2018/Jan. 2019, pages 7 and 8, available at: http://www.svs-ch.ch/sites/default/files/svs-aktuell/winter_2018.pdf

THE DEVELOPMENT
OF THE AVAILABLE DRAUGHT FOR RHINE AND DANUBE GAUGE STATIONS

RHINE GAUGE STATIONS

For important Rhine gauge stations, the parameters are listed in Table 1.

TABLE 1: **HYDRAULIC PARAMETERS FOR IMPORTANT RHINE GAUGE STATIONS**

Gauge station	Minimum navigation channel depth	Equivalent water level
Duisburg-Ruhrort (Lower Rhine)	280 cm	233 cm
Cologne (Lower Rhine)	250 cm	139 cm
Kaub (Middle Rhine)	190 cm	78 cm
Oestrich (Middle Rhine)	190 cm	87 cm
Maxau (Upper Rhine)	210 cm	369 cm

Sources: German Federal Waterways and Shipping Administration and Swiss Association for Shipping and Port Management

For these five Rhine gauge stations, daily water level data were collected and analysed. The reason for using daily data is that when evaluating navigating conditions on a river, it is important to know the number of days per year when certain navigation conditions were present. The use of monthly averages could lead to a bias within such an evaluation, as high and low water levels would cancel each other out.

If water levels drop below the equivalent water level, the minimum navigation channel depth can no longer be achieved. In order to assess the stability of navigating conditions for a particular year, it is therefore straightforward to determine the number of days per year on which the actual water levels fell below the equivalent water level. Table 2 shows this number of days for the above-mentioned gauge stations.

TABLE 2: **NUMBER OF DAYS PER YEAR WITH A WATER LEVEL BELOW THE EQUIVALENT WATER LEVEL – IMPORTANT GAUGE STATIONS ALONG THE RHINE**[30]

	Kaub	Oestrich	Maxau	Cologne	Duisburg
2015	29	23	30	37	39
2016	19	18	27	26	35
2017	28	27	28	23	25
2018	107	78	80	121	128
2019	0	0	0	0	3
2020	0	0	0	11	14
2021	10	4	6	9	13
Average 2015-2021	28	21	24	32	37

Sources: CCNR calculation based on data from German Federal Waterways and Shipping Administration, provided by the Federal Office of Hydrology

Compared to 2015, 2016 and 2018, the years 2019, 2020 and 2021 were, overall, years with fewer days of critical navigating conditions on the Rhine.

Infrastructural works that are currently in the planning approval procedure, foresee an increase of the depth of the fairway at low water from 1.90 metres to 2.10 metres (= increase of the minimum navigational channel depth) in the Middle Rhine valley between Budenheim and St. Goar (encompassing Oestrich and Kaub).[31]

DANUBE GAUGE STATIONS

The critical low water level of the Danube is not known as equivalent water level but "Low Navigable Water Level (LNWL)". Its definition is similar, but not wholly identical to the equivalent water level. The LNWL is defined as the water level reached or exceeded at a Danube water gauge on an average of 94% of days in a year (i.e. on 343 days) over a reference period of several decades (excluding periods with ice). In other words, the LNWL is a critical low water level under which the water levels do not fall below more than 22 ice free days per year.[32]

Based on this definition, equivalent calculations can be carried out for the Danube. Two gauge stations on the Danube in Austria are considered (Kienstock and Wildungsmauer), as well as two gauge stations on the Danube in Germany (Pfelling and Hofkirchen).

[30] *The years 2016 and 2020 had 366 days (as they were leap years with an extra day in February), the other years had 365 days.*
[31] *See: Wasser- und Schifffahrtsamt Rhein – Abladeoptimierung am Mittelrhein (https://www.abladeoptimierung-mittelrhein.wsv.de/Webs/Projektseite/Mittelrheinoptimierung/DE/01_Startseite/startseite_node.html) (last consulted on 28 March 2022)*
[32] *Source: viadonau*

TABLE 3: **HYDRAULIC PARAMETERS FOR IMPORTANT DANUBE GAUGE STATIONS**

Gauge station	Minimum navigation channel depth	Equivalent water level
Pfelling (Upper Danube)	200 cm	290 cm
Hofkirchen (Upper Danube)	200 cm	207 cm
Kienstock (Upper Danube)	250 cm	164 cm
Wildungsmauer (Upper Danube)	250 cm	162 cm

Sources: German Federal Waterways and Shipping Administration, viadonau

The number of days per year, on which the actual water levels fell below the equivalent water level, is shown in Table 4.

TABLE 4: **NUMBER OF DAYS PER YEAR WITH A WATER LEVEL BELOW THE LOW NAVIGABLE WATER LEVEL – IMPORTANT GAUGE STATIONS ALONG THE UPPER DANUBE**

	Pfelling	Hofkirchen	Kienstock	Wildungsmauer
2015	106	92	35	54
2016	22	6	12	23
2017	38	18	24	37
2018	148	126	56	91
2019	47	13	4	30
2020	85	50	4	32
2021	36	21	22	48
Average 2015-2021	**69**	**47**	**22**	**45**

Sources: CCNR calculation based on data from German Federal Waterways and Shipping Administration, provided by Federal Office of Hydrology, data from viadonau and from the Federal State of Lower Austria

It can be observed that on average, days with critical low water conditions are more frequent on the Danube than on the Rhine.

In July 2021, infrastructure works on the 70 km Danube stretch between Straubing and Vilshofen began (encompassing the two gauge stations of Pfelling and Hofkirchen), with the aim of deepening the fairway depth. These works will be carried out over seven years.[33] A one-time riverbed dredging of 450,000 cubic metres is necessary to create a greater channel depth. The future annual dredging quantities for maintaining the fairway depth and for securing the riverbed will amount to an average of about 105,000 cubic metres.

[33] *See: Lebensader Donau, Offizieller Spatenstich zum Donauausbau (https://www.lebensader-donau.de/das-gesamtprojekt/news/offizieller-spatenstich-zum-donauausbau/) (last consulted on 28 March 2022)*

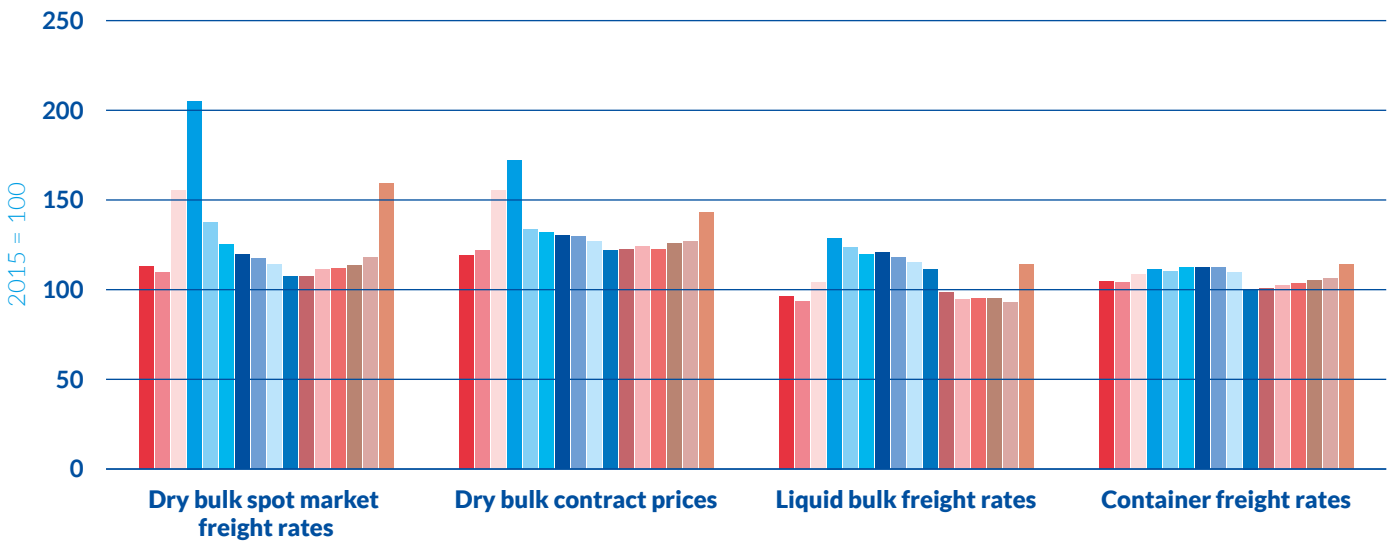
FREIGHT RATES
IN THE RHINE REGION

CBS FREIGHT RATE INDEX FOR THE RHINE REGION

The freight rate index based on the surveys of the CBS are illustrated in Figure 2. Dry bulk and container freight rates followed an increasing path since the third quarter of 2020, as the underlying transport demand recovered from the pandemic. No such recovery can be seen for liquid cargo freight rates. This stems from a weaker development of transport demand compared to dry cargo, both during and after the pandemic[34]. Also, the liquid cargo segment experienced a stronger expansion of its supply side, in terms of a higher newbuilding rate and thus more additional cargo carrying capacity. This changed the supply-demand-relationship and put transport prices under pressure.

Freight rates for all cargo types increased in the fourth quarter of 2021, due to the low water period. The strongest increase was hereby noted for dry bulk spot market rates.

FIGURE 2: **CBS FREIGHT RATE INDICES PER QUARTER** (2015 = 100) *



Source: CBS

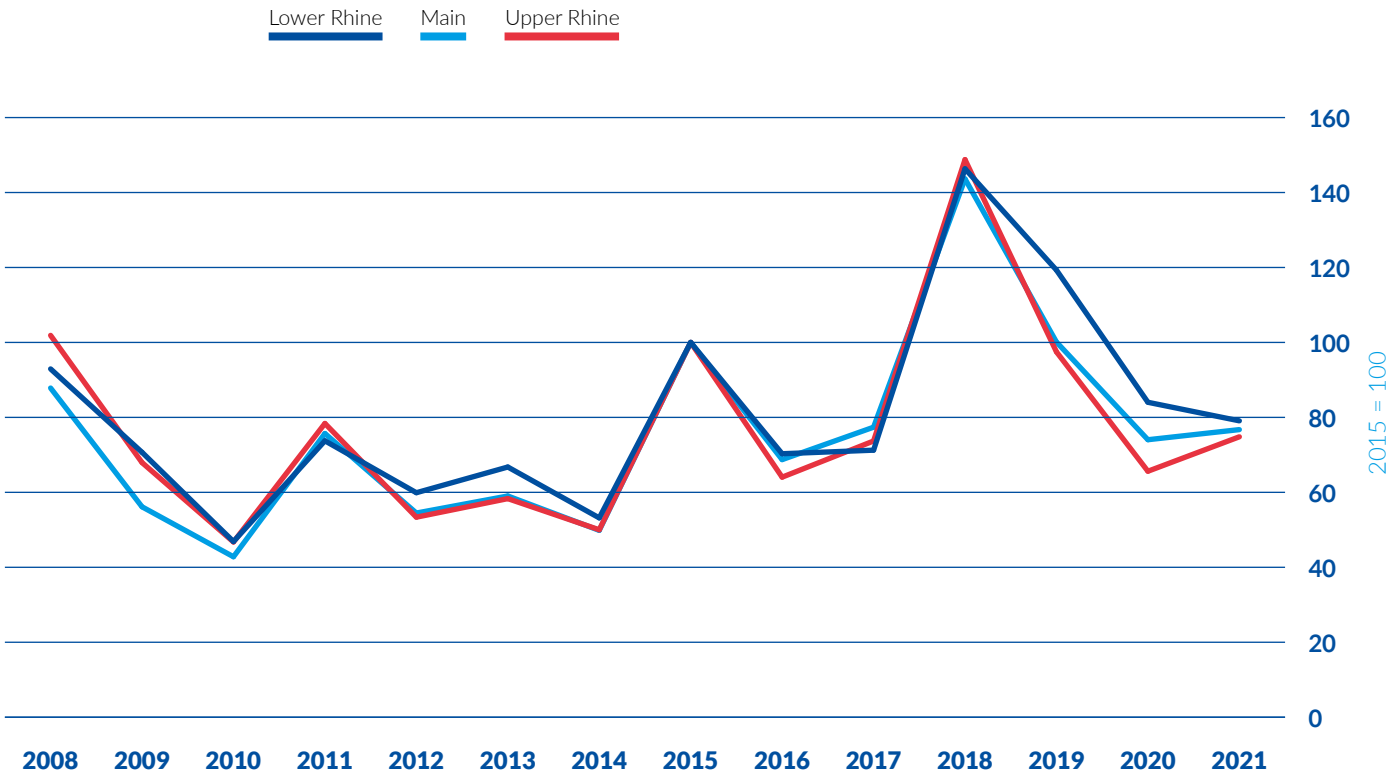
** The prices of established routes are observed twice a quarter and include fuel and low water surcharges but exclude loading and unloading. The time of observation is in the middle and at the end of the quarter. All prices are nominal prices.*

[34] *See also Chapter 2*

PJK FREIGHT RATE INDEX FOR THE RHINE REGION

Figure 3 illustrates the liquid cargo spot market freight rate index for gasoil for ARA-Rhine transport (yearly averages). Since 2010 an overall positive trend is captured with three outliers during the low water periods in 2011, 2015 and 2018. For 2021, only a slight upward movement is noticed, mainly for the Upper Rhine.

FIGURE 3: **PJK FREIGHT RATE INDEX FOR LIQUID CARGO TRANSPORT IN THE ARA-RHINE AREA** (INDEX 2015 = 100)



Source: CCNR calculation based on PJK International

CITBO FREIGHT RATE INDEX FOR THE FARAG REGION[35]

For the liquid cargo transport within the extended ARA region, a dataset on spot market freight rates provided by the tanker barge corporation CITBO[36] was analysed. Within the spot market data, the shares of the different product groups were as follows:

- **Gasoil and components:** share of 40.6% in 2021 (55% in 2020; 50% in 2019, 47% in 2018)
- **Gasoline and components:** share of 23.6% in 2021 (21% in 2020; 26% in 2019 and 35% in 2018)
- **Biodiesel:** share of 28% in 2021 (17.6% in 2020; 15% in 2019 and 11% in 2018)
- **Chemicals:** share of 4.7% in 2021 (5.4% in 2020; 9% in 2019 and 8% in 2018)
- **Heavy and other products:** share of 3.3% in 2021 (1.1% in 2020; 1% in 2019 and 2018).

Of all liquid cargo transported during the period under study (January until December 2021), 34% was loaded in Antwerp, 32% in Rotterdam, 8% in Flushing, 9% in Amsterdam, and 15% in all other ports. Regarding the ports of unloading, around 29% of the volumes were unloaded in Antwerp, 24% in Rotterdam, and 14% in Amsterdam.

A freight rate index was calculated for gasoil and components, gasoline and components, and biodiesel, based on the spot market freight rates.[37] For these three cargo segments, freight rates followed quite different trends in 2021:

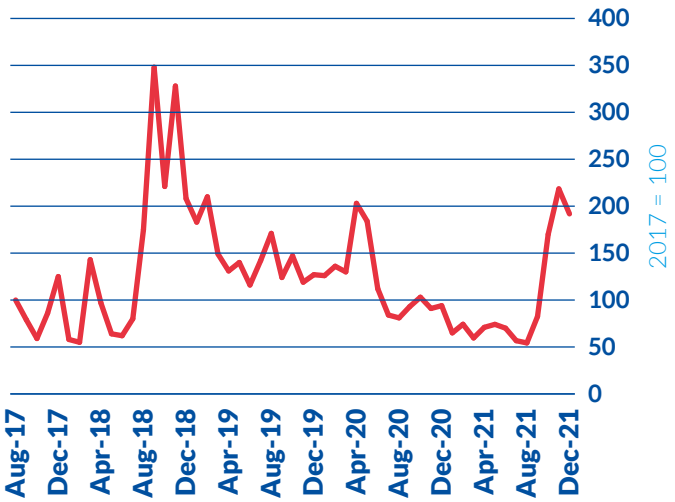
- **Gasoil and components:** a clear peak in the fourth quarter of 2021 can be observed. The reason for this lies in the low water period towards the end of 2021.
- **Gasoline and components:** a stable development throughout the year 2020 continued in 2021 up to the fourth quarter, where a little peak is noticeable.
- **Biodiesel:** the overall downward trend during the year 2020 continued into 2021 up to the third quarter. The low water in the fourth quarter of 2021 led to strongly rising freight rates.

Gasoline and its components had the highest average spot market freight rates in absolute terms (€/tonne), as these trips are on average relatively long and therefore have to cover higher absolute costs (more fuel consumption, etc.) Transport of gasoline and components had an average duration of 21 hours, compared to 13 hours for gasoil and components and 10 hours for biodiesel.

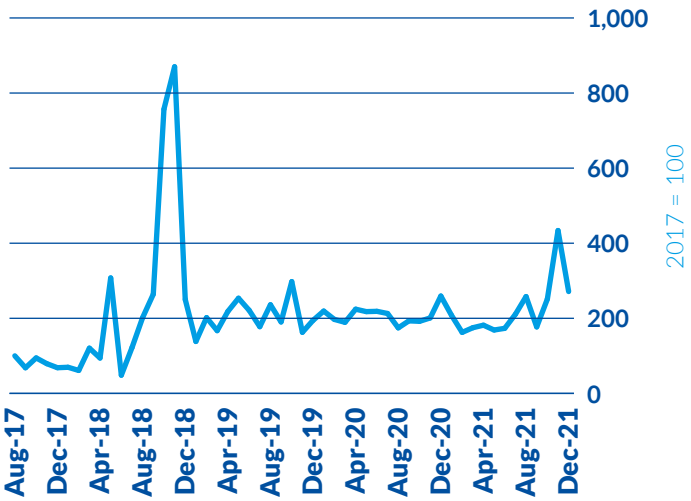
[35] *Flushing, Antwerp, Rotterdam, Amsterdam, Ghent, Terneuzen*
[36] *https://citbo.com/*
[37] *The data on freight rates for chemical transport were not sufficiently numerous to allow an index to be constructed. The same was the case for time charter renting prices.*

FIGURES 4, 5 AND 6: **CITBO FREIGHT RATE INDEX FOR LIQUID CARGO SEGMENTS** (INDEX AUGUST 2017 = 100)

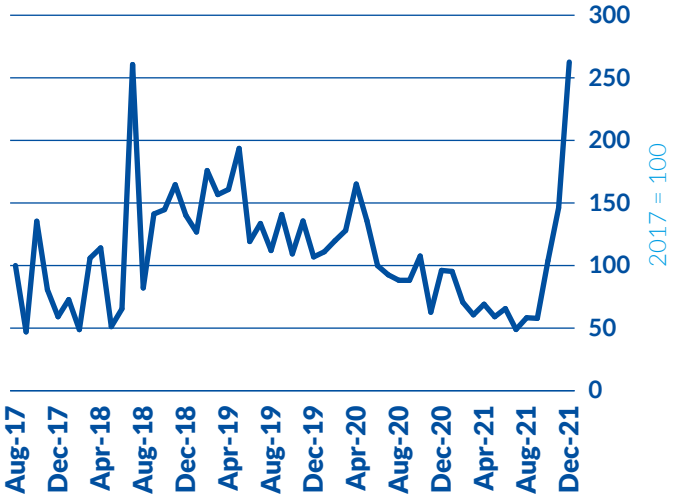
Gasoil and components



Gasoline and components



Biodiesel



Source: CCNR analysis based on CITBO spot market freight rates

FREIGHT RATES
IN THE DANUBE REGION

Freight rates on the Danube represent an average of transport prices for bulk cargo transport.

In September 2021 there was a blockage at river km 365 (in the Bulgarian-Romanian lower Danube stretch) for about three weeks. The blockage concerned both navigating directions and had a negative impact on freight transport and freight rates. In 2021, grain transport on the Middle Danube was influenced by this blockage and decreased by 32% compared to 2020. The decrease mainly took place in the month of September.

Although bunkering prices showed a strong increase of 74% in the Danube region in 2021, this was not reflected in the development of the freight rate index for Danube transport. Slight increases were only recorded in Q1 2021 and in Q3 2021, whereas Q2 2021 and Q4 2021 showed a stagnation in freight rates.[38]

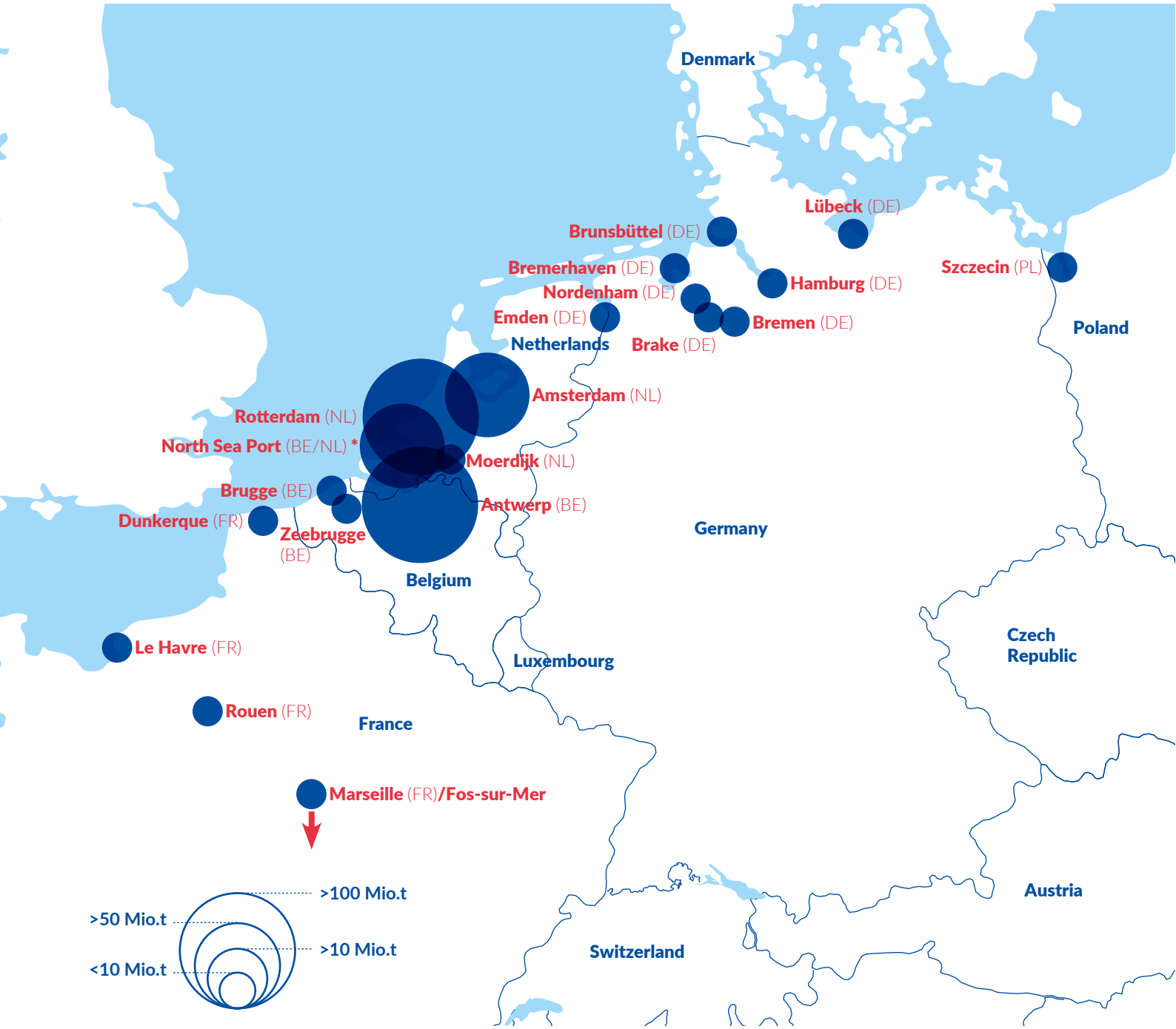
[38] *Reference period for the freight rates index calculation is Q4 2020.*

05

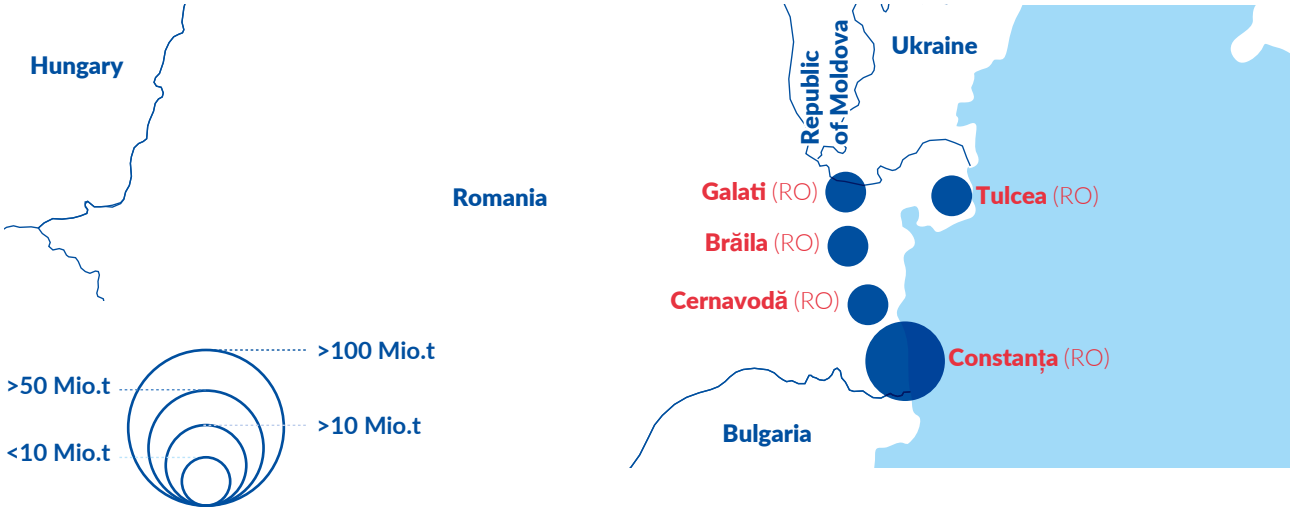
INLAND WATERWAY TRANSPORT IN PORTS

- The recovery in goods transport on inland waterways was also reflected by higher figures for waterside goods handling in ports. An increase by 3.2% of the 15 largest Rhine ports' total waterside goods handling can be observed.
- The results for the Port of Duisburg, the largest inland port in Europe, was 5.9% higher than the previous year. The second largest inland port in Europe, the Port of Paris, recorded a slight decrease in waterside goods transport by 1.6%. For the Port of Liège, another large inland port in Europe, the result was 7.2% higher than in 2020.
- Inland waterway transport in most seaports increased as well. Examples are the Port of Rotterdam (+6%), the Port of Antwerp (+7.5%), the North Sea Port (+9.0%), and the Port of Constanţa (+6.7%) in the lower Danube region. The Port of Hamburg recorded a strong decrease (-16.9%).

MAIN EUROPEAN SEAPORTS



Sources: Port Statistics, Eurostat [iww_go_aport], CBS
** For most ports: data from 2019; Zeebrugge, Brugge, Dunkerque: data from 2016*



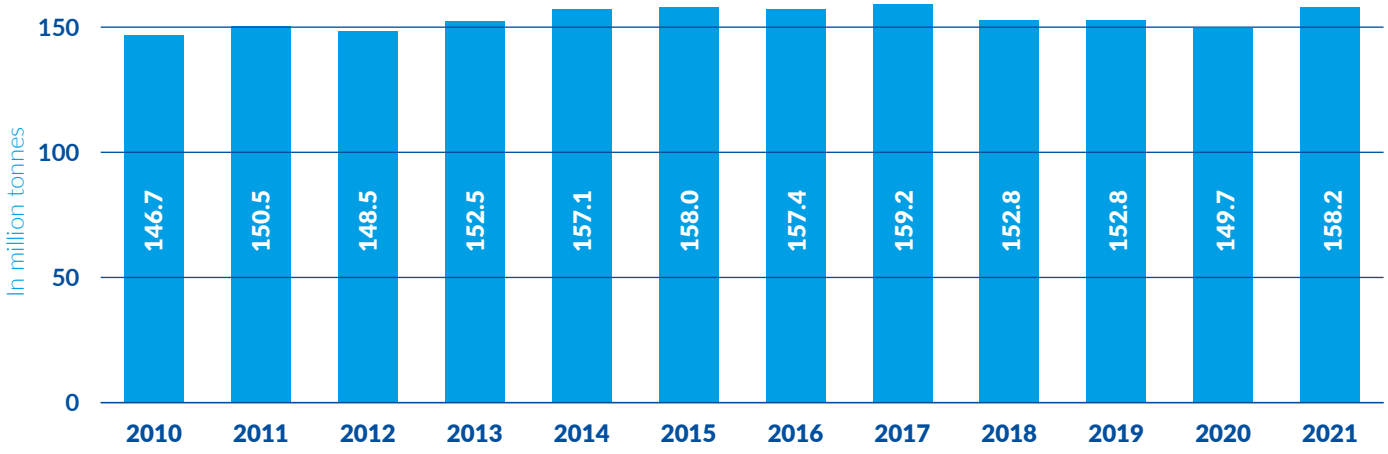
Source: Romanian national Institute of Statistics

ROTTERDAM

Rotterdam is the largest European seaport and remains the market leader in the Hamburg-Le Havre range[39]. The volumes of loaded or unloaded IWT cargo at the Port of Rotterdam increased by 6% to 158.2 million tonnes in 2021 (compared to 149.7 million tonnes in 2020). Both the liquid cargo (+ 1.8%) and the dry cargo (+11.9%) segments increased. So did container transport (+2.6%). As observed in previous years, outgoing traffic continues to play an important role at the port. In 2020, 99,558 inland vessels visited the Port of Rotterdam, almost 8,000 more vessels than in 2020.

It is also worth noting that inland navigation plays an important role in the Port of Moerdijk, situated between Rotterdam and Antwerp. In 2021, IWT goods transport at the Port of Moerdijk reached a volume of almost 10.5 million tonnes.

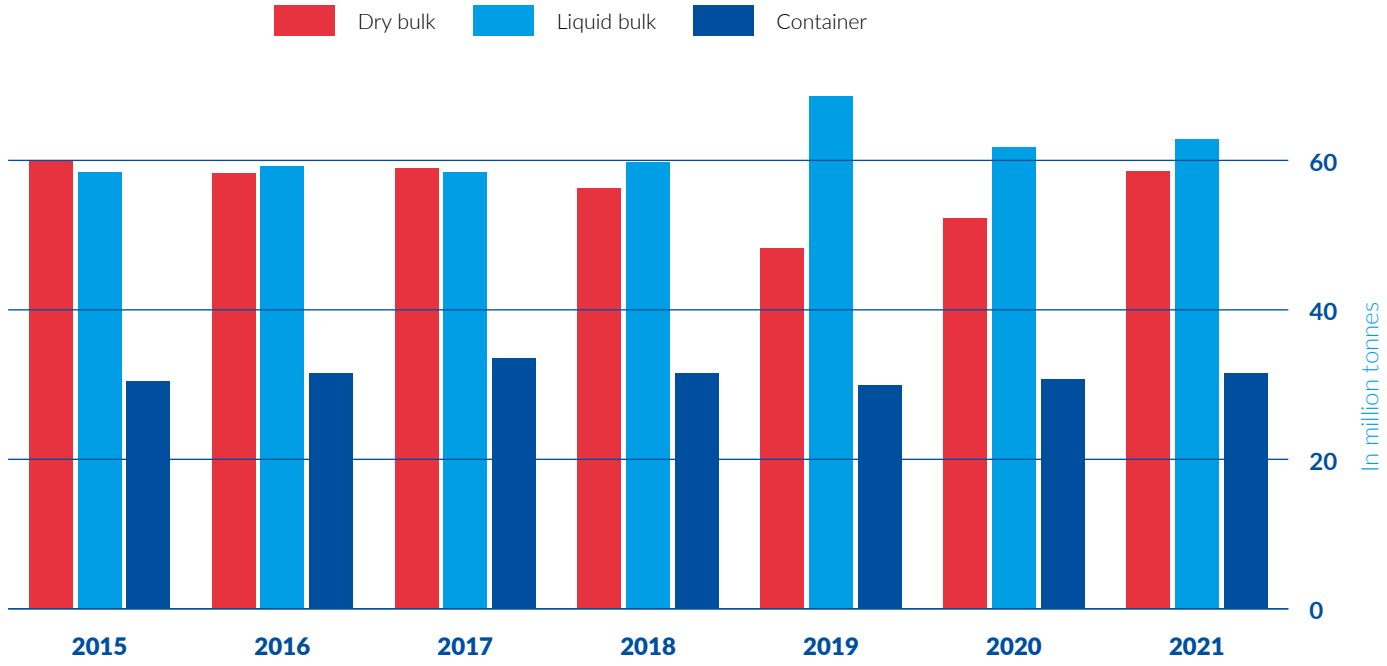
FIGURE 1: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF ROTTERDAM** (IN MILLION TONNES)



Source: Port of Rotterdam based on CBS

[39] *Port of Rotterdam Authority, annual report 2021: PDF - Quick Web Preview (portofrotterdam.com)*

FIGURE 2: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF ROTTERDAM PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: Port of Rotterdam based on CBS
** General cargo is not taken into account in these calculations. In 2021, the volume transported for general cargo amounted to 5.4 million tonnes.*

ANTWERP

In 2021, 59,383 inland vessels frequented the Port of Antwerp (compared to 56,583 in 2020). The inland waterway goods transport at the Port of Antwerp significantly increased by 7.5% in 2021, reaching a volume of 108.5 million tonnes (compared to 101.0 in 2020). Both imports and exports increased.

The modal split within total maritime throughput (but excluding industrial traffic[40]) in 2021 was as follows: 41.5% for road, 7.1% for rail and 51.4% for IWT (compared to the figures in 2020 as follows: 45% for road, 47.3% for IWT and 7.7% for rail). In 2021, the modal split share within container transport to and from the hinterland was 56.8% for road, 35.8% for IWT and 7.4% for rail. For IWT, the goal is to increase this share to 43% by 2030.

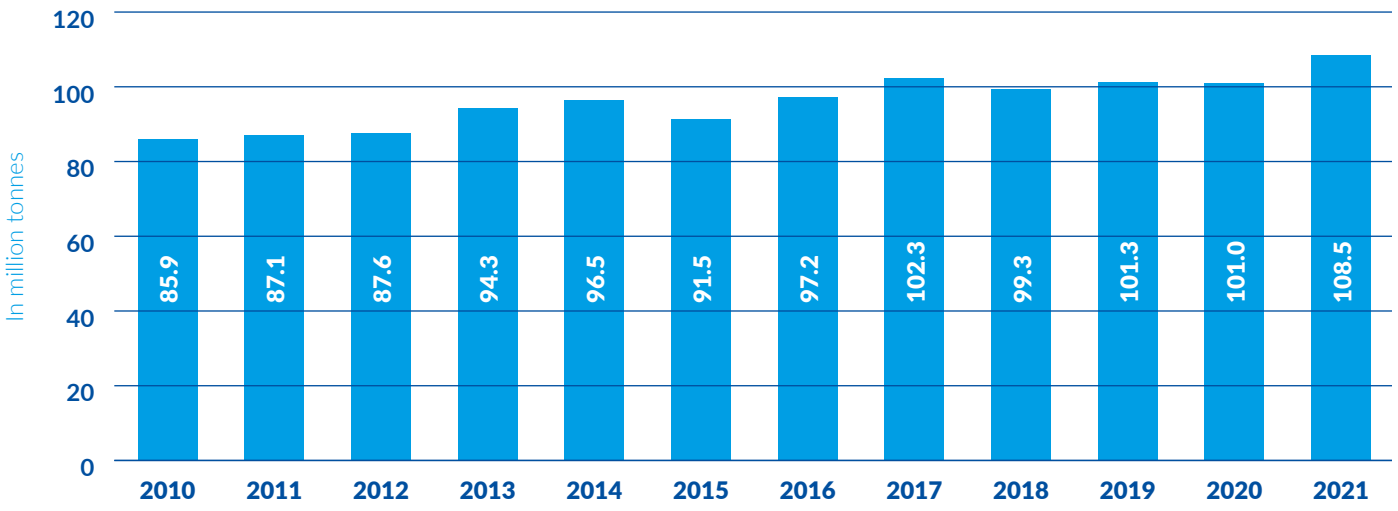
The most relevant market segments are petroleum products and chemicals, which make up more than half of the total cargo handling in riverside transport. They are followed by container transport, with a share approaching 25% of total riverside transport. Dry bulk has a share of 12.1%.

Compared to 2020, an increase in the transport of metalware was observed in 2021, particularly on the imports side. An increase was also noticeable for most of the market segments, but foodstuff and fodder as well as the transport of raw minerals and building materials, experienced a decrease.

Container volumes experienced a slight increase in 2021 compared to 2020.

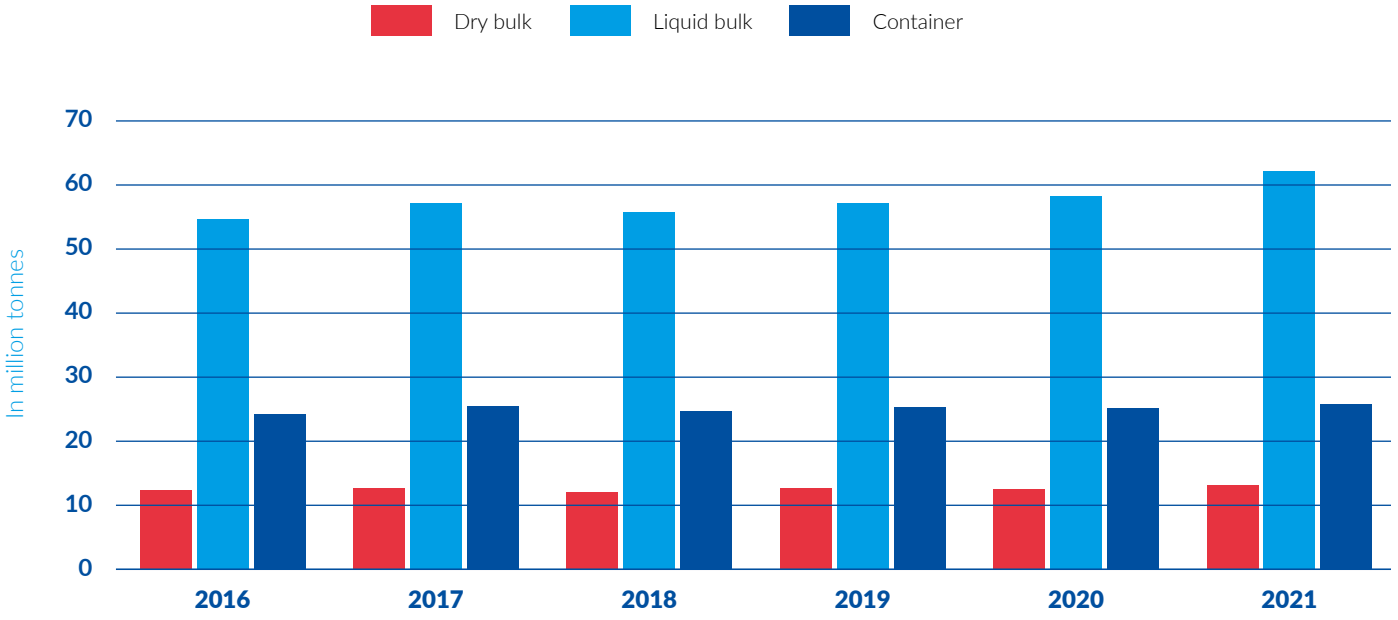
[40] Industrial traffic refers to the traffic taking place directly between the industries located in the port area (such as BASF, AIR LIQUIDE, EUROCHEM...) and the hinterland.

FIGURE 3: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF ANTWERP** (IN MILLION TONNES)



Source: Port of Antwerp

FIGURE 4: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF ANTWERP PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: Port of Antwerp

** Ro/ro general and not assigned goods are not taken into account in these calculations (in 2021, the volume transported for these three cargo types amounted to 7.7 million tonnes, mostly attributed to conventional goods).*

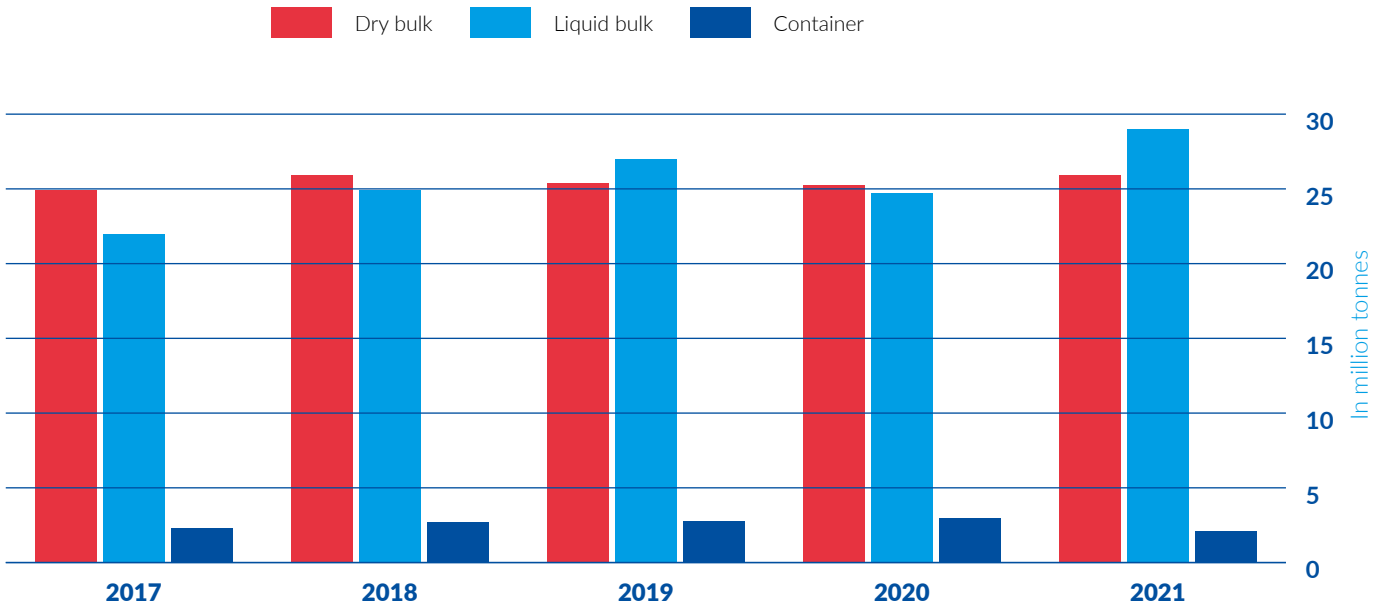
NORTH SEA PORT

In the North Sea Port (Ghent, Terneuzen, Borsele, Flushing), 40,912 inland vessels called at the port in 2021 (compared to 41,446 in 2020).

The evolution of inland waterway transport usually follows the evolution of seagoing transport. With nearly 69 million tonnes of seaborne cargo transhipped in 2021, the North Sea Port grew by 9% compared to the Covid year of 2020. Total river transport experienced a full recovery in 2021, amounting to 59.7 million tonnes. This also represents a 9% increase compared to 2020, well above its pre-pandemic (2018) volume of 58.5 million tonnes. The import-export ratio was 41%/59%. The port expects to completely eliminate losses due to the pandemic in 2022, both for seagoing and inland waterway transport.

Regarding types of transport, this increase in inland waterway transport was driven by a surge in exports (+14%). From the perspective of cargo segments, this increase was driven by liquid bulk (+17%), particularly vegetable oils and chemical products. Dry bulk and general cargo both saw an absolute growth of around 0.5 million tonnes. Container transport decreased. Regarding a modal split for hinterland transport, inland navigation ranks first with a share of 58% followed by road (30%), rail (10%) and transshipment (2%).

FIGURE 5: **INLAND WATERWAY TRANSPORT IN THE NORTH SEA PORT**
(IN MILLION TONNES)



Source: North Sea Port
** Ro/ro and conventional cargo are not taken into account in these calculations (in 2021, the volume transported for these two cargo types amounted to respectively 0.31 million tonnes and 2.44 million tonnes).*

CONSTANŢA

In Constanța, 10,619 inland vessels called at the port in 2021 (10,344 in 2020). Inland waterway transport increased by almost 6.7%, to reach 15.86 million tonnes compared to 2020. It is worth noting that the total cargo transport registered at the Port of Constanța (both maritime and inland waterway transport) in 2021 represents the largest freight transport level in the history of Romanian maritime ports. Cereal transport reached 25.2 million tonnes compared to 21.9 million tonnes in 2020, the largest grain transport ever registered at the Port.

Regarding inland waterway transport specifically, mainly dry cargo is handled in the Port of Constanța, with a share above 90% of the total cargo volume in 2021. Dry cargo volumes registered a 5% increase compared to 2020. This increase was mostly driven by the transport of cereals and liquid cargo volumes also increased. Container and general cargo amounted to almost 400,000 tonnes in 2021, mostly attributed to general cargo. Cabotage and transit traffic together had a share of 98% in 2021 while export and import traffic had a share of only 2%.

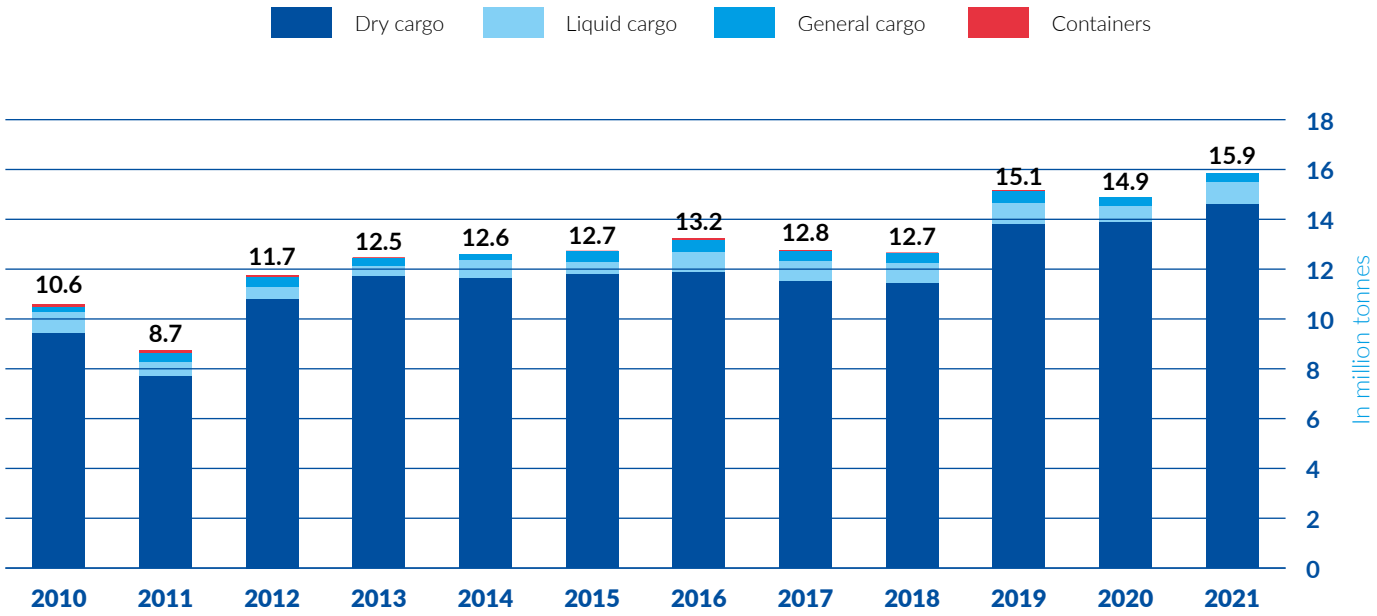
The Dionysus[41] and IW-NET[42] projects, the aims of which include developing container transport on the Danube, are ongoing. The Port of Constanța is identified as an important player to drive this development. Indeed, a very small number of containers are currently being transported on the Danube and are mainly empty. However, there is free capacity available on the Danube for the development of container transport and connections with strong industrial regions in southeast Europe also exist, which can be considered as favourable.

At the same time, there are also several unfavourable conditions, such as the lack of adequate container handling infrastructure in ports, the need for vessels to be adapted to navigate in low water periods, administrative and political obstacles, long container transit times, lack of information among shippers regarding inland navigation container transport. Despite this context and the several attempts to develop container transport on the Danube, recent public policy developments such as the EU-Green Deal and the availability of public subsidies, may have a positive impact on the development of this new market on the Danube.

Regarding the impact of the war in Ukraine on inland navigation, it can be highlighted that some increases in dry cargo transport have been registered, linked to more cereals being transported from Ukraine via the Port of Constanța. The impact of war is more visible on road and rail transport, given that an important flow of goods is being redirected to the Port of Constanța. So far, maritime transport at the Port of Constanța increased due to the war in Ukraine.

[41] Interreg Danube (interreg-danube.eu)
[42] IW-Net Project | IW-Net, https://www.iw-net.eu/

FIGURE 6: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF CONSTANȚA** (IN MILLION TONNES)



Sources: Port of Constanța

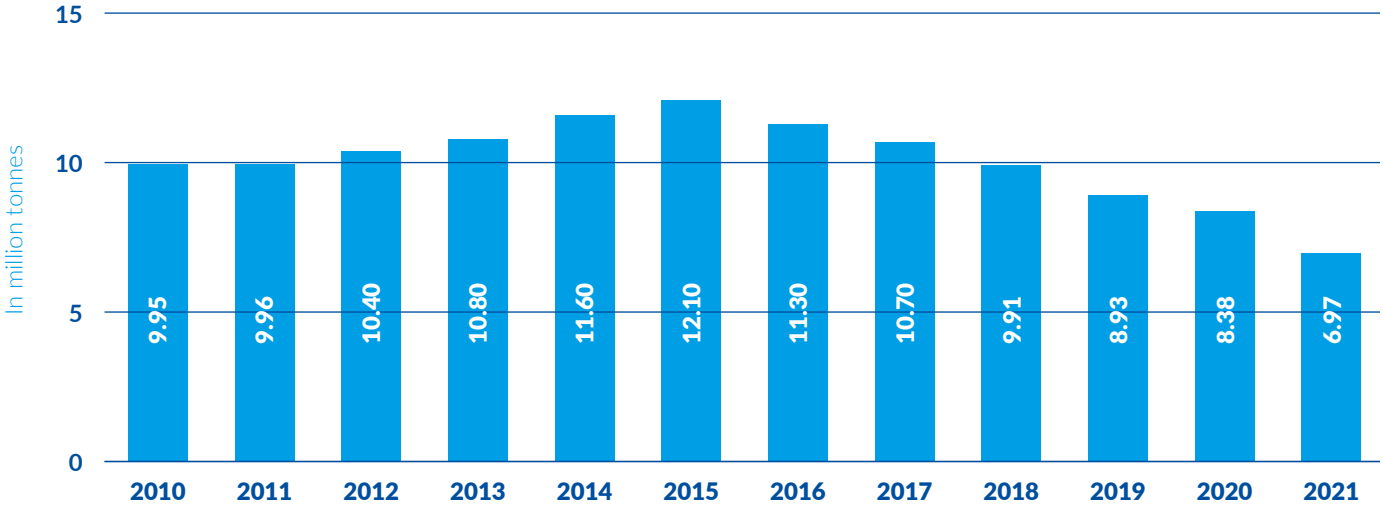
HAMBURG

Volumes transported by IWT decreased by 16.9% in 2021 (7 million tonnes) compared to 2020 (8.3 million tonnes) in the Port of Hamburg. Both imports (-19.6%) and exports (-13.4%) experienced a strong reduction. Many factors contributed to this decrease: congestion, Covid pandemic, ice and low water periods on the Elbe, operational restrictions at critical points of the hinterland infrastructure such as the Scharnebeck vessel lift. Alongside such factors, a change in statistical recording in 2021, resulting in a downwards distortion in the data series, can partly explain this reduction. The number of vessels calling at the port also decreased by 25% to reach 10,599 port calls in 2021.

Overall bulk cargo has been following a decreasing trend since 2015 (-38.5%). The two main cargo types within IWT at the Port of Hamburg both recorded lower values, with a reduction by almost 18% for ores and mining products and by 21.3% for coke and petroleum products. A similar decrease in transport of coke and petroleum products was already observed in 2020 (-24.3%). However, transport of coal, crude oil and natural gas experienced an increase of 70%, which results mainly from the high gas prices observed in 2021 and the resulting shift towards coal in the energy sector (see Chapter 2). A stable trend is observed for container transport.

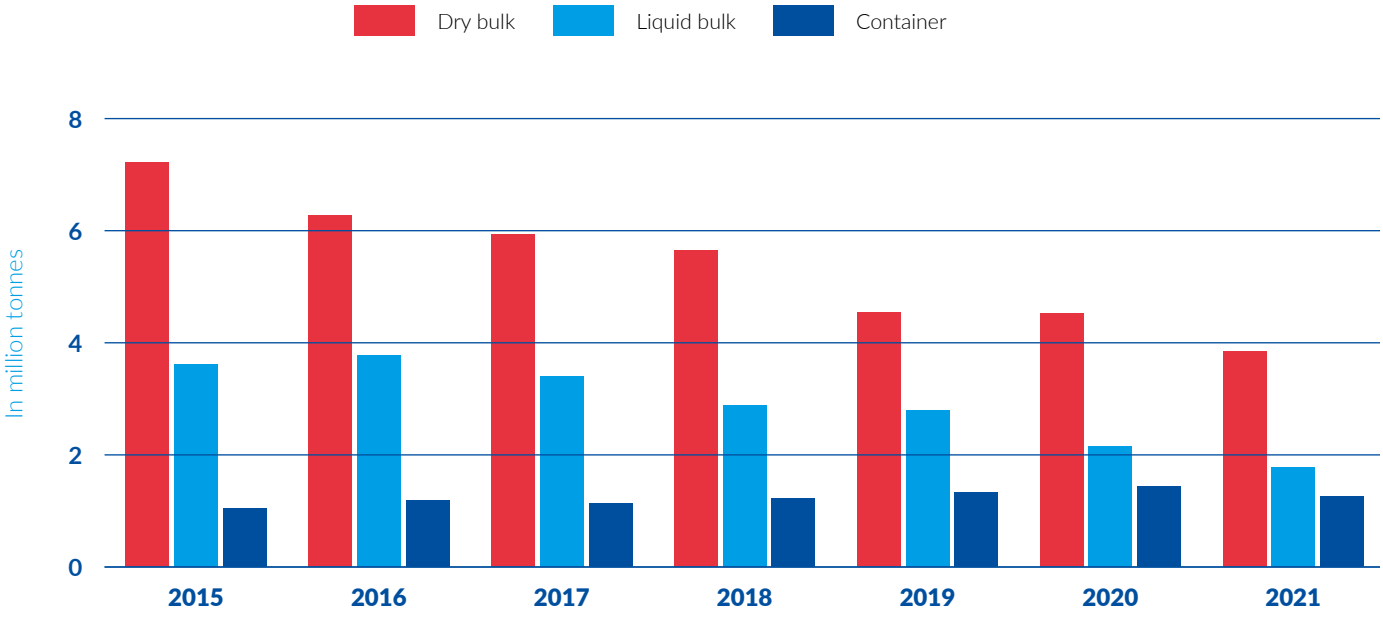
As in 2020, hinterland transport consisted of 92 million tonnes of transported goods in 2021. With a share of 52.8%, railway transport is ahead of truck transport with 39.7% and inland waterway transport with 7.6% (against 9% in 2020).

FIGURE 7: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF HAMBURG** (IN MILLION TONNES)



Source: Statistical Office of Hamburg

FIGURE 8: **INLAND WATERWAY TRANSPORT IN THE SEAPORT OF HAMBURG PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: Statistical Office of Hamburg

** General cargo is not taken into account in these calculations (in 2021, the volume transported for this cargo type amounted to 0.1 million tonnes).*

MAIN EUROPEAN INLAND PORTS[43]

RHINE PORTS

TABLE 1: **INLAND WATERWAY TRANSPORT IN MAJOR RHINE PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020 ***

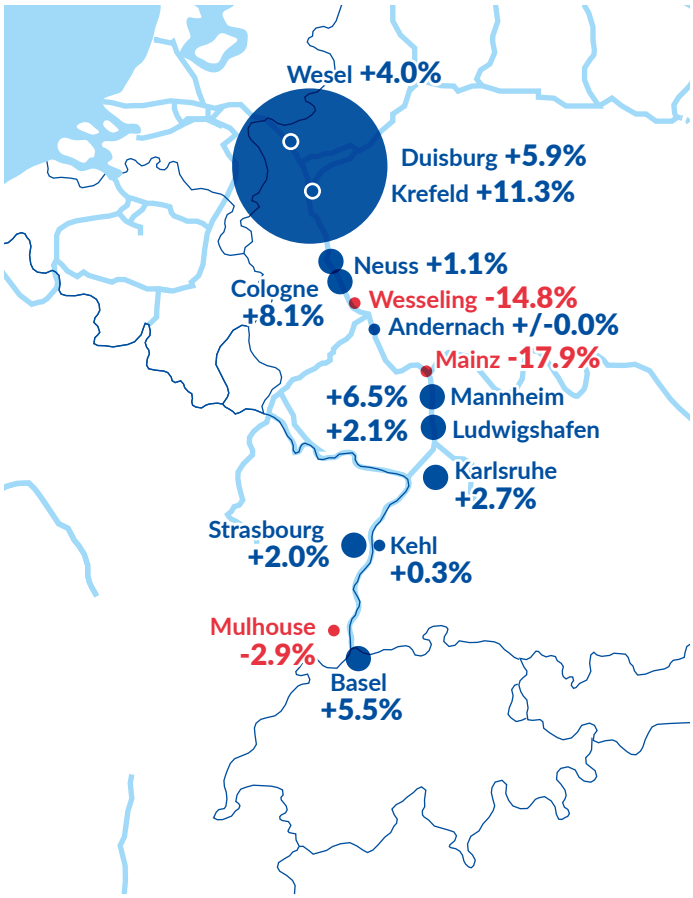
	2018	2019	2020	2021	2021/2020
Duisburg	48.1	47.8	42.4	44.9	+5.9%
Cologne	8.9	9.1	9.1	9.8	+8.1%
Mannheim	7.5	7.9	6.9	7.3	+6.5%
Strasbourg	5.9	7.5	6.8	6.9	+2.0%
Ludwigshafen	6.1	6.6	6.8	6.9	+2.1%
Neuss	7.6	6.9	6.5	6.6	+1.1%
Karlsruhe	6.4	6.9	6.2	6.4	+2.7%
Basel	4.7	6.1	5.1	5.4	+5.5%
Kehl	3.9	4.2	4.4	4.4	+0.3%
Mulhouse	4.4	4.9	4.2	4.1	-2.9%
Krefeld	3.3	3.6	3.0	3.4	+11.3%
Mainz	3.2	3.7	3.8	3.1	-17.9%
Andernach	2.3	2.7	2.7	2.7	+/-0.0%
Wesseling	2.0	2.7	2.5	2.1	-14.8%
Wesel	1.7	2.0	2.0	2.1	+4.0%
Total	**116.0**	**122.6**	**112.4**	**116.1**	**+3.2%**

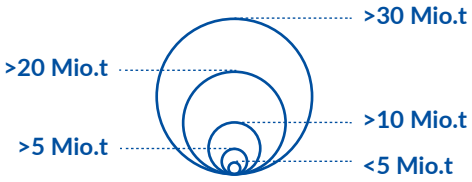
Sources: Destatis, Port de Strasbourg, Swiss Rhine ports, Port de Mulhouse. The "total" relates only to the ports mentioned in the table, not all Rhine ports.

** Data on German ports are based on the geographical approach, which means that all cargo turnover within a city is taken into account and not only the cargo handled in a specific port.*

[43] *For German, French, Belgian, Dutch and Rhine ports, the number of ports shown is limited to the 15 largest ports.*

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)





Negative rate of change in 2021 vs 2020

Positive rate of change in 2021 vs 2020

PORTS IN GERMANY OUTSIDE THE RHINE *

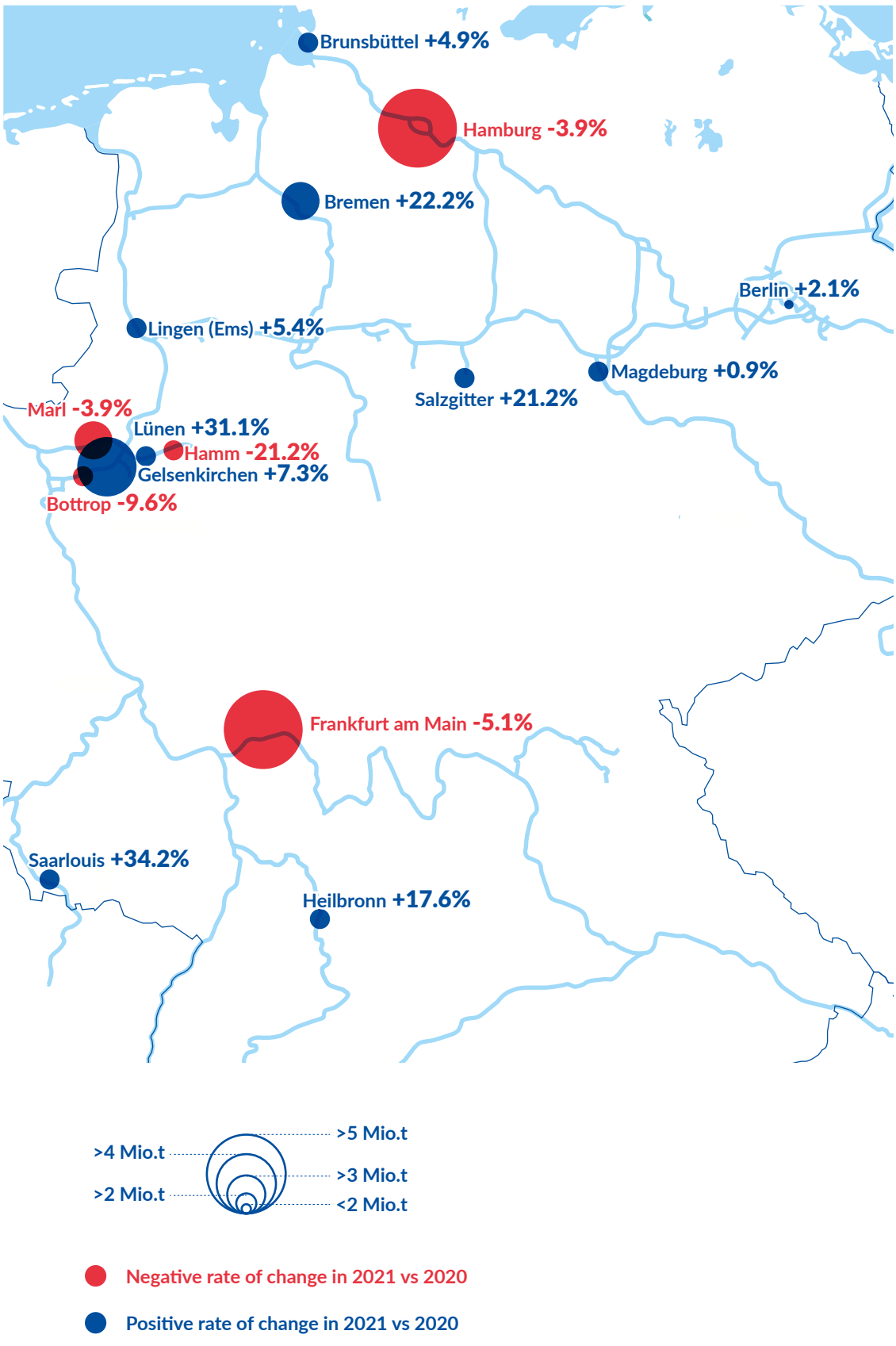
TABLE 2: **INLAND WATERWAY TRANSPORT IN MAJOR NON-RHINE PORTS IN GERMANY** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020** *

	2018	2019	2020	2021	2021/2020
Hamburg	9.8	8.7	7.9	7.6	-3.9%
Frankfurt am Main	4.7	5.4	5.7	5.4	-5.1%
Gelsenkirchen	3.9	4.7	4.6	4.9	+7.3%
Bremen	3.7	2.8	2.7	3.3	+22.2%
Marl	3.1	3.3	3.2	3.1	-3.9%
Brunsbüttel	3.4	3.1	2.7	2.8	+4.9%
Bottrop	3.0	3.8	3.1	2.8	-9.6%
Salzgitter	2.8	2.9	2.2	2.7	+21.2%
Magdeburg	2.5	2.3	2.6	2.7	+0.9%
Saarlouis	2.9	2.6	1.9	2.6	+34.2%
Lünen	2.4	2.6	1.8	2.3	+31.1%
Heilbronn	2.1	2.3	1.8	2.2	+17.6%
Hamm	3.5	2.8	2.7	2.1	-21.2%
Lingen (Ems)	2.6	2.3	1.9	2.1	+5.4%
Berlin	2.3	1.9	1.8	1.8	+2.1%
Total	52.7	51.5	46.6	48.4	+3.9%

Source: Destatis

** Data on German ports are based on the geographical approach, which means that all cargo turnover within a city is taken into account and not only the cargo handled in a specific port. For Hamburg, figures according to this approach are therefore higher than the figures of the Port of Hamburg, due to other transshipment places in the city.*

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)



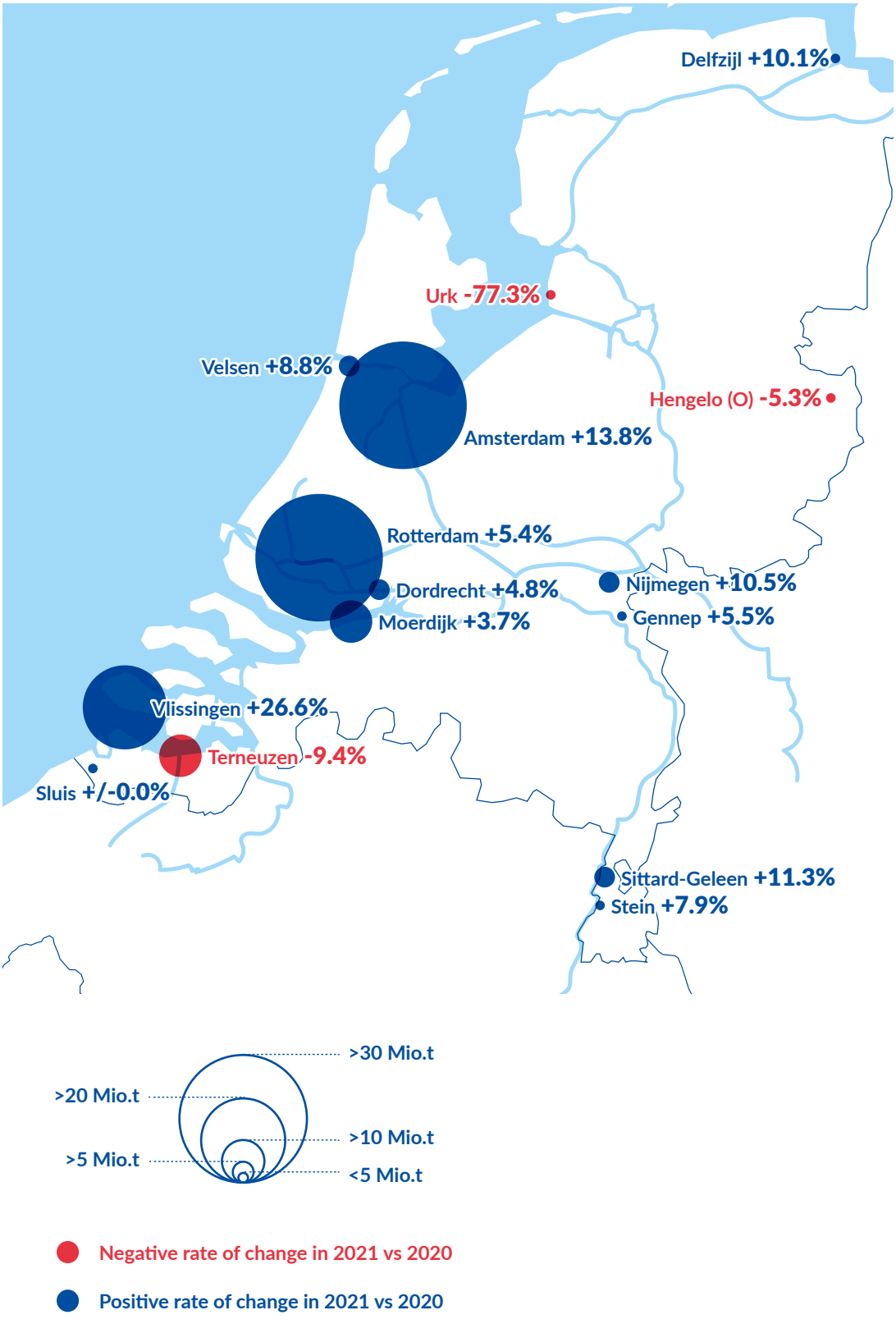
DUTCH PORTS

TABLE 3: **INLAND WATERWAY TRANSPORT IN MAJOR DUTCH PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020**

	2018	2019	2020	2021	2021/2020
Rotterdam	152.8	152.8	150.6	158.7	+5.4%
Amsterdam	60.1	60.0	53.1	60.4	+13.8%
Vlissingen	15.3	19.9	17.0	21.5	+26.6%
Terneuzen	14.1	14.4	14.3	13.0	-9.4%
Moerdijk	10.2	10.2	10.9	11.3	+3.7%
Sittard-Geleen	6.3	6.8	6.4	7.1	+11.3%
Velsen	4.6	6.4	6.6	7.2	+8.8%
Urk	5.1	6.0	2.5	0.6	-77.3%
Dordrecht	5.3	5.7	6.4	6.8	+4.8%
Delfzijl	6.4	5.2	4.2	4.6	+10.1%
Nijmegen	2.8	4.1	5.1	5.7	+10.5%
Hengelo (O)	3.6	4.0	3.8	3.6	-5.3%
Gennep	3.7	3.2	3.2	3.3	+5.5%
Stein	3.6	3.1	3.1	3.3	+7.9%
Sluis	3.3	2.8	3.0	3.0	+/-0.0%
Total	**298.0**	**305.3**	**290.2**	**310.1**	**+6.9%**

Source: CBS

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)



FRENCH AND BELGIAN PORTS

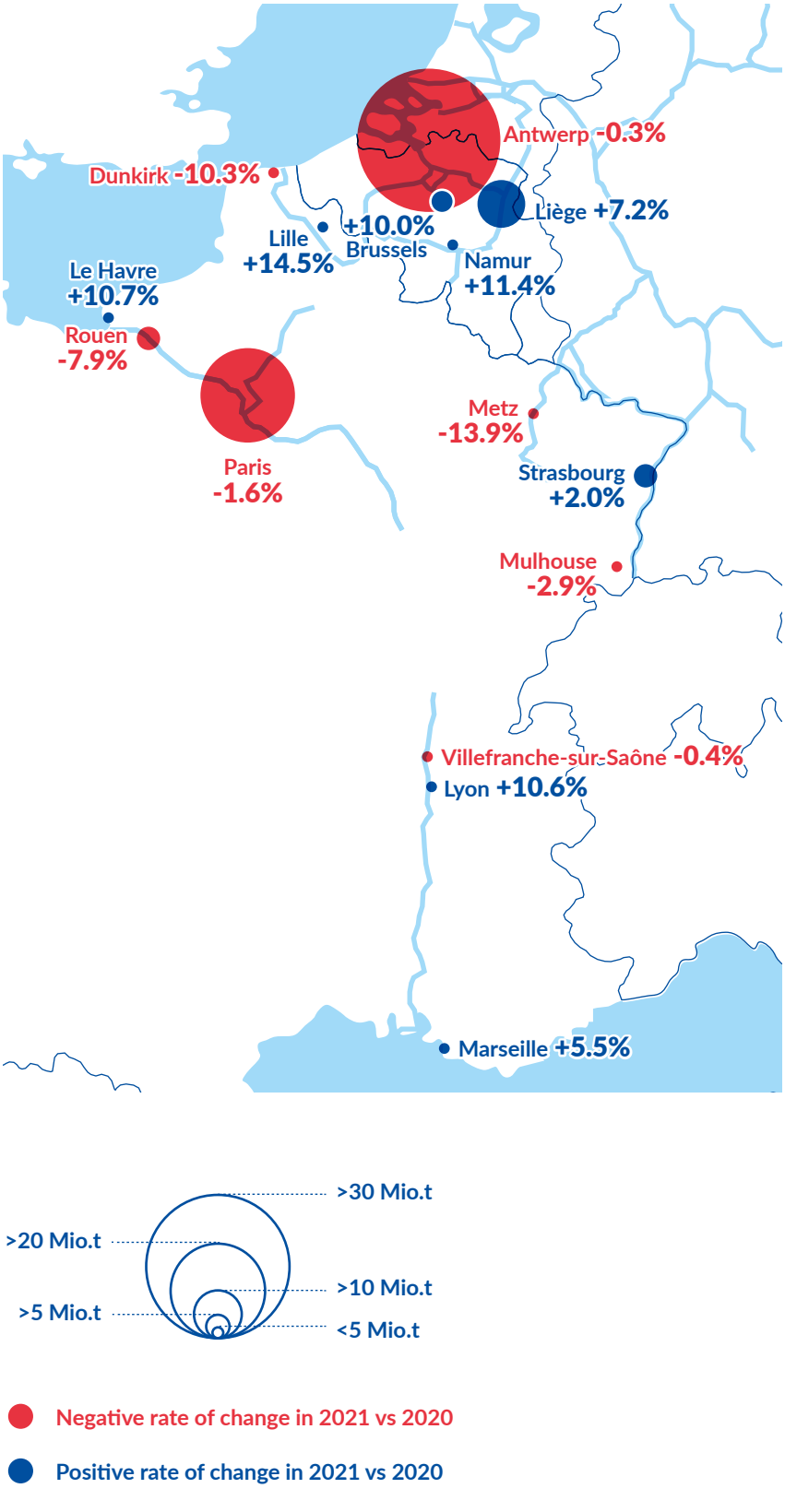
TABLE 4: **INLAND WATERWAY TRANSPORT IN MAJOR FRENCH AND BELGIAN PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020**

	2018	2019	2020	2021	2021/2020
Antwerp	102.3	99.3	101.3	101	-0.3%
Paris	22.1	25.3	22.8	22.5	-1.6%
Liège	16.0	16.0	13.9	14.9	+7.2%
Strasbourg	5.9	7.5	6.8	6.9	+2.0%
Rouen	4.8	5.5	5.9	5.4	-7.9%
Brussels	5.2	5.2	4.9	5.4	+10.0%
Mulhouse	4.4	4.9	4.2	4.1	-2.9%
Namur	5.1	4.6	3.8	4.3	+11.4%
Le Havre	3.2	3.4	2.7	3.0	+10.7%
Marseille	2.5	2.8	1.9	2.1	+5.5%
Dunkirk	2.4	2.5	2.9	2.6	-10.3%
Metz	1.9	2.2	2.0	1.7	-13.9%
Lille	1.8	1.9	2.0	2.3	+14.5%
Lyon	1.4	1.1	1.0	1.2	+10.6%
Villefranche-sur-Saône	0.8	0.8	0.7	0.7	-0.4%
Total	**179.8**	**185.0**	**177.2**	**178.3**	**+1.4%**

Sources: Ministère de la transition écologique, Voies Navigables de France, Ports de Paris, Port de Liège, Port de Strasbourg, Port de Mulhouse, Port de Bruxelles, Port de Namur, Nouveau Port de Metz, Port de Lille, Port de Dunkerque, Port of Antwerp

The "total" relates only to the ports mentioned in the table, and not to all French and Belgian ports.

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)



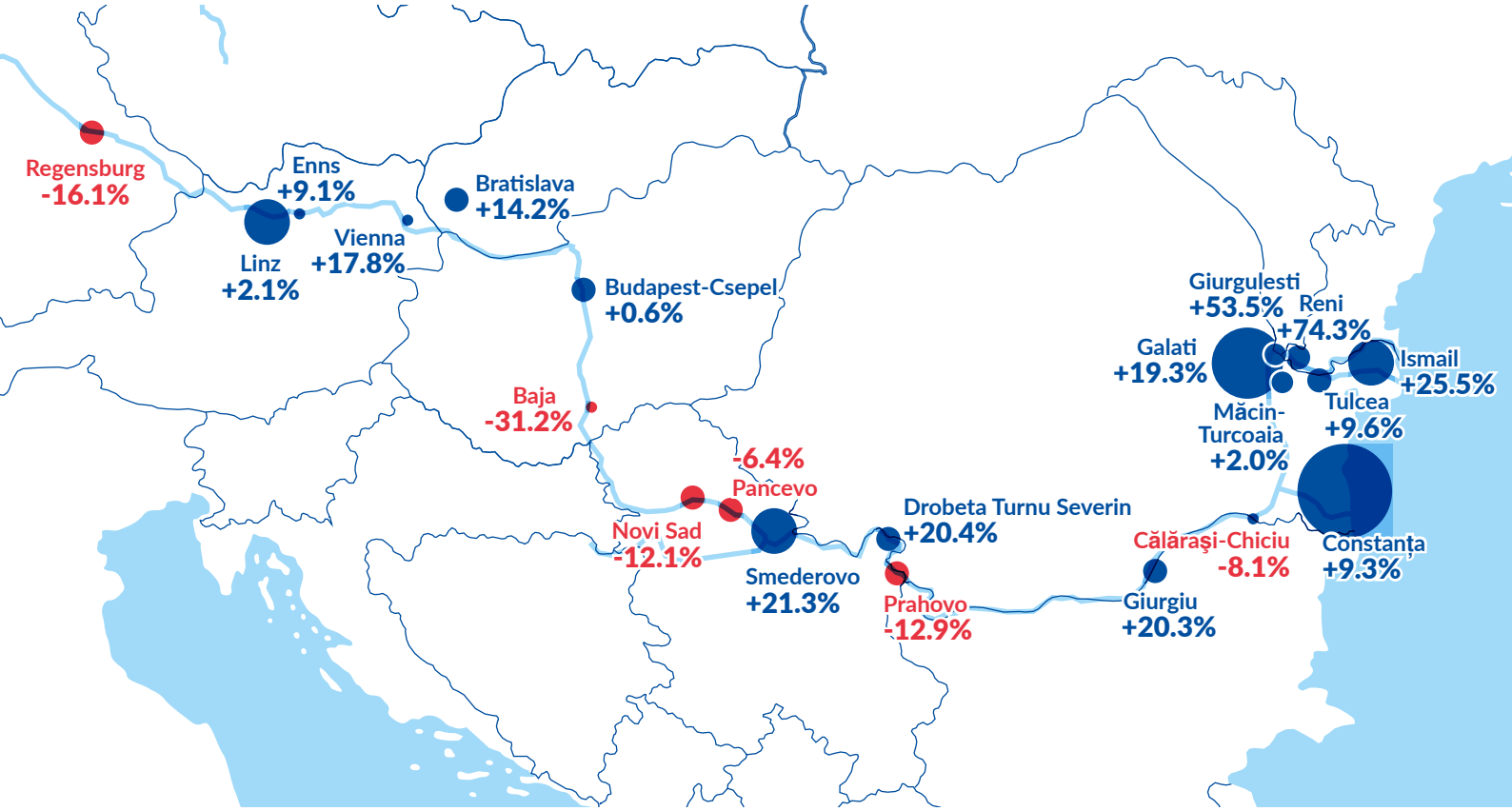
DANUBE PORTS

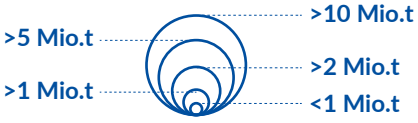
TABLE 5: **INLAND WATERWAY TRANSPORT IN MAJOR DANUBE PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2021/2020**

	2018	2019	2020	2021	2021/2020
Constanța	12.1	14.5	14.5	15.8	+9.3%
Galati	6.4	5.9	4.5	5.4	+19.3%
Ismail	4.7	4.3	3.2	4.1	+25.5%
Linz	3.2	3.3	3.4	3.5	+2.1%
Smederovo	3.6	4.0	2.6	3.2	+21.3%
Pancevo	1.4	1.5	2.0	1.9	-6.4%
Bratislava	1.5	1.7	1.5	1.8	+14.2%
Giurgulesti	1.9	1.3	1.2	1.8	+53.5%
Novi Sad	1.0	1.4	1.6	1.4	-12.1%
Reni	1.3	1.3	0.8	1.4	+74.3%
Tulcea	1.7	1.6	1.2	1.3	+9.6%
Regensburg	1.1	1.3	1.5	1.3	-16.1%
Drobeta Turnu Severin	1.1	1.2	1.0	1.2	+20.4%
Budapest-Csepel	0.9	1.1	1.2	1.2	+0.6%
Prahovo	1.0	1.1	1.2	1.0	-12.9%
Măcin-Turcoaia	0.8	0.9	1.2	1.0	+2.0%
Giurgiu	0.7	0.8	0.8	1.0	+20.3%
Călăraşi-Chiciu	0.7	1.1	0.9	0.9	-8.1%
Vienna	1.0	1.2	0.8	0.9	+17.8%
Enns	0.5	0.8	0.6	0.7	+9.1%
Baja	0.3	0.5	0.8	0.6	-31.2%
Total	**47.2**	**50.8**	**46.9**	**51.7**	**+10.1%**

Sources: Danube Commission market observation, Romanian Statistical Institute, Austrian Statistical Institute. The "total" relates only to the ports mentioned in the table and not all Danube ports. In Figure 5, the data used come from the Port of Constanța while the data used in this table come from the Romanian Statistical Institute. This can explain the slight difference in the figures reported.

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)





Negative rate of change in 2021 vs 2020

Positive rate of change in 2021 vs 2020

SAVA PORTS

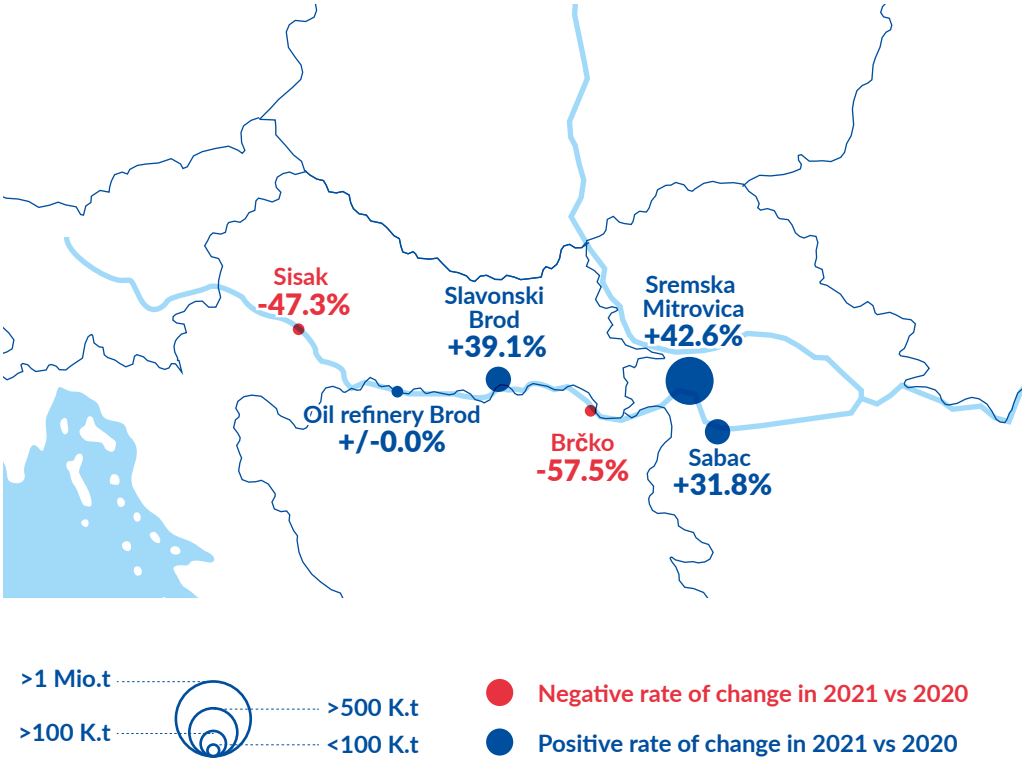
TABLE 6: **INLAND WATERWAY TRANSPORT IN MAJOR SAVA PORTS** (IN THOUSAND TONNES) **AND RATE OF CHANGE 2021/2020 ***

	2018	2019	2020	2021	2021/2020
Other ports (Serbia)	682	949	2,100	2,283	+8.7%
Sremska Mitrovica (Serbia)	234	560	486	693	+42.6%
Sabac (Serbia)	149	149	170	224	+31.8%
Slavonski Brod (Croatia)	131	199	138	192	+39.1%
Sisak (Croatia)	66	70	55	29	-47.3%
Brčko (Bosnia and Herzegovina - BaH)	98	125	73	31	-57.5%
Oil refinery Brod (BaH)	29	8	0	0	+/-0.0%
Total	1,389	2,060	3,022	3,452	+14.2%

Source: Sava Commission

** In 2015, the Port of Šamac in Bosnia and Herzegovina reported bankruptcy, therefore no transshipment of cargo has been recorded since then. Due to the Covid-19 pandemic in 2020 and reconstruction of the Brod oil refinery in 2021, no transshipment at the river terminal was recorded in 2020 and 2021. Since 2018 and 2019, data for smaller transshipment places in Serbia began to be collected which explains the increasing amount of transshipped goods recorded in Serbia for those years.*

TOTAL YEARLY WATERSIDE TRAFFIC (IN THOUSAND TONNES)



06

CARGO FLEETS

- In 2021, the total number of vessels in the Rhine countries amounted to 10,256 units: 7,445 dry cargo vessels, 1,453 liquid cargo vessels, 1,358 push and tugboats. Small vessels with a deadweight of up to 1,500 tonnes represent around 41% of the Dutch dry cargo fleet, 75% of the French and German dry cargo fleet, and 53% of the Belgian dry cargo fleet. The number of small vessels has followed a decreasing trend over the last ten years.
- Regarding newbuilding activities, a sizeable difference can be observed in the new building trends between the liquid cargo and the dry cargo sector. Newbuilding rates in liquid cargo followed a recovery path between 2016 and 2020.
- Newbuilding activity in the dry cargo sector has remained on a much lower level compared to liquid cargo since 2016, with newbuilding figures on a relative stagnation orientated pathway.

SIZE OF FLEETS
PER MACRO-REGION AND COUNTRY IN EUROPE

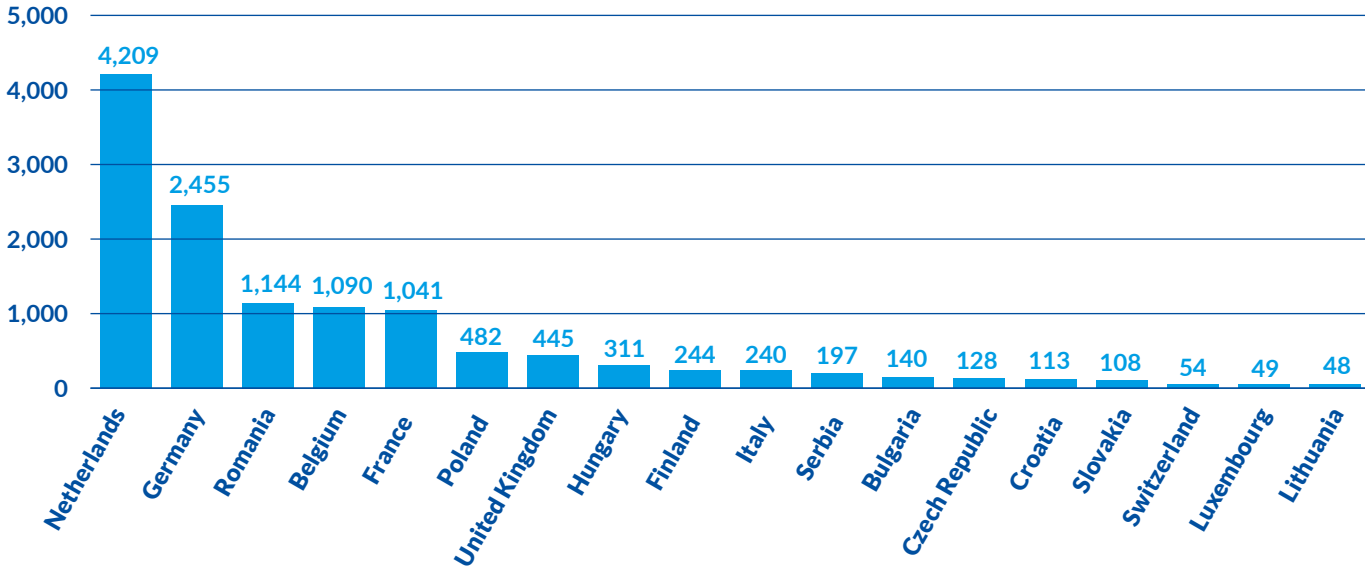
TABLE 1: **SIZE OF FLEETS** (NUMBER OF INLAND VESSELS) **PER MACRO-REGION AND VESSEL TYPE IN EUROPE**

	Dry cargo vessels	Liquid cargo vessels	Push & tug boats	
RHINE FLEET	7,445	1,453	1,358	10,256
DANUBE FLEET	2,652	204	642	3,498
OTHER COUNTRIES *	1,561	26#	727	2,314
	11,658	1,683	2,727	16,068

Sources: 1) Rhine countries: VNF (France), CBS/Rijkswaterstaat (Netherlands), ITB (Belgium), Waterway Administration of Germany, National fleet register of Luxembourg, Swiss Waterway Administration. 2) Danube countries: Danube Commission. 3) Other countries: Eurostat [iww_eq_loadcap], [iww_eq_age], Czech Ministry of transport, Statistics Poland, Statistics Lithuania.
** Other countries = Poland, Czech Republic, Italy, United Kingdom, Finland, Lithuania*
 # Comprises 9 tanker vessels in Poland, 1 in the Czech Republic and 16 in Lithuania, but an unknown number in the other countries.

The following figures show the number of dry and liquid cargo vessels taken together (self-propelled vessels and barges) and the number of push and tugboats per country in Europe. Regarding the number of dry and liquid cargo vessels (Figure 1), the data are the latest available and refers to 2021 for Belgium, France, Luxembourg, the Netherlands and Switzerland, to 2020 for Germany, and to 2019 for all other countries, except for Italy (2018), the UK (2018) and Serbia (2017).

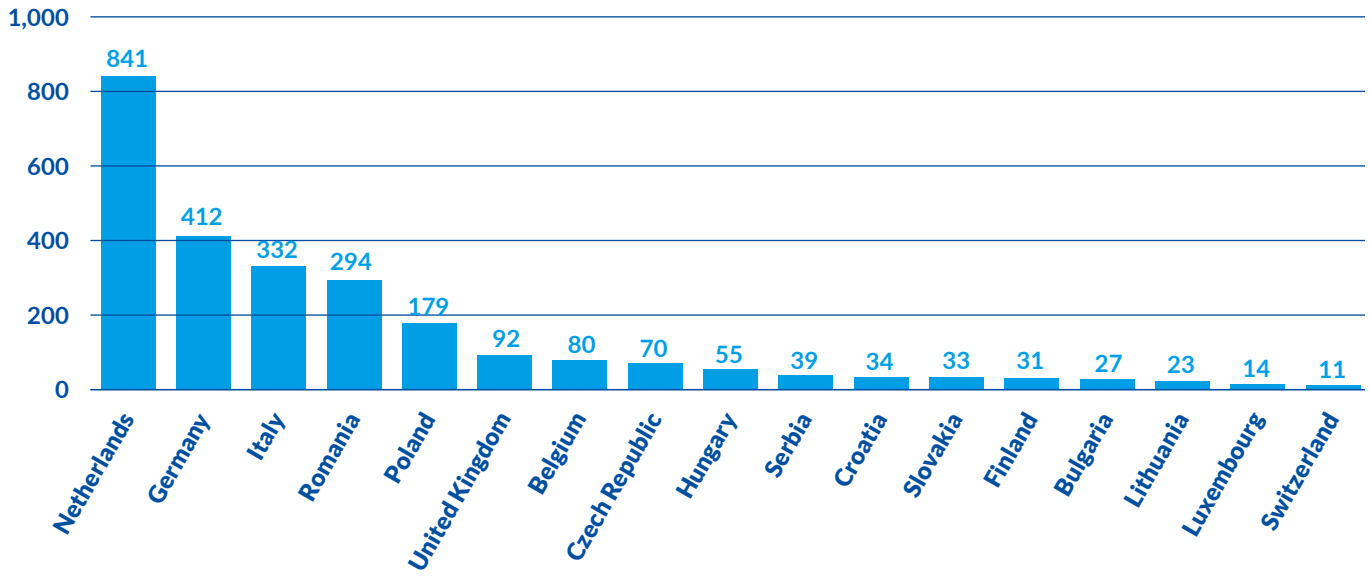
FIGURE 1: **NUMBER OF DRY AND LIQUID CARGO VESSELS PER COUNTRY IN EUROPE**



Sources: Eurostat [iww_eq_loadcap] and national sources for Rhine countries

The data for the number of push and tugboats per country were taken from the Eurostat fleet database, with the exception of Belgium and Luxembourg (for both countries, Eurostat data were not available, so national waterway administration data were used).

FIGURE 2: **NUMBER OF PUSH BOATS AND TUGBOATS PER COUNTRY IN EUROPE**



Sources: Eurostat [iww_eq_age] and ITB (Belgium), vessel register for Luxembourg

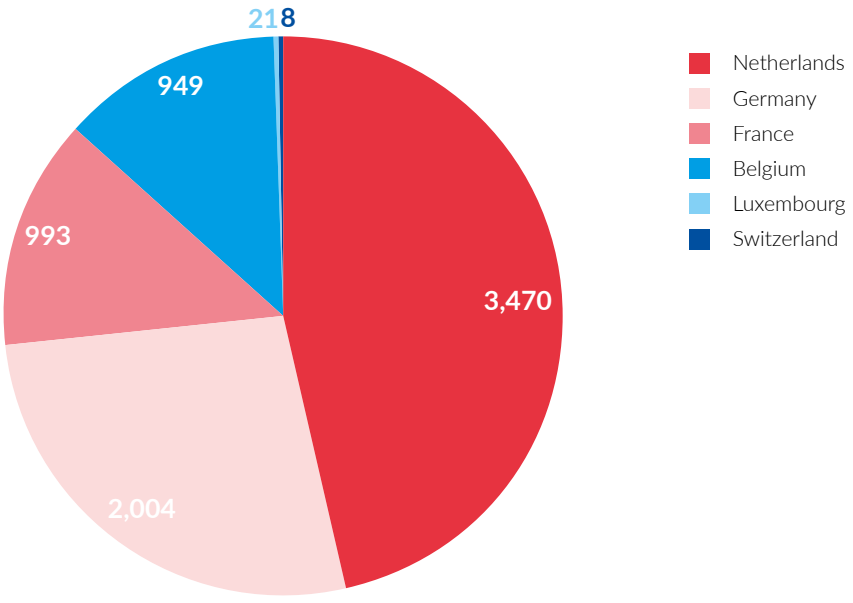
EVOLUTION
OF THE RHINE FLEET

DRY CARGO FLEET IN RHINE COUNTRIES

Fleet data used for this section are entirely based on national fleet data from waterway administrations. The reason is that a distinction between dry and liquid cargo vessels is only available in national fleet databases and in the IVR database, but not in the Eurostat databases.

Data used for the Dutch fleet contain the inland vessels that are registered in the Netherlands and which were active there in 2021.[44] Fleet data for other Rhine countries concern also predominantly active vessels and is delivered by the Belgian, German, French, and Swiss Waterway Administration, as well as from the vessel register of Luxembourg. Based on 2021 data for all Rhine countries except for Germany, the total number of dry cargo vessels registered was around 7,444 in 2021, compared to 6,942 in 2020 and 7,012 in 2019.

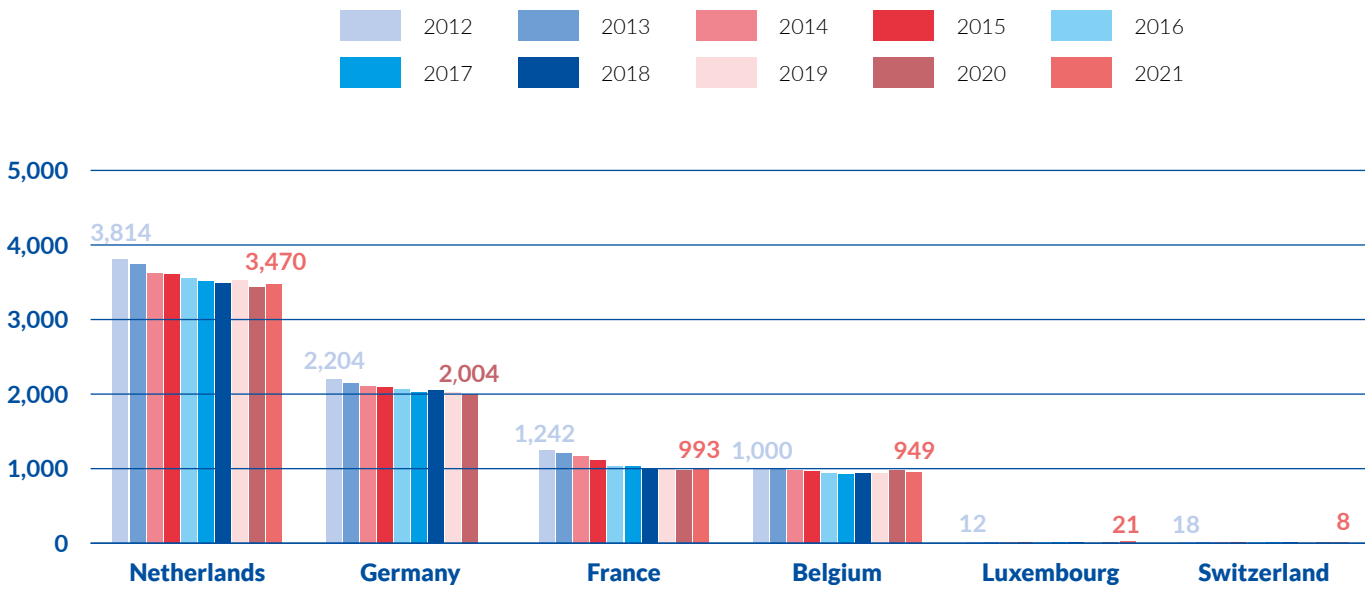
FIGURE 3: **NUMBER OF DRY CARGO VESSELS IN RHINE COUNTRIES IN 2021 ***



Source: CCNR based on national data (see Table 1)
** German data refer to the year 2020.*

[44] The Statistical Office of the Netherlands (CBS) receives raw data on the operative fleet in the Netherlands from the Waterway Administration (Rijkswaterstaat) and transmits it to the CCNR. These vessels are operative as they have passed measurement points in 2021 in the Netherlands.

FIGURE 4: **NUMBER OF DRY CARGO VESSELS PER RHINE COUNTRY ***



Source: CCNR based on national data
** German fleet data were not yet available for 2021.*

The average loading capacity or deadweight of a vessel in the Rhine fleet was around 1,500 tonnes in 2020, compared to 1,090 tonnes in 2005. The total loading capacity of the fleet has remained rather constant since 2008 and amounted to 10.5 million tonnes in 2020.

Small vessels are mostly defined as vessels with a loading capacity of up to 1,500 tonnes. According to this definition, the Belgian, Dutch, French, German and Swiss fleets are composed as follows:

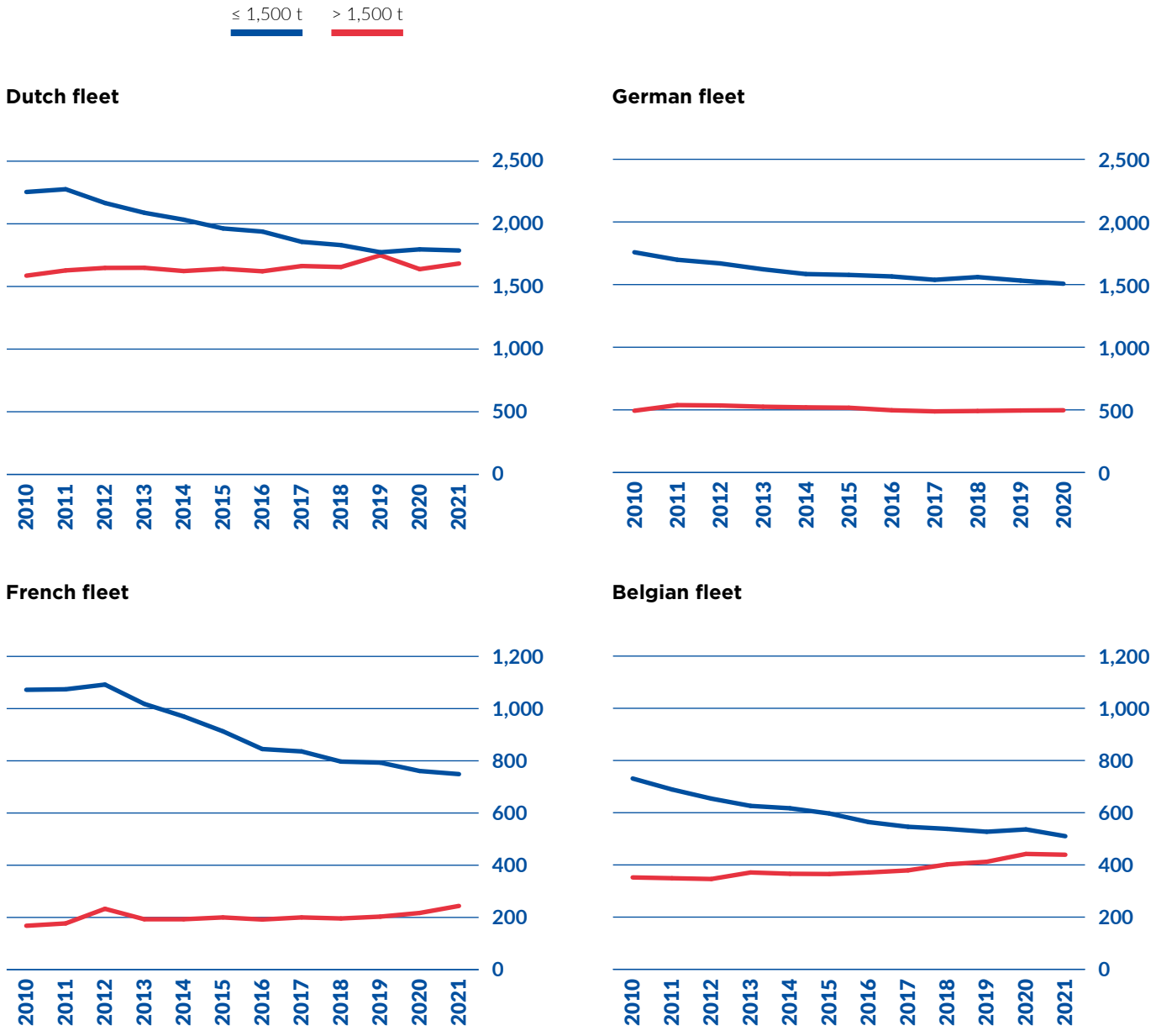
TABLE 2: **COMPOSITION OF DRY CARGO FLEET** (SELF-PROPELLED VESSELS AND BARGES) **PER RHINE COUNTRY IN 2020/2021 ***

Fleet	Small vessels (≤ 1,500 t)	All dry cargo vessels	Share of small vessels
Dutch fleet	1,787	3,470	41.1%
German fleet	1,507	2,004	75.2%
French fleet	749	993	75.4%
Belgian fleet	510	949	53.8%
Swiss fleet	4	8	50.0%

Sources: CBS/Rijkswaterstaat, German Waterway Administration, ITB, VNF
** German data are for 2020, all other data for 2021.*

It is often cited that the number of small vessels in the inland navigation sector is decreasing. Long-term data tend to confirm this hypothesis, as is shown in the next figures.

FIGURES 5, 6, 7, 8: **NUMBER OF DRY CARGO VESSELS IN THE DUTCH, GERMAN, FRENCH AND BELGIAN FLEET - NUMBER OF SMALL VESSELS** (≤ 1,500 T) **AND LARGER VESSELS** (> 1,500 T)



Sources: CCNR analysis based on CBS/Rijkswaterstaat, ITB, WSV

- The number of small Dutch dry cargo vessels decreased by 467 units between 2010 and 2021 which represents a reduction of 20.7%.
- The number of small German dry cargo vessels decreased by 251 units between 2010 and 2020 which represents a reduction of 14.3%.

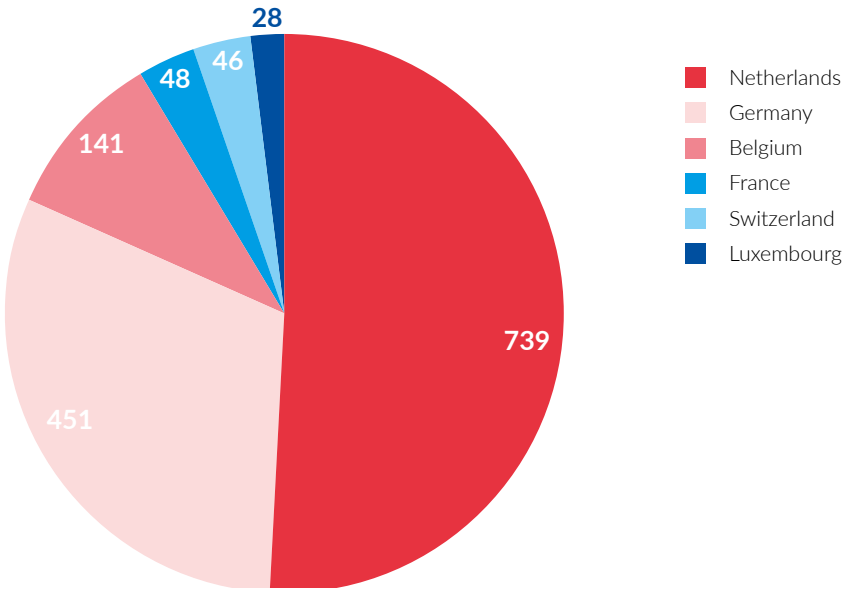
- The number of small French dry cargo vessels decreased by 323 units between 2010 and 2021 which represents a reduction of 30.1%.
- The number of small Belgian dry cargo vessels decreased by 221 units between 2010 and 2021 which represents a reduction of 30.2%.

Small vessels are needed to transport grain and other agricultural products, so that a reduction in their number creates problems and bottlenecks. A shift of grain volumes from inland navigation towards road transport seems to be one possible outcome. This stands in opposition to the overall aim of shifting transport volumes from road transport to waterborne transport.

LIQUID CARGO FLEET IN RHINE COUNTRIES

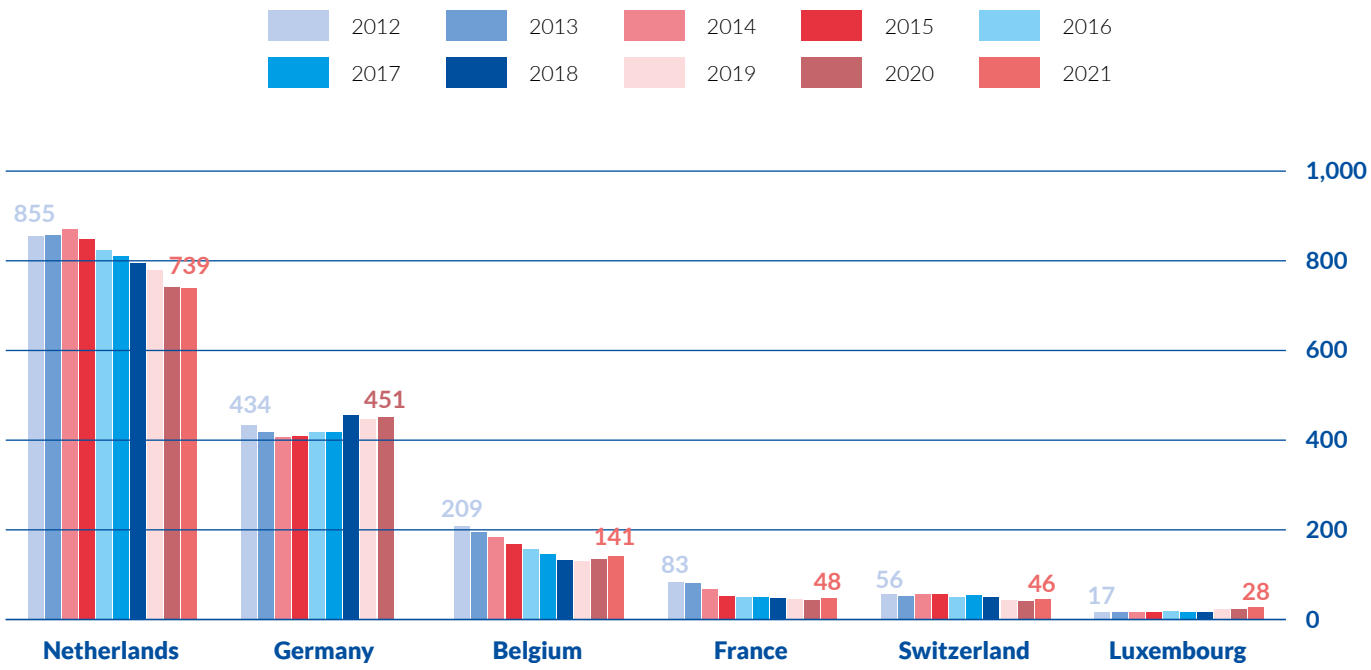
The share of the Dutch fleet within all liquid cargo vessels in Rhine countries is 52%. Switzerland and Luxembourg have relatively high numbers of tanker vessels. From a quantitative perspective, the total number of tanker vessels has decreased since 2012, as the number of vessels being phased out was higher than the number of new double hull vessels entering the market.

FIGURE 9: **NUMBER OF LIQUID CARGO VESSELS IN RHINE COUNTRIES IN 2021 ***



Source: CCNR based on national data
** German data are for 2020.*

FIGURE 10: **NUMBER OF ALL LIQUID CARGO VESSELS PER RHINE COUNTRY ***



Source: CCNR based on national data
** German fleet data were not yet available for 2021.*

II EVOLUTION OF THE DANUBE FLEET

DRY CARGO FLEET IN THE DANUBE REGION

According to the statistics of the Danube Commission (with clarification based on surveys of shipping companies in the DC Member States), by the end of 2017[45], there were around 400 push boats, 242 tugs, 409 self-propelled dry cargo vessels, and circa 2,100 dry cargo barges in the Danube fleet. More than 70% of the total transport volume is carried by pushed convoys, whose composition is set out in the table below, depending on the waterway class and shipping conditions.

TABLE 3: **TYPE OF DRY CARGO TRANSPORT ON THE DANUBE** (SHARE OF TOTAL TRANSPORT IN %)

Push boat + 7-9 pushed barges (lighters)	**40-42%**
Push boat + 6 lighters	**20-23%**
Push boat + 4 lighters	**12-14%**

Source: Danube Commission market observation

The total Danube fleet of dry cargo vessels has diminished since 2005. However, from the year 2014 onwards, the decreasing trend came to a halt, and the fleet size has now stabilised. The Romanian dry cargo fleet is the largest in the Danube area with a share of around 48% of all dry cargo vessels. Its size is increasing.

LIQUID CARGO FLEET IN THE DANUBE REGION

According to the statistics of the Danube Commission (with clarification based on surveys of shipping companies in the DC Member States), by the end of 2017 there were 74 self-propelled tanker vessels and 128 tanker barges, with a total cargo capacity of around 0.22 million tonnes.[46]

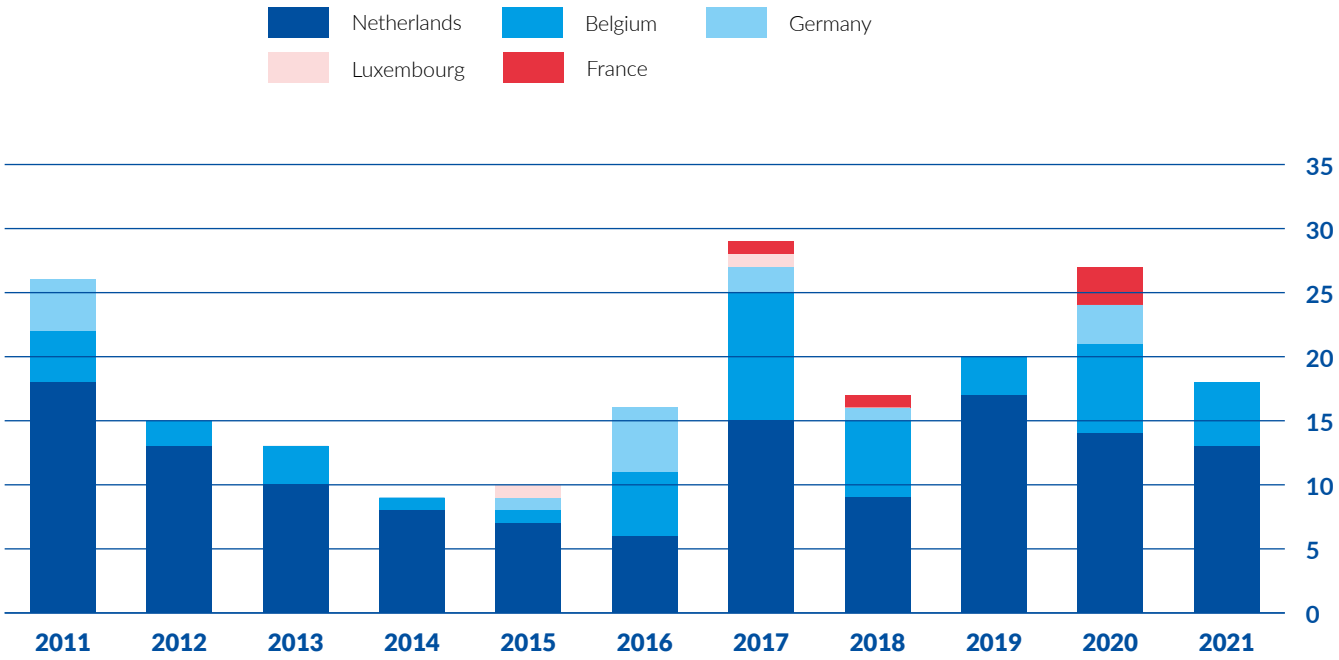
[45] *There were no data available for later years for the Danube fleet, which would have allowed a distinction between dry cargo and liquid cargo vessels.*
[46] *The 2017 fleet data were the latest available from the Danube Commission.*

NEW VESSEL CONSTRUCTION[47]

Compared to the year 2020, the number of new dry cargo vessels decreased by nine units whereas the number of newly built tanker vessels increased by four units (40 in 2019, 54 in 2020 and 58 in 2021). A strong increase in the newly built capacity of liquid cargo vessels can be noted.

The majority of the new dry cargo vessels entering the market in 2021 are registered in the Netherlands (13 out of 18), followed by Belgium with five new vessels.

FIGURE 11: **NEW DRY CARGO VESSELS COMING ON THE MARKET PER COUNTRY OF REGISTER** (NUMBERS, 2011-2021)

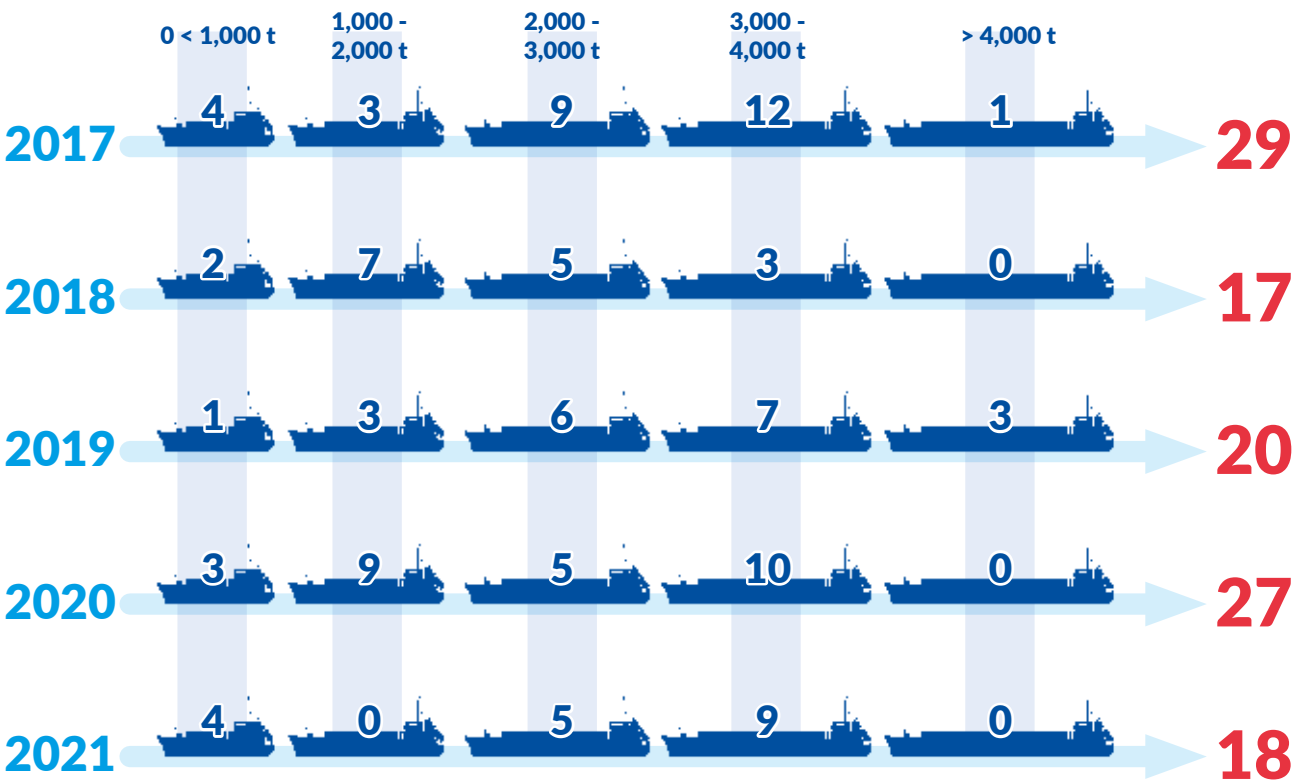


Source: IVR

Regarding the analysis according to loading capacity in newly built dry cargo vessels, the highest share with nine units is dedicated to the category of 3,000-4,000 tonnes followed by the category below with 2,000-3,000 tonnes. The average capacity of newly built dry cargo vessels amounted to 2,488 tonnes in 2021.

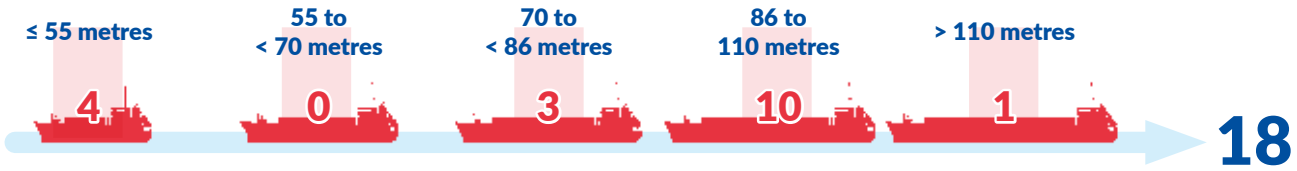
[47] *New vessel construction for Rhine countries. Data for Danube countries are not available.*

TABLE 4: **NEWLY BUILT DRY CARGO VESSELS ACCORDING TO LOADING CAPACITY**



Source: IVR
Note that for 1 newly built vessel the deadweight was partly estimated due to initially missing values.

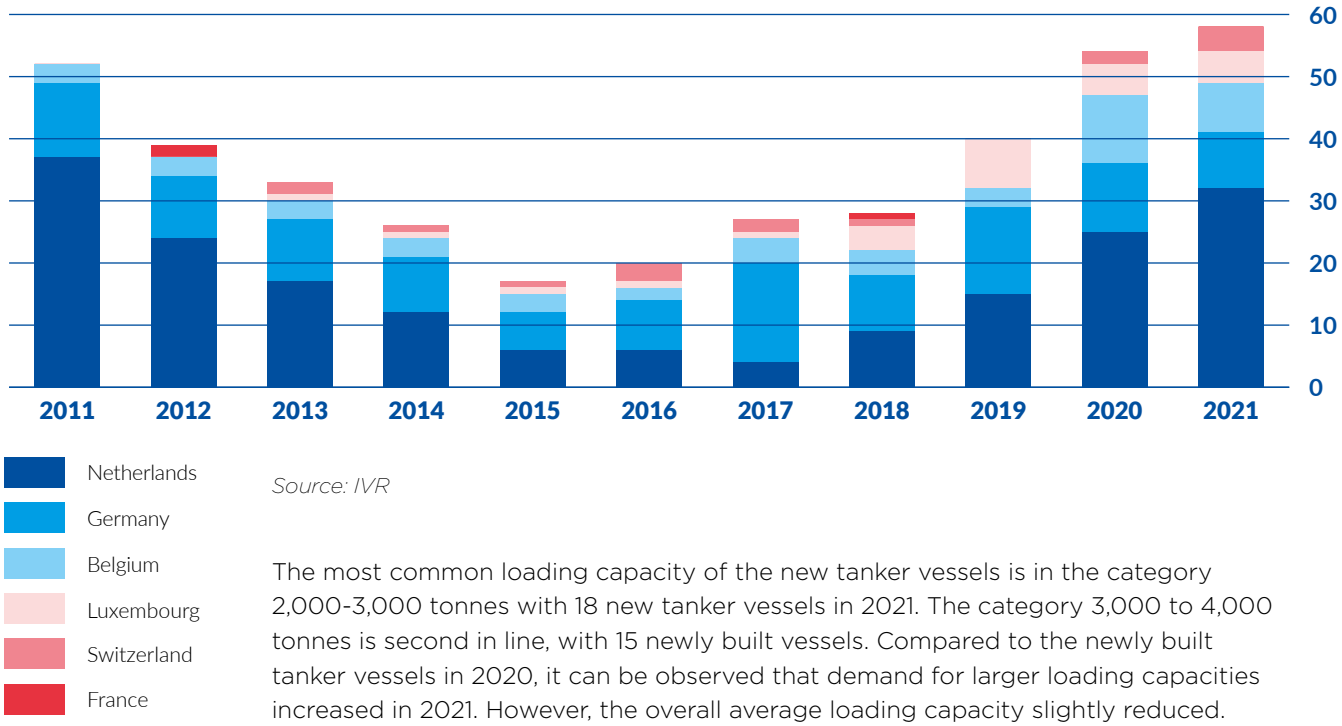
TABLE 5: **NEWLY BUILT DRY CARGO VESSELS IN 2021 BY LENGTH**



Sources: IVR, CCNR analysis

According to the IVR database, 58 new tanker vessels entered the market in 2021, four more than in 2020. After the 32 new vessels registered in the Netherlands, nine were registered in Germany, eight in Belgium, five in Luxembourg and four in Switzerland.

FIGURE 12: **NEW TANKER VESSELS COMING ON THE MARKET PER COUNTRY OF REGISTER** (NUMBERS, 2011-2021)



Source: IVR

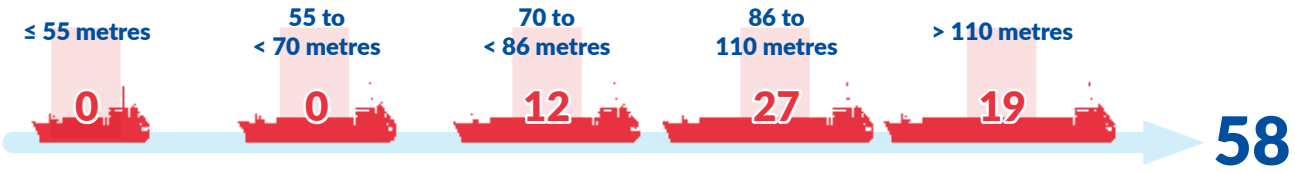
The most common loading capacity of the new tanker vessels is in the category 2,000-3,000 tonnes with 18 new tanker vessels in 2021. The category 3,000 to 4,000 tonnes is second in line, with 15 newly built vessels. Compared to the newly built tanker vessels in 2020, it can be observed that demand for larger loading capacities increased in 2021. However, the overall average loading capacity slightly reduced. The average loading capacity for new tanker vessels amounted to 3,550 in 2021, 3,793 tonnes in 2020 and 3,103 tonnes in 2019.

TABLE 6: **NEWLY BUILT TANKER VESSELS ACCORDING TO LOADING CAPACITY**

	0 < 1,000 t	1,000 - 2,000 t	2,000 - 3,000 t	3,000 - 4,000 t	> 4,000 t	
2017	1	10	14	2	1	28
2018	2	12	7	3	4	28
2019	1	15	11	5	8	40
2020	0	9	21	10	14	54
2021	0	13	18	15	12	58

Sources: IVR, CCNR analysis
Note that for 4 newly built vessels the deadweight was partly estimated due to an initially missing value.

TABLE 7: **NEWLY BUILT TANKER VESSELS IN 2021 BY LENGTH**

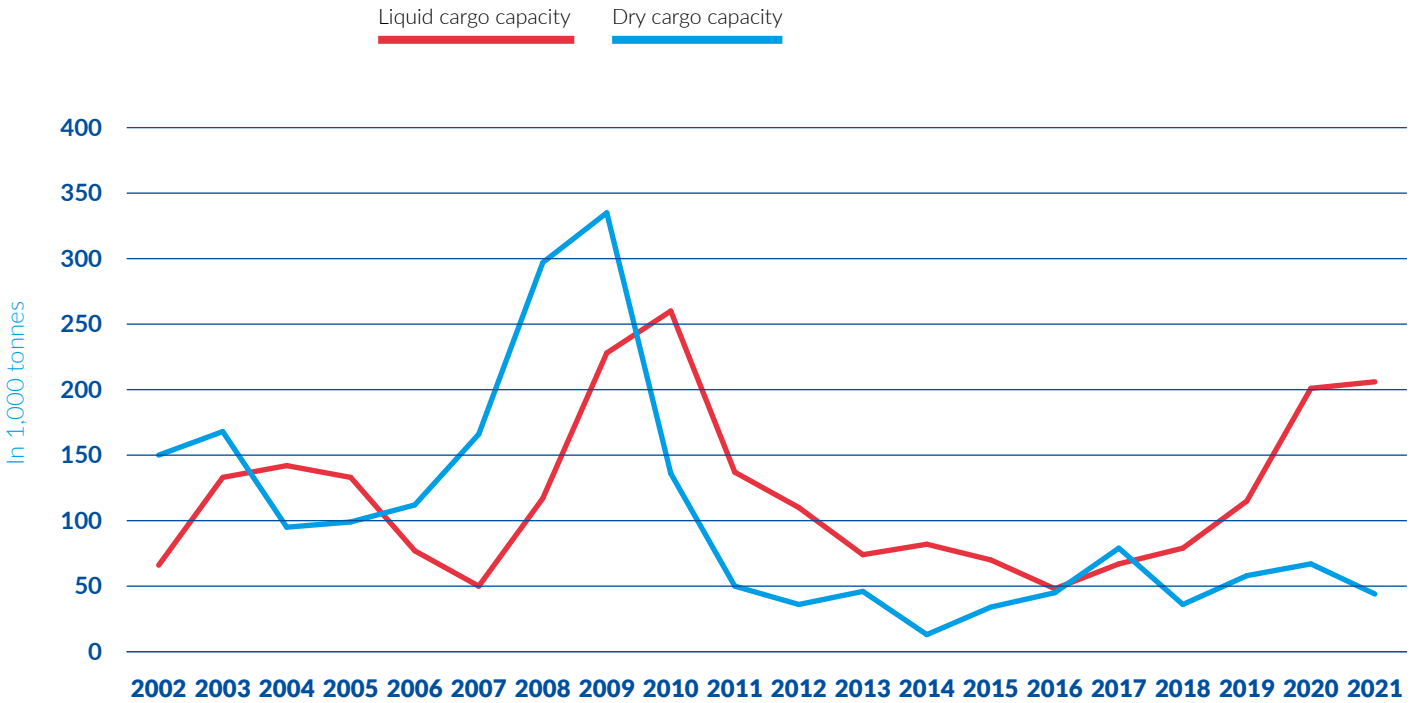


Sources: IVR, CCNR analysis

In the category of push boats and tugs, seven newbuilds came on the market: six new push boats (three in Luxembourg, two in Germany and one in the Netherlands) and one tugboat registered in the Netherlands.

Figure 13 illustrates the new loading capacity entering the market by year and for dry and liquid cargo vessels. After a long decline following the financial crisis, new dry and liquid capacity showed an increase in recent years. For liquid cargo vessels, this increase in newbuilding activity was certainly more significant than for dry cargo vessels. However, as the newbuilding rate in 2020 and 2021 indicates, transport demand conditions deteriorated for one part of liquid cargo (mineral oil products) in the wake of the pandemic.

FIGURE 13: **NEW CAPACITY COMING ON THE MARKET FOR DRY AND LIQUID CARGO** (LOADING CAPACITY IN 1,000 TONNES)



Source: IVR

AGE STRUCTURE
OF THE RHINE FLEET[48]

Around 83.2% of the dry cargo fleet was constructed in the 20th century whereas the respective share for the tanker fleet amounts to 41.6%.

TANK CARGO

Year of construction	Number of vessels	Share in %
2000 to 2021	1,043	58.3
1900 to 1999	744	41.6
1875 to 1899	2	0.1

Source: IVR, CCNR analysis

DRY CARGO

Year of construction	Number of vessels	Share in %
2000 to 2021	1,420	16.6
1900 to 1999	7,138	83.2
1875 to 1899	24	0.3

Source: IVR, CCNR analysis

Regarding the passenger fleet, a distinction is made between passenger ferries and passenger day trip vessels. The river cruise vessels are analysed separately in Chapter 8. Most passenger ferries and passenger day trip vessels were built in the 20th century. The same holds also for the push boats and tugs with a remarkable share of 92.2% built between 1900 and 1999.

PASSENGER FERRIES

Year of construction	Number of vessels	Share in %
2000 to 2021	62	37.8
1900 to 1999	102	62.2
1875 to 1899	0	0

Source: IVR, CCNR analysis

[48] For the age structure analysis, the IVR database was used. The database of IVR accounts for active vessels but might also include some inactive vessels.

PASSENGER DAY TRIP[49]

Year of construction	Number of vessels	Share in %
2000 to 2021	169	13.6
1900 to 1999	1,051	84.5
1875 to 1899	24	1.9

Source: IVR, CCNR analysis

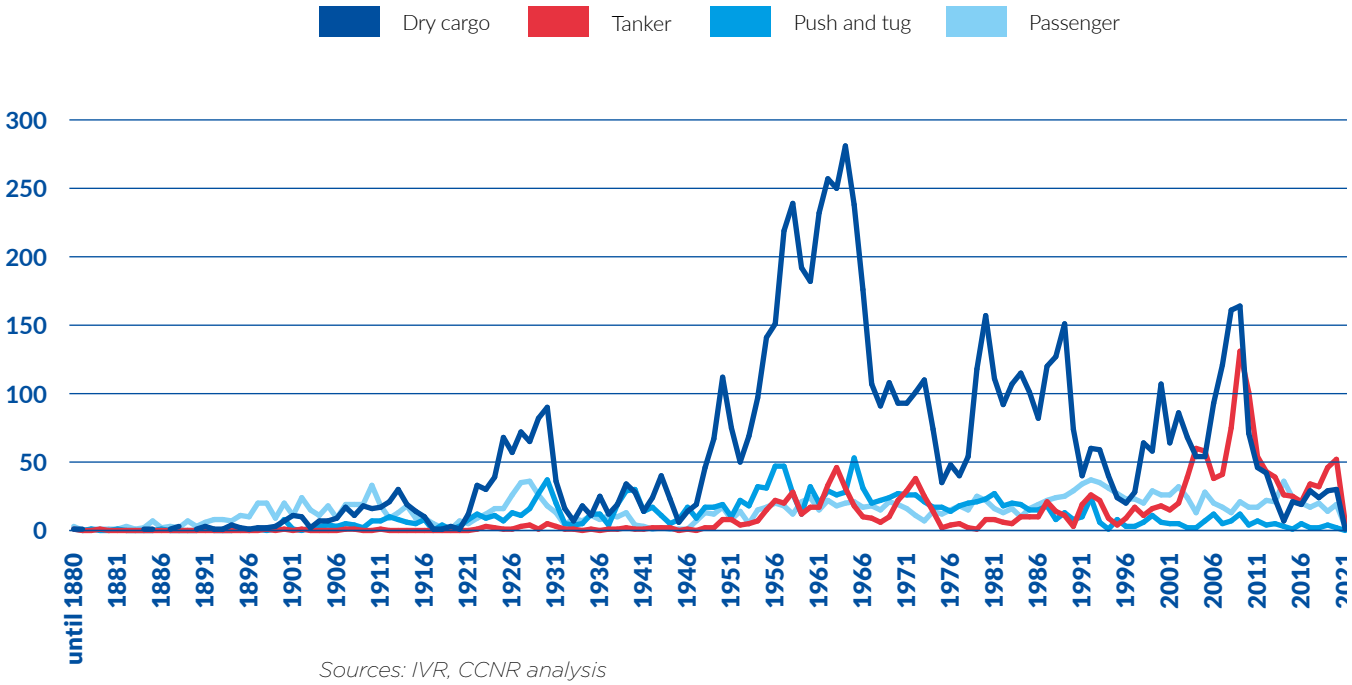
PUSH AND TUG

Year of construction	Number of vessels	Share in %
2000 to 2021	130	7.4
1900 to 1999	1,627	92.2
1875 to 1899	8	0.5

Source: IVR, CCNR analysis

According to the IVR database, the Netherlands holds the largest vessel numbers within the Rhine fleet in almost every vessel category, followed by Germany.

FIGURE 14: **COMMISSIONING YEARS FOR THE RHINE FLEET OVER TIME** (NUMBER OF INLAND VESSELS)



Sources: IVR, CCNR analysis
Furthermore, 60 dry cargo vessels, 50 passenger vessels, 30 push/tug vessels and 2 tank cargo vessels have an unknown year of construction. The database of IVR accounts for active vessels but might also include some inactive vessels, in particular those commissioned in earlier years.

[49] *The IVR database contains a non-exhaustive list of day trip vessels.*

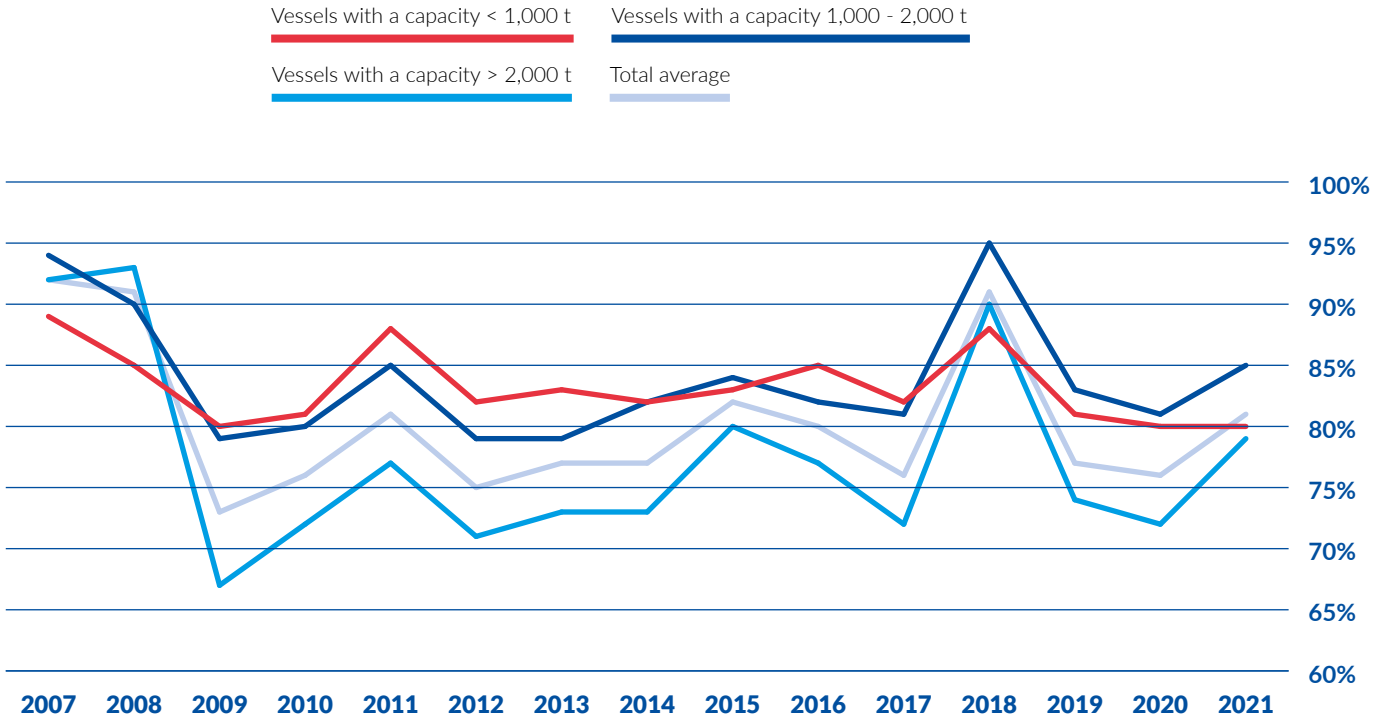
CAPACITY
MONITORING

DRY CARGO VESSELS

The year 2021 was characterised by a recovery after the pandemic crisis of 2020. In particular, the international transport of dry bulk enjoyed a boost. This led to better capacity utilisation of the larger vessels. For dry cargo the average utilisation rate was 81% in 2021. This is significantly higher than in 2020 (76%) and comparable to the years 2015 and 2016.

The signs that the fleet capacity is currently too tight to cope with low water periods have been noted. In 2022, the low water period that built up until mid-July[50], and the further increase in coal demand and coal transport, as well as the transfer of dry cargo vessels from the Rhine region to eastern Europe (where they help transport grain from Ukraine), is expected to lead to a further strong increase in capacity utilisation for dry cargo vessels. However, it must also be recognised that this increase in transport demand, especially related to coal transports, is temporary.

FIGURE 15: **CAPACITY UTILISATION FOR THE DRY CARGO FLEET IN RHINE COUNTRIES** (PER VESSEL SIZE CLASSES)



Source: Panteia analysis based on data provided by CCNR

[50] *The editing of the report was finalized by mid-July 2022.*

Compared to 2020, there were no more restrictions in the operating times of locks and moveable bridges. In the first phase of the Covid-19 crisis, the operation of locks on, for example, the Upper Rhine and Moselle was restricted, and the waterway authorities of the rivers and canals in the Netherlands and Belgium also limited the passage possibilities. In 2021, the service was fully restored and in many cases passage was possible on 24 hours per day during the whole week.

In the dry bulk segment transport demand recovered from the Covid-19 crisis. The transport of coal and ores increased very strongly, and not only because of increased production and restocking of the blast furnaces of the steel industry in the Ruhr area. Germany also was obliged to look for alternative energy sources due to the decommissioning of nuclear power plants. As a result, additional steam coal was transported to the power plants. This led to a high demand for large (> 2,000 tonnes) inland vessels. The increased production at the blast furnaces also led to more transport of metal products by inland shipping. With regards to the transport of agricultural products, demand was still lagging behind the pre-pandemic levels, particularly due to the still limited opening hours.

Water conditions in 2021 were more favourable than in 2020, especially in the period from May to September. As a result, for a large part of the year, inland vessels were able to take on more cargo than in the previous year. In relative terms, this meant that more transport capacity was available to accommodate the additional demand for cargo.

Fleet capacity increased in 2021. In particular, the number of large vessels (> 2,000 tonnes) increased sharply. The number of small and medium-sized vessels decreased, which is a trend that is expected to continue. In the case of the smallest vessels, it is noticeable that the supply of cargo is decreasing at about the same rate as vessel capacity. As a result, the overall utilisation rate remains the same in this particular fleet segment.

LIQUID CARGO VESSELS

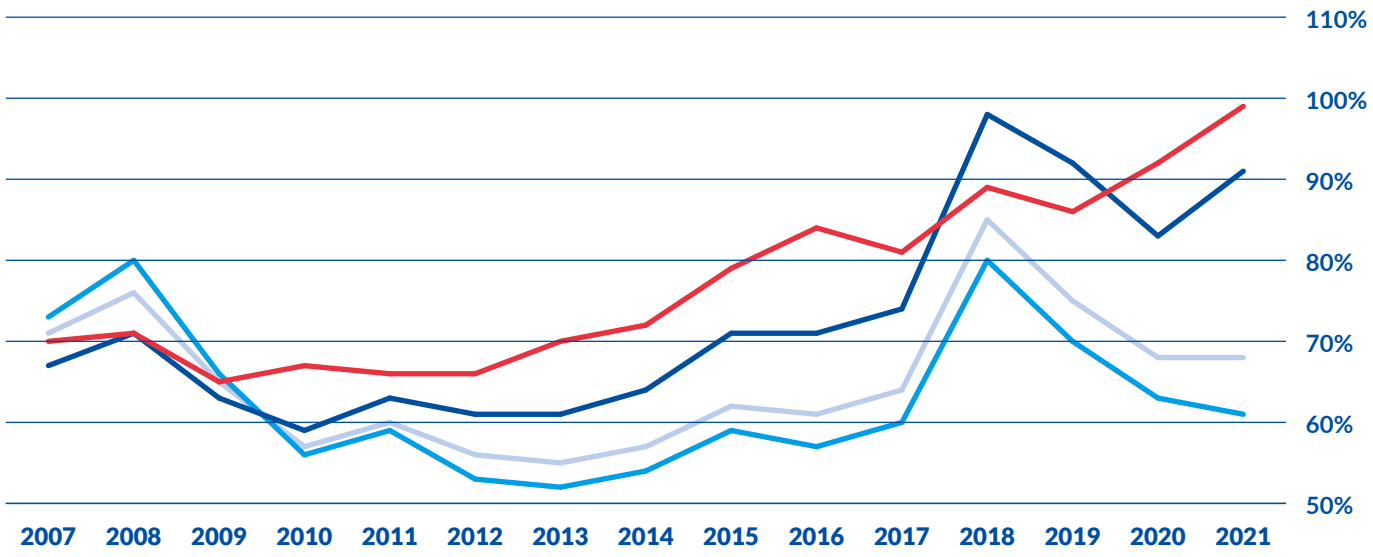
For tanker shipping, the average utilisation of the fleet in 2021 has remained the same as in the previous year. Utilisation is still at 68%. It should be noted that there has been an increase in the utilisation of small (< 1,000 tonnes) and medium-sized (1,000 to 2,000 tonnes) vessels, and a decrease in the utilisation of larger vessels. There are various reasons for this development:

- Only very limited growth in the cargo supply. Unlike the dry cargo market, this market was not yet able to recover from the Covid-19 crisis. Although volumes grew a little, the demand, especially for the transport of fuels such as petrol, diesel and kerosene, was still considerably lower than in 2019 as a result of people working from home.

- More favourable water conditions. For a large part of 2021, it was possible to sail on the Rhine without restrictions. This was different from 2020, when from spring to the end of the year there were almost always water level restrictions which reduced loading capacity. In 2021, water conditions were restricted only in the months of October and November. As a result, tankers were able to carry more cargo on average and this had a dampening effect on the capacity utilisation.

- Growth in fleet capacity. Many new tankers entered service in 2021. These were almost exclusively tankers with a cargo capacity of 2,000 tonnes or more. As a result, there was growth in the tanker fleet as a whole grew.

FIGURE 16: **CAPACITY UTILISATION FOR THE LIQUID CARGO FLEET IN RHINE COUNTRIES** (PER VESSEL SIZE CLASSES)



Source: Panteia analysis based on data provided by CCNR

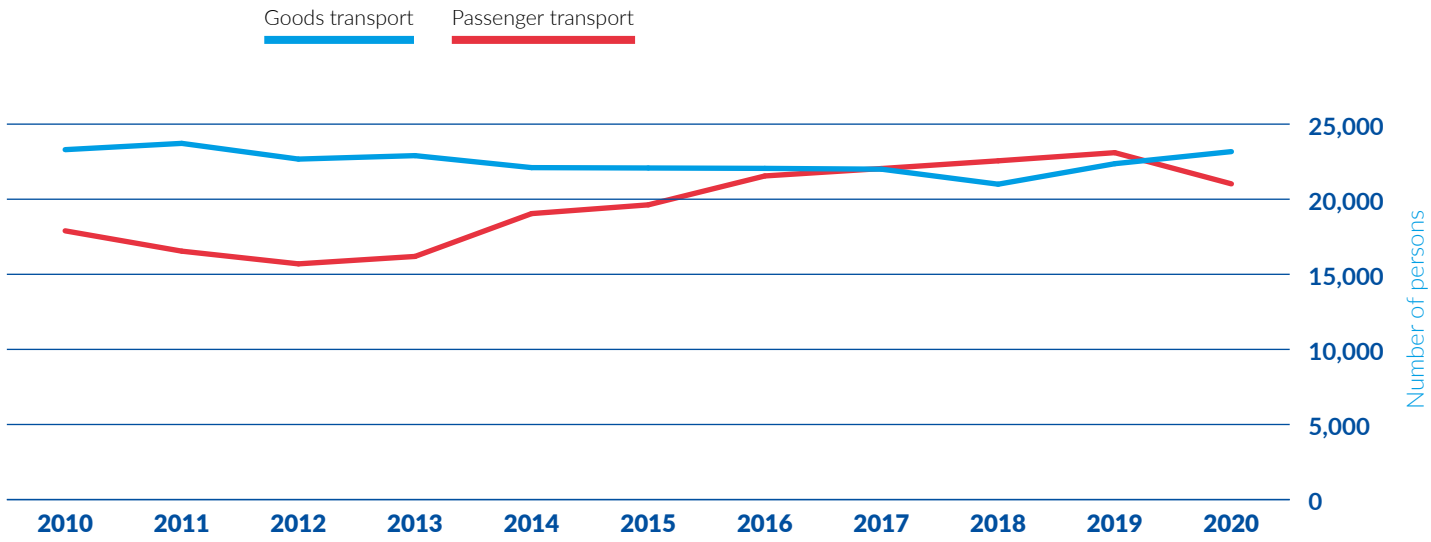
Specifically for the sub-segments, there is full capacity utilisation of the small and medium-sized tankers. In almost all cases, these are highly specialised tankers that are active in the transport of, for example, cement or edible oils. In other cases, they are very specifically built for a single client and therefore have an optimal usage. In this market, there is probably undercapacity and a disruption such as prolonged low water levels will cause production losses or modal shift. For the larger tankers, there is enough shipping capacity available, even if there is another period of low water, as in 2018.

07

COMPANIES, EMPLOYMENT, TURNOVER

- **According to Eurostat data, there are 5,606 IWW freight companies with a total employment of 23,170 persons. The geographical scope for these numbers is the EU plus Bosnia-Herzegovina, Serbia and Switzerland. Companies in the Rhine region (the Netherlands, France, Germany, Belgium, Switzerland) account for 87% of the total number of companies and for 75% of the total number of persons employed.**
- **In the geographical zone defined above, there are 4,211 IWW passenger transport companies with a total employment of 21,023 persons. Employment in the passenger sector decreased by 9% in 2020 compared to 2019, due to the pandemic crisis. This stands in contrast to IWW freight transport, where employment increased by 3.6% in 2020 compared to 2019.**
- **While employment and company numbers in IWW freight transport are slightly higher than in IWW passenger transport, the financial turnover in freight transport exceeds that in passenger transport many times over. For the Rhine countries, the net financial turnover in IWW freight transport is around 5.5 billion euros (2020), compared to an estimated 1.3 billion euros for IWW passenger transport (2020).**

FIGURE 1: **DEVELOPMENT OF EMPLOYMENT IN GOODS AND IN PASSENGER TRANSPORT IN THE INLAND WATERWAY TRANSPORT SECTOR IN EUROPE** (NUMBER OF PERSONS)



Source: Eurostat [sbs_na_1a_se_r2]

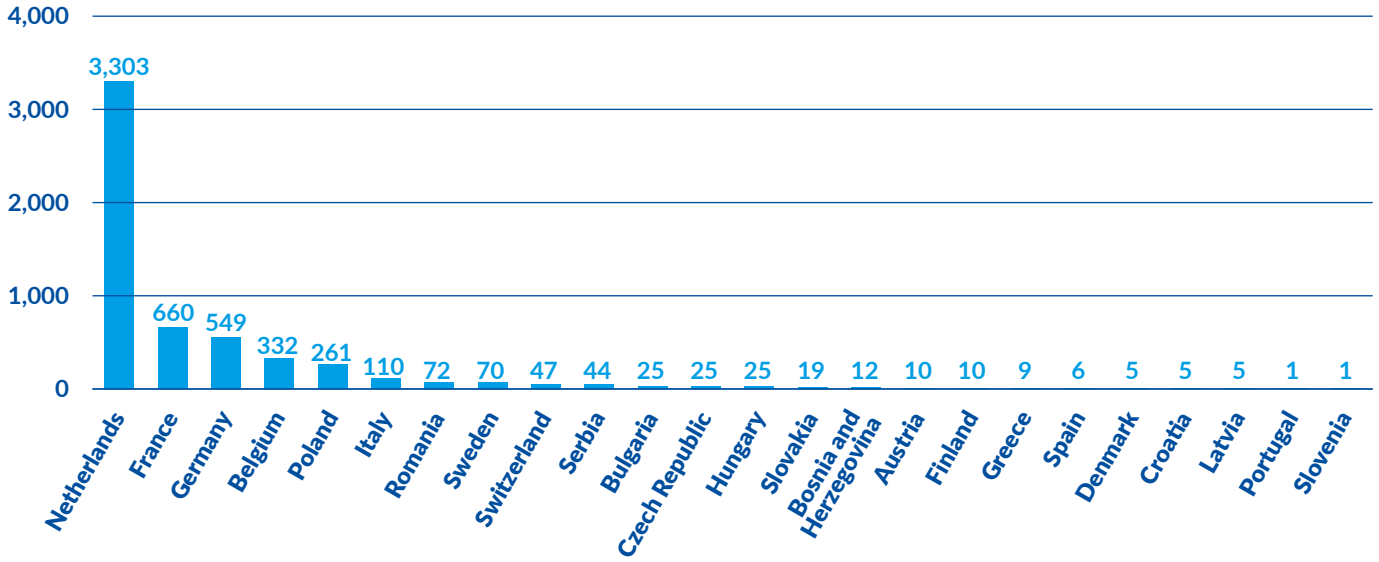
COMPANIES
AND EMPLOYMENT IN GOODS TRANSPORT

According to the latest Eurostat figures, 5,606 IWW freight transport companies are active in Europe (EU plus Bosnia-Herzegovina, Serbia and Switzerland). Around 87% of them (4,891 in absolute numbers) are registered in Rhine countries (the Netherlands, Germany, Belgium, France, and Switzerland). In the Netherlands alone, 3,303 IWW freight companies are counted, which represents 59% of the total number in Europe and 68% of the number of companies in Rhine countries.

In the Danube region, freight companies are on average larger, with more employed persons than in western Europe.[51] This explains the rather small number of companies in Danube countries (212), representing a share of only 4% within all European IWW freight companies.

[51] *The average number of employed persons in freight transport companies is 3.7 for companies in Rhine countries, but 17.3 for companies in Danube countries.*

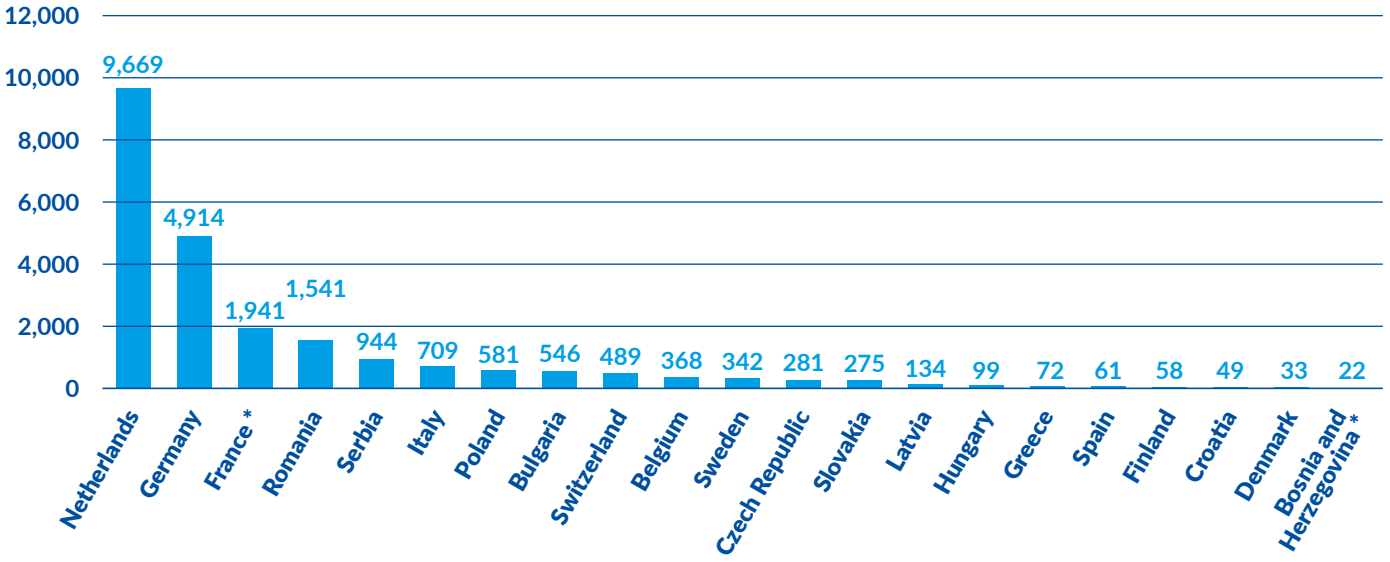
FIGURE 2: **NUMBER OF COMPANIES IN IWW GOODS TRANSPORT IN EUROPE ***



Sources: Eurostat [sbs_na_1a_se_r2] and Federal Statistical Office (CH)
** Data refer to 2019.*

The number of employed persons in freight transport includes self-employed, helping family members and employees. The total number of this variable stood at 23,170 in 2020.[52] Rhine countries account for 75%, Danube countries for 15% and companies in countries outside the Rhine and Danube regions for 10%.

FIGURE 3: **NUMBER OF PERSONS EMPLOYED IN IWW GOODS TRANSPORT IN EUROPE #**



Source: Eurostat [sbs_na_1a_se_r2]
*# Data refer to the year 2020 except for countries denoted with *, for which data refer to the year 2019. It should be noted that figures obtained from national labour market institutions or from other national offices might differ from figures obtained from Eurostat, due to different statistical labour market concepts. However, for cross-country comparisons, Eurostat is treated as the preferred source because data are harmonised across countries and are thus comparable.*

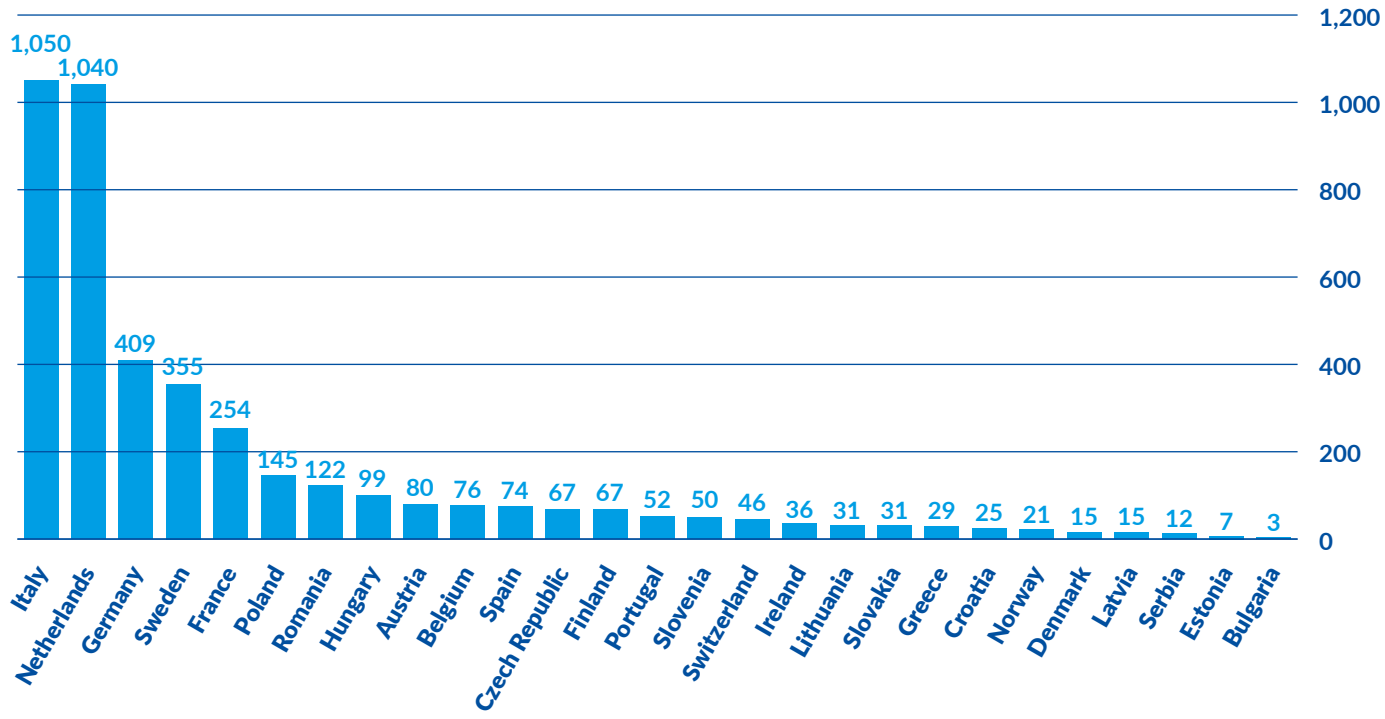
[52] This number underestimates the total employment in European inland navigation. The reason lies in the fact that within Eurostat SBS data, only persons working for companies with primary activity in IWT are taken into account. For almost all countries, data were available for 2020, the exceptions being France (2019) and Bosnia-Herzegovina (2019).

COMPANIES
AND EMPLOYMENT IN PASSENGER TRANSPORT

IWW passenger companies in Europe (4,211 companies in total) are active in three different segments: river cruises, day trips on rivers, canals and lakes, ferries for commuter and tourist transportation. The NACE sector *H50.30* with the title *'Inland passenger water transport'* forms the underlying basis for the Eurostat data presented, and it entails all the above-mentioned activities.

This broad scope of the NACE sector *H50.30* is also the reason why Italy stands on the first position regarding the number of IWW passenger companies. Italy has many lakes in the northern part of the country, with many day trip vessels. The numerous canal boats in Venice play an important role as well. Passenger transport on rivers such as the Po, however, is currently not very high, due to many shallow river sections on the Po. Dutch companies are in second position. The number of Dutch companies is high because of the numerous amount of small day trip vessel and ferry companies in Dutch cities.

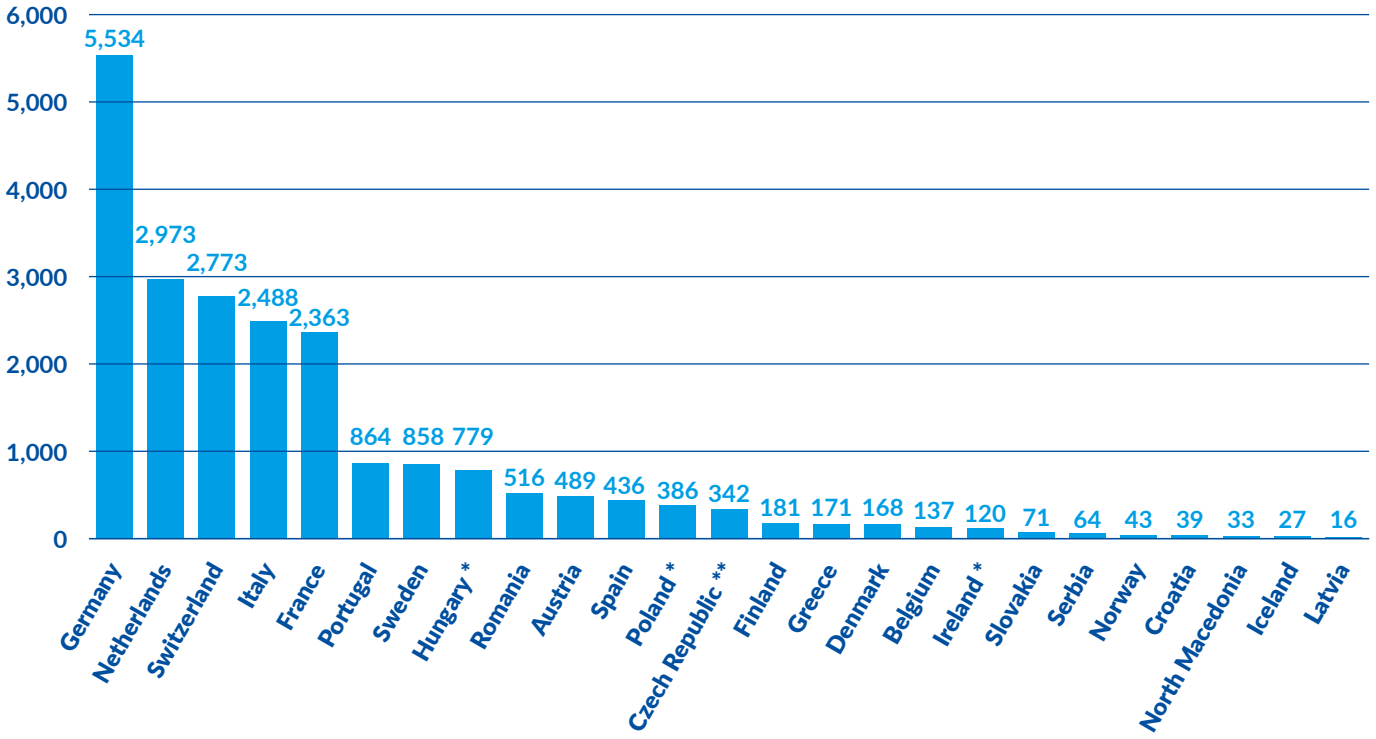
FIGURE 4: **NUMBER OF IWW PASSENGER TRANSPORT COMPANIES IN EUROPE ***



Sources: Eurostat [sbs_na_1a_se_r2] and Federal Statistical Office (CH)
** Data refer to 2019.*

The total number of persons employed in European IWW passenger transport amounted to 21,023 in 2020 and was therefore lower than the employment level in freight transport. In previous years, the number of persons employed in IWW passenger transport was higher than in IWW freight transport. The explanation for this change is the Covid crisis, which led to a sharp decrease in passenger transport and had an impact on employment. The decrease in employment was 9% in 2020 (year-on-year-rate compared to 2019), based on Eurostat data.

FIGURE 5: **NUMBER OF PERSONS EMPLOYED IN IWW PASSENGER TRANSPORT IN EUROPE #**



Source: Eurostat [sbs_na_1a_se_r2]
*# Data refer to 2020 except for cases denoted with * (2019) and ** (2018).*

Around 63% of all persons employed in EU inland waterway passenger transport are employed in Rhine countries. The share of Danube countries amounts to 9%. All other European regions taken together have a share of 28%.

II TURNOVER

TURNOVER IN IWW FREIGHT TRANSPORT

IWW freight transport companies in the EU (plus Switzerland) generated a turnover of approximately 6.057 billion euro in 2020.

IWW companies registered in Rhine countries accounted for 5.502 billion euro. These figures are valid for the year 2020 except for France (2018) and the Netherlands (2019).

TABLE 1: **NET TURNOVER IN IWW FREIGHT TRANSPORT IN RHINE COUNTRIES ***

	Net turnover in million euro
Dutch companies	3,314
German companies	1,525
French companies	397
Belgian companies	135
Swiss companies	131
Rhine countries	5,502

Sources: Eurostat [sbs_na_1a_se_r2], Centraal Bureau voor de Statistiek (NL)
** All values refer to 2020, except for French companies (2018) and Dutch companies (2019). The value for Dutch companies is estimated, based on information from CBS that 92% of total turnover in IWT is freight transport turnover.*

The turnover generated in inland waterway freight transport companies registered in Danube countries amounted to 398 million euro in 2020.

TABLE 2: **NET TURNOVER IN IWW FREIGHT TRANSPORT IN DANUBE COUNTRIES IN 2020**

	Net turnover in million euro
Serbian companies	109
Romanian companies	107
Slovakian companies	80
Hungarian companies	47
Bulgarian companies	29
Austrian companies	23
Croatian companies	3
Danube countries	398

Source: Eurostat [sbs_na_1a_se_r2]

Turnover of companies active in IWW freight transport and registered in European regions outside the Rhine and Danube region amounted to 157 million euro in 2020.

TURNOVER IN IWW PASSENGER TRANSPORT

For IWW passenger transport companies in the EU (plus Switzerland), total turnover cannot be indicated due to many missing values in the Eurostat SBS database.

For Rhine countries, values were partly available and partly estimated, and point to around 1.217 billion euro of financial net turnover in 2020.

TABLE 3: **NET TURNOVER IN IWW PASSENGER TRANSPORT IN RHINE COUNTRIES IN 2020 ***

	Net turnover in million euro
Swiss companies	521
German companies	301
Dutch companies **	288
French companies#	87
Belgian companies	20
Rhine countries	1,217

Sources: Eurostat [sbs_na_1a_se_r2], Centraal Bureau voor de Statistiek (NL)
** All values for 2020, except for Dutch companies (2019)*
*** Value for Dutch companies is estimated, based on information from CBS that 8% of total turnover in IWT is related to passenger transport.*
 # Value for French companies is estimated, based on the reduction in the INSEE index of turnover in 2020 compared to 2018 for France (https://www.insee.fr/fr/statistiques/serie/010543475#Tableau).

For companies in Danube countries, turnover data show the following values for 2020: Austria (49 million euro), Romania (8 million euro), Serbia (2 million euro), Slovakia (1 million euro), Croatia (0.4 million euro). Missing data in the Eurostat database for Bulgaria and Hungary is the reason why a tabular overview cannot be given.

The lower turnover values of companies in the Danube region can be explained by two main factors. First, the lower wage level in these countries must be considered. According to Eurostat SBS database, Romania, Serbia and Croatia are among the four countries with the lowest average annual personnel costs per employee in European IWT (the fourth country is Bulgaria, for which turnover data are missing). Lower wages imply lower total costs, especially in passenger transport which is quite labour-intensive. Lower costs, in return, imply lower price levels and therefore also lower turnover figures.

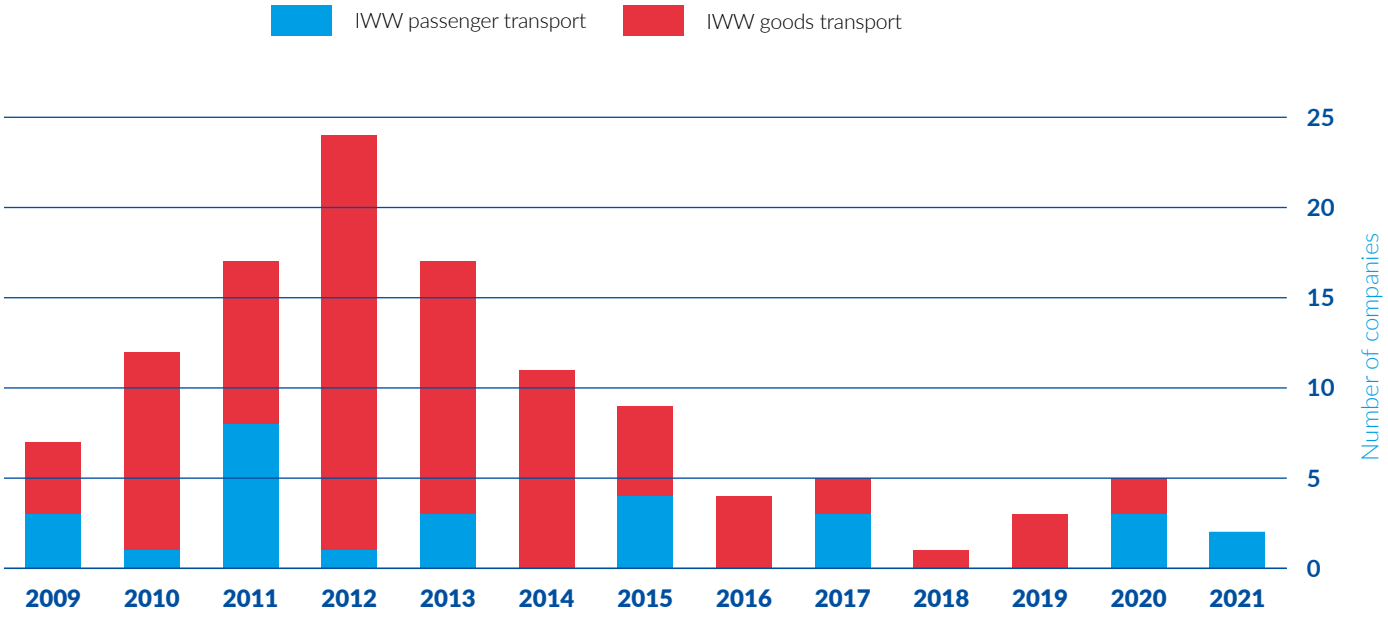
A second explanation that can be considered is the lower overall activity of companies established in the Danube region in passenger transport. In river cruising for example, the activity is mainly carried out by companies from western Europe, also on the Danube.

Two countries in Europe outside the Rhine and Danube region with a considerable level of turnover are Italy (302 million euro in 2020) and Sweden (98 million euro in 2020). Together with Portugal (19 million euro in 2020) and Spain (13 million euro in 2020), this group of countries had a share of 23% of all IWW passenger transport turnover in Europe in the year 2020.

II BANKRUPTCIES

Data about bankruptcies in IWT are not available at Eurostat level. They are only available for the Netherlands at the level of the Dutch national statistical office (CBS).

FIGURE 6: **NUMBER OF BANKRUPTCIES IN THE INLAND NAVIGATION SECTOR IN THE NETHERLANDS**



Source: Centraal Bureau voor de Statistiek (NL)

The data show only a minor uptake in the number of bankruptcies for passenger transport in 2020 and 2021. For goods transport companies, the data do not indicate any impact of the Covid crisis.

One reason for this result might consist in the state aid schemes that were introduced by governments in 2020. In the Netherlands, independent entrepreneurs had access to income support, as well as to a loan for working capital at an interest rate below the market level.[53]

Next to public stakeholders, banks helped to maintain the IWT sector financially afloat. The suspension of loan payments for inland barging companies that were fundamentally "healthy" but in financial distress due to Covid, was one such measure that was taken in early 2020 by several banks in the Netherlands.[54]

[53] *Source: CCNR WEEKLY NEWSLETTER – N°3, Rhine navigation in the context of Covid-19 (15 April 2020), https://www.ccr-zkr.org/files/documents/covid19/20200415_CCNR_Weekly_newsletter_3.pdf*
[54] *Source: Article 'Banken geven bedrijven half jaar uitstel van aflossingen', in: Weekblad Schuttevaer, 25 March 2020*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08

PASSENGER TRANSPORT

- In 2021, the market situation was still characterised by a rather low activity on the demand side, as a direct result of the pandemic, which slowed down the shipbuilding activity for river cruises.
- The number of river cruise vessels in Europe reached 405, with nine new vessels commissioned (compared to 19 in 2020). The downward trend in the newbuilding rate is expected to continue in 2022.
- Even though it is possible to observe a recovery of cruise vessel movements in 2021, river cruise transit figures at locks on the Rhine are still 55% below the pre-pandemic level of 2019. The occupancy rate of vessels is also well below the 2019 level.

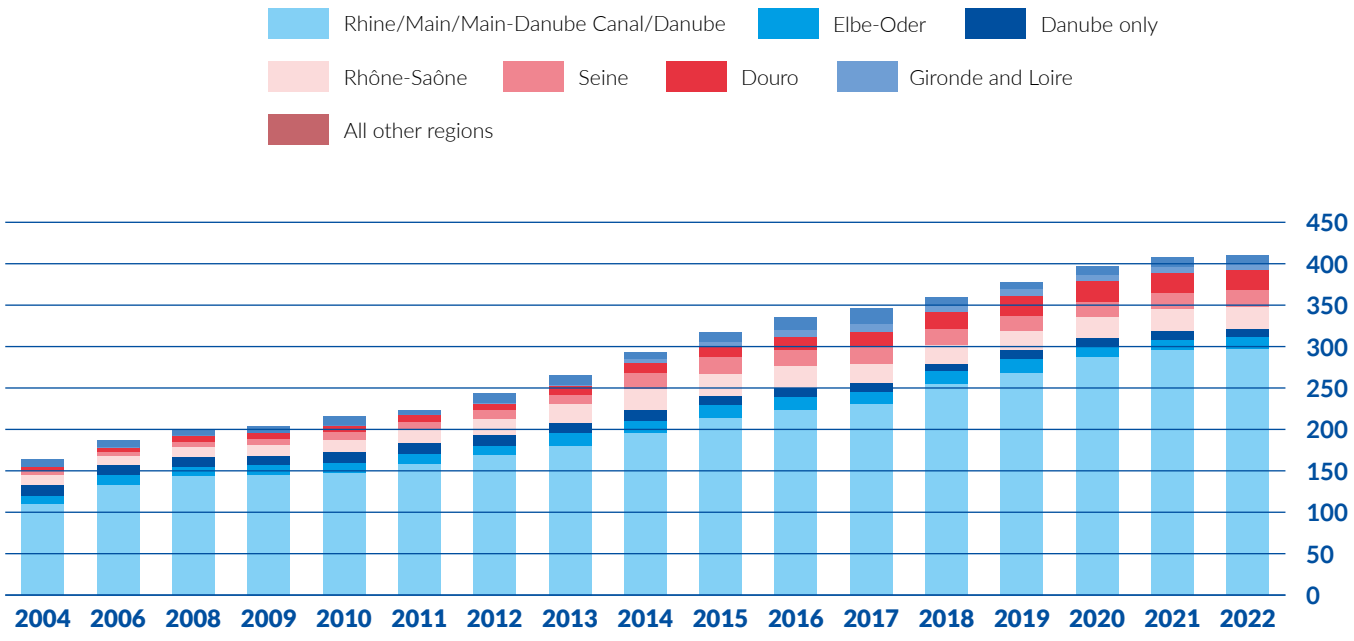
The market situation in 2021 was still characterised by a rather low activity on the demand side, which slowed down the shipbuilding activity for river cruises. The recovery from the Covid-19 pandemic led to an increase in the price of raw materials such as steel, necessary for building new vessels, but also to difficulties in obtaining supplies of certain components. Shipyards specialised in cruise vessels count among those who suffered the most from the pandemic. Some examples of recent bankruptcies in this sector exist, such as the shipyard "De Hoop" in the Netherlands or the shipyard "Meuse et Sambre" in Belgium.

FLEET
FOR RIVER CRUISES[55]

The active river cruise fleet in Europe represents more than 40% of the world active river cruise fleet. The fleet for river cruises in the EU is mainly concentrated on central European waterways[56] (close to 75% of the total river cruise fleet in the EU).

In 2021, the number of river cruise vessels in Europe reached 405, amounting to 59,750 beds (compared to 397 active vessels in 2020 with 57,940 beds).

FIGURE 1: **NUMBER OF RIVER CRUISE VESSELS IN THE EU BY REGION OF OPERATION** (2004 – 2022) *



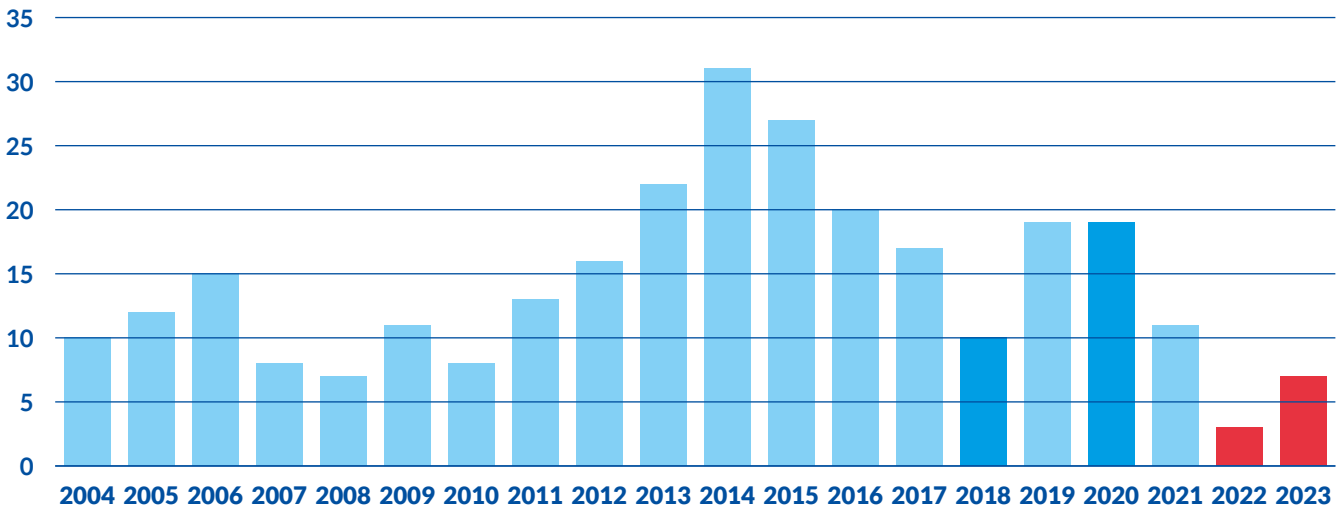
Source: Hader, A. (March 2022), The River Cruise Fleet
** 2022: based on order book as of March 2022*

[55] *Hader, A. (March 2022), The River Cruise Fleet*
[56] *Rhine, Main, Main-Danube Canal, Danube, Elbe-Oder*

In the 2021 season, nine new vessels were commissioned (compared to 19 in 2020), but not all of them started cruising. Two additional vessels were commissioned in 2021 but their completion was delayed to 2022. The 11 newbuilds which were commissioned in 2021 are expected to operate in the following regions: eight on central European waterways, two on the Danube, and one on the Rhône.

The downward trend in new building orders reflects the reduction of passenger demand due to the pandemic. It is expected to continue in 2022, as only three new vessels are to be delivered in 2022, as well as the two others which were postponed from 2021 to 2022.

FIGURE 2: **NEW RIVER CRUISE VESSELS FOR THE EUROPEAN MARKET 2004-2023 ***



Source: Hader, A. (March 2022), The River Cruise Fleet
** 2022 and 2023: based on order books as of March 2022. Note that out of the 11 new vessels commissioned in 2021, two will be delivered in 2022.*

In 2021, the 11 new vessels brought an additional capacity of 1,963 beds (compared to 3,155 beds in 2020) to the river cruise market in Europe.

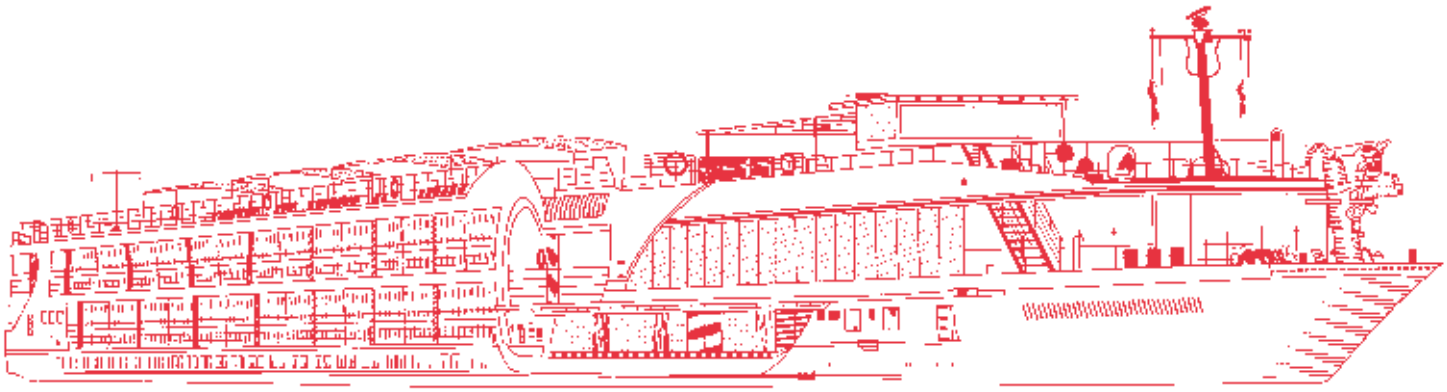
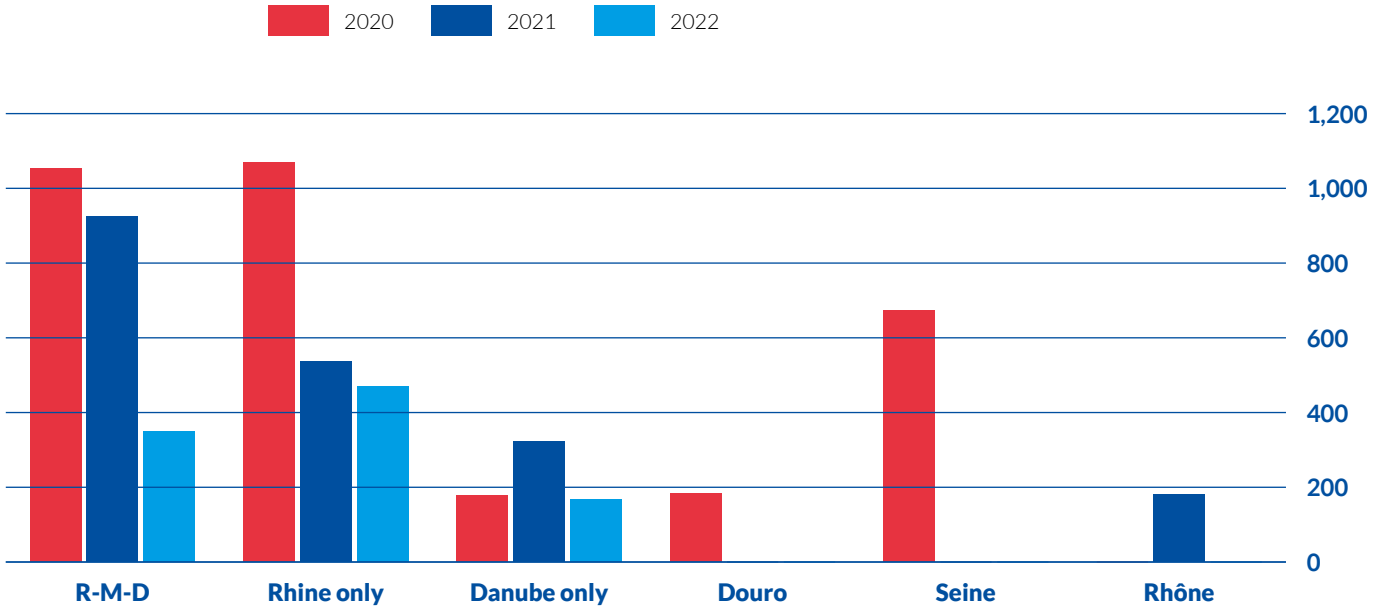


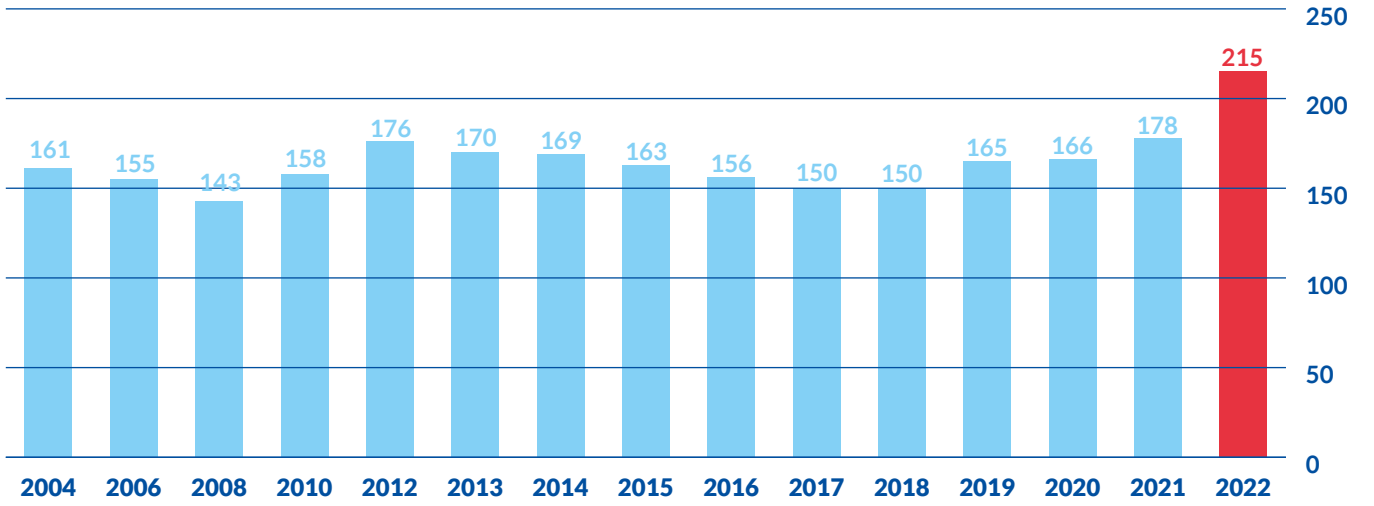
FIGURE 3: **NEW CRUISE CAPACITIES IN 2020, 2021 AND 2022 PER REGION OF OPERATION** (NUMBER OF BEDS) *



Source: Hader, A. (March 2022), The River Cruise Fleet
** R-M-D= Rhine/Main/Main-Danube Canal/Danube. 2022: based on order books as of March 2022.*

After a decrease between 2014 and 2018, the average number of beds in new cruise vessels has been rising continuously. Indeed, owners now make use of the extension of the length limit to 135 m, enabling the installation of more cabins on a river cruise vessel.

FIGURE 4: **AVERAGE NUMBER OF BEDS IN NEW RIVER CRUISE VESSELS IN EUROPE BY YEAR OF CONSTRUCTION ***



Source: Hader, A. (March 2022), The River Cruise Fleet
** Figure for 2022: forecast*

II DEMAND
FOR RIVER CRUISES

The year 2021, as the year 2020, was again affected by the Covid-19 pandemic. Overall, the figures show that the industry was able to withstand the second pandemic year with restraint and that it is on a path, yet difficult, to normality. The statistical collection of the annual figures for the 2021 river cruise season was a difficult exercise as the business activities of the companies were not in normal operation for a long part of the year. At the beginning of the season, only travel within Germany was possible. The Italian and French markets opened up only in June 2021.[57] The greatest negative effects of the pandemic for river cruises in Europe was the impossibility for tourists from the United States to book river cruises in Europe in 2021, even if smaller vessels benefited from some exemptions. Instead of travelling to Europe, most US-Americans travelled on US-American waters. As a result, the company *American Cruise Lines* recently ordered 12 new cruise vessels. In fact, overseas passengers from US- Americans, who account for about 50% of the passenger volume in normal years, found their way to Europe very late and only in small numbers.

In light of the above, figures for 2021 could only be collected in detail for the German travel market. Regarding this market specifically, the number of passengers who booked a river cruise in Germany increased by 62.8%, in 2021 to reach 182,844 passengers. Those numbers are however still 66% below the passenger numbers recorded for the year 2019 (with 541,133 passengers). A trend to normalisation is observable and the German industry expects to reach pre-Covid levels within two years. It is worth noting that the industry sees the shift to a more environmentally-friendly fleet as highly relevant for its future[58].

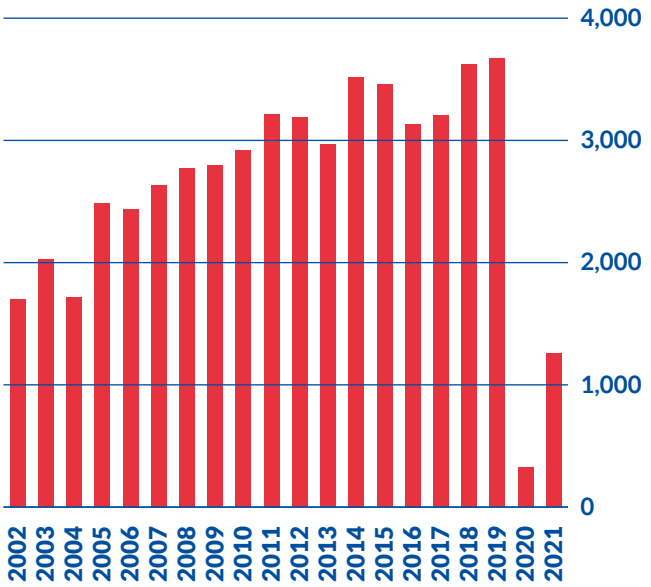
The yearly vessel movement figures of river cruising on the Danube, Rhine and Moselle show that in 2021, cruising activity on the Upper Danube (at the Austrian-German border) was still 66% below the pre-pandemic level of 2019. On the Rhine, the gap between 2021 and 2019 was 55%, and 35% on the Moselle.

In general, it must be noted that the capacity utilisation of cruise vessels is still lower than before the pandemic. This means that the gap in terms of number of passengers is even larger than the gap in terms of vessel movements.

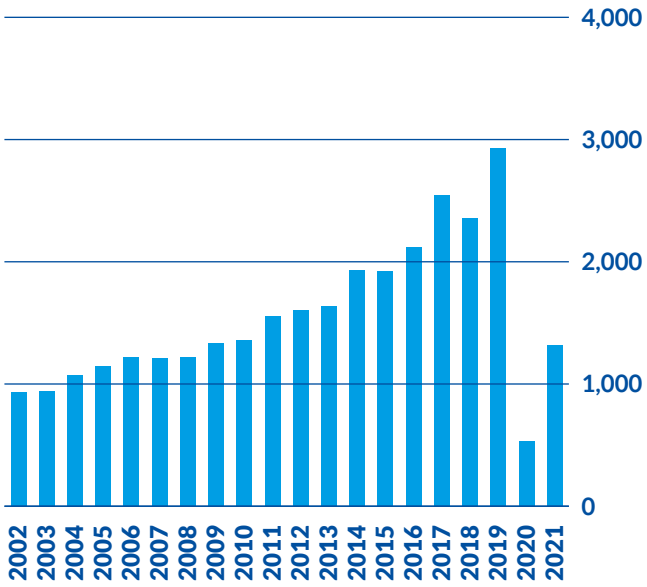
[57] *Source: IG RiverCruise - Der Fluss-Kreuzfahrtmarkt 2021*
[58] *Idem*

FIGURES 5, 6 AND 7: **YEARLY NUMBER OF CRUISE VESSEL TRANSITS ON DANUBE, RHINE AND MOSELLE**

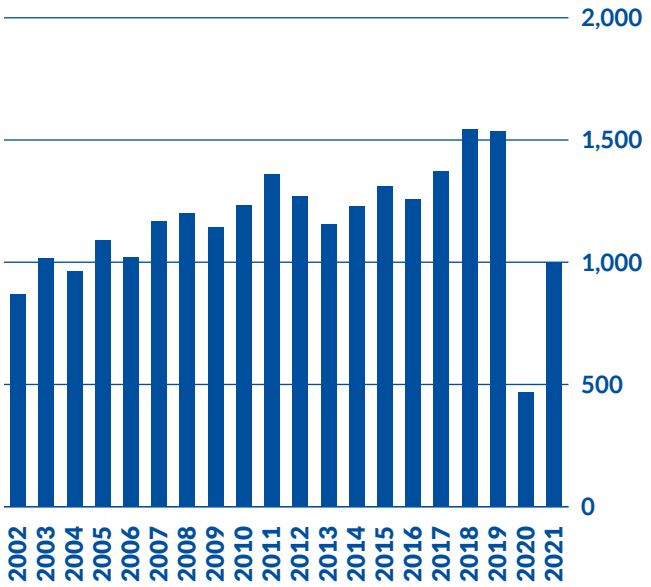
Danube



Rhine



Moselle



Sources: German Waterway and Shipping Administration and Moselle Commission
** Rhine = Upper Rhine (lock of Iffezheim). Danube = Upper Danube at the Austrian-German border (lock of Jochenstein). Moselle = lock of Koblenz.*

For the Danube, the following tables show figures for vessel movements and for passenger numbers in a higher geographical resolution. Three measurement points along the Danube are hereby distinguished:

- German-Austrian border (lock of Jochenstein), for which data were shown graphically in Figure 5
- Slovakian-Hungarian border (lock of Gabčíkovo)
- Hungarian-Croatian-Serbian border (border point of Mohács in southern Hungary)

By this geographical distinction it is possible to observe differences in cruising intensity on the Danube. The distinction shows that the activity is highest between Vienna and Budapest. Cruising activity south of Budapest is lower than on the Danube stretches upstream of Budapest.

TABLE 1: **CRUISE VESSEL TRAFFIC ON THE DANUBE AT THE GERMAN-AUSTRIAN BORDER** (LOCK OF JOCHENSTEIN) **AND NUMBER OF PASSENGERS**

BORDER DE/AT			
Year	**Number of vessel transits**	**Number of passengers**	**Average number of passengers per vessel**
2015	3,456	473,800	137
2016	3,134	430,000	137
2017	3,204	414,153	129
2018	3,625	507,665	140
2019	3,668	512,500	140
2020	324	25,160	78
2021	1,255	107,727	86

Sources: German Waterway and Shipping Administration and Danube Commission

TABLE 2: **CRUISE VESSEL TRAFFIC ON THE DANUBE AT THE SLOVAKIAN-HUNGARIAN BORDER** (LOCK OF GABČÍKOVO) **AND NUMBER OF PASSENGERS**

BORDER SK/HU			
Year	**Number of vessel transits**	**Number of passengers**	**Average number of passengers per vessel**
2015	3,702	534,000	144
2016	3,946	564,700	143
2017	4,210	595,500	141
2018	3,945	548,800	139
2019	5,141	720,800	140
2020	557	56,100	101
2021	1,419	149,100	105

Source: Danube Commission

TABLE 3: **CRUISE VESSEL TRAFFIC ON THE DANUBE AT THE HUNGARIAN-CROATIAN-SERBIAN BORDER** (MOHÁCS) **AND NUMBER OF PASSENGERS**

BORDER HU/HR/RS			
Year	**Number of vessel transits**	**Number of passengers**	**Average number of passengers per vessel**
2015	667	83,000	124
2016	693	86,900	125
2017	707	97,700	138
2018	754	103,600	137
2019	1,017	135,040	133
2020	58	5,141	89
2021	328	34,100	104

Source: Danube Commission

Regarding passenger traffic in the Sava and Kupa river ports, most of the passenger traffic is recorded at the port of Belgrade, Serbia. Since 2015, the number of river cruise passengers recorded by the port of Belgrade (passenger terminal) has constantly increased, from 60,000 passengers in 2015 to 104,000 in 2019.

This reflects the positive evolution of cruising activity observed on the Danube. Indeed, most of the cruise vessels that stop in Belgrade are generally for cruises that take place along the Danube and stop in the main eastern European capitals. As is the case in other regions, passenger traffic suffered from the Covid-19 pandemic. In Belgrade, only 561 passengers were recorded by the port in 2020, and 19,000 in 2021. It is expected that the pandemic will continue to have an impact on passenger traffic in 2022. Navigability conditions on the waterways also remain an obstacle for the further development of passenger transport in this region.[59]

[59] *Passenger transport data have so far not been processed in a detailed manner due to a lack of up-to-date records, as well as non-harmonised methodology between the countries.*

OUTLOOK
FOR RIVER CRUISES

The war in Ukraine came as an additional blow for the river cruise industry. Firstly, because the attractiveness of the lower Danube region might be affected, disturbing the European river cruise market further. Secondly, several river cruising companies report cancellations of previously booked cruises from the US-American client market. The reason is that US-American tourists might perceive the war in Ukraine as a phenomenon linked to Europe in general.

In addition to a decrease in demand, there will also be bottlenecks on the supply side, as the crew working on river cruise vessels is directly affected. Indeed, many Ukrainian captains and crew members were active in the European river cruise market. Their numbers have been rising in recent years. Due to the war, they remained in Ukraine in 2022. Also, fuel costs are currently soaring, which may lead to higher travel fares, thereby impacting passenger demand as well.

It seems that new orders for river cruise vessels are starting to be placed again, with seven river cruise vessels in the 2022 order books. Specifically, in March 2022, the UK cruise operator SAGA Travel ordered four 135 m vessels for operation on various European rivers (to be delivered in 2023).

09

OUTLOOK FOR INLAND WATERWAY FREIGHT TRANSPORT

- Traditional market segments, such as the steel, agricultural/food and chemical segments, form the basis of inland water transport. Steel demand is foreseen to remain on a positive path throughout 2022 and 2023 but at a more moderate pace. The chemical industry faces a lower demand for chemical products due to supply chain disruptions and increased production costs.
- With regard to the food and agriculture segment, Ukrainian grain is blocked within the country, which further fuels an upward surge in commodity prices and a scarcity of grain in importing countries.
- Therefore, alternative trading routes for grain need to be established. These new routes could at least partly benefit inland navigation. One example is the higher export of grain from regions in northern France to North Africa, involving inland waterway transport in the hinterland.

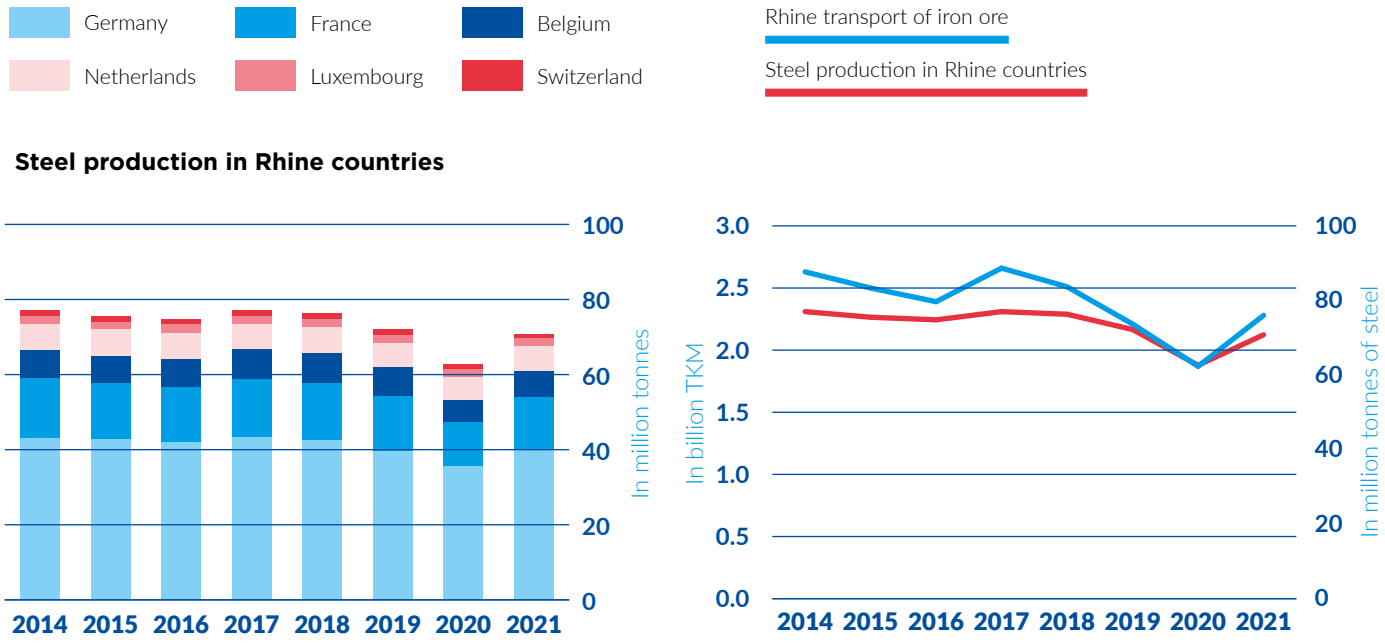
Inland waterway transport in its present structure relies on traditional market segments. Examples are the steel segment, the agricultural and food segment, as well as the chemical segment.

Iron ore and steel segment

On the Rhine, around 24.4% of all cargo transport is related to steel production (iron ore, scrap steel, coking coal, metals, metal products). On the Danube, this share is even higher and amounts to 40.3% for the Middle Danube.

Steel production in Rhine countries recovered in 2021, reaching 70.8 million tonnes in 2021, which was 13% higher than in 2020. But there was still a gap of 2% compared to 2019. Iron ore transport volume on the Rhine reached 21.4 million tonnes in 2021, 16% higher than in 2020, leaving only a small gap of 1% compared to 2019. In 2021, iron ore transport performance was 22% higher than in 2020 and 3% higher than in 2019.

FIGURES 1 AND 2: **STEEL PRODUCTION IN RHINE COUNTRIES AND TRANSPORT OF IRON ORE ON THE TRADITIONAL RHINE**

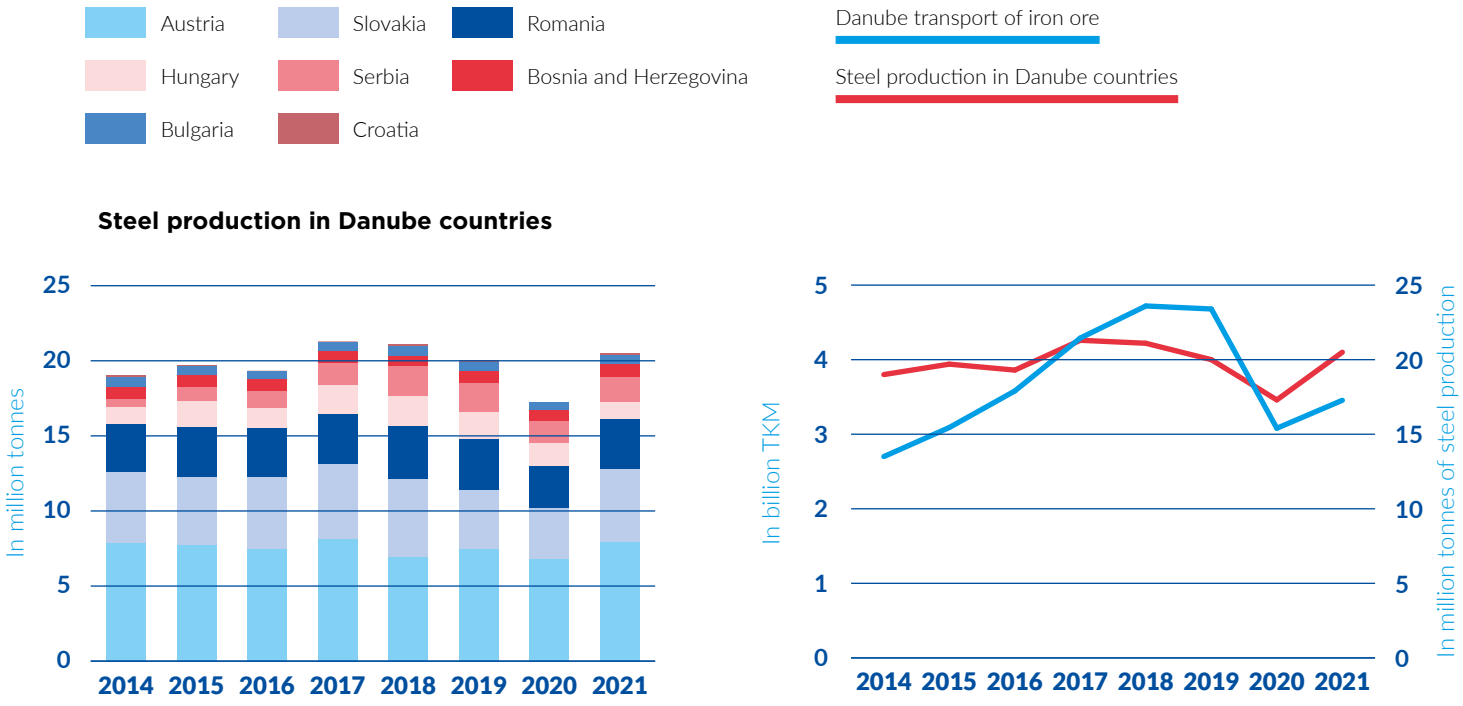


Sources: World Steel Association, Eurofer, Destatis, CCNR analysis

Steel production in Danube countries[60] amounted to 20.5 million tonnes in 2021, an increase of 19% compared to 2020.

[60] *Without Ukraine*

FIGURES 3 AND 4: **STEEL PRODUCTION IN DANUBE COUNTRIES AND TRANSPORT OF IRON ORE ON THE LOWER DANUBE**



Sources: World Steel Association, Eurofer, Eurostat [iww_go_atygo]
** Lower Danube = Romania and Bulgaria. Data for Middle Danube countries were mostly missing.*

Outlook for the steel segment

According to the European Steel Association *Eurofer*[61] , steel demand is expected to continue its recovery in 2022, but at a more moderate pace. The reason for the moderation after the vigorous recovery in 2021 is related to Russia's invasion of Ukraine in February 2022. This led to wide repercussions on energy prices, global trade and supply chains.

In 2022, the growth of production of steel-using sectors is expected to continue, but the rate of growth was revised downwards from +4 % to +2 %. The new situation has cast wide uncertainty on the outlook for 2023. Nevertheless, a modest growth rate of 2.3% is foreseen for this year.

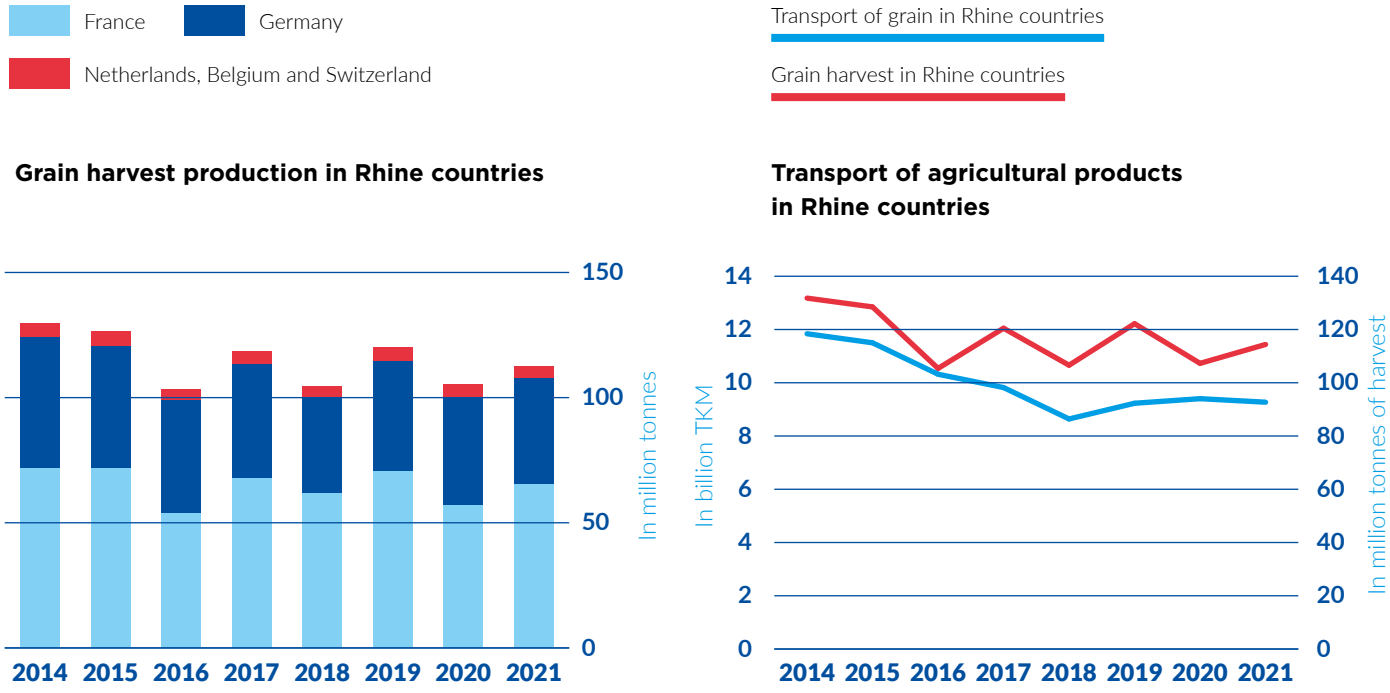
The *World Steel Association* differs in its outlook from *Eurofer*. In its short-range outlook dating from April 2022, the Association underlines a slight decline of steel demand within the European Union and the UK of 1.3% in 2022 and a rebound of 4.0% in 2023.[62] However, uncertainty prevails for 2022 and 2023. Due to inflationary pressure and the war in Ukraine, the expectation of a continued and stable recovery from the pandemic has been shaken.

Agricultural and food products

Agricultural and food products have a share of around 10% in Rhine navigation and around 23% in Danube navigation. In general, agricultural transport on inland waterways in one specific year is partly determined by harvest results in the previous year.

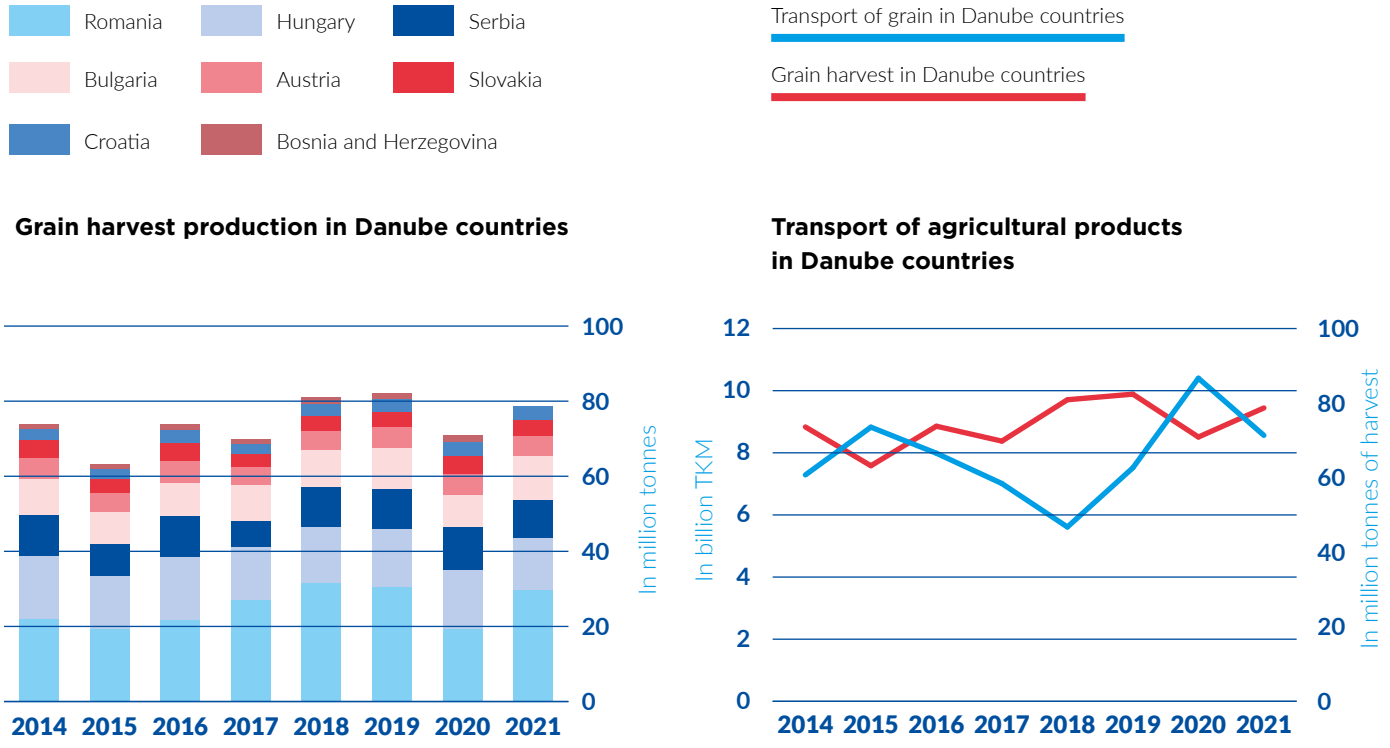
[61] *Eurofer. "Economic and steel market outlook 2022-2023, second quarter", available at: https://www.eurofer.eu/publications/economic-market-outlook/economic-and-steel-market-outlook-2022-2023-second-quarter/ (last consulted 25 May 2022)*
[62] *Source: World Steel Association Short Range Outlook, April 2022. Available at https://worldsteel.org/wp-content/uploads/worldsteel-Short-Range-Outlook-April-2022_press-release-table.pdf (last consulted 28 April 2022)*

FIGURES 5 AND 6: **GRAIN HARVEST PRODUCTION IN RHINE COUNTRIES AND TRANSPORT OF AGRICULTURAL PRODUCTS**



Source: Eurostat [apro_cpsh1] and [iww_go_atygo]

FIGURES 7 AND 8: **GRAIN HARVEST PRODUCTION IN DANUBE COUNTRIES AND TRANSPORT OF AGRICULTURAL PRODUCTS**



Source: Eurostat [apro_cpsh1] and [iww_go_atygo]

Outlook for the agri-food segment

The war has disrupted the Ukrainian and Russian export of grain, wheat, and maize, mainly due to the closure of Ukrainian ports and sanctions imposed on Russia. The consequent rapid increase in the prices for agricultural commodities is expected to last throughout 2023, pushed by the lagged impact from the harvest in 2022.

This situation led to a large stock of corn in Ukraine (13 million tonnes by the end of March), which can be transported only by rail since the seaports have been blocked. The growing inventories and the limited sales opportunities put further pressure on corn prices.

The Ukrainian export of grain is not likely to recover quickly since the war has caused devastation and contamination of the harvest. It has also severely disturbed the planting of new crops. Thus, countries which are highly dependent on agricultural imports from Ukraine (mainly North Africa, the Middle East and Asia) are expected to address their demand also towards other grain exporters.

One such region could be the Middle Danube region, from which grain could be exported in higher volumes on the Danube. However, in March 2022, Hungary as one Middle Danube country with large agricultural production decided to restrict the export of grain and other agricultural commodities. The decision was taken as a reaction to the tense situation on the world grain market due to the war in Ukraine.

Another region with a high agricultural production is northern France. The river-sea Port of Rouen is the largest export harbour for grain in Europe. The volume in the harvest season from mid-2021 to mid-2022 is foreseen to lie between 7.5 to 8.0 million tonnes. During the harvest season stretching from mid-2019 to mid-2020, the volume amounted to 9.9 million tonnes. Given the geopolitical tensions, old trading partners such as Algeria, Morocco, Tunisia and western African countries return towards the Port of Rouen to cover their demand for grain.[63] This revival of old trade patterns could have a positive effect on the grain exporting activity of the Port of Rouen and therefore also on the hinterland transport of grain on inland waterways in northern France.

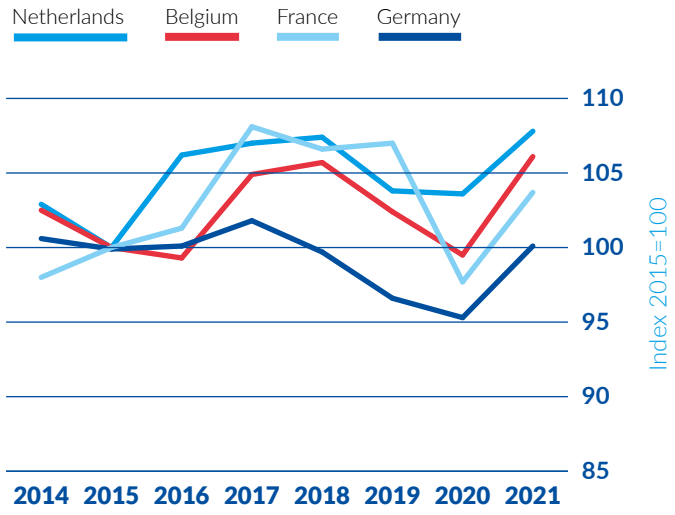
Chemicals

The share for chemicals transported on the Rhine (year 2021) amounts to 11.6% and to 10.8% on the Danube. The transport performance for chemicals in Rhine countries has remained at more or less stable levels over the last five years, with only one significant drop in 2018 (low water effect). The volumes of chemicals transported along the Danube, albeit on a lower level, follow a positive trend, with some fluctuations. From 2019 to 2020, a significant 39% increase can be seen within the transport of chemicals on the Danube.

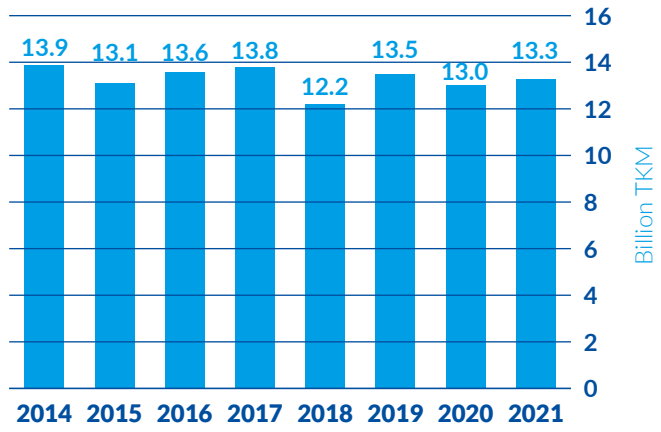
[63] *Source: NPI (2022), article « Céréales et guerre en Ukraine, Rouen sollicité par de nouveaux partenaires commerciaux », 15 April 2022*

FIGURES 9, 10, 11 AND 12: **INDEX OF CHEMICAL PRODUCTION IN RHINE AND DANUBE COUNTRIES AND TRANSPORT OF CHEMICAL PRODUCTS**

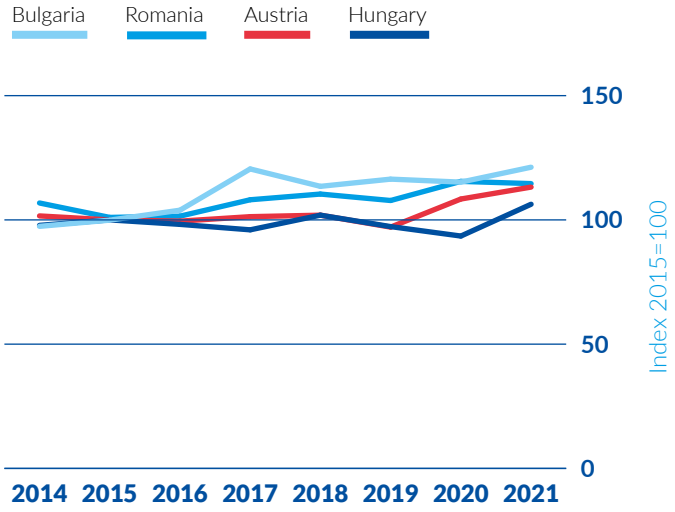
Index of chemical production in Rhine countries



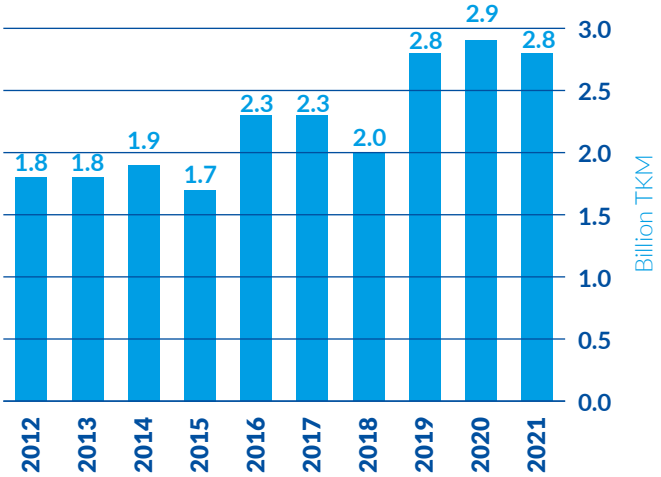
Transport of chemical products in Rhine countries



Index of chemical production in Danube countries



Transport of chemical products in Danube countries



Source: Eurostat [STS_INPR_A], [IWW_GO_ATYGO]

Outlook for the chemical segment

The chemical industry is an energy intensive industry. It uses in particular petrochemical substances as feedstocks. Given the sharp price increase in crude oil and petroleum products, the industry faces rising production costs.

The Association of the Chemical Industry in Germany sees this development as a main reason for its downward revision of the economic outlook. In addition, due to disruptions in supply chains, the production level in different areas of the economy is cut back. This leads also to less demand for chemical products. For the German chemical industry, a gas embargo or a halt in gas supplies from Russia would have additional "devastating effects".[64]

[64] *VCI, 2022. Press release 'Final results of the chemical-pharmaceutical industry were satisfactory overall' (24.05.2022). Available at: https://www.vci.de/presse/pressemitteilungen/dunkle-wolken-im-chemiegeschaeft.jsp (last consulted on 25.May 2022).*

STATISTICAL ANNEX

TABLE 1: **YEARLY TRANSPORT VOLUME ON THE TRADITIONAL RHINE BY CARGO SEGMENT** (IN MILLION TONNES)

	1	2	3	4	5	6	7
Year	**Dry cargo**	**Liquid cargo**	**Container ***	**Container ****	**Unit cargo**	**Other cargo**	**Total *****
2009	97.724	41.201	13.334	16.710	8.551	6.179	170.364
2010	114.615	44.947	16.008	20.031	10.298	6.209	196.100
2011	107.780	39.013	15.704	19.652	13.761	5.520	185.725
2012	108.048	41.740	14.707	18.653	14.865	4.827	188.133
2013	112.213	43.021	15.256	19.279	14.183	3.756	192.452
2014	111.622	42.281	15.838	20.152	14.499	3.759	192.313
2015	106.342	40.695	15.431	19.758	14.111	3.686	184.593
2016	106.194	41.877	16.062	20.475	13.556	3.792	185.894
2017	104.966	43.206	16.924	21.609	12.943	3.680	186.404
2018	93.840	39.584	14.736	18.951	8.757	3.103	164.235
2019	97.486	45.411	15.162	19.192	7.753	4.305	174.146
2020	87.678	42.591	14.955	18.819	6.952	3.611	159.651
2021	94.910	42.219	14.929	18.821	7.733	3.874	167.558

Source: Destatis
** Weight of cargo in container*
*** Weight of cargo in container plus weight of loading unit (container box)*
**** Total = 1+2+4+5+6*

TABLE 2: **YEARLY TRANSPORT VOLUME ON THE TRADITIONAL RHINE BY MAIN GOODS SEGMENTS** (IN MILLION TONNES)

	1	2	3	4	5	6	7
Year	**Coal**	**Sands, stones, gravel**	**Iron ore**	**Agricultural and food products**	**Metals**	**Mineral oil products**	**Chemicals**
2012	30.221	23.736	23.152	19.562	11.613	33.201	22.834
2013	33.766	25.280	24.608	22.262	10.621	30.919	20.807

	1	2	3	4	5	6	7
Year	Coal	Sands, stones, gravel	Iron ore	Agricultural and food products	Metals	Mineral oil products	Chemicals
2014	31.851	25.613	25.541	21.993	11.407	29.378	21.240
2015	30.453	23.994	25.993	20.603	11.138	28.681	19.883
2016	30.923	24.109	25.600	20.057	10.727	28.466	20.942
2017	28.150	25.510	25.520	17.320	11.340	29.000	21.450
2018	23.690	23.584	23.251	15.116	9.577	25.167	18.492
2019	22.430	28.650	21.611	15.690	9.306	29.958	20.070
2020	17.100	26.240	18.550	17.370	7.950	27.570	19.320
2021	21.970	25.790	21.400	17.010	8.890	27.330	19.610

Source: CCNR analysis based on Destatis

TABLES 3 - 7: RHINE FLEET[65]

TABLE 3: **NUMBER OF DRY CARGO VESSELS** (SELF-PROPELLED VESSELS AND BARGES)

	1	2	3	4	5	6	7
Year	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
2012	3,814	2,204	1,242	1,000	18	12	8,290
2013	3,737	2,147	1,211	997	16	12	8,120
2014	3,626	2,104	1,163	983	14	13	7,903
2015	3,604	2,094	1,114	962	14	9	7,797
2016	3,559	2,062	1,037	935	13	7	7,613
2017	3,519	2,026	1,036	925	11	6	7,523
2018	3,485	2,051	993	940	10	8	7,487
2019	3,522	2,027	996	939	10	16	7,510
2020	3,434	2,004	977	978	8	15	7,416
2021	3,470	##	992	949	8	21	##

[65] *Vessels registered in Rhine countries*

TABLE 4: **NUMBER OF LIQUID CARGO VESSELS** (SELF-PROPELLED VESSELS AND BARGES)

	1	2	3	4	5	6	7
Year	**The Netherlands**	**Germany**	**France**	**Belgium**	**Switzerland**	**Luxembourg**	**Total**
2012	855	434	83	209	56	17	1,654
2013	857	419	81	196	53	17	1,623
2014	871	406	67	184	56	16	1,600
2015	849	409	53	168	56	16	1,551
2016	824	418	51	158	51	18	1,520
2017	811	419	50	146	55	17	1,498
2018	794	455	48	133	51	17	1,498
2019	780	447	46	131	43	23	1,470
2020	741	451	44	136	42	23	1,437
2021	739	##	48	141	46	28	##

TABLE 5: **NUMBER OF PUSH BOATS AND TUGBOATS**

	1	2	3	4	5	6	7
Year	**The Netherlands**	**Germany**	**France**	**Belgium**	**Switzerland**	**Luxembourg**	**Total**
2012	n.d.	423	n.d.	77	7	10	n.d.
2013	851	423	n.d.	78	6	10	n.d.
2014	833	413	n.d.	80	9	10	n.d.
2015	821	411	n.d.	76	8	9	n.d.
2016	820	416	n.d.	85	10	10	n.d.
2017	838	414	n.d.	78	9	10	n.d.
2018	806	418	n.d.	76	10	10	n.d.
2019	841	412	n.d.	72	11	10	n.d.
2020	##	412	n.d.	80	11	12	n.d.
2021	##	##	n.d.	80	9	14	n.d.

TABLE 6: **RHINE DRY CARGO FLEET PER LOADING CAPACITY CATEGORY 2016-2021 ***

2016	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,323	1,167	725	359	3	5	3,582
1,000 t - 2,000 t	972	587	166	272	3	2	2,002
2,000 t - 3,000 t	772	233	126	155	5	0	1,291
> 3,000 t	492	20	20	148	2	0	682
Total	3,559	2,062	1,037	934	13	7	7,612

2017	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,257	1,150	710	341	3	6	3,467
1,000 t - 2,000 t	956	575	173	267	3	2	1,976
2,000 t - 3,000 t	792	221	132	160	4	0	1,309
> 3,000 t	514	22	21	157	2	0	716
Total	3,519	2,026	1,036	925	12	8	7,526

2018	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,241	1,172	666	343	3	6	3,431
1,000 t - 2,000 t	955	577	181	266	2	2	1,983
2,000 t - 3,000 t	773	219	126	164	3	0	1,285
> 3,000 t	516	23	20	167	2	0	728
Total	3,485	2,051	993	940	10	8	7,487

2019	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,183	1,161	657	330	3	6	3,340
1,000 t - 2,000 t	961	552	187	270	2	6	1,978
2,000 t - 3,000 t	876	224	134	165	3	3	1,405
> 3,000 t	502	25	18	174	2	0	721
Total	3,522	2,027	996	939	10	15	7,509

** Total numbers for Germany contain some vessels for which no deadweight value is known (between 55 and 65 per year).*

2020	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,186	1,137	618	337	2	6	3,286
1,000 t - 2,000 t	988	551	195	276	3	6	2,019
2,000 t - 3,000 t	775	228	146	171	2	3	1,325
> 3,000 t	485	28	18	194	1	0	726
Total	3,434	2,004	977	978	8	15	7,416

2021	The Netherlands	Germany	France	Belgium	Switzerland	Luxembourg	Total
< 1,000 t	1,190	##	610	318	2	10	##
1,000 t - 2,000 t	967	##	195	270	3	7	##
2,000 t - 3,000 t	774	##	165	168	2	3	##
> 3,000 t	539	##	22	193	1	1	##
Total	3,470	##	992	949	8	21	##

TABLE 7: **RHINE LIQUID CARGO FLEET PER LOADING CAPACITY CATEGORY 2016-2021**

2016	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	236	22	46	9	0	0	313
1,000 t - 2,000 t	206	201	35	14	10	12	478
2,000 t - 3,000 t	157	132	37	25	27	2	380
> 3,000 t	225	17	40	3	14	4	303
Total	824	418	158	51	51	18	1,520

2017	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	241	23	47	8	0	0	319
1,000 t - 2,000 t	199	200	28	13	6	12	458
2,000 t - 3,000 t	151	134	30	27	35	2	379
> 3,000 t	220	18	38	2	14	4	296
Total	811	419	143	50	55	18	1,496

2018	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	238	51	38	9	2	0	338
1,000 t - 2,000 t	189	201	29	14	6	13	452
2,000 t - 3,000 t	150	138	27	23	29	1	368
> 3,000 t	217	20	39	2	14	4	296
Total	794	455	133	48	51	18	1,499

2019	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	221	46	39	7	0	0	313
1,000 t - 2,000 t	194	199	26	15	0	7	441
2,000 t - 3,000 t	143	140	24	22	29	2	360
> 3,000 t	222	19	42	2	14	3	302
Total	780	447	131	46	43	12	1,459

2020	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	174	46	34	8	0	0	262
1,000 t - 2,000 t	186	198	27	15	3	7	436
2,000 t - 3,000 t	156	139	24	19	27	16	381
> 3,000 t	225	25	51	2	12	5	320
Total	741	451	136	44	42	28	1,442

2021	The Netherlands	Germany	Belgium	France	Switzerland	Luxembourg	Total
< 1,000 t	144	##	32	8	0	0	##
1,000 t - 2,000 t	192	##	26	16	3	7	##
2,000 t - 3,000 t	160	##	28	21	29	16	##
> 3,000 t	243	##	55	3	14	5	##
Total	739	##	141	48	46	28	##

Sources: CCNR analysis based on CBS/Rijkswaterstaat; WSV, ITB, VNF, Swiss Rhine ports, vessel register Luxembourg and Eurostat [iww_eq_age]
= data are not yet available.
n.d. = data are not available at all.

GLOSSARY

ACTUAL DRAUGHT OF A VESSEL: the vertical distance between the vessel's keel and the waterline at which the vessel is sailing. For a moving vessel, the actual draught comprises also the squat effect (see "SQUAT EFFECT" in this glossary).

ACTUAL WATER LEVEL: a measurement indicated on a water level stick that is installed at or near the shore of a river at a gauge station. It does not measure the actual depth of the river, as rivers become deeper in their mid-section. Actual water levels are nevertheless needed to calculate the available draught for the navigation of a vessel on a particular river stretch.

ARA REGION: Amsterdam-Rotterdam-Antwerp

AVAILABLE OR POSSIBLE DRAUGHT OF A VESSEL: the maximum depth to which the vessel may be safely immersed when loaded with cargo. Both for inland and for seagoing vessels, this depth varies with the ship's dimensions. For seagoing vessels, it depends also on the time of the year and the mass density of the water encountered. The available draught of inland vessels sailing on free-flowing rivers takes into account several parameters that are specific to each river stretch and gauge station. It is calculated as follows:
Available draught = Minimum navigation channel depth + (Actual water level – Equivalent water level) – Under keel clearance.

AVERAGE UTILISATION RATE (OF A CARGO FLEET): relation between the needed cargo carrying capacity (needed due to transport demand in a certain year) and the available capacity of the fleet in that same year, in percentage terms.

BN: billion

CENTRAL EUROPEAN WATERWAYS: Rhine, Main, Main-Danube Canal, Danube, Elbe-Oder

CONNECTING EUROPE FACILITY II PROGRAMME (CEF II): an EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level.

DANUBE COUNTRIES: Austria, Bulgaria, Croatia, Hungary, Republic of Moldova, Romania, Serbia, Slovakia, Ukraine

DEADWEIGHT (DWT): it is the maximum loading capacity of a ship, therefore the maximum weight that it can carry (measured in tonnes). This weight includes cargo, fuel, fresh water, ballast water, provisions, passengers, and crew. It does not include the empty weight or lightweight of the vessel itself. The sum of deadweight and lightweight of a ship gives the maximum displacement (measured in tonnes).

EAST-WEST AXIS: west German Canals, Mittelland Canal, Berlin, eastern Germany, Poland

EQUIVALENT WATER LEVEL (EWL): refers to a low water level on the Rhine under which, on a 100-year average, the water levels do not fall below more than 20 ice free days per year.

EU: European Union

EUROPE: European inland navigation in this report includes four countries that are not members of the European Union, Republic of Moldova, Serbia, Switzerland and Ukraine.

EUROPEAN CONFERENCE OF THE MINISTERS OF TRANSPORT CLASS I-VII (CEMT CLASS I-VII): the Classification of European Inland Waterways is a set of standards for interoperability of large navigable waterways forming part of the Trans-European Inland Waterway network within Continental Europe and Russia. It was created by the European Conference of Ministers of Transport in 1992, hence the range of dimensions are also referred to as CEMT Class I–VII.

EUROPEAN CRUISE FLEET: cruise vessels with more than 39 beds operating in the EU and in Switzerland.

FAIRWAY REHABILITATION AND MAINTENANCE MASTER PLAN (FRMMP): this highlights national needs and short-term measures in order to ensure the efficient and effective realisation of harmonised waterway infrastructure parameters along the entire Danube and its navigable tributaries.

FARAG REGION: Flushing, Amsterdam, Rotterdam, Antwerp, Ghent

FREIGHT RATE: price at which a cargo is delivered from one point to another.

GDP: Gross Domestic Product (basic measure of the overall size of a country's economy)

GOOD NAVIGATION STATUS (GNS): the state of the inland navigation transport network, which enables efficient, reliable and safe navigation for users by ensuring minimum waterway parameter values and levels of service.

INTERNATIONAL TRANSPORT FORUM (ITF): an intergovernmental organisation within the OECD system

IRON GATES: these set the border between the downstream free-flowing part of the Danube and the upstream part which counts many locks. They are located at the Serbian - Romanian border.

IWT: Inland Waterway Transport

IWW: Inland Waterways

LOWER DANUBE: stretch of the Danube from the Iron Gates at the border between Serbia and Romania to Sulina on the Black Sea in Romania

LOWER RHINE: section of the Rhine which flows from Bonn, Germany, to the North Sea at Hoek van Holland, the Netherlands.

LOW NAVIGABLE WATER LEVEL (LNWL): refers to a low water level on the Danube under which the water levels do not fall below more than 22 ice free days per year.

MARITIME DANUBE: the Danube Delta region

MIDDLE DANUBE: stretch of the Danube from Devín Gate at the border between Austria and Slovakia to the Iron Gates

MIDDLE RHINE: stretch of the Rhine between Bingen am Rhein and Bonn

MINIMUM NAVIGATIONAL CHANNEL DEPTH: this corresponds to the minimum depth that should prevail in the fairway area (depth of the fairway box below the equivalent water level). This minimum depth is related to the equivalent water level, as it is the channel depth that should still be present, even if water levels drop to the level of the equivalent water level.

MIO: million

MODAL SPLIT SHARE: the percentage of inland waterway freight transport performance (in TKM) within total land-based transport performance. Land-based freight transport modes include road, rail and inland waterways.

NORTH SEA PORT: 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.

RHINE COUNTRIES: Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland

SMALL VESSELS: vessels with a loading capacity of up to 1,500 tonnes. According to an alternative definition, small vessels have a loading capacity of 650 tonnes or less.

SQUAT EFFECT: a hydrodynamic effect that is related to the velocity of the water flow under the vessel. The shallower the waterflow under a vessel is, the higher is its flow velocity, and the higher is its dynamic pressure. Due to the Bernoulli principle, total pressure is a constant which implies that a higher dynamic pressure implies a lower static pressure. This lower static pressure leads to a lower resistance of the water towards the vessel and implies therefore a further sinking of the vessel into the water, thereby increasing the vessel's actual draught.

TEU: Twenty-foot Equivalent Unit, is a unit of cargo capacity for container transport. It is based on the volume of a 20-foot-long (6.1 m) intermodal container, a standard-sized metal box which can be easily transferred between different modes of transport, such as ships, trains, and trucks.

TKM: Tonne-Kilometre (unit for transport performance which represents volume of goods transported multiplied by transport distance)

TRADITIONAL RHINE: section of the Rhine from Basel to the border between Germany and the Netherlands

TURNOVER: sales volume net of sales taxes

UNDER-KEEL CLEARANCE: the distance between the lowest point on the ship's keel (or hull) and the highest point on the channel bottom beneath the ship. This is so to say the "security margin" under the keel.

UPPER DANUBE: section of the navigable Danube from Kelheim, Germany, to Devín Gate, at the border of Austria and Slovakia

UPPER RHINE: section of the navigable Rhine in the Upper Rhine Plain between Basel in Switzerland and Bingen in Germany

NATIONAL STATISTICAL OFFICES

Acronym	Original Name	English Name	Country
CBS	Centraal Bureau voor de Statistiek	Central Statistical Office	The Netherlands
Destatis	Statistisches Bundesamt	Federal Statistical Office of Germany	Germany
FSO	Bundesamt für Statistik	Federal Statistical Office	Switzerland
GUS	Główny Urząd Statystyczny	Statistics Poland	Poland
INSEE	Institut national de la statistique et des études économiques	National Institute of Statistics and Economic Studies	France
INSSE	Institutul National de Statistica	National Institute of Statistics	Romania
KSH/HCSO	Központi Statisztikai Hivatal	Hungarian Central Statistical Office	Hungary
Lietuvos statistika	Lietuvos statistika	Statistics Lithuania	Lithuania
Statistik Austria	Statistik Austria	Statistics Austria	Austria

BOOKS, JOURNAL ARTICLES AND STUDIES

Original Name	Country
CCNR weekly newsletter – N°3, Rhine navigation in the context of Covid-19 (15.04.2020). Available at : https://www.ccr-zkr.org/files/documents/covid19/20200415_CCNR_Weekly_newsletter_3.pdf	Europe
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2022), An action plan for EU-Ukraine Solidarity Lanes to facilitate Ukraine's agricultural export and bilateral trade with the EU (12.05.2022)	EU
Danube Commission market observation	Europe
Danube Region Strategy: National Action Plans. Available at: https://navigation.danube-region.eu/documents/ (last consulted: 02.06.2022)	Europe
Dutch Finance Ministry, Infrastructure fund. Available at: https://www.rijksfinancien.nl/visuals/2021/begroting/uitgaven/A (last consulted: 02.06.2022)	The Netherlands
EU/CCNR (2022), Market Insight Spring 2022, Chapter 2	Europe
Eurofer, Economic and steel market outlook 2022-2023, second quarter. Available at: https://www.eurofer.eu/publications/economic-market-outlook/economic-and-steel-market-outlook-2022-2023-second-quarter/ (last consulted: 25.05.2022)	Europe
FAIRway: National Action Plans, May 2021	EU
Hader, A. (March 2022), The River Cruise Fleet	Europe
IG RiverCruise, Der Fluss-Kreuzfahrtmarkt 2021	Germany

Original Name	Country
IMF World Economic Outlook Database, Outlook from April 2022. Available at: https://www.imf.org/en/Publications/WEO/weo-database/2022/April (last consulted: 07.06.2022)	World
IWD (2020), IW-Konjunkturprognose: Wirtschaft erholt sich langsam. Available at: https://www.iwd.de/artikel/iw-konjunkturprognose-wirtschaft-erholt-sich-langsam-484045/ (last consulted: 25. 05. 2022)	Germany
Lebensader Donau, Offizieller Spatenstich zum Donauausbau. Available at: https://www.lebensader-donau.de/das-gesamtprojekt/news/offizieller-spatenstich-zum-donauausbau/ (last consulted: 28.03.2022)	Germany
Le Journal de la Marine Marchande, 27 April 2022, Ukraine : 80 000 t de céréales ont pu être expédiées. Available at: https://www.journalmarinemarchande.eu/filinfo/ukraine-80-000-t-de-cereales-ont-pu-etre-expediees (last consulted: 28.04.2022)	France
Moselle Commission (2022), report ‚Verkehrszahlen Mosel 2021	Europe
NPI (2022), « Céréales et guerre en Ukraine, Rouen sollicité par de nouveaux partenaires commerciaux » (15.04.2022)	France
OECD (2021), OECD Economic Outlook, Interim Report September 2021: Keeping the Recovery on Track, OECD Publishing, Paris. Available at: https://doi.org/10.1787/490d4832-en	World
Port of Rotterdam Authority, annual report 2020. Available at: PDF - Quick Web Preview (portofrotterdam.com)	The Netherlands
SVS Aktuell, Dec. 2018/Jan. 2019, pages 7 and 8, Verwirrung um Pegel. Welche Abladetiefe gilt? Available at: http://www.svs-ch.ch/sites/default/files/svs-aktuell/winter_2018.pdf	Switzerland
The Federal Transport Infrastructure Plan 2030. Available at: 2030-federal-transport-infrastructure-plan.pdf (bmvi.de)	Germany
VCI, 2022, Press release, Final results of the chemical-pharmaceutical industry were satisfactory overall (24.05.2022). Available at: https://www.vci.de/presse/pressemitteilungen/dunkle-wolken-im-chemiegeschaeft.jsp (last consulted: 25.05.2022)	Germany
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Weekblad Schuttevaer (25.03.2020), Banken geven bedrijven half jaar uitstel van aflossingen’	The Netherlands
Weekblad Schuttevaer (14.07.2021), ING: ‘Vervoer grondstoffen over de Rijn trekt aan door grotere vraag’	The Netherlands
World Steel Association Short Range Outlook, April 2022. Available at: https://worldsteel.org/wp-content/uploads/worldsteel-Short-Range-Outlook-April-2022_press-release-table.pdf (last consulted: 28.04.2022)	World

OTHER SOURCES

Original Name	English Name	Country
Administrația Canalelor Navigabile (ACN)	Administration of the Navigable Canals (ACN)	Romania
Administration de l'enregistrement, des domaines et de la TVA	Registration Duties, Estates and VAT Authority	Luxembourg
Bundesanstalt für Gewässerkunde (BfG)	German Federal Office for Hydrology	Germany
CCNR/ZKR/CCR	Central Commission for the Navigation of the Rhine (CCNR)	Europe
Corporation Inland Tanker Barge Owners (CITBO)	Corporation Inland Tanker Barge Owners (CITBO)	Belgium
DIONYSUS project	DIONYSUS project	Europe
Donaukommission	Danube Commission	Europe
European Steel Association (Eurofer)	European Steel Association (Eurofer)	Europe
EUROSTAT	EUROSTAT	EU
FAIRway project	FAIRway project	EU
Institut pour le Transport par Batellerie/ Instituut voor het Transport langs de Binnenwateren (ITB)	Institute for transport by skippers (ITB)	Belgium
International Monetary Fund (IMF)	International Monetary Fund (IMF)	World
International Sava River Basin Commission	International Sava River Basin Commission	Europe
International Transport Forum (ITF)	International Transport Forum (ITF)	World
Internationale Vereniging voor de behartiging van de gemeenschappelijke belangen van de binnenvaart en de verzekering en voor het houden van het register van binnenschepen in Europa (IVR)	International Association for the representation of the mutual interests of the inland shipping and the insurance and for keeping the register of inland vessels in Europe (IVR)	The Netherlands
INTERREG	INTERREG	Europe
IW-NET project	IW-NET project	Europe
Land Niederösterreich	Federal State of Lower Austria	Austria
Ministère de la transition écologique	Ministry for Ecological Transition	France
Ministerie van Financiën	Dutch Finance Ministry	The Netherlands
Ministerstvo dopravy České republiky	Ministry of Transport of the Czech Republic	Czech Republic
Moselle Commission	Moselle Commission	Europe
National fleet data	National fleet data	Europe

Original Name	English Name	Country
National fleet register of Luxembourg	National fleet register of Luxembourg	Luxembourg
Organisation for Economic Co-operation and Development (OECD)	Organisation for Economic Co-operation and Development (OECD)	World
Panteia	Panteia	The Netherlands
PJK International (Insights Global)	PJK International (Insights Global)	The Netherlands
Ports mentioned in the report	Ports mentioned in the report	Europe
R.A. Administratia Fluviala a Dunarii de Jos Galati (AFDJ)	Galati Lower Danube River Administration, A.A.	Romania
Rijkswaterstaat	Ministry of Infrastructure and Water Management	The Netherlands
Statistikamt Nord	Statistical Office for Hamburg and Schleswig-Holstein	Germany
UK Department of Transport	UK Department of Transport	United Kingdom
Verein der Kohlenimporteure (VDKI)	German Association of Coal Importers (VDKI)	Germany
viadonau	viadonau	Europe
Voies Navigables de France (VNF)	Navigable Waterways of France	France
Wasserstraßen-und Schifffahrtsverwaltung des Bundes (WSV)	German Waterway and Shipping Administration	Germany
World Steel Association	World Steel Association	World

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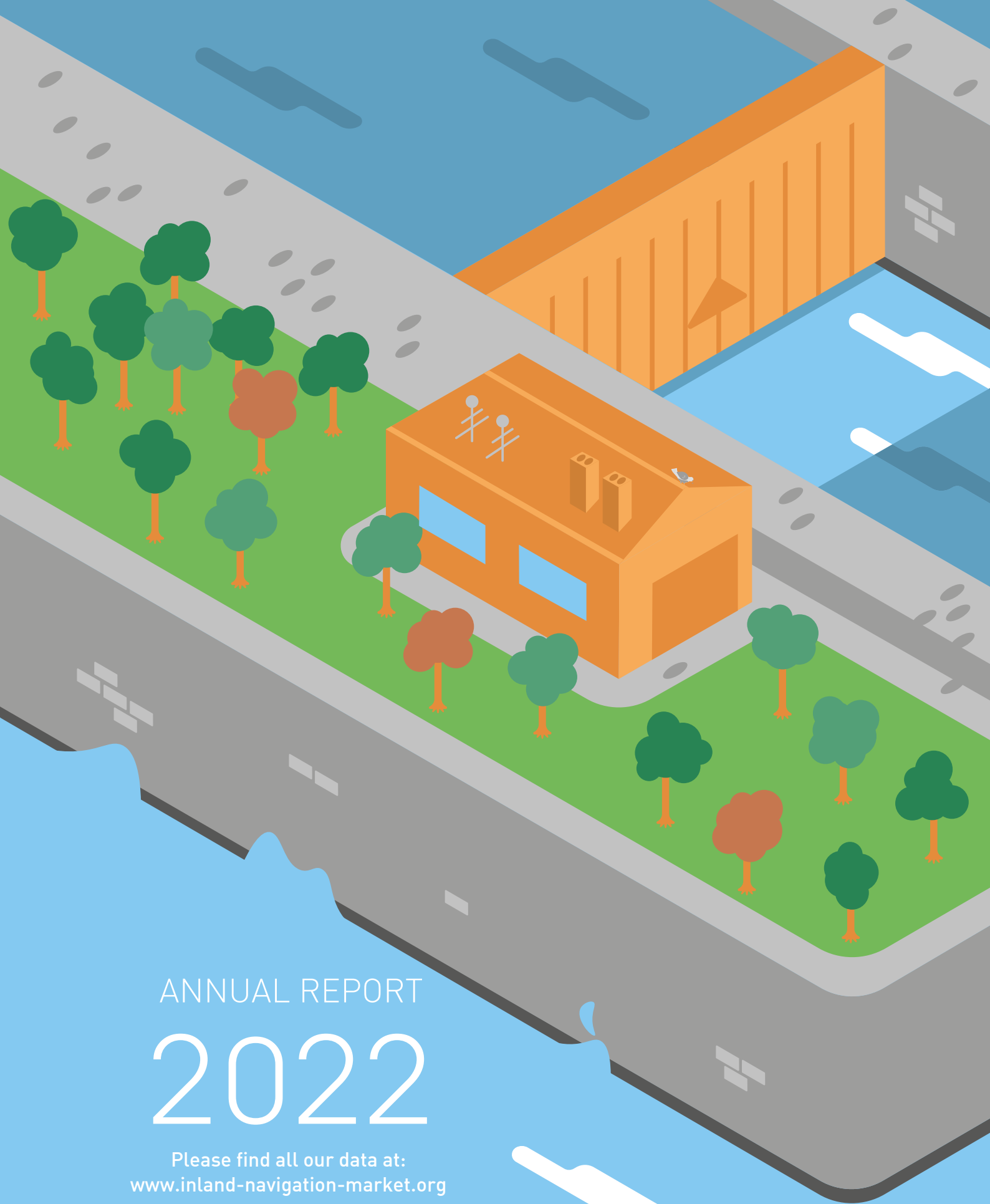

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