ANNUAL REPORT

2024

INLAND NAVIGATION IN EUROPE
MARKET OBSERVATION

CCNR
CENTRAL COMMISSION
FOR THE NAVIGATION OF THE RHINE

European Commission

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October 2024

II FOREWORD

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

The Central Commission for the Navigation of the Rhine (CCNR) is delighted to present the 2024 edition of its Annual Market Observation report, which, as every year, builds upon a close and fruitful collaboration with the European Commission.

The year 2023 brought about new challenges for inland navigation, as world trade continued to struggle against the lasting effects of the Russian full-scale invasion and war of aggression against Ukraine – among which persistently high gas prices – as well as attacks by Houthi rebels on container ships in the Red Sea, which put European exports under pressure at the end of the year. Despite these difficulties, the global economy has proven resilient and seems to be on the way towards a recovery, with inflation falling almost as fast as it rose in 2022, and GDP growth being steady, albeit weak. Risks remain, however, and inland navigation in Europe in 2023 suffered greatly from the uncertain macroeconomic and geopolitical context; the volumes of transported goods thus decreased substantially, notably those transported by containers, when container transport was expected to be a growth market for inland waterway transport (IWT). Most market segments have suffered from decreased production and/or transport in Rhine and Danube countries: steel and iron, agricultural products, coal and chemicals, the last of which has been particularly severely hit. However, container transport has shown signs of a recovery in early 2024, along with iron and steel.

Although 2023 was a year with relatively tame weather, it is of crucial importance to address proactively the very real concerns of future extreme weather conditions, such as those witnessed in 2022 and 2018. Indeed, those two years acted as stark reminders of the significant ecological, economic, and social impacts that low water episodes can have, in addition to potentially driving a modal shift away from inland navigation. Yet, it is inland navigation that has the greatest potential to reduce greenhouse gas and air pollutants emissions in the transport sector internationally. I wish to reiterate that the CCNR is committed to playing a pivotal role in overcoming these challenges, by facilitating dialogue between all relevant stakeholders, be they industrial, political, or from civil society. It is in this spirit that we have developed a roadmap in view of mitigating climate change and encouraging the energy transition, including that undertaken by the inland fleet. Since 2023, we have thus started monitoring the construction and retrofitting of vessels that use alternative, more environmentally friendly propulsion technologies.

As always, our report investigates the macroeconomic conjuncture, the freight transport on inland waterways, the operating conditions and freight rates related to water levels, national investments on inland waterway transport infrastructure, commodity prices, trends in market segments and river basins, the fleet of inland vessels, employment, passenger transport, and an outlook of the main inland navigation market segments. The 2024 edition of the report expands this last section by providing additional insights into the long-term trends of the main market segments, made possible thanks to data provided by Oxford Economics. From now on, this collaboration will allow for a more comprehensive analysis of the main inland navigation market segments by considering trends that are less palpable from a short-term perspective, such as structural changes in trade relations or energy transition.

By way of these annual reports, we hope to support data-based, informed decision-making processes at every level for the benefit of the European IWT and our future livelihoods. In this context, I wish to extend my gratitude to Ms Daisy Rycquart, Director of the Corporation Inland Tanker Barge Owners (CITBO) and Secretary of the Innovation & Greening Committee of the European IWT Platform, with whom we have been collaborating for years by sharing our mutual expertise, including data about freight rates which are analysed in this report. It is a pleasure for me to share this foreword with her.

Last but not least, I would also like to thank all our other partners whose contributions were essential to making this report possible: the Danube, Moselle and Sava Commissions, Eurostat and all national statistical offices, ports, national and regional waterway administrations, as well as the various professional organisations such as the European Barge Union (EBU) and the European Skippers' Organisation (ESO), for generously sharing their knowledge and statistics.

I trust that you will enjoy reading the 2024 version of our annual report and hope that it will provide you with all the information that you may wish to have.

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FOR THE NAVIGATION OF THE RHINE

The added value of cooperation

Daisy Rycquart
Director
Corporation Inland Tanker Barge Owners (CITBO)

As we reflect on another year of operations, we are proud to present once again our comprehensive annual CITBO figures, which encapsulate the achievements, challenges, and growth of our inland tanker shipping corporation. These statistics are not just numbers and data points; they are a testament to the dedication, hard work, and a result of trust of our team and our members.

As we are a commercial cooperation, we do admit it has been a challenge to collect these statistics year after year from our members. Collaboration is key in our point of view, a value we hold seriously. Even with more than 170 vessels amongst our members, market related data is and will stay a sensitive matter. Thus, we are proud to have found an approach to collaborate on market data in an anonymous way and to have created an added value in reporting on it. The collaboration with the CCNR is a tremendous driver in this matter, with their high-level reporting and analysis skills.

The Market Observation reports provide a detailed analysis of the trends, opportunities, and challenges within the inland tanker shipping sector. They offer valuable insights into market dynamics, competitive landscapes, and emerging technologies that shape our industry. These reports are a cornerstone of strategic planning, enabling us to navigate the complexities of the market with agility and foresight.

We have been involved in these reports during some of the most challenging events that have taken place in the past decade. Since 2017 we can state the impact of the war on the energy market, the shortage of crew and of course the ongoing zero-emission challenge for the whole fleet, which are all of utmost importance to keep a watch over. These Market Observation reports allow us to have a rare opportunity to (re)view these trends and create a perspective which is bigger than our own. The continuation of these reports is therefore self-evident in our opinion.

We would like to extend a heartfelt word of thanks to the CCNR and collaborators who have integrated our company's statistics into this prolonged collaboration. The trust, support, and partnership have been instrumental in our journey. Together, we have not only weathered the challenges but also seized opportunities for growth and added value.

As we move forward, we remain committed to our core values of reliability, sustainability, and collaboration. We look forward to continuing our journey with you, building on our successes and exploring new horizons in inland tanker shipping.

Thank you for your continued support and partnership.


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II EXECUTIVE SUMMARY

The year 2023 showed several promising signs of an upcoming economic recovery, with most indicators pointing to a soft landing. However, the end of the year was marked by the emergence of new difficulties for inland navigation. With the Russian large-scale war of aggression against Ukraine still raging and tensions rising in the Middle East, uncertainty remains high for several market segments, leading to a negative impact on inland waterway transport activities and to a mixed outlook. More specifically, freight transport on the entire Rhine (from Basel to the North Sea) declined from 292.3 million tonnes in 2022 to 276.5 million tonnes in 2023, an overall decrease of -5.4%. This decline was higher on the traditional Rhine (from Basel to the German-Dutch border) (-6.0%) than on the lower Rhine in the Netherlands (-4.5%), where transport activity is more intense. The transport volumes for many market segments witnessed a negative growth rate, from -5.3% for metal products to -27.0% for coal. Mineral oil products (+3.0%) and iron ore (+2.5%) experienced a positive growth rate.

Inflation greatly diminished in the euro area in 2023, falling from 9.2% at the end of 2022 to 2.9% at the end of 2023, and is expected to reach the 2% target defined by the European Central Bank (ECB) by the end of 2025. This decrease is mainly due to the fall of energy and food prices in 2023 after their sharp rise following the invasion of Ukraine, most notably regarding natural gas, which until then was heavily imported from Russia. Coal then became widely sought after as a cheaper substitute to natural gas, strongly increasing coal demand and price in the euro area in 2022. However, as gas demand started dwindling in early 2023 and the transition to alternative energy sources – such as coal – was achieved, coal prices dropped to more usual levels, i.e. -53% between 2022 and 2023. Natural gas prices followed the same trend, falling -59% between 2022 and 2023. In the meantime, crude oil, faced with weakening demand and a fully caught-up supply, witnessed a -16% decrease in its prices, dragging fuel prices down along with it throughout 2023. Food prices also continuously decreased in 2023 as the increase in global supply more than fully compensated for the disruptions caused by the war, partly thanks to the Black Sea Grain Initiative.

These trends are very well illustrated by transport volumes on the Danube, which allows for direct access to the Black Sea and Ukraine: between 2022 and 2023, the transport of agribulk increased by +32.8% and the transport of food products and foodstuff increased sharply by +232.9%, while the transport of fertilizers and coal crashed by -46.3% and -99% respectively. Other segments witnessed more moderate declines such as iron ores (-6.6%), metals (-4.5%) and mineral oil products (-2.6%). In total, transport on the Danube decreased by -15.5%. However, on the Rhine, the figures are very much different. Although the presumed end of the energy crisis resulted in the aforementioned decrease of -27.0% in coal transport volumes on the Rhine between 2022 and 2023, other segments did not react in the same way as they did on the Danube. The volume of agricultural products transported by inland waterways (IWW) thus fell by -5.7% despite an increase in production in Rhine countries and ample global supply. Similarly, the container segment, which is thought to be a major growth market for inland navigation, dropped by -13.0% in the same period after being repeatedly put to the test since the low water episode of 2018. Other similar declines were witnessed on the Rhine regarding the transport of chemicals (-8.3%) and metals (-5.3%).

European seaports suffered from the difficult, although improving, macroeconomic conjuncture, and from the geopolitical context. Indeed, nearly all of them witnessed negative growth rates in 2023, including even the busiest seaports with an inland activity. Inland waterway cargo handling in the port of Rotterdam thus decreased by -6.9%, in the port of Antwerp-Bruges by -3.4%, in the North Sea Port by -4.8%, and in Hamburg by -6.2%, with even greater declines when accounting for maritime throughput. As a rare exception to the rule, the port of Constanța reached its highest level of traffic ever recorded, both in maritime and in inland waterway traffic. This performance is largely attributable to it having become the most viable alternative route for the massive Ukrainian grain exports after the start of the war and the Black Sea Grain Initiative. The vast majority of European inland ports witnessed similar declines in cargo handling, with Duisburg being one of the least affected (-0.9%), and some ports showing increasing volumes, mostly along the Danube.

The handling of containerised cargo was particularly heavily hit by the geopolitical context, mostly by the Red Sea crisis. In late October 2023, Yemeni rebels started attacking merchant ships traveling through the Bab-el-Mandeb strait indiscriminately. As 75% of European exports usually travel through this strait, these attacks caused an important decline in container transport to and from European ports in the latter months of 2023 as shippers diverted vessels from their usual routes. This crisis played a significant part in the poor performance of the container segment at the end of 2023.

On average, freight rates for all segments decreased by -11.8% in 2023 compared to 2022, after increasing by +42.5% in 2022 while reacting to low water periods. This is mainly because of the important decline in dry cargo freight rates – that is to say -21.4% on the spot market and -10.6% with regard to contract prices – dragged by decreasing demand, and more specifically coal demand. Despite a struggling chemical sector in 2023, liquid cargo freight rates slightly increased (+3.9%) on average due to an increase in demand, although freight rates from the spot market alone decreased by approximately -25%. In the meantime, container freight rates rose slightly (+2.2%), but less than in 2022 due to weaker demand.

The inland fleet in Europe in 2023 comprised almost 15,319 vessels, among which 9,658 were registered in Rhine countries, 3,355 in Danube countries, and 2,306 in other European countries. In 2023, the dry cargo fleet in Rhine countries consisted of almost 7,000 units, confirming the downward trend that started in 2021. This is attributed to difficulties in company succession and to the more recent export of dry cargo vessels to the Danube in response to the Solidarity Lanes Initiative in support of Ukraine. The liquid cargo fleet in Rhine countries consisted of 1,434 vessels, with the same observed downward trend as in the dry cargo fleet. However, there has been a growing tendency of vessels to become larger and larger in recent years, resulting in a stagnation of the overall loading capacity of the dry cargo fleet, and an even increase in the loading capacity of the liquid cargo fleet. The innovative vessels fleet, monitored by the CCNR as a part of its roadmap for emissions reduction, is growing steadily despite representing less than 0.2% of the European inland navigation fleet.

In 2023, the European river cruise fleet accounted for 408 vessels, two fewer than in 2022. The newbuilding activity for cruise vessels continued to decline in 2023 as it did in 2022, as the shipbuilding costs remained high despite the resorption of inflation.

It is however expected to pick up again in 2024 and 2025. Very similar to 2022, some vessels were used as floating hotels in parallel to their usual cruising activity in 2023, and some of them have even been permanently converted in order to accommodate Ukrainian war refugees. The number of cruise vessel transits on the Rhine grew in 2023, while those on the Danube and the Moselle declined; even then, the figures remain markedly higher than in 2020 and 2021, and are, as in 2022, comparable to those witnessed before the pandemic. Although vessel movements on the Danube decreased, the number of passengers and the average number of passengers per vessel increased, confirming a pick-up in river cruise activity.

The number of persons employed in passenger transport companies in the IWT sector in Europe decreased significantly in 2020 compared to 2019 due to the Covid-19 pandemic, despite rising steadily since 2012. The employment level has been slowly recovering since, but, as of 2022, has not yet reached pre-pandemic levels . The number of companies in freight transport, conversely, started rising abruptly in 2020, while the number of companies in passenger transport kept increasing as it had since 2010. The net turnover in the EU-27 (plus Switzerland and Serbia) for IWW freight companies was approximately 7.5 billion euros in 2022, a pronounced increase compared to the 6.0 billion euros registered in 2021. For passenger transport companies, this figure was 2.8 billion euros in 2022.

Inland waterway transport is thus faced with a mixed outlook. 2023 was a difficult year for freight transport, as the economic conjuncture remained difficult – despite notable improvements – and the geopolitical context uncertain, between the lasting war in Ukraine and rising tensions in the Middle East. Improvements are foreseen in the coming years for most market segments as well as for passenger transport and newbuilding, although a precise forecast is difficult to establish.


SCENIC JASPER


Hapag-Lloyd
msc

01

MACROECONOMIC CONTEXT AND OUTLOOK

- The global macroeconomic context in 2023 has shown signs of improvement. Inflation decreased at a very rapid pace, and GDP growth, although relatively low, is steady. Uncertainty is still high however, as world trade has suffered from rising geopolitical tensions in the Middle East, leading it to stagnate in 2023 despite previous hopeful forecasts.
- In the wake of the pandemic, many countries questioned the free trade paradigm and started to gravitate towards more protectionist policies. The Russian full-scale invasion and war of aggression against Ukraine and the resulting fears of natural gas shortages led these countries further towards this situation, with three times as many trade barriers being constructed in 2022 than in 2019. 2023 was no exception, with more than 3,000 trade barriers put in place and a rising trend towards friendshoring and an overall fragmentation of trade relations between pro-Russian and anti-Russian countries.
- The price of most commodities has normalised, although the aforementioned tensions in the Middle East let uncertainty linger about the future price of crude oil. Natural gas prices have continued falling but remain in the upper range of historical prices.

Economic overview[1]

The global economy is showing signs of recovery in the aftermath of the Covid-19 pandemic and the initial disruptions after the start of the Russian full-scale invasion and war of aggression against Ukraine, with most indicators pointing to a soft landing. In 2023, economic growth has proven to be surprisingly resilient, given the energy and food crisis caused by the war, the global surge in inflation and the supply chain disruptions caused by the pandemic. Inflation, for that matter, has decreased, and is expected to reach 2% by 2025 in advanced economies, a rate that central banks usually aim for. On the other hand, trade has been subjected to more difficulties, with numerous trade barriers raised among a worldwide restructuration of trade patterns, hindering its recovery.

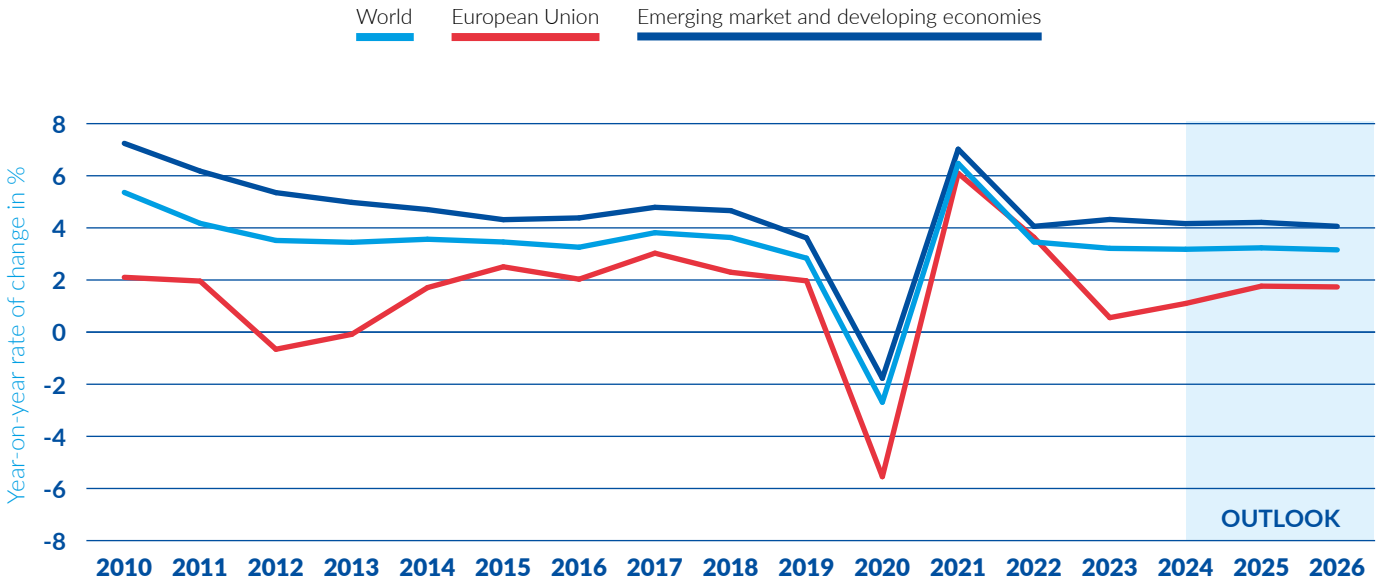
Global GDP growth is steady but weak at 3.2% (compared to a pre-pandemic annual average of 3.8%), a rate that is expected to carry on until 2024 and 2025. This relatively low growth is explained by the adoption of restrictive monetary policies to fight inflation, the withdrawal of the exceptional fiscal support granted during the pandemic in many countries, as well as the long-term decline of productivity growth. It is important to note that economic growth is unevenly distributed around the world with, for instance, the GDP growth rate of the United States unexpectedly exceeding its pre-pandemic average. GDP growth in emerging markets should remain strong, stabilising at its current rate of 4.2% from 2024 onwards. In the euro area, growth is slow but resilient at 0.4% in 2023 and is projected to rise to 0.8% in 2024 and 1.5% in 2025, due to strong household consumption and labour markets. Meanwhile, low income and developing countries still show signs of scarring from the numerous crises of recent years, and thus their recovery is expected to be slower and more difficult.

Inflation – one of the main concerns in relation to a potential recovery of the world economy – has been declining rapidly ever since mid-2022, with the global average headline inflation having fallen from 8.7% in 2022 to 6.8% in 2023 and expected to keep decreasing to 5.9% in 2024 and 4.5% in 2025. The same is true of the countries in the euro area, where the average headline inflation fell from 8.4% in 2022 to 5.4% in 2023 and should reach the 2% target defined by the European Central Bank in 2025. The energy price shocks that used to pull inflation up in the euro area are fading, which is likely to bring it down to this 2% target. The ECB and other central banks around the world should be able to ease their monetary policy as early as the third quarter of 2024, which would encourage private investment and restore purchasing power to consumers, and in turn fuel economic growth.

Some risks remain, however, as geopolitical uncertainty is still high as the Russian full-scale invasion and war of aggression against Ukraine rages on and tensions in the Middle East are rising, affecting the safe passage of seagoing ships trough the Red Sea and threatening to prevent the passage of oil tankers through the Strait of Hormuz. This could hinder medium-term economic growth and alter the availability of food and energy, and hence cause a resurgence in inflation. Moreover, the decrease in inflation in the second half of 2022 and 2023 has mostly been due to headline inflation being dragged down by fuel and food prices; meanwhile, core inflation has proven more persistent and could stall disinflation, although it is expected to decline by 1.2% in 2024.

[1] *All figures quoted in this chapter come from the IMF World Economic Outlook of April 2024.*

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



Source: IMF World Economic Outlook Database, Outlook from April 2024

Trade

In 2023, global trade followed the same trends as in 2022: a larger-than-expected decline in trade volume (-1.2% from its peak in late 2022)[2] due to the Russian full-scale invasion and war of aggression against Ukraine and a shift in the composition of spending from traded goods towards services in the aftermath of the pandemic. Towards the end of the year, the Red Sea crisis further increased the burden on trade, leading it to almost stagnate during 2023 (+0.3%) despite a promising first semester. Global trade is however expected to recover and grow slowly in 2024 and 2025, at a rate below its pre-pandemic average (respectively 3.3% and 3.6%, against a previous average of 4.9%).[3]

Indeed, on 19 October 2023, the Houthi movement in Yemen started to attack merchant vessels in the Red Sea. This incident, known as the Red Sea crisis, caused hundreds of ships to alter their course and sail through the Cape of Good Hope to avoid attacks. Despite efforts by the UN Security Council to enforce freedom of navigation, this crisis led to a significant drop in international container transport at the end of the year 2023. In Europe, where 75% of exports usually travel through the Red Sea, the fall was particularly severe. Overall, container throughput in Europe remained stable in 2023 despite a weak second semester and the difficulties caused by the crisis, ending the year with 0.3 percentage point lower than in January. European ports saw the beginning of a recovery at the start of 2024, as their container traffic rose by more than +13% from January to April 2024.[4] However, this may be temporary, as international tensions and uncertainty remain high, and since this surge may be partly due to prospects of an economic recovery in Europe or ships having sailed around Africa instead of going through the Red Sea.

[2] *Source: WTO Global Trade Outlook and Statistics, April 2024*
[3] *Source: IMF World Economic Outlook, April 2024*
[4] *Source: RWI/ISL Container Throughput Index database: https://www.isl.org/en/services/rwiisl-container-throughput-index*

Similarly to 2022, 2023 has witnessed a strong reinforcement of trade barriers, with three times as many being created in both years compared to 2019. This, combined with a decline in foreign direct investments and cross-border mergers, as well as a growing trend towards reindustrialisation, is expected to cause increased volatility in the price of commodities, including some that are transported in containers.[5]

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

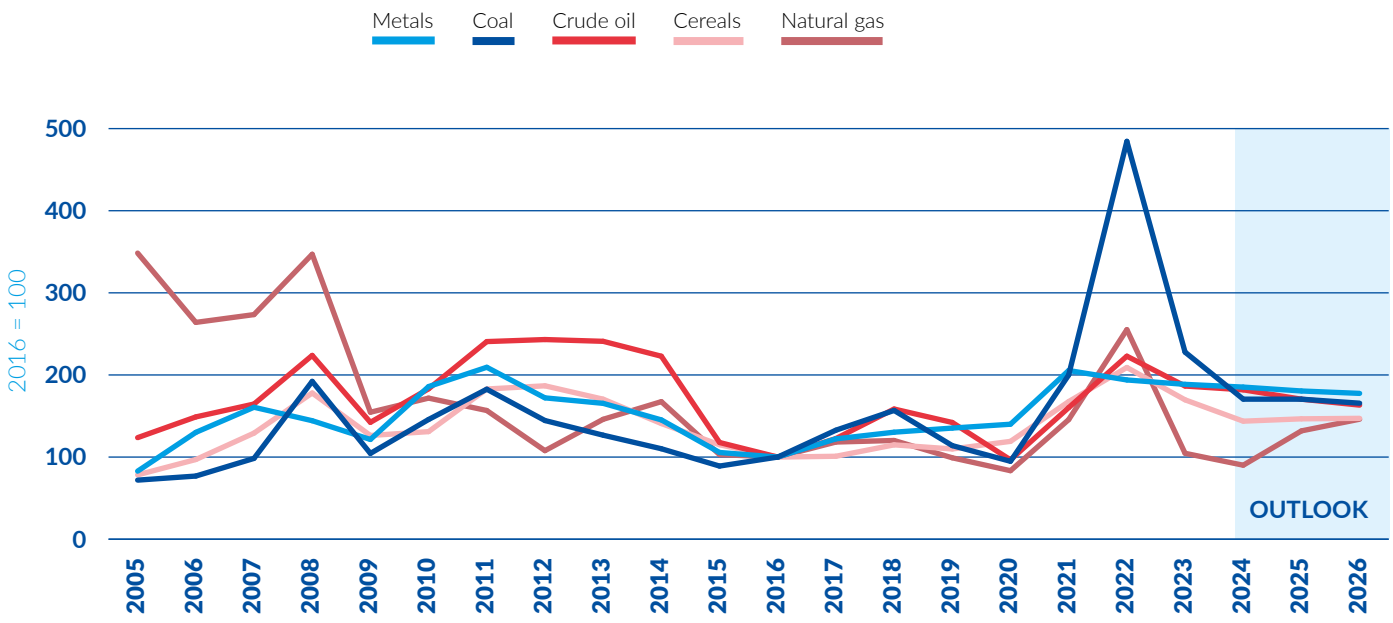
Crude oil

Crude oil prices significantly increased between 2021 and mid-2022 due to oil production struggling to catch up with a quickly rising demand after most countries relaxed their pandemic-related restrictions, and to the Russian full-scale invasion and war of aggression against Ukraine. This, in the same time frame, drove up fuel prices in inland navigation with the crude oil prices. From August 2022 to February 2023, however, the latter fell by -15.7% because of a weaker growth in global demand and a fully caught-up supply. This decrease has continued throughout 2023 (-13.9%, to $83 per barrel) and carried on into early 2024. Financial markets suggest that crude oil prices will decrease by -2.5% year over year, to eventually average $78.60 per barrel by the end of 2024. The Red Sea crisis caused concerns as to the availability of oil imported from the Arabic Peninsula, but the impact on oil quantities and prices for European consumption turned out to be minor.

Oil price is a leading indicator for the transport sector due to its essential utility for transport activities. The decrease of crude oil prices seen in 2023 and expected in the following years should translate into lower fuel costs for Rhine operators. In addition, the oil price influences the transportation of oil products.

[5] *UNCTAD Review of Maritime Transport 2023*

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



Source: IMF World Economic Outlook Database, Outlook from April 2024

Gas and coal

The first six months of 2022 witnessed a significant increase in the prices of gas and coal; the second half of 2022, however, was marked by an equally sharp fall, with gas prices at the European trading hub[6] plummeting by -76.1% from their record highs of August. This trend carried on until 2023, when natural gas prices at the European trading hub reached $16.7 per MMBtu[7] in February 2023 as concerns about supply shortages faded. Increased LNG[8] imports, as well as reduced gas demand due to high prices, an economic slowdown in China, and a substitution to alternative fuel sources such as coal helped prevent any shortage. Moreover, the weather in late 2022 and throughout 2023 was unusually mild – particularly in the winter of 2023 – contributing further to lower gas demand in Europe.

Overall, Title Transfer Facility trading hub prices in Europe fell by -24.4% from August 2023 to February 2024, where they remained in the upper range of historical prices at $8.10 per MMBtu. Gas prices are however projected to rise slightly and average $9.45 in 2024, before slowly declining again to $8.73 in 2029.

Agricultural commodities and foodstuff

Food and beverage prices reached their peak in May 2022, amid the supply disruptions caused by the war in Ukraine. However, their increase slowed down after the Black Sea grain corridor initiative was renewed in November 2022, allowing Ukrainian wheat and other exports to re-enter the global market. Prices remained high, however, spurring increases in wheat production in the European Union and India, among others. The prices of raw agricultural materials declined by -9.1% between August 2022 and February 2023, then fell further during 2023, reaching their pre-pandemic levels by the end of the year due to abundant global supplies.

[6] *Natural gas prices at European Title Transfer Facility trading hub*
[7] *Million British thermal unit*
[8] *Liquified natural gas*

Metals

After a first rise in 2021 and 2022, the base metal price index decreased below levels preceding the start of the Russian full-scale invasion and war of aggression against Ukraine. Slowing Chinese metal demand was an additional factor in this decline, as China usually accounts for approximately half of the global consumption of major metals. However, China's reopening of economic and ports activities and increased infrastructure spending led to a record steel production, causing base metal prices to rise by +4.7% between August 2023 and February 2024 (after already increasing by +19.7% between August 2022 and February 2023).

Economic sentiment - Consumer confidence

Consumer confidence provides an indication of developments of households' consumption and savings. An indicator above 100 signals a boost in the consumers' confidence towards the future economic situation and points to consumers being more inclined to spend money. Values below 100 indicate a pessimistic attitude towards future developments in the economy, possibly resulting in a tendency to save more and consume less.

After a slight rise in the last months of 2022, consumer confidence started to degrade slowly from January 2023, before crumbling in March. The Economic Sentiment Indicator eventually reached a drop in October 2023 at 93.6, before reverting back to 95.9 in December 2023, a recovery mostly attributed to improved confidence among retailers, as well as the services and the construction sectors. It is still below its long-term average of 100, under which it lapsed in mid-2022.

Main consequences for Rhine and Danube navigation in brief

Despite a recovering European economy and falling inflation, Rhine and Danube navigation still declined in 2023, after a difficult year 2022. This is due to lingering geopolitical tensions in Ukraine and the Middle East as well as structural shifts in global trade, with a high number of barriers being implemented and a trend towards onshoring and friendshoring.[9] Commodity prices have stabilised after months of high volatility, but gas prices remain high.

[9] The term "friendshoring" was coined by the US Secretary of Treasury during a press conference held on April 13th 2022, to encourage western countries to favour trade with countries that share the same values. This phenomenon was indeed observed by the IMF, who adopted the term to designate the concept in their World Economic Outlooks.

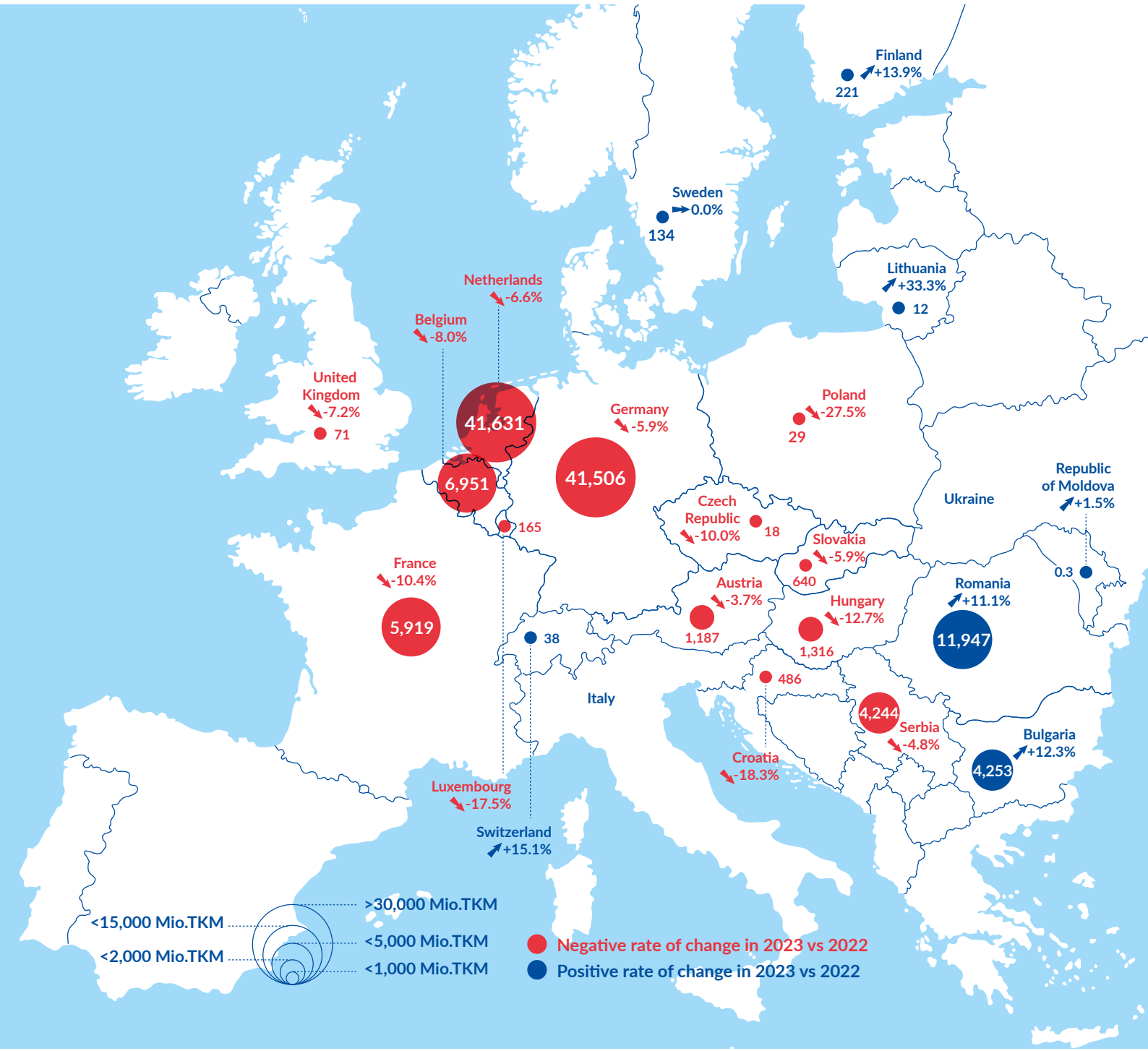
02

FREIGHT TRANSPORT ON INLAND WATERWAYS

- European inland navigation was heavily hit by the difficult macroeconomic circumstances, with volumes decreasing in all main market segments – including containers, a segment previously projected to develop strongly.
- Cargo transport on the entire Rhine (from Basel to the North Sea) amounted to 276.5 million tonnes in 2023, compared to 292.3 in 2022 (-5.4%). In 2023, transport of goods on the Rhine was negatively affected by factors such as reduced aggregate demand due to high inflation, the Russian full-scale invasion and war of aggression against Ukraine and other geopolitical conflicts leading to a global economic slowdown.
- Container transport on the Rhine was notably reduced by -13.0% in 2023. This decrease reflects a weakness in maritime container transport. Data from the port of Rotterdam show a drop in maritime container throughput by -7%.

TRANSPORT IN EUROPE
AND BY COUNTRY

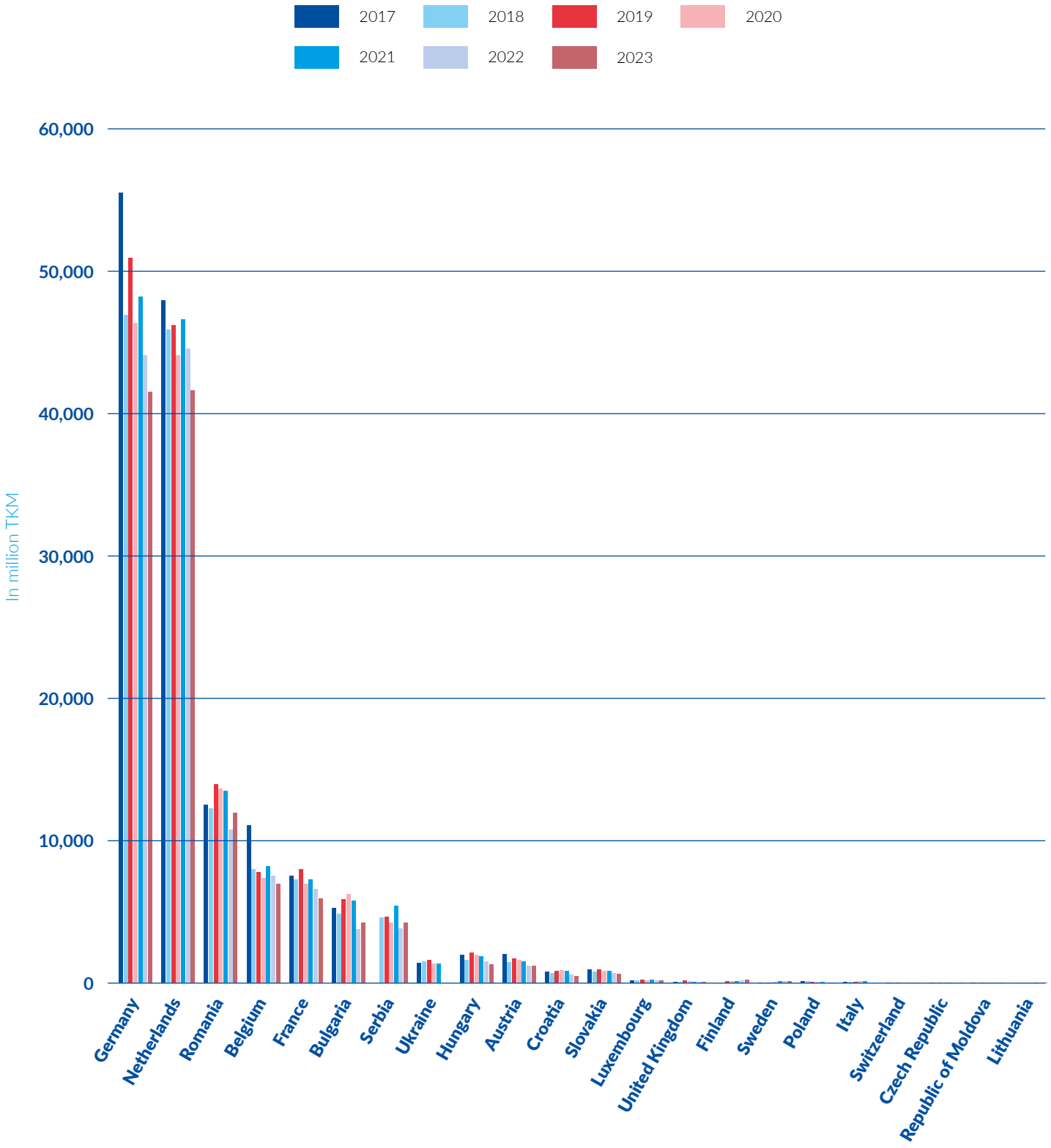
TRANSPORT PERFORMANCE IN IWT ON THE NATIONAL TERRITORY OF EACH COUNTRY IN EUROPE – COMPARISON BETWEEN 2022 AND 2023 (IN MILLION TKM) *



Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland, France and the Republic of Moldova), UK Department for Transport

** The share of IWT performance in Europe in 2022 and 2023 for Ukraine and Italy is not available due to a delay in the publication of the data.*

FIGURE 1: **IWT TRANSPORT PERFORMANCE BETWEEN 2017 AND 2023 IN MAIN EUROPEAN IWT COUNTRIES** (IN MILLION TKM) *****



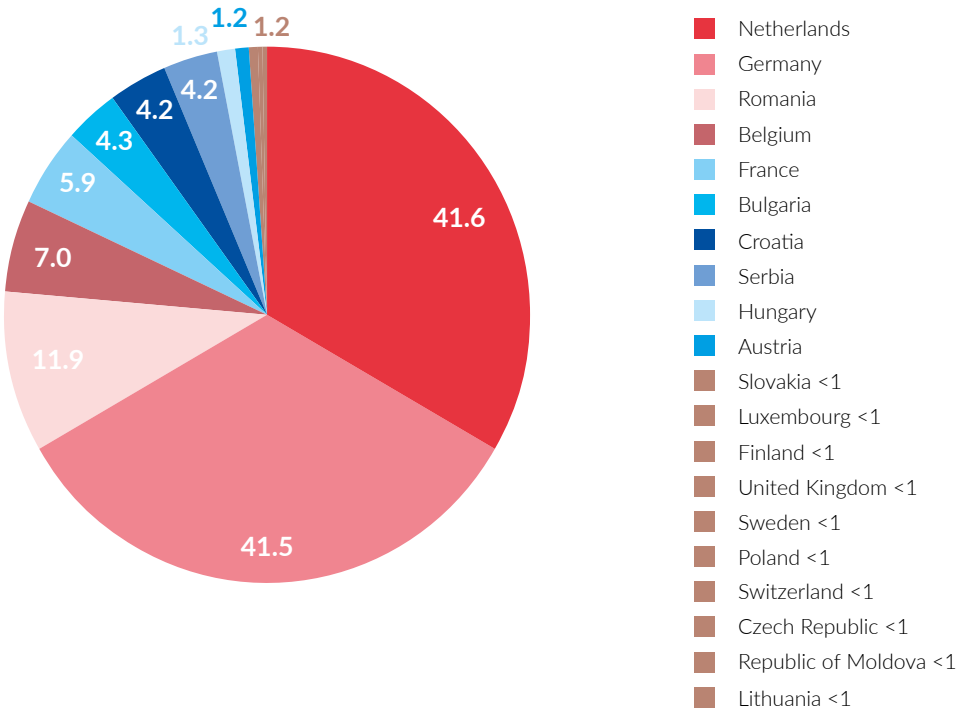
Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland and the Republic of Moldova), UK Department for Transport

** The values for Ukraine, Italy (2022 and 2023) and Serbia (2017) are not available.*

Note: for the UK, IWT is defined as non-seagoing traffic which takes place entirely within inland waters and river-sea transport (seagoing vessels navigating partly at sea and on inland waterways). 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 71 million TKM). However, it is worth noting that most of IWT in the UK consists of river-sea transport (amounting to almost 1.3 billion TKM). Overall, the IWT performance in the UK is reported to reach almost 1.4 billion TKM.

In 2023, in terms of inland navigation for Europe (EU-27 plus Switzerland, Serbia and Republic of Moldova, and excluding Ukraine), freight transport performance decreased by -3.8% compared to 2022. Rhine countries (Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland) accounted for 80.1% of total inland waterway transport performance in the EU-27, plus Switzerland, Serbia and the Republic of Moldova. The share for Danube countries was 19.6% (excluding Ukraine).

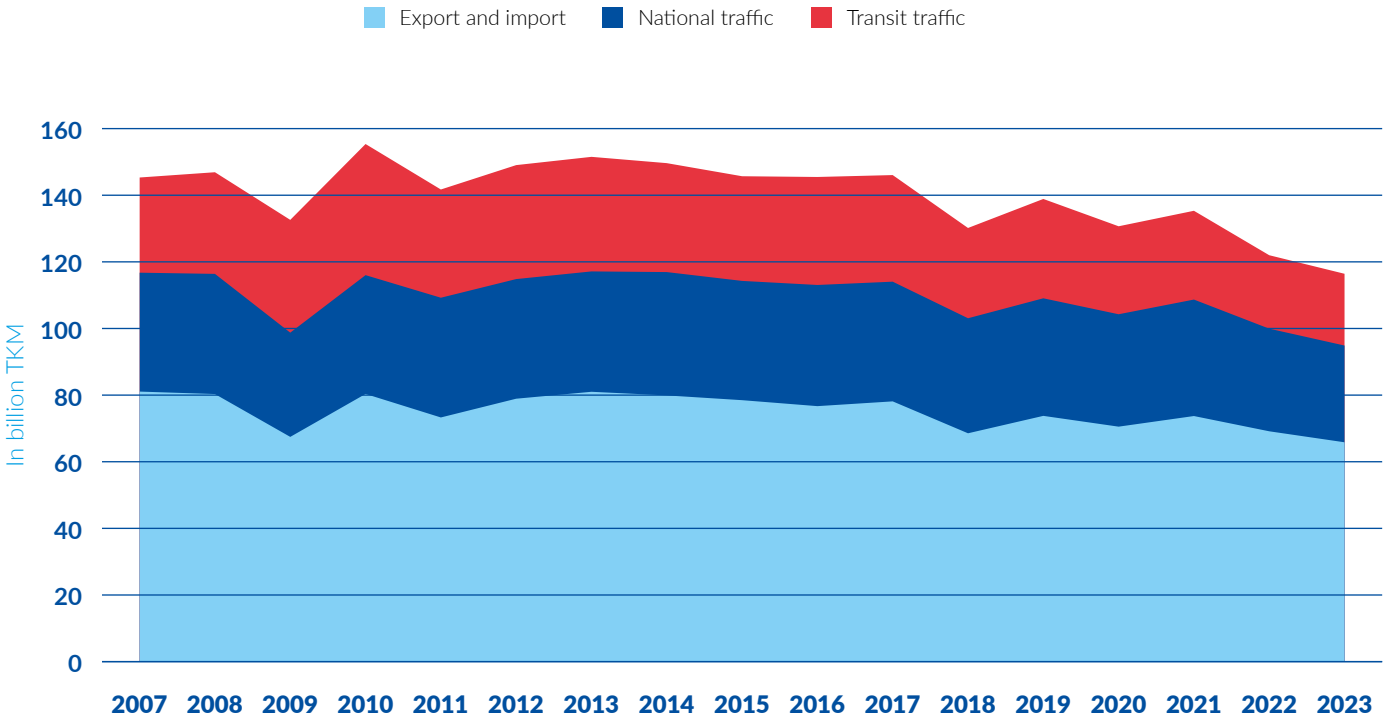
FIGURE 2: **INLAND WATERWAY TRANSPORT PERFORMANCE IN EUROPEAN COUNTRIES IN 2023** (IN BILLION TKM) *



Sources: Eurostat [iww_go_atygo] and [iww_go_qnave], OECD (Switzerland and the Republic of Moldova), UK Department for Transport
** Data for Ukraine and Italy were not available for 2022 and 2023.*

From the total inland waterway transport performance in Europe in 2023, which amounted to around 116 billion TKM (without Ukraine, Switzerland, Serbia, and Republic of Moldova), 75.1% 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 18.5% and export and import traffic had a share of 28.8% and 27.8%, respectively.

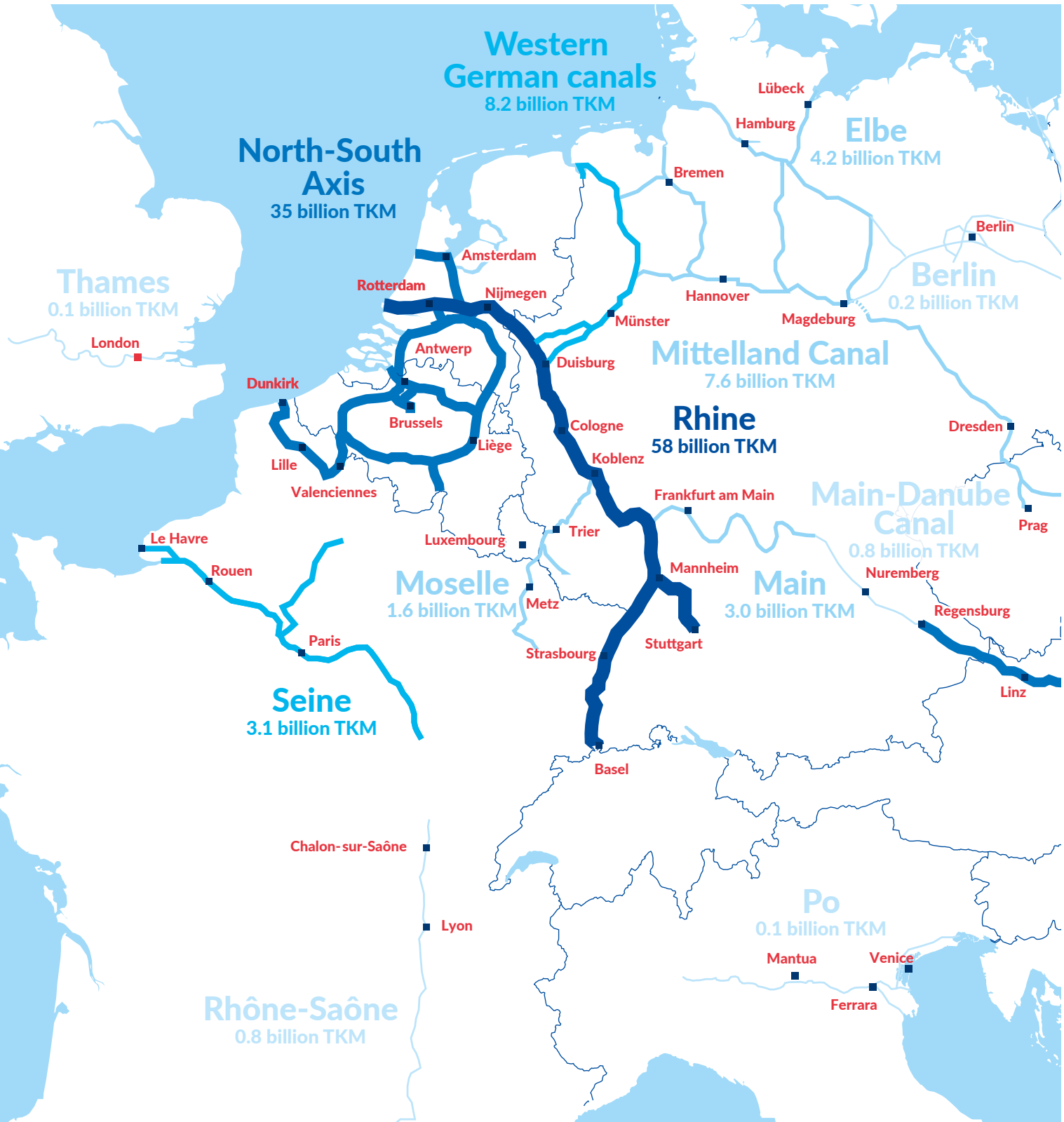
FIGURE 3: **YEARLY INLAND WATERWAY TRANSPORT PERFORMANCE IN THE EU-27** (IN BILLION TKM) *



Source: Eurostat [iww_go_atygo]
** EU-27 according to member countries in 2023.*

TRANSPORT

PERFORMANCE 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 for Transport
Figures for the Po are from 2022, the others are from 2023.

RHINE BASIN

Transport volume and transport performance on the entire Rhine (from Basel to the North Sea)

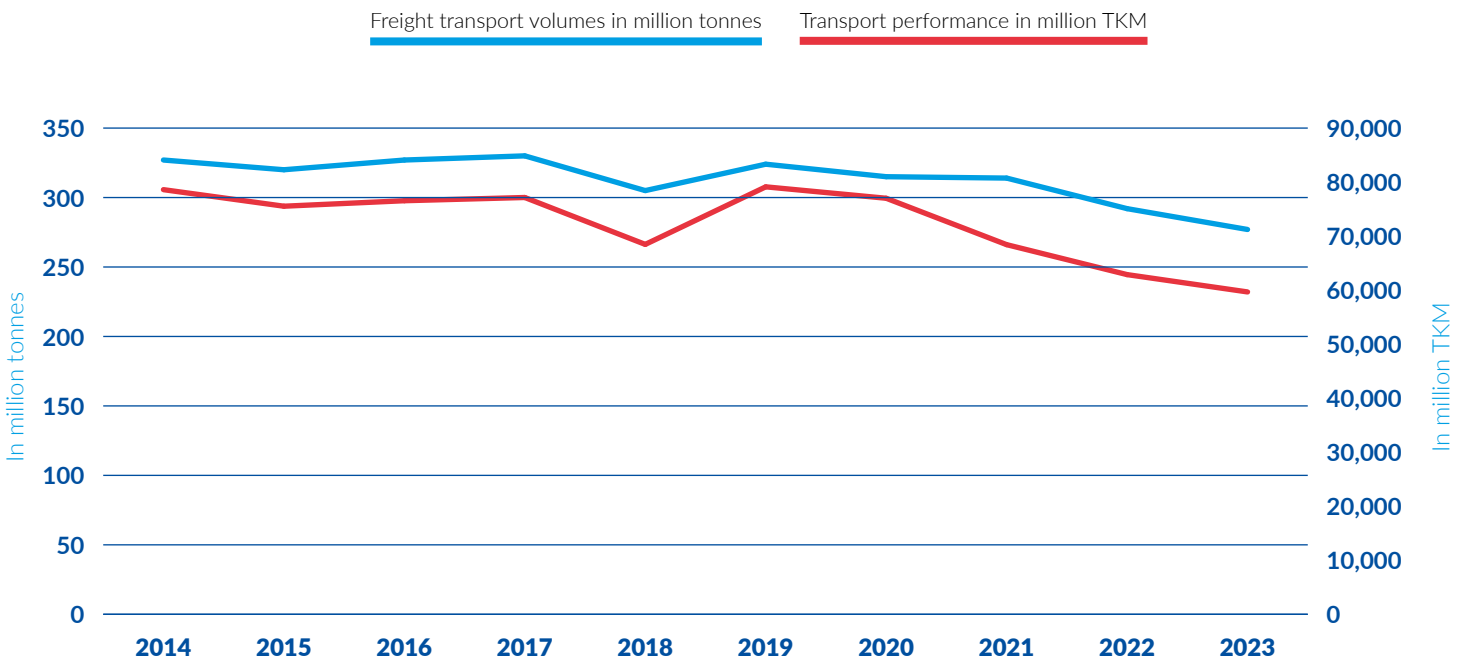
In the past, this chapter reported on the volumes transported on the Traditional Rhine only, namely the Rhine from Basel to the German-Dutch border. From 2023 onwards, it became possible to report on transport volumes on the entire Rhine from Basel to the North Sea.

Cargo transport on the entire Rhine (from Basel to the North Sea) amounted to 276.5 million tonnes in 2023, compared to 292.3 in 2022 (-5.4%).

- The Traditional Rhine (from Basel to the German-Dutch border) amounted to 146.1 million tonnes in 2023, compared to 155.5 million tonnes in 2022 (-6.0%).
- The Rhine delta in the Netherlands (from the German-Dutch border to the North Sea, including the link to Antwerp via the Rhine-Scheldt link[10]) amounted to 227.2 million tonnes in 2023 compared to 237.8 million tonnes in 2022 (-4.5%).

When calculating the total volume of goods transported on the entire Rhine, all steps were taken to avoid the double counting of volumes transported on both stretches. This is why the volumes on these two stretches cannot simply be added together, as certain volumes are transported on both stretches.

FIGURE 4: **FREIGHT TRANSPORT VOLUME** (IN MILLION TONNES) **AND TRANSPORT PERFORMANCE** (IN MILLION TKM) **ON THE ENTIRE RHINE ***

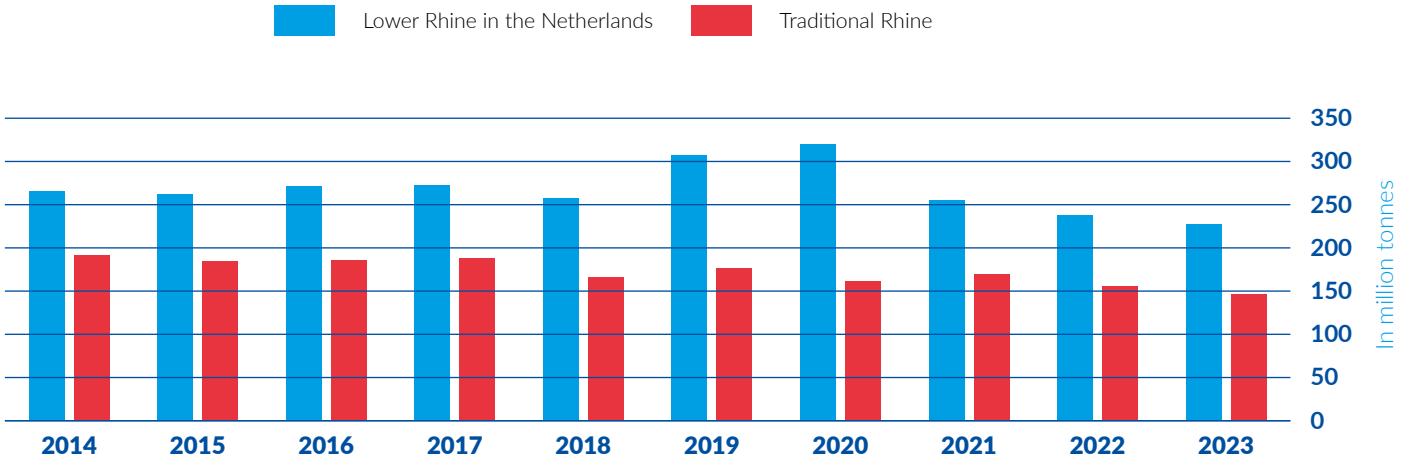


Source: CCNR analysis based on Destatis and Rijkswaterstaat

** In earlier reports, only the volumes transported on the Traditional Rhine, namely the Rhine from Basel to the German-Dutch border, were reported. From now onwards, it will become possible to report on transport volumes on the entire Rhine from Basel to the North Sea (including link to Antwerp via the Rhine-Scheldt link). When calculating the total volume of goods transported on the entire Rhine, all steps were taken to avoid double counting.*

[10] *Waterway sections considered: Waal, Hollands Diep, Boven Merwede, Oude Maas, Dordtsche Kil, Beneden Merwede, Lek, Nieuwe Maas, Noord, Nieuwe Merwede, Nieuwe Waterweg, Amsterdam-Rijnkanaal, Rijn-Schelde-Verbinding, Hartelkanaal, IJssel.*

FIGURE 5: **FREIGHT TRANSPORT ON THE TRADITIONAL RHINE AND ON THE LOWER RHINE IN THE NETHERLANDS** (IN MILLION TONNES) *****



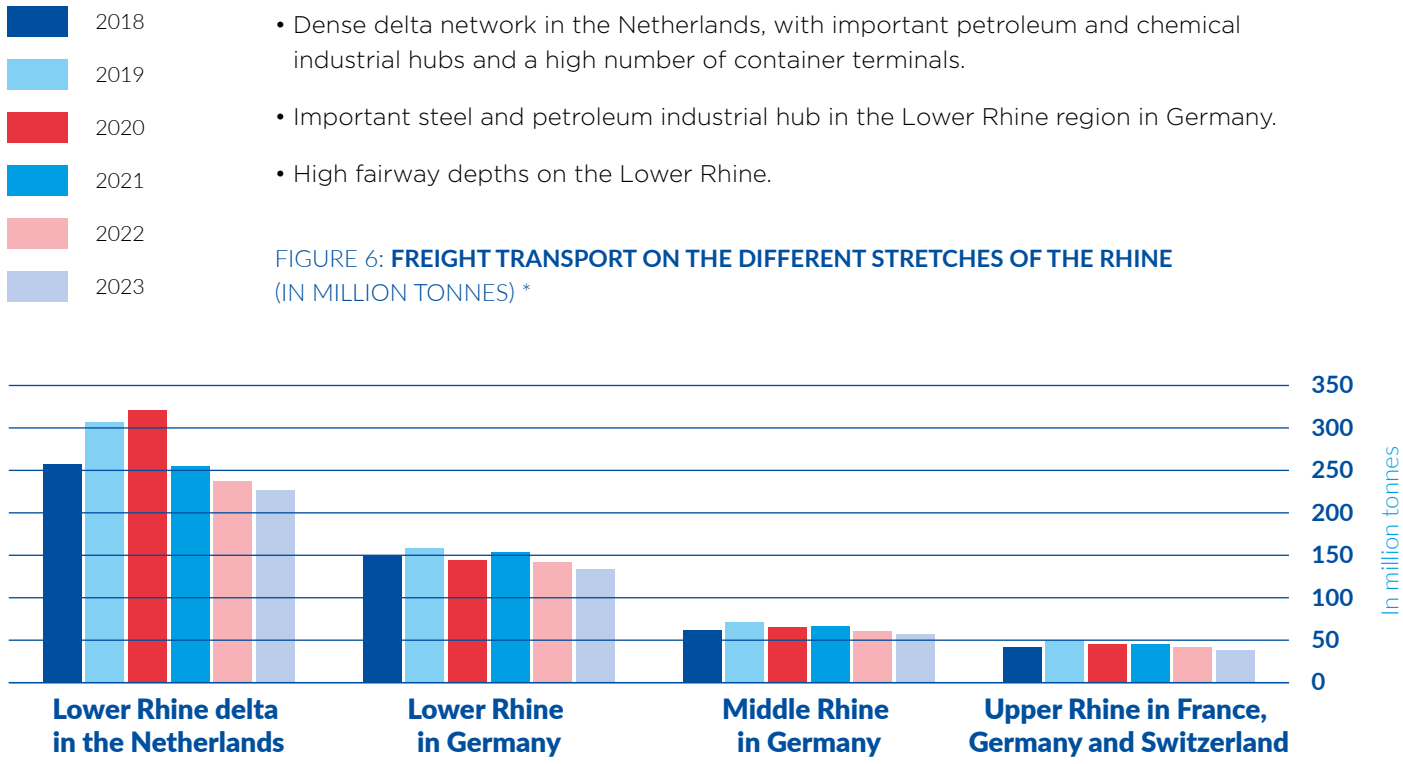
Source: CCNR analysis based on Destatis and Rijkswaterstaat
** To avoid double counting, the volumes on the different stretches cannot be added together, as certain volumes are transported on both stretches.*
Traditional Rhine = Rhine from Rheinfelden (CH) to the German-Dutch border
Lower Rhine in the Netherlands = Rhine from the German-Dutch border to the North Sea (including link to Antwerp via the Rhine-Scheldt link)

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

In terms of geographical structure, the transport intensity is highest on the Lower Rhine compared to the Middle and Upper Rhine, as illustrated in Figure 6. This higher intensity on the Lower Rhine can be explained by several reasons:

- Dense delta network in the Netherlands, with important petroleum and chemical industrial hubs and a high number of container terminals.
- Important steel and petroleum industrial hub in the Lower Rhine region in Germany.
- High fairway depths on the Lower Rhine.

FIGURE 6: **FREIGHT TRANSPORT ON THE DIFFERENT STRETCHES OF THE RHINE** (IN MILLION TONNES) *



Source: CCNR analysis based on Destatis and Rijkswaterstaat
** To avoid double counting, the volumes on the different Rhine stretches cannot be calculated together, as certain volumes are present on several Rhine stretches.*

Rhine transport by cargo segment

In terms of global cargo transport volumes for the entire Rhine, the segments of mineral oil products, chemicals and sand, stones, gravel, were the top three contributors both in 2022 and 2023.

FIGURE 7: **CARGO TRANSPORT ON THE ENTIRE RHINE * BY TYPE OF GOODS** (IN MILLION TONNES) **

Source: CCNR analysis based on Destatis and Rijkswaterstaat

** Entire Rhine = Rhine from Rheinfelden (CH) to the North-Sea (including link to Antwerp via the Rhine-Scheldt link)*

*** For containers: net-weight*

Overall, in the year 2023, transport of goods on the entire Rhine was negatively affected by factors such as reduced aggregate demand due to high inflation, the Russian full-scale invasion and war of aggression against Ukraine and other geopolitical conflicts leading to a slowdown in the global economy. One example is the chemical production in the largest producer country (Germany) which decreased by -11% in 2023, due to less aggregate demand for chemicals. This decrease in production consequently impacted transport of chemical products on the entire Rhine (-8.3%).

Also, for other goods segments, the decrease in inland navigation is explained by the decrease in other sectors of the economy such as world trade. Maritime statistics are representative for world trade, as 75% of all world trade is carried out by seaborne trade[11]. From this viewpoint, it is important to refer to maritime container transport in the Port of Rotterdam, which showed a -7% decrease in 2023 compared to 2022. The main reasons for this are lower consumption, lower production in Europe and the loss of volumes from and to Russia due to the sanctions. This rate of decrease is smaller than the rate of decrease in inland container barging on the Rhine (-13.0%). This leads to the conclusion that inland navigation lost market shares in container transport to other transport modes.

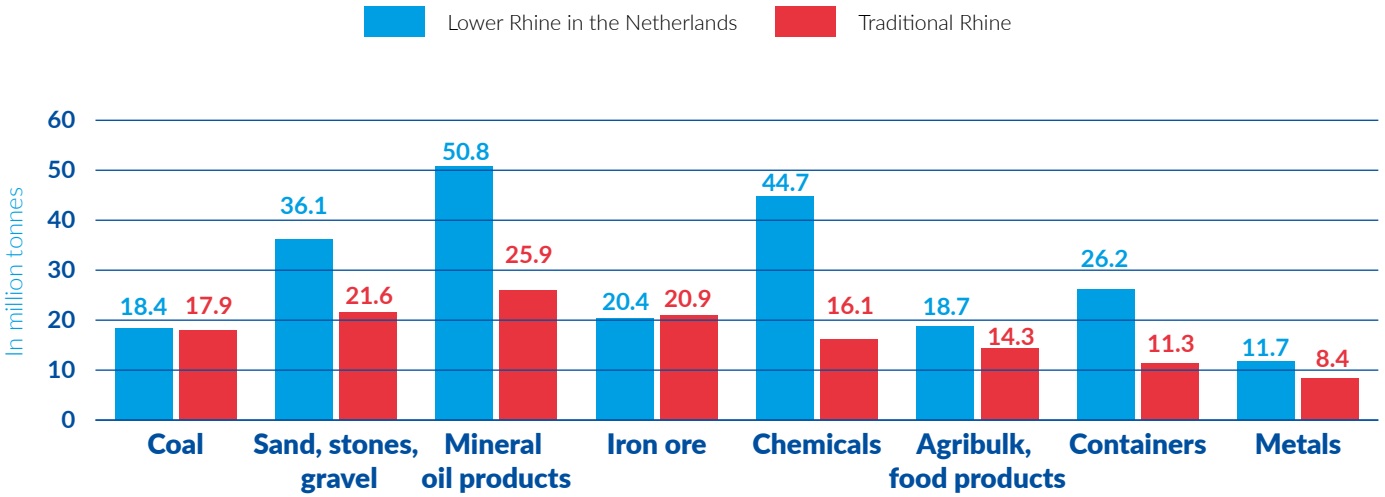
The explanation of the rather positive result for iron ore is the replenishment of iron ore stocks in 2023. Iron ore stocks were replenished after only little iron ore was imported in 2022 due to low steel production. The negative result for agricultural products is due to drought and flooding and the resulting crop failures in the European agricultural sector.[12] Grain harvest results in Rhine countries were therefore low in 2023 (see also Chapter 9, short-term outlook).

It can also be observed that there was no booming coal transport in 2023, unlike in the previous year. The reason is the drop in demand for coal in the energy sector.

An analysis of cargo segments split between the Lower Rhine in the Netherlands and the Traditional Rhine enables a better understanding of the dynamics regarding transport of goods per type of products along the Rhine. The Lower Rhine in the Netherlands has a far greater amount of chemicals transport compared to the Traditional Rhine. Container transport as well as transport of sand, stones and gravel are also more intense on the Lower Rhine in the Netherlands. For commodities and final products of the steel industry, as well as coal for the energy sector, the volumes are rather evenly distributed between the Lower Rhine in the Netherlands and the Traditional Rhine.

[11] Source: Verschuur, J., Koks, E.E. & Hall, J.W. Ports' criticality in international trade and global supply-chains. Nat Commun 13, 4351 (2022): https://doi.org/10.1038/s41467-022-32070-0
[12] Source: Port of Rotterdam (2024), https://www.portofrotterdam.com/de/nachrichten-und-pressemitteilungen/rotterdamer-hafen-2023-vollstaendig-im-zeichen-des-wandels (last consulted on 12.04.2024)

FIGURE 8: **CARGO TRANSPORT ON THE RHINE BY TYPE OF GOODS – SPLIT BETWEEN THE LOWER RHINE IN THE NETHERLANDS AND THE TRADITIONAL RHINE IN 2023** (IN MILLION TONNES) *



Source: CCNR analysis based on Destatis and Rijkswaterstaat
** Traditional Rhine = Rhine from Rheinfelden (CH) to the German-Dutch border; Lower Rhine in the Netherlands = Rhine from the German-Dutch border to the North Sea (including link to Antwerp via the Rhine-Scheldt link)*

Along with the overall cargo transport on the 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		
			2021	2022	2023	2021	2022	2023
Lower Rhine *	Border DE/NL	Emmerich	134.5	124.9	117.9	106,497	105,886	105,809
Upper Rhine	Border DE/FR	Iffezheim	19.1	16.3	16.0	23,631	24,274	22,272
Wesel-Datteln Canal *	Junction with Rhine	Wesel-Friedrichsfeld	19.1	17.9	16.2	18,961	16,520	15,255
Rhein-Herne Canal *	Junction with Rhine	Duisburg-Meiderich	13.6	12.4	10.7	11,688	15,400	11,079
Main	Junction with Rhine	Mainz-Kostheim	12.1	11.1	11.5	15,213	14,309	13,707
Moselle	Junction with Rhine	Koblenz	9.2	8.8	7.7	8,459	9,106	5,073
Neckar	Junction with Rhine	Mannheim-Feudenheim	5.7	4.5	3.9	5,663	5,484	4,463

Sources: German Waterway and Shipping Administration, Destatis, Moselle Commission
** The source for the volume of transport on the Lower Rhine and on the two canals is the German Statistical Office (Destatis), whereas for all other data in the table, the source is the German Waterway Administration.*

Container transport on the Rhine

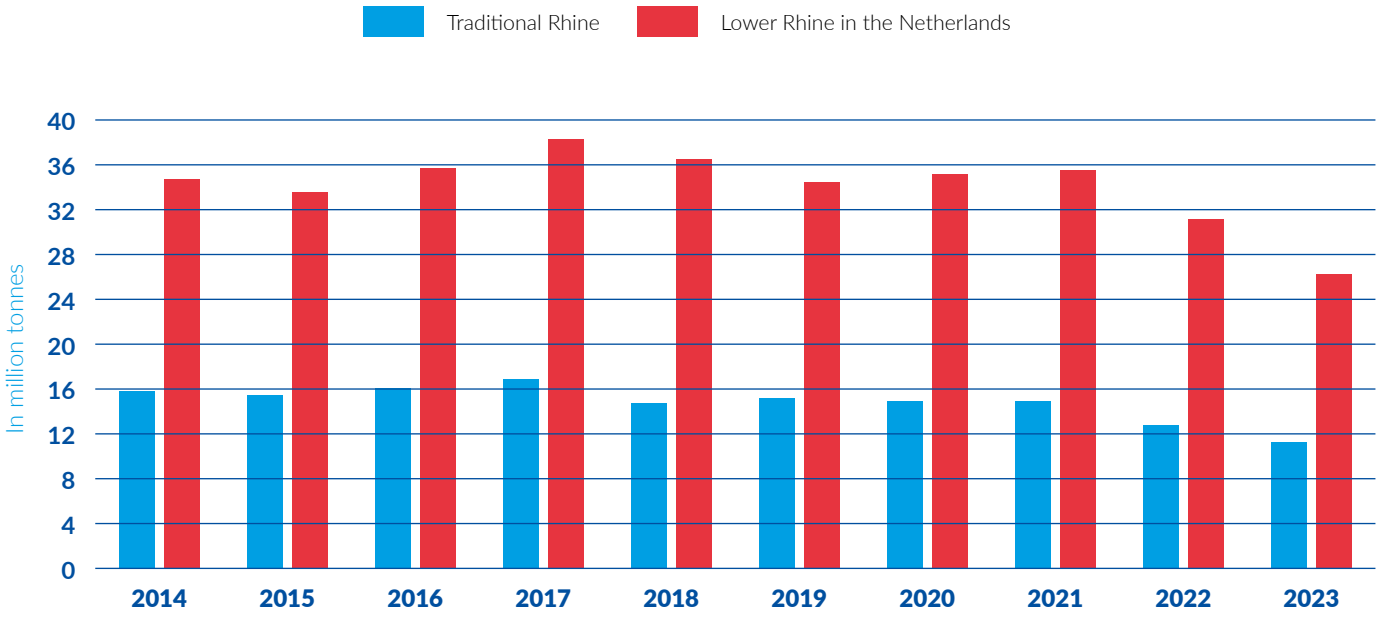
Between 2018 and 2023, container transport on the Rhine was impacted by a series of negative events:

- The low water period of 2018 and 2022 caused cargo losses in both years. The 2018 low water period led to modal share losses in the following years.
- The introduction of new tariffs in world trade in 2019 caused a deterioration in the business environment and in world trade activity, which is impacting both seaborne container throughput as well as inland container barging.
- In 2021, the overall business environment and world trade were still rather bleak due to disruptions in supply chains and rising inflation.
- In 2022, the Russian full-scale invasion and war of aggression against Ukraine broke out, causing high inflation and further disruptions in world trade.
- A long running factor is the ageing of the population in western Europe.
- Over all these years, inland container barging suffered also due to congestion in seaports and related delays.

Measured in million tonnes, the result for container transport on the entire Rhine (from Basel to the North Sea) in 2023 was -13.0% lower than in the year 2022 (-11.6% for the Traditional Rhine and -13.9% for the Lower Rhine in the Netherlands).

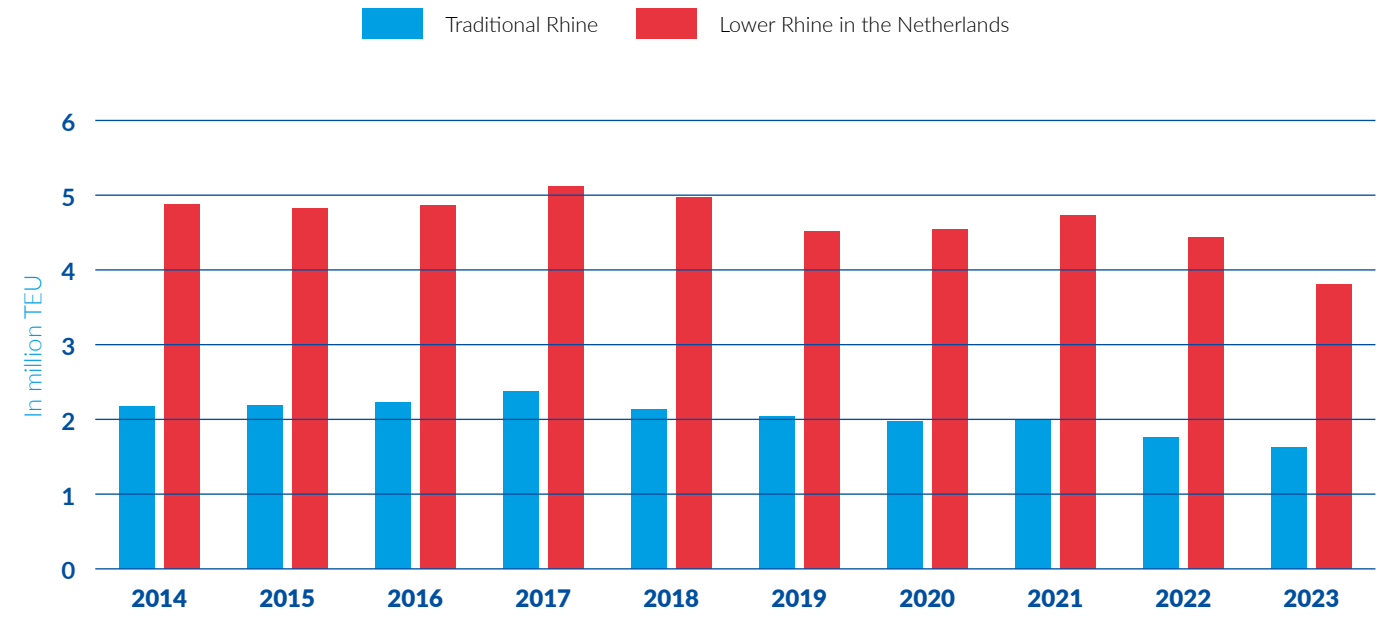
In the TEU unit, the rate of decrease was -10.6% for the entire Rhine (-7.8% for the Traditional Rhine and -12.2% for the Lower Rhine in the Netherlands).

FIGURE 9: **CONTAINER TRANSPORT ON THE TRADITIONAL RHINE AND THE LOWER RHINE IN THE NETHERLANDS** (IN MILLION TONNES, NET WEIGHT OF GOODS IN CONTAINERS), **2014-2023 ***



Source: CCNR analysis based on Destatis and Rijkswaterstaat
** Traditional Rhine = Rhine from Rheinfelden (CH) to the German-Dutch border; Lower Rhine in the Netherlands = Rhine from the German-Dutch border to the North Sea (including link to Antwerp via the Rhine-Scheldt link)*

FIGURE 10: **CONTAINER TRANSPORT ON THE TRADITIONAL RHINE AND THE LOWER RHINE IN THE NETHERLANDS** (IN MILLION TEU), **2014-2023 ***



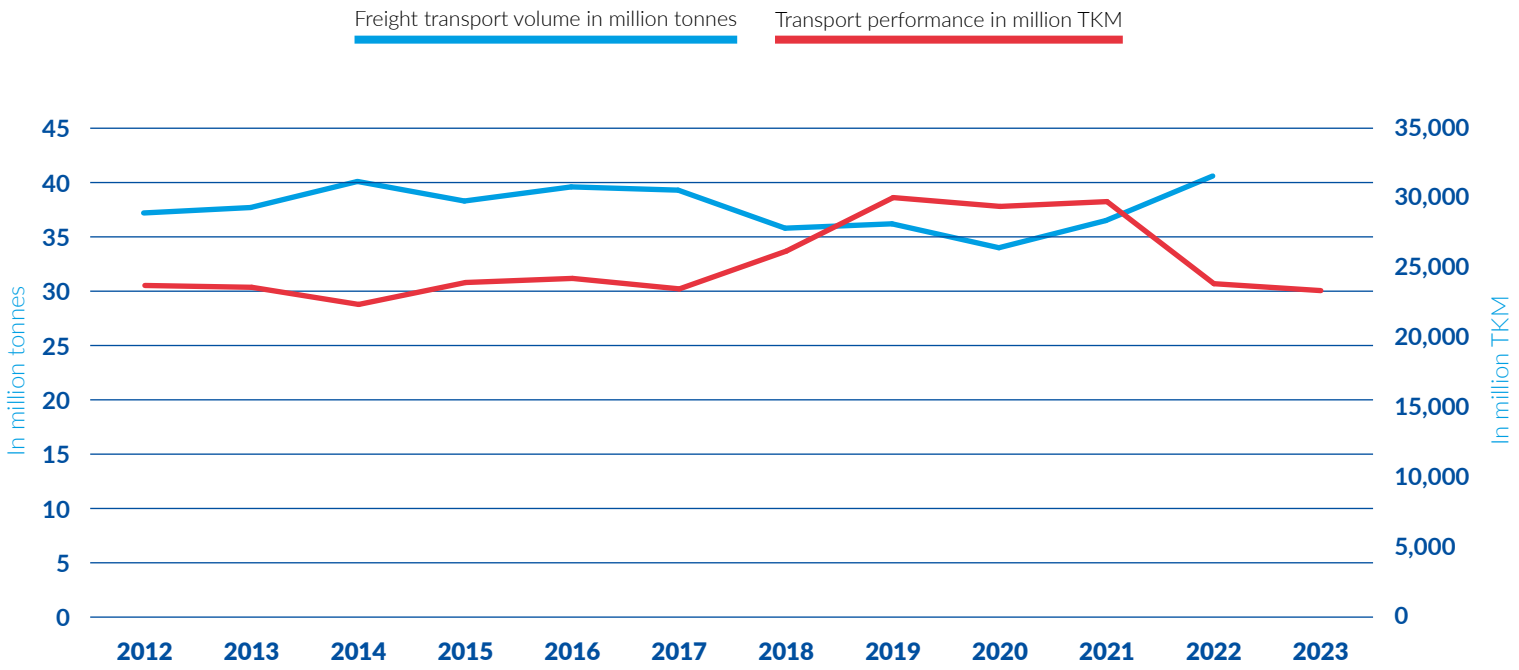
Source: CCNR analysis based on Destatis and Rijkswaterstaat
** Traditional Rhine = Rhine from Rheinfelden (CH) to the German-Dutch border; Lower Rhine in the Netherlands = Rhine from the German-Dutch border to the North Sea (including link to Antwerp via the Rhine-Scheldt link)*

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 of between 34 and 40 million tonnes per year.[13] Transport performance on the Danube (EU Danube countries plus Serbia) reached 23.9 billion TKM in 2022, a decrease of -20% compared to 2021.

FIGURE 11: **FREIGHT TRANSPORT VOLUME** (IN MILLION TONNES) **AND TRANSPORT PERFORMANCE** (IN MILLION TKM) **ON THE DANUBE ***



Sources: for transport volumes - viadonau, Annual reports on Danube navigation; for transport performance - 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 waterway administrations register data at certain borders or measurement points which are described in the following table.

[13] *Source: viadonau, several annual reports available at: https://www.viadonau.org/newsroom/publikationen/broschueren (last consulted on 20.08.2024)*

TABLE 2: **MEASUREMENT POINTS FOR DANUBE FREIGHT TRANSPORT**

Danube stretch or affluent	Measurement point	Name	Volume of transport (in million tonnes)			
			2020	2021	2022	2023
Upper Danube	Border Germany/ Austria	Lock of Jochenstein	2.3	2.2	2.2	2.1
Upper Danube	Border Slovakia/ Hungary	Lock of Gabčíkovo	5.0	4.9	4.3	4.0
Middle Danube	Border Hungary/ Croatia/Serbia	Mohács	6.1	5.8	4.0	3.4
Danube-Black Sea Canal	No specific point, total volumes on the canal are taken into account	Canal authority CAN[14]	16.5	17.3	17.3	23.4
Sulina Canal	No specific point, total volumes on the canal are taken into account	Waterway Administration AFDJ[15]	4.5	5.1	10.6	16.4

Source: Danube Commission market observation

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 on the Black Sea (southern arm) and to Năvodari (northern arm) on the Black Sea.

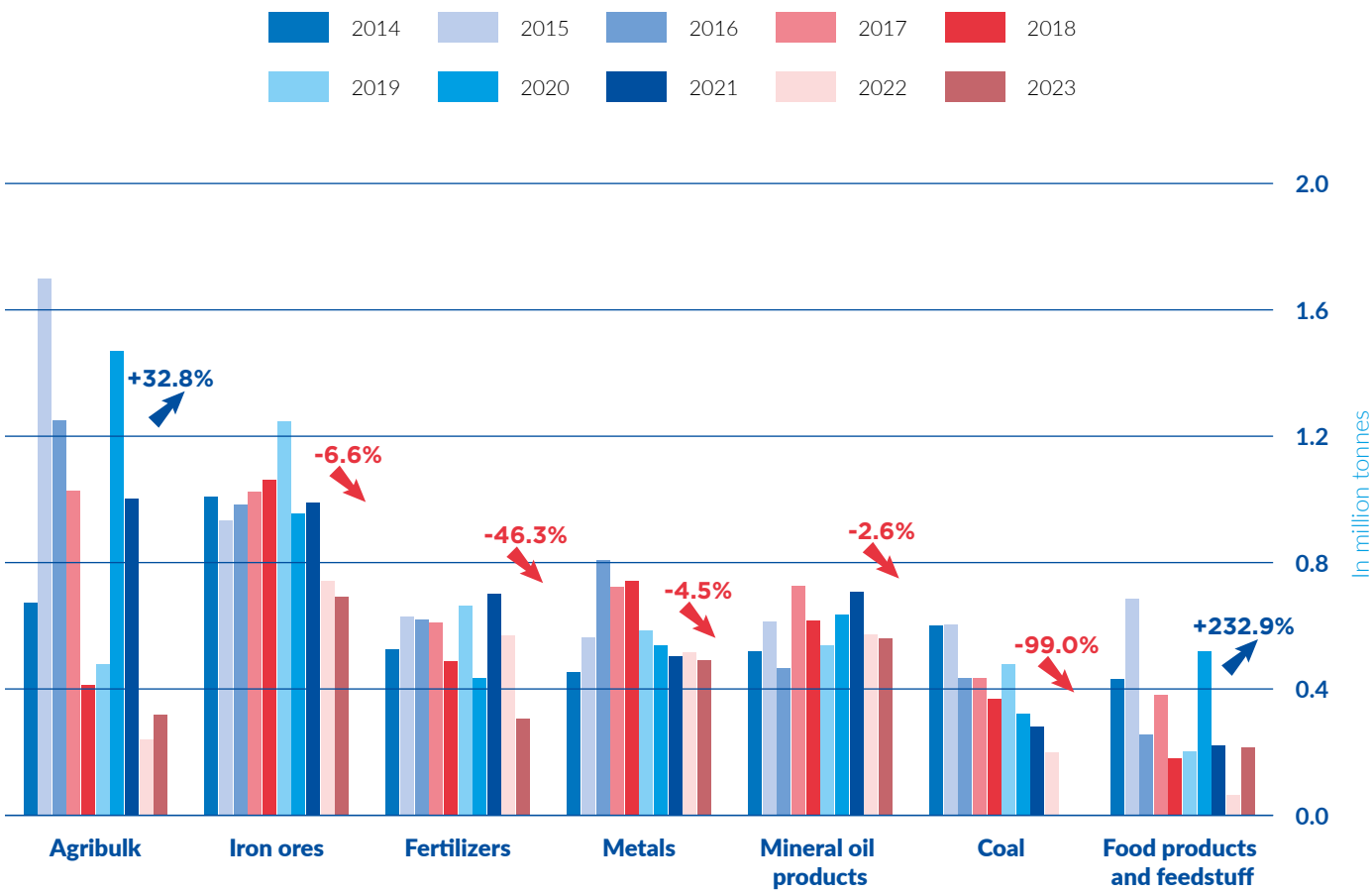
Another estuary arm is the Sulina Canal, which flows into the Black Sea in the Danube delta region near the Romanian-Ukrainian border. The exceptional increase of transport in 2022 and 2023 for both canals was driven by the need to support Ukrainian exports of grain via alternative routes ("Solidarity Lanes EU-Ukraine"). In this respect, the Danube Commission undertook a number of initiatives to contribute to solving problems related to the proper functioning of the Lower Danube corridor and to facilitate existing IWT logistics. It also promoted a more active use of the transport potential of the Danube waterway based on a systematic analysis of identified cargo flows and throughput capacity of the ports on the Lower Danube, including the Port of Constanța.

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

Danube transport by cargo segment

The Russian full-scale invasion and war of aggression against Ukraine led to the emergence of several factors weighing heavily on Danube navigation: the energy crisis, the shortage and rise in iron ore prices, restrictions to the export of grain and other food products as well as rising fuel prices. As a result, in 2023 and for the second year in a row, volumes of transport decreased for almost all cargo segments. For agribulk, the most important cargo segment transported on the Danube, a slight increase was observed in 2023 compared to 2022 (+32.8%), however, still remaining at -70% pre-war levels.

FIGURE 12: **GOODS TRANSPORT ON THE MIDDLE DANUBE** (IN MILLION TONNES) *



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

CONTAINER TRANSPORT
PER COUNTRY IN EUROPE

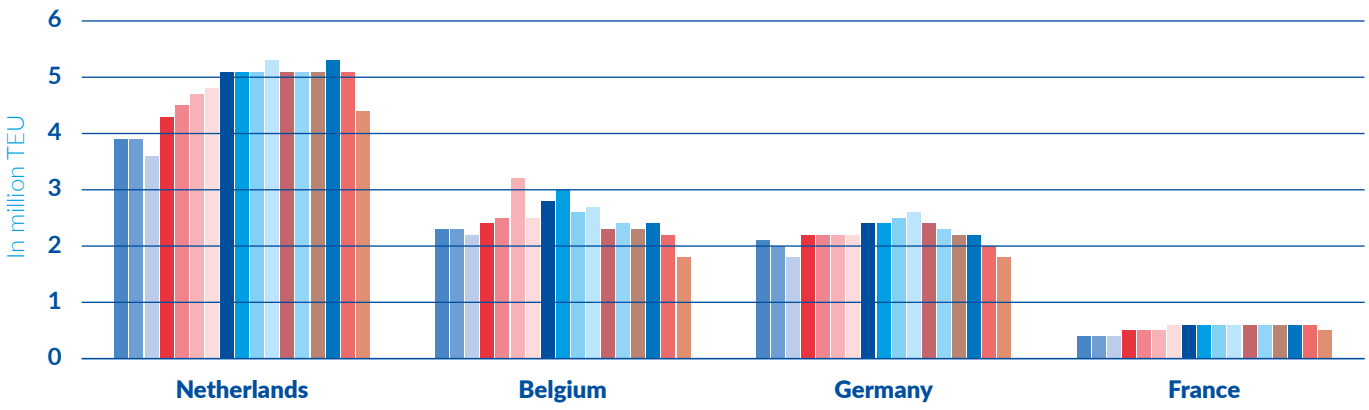
THE WHOLE EUROPEAN AND GEOGRAPHICAL STRUCTURE

In 2022, with 12 billion TKM, more than 6 million TEU and over 52 million tonnes of cargo in containers, container transport on EU inland waterways represented 9.8% of the total IWW transport performance of approximately 122 billion TKM in the EU. Moreover, 99.4% of the container transport performance (TKM) took place in Rhine countries (the Netherlands, Belgium, Germany, France, Switzerland, Luxembourg). Container transport on the Danube accounted for 0.5% and container transport in Sweden accounted for 0.1%.

RHINE COUNTRIES

In 2023, container transport measured in TEU regressed by -12.6% in the Netherlands, by -7.7% in Germany, by -18.7% in Belgium and by -11.1% in France. In the Netherlands, 39.6 million tonnes of cargo were transported in containers (-13.0% compared to 2022), making this country the frontrunner in inland waterway container transport in Europe.

FIGURE 13: **IWW CONTAINER TRANSPORT PER RHINE COUNTRY** (IN MILLION TEU) *



Source: Eurostat [iww_go_actygo] and [iww_go_qcnave]

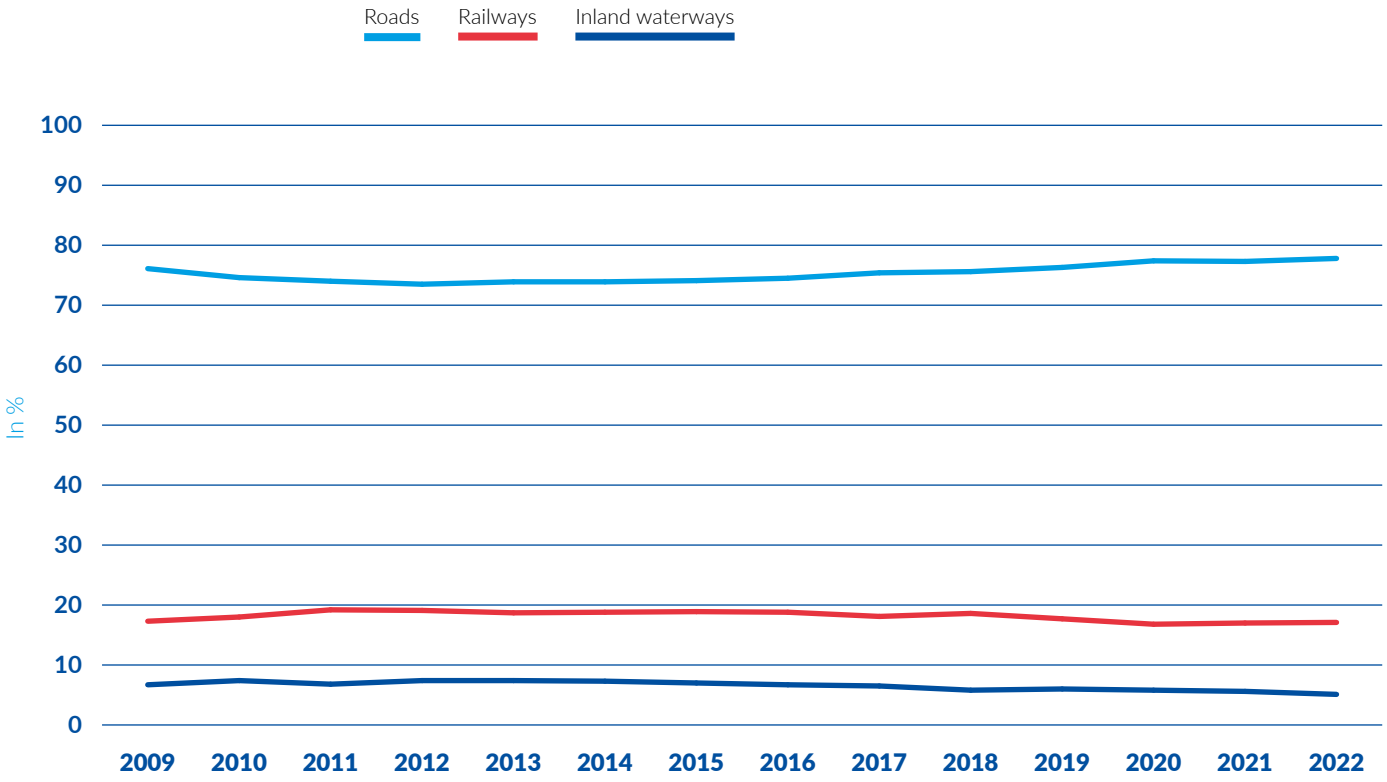
** In Luxembourg, 17,436; 14,132; 9,995 and 10,750 TEU were recorded for 2020, 2021, 2022 and 2023 respectively.*

DANUBE COUNTRIES

The two Danube countries with the highest container transport are currently Romania and Hungary. In 2023, 3,550 TEU were transported on Hungarian inland waterways. In Romania, container transport amounted to 34,594 TEU in 2023, which was a spurred increase compared to previous years. Considering the weight of cargo, container transport on Hungarian waterways represented 8,000 tonnes in 2023. In Romania, 475,000 tonnes of cargo were transported in containers. These values illustrate the immense gap towards Rhine countries. In 2023, 39.6 million tonnes were transported in containers on inland waterways in the Netherlands, 16.0 million tonnes in Belgium, 16.3 million tonnes in Germany and 3.5 million tonnes in France.

INLAND NAVIGATION
AND OTHER MODES OF TRANSPORT

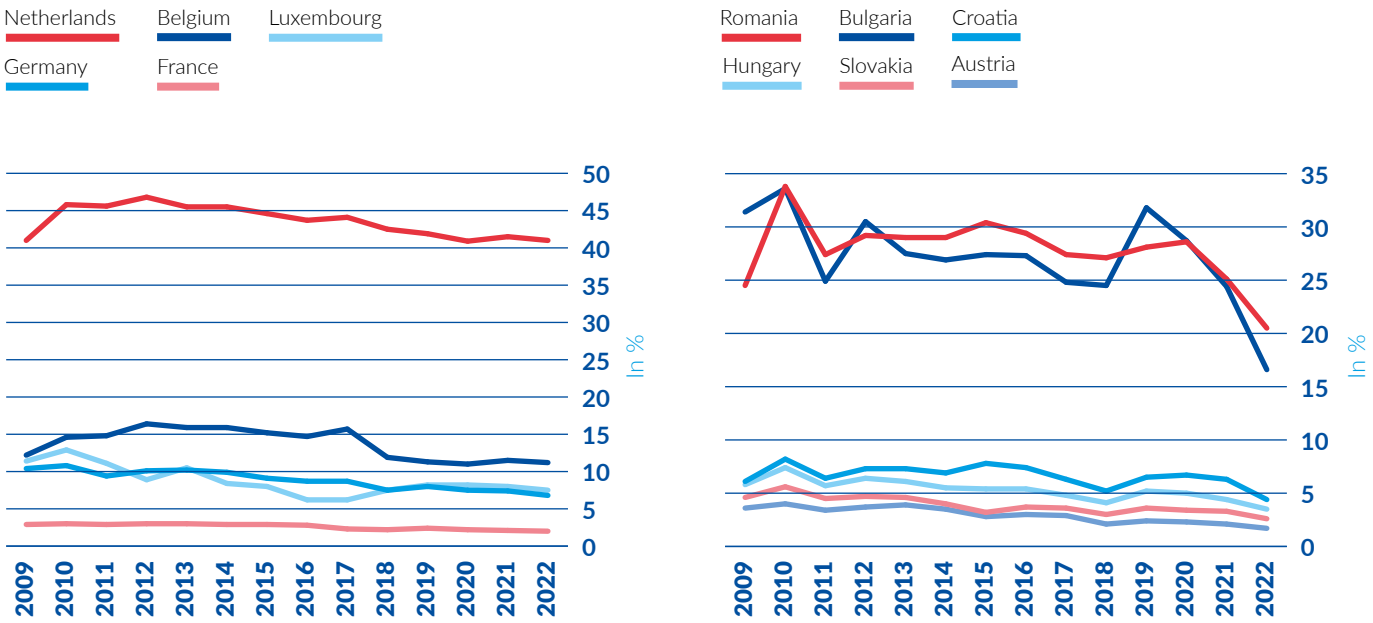
FIGURE 14: **MODAL SPLIT SHARE OF INLAND TRANSPORT MODES IN THE EU-27** (IN %) **2009-2022**



Source: Eurostat [tran_hv_frmod]

Over the last decade, modal split shares have overall decreased for IWT and rail at the level of the EU-27, while those of road transport have increased. IWT lost 2.3 percentage points in the last 10 years, to reach 5.1% in 2022, its lowest level since 2005. It is well behind road transport (77.8% in 2022, +4.3 percentage points in the last 10 years) and rail transport (17.1%, -2.0 percentage points in the last 10 years). 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.

FIGURES 15 AND 16: **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*

Modal split shares of inland waterway transport (IWT) in main IWT countries have decreased in the last decade. In the Netherlands, the modal split share of IWT increased until 2012, to reach a peak at 47.2%. It decreased in the following years, reaching 41.0% in 2022. This decline also took place in Germany, as the IWT modal share fell below the 7.0% mark for the first time since 2005.[16] Within Danube countries, Romania and Bulgaria record high IWT modal shares. However, after a first decrease in 2021, both sustained another strong decrease in their IWT modal shares in 2022 reaching respectively 20.5% (-4.6 percentage points lost to road) and 16.6% (-7.8 percentage points lost to both road and rail).

[16] 2005 being the earliest date available on the Eurostat database.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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.**
- **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, it should be borne in mind that these are long-running 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, is 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 output in new projects such as the enlargement or upgrading of waterways. Such investments are eligible for co-funding at EU level, for instance via CEF II. In legal understanding, an investment must undergo an environmental impact assessment whereas maintenance spending is usually not tied to such legal requirements. Investments in port infrastructure are not within the scope of this chapter.

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

SHORTCOMINGS
RELATING TO DATA COLLECTION ON INFRASTRUCTURE SPENDING

It might be tempting 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 from differences regarding the types of waterways present in the 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. On the other hand, rivers which count numerous locks require high investment spending.

Regarding differing methodologies, infrastructure maintenance equipment is included for one country under infrastructure maintenance spending but might not be included in another country. 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, it could either be the national authority or the regional authorities. The infrastructure spending related to inland waterways that are 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 for the Netherlands and Poland.

These observations call for improving the data collection process, perhaps through the development of harmonised criteria for reporting such infrastructure spending investments at European level.

[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 OECD. Due to the shortcomings explained in the above section, no country comparisons shall be made. This data serves to carry out a country trend analysis in the two given indicator variables. Note that data for the Netherlands, Switzerland and for infrastructure maintenance spending in Germany, is not available in the OECD data.

The OECD database encompasses 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".[19]

Regarding infrastructure maintenance spending in Germany, 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.

[19] *https://data-explorer.oecd.org/vis?lc=en&df[ds]=DisseminateArchiveDMZ&df[id]=DF_ITF_INV-MTN_DATA&df[ag]=OECD&pd=%2C&dq=..&to[TIME_PERIOD]=false&lo=5&lom=LASTNPERIODS*

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

Year / Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belgium	58.0	71.0	66.0	27.0	82.0	103.0	87.5	60.0	61.0	55.0	94.0	n.a
France	61.0	61.0	61.0	60.0	59.8	59.6	62.2	65.4	65.1	64.2	65.2	68.2
Germany	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Luxembourg	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.1	n.a	n.a
Netherlands	430.5	346.5	266.9	291.9	317.3	398.4	419.7	411.1	463.7	480.9	577.7	635.2
Switzerland	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a

Source: OECD

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

Year / Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belgium	152.0	152.0	167.0	103.0	291.0	225.0	237.5	197.0	197.0	249.0	562.0	n.a
France	264.3	236.0	224.4	180.0	164.1	192.3	35.1	226.3	163.0	306.6	349.5	381.0
Germany	1,070.0	780.0	740.0	780.0	730.0	780.0	720.0	760.0	1,000.0	1,220.0	1,090.0	1,270.0
Luxembourg	1.3	0.7	0.1	0.3	0.0	0.1	0.0	0.1	0.1	0.1	n.a	n.a
Netherlands	460.7	470.6	558.6	589.7	578.7	357.9	511.0	430.5	532.7	555.7	826.2	810.3
Switzerland	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a

Source: OECD

DANUBE COUNTRIES

For the Danube countries and Czech Republic, relevant data regarding infrastructure maintenance and investment spending in general can also be retrieved from the OECD database. In addition to the OECD data, more detailed data stemming from the FRMMP[20] are also available, covering waterside infrastructure only (no landside infrastructure) but discrepancies between the OECD and the FRMMP data exist mainly because of differences in the methodology, scope and definition.

[20] *FRMMP stands for Fairway Rehabilitation and Maintenance Master Plan.*

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

Year / Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Austria	11.0	12.0	17.0	19.0	14.0	12.0	13.0	12.0	13.1	13.4	14.0	14.3
Serbia	23.0	17.6	16.5	17.3	29.8	28.7	32.9	35.3	43.3	32.6	30.5	40.6
Slovakia	2.0	3.0	4.0	9.0	3.7	0.3	7.1	1.8	n.a	2.0	2.0	3.0
Republic of Moldova	n.a	n.a	n.a	n.a	0.1	0.1	0.1	0.1	n.a	n.a	n.a	n.a
Hungary	1.6	0.8	0.8	1.3	1.4	2.7	2.2	2.1	2.2	2.0	1.8	2.5
Bulgaria	1.5	1.0	1.0	1.0	1.0	1.3	1.4	3.4	3.6	3.6	3.1	2.6
Croatia	0.8	1.2	1.2	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Czech Republic	1.8	2.9	4.6	4.5	7.5	6.2	6.5	7.5	12.2	5.3	3.9	6.2

Source: OECD

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

Year / Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Austria	2.0	3.0	11.0	10.0	2.0	2.0	3.0	3.0	4.5	3.7	4.3	7.0
Serbia	25.8	24.7	15.5	17.7	22.3	40.7	34.3	45.9	49.1	47.2	50.6	55.2
Slovakia	1.0	1.0	1.0	0.0	0.1	0.1	1.1	1.5	n.a	1.1	0.0	1.0
Republic of Moldova	0.7	0.2	0.1	0.1	0.1	0.1	0.1	0,1	n.a	n.a	n.a	n.a
Hungary	0.2	0.01	0.1	0.02	0.0	10.3	0.2	1.1	0.9	3.1	1.1	0.0
Bulgaria	0.0	0.0	0.0	0.5	1.3	0.0	0.2	0.0	0.0	1.0	0.0	0.0
Croatia	3.5	3.3	1.7	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Czech Republic	22.3	17.2	7.2	9.6	15.1	9.8	7.2	2.8	51.1	55.5	30.2	24.1
Romania	519.0	279.5	268.1	314.1	505.9	236.9	105.1	189.7	n.a	n.a	n.a	n.a

Source: OECD


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WATER LEVELS AND FREIGHT RATES

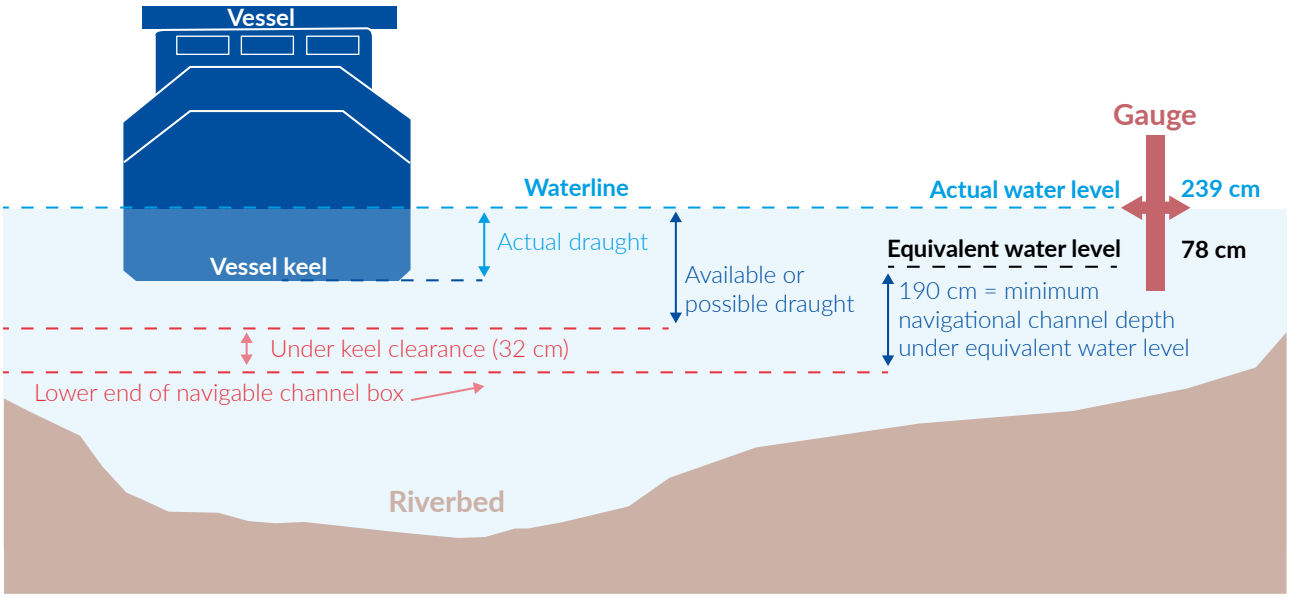
- On the Rhine, the year 2023 was characterised by good navigating conditions with very few and short low water periods. The Danube had more critical navigating conditions, with a rather high number of low water days (days when water levels were below the critical threshold 'Low navigable water level'). The freight rates for dry cargo transport on the Rhine mostly recorded a decrease in 2023 compared to 2022. The strongest drop was observed for dry bulk spot market rates. This decrease in dry cargo freight rates can be explained by the decrease in dry bulk transport in 2023 compared to 2022 and the driving effect of extra coal demand observed in 2022 coming to an end in 2023. For containers, freight rates have on a yearly average been increasing since 2021.
- For liquid cargo, freight rates were on a rather high level in 2023. Although they were partly lower than in 2022, the freight rates level for liquid cargo was still higher than during the time before the low water period of 2022.

WATER LEVELS,
AVAILABLE DRAUGHTS AND NAVIGATION CONDITIONS

The overall performance of inland waterway transport is linked to - among other factors - 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 unit costs of inland waterway transport. A high load factor represents a high volume of cargo transported per trip, and therefore lower costs per TKM. In addition, high water depths and the resulting high load factors enable inland waterway transport to reach a high degree of energy efficiency.

Low water periods therefore reduce not only the load factor and overall cargo transport on inland waterways but lead also to higher costs. Although the reduction of the load factor could be compensated by putting more vessels into operation, there are obvious limitations to this.[21] An example is the low water period experienced in both autumn 2018 and summer 2022 on the Rhine. The amount of cargo that a vessel can load at a certain water level, while keeping safe navigation conditions, is determined by the available draught, as can be seen in the next figure.

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



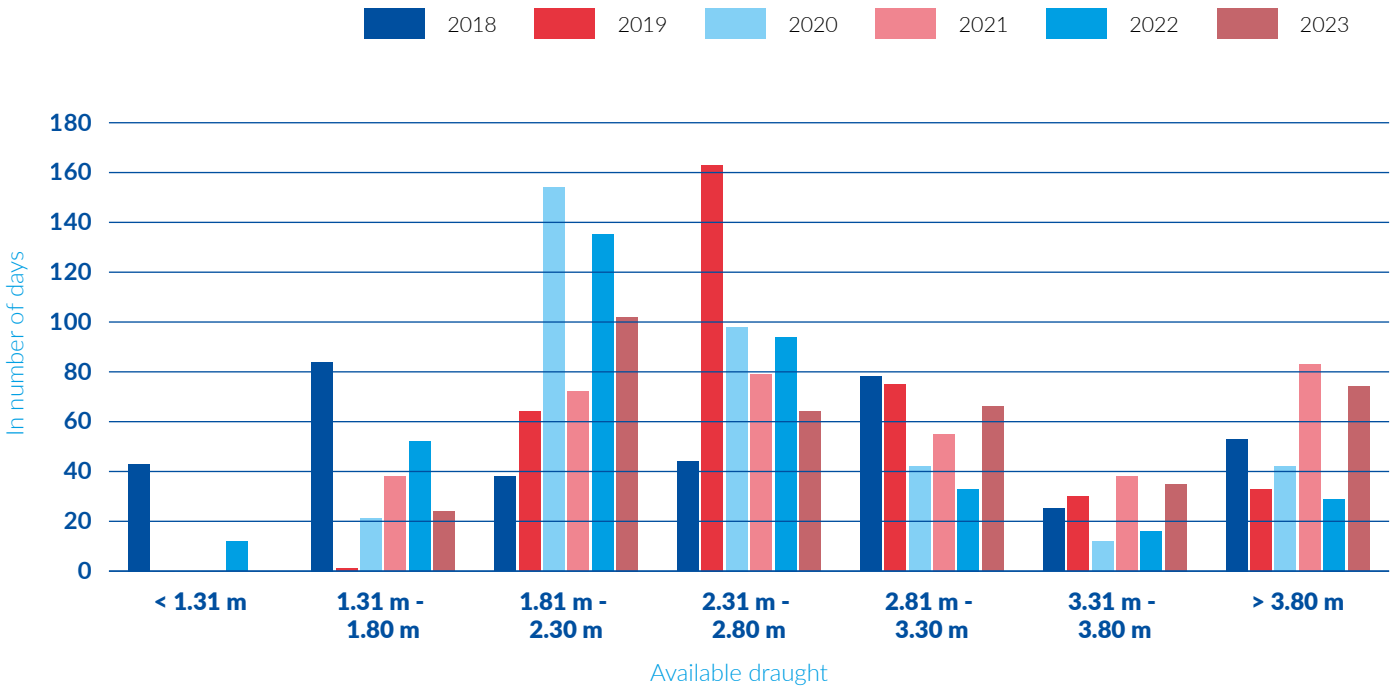
Source: CCNR based on the German Federal Institute for Hydrology (BfG) (2015)

** 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. For a sailing vessel, the actual draught also contains the squat effect. The latter results from hydrodynamic effects and leads to a higher draught compared to a vessel at rest. The squat effect is stronger the less water present under the keel, and the faster the vessel is sailing.*

[21] 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 revenue at all from the particular vessel.

One way of observing low water periods is to calculate the statistical frequencies of available draught[22] values for different years. The frequency distribution shows that the year 2023 was characterised by a smaller frequency of low water days compared to the year 2022. For example, in 2023, there were 24 days at the gauge station Kaub when the available draught was in the interval between 1.31 m and 1.80 m. In 2022, this category counted 52 days.

FIGURE 2: **NUMBER OF DAYS PER YEAR FOR AVAILABLE DRAUGHT INTERVALS AT KAUB**



Sources: CCNR calculation based on data from the German Federal Waterways and Shipping Administration (WSV), provided by the German Federal Office for Hydrology (BfG)

Another method for assessing the quality of navigating conditions over an entire year is based on the concept of counting the number of days when water levels are below a certain reference low water level, known as Equivalent Water Level (EWL) for the free-flowing sections of the Rhine and Low Navigable Water Level (LNWL) for the Danube. If water levels drop below this reference low water level, this indicates a situation of critical navigation.

[22] *The waterway administrations recommend calculating the available draught on the basis of the actual water level and certain waterway parameters (shown in the drawing).*
Actual water level
- Equivalent water level
+ Minimum navigational channel depth
= Actual fairway depth
- Under keel clearance
= Available or possible draught of vessel

NUMBER OF CRITICAL
LOW WATER DAYS FOR RHINE AND DANUBE GAUGE STATIONS

RHINE GAUGE STATIONS

The EWL is determined by the Central Commission for the Navigation of the Rhine (CCNR) for several gauge stations along the Rhine. The values are adapted every ten years, to take account of natural and anthropogenic changes.

The equivalent water level 2012 came into force in 2014 and remained valid until the end of 2022. A new equivalent water level was introduced on 1 January 2023 (known as EWL 2022) and is applicable until the end of 2031.

Although the equivalent water level is measured in centimetres, the starting point of its determination is a flow concept. Indeed, equivalent flow values (indicated in the unit m^3/s) measured against the benchmark levels are recalculated every ten years as flows within a 100-year time series. The equivalent flow values are then used to recalculate the corresponding equivalent water level (EWL) values against the benchmark levels every ten years. The EWL consequently contains the following definition: "The equivalent water level (EWL) is the water level occurring along the Rhine at an equivalent water flow falling below the long-term average for 20 days [per year]".

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

Gauge station	Guaranteed navigation channel depth	Equivalent water level 2022
Tiel (Waal, NL)	280 cm	255 cm
Nijmegen (Waal, NL)	280 cm	516 cm
IJsselkop (Nederrijn, NL)	280 cm	683 cm
Lobith (Lower Rhine, NL)	280 cm	733 cm
Emmerich (Lower Rhine, DE)	280 cm	74 cm
Duisburg-Ruhrort (Lower Rhine, DE)	280 cm	227 cm
Cologne (Lower Rhine, DE)	250 cm	139 cm
Kaub (Middle Rhine, DE)	190 cm	77 cm
Oestrich (Middle Rhine, DE)	190 cm	92 cm
Maxau (Upper Rhine, DE)	210 cm	372 cm
Basel (Upper Rhine, CH)	300 cm	501 cm

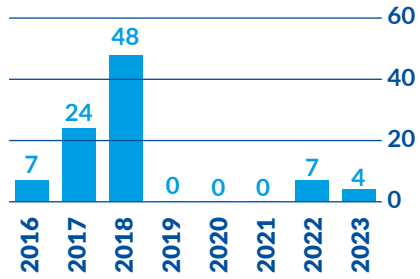
Sources: German Federal Waterways and Shipping Administration (WSV), Rijkswaterstaat
** Waal and Nederrijn are two branches of the Rhine delta in the Netherlands.*

For these 11 Rhine gauges, daily water level data were collected and analysed.

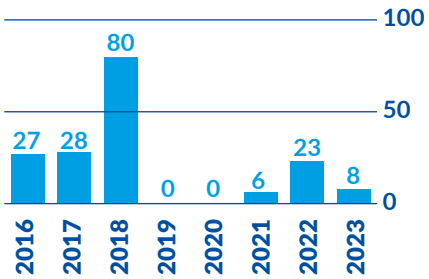
The figures show the number of days below the equivalent water level for the above-mentioned gauge stations.

NUMBER OF DAYS BELOW THE EQUIVALENT WATER LEVEL (EWL)

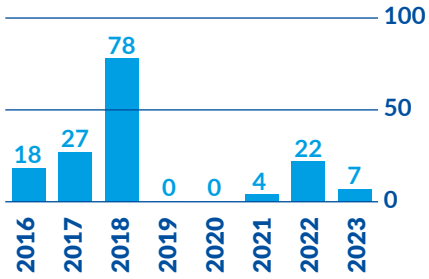
Basel



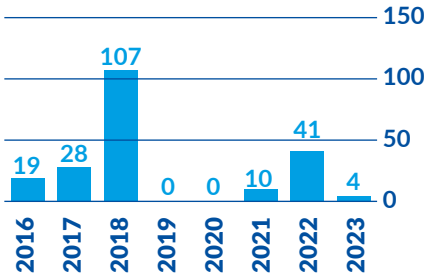
Maxau



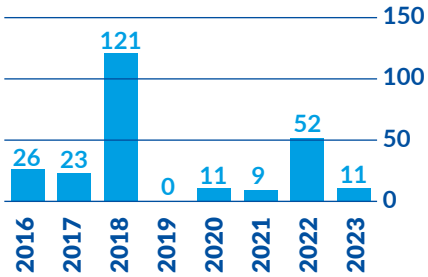
Oestrich



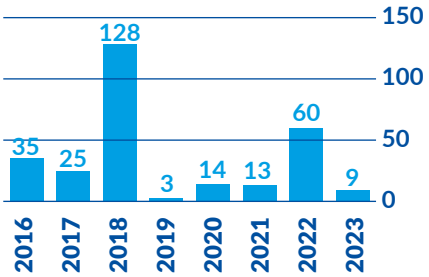
Kaub



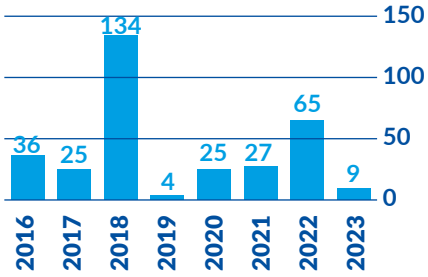
Cologne



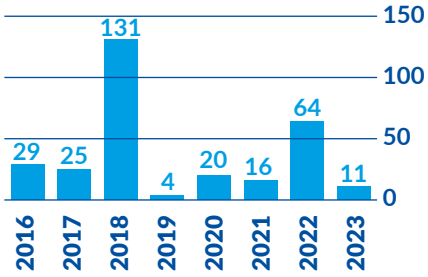
Duisburg-Ruhrort



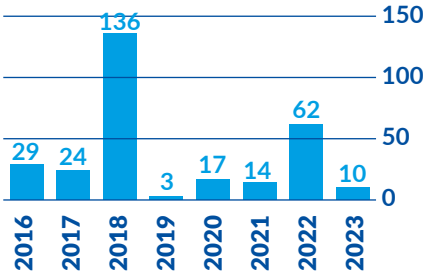
Emmerich



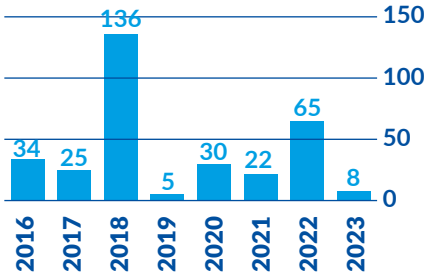
Lobith



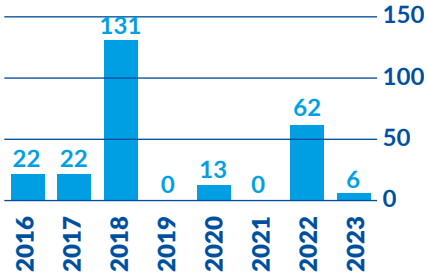
Nijmegen



IJsselkop



Tiel



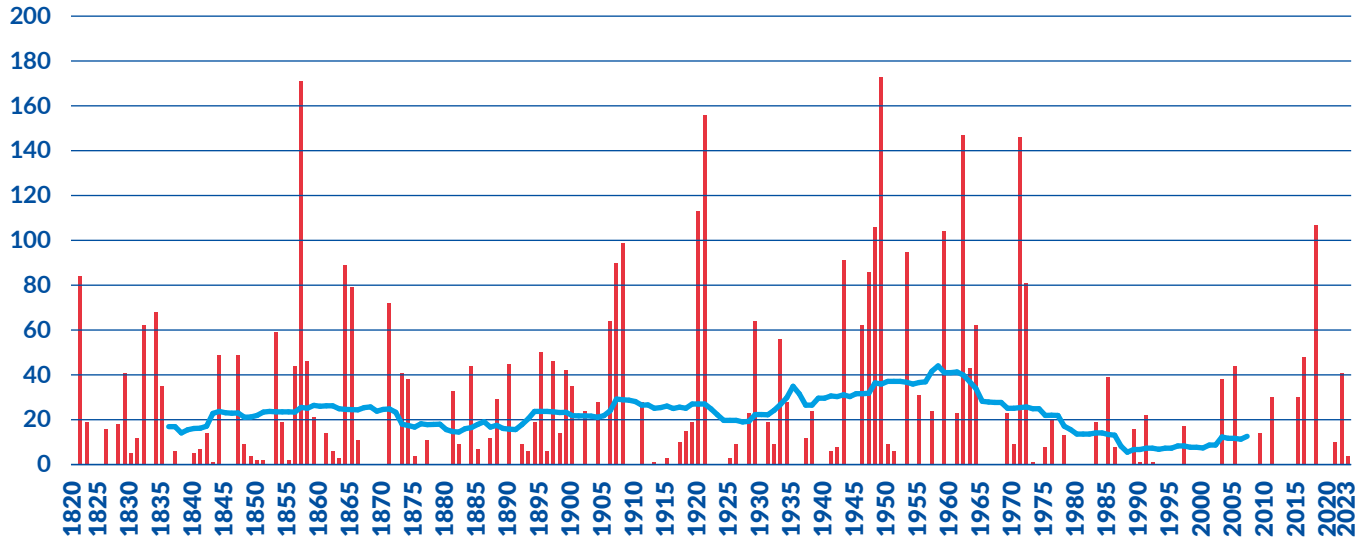
Sources: CCNR calculation based on data from the German Federal Waterways and Shipping Administration (WSV), provided by the German Federal Office for Hydrology (BfG), and from Rijkswaterstaat

Between 2015 and 2023, the two years with the highest number of low water days were 2018 and 2022. Although the summer of 2022 experienced days of extreme heat and a period of rapidly decreasing water levels, the 2022 low water period (July to August 2022) did not last as long as it did in 2018 (August to November 2018). This explains the smaller number of days below the equivalent water level in 2022, compared to the year 2018.

Low water levels and low flows from a historical perspective

For Kaub, on the Middle Rhine, data on the number of days with a discharge of less than 783 m^3 per second (which is the equivalent flow value, corresponding to the equivalent water level of 78 cm at Kaub) are modelled statistically dating back to the year 1820. The aim of this procedure is to compare today's flows with the past. The resulting values show that years of severe low water periods also occurred in the past. However, their impact on transport volumes was not as strong as in 2018 and 2022, due to smaller vessels with a lower draught, different logistics (less 'Just-in-time') and less competition from other transport modes.

FIGURE 3: **NUMBER OF DAYS PER YEAR WITH A DISCHARGE Q < 783 M^3/S * AT KAUB, MIDDLE RHINE INCLUDING 30-YEAR-MOVING AVERAGE**



Source: German Federal Office for Hydrology (BfG)
** Corresponds to a water level of 78 cm (equivalent water level).*

DANUBE GAUGE STATIONS

The reference low water level of the Danube is known as 'Low Navigable Water Level (LNWL)'. It is defined as the water level exceeded on 94.0% of days in a year (i.e. on 343 days) during ice-free periods with a reference to a 30-year observation period (1981 – 2010).[23]

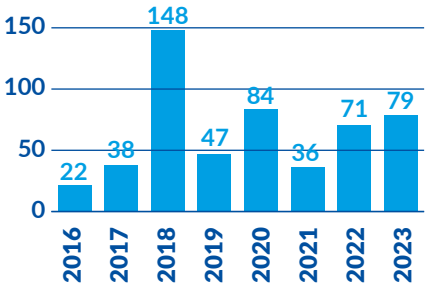
Based on this definition, equivalent calculations can be carried out for the Danube.

[23] *Source: viadonau*

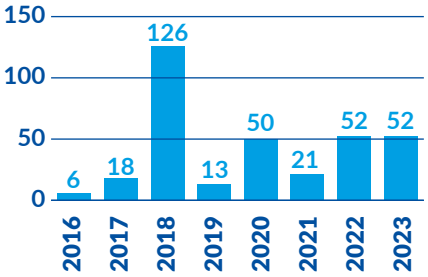
For 11 important gauge stations on the Danube, daily water level data were collected and analysed. The figures below show the number of days per year on which the actual water levels fell below the Low Navigable Water level.

NUMBER OF DAYS BELOW THE LOW NAVIGABLE WATER LEVEL (LWL)

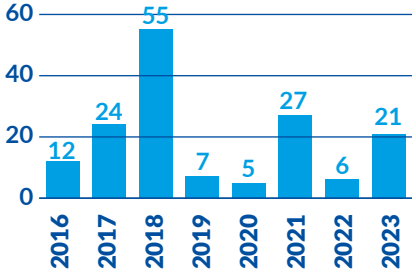
Pfelling, Upper Danube (DE)



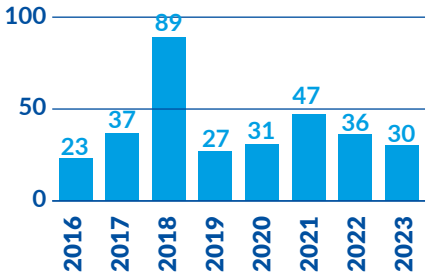
Hofkirchen, Upper Danube (DE)



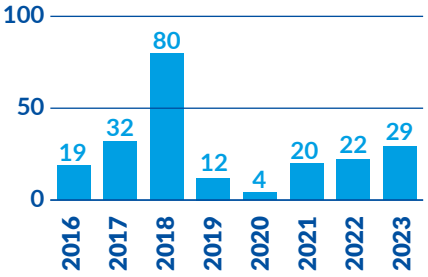
Kienstock, Upper Danube (AT)



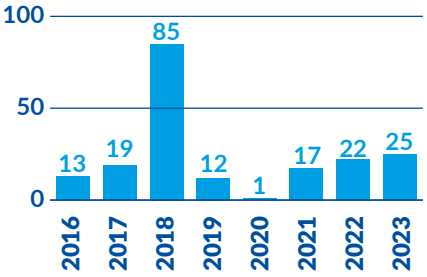
Wildungsmauer, Upper Danube (AT)



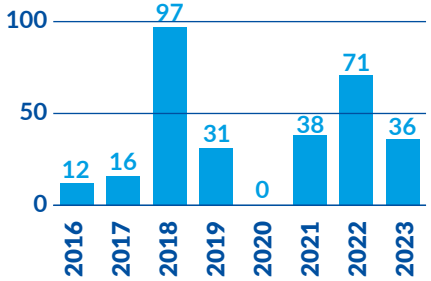
Devin, Upper Danube (SK)



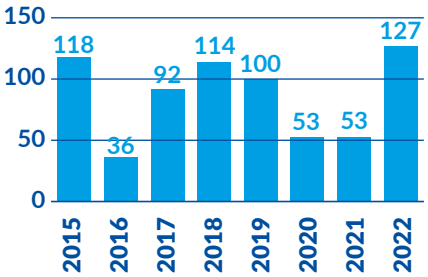
Budapest, Middle Danube (HU)



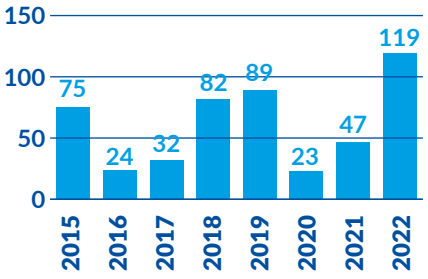
Bezdan, Middle Danube (RS)



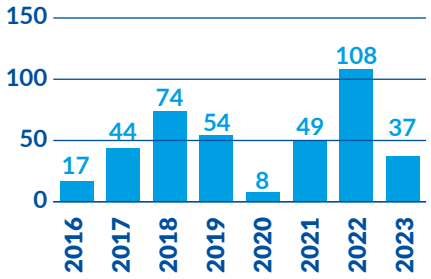
Calafat, Lower Danube (RO)



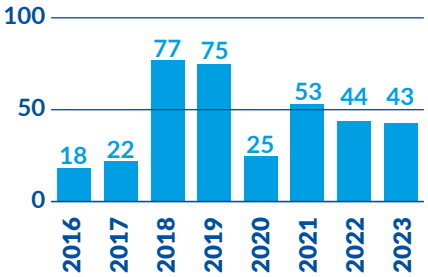
Calarasi, Lower Danube (RO)



Lom (BG), Lower Danube



Silistra (BG), Lower Danube



Sources: CCNR calculation based on data from the German Federal Waterways and Shipping Administration (WSV), provided by the German Federal Office for Hydrology (BfG), data from the Federal State of Lower Austria and the Danube Commission.
For Calafat and Calarasi, data for 2023 were not available.

FREIGHT RATES
IN THE RHINE REGION

CBS FREIGHT RATE INDEX FOR THE RHINE REGION

Statistics Netherlands (CBS) collects freight rate data from a panel of Dutch IWT companies. The price levels are based on fixed routes for which questionnaires are sent out twice a quarter. They comprise the sailing costs including fuel and low water surcharges and exclude cargo handling costs. In 2023, taking into account all market segments together, freight rates decreased on average by -11.8% compared to 2022 (while they had increased by +42.5% between 2021 and 2022).

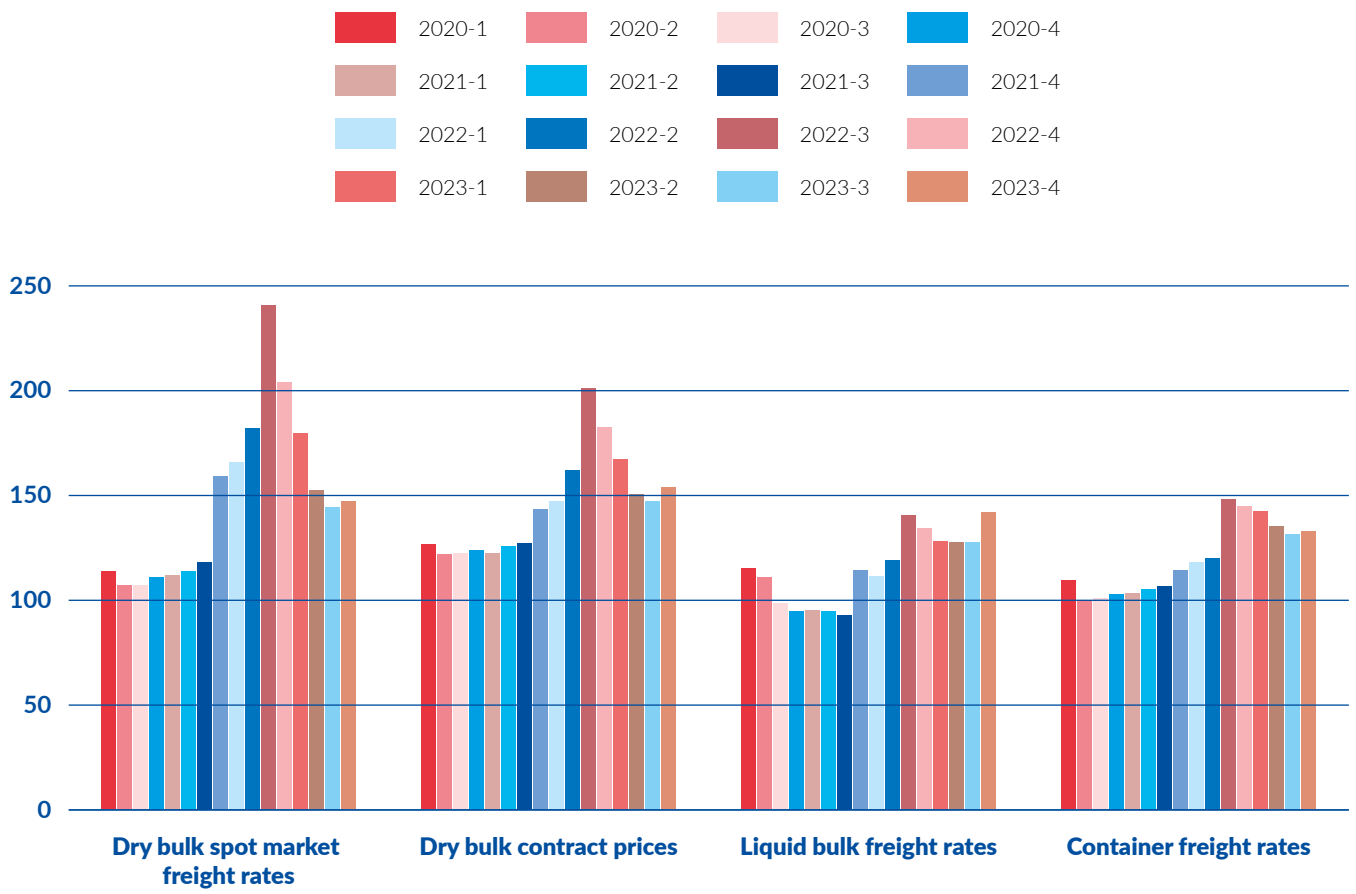
More specifically, dry bulk and container freight rates had been following an increasing path since the third quarter of 2020, as the underlying transport demand recovered from the pandemic. In 2023, while container freight rates continued overall to follow this upwards trend, yet with less intensity between 2022 and 2023 as a result of a decreasing demand, dry cargo freight rates strongly decreased in 2023 on average (-21.4% in regard to the spot market and -10.6% in regard to contract prices). This decrease in dry cargo freight rates can be explained by the decrease in dry bulk transport in 2023 compared to 2022. More specifically, the temporary driving effect of extra coal demand in inland shipping which was observed in 2022 came to an end in 2023.

Liquid cargo freight rates followed a decreasing trend between 2019 and 2021, stemming from a weaker development of transport demand compared to dry cargo[24] and a stronger expansion of its supply side, in terms of a higher newbuilding rate and thus more additional cargo carrying capacity. However, liquid cargo freight rates have been increasing overall since Q4 2021 driven by the effects of low waters and an overall increase in demand, despite a difficult year for the chemical sector. On average, liquid cargo freight rates increased in 2023 compared to 2022 (+3.9%).[25]

As for containers, freight rates have been increasing on a yearly average since 2021 (+2.2% between 2023 and 2022; +23.6% between 2022 and 2021).

[24] See also Chapter 2
[25] They had already increased on average by +27.2% between 2022 and 2021.

FIGURE 4: **CBS FREIGHT RATE INDICES PER QUARTER** (2015 = 100) *



Source: CBS, Table 84050NED

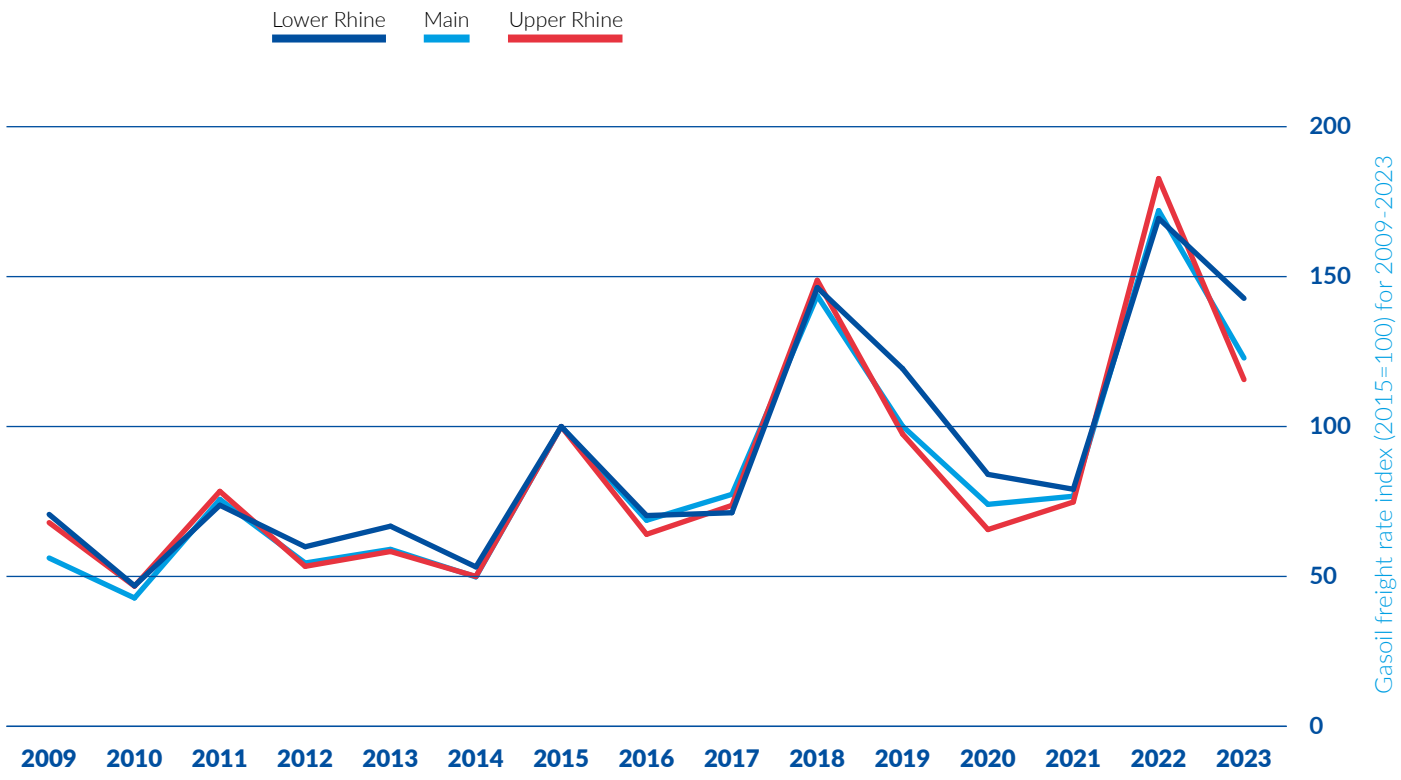
** The prices of established routes are observed twice a quarter and include fuel and low water surcharges but exclude loading and unloading. The time of observation is in the middle and at the end of the quarter. All prices are nominal prices.*

LIQUID CARGO FREIGHT RATES IN THE RHINE REGION

Figure 5 illustrates the liquid cargo spot market freight rate index for gasoil for ARA-Rhine transport (yearly averages). Since 2010 an overall positive trend is seen. To some extent, this positive trend was driven by low water periods, which occurred in 2011, 2015, 2018 and 2022.

The observed trends are almost identical for the three different geographical entities shown – two stretches of the Rhine (Lower Rhine, Upper Rhine) and the Main affluent.

FIGURE 5: **INSIGHTS GLOBAL FREIGHT RATE INDEX FOR LIQUID CARGO TRANSPORT IN THE ARA-RHINE AREA** (2015 = 100)



Source: CCNR calculation based on Insights Global

CITBO LIQUID CARGO
FREIGHT RATE INDEX FOR THE FARAG REGION

Geography of the CITBO transport activity and product segment structure

For the liquid cargo transport within the extended ARA region, between Amsterdam, Antwerp, Flushing, Ghent, Rotterdam and Terneuzen, a dataset on spot market freight rates provided by the tanker barge cooperation CITBO[26] was analysed. The shares of the different product groups within cargo transported were as follows:

- **Gasoil and components:** share of 41% in 2023 (38% in 2022)
- **Gasoline and components:** share of 37% in 2023 (29% in 2022)
- **Biodiesel:** share of 18% in 2023 (26% in 2022)
- **Chemicals:** share of 2% in 2023 (6% in 2022)
- **Heavy products:** share of 0.2% in 2023 (1% in 2022)

Of all liquid cargo transport in 2023, the five ports with the highest shares are represented as follows:

- in loaded cargo, volumes accounted for 80% and,
- in unloaded cargo, volumes accounted for 67%.

Port of loading	Cargo volume - share in %	Port of unloading	Cargo volume - share in %
Antwerp	34% (in 2022: 35%)	Rotterdam	21% (in 2022: 28%)
Rotterdam	28% (in 2022: 27%)	Amsterdam	18% (in 2022: 12%)
Amsterdam	8% (in 2022: 8%)	Antwerp	14% (in 2022: 17%)
Flushing	5% (in 2022: 6%)	Ghent	7% (in 2022: 6%)
BioWanze	5% (in 2022: 4%)	Wandre	7% (in 2022: 4%)
All other ports	20% (in 2022: 19%)	All other ports	33% (in 2021: 34%)

The locations of other ports of loading and unloading are mainly found in Belgium and in the Netherlands, but locations in France, Germany and Switzerland also appear.

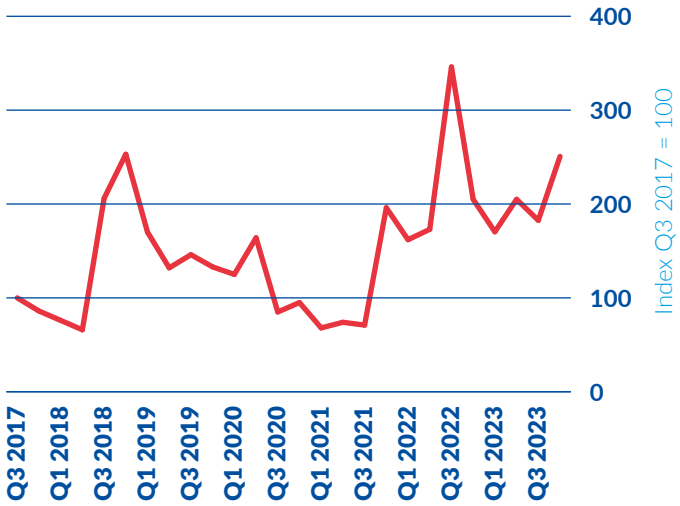
[26] *https://citbo.com/*

Results of the calculation of freight rate indices (spot market data)

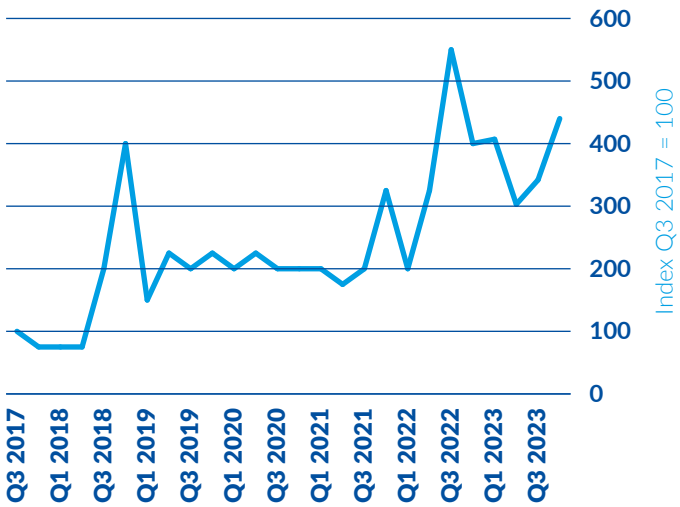
A freight rate index was calculated for the four main different product segments.[27] From these indices, it can be observed that low waters (in 2018 and 2022) had a strong influence on freight rates for all product segments. In the year 2023, spot market freight rates kept a high level, despite the fact that water levels were not as low as in 2022.

FIGURES 6, 7, 8 AND 9: **CITBO FREIGHT RATE INDEX FOR LIQUID CARGO SEGMENTS** (INDEX Q3 2017 = 100)

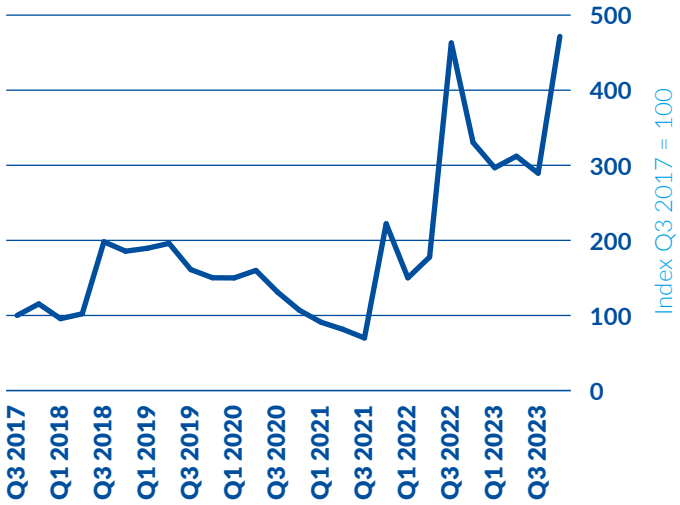
Gasoil and components



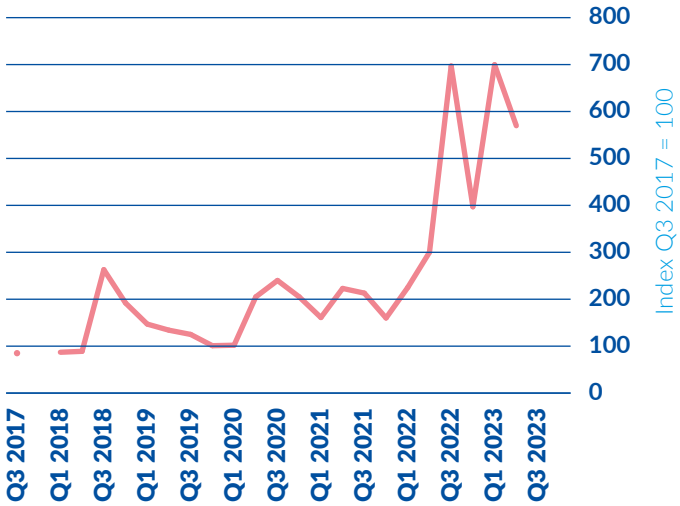
Gasoline and components



Biodiesel



Chemicals



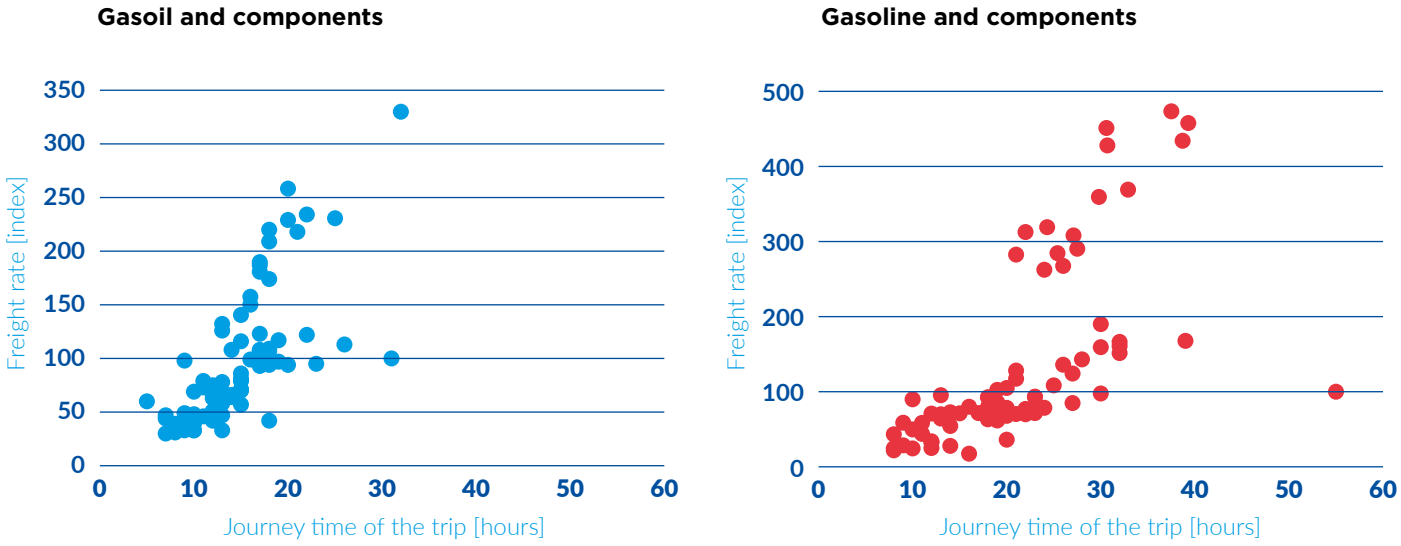
Source: CCNR analysis based on spot market data provided by CITBO

[27] *Thus, the absolute spot market freight rate data (given in euro per tonnes) were transformed into index figures with base period Q3 2017 = 100. For heavy and other products, no index could be calculated due to missing values in several financial quarters.*

Influencing factors for CITBO freight rates

Longer journey time leads to higher costs, thereby contributing to higher freight rates. The longest journey time observed is for the transport of gasoline. In 2023, the average duration of trips was 30 hours for gasoline and components, compared to 19 hours for gasoil and components, 17 hours for chemicals and 22 hours for biodiesel. The strong influence the journey time for trips has on the level of freight rates is confirmed in Figure 10.

FIGURE 10: **RELATIONSHIP BETWEEN JOURNEY TIME OF A TRIP AND FREIGHT RATE INDEX VALUE** (INDEX Q3 2017 = 100) *



Source: CCNR analysis based on spot market data provided by CITBO

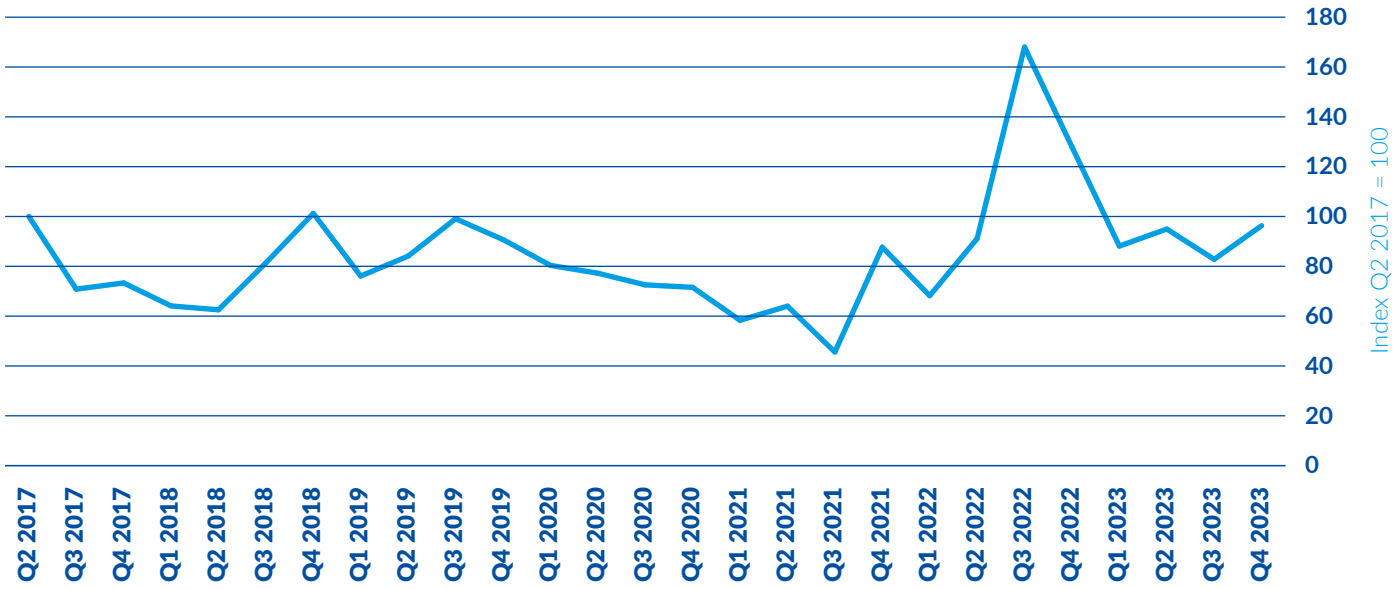
** The dots in the graphs represent the combination of average journey time and average freight rate index for certain months between July 2017 and December 2023.*

Additional influencing factors for freight rates exist. Overall, it can be observed that chemicals have by far the highest spot market freight rates in absolute terms (euro/tonne), followed by gasoline and its components. The high freight rate levels for chemical transports cannot be explained by journey times, as these are rather low for chemicals (see above). The high freight rates can be attributed primarily to the relatively expensive vessels for chemical transport, often with stainless steel tanks, as well as the high safety standards and high cleaning costs. The significant demand on the shippers' side to transport their chemicals by IWW therefore contributes to higher freight rate levels for chemical products within the CITBO database.

CITBO time charter rates

As well as the spot market rates, the CITBO data also contain timer charter data. These data allow to calculate an index of average time charter rates, based on the rental prices of vessels per day. The quarterly index of average rental prices per day is shown in the following graph. All product segments are taken into account. The index shows an increase at the end of 2022 due to the low water period. In 2023, time charter rates were lower than in 2022, but remained at a higher level than before the 2022 low water period.

FIGURE 11: **CITBO TIME CHARTER RATES** (INDEX Q2 2017 = 100)



Source: CCNR analysis based on CITBO data


CONTARGO
MAERSK
SEALAND

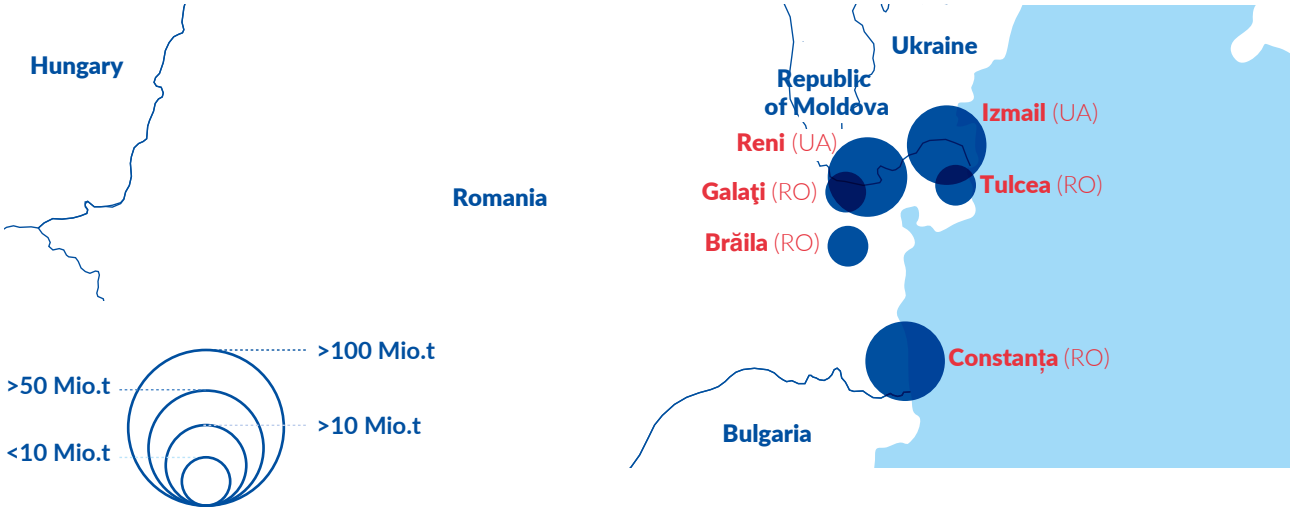
05

INLAND WATERWAY CARGO HANDLING IN PORTS

- In 2023, persisting geopolitical tensions, low economic growth, decline in world trade and high inflation significantly impacted maritime throughput in main European seaports.
- As a consequence, main European seaports such as Rotterdam, Antwerp-Bruges, North-Sea Port and Hamburg registered a decrease in the volumes of inland waterway cargo handled. Yet, driven by a record increase in grain traffic, mainly attributed to Ukrainian grain transiting through Romania, IWT traffic at the port of Constanţa in 2023 was the highest recorded in its history.
- Most of the European inland ports were negatively impacted by multiple downward factors, except for the Danube ports, notably Ismail and Reni, which experienced a strong increase in inland waterway cargo handling.

MAIN EUROPEAN SEAPORTS

Sources: Ports' statistics, Destatis, CBS, Eurostat [iww_go_aport] and Danube Commission
** For Szczecin, data are for 2022*



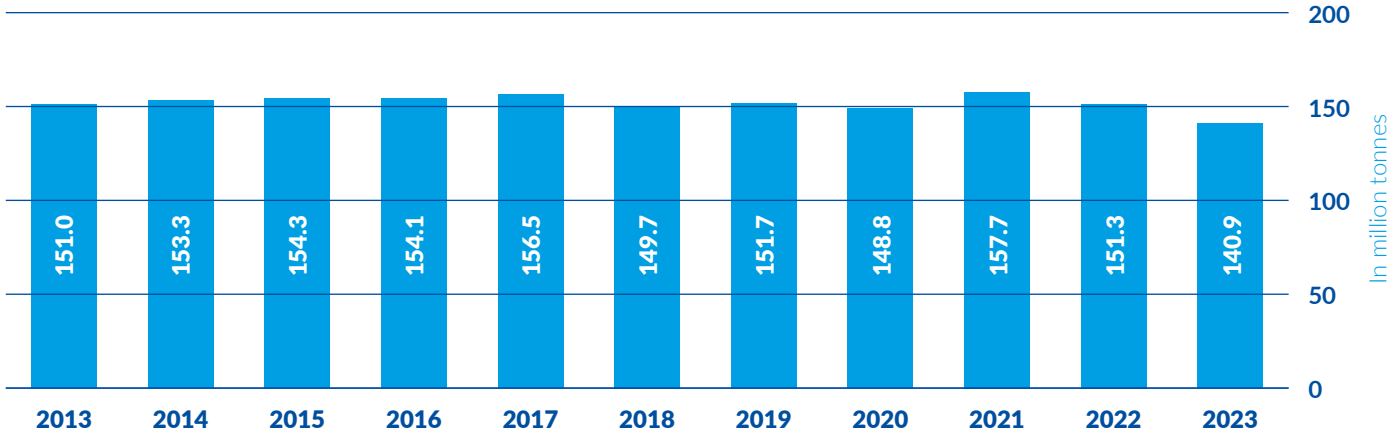
Source: Romanian national Institute of Statistics

ROTTERDAM

In 2023, 89,175 inland vessels called at the Port of Rotterdam (82,763 in 2022).

The volumes of inland waterway cargo handling at the Port of Rotterdam decreased by -6.9% to 140.9 million tonnes in 2023 (compared to 151.3 million tonnes in 2022). All cargo segments decreased. Overall, geopolitical tensions, low economic growth and high inflation are the main explanatory factors behind these negative results. This affected particularly containerised cargo, which sustained a -11.2% decrease for the second year in a row. The handling of dry cargo also sustained a strong decrease (-9.6%), driven mainly by a fall in coal throughput, because of low demand for energy coal for power production. Indeed, in 2022, demand for coal rose sharply due to concerns about energy security and large increases in gas prices, a demand which returned to normal levels in 2023. Lower demand for raw materials from the European industry also contributed to these negative results in the area of dry bulk. Liquid cargo fell, with a smaller decline (-2.5%), mainly attributable to the low demand and stock reductions observed in the chemical industry and to a lesser extent, a decrease in mineral oil products.

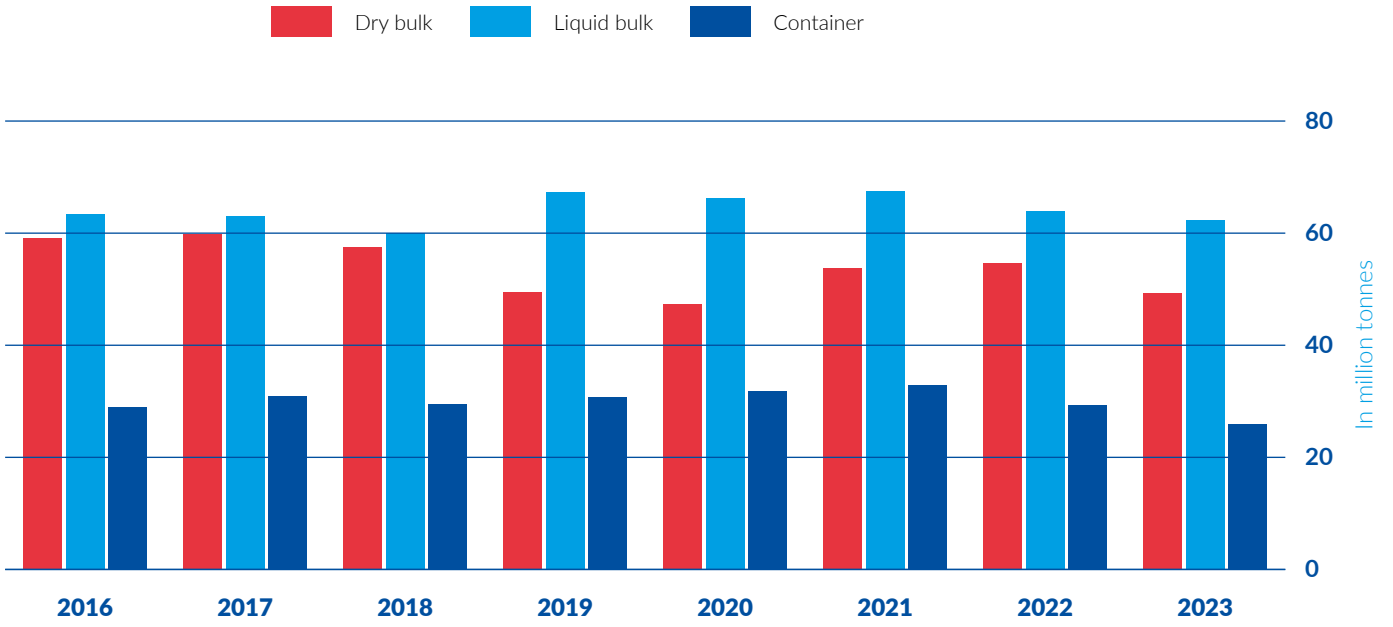
FIGURE 1: **INLAND WATERWAY CARGO HANDLING IN THE SEAPORT OF ROTTERDAM** (IN MILLION TONNES) *



Source: CBS

** Note that data from the Port of Rotterdam based on CBS data were used in previous years, which can explain a difference in the numbers reported in the last years. However, the overall trends remain identical.*

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



Source: CBS

** General cargo is not taken into account in these calculations. In 2023, the volume transported for general cargo amounted to 3.1 million tonnes.*

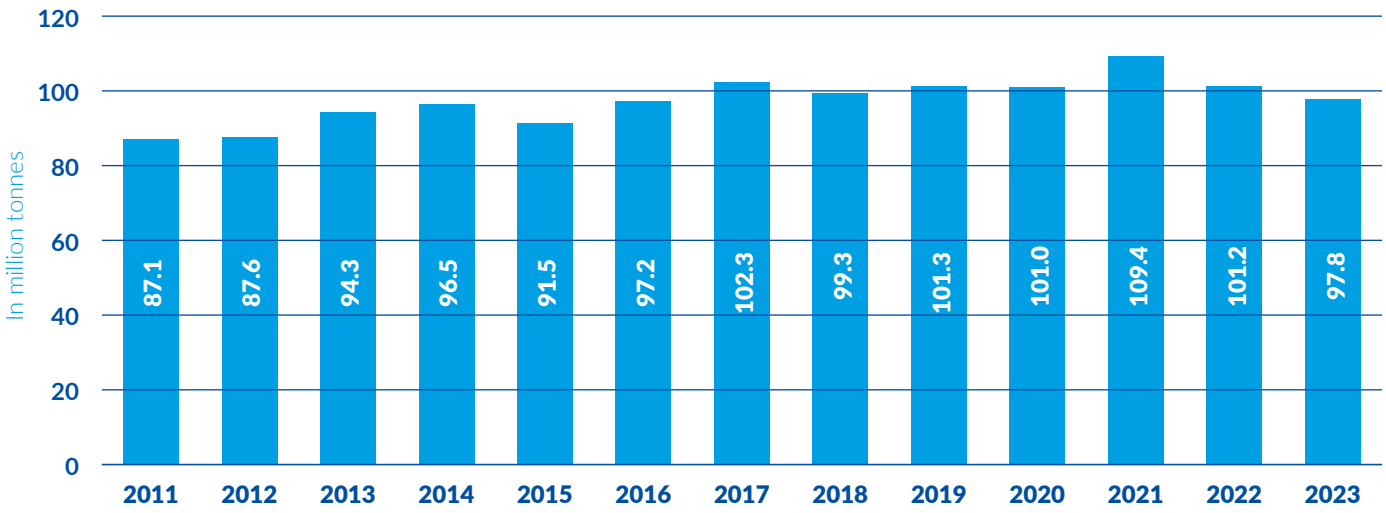
ANTWERP-BRUGES

The ports of Antwerp and Zeebrugge have been operating under the name "Port of Antwerp-Bruges" since April 2022. Most of IWW cargo handling at the port takes place on the Antwerp site. In 2023, the number of vessels calling at the port decreased to 55,604 (compared to 57,987 in 2022).

Liquid bulk is the most important cargo type (59.9%), followed by containers (18.9%) and dry bulk (14.4%). The IWW cargo handling decreased in 2023 (-3.4% compared to -7.5% in 2022) reaching a volume of 97.8 million tonnes (compared to 101.2 in 2022), reflecting geopolitical tensions and slowing economic growth which are driving down industrial production and trade flows. This result was driven by a sharp decrease in the transport of containers (-19.3%) for the second year in a row (-10.9% in 2022 already), because of the disruptions in global containerised liner shipping, exacerbated by the war in Ukraine. On the other hand, the transport of liquid bulk (+3.0%) increased, driven by petroleum products (+15.9%), thereby recovering from the losses observed in 2022 (-12.7%). It offset the decrease observed for all other liquid products, chemicals in particular (-8.5%), an industry which experienced an economic slowdown in 2023. Dry bulk also slightly increased (+0.9%) driven by higher transport volumes of crude minerals and building materials while all the other dry product segments slightly decreased.

The IWW modal split within total maritime throughput (excluding industrial traffic[28]) in 2023 was 48.7% at the port of Antwerp (51.4% in 2022). The IWW modal split share within container transport to and from the hinterland was 34.0% (minus one percentage point).

FIGURE 3: **INLAND WATERWAY CARGO HANDLING IN THE SEAPORT OF ANTWERP-BRUGES** (IN MILLION TONNES) *

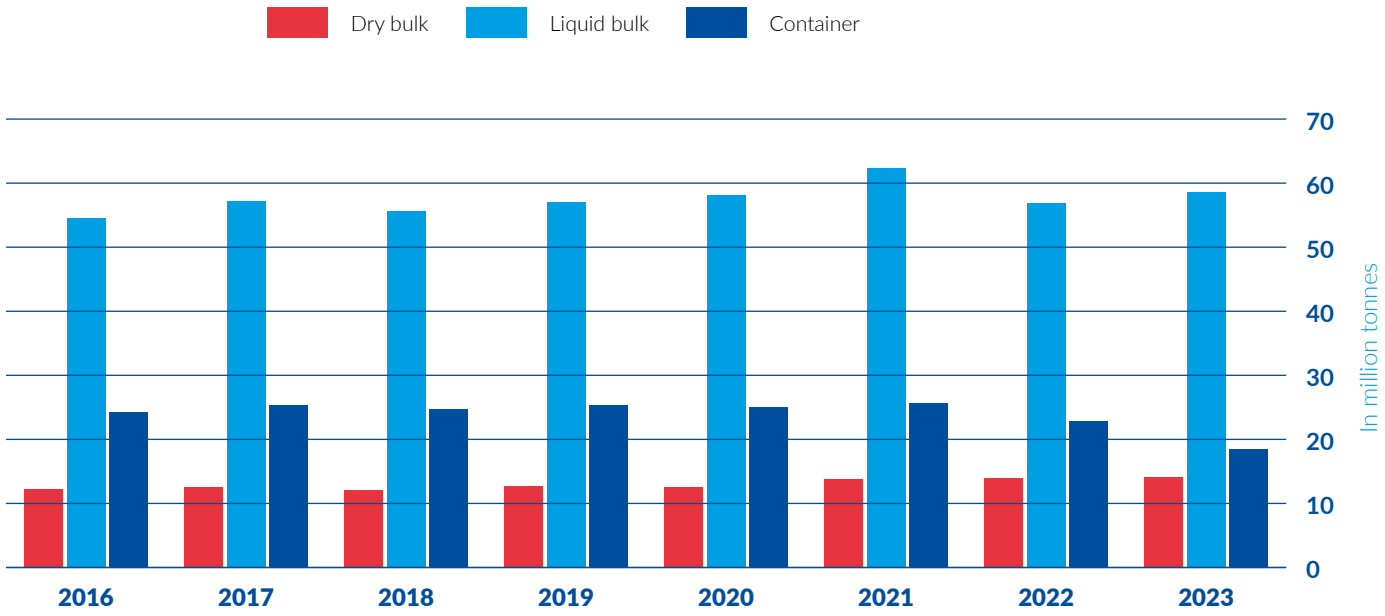


Source: Port of Antwerp-Bruges

** From 2021 onwards, figures for inland waterway cargo handling at the Port of Antwerp and Zeebrugge appear under the name "Port of Antwerp-Bruges".*

[28] *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 4: **INLAND WATERWAY CARGO HANDLING IN THE SEAPORT OF ANTWERP-BRUGES PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: Port of Antwerp-Bruges
** Ro/ro, general and not assigned goods are not taken into account in these calculations (in 2023, the volume transported for these three cargo types amounted to 6.6 million tonnes mostly attributed to general goods).*
From 2021 onwards, figures for inland waterway cargo handling at the Port of Antwerp and Zeebrugge appear under the name "Port of Antwerp-Bruges".

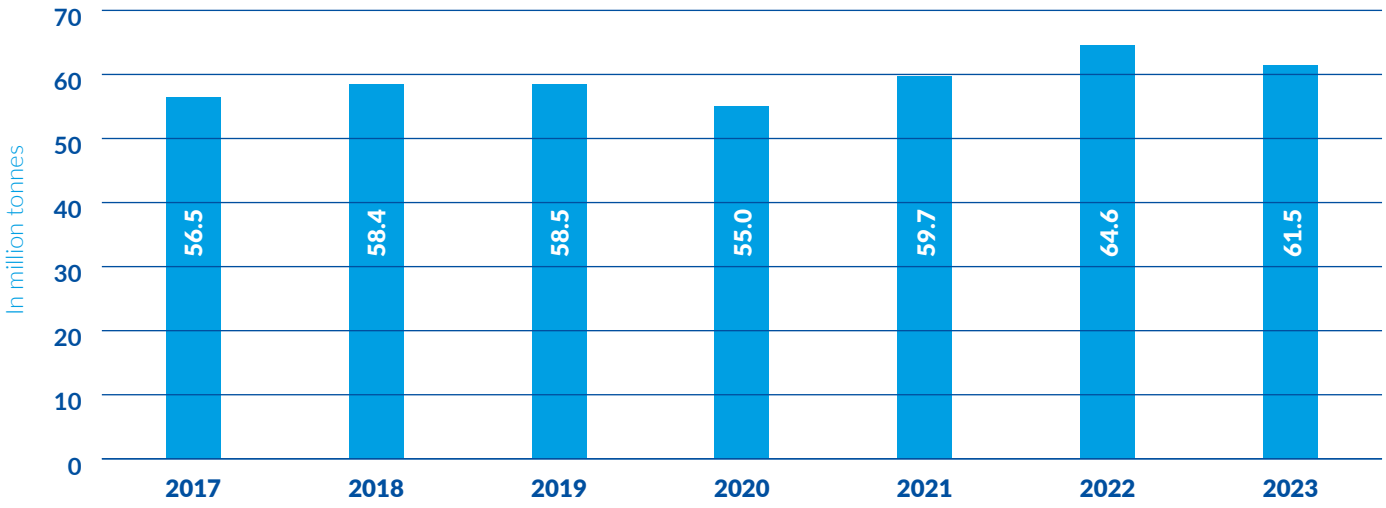
NORTH SEA PORT

In 2023, 37,752 inland vessels called in at North Sea Port (Ghent, Terneuzen, Borsele, Flushing), compared to 40,645 in 2022.

Because of the difficult geopolitical and economic conditions such as the Russian full-scale invasion and war of aggression against Ukraine, the energy crisis, the rise in commodity prices and the reduced global demand, inland waterway transhipment sustained a -4.8% drop in 2023 compared to 2022, reaching 61.5 million tonnes (this decrease reached -10.6% for maritime throughput). Both liquid bulk (-6.6% compared to 2022) and dry bulk (-7.9%) decreased while container transport strongly increased (+36.8%). Both imports (-5.6%) and exports (-4.3%) decreased.

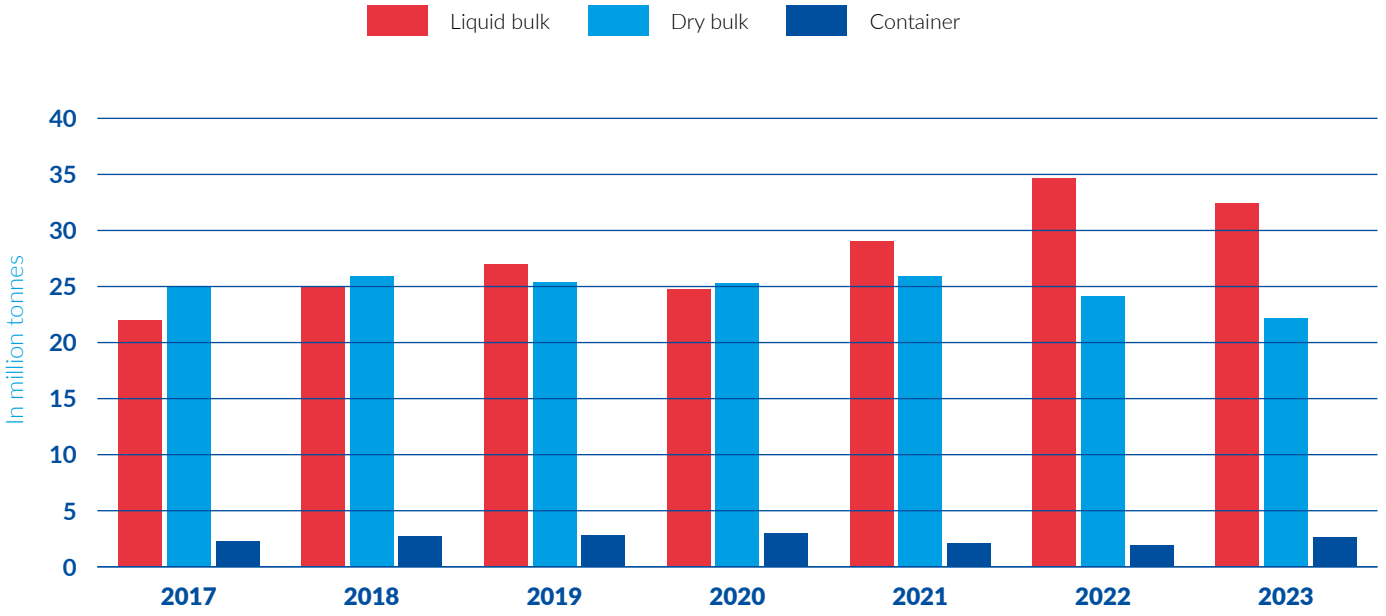
As for the modal split within hinterland transport, inland navigation ranks first with a share of 60.6% (including 2 additional percentage points taken from road) followed by road (28.1%), rail (9.6%) and transhipment or feeder traffic (1.6%).

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



Source: North Sea Port

FIGURE 6: **INLAND WATERWAY CARGO HANDLING IN THE NORTH SEA PORT PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: North Sea Port

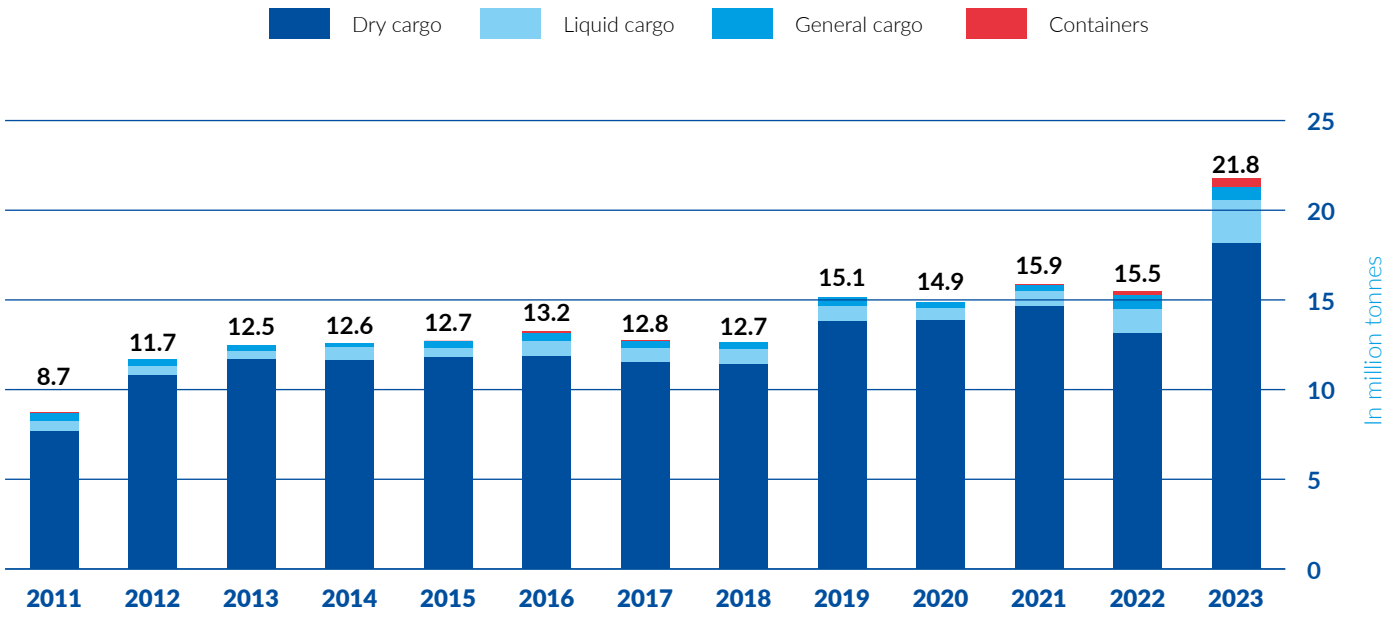
** Ro/ro and conventional cargo are not taken into account in these calculations (in 2023, the volume transported for these two cargo types amounted to 0.1 million tonnes and 4.2 million tonnes respectively).*

CONSTANŢA

In Constanța, 14,614 inland vessels called at the port in 2023 (10,890 in 2022). As for maritime traffic, IWT traffic in 2023 recorded at the Port of Constanța was the highest recorded in history. It reached 21.8 million tonnes, an increase of +40% compared to 2022. This growth is mainly attributed to higher volumes of grain transport. Indeed, Ukraine is one of the world's largest grain exporters, and Constanța has become the largest alternative export route since the start of the Russian full-scale invasion and war of aggression against Ukraine. The cargo handled at the port of Constanța in relation to Ukraine (covering both maritime and IWT) has registered 25 million tonnes, of which 14 million can be attributed to Ukrainian grain transiting through the port of Constanța.

Regarding IWT specifically, mainly dry cargo is handled at the Port of Constanța, with a share of almost 85% of the total IWT cargo volume handled. Dry cargo volumes registered a +40% increase compared to 2022. While the largest increase in dry bulk was propelled by grain, an increase was also recorded for iron ore as well as steel and iron scrap. For the second year in a row, liquid cargo volumes almost doubled, which can be attributed mainly to an increase in the volumes of petroleum products handled at the port. Container transport also reached a record year for the second year in a row and more than doubled compared to 2022. It however remains at low levels compared to liquid and dry bulk. General cargo remained stable. IWT traffic mainly consists of transit traffic and cabotage.

FIGURE 7: **INLAND WATERWAY CARGO HANDLING IN THE SEAPORT OF CONSTANŢA** (IN MILLION TONNES)



Source: Port of Constanța

HAMBURG

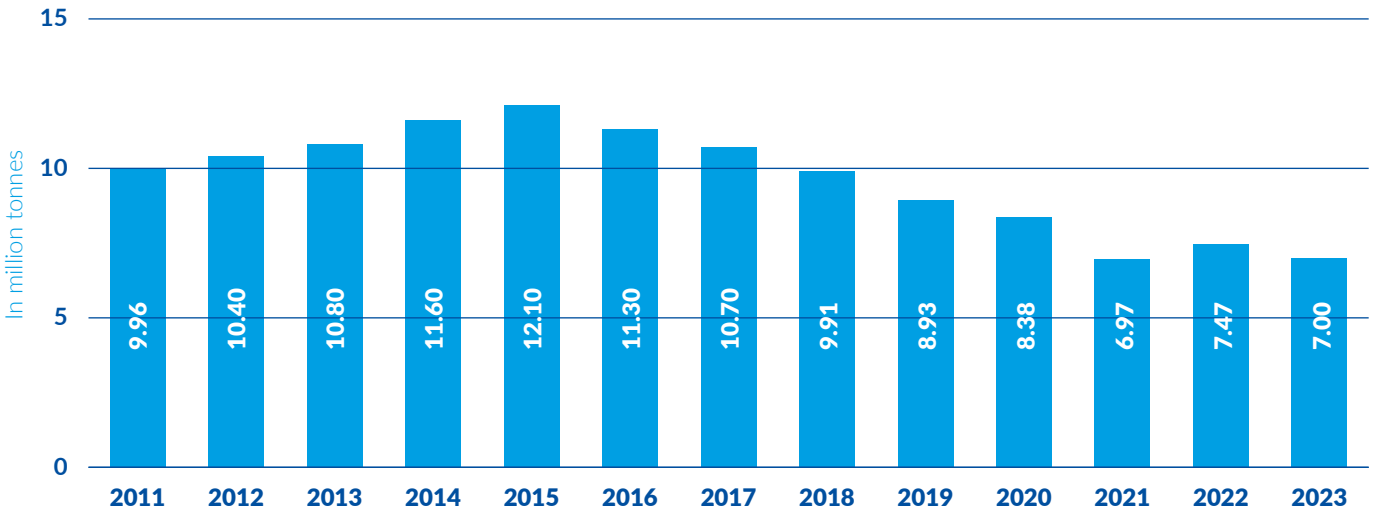
IWT cargo handling dropped by -6.2% in 2023 (7.00 million tonnes) compared to 2022 (7.47 million tonnes): exports suffered a decrease (-15.6%) while imports increased slightly (+1.9%). This reduction is attributed to the unfavourable economic conditions closely linked to the worldwide geopolitical situation.

Containers and dry cargo volumes decreased by -15.7% and -7.8% respectively between 2022 and 2023. For the containers category, which has been decreasing since 2021, this reduction has been mainly driven by the general difficult macroeconomic context which also affected many other European ports in 2023. Among dry cargo, the coal segment experienced a strong drop (-32.1%) compared with 2022 when there was a shift towards coal in the energy sector as a result of the war in Ukraine. This shift towards coal was no longer observed in 2023 and Germany has continued its energy transition, leading to sustainable electricity production and shifting away from coal-fired power stations.

As to liquid cargo, volumes remained stable between 2022 and 2023.

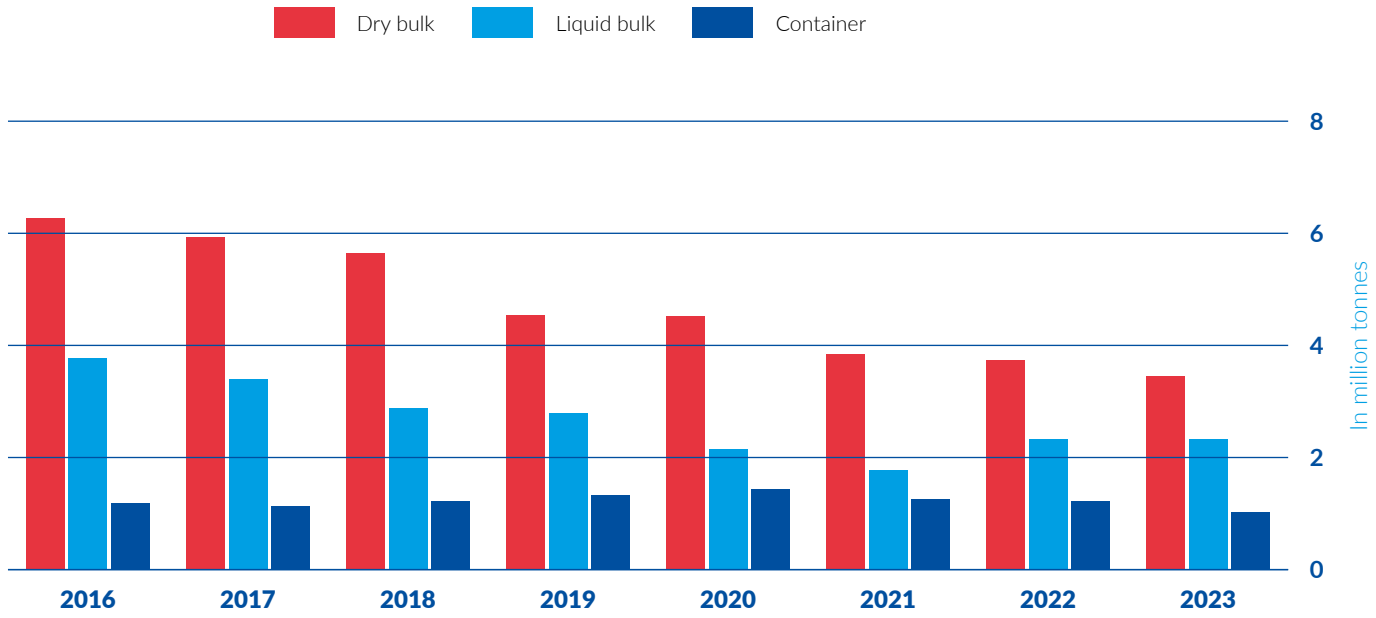
In 2023, the entire hinterland transport amounted to 85.3 million tonnes (compared to 88 million tonnes in 2022). With a share of 53.5% (-0.4 percentage point), railway transport is ahead of truck transport with 38.1% (+0.5 percentage point) and inland waterway transport with 8.4% (-0.1 percentage point).

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



Source: Statistical Office of Hamburg and Schleswig-Holstein

FIGURE 9: **INLAND WATERWAY CARGO HANDLING IN THE SEAPORT OF HAMBURG PER CARGO SEGMENT** (IN MILLION TONNES) *



Source: Statistical Office of Hamburg and Schleswig-Holstein

* *General cargo is not taken into account in these calculations (in 2023, the volume transported for this cargo type amounted to almost 0.2 million tonnes).*

MAIN EUROPEAN
INLAND AND SEAPORTS[29]

RHINE PORTS

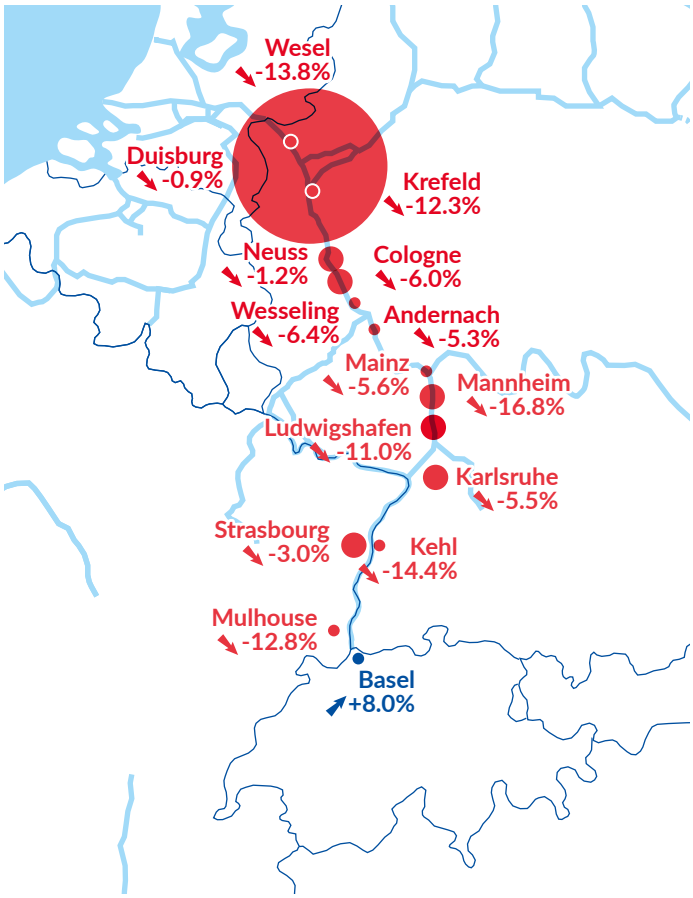
TABLE 1: **INLAND WATERWAY CARGO HANDLING IN MAJOR RHINE PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2023/2022** *

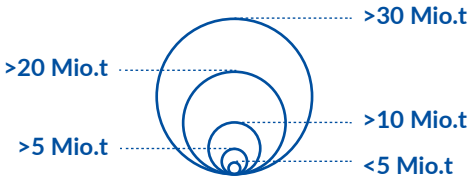
	2020	2021	2022	2023	2023/2022
Duisburg	42.4	44.9	41.9	41.5	-0.9%
Cologne	9.1	9.8	8.2	7.7	-6.0%
Karlsruhe	6.2	6.4	6.8	6.4	-5.5%
Mannheim	6.9	7.3	7.6	6.3	-16.8%
Strasbourg	6.8	6.9	6.4	6.2	-3.0%
Neuss	6.5	6.6	5.6	5.5	-1.2%
Ludwigshafen	6.8	6.9	5.6	5.0	-11.0%
Basel	5.1	5.4	4.6	4.9	+8.0%
Mainz	3.8	3.1	3.5	3.3	-5.6%
Mulhouse	4.2	4.1	3.6	3.2	-12.8%
Kehl	4.4	4.4	3.2	2.7	-14.4%
Krefeld	3.0	3.4	3.1	2.7	-12.3%
Andernach	2.7	2.7	2.3	2.2	-5.3%
Wesseling	2.5	2.1	1.9	1.8	-6.4%
Wesel	2.0	2.1	2.1	1.8	-13.8%
Total	**112.4**	**116.3**	**106.5**	**101.4**	**-4.8%**

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.*

[29] *For German, French, Belgian and Rhine ports, the number of ports shown is limited to the 15 largest ports. Dutch ports currently do not appear due to a change of privacy policy of CBS.*

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)





Negative rate of change in 2023 vs 2022

Positive rate of change in 2023 vs 2022

PORTS IN GERMANY OUTSIDE THE RHINE *

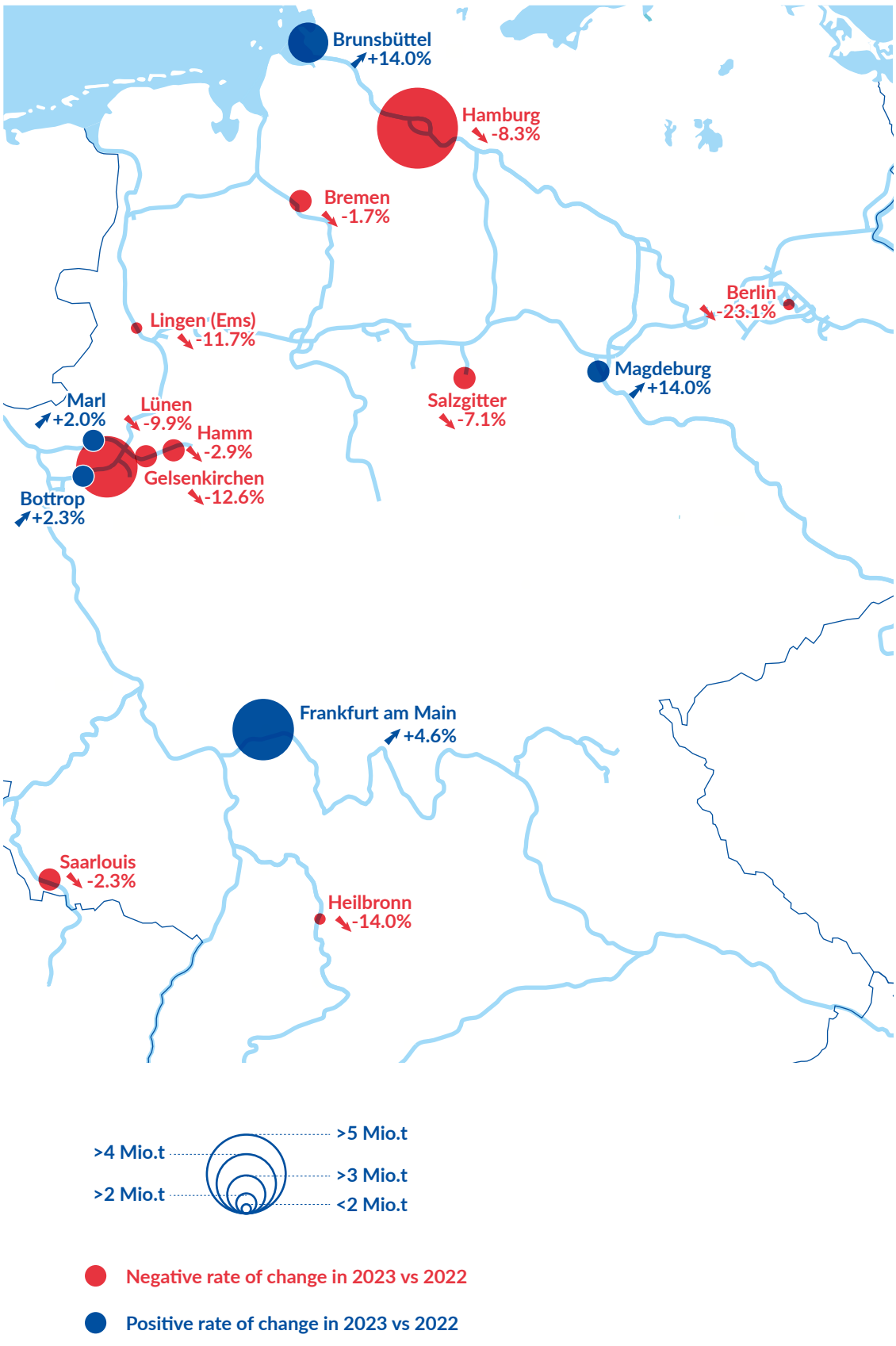
TABLE 2: **INLAND WATERWAY CARGO HANDLING IN MAJOR NON-RHINE PORTS IN GERMANY** (IN MILLION TONNES) **AND RATE OF CHANGE 2023/2022 ***

	2020	2021	2022	2023	2023/2022
Hamburg	7.9	7.6	8.3	7.6	-8.3%
Frankfurt am Main	5.7	5.4	4.8	5.0	+4.6%
Gelsenkirchen	4.6	4.9	4.9	4.3	-12.6%
Brunsbüttel	2.7	2.8	2.8	3.2	+14.0%
Marl	3.2	3.1	2.9	2.9	+2.0%
Bottrop	3.1	2.8	2.8	2.8	+2.3%
Bremen	2.7	3.3	3.2	2.7	-16.7%
Saarlouis	1.9	2.6	2.8	2.7	-2.3%
Magdeburg	2.6	2.7	2.4	2.7	+14.0%
Salzgitter	2.2	2.7	2.7	2.5	-7.1%
Lünen	1.8	2.3	2.6	2.3	-9.9%
Hamm	2.7	2.1	2.1	2.0	-2.9%
Lingen (Ems)	1.9	2.1	2.0	1.8	-11.7%
Heilbronn	1.8	2.2	1.9	1.6	-14.0%
Berlin	1.8	1.8	1.7	1.3	-23.1%
Total	46.6	48.4	47.7	45.5	-4.7%

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, the figures in accordance with this approach are therefore higher than the figures of the Port of Hamburg, due to other transhipment places in the city.*

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)



FRENCH AND BELGIAN[30] PORTS

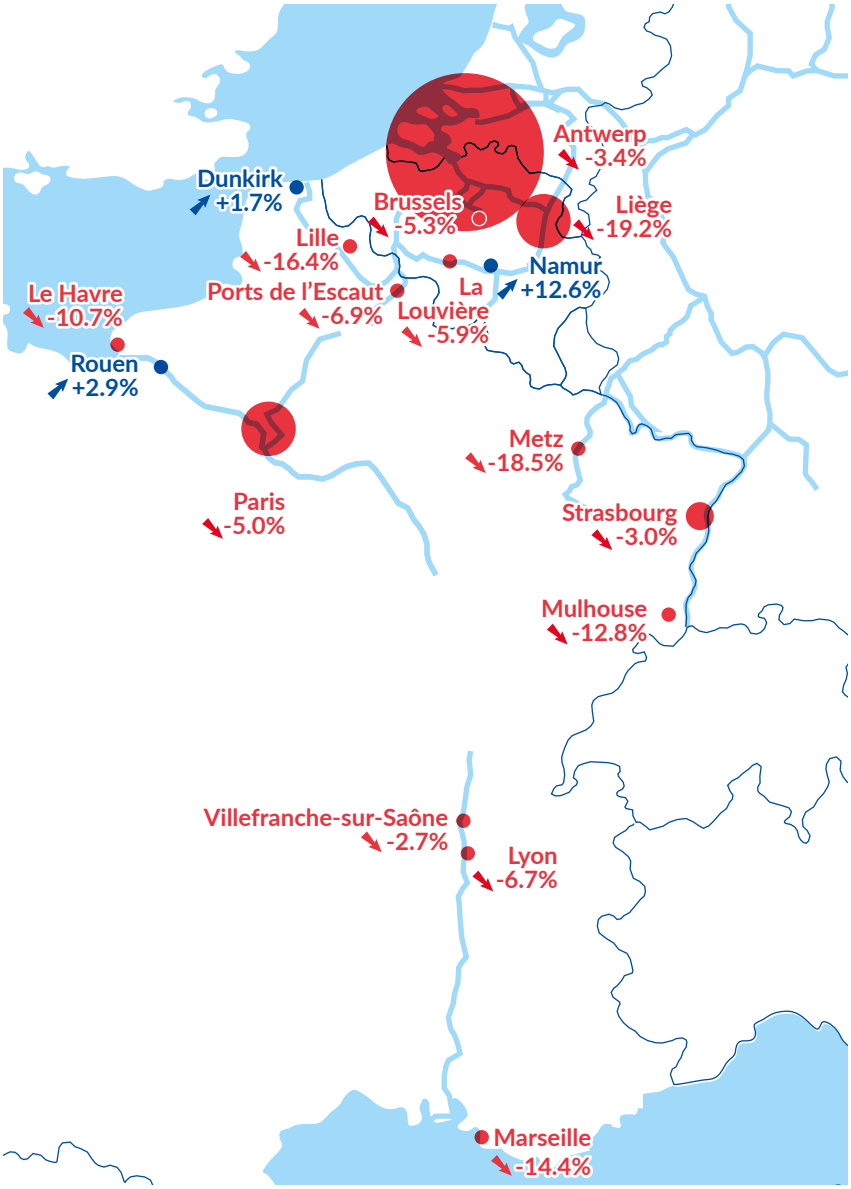
TABLE 3: **INLAND WATERWAY CARGO HANDLING IN MAJOR FRENCH AND BELGIAN PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2023/2022**

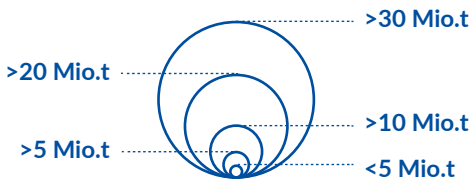
	2020	2021	2022	2023	2023/2022
Antwerp	101.0	109.4[31]	101.2	97.8	-3.4%
Paris	22.8	22.5	20.6	19.6	-5.0%
Liège	13.9	14.9	14.5	11.8	-19.2%
La Louvière	6.2	6.4	6.8	6.4	-5.9%
Strasbourg	6.8	6.9	6.4	6.2	-3.0%
Rouen	5.9	5.4	4.9	5.0	+2.9%
Brussels	4.9	5.4	5.1	4.8	-5.3%
Namur	3.8	4.3	4.3	4.8	+12.6%
Mulhouse	4.2	4.1	3.6	3.2	-12.8%
Le Havre	2.7	3.0	3.2	2.9	-10.7%
Dunkirk	2.9	2.6	2.1	2.1	+1.7%
Lille	2.0	2.3	2.4	1.9	-16.4%
Marseille	1.9	2.0	2.1	1.8	-14.4%
Metz	2.0	1.7	1.8	1.4	-18.5%
Lyon	1.0	1.2	1.2	1.1	-6.7%
Ports de l'Escaut[32]	1.1	1.2	1.2	1.1	-6.9%
Villefranche-sur-Saône	0.7	0.7	0.7	0.7	-2.7%
Total	**183.8**	**194.0**	**182.0**	**172.6**	**-5.1%**

Sources: Voies Navigables de France, Ports de Paris, Port de Liège, Port Autonome du Centre et de l'Ouest, 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-Bruges, Association française des ports intérieurs (AFPI)
The "total" relates only to the ports mentioned in the table, and not to all French and Belgian ports.

[30] *Ghent does not appear in the table since it merged with North Sea Port. Ghent nevertheless has to be mentioned as one of Belgium's major ports.*
[31] *From 2021 onwards, figures for inland waterway goods transport at the Port of Antwerp and Zeebrugge appear under the name "Port of Antwerp-Bruges".*
[32] *"Ports de l'Escaut" or "Syndicat Mixte Dock Seine Nord Europe Escaut", more information available at: https://hautsdefrance.cci.fr/cci-grand-hainaut/docks-seine-nord-europe-escaut/*

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)





Negative rate of change in 2023 vs 2022

Positive rate of change in 2023 vs 2022

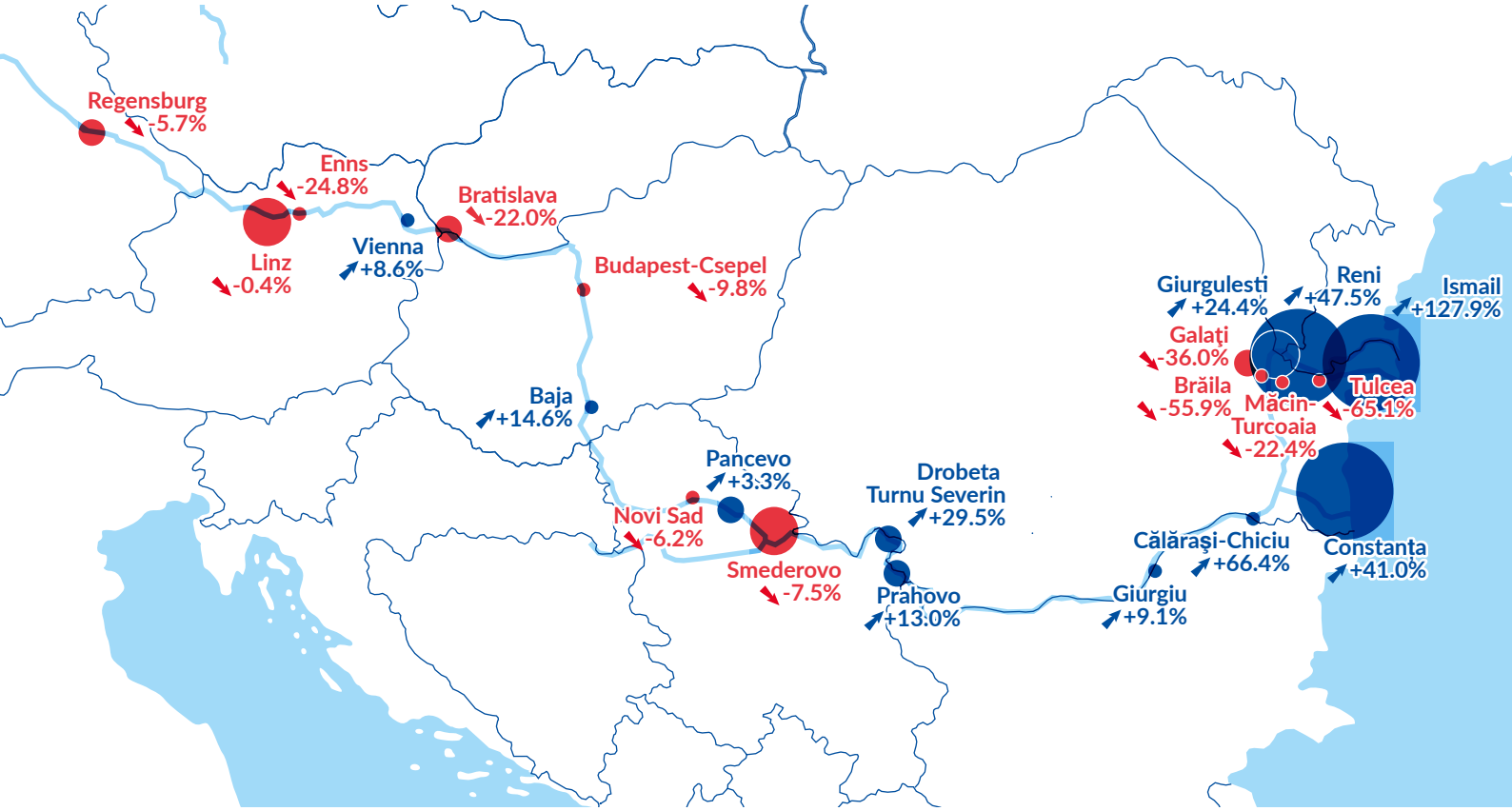
DANUBE PORTS

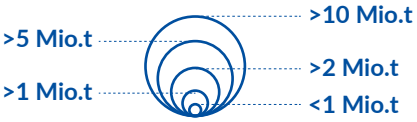
TABLE 4: **INLAND WATERWAY CARGO HANDLING IN MAJOR DANUBE PORTS** (IN MILLION TONNES) **AND RATE OF CHANGE 2023/2022**

	2020	2021	2022	2023	2023/2022
Constanţa	14.5	15.8	15.4	21.7	+41.0%
Ismail	3.2	4.1	8.9	20.3	+127.9%
Reni	0.8	1.4	6.8	10.1	+47.5%
Linz	3.4	3.5	2.9	2.9	-0.4%
Smederovo	2.6	3.2	3.0	2.8	-7.5%
Giurgulesti	1.2	1.8	2.1	2.7	+24.4%
Galaţi	2.8	3.3	3.0	1.9	-36.0%
Pancevo	2.0	0.9	1.6	1.6	+3.3%
Bratislava	1.5	1.8	1.9	1.5	-22.0%
Drobeta Turnu Severin	1.0	1.2	1.0	1.4	+29.5%
Regensburg	1.5	1.3	1.1	1.0	-5.7%
Prahovo	1.2	1.0	0.9	1.0	+13.0%
Budapest-Csepel	1.2	1.2	1.0	0.9	-9.8%
Novi Sad	1.6	1.4	0.9	0.9	-6.2%
Călăraşi-Chiciu	0.9	0.9	0.6	0.9	+66.4%
Măcin	1.2	1.2	0.9	0.7	-22.4%
Giurgiu	0.8	1.0	0.7	0.7	+9.1%
Vienna	0.8	0.9	0.6	0.6	+8.6%
Brăila	0.3	0.5	0.8	0.4	-55.9%
Enns	0.6	0.7	0.5	0.4	-24.8%
Baja	0.8	0.6	0.3	0.3	+14.6%
Tulcea	1.2	1.3	0.5	0.2	-65.1%
Total	**45.1**	**49.0**	**55.4**	**75.0**	**+34.8%**

Sources: Danube Commission market observation, Romanian National Institute of Statistics
The "total" relates only to the ports mentioned in the table and not all Danube ports. The data used in Figure 6 come from the Port of Constanța while the data used in this table come from the Romanian National Institute of Statistics. This can explain the slight difference in the figures reported.

TOTAL YEARLY WATERSIDE TRAFFIC (IN MILLION TONNES)





Negative rate of change in 2023 vs 2022

Positive rate of change in 2023 vs 2022

SAVA PORTS

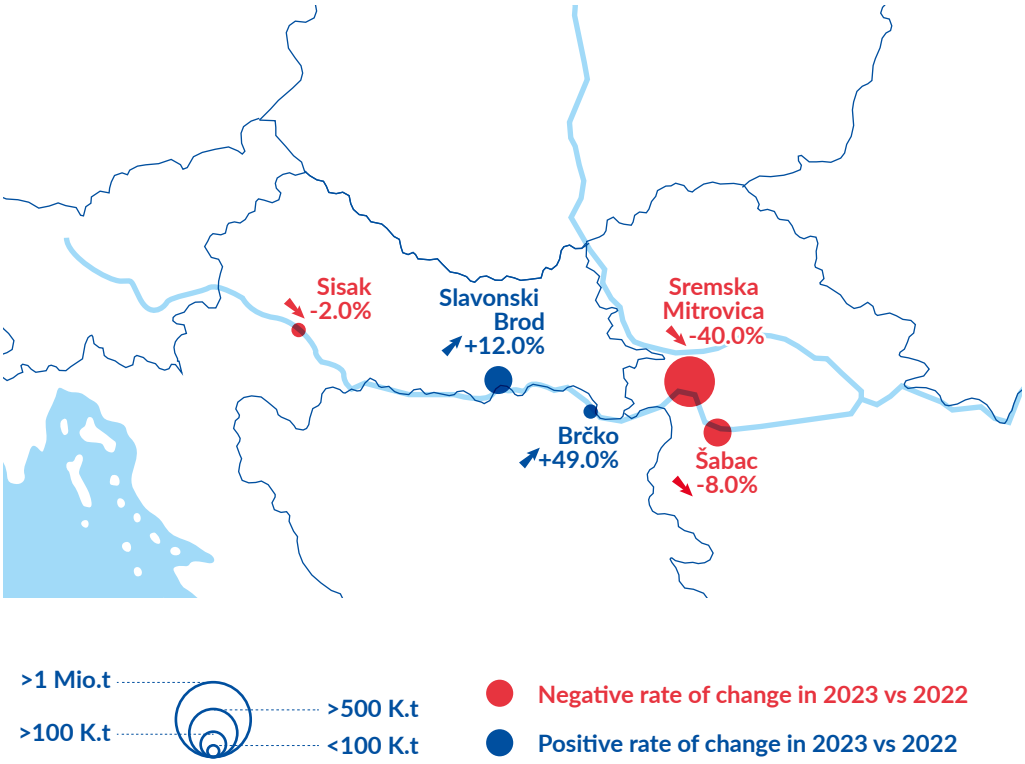
TABLE 5: **INLAND WATERWAY CARGO HANDLING IN MAJOR SAVA PORTS** (IN 1,000 TONNES) **AND RATE OF CHANGE 2023/2022 ***

	2020	2021	2022	2023	2023/2022
Other ports (Serbia)	2,100	2,283	3,200	4,381	+37.0%
Sremska Mitrovica (Serbia)	486	693	1,194	722	-40.0%
Šabac (Serbia)	170	224	142	131	-8.0%
Slavonski Brod (Croatia)	138	192	161	180	+12.0%
Sisak (Croatia)	55	29	38	29	-2.0%
Brčko (Bosnia and Herzegovina - BaH)	73	31	41	61	+49.0%
Total	3,022	3,452	4,775	5,504	+15.0%

Source: International Sava River Basin Commission

** In 2015, the Port of Šamac in Bosnia and Herzegovina reported bankruptcy, therefore no transhipment of cargo has been recorded since then. The production process of Brod oil refinery has been at a standstill since 2020. Since 2018, data for smaller transhipment places in Serbia began to be collected as part of the category "other ports".*

TOTAL YEARLY WATERSIDE TRAFFIC (IN 1,000 TONNES)

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06

CARGO FLEETS

- The newbuilding rate for dry and liquid vessels showed an increase in 2023, compared to 2022. Thirty new vessels were added to the dry cargo fleet in western Europe, and 45 new vessels added to the tanker fleet.
- The average loading capacity for newly built dry cargo vessels amounted to 2,664 tonnes in 2023 which was a slight increase compared to the average of 2,499 tonnes in 2022. The average loading capacity of the new tanker vessels increased from 2,868 tonnes in 2022 to 4,022 tonnes in 2023.
- In 2023, the capacity utilisation of the fleet was lower than in 2022. This was due to a reduced transport demand and higher water levels. The strongest reduction in capacity utilisation was recorded for large dry cargo vessels.

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 and tug boats	
RHINE FLEET	6,928	1,398	1,332	9,658
DANUBE FLEET	2,652	204	499	3,355
OTHER COUNTRIES *	1,561	26 #	719	2,306
	11,141	1,628	2,550	15,319

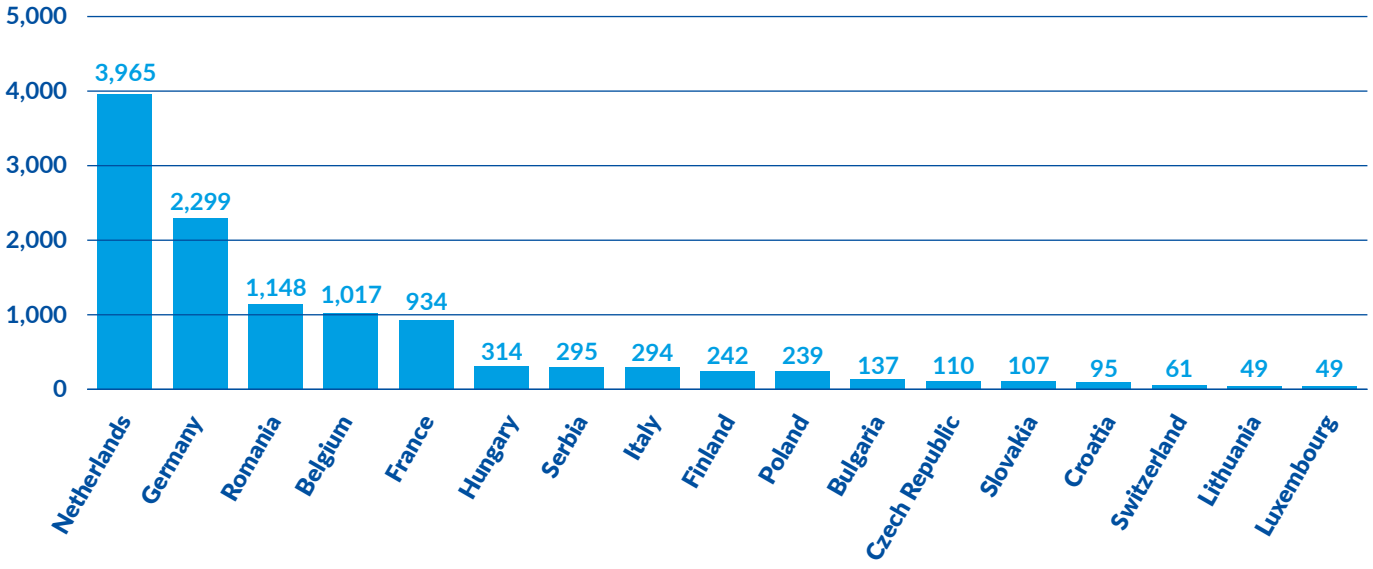
Sources: 1) Rhine countries: VNF (France), CBS/Rijkswaterstaat (Netherlands), ITB (Belgium), German Waterways and Shipping Administration (WSV), inland waterway register of Luxembourg, Swiss Waterway Administration 2) Danube countries: Danube Commission 3) Other countries: Eurostat [iww_eq_loadcap], [iww_eq_age], Ministry of Transport of the Czech Republic, Statistics Poland, Statistics Lithuania. For push boats and tugs: Eurostat [iww_eq_age].

** 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.

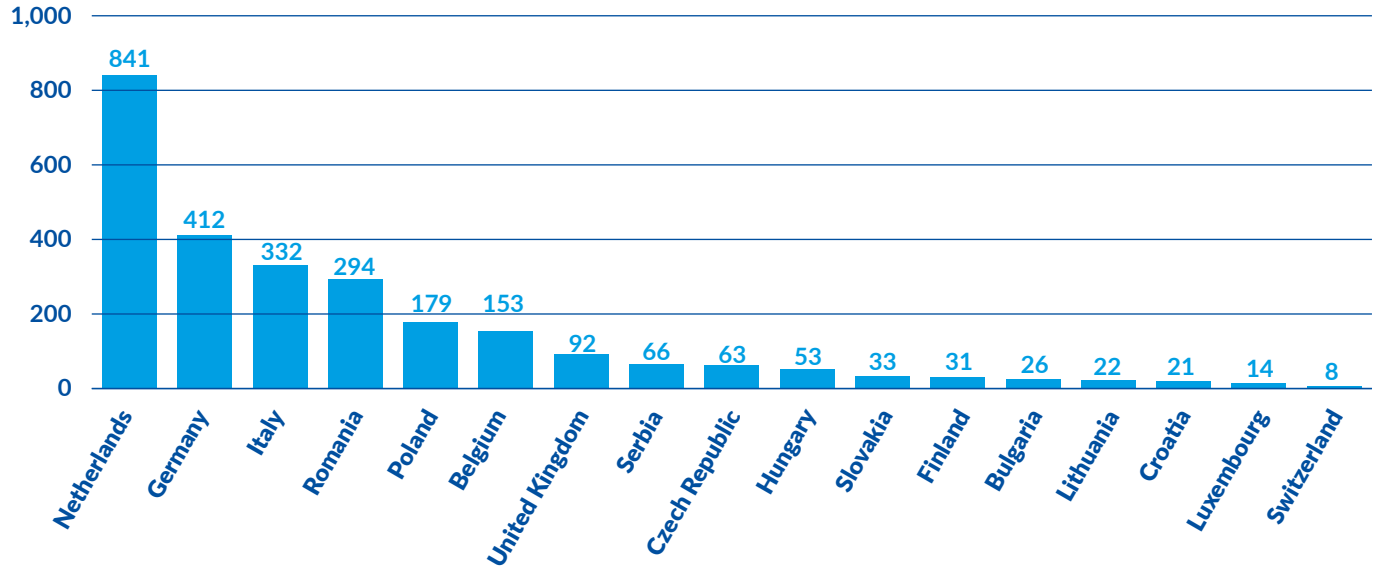
The following figures show the number of dry and liquid cargo vessels taken together (self-propelled vessels and barges) and the number of push and tugboats per country in Europe.

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



Sources: Eurostat [iww_eq_loadcap] and national sources for Rhine countries
** Most data are from 2022 and 2023.*

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



Source: Eurostat [iww_eq_age]
** Most data are from 2022.*

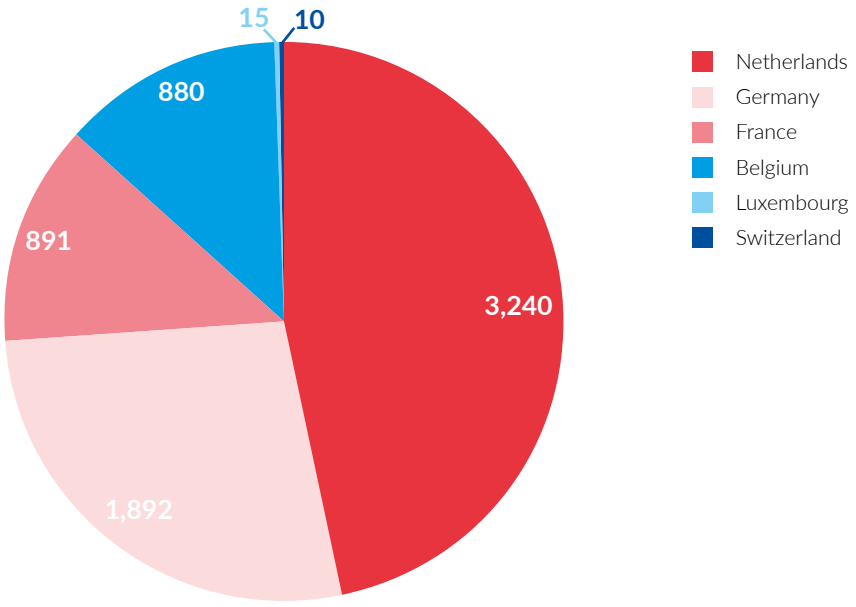
II EVOLUTION OF THE RHINE FLEET

DRY CARGO FLEET IN RHINE COUNTRIES

Fleet data used for this part are entirely based on national fleet data from waterway administrations. The reason for this 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 (in the Netherlands as well as abroad) in 2023.[33] The total number of dry cargo vessels registered in Rhine countries was, according to these sources, 6,928 in 2023, compared to 7,288 in 2022 and 7,437 in 2021. As these figures show, there has been a clear downward trend, in particular in the most recent past. This downward trend is due to problems of company succession in the dry cargo market segment, but also due to the more recent export of dry cargo vessels from the Rhine to the Danube region within the Solidarity Lanes initiative.

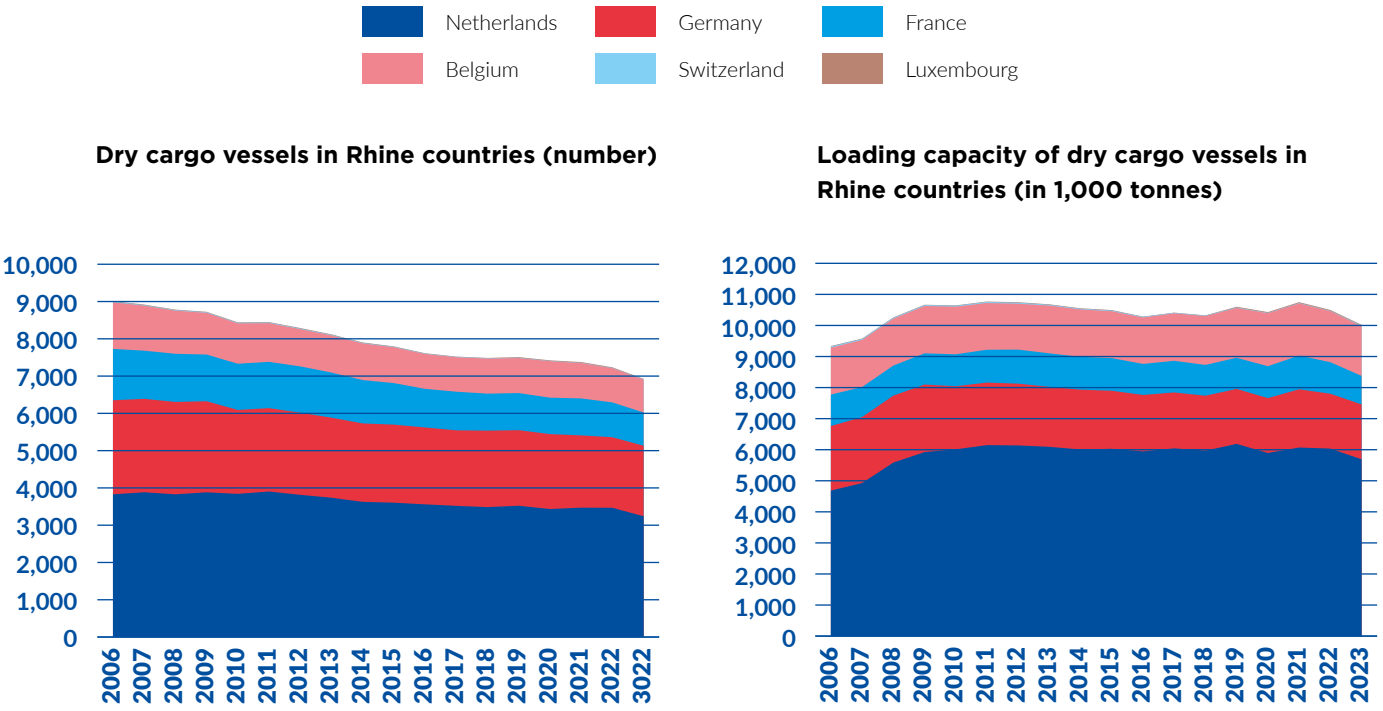
FIGURE 3: **NUMBER OF DRY CARGO VESSELS IN RHINE COUNTRIES IN 2023 ***



Source: CCNR based on national data (see Table 1)
** Data for Germany relate to 2022.*

[33] The Statistical Office of the Netherlands (CBS) receives raw data on the operative fleet in the Netherlands from the Waterway Administration (Rijkswaterstaat) and transmits them to the CCNR. These vessels are operative as they have passed measurement points in 2023 in the Netherlands.

FIGURES 4 AND 5: **DRY CARGO FLEET IN RHINE COUNTRIES ***



Source: CCNR based on national data (see Table 1)
** Data for Germany relate to 2022.*

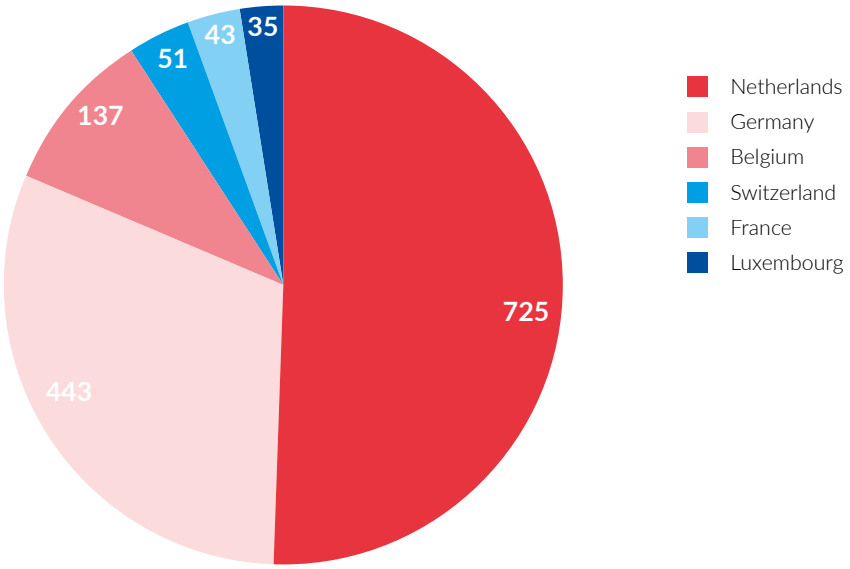
The total loading capacity of the dry cargo Rhine fleet has remained rather constant since 2008 and amounted to 10.0 million tonnes in 2023. The average loading capacity per vessel was 1,447 tonnes in 2023, compared to 1,296 in 2012.

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 (see 2022 Annual Report, Chapter 6).

LIQUID CARGO FLEET IN RHINE COUNTRIES

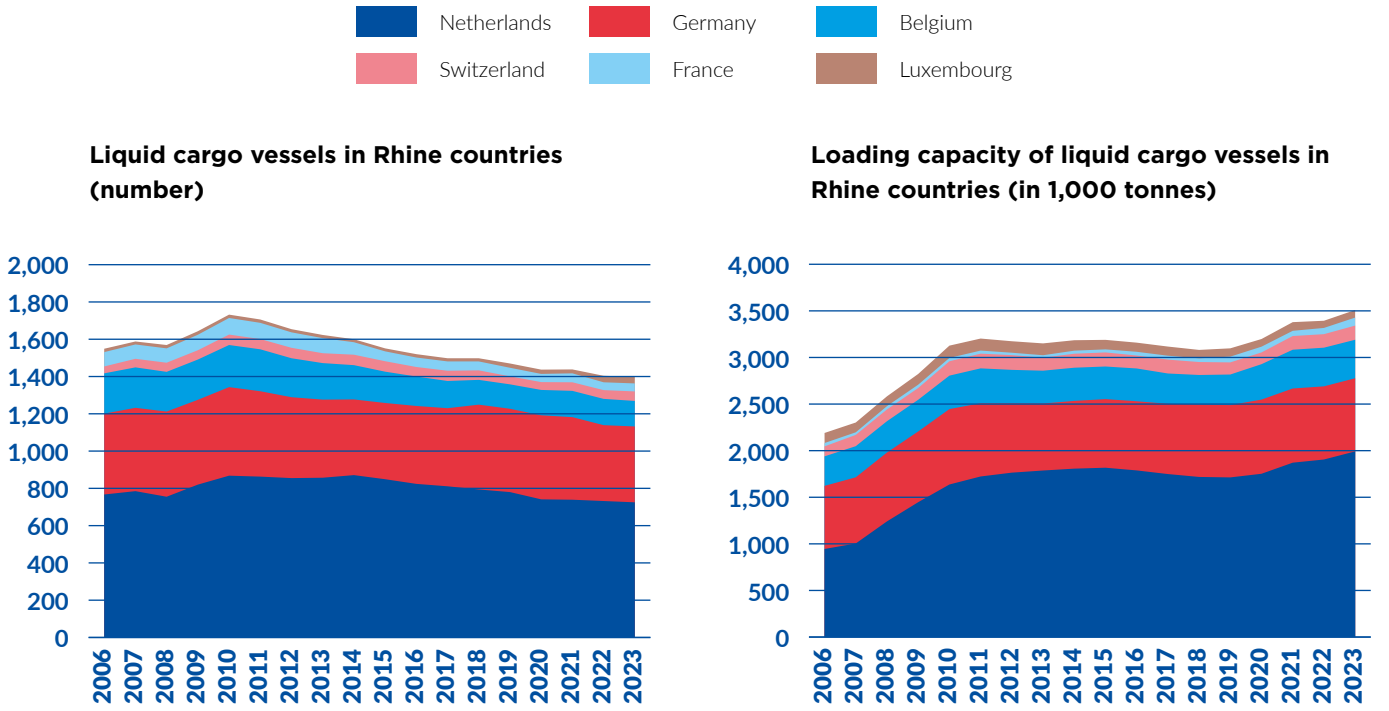
The share of the Dutch fleet within all liquid cargo vessels in Rhine countries is 52%. Switzerland and Luxembourg have relatively high numbers of tanker vessels (share of 4% and 2% respectively). The total number of tanker vessels has decreased since 2012, as the number of vessels being phased out (mostly single hull vessels) was higher than the number of new (double hull) vessels entering the market.

FIGURE 6: **NUMBER OF LIQUID CARGO VESSELS IN RHINE COUNTRIES IN 2023 ***



Source: CCNR based on national data (see Table 1)
** Data for Germany relate to 2022.*

FIGURES 7 AND 8: **LIQUID CARGO FLEET IN RHINE COUNTRIES**



Source: CCNR based on national data (see Table 1)
** Data for Germany relate to 2022.*

Despite a decline in the number of tanker vessels, the loading capacity of the entire tanker fleet has increased in recent years. This reflects the growing average size of newly built vessels in the tanker market. Due to this trend, the average loading capacity of a tanker vessel in Rhine countries has risen to 2,510 tonnes in 2023, compared to 1,919 tonnes in 2012.

II EVOLUTION OF THE DANUBE FLEET

DRY CARGO FLEET IN THE DANUBE REGION

According to the Danube Commission (DC) statistics (with clarification based on surveys of shipping companies in the DC Member States), by the end of 2017,[34] 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 (the German-flagged fleet is counted by port of registry on the Danube). 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 2: **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 as from 2005. However, from the year 2014 onwards, this 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.[35]

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

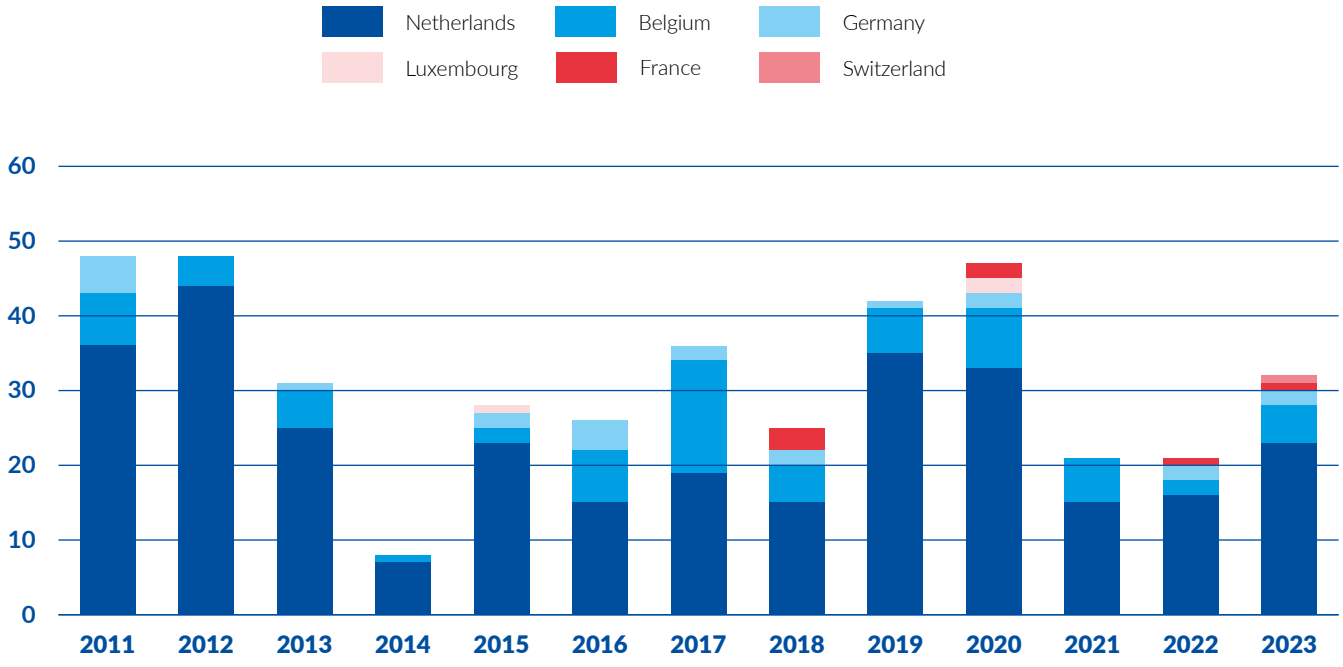
NEW VESSEL CONSTRUCTION IN RHINE COUNTRIES[36]

In 2023, newbuilding activity has accelerated compared to 2022, a year in which the newbuilding activity had slowed down acutely for several reasons (decline in transport of goods, cost increase in shipbuilding, uncertain macroeconomic and geopolitical conditions). Both the number of new dry cargo vessels and new liquid cargo vessels have increased significantly, with 32 new dry cargo vessels and 47 new liquid cargo vessels having been built, which is respectively 9 and 14 more than in 2022.

Dry cargo

The majority of the new dry cargo vessels entering the market in 2023 are registered in the Netherlands (23 out of 32), followed by Belgium (5 out of 32), with Germany, France, and Switzerland contributing very little to the total.

FIGURE 9: **NEW DRY CARGO VESSELS COMING ON THE MARKET PER COUNTRY OF REGISTER** (NUMBERS, 2011-2023)

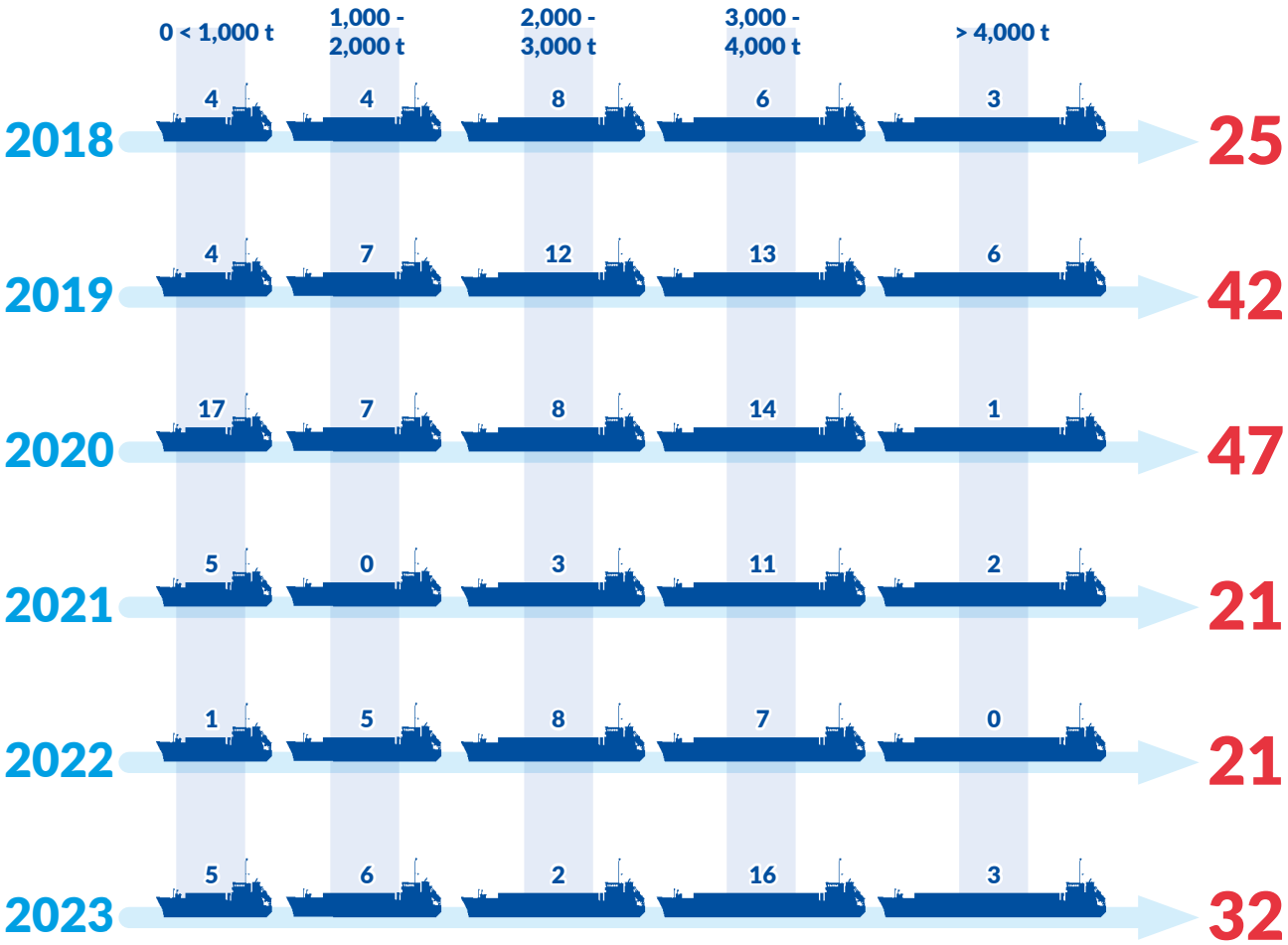


Source: IVR

[36] *The Netherlands, Germany, Belgium, France, Switzerland, Luxembourg*

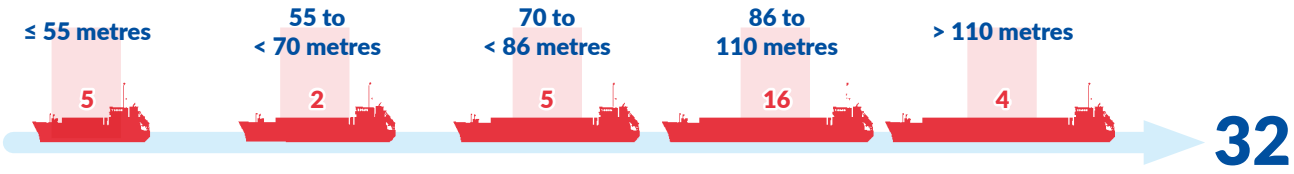
As often, the most common loading capacity for newly built dry cargo vessels in 2023 was in the 3,000 < 4,000 tonnes range. The average loading capacity amounted to 2,664 tonnes which was a slight increase compared to the average of 2,499 tonnes in 2022.

TABLE 3: **NEWLY BUILT DRY CARGO VESSELS ACCORDING TO LOADING CAPACITY**



Source: IVR
Note that in 2023, for three newly built vessels, the deadweight was partly estimated due to initially missing values. Estimations were also made in the previous years.

TABLE 4: **NEWLY BUILT DRY CARGO VESSELS IN 2023 BY LENGTH**

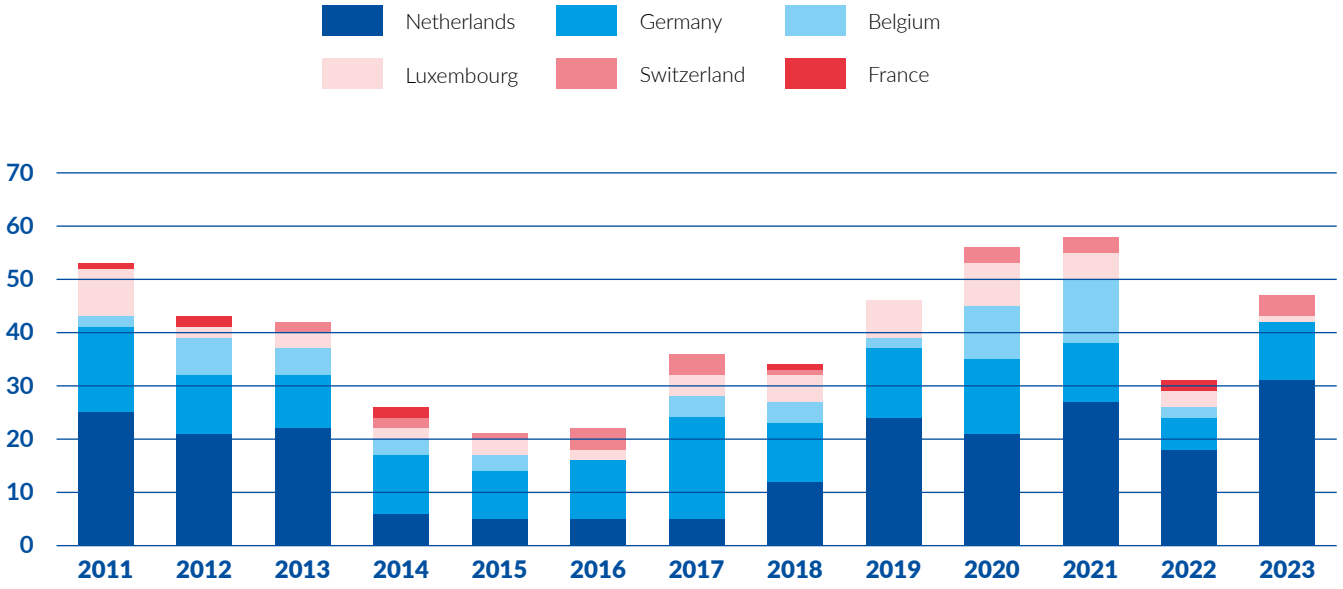


Sources: IVR, CCNR analysis

Liquid cargo

According to the IVR database, 47 new tanker vessels entered the market in 2023, a significant increase compared to 2022, when only 31 were built. This number is closer to the figures of previous years, which were 46 in 2019, 56 in 2020, and 58 in 2021. As usual, most new vessels are registered in the Netherlands (31), followed by Germany (11).

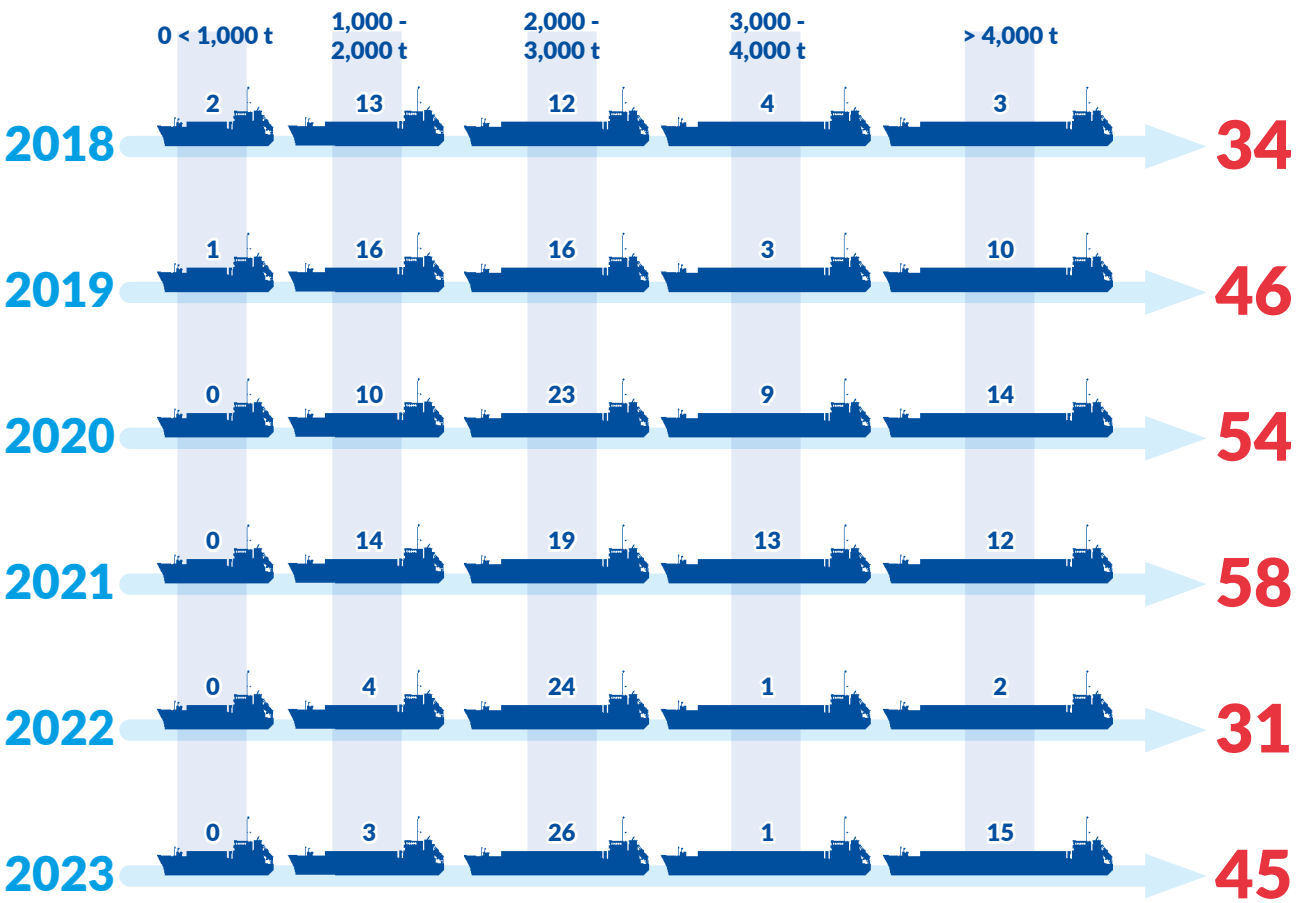
FIGURE 10: **NEW TANKER VESSELS COMING ON THE MARKET PER COUNTRY OF REGISTER** (NUMBERS, 2011-2023)



Source: IVR
Note: two tanker vessels, which were excluded from tables 5 and 6 because of missing data, have nevertheless been included in this figure, explaining the difference in total number of newly built ships in 2023.

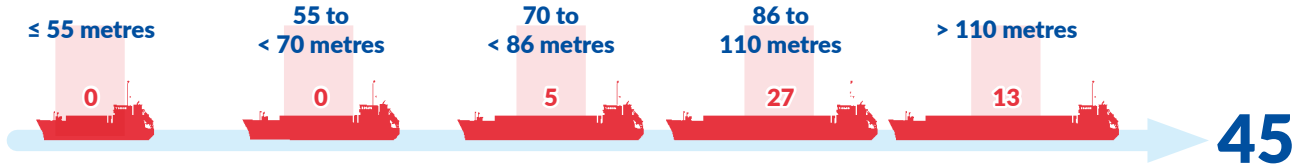
The most common loading capacity of the new tanker vessels is in the category 2,000 < 3,000 tonnes, with 26 new tanker vessels in 2023. The overall average loading capacity increased from 2,868 tonnes in 2022 to 4,022 tonnes in 2023. This is solely explained by the high number of newbuilt vessels in the > 4,000 tonnes category in 2023 (15) compared to 2022 when only two such vessels were built. In general, an increasing number of vessels are built to have a loading capacity exceeding 4,000 tonnes, often by several thousand tonnes, confirming the trend towards larger vessels being built in the liquid cargo segment observed in recent years.

TABLE 5: **NEWLY BUILT TANKER VESSELS ACCORDING TO LOADING CAPACITY**



Sources: IVR, CCNR analysis
Note that in 2023, for six newly built vessels, the deadweight was partly estimated due to initially missing values. Estimations were also made in the previous years. Two additional tanker vessels were excluded from the analysis, as they were not put in service by the time this report was published.

TABLE 6: **NEWLY BUILT TANKER VESSELS IN 2023 BY LENGTH**

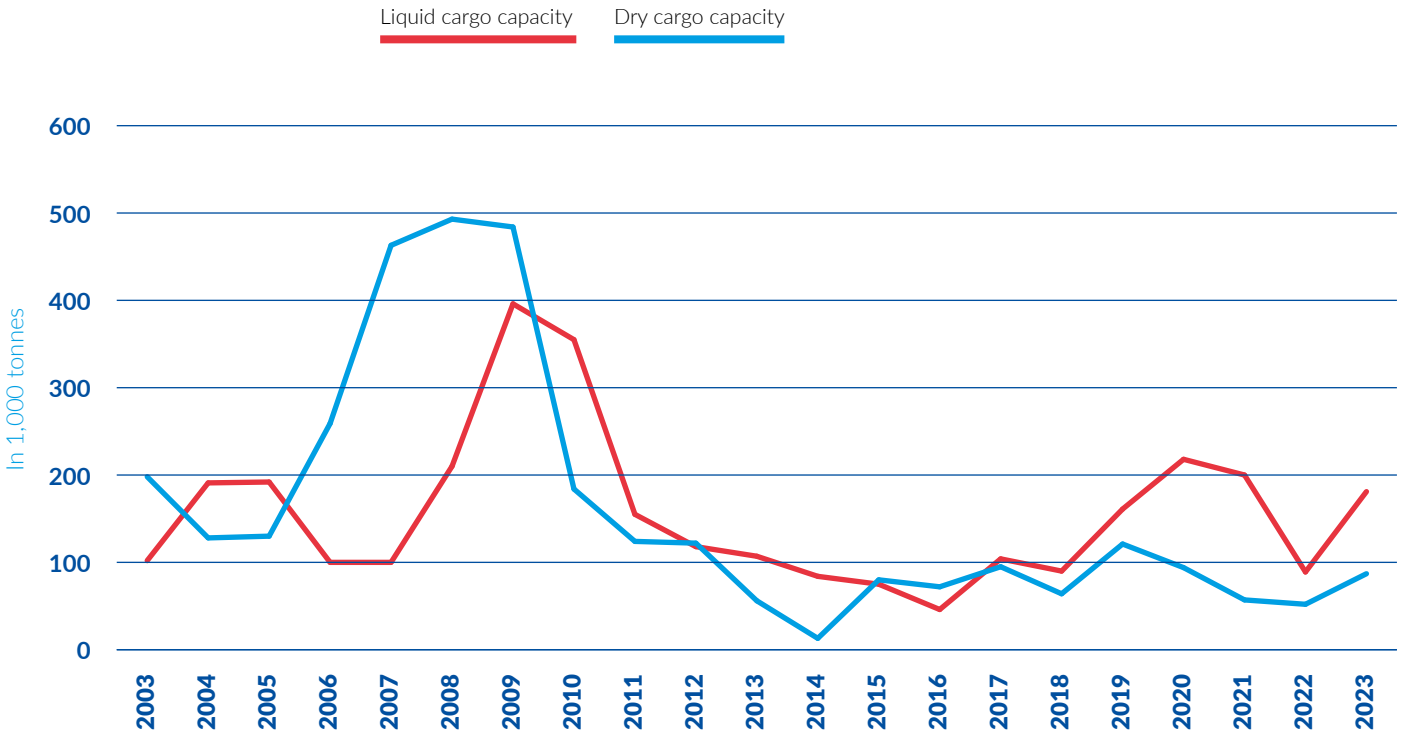


Sources: IVR, CCNR analysis
Note: two additional tanker vessels were excluded from the analysis, as they were not in service by the time this report was published.

Six new push boats and tugs were built in 2023 (compared to four in 2022), of which four are registered in the Netherlands, one is registered in Germany, and one in Belgium.

Figure 11 illustrates the new loading capacity for dry and liquid cargo vessels entering the market by year. Following a prolonged slump post-financial crisis, recent years have witnessed a resurgence in new capacity, with liquid cargo vessels experiencing a more substantial increase compared to dry cargo vessels. The years 2021 and 2022 saw a slowdown in newbuilding activity due to the uncertainty in business induced by the pandemic and the Russian full-scale invasion and war of aggression against Ukraine. However, 2023 witnessed a recovery in newbuilding activity, climbing back to pre-pandemic levels.

FIGURE 11: **NEW CAPACITY COMING ON THE MARKET FOR DRY AND LIQUID CARGO** (LOADING CAPACITY IN 1,000 TONNES)

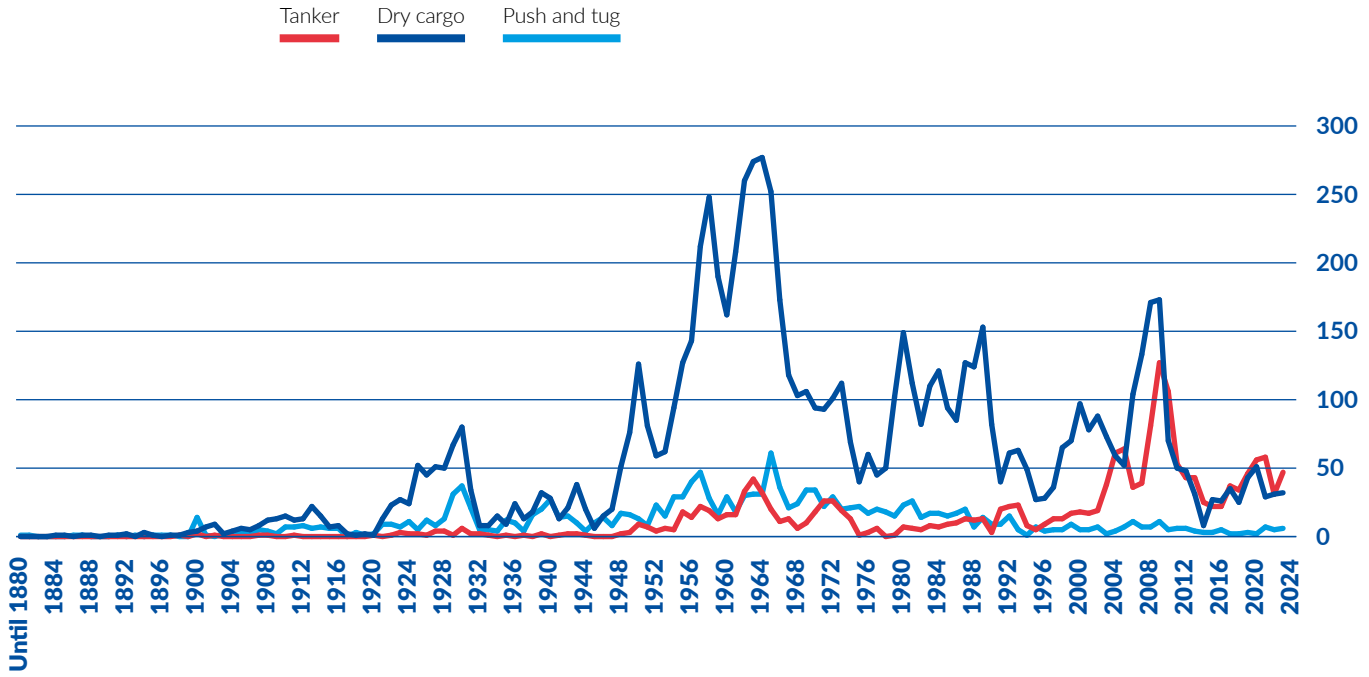


Source: IVR
Note: two additional tanker vessels were excluded from the analysis, as they were not in service by the time this report was published. In 2023, for three newly built vessels, the deadweight was partly estimated due to initially missing values. Estimations were also made in the previous years.

AGE STRUCTURE
OF THE RHINE CARGO FLEET

According to the vessel database of the IVR,[37] around 80% of the dry cargo fleet was constructed in the 20th century, whereas this share for the tanker fleet amounts to around 40%. According to this same database, the Netherlands holds the largest number of vessels within the Rhine fleet in almost every vessel category, followed by Germany.

FIGURE 12: **COMMISSIONING YEARS FOR THE RHINE FLEET OVER TIME** (NUMBER OF INLAND VESSELS)



Sources: IVR, CCNR analysis
Note that 135 dry cargo vessels and 31 push and tug vessels have an unknown year of construction. Furthermore, 255 additional tanker vessels, 1,876 dry cargo vessels and 496 push and tug vessels are recorded in the IVR database as being registered in countries other than Rhine countries.

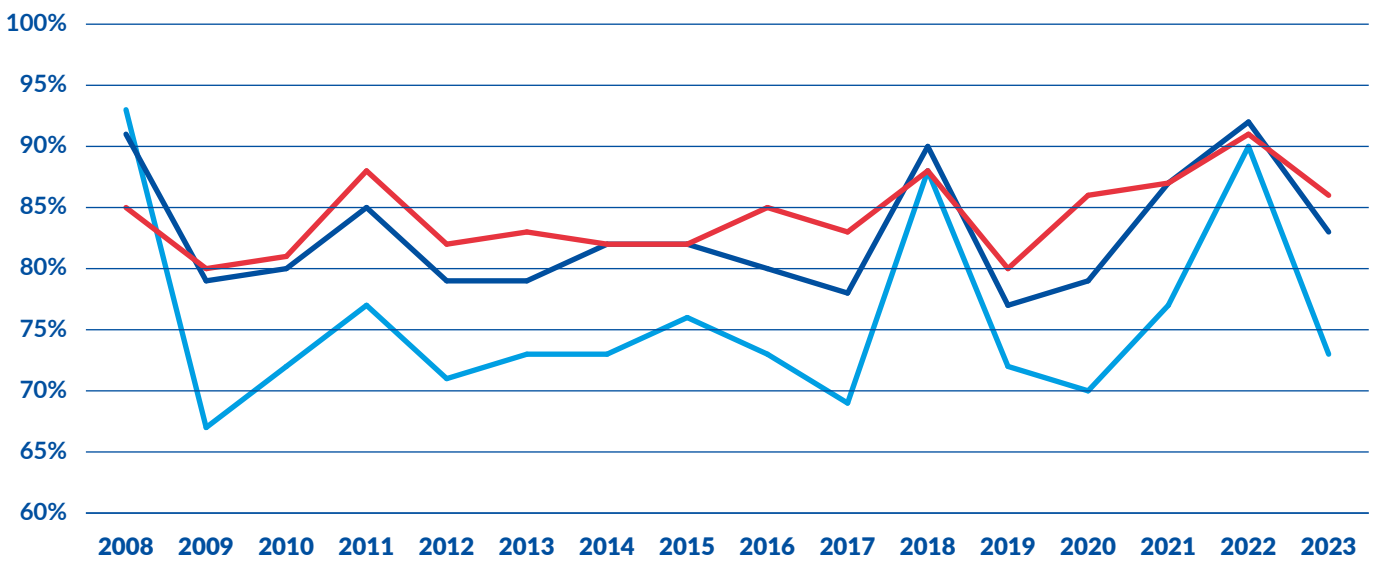
[37] *The IVR database accounts for active vessels but might also include some inactive vessels, in particular those commissioned in earlier years.*

CAPACITY MONITORING

DRY CARGO VESSELS

The year 2023 was difficult for the dry cargo fleet. Weak economic prospects, consequently low industrial production in Germany and global trends such as energy transition, reduced transport demand for traditional commodities and containers. More locally, the nitrogen crisis in the Netherlands caused declining volumes in the construction sector and less demand for animal feed raw materials. The container market, which was for years an unprecedented growth market for the dry cargo fleet, also showed a sharp drop in volumes in 2023 across all transport markets, both domestic and international. This was partly due to global factors as all major seaports also saw declining figures. However, the decreasing volumes transported by inland navigation also indicates a possible reverse modal shift which in turn can be linked to reliability issues due to congestion in seaports and more frequent low water levels, as for instance in autumn 2018 and more recently, in summer 2022. Overall, a sharp drop in cargo volume for dry cargo vessels was observed and, despite continued high demand for vessel capacity in the Danube countries, this manifested itself in declining capacity utilisation.

FIGURE 13: **EVOLUTION OF CAPACITY UTILISATION FOR DRY CARGO VESSELS IN WESTERN EUROPE**



Source: Panteia

From the viewpoint of capacity utilisation, it could be seen as a 'blessing in disguise' that the fleet capacity of the dry cargo fleet has fallen sharply in recent years, mainly due to exports of vessels towards the Danube basin. In the Danube region, as a result of the war in Ukraine, there is a high demand for small, medium and large dry cargo vessels to carry grain shipments in particular. Estimates for 2023 again show exports towards the Danube countries of around 50 motor vessels and a similar number of barges. As a result, the fleet capacity of the dry cargo fleet in western Europe has fallen very sharply in recent years. In 2023, a solid decrease representing around 3% of the total fleet capacity available, could be observed.

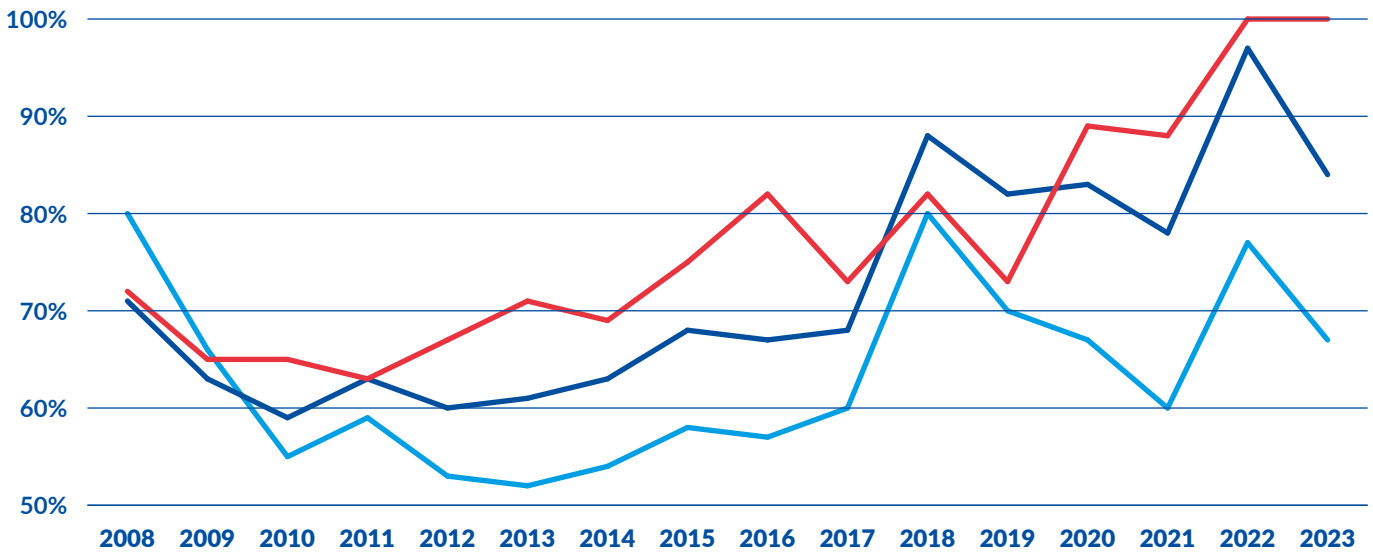
The year 2023, unlike 2022, showed encouraging navigation conditions on the Rhine with relatively favourable water levels. Except for a short-lived period of about 2 weeks in the month of October, there were no significant restrictions on navigation depth. This contrasts sharply with the year 2022, during which water levels were very low over a relatively long period during the summer months. This forced goods destined for ports on the Middle and Upper Rhine to be switched via alternative modes of transport.

It is important to realise that dry cargo shipping must once again start to position itself as an attractive alternative to road freight transport. Indeed, there is a risk of substantial overcapacity of large vessels in particular in the short and medium term. Traditional cargo segments such as coal and ores will not show growth in the coming years. The same applies to agribulk, while in the construction materials market, national restrictions (especially in the Netherlands) are reducing volumes. Fleet capacity will continue to decline to a limited extent in the coming years.

LIQUID CARGO VESSELS

In the liquid cargo segment, unlike in the dry cargo market, volumes remained relatively stable with only limited declines. Of particular note was the decline in chemical product volumes, while the petroleum product market remained stable. This, combined with more favourable navigation conditions than the previous year 2022, and fleet capacity expansion through new construction of several tankers, led to lower capacity utilisation rates in the tanker market. Nevertheless, the situation is still acceptable and comparable to recent years without prolonged low water periods.

FIGURE 14: **EVOLUTION OF CAPACITY UTILISATION FOR LIQUID CARGO VESSELS IN WESTERN EUROPE**



Source: Panteia

The tanker shipping market characterises itself as hypersensitive to situations with extreme low water levels. Seen in this light, 2023 was a favourable year with only a brief period of not too extreme low water in the month of October. While this led to low loading rates of vessels in relation to the Middle and Upper Rhine, it did not cause extreme tightness on the market as water levels towards the Lower Rhine remained at an acceptable level. As a result, capacity utilisation of the tanker shipping market changed significantly compared to 2022, in which extreme low water levels occurred in the month of August. In that year, a substantial part of the fleet was unable to pass over the shallow water at Kaub, forcing refineries and chemical plants along the Middle and Upper Rhine to implement production restrictions. There were no such restrictions in 2023.

The outlook is also favourable in smaller niche markets of the tanker sector. The edible oil tanker market shows stable volumes and is expected to continue to grow in the coming years. For powder tankers, products such as cement and fly ash (residue from coal-fired power plants) will be replaced by alternative materials in the concrete industry. As the construction sector – despite restrictions in the Netherlands and also in Flanders due to nitrogen – does have a favourable outlook in the longer term, these submarkets will also continue to be well used. For the more traditional market segments, such as petroleum products, bio-alternatives will generate more rather than less demand in the shorter term. In the longer term, some of the domestic petrol distribution traffic will be phased out. The chemicals sector is currently experiencing a downturn, partly due to investment decisions by major industrial players in north-western Europe. But as long as the population continues to grow, practically speaking, demand for chemical products will also continue to grow.

There is, however, a threat of overcapacity in tanker shipping due to the large amount of new construction in the longer term. However, given high sensitivity to low water levels and the importance of security of supply, some degree of overcapacity is not necessarily a problem if it is contractually well regulated between carriers and shippers. The sectors on both sides of the chain currently seem to be aware of this.[38]

[38] This topic is closely related to issues of crew shortage which were further analysed and developed in the thematic report 2023 on labour market, available at: https://inland-navigation-market.org/year-n-1-archive/?lang=en

INNOVATIVE
DEVELOPMENTS IN THE INLAND NAVIGATION FLEET CONTRIBUTING TO REDUCING EMISSIONS

In accordance with the mandate given by the Mannheim Ministerial Declaration of 17 October 2018, the CCNR adopted in December 2021 a roadmap for reducing emissions from inland navigation,[39] which called for the creation of a database on innovative vessels.

To develop such a database, available data on innovative inland navigation vessels was compiled within the framework of the Inspection Regulation Committee of the CCNR, with the following scope:

- innovative vessel understood as designed to emit less air pollutants or greenhouse gases than a conventional diesel vessel;
- freight and passenger vessels with a Rhine Vessel Inspection Certificate or a Union certificate;[40]
- vessels planned, under construction, in service or cancelled projects.

Even if biofuels contribute to reducing - under certain conditions - greenhouse gas emissions, vessels running on biofuels were not taken into account in the analysis, as switching to biofuels does not call for a specific design or technical adaptation at the level of the vessel.

For the purpose of this analysis, 64 vessels were considered: 46 freight vessels, 17 day-trip passenger vessels and 1 cabin vessel.[41] The vast majority of the innovative vessels sail with a Rhine Vessel Inspection Certificate. They are mainly new built vessels (around 85%), but also retrofitted vessels (around 15%).

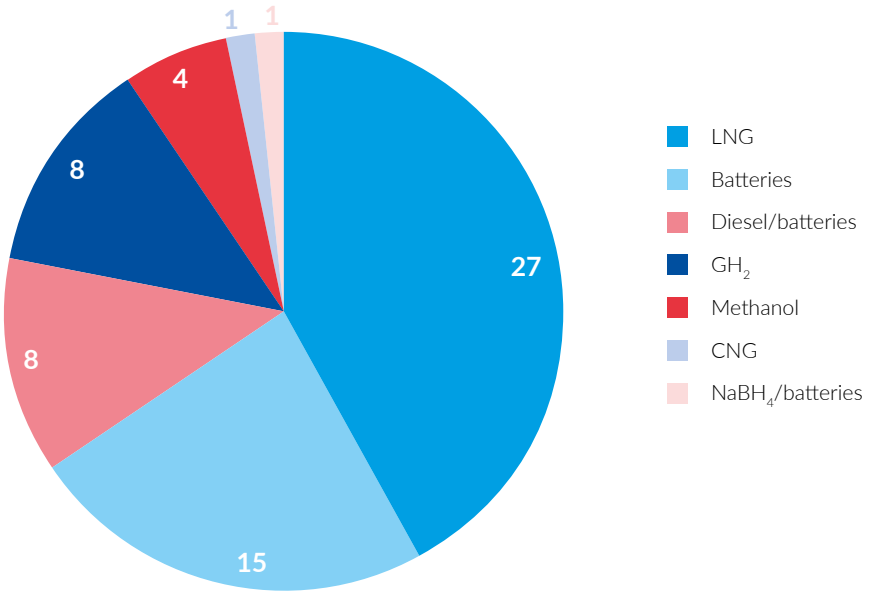
The number of innovative vessels in service represent less than 0.2% of the entire inland navigation fleet in Europe, 34 of which built, retrofitted or planned from 2021 onwards. Six came into service in 2023, and eight are still considered as projects (newbuilt mainly). Several projects were foreseen to be built in 2022 and 2023 but suffered some delays. Several projects have also been cancelled before their finalisation.[42] The reasons behind the cancellation of a project could be of a different nature, such as economic (not enough demand, lack of subsidies), organisational (withdrawal of a partner) or even technical (safety or operational issues). Most of the projects cancelled were LNG propelled vessels. Indeed, fossil LNG is no longer considered as a long-term option, notably for reducing carbon emissions in inland navigation. Two vessels operating with fuel cell systems were also cancelled or removed from service.

This trend does not prejudge the evolution of the number of innovative vessels outside the scope of this database.

[39] See https://www.ccr-zkr.org/files/documents/Roadmap/Roadmap_en.pdf
[40] This excludes vessels with a strictly national certificate or vessels below the thresholds of the Rhine Vessel Inspection Regulations (RVIR) and the directive (EU) 2016/1629.
[41] The training vessels and floating equipment were not taken into account for the purpose of this analysis but are included in the database.
[42] These are not taken into account in the 64 vessels considered in this analysis.

These innovative vessels run or are expected to run on - as the primary energy carrier[43] - batteries, compressed natural gas (CNG), liquefied natural gas (LNG), diesel, methanol, compressed hydrogen (GH_2) mainly in combination with batteries, or sodium borohydride with batteries ($NaBH_4$).

FIGURE 15: **NUMBER OF VESSELS USING ALTERNATIVE ENERGIES AS ONE OF THE MAIN ENERGY CARRIERS ***



Source: CCNR database

** The category "GH_2" includes 2 vessels operating with a combustion engine and 6 with fuel cell systems. The category "Methanol" includes 3 vessels operating with a combustion engine and 1 with a fuel cell system. The category "Diesel/batteries" consists solely of vessels which are capable of relying on batteries alone for propulsion. In this category, 7 of them are also equipped with a fuel cell system.*

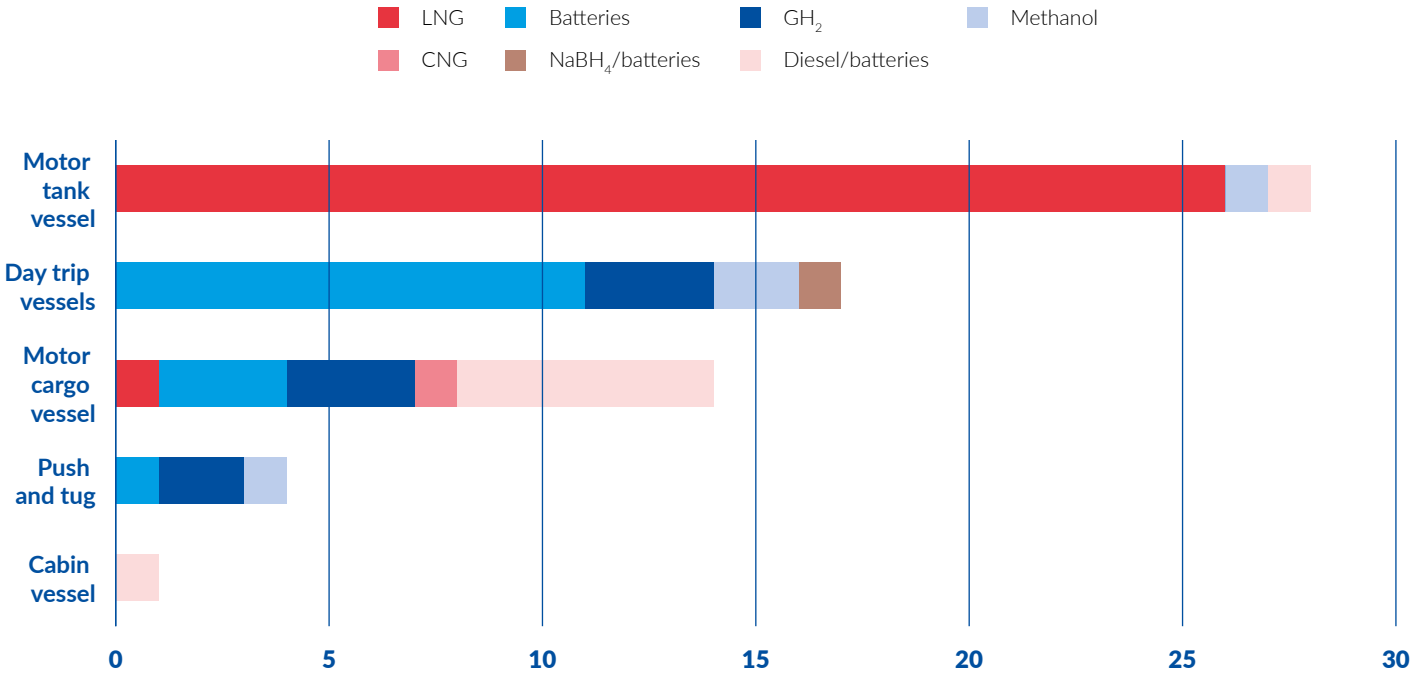
Figure 15 above reflects the alternative energies used as one of the main energy carriers (for vessel propulsion). It often comes with other energy carriers onboard, notably diesel engines for redundancy purposes or as an emergency power source. In other words, it is anticipated that different (modular) options for zero-emissions powertrains, using mixes of energy sources/fuels, will play a role in achieving the ambitious emission reduction objectives set at international level. This is confirmed by the profile of the innovative vessels (in service, under construction or project) which almost all use multiple energy carriers.

Moreover, there is no "one-size-fits-all" solution for achieving the energy transition. The choice of an appropriate emissions reduction technology depends on several factors, that include the sailing profile of the vessels, their type, the market segment in which they operate, but also the related technical constraints.

This is reflected in the following figure, showing how innovative applications find their way into the inland navigation sector.

[43] The primary energy carrier is the most commonly used for vessel propulsion, while secondary and tertiary energy carriers are used to a lesser extent.

FIGURE 16: **DISTRIBUTION OF INNOVATIONS PER VESSEL TYPE AND PRIMARY ENERGY CARRIER**[44]



Most of these innovative vessels are equipped with a combustion engine as their main energy converter (38), of which 31 are also equipped with an electric motor. In addition, seven vessels running mainly on batteries are also equipped with a combustion engine for redundancy purposes or as emergency power source. This is a positive evolution which should facilitate a modular system approach. Indeed, the integration of batteries or fuel cell systems in existing vessels require a vessel to be equipped with an electric motor in the first place. Eighteen vessels operate with battery electric propulsion systems and nine with fuel cell systems. It should be highlighted that one vessel is designed to use swappable batteries containers. The number of vessels with similar design might grow in the coming years.

[44] *Projects cancelled or out of service excluded.*

07

PASSENGER TRANSPORT

- The number of active river cruise vessels in 2023 reached 408, representing 60,702 beds in total (compared to 410 active vessels for 60,639 beds in 2022). The newbuilding activity has been rather slow since the Covid-19 pandemic, with only four being built in 2023, but it is expected to pick up again in 2024 and 2025.
- In 2022, the Russian full-scale invasion and war of aggression against Ukraine led to an increase in demand for hotel capacity for war refugees, and to some river cruise vessels being used as floating hotels in parallel to their usual cruising activities. Some older vessels have even been permanently converted. This trend continued in 2023, with 16 vessels having been permanently converted into floating hotels in 2023 compared to only six in 2022.
- The yearly cruise vessel movement figures for the Danube, Rhine and Moselle, as well as the catch-up phenomenon for capacity utilisation on the Danube in 2023, confirmed the general recovery of the river cruise sector in Europe. In addition, 1.22 million passengers from all over the world, notably from USA and Canada, travelled on European rivers in 2023, the Rhine and the Danube being the most frequented rivers in Europe.

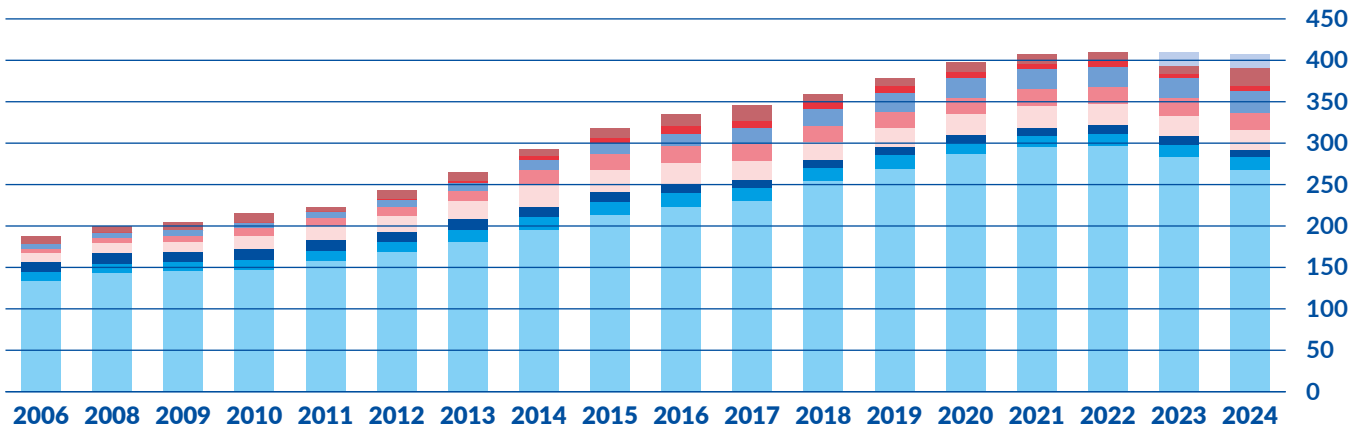
FLEET
FOR RIVER CRUISES[45]

The active river cruise fleet in Europe[46] , which represents more than 40% of the world active river cruise fleet, is mainly concentrated on central European waterways,[47] accounting for nearly 75% of the total river cruise fleet in Europe. In 2023, the number of active river cruise vessels in Europe reached 408,[48] representing 60,702 beds in total, compared to 410 active vessels with 60,639 beds in 2022.

Despite the Covid-19 pandemic coming to an end, the new building activity for river cruises remained rather slow in 2022 and 2023 but is expected to pick up again in 2024 and 2025. Despite a sharp decrease in inflation, the newbuilding activity continued to decline in 2023 due to persistently high shipbuilding costs as well as lower demand caused by geopolitical and economic uncertainty.

The Russian full-scale invasion and war of aggression against Ukraine has spurred an increase in the demand of hotel capacity for war refugees from Ukraine, adding to an already rising number of people asking for asylum in Europe. As a result, some vessels, in parallel to their cruising activities outside the main touristic seasons, are being used as floating hotels. Some vessels, particularly those that are more than 50 years old, have even been permanently converted to floating hotels; this was the case for six vessels in 2022 and 16 in 2023. In early 2024, 18 such vessels were declared; it is unknown whether they will return to the cruise market.

FIGURE 1: **NUMBER OF RIVER CRUISE VESSELS IN THE EU BY REGION OF OPERATION** (2006-2024) *

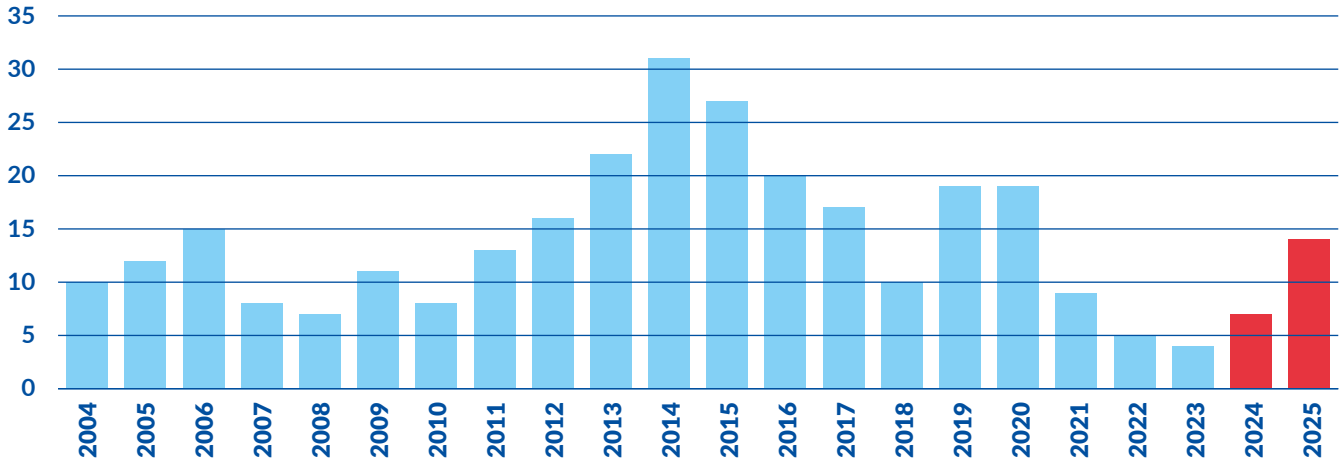


Source: A. Hader., The River Cruise Fleet Handbook (May 2024)
** 2024: based on order books as of May 2024, of which 18 are temporarily being used as floating hotels.*

[45] *A. Hader, The River Cruise Fleet Handbook (May 2024). Only river cruise vessels with a minimum of 40 beds are considered in this analysis.*
[46] *Europe without Russia and Ukraine*
[47] *Rhine, Main, Main-Danube Canal, Danube, Elbe-Oder*
[48] *Including 16 vessels used as floating hotels and not actively cruising.*

During the 2023 season, four new vessels were built (compared to five in 2022), as was planned in the order books and confirming the downward trend observed over the last years. However, seven new vessels are planned to be delivered in 2024, which might mark the start of a return to newbuilding, and this figure is even expected to double in 2025.

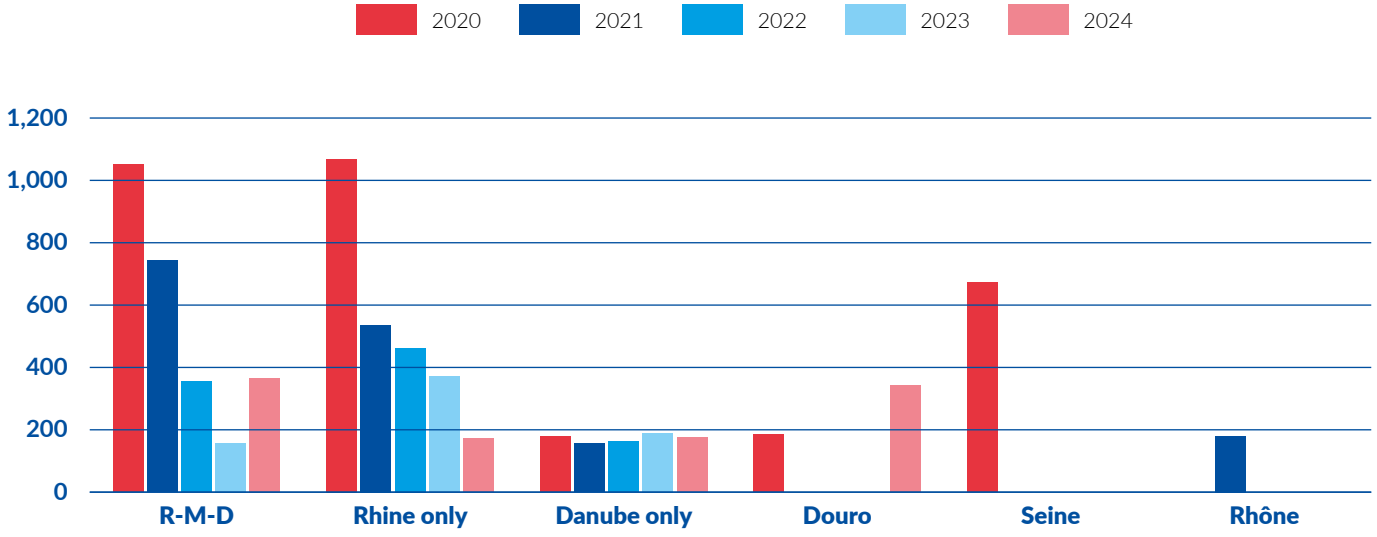
FIGURE 2: **NEW RIVER CRUISE VESSELS FOR THE EUROPEAN MARKET 2004-2025 ***



Source: A. Hader, The River Cruise Fleet Handbook (May 2024)
** 2024 and 2025: based on order books as of May 2024*

In 2023, the four new vessels brought an additional capacity of 720 beds (compared to 980 beds in 2022) to the river cruise market in Europe. An additional capacity of 1,056 beds is expected for the year 2024.

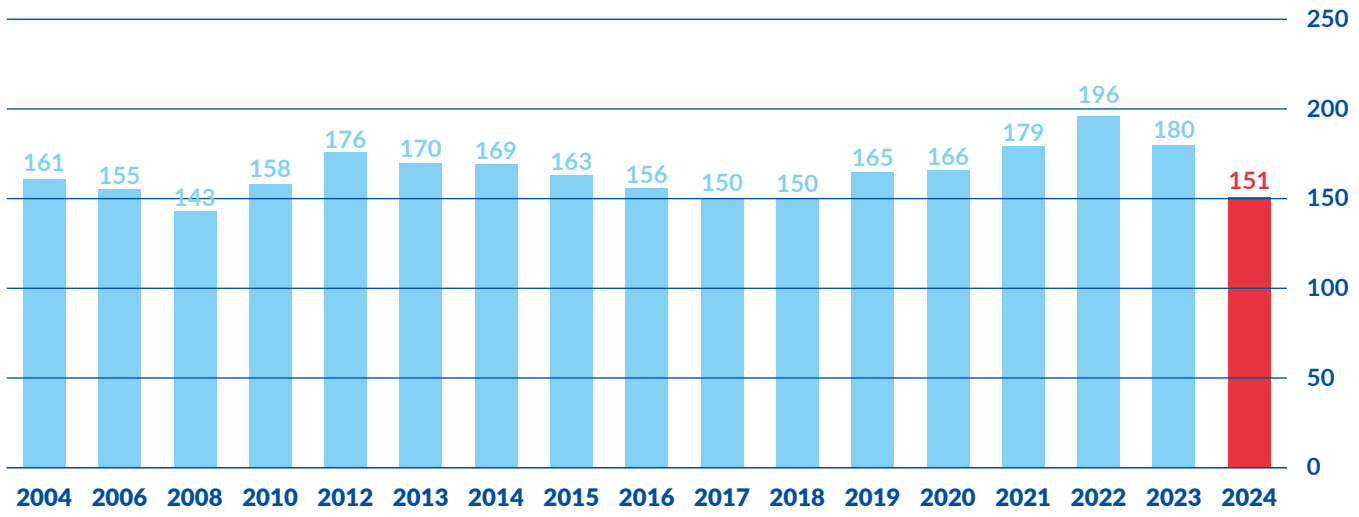
FIGURE 3: **NEW CRUISE CAPACITIES FROM 2020 TO 2024 PER REGION OF OPERATION** (NUMBER OF BEDS) *



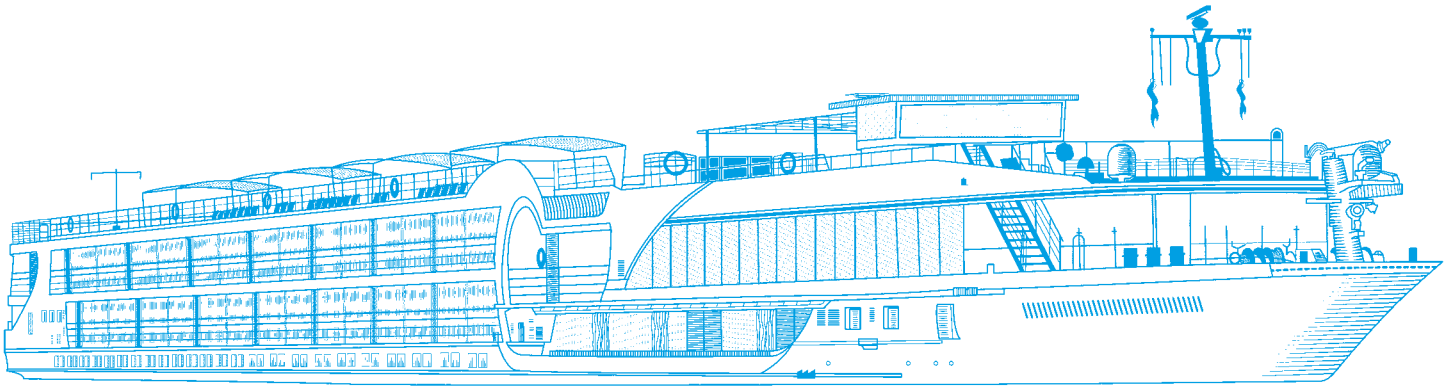
Source: A. Hader, The River Cruise Fleet Handbook (May 2024)
** R-M-D= Rhine/Main/Main-Danube Canal/Danube. 2024: based on order books as of May 2024.*

After a decrease between 2014 and 2018, the average number of beds in new cruise vessels has since been rising continuously. In 2022, the important increase in this figure is explained by the entry into the market of the A-ROSA SENA which has a capacity of 280 beds. Apart from this unusually large vessel, the average number of beds in new river cruise vessels in 2023 remains consistent with this increase, although the prospects for 2024 point to its first decrease since 2018. This can be explained by the entry on the river cruise market of 3 vessels on the Douro with a rather small number of beds (between 102 and 120 each). The average number of beds in the other regions remains consistent with previous years.

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



Source: A. Hader, The River Cruise Fleet Handbook (May 2024)
** Figure for 2024: based on order books as of May 2024.*



DEMAND
FOR RIVER CRUISES

The year 2023 confirms the recovery of the river cruise sector, with values similar to pre-pandemic levels with regard to vessels' movements. Figures also confirm the catch-up phenomenon concerning the number of passengers embarking on river cruises and the passenger capacity utilisation rates of vessels.

Regarding the European travel market, 1.22 million passengers from all over the world travelled on European rivers[49] in 2023, which showed a positive development in comparison with 2022, according to the stakeholders interviewed. In addition to this, the current business expectations have become increasingly positive for land and river stakeholders since 2021.

With regard to the key figures, the three most important groups of passengers represented were from USA/Canada (515,157), Germany/Austria/Switzerland (450,701) and France (100,100). Passengers from the first two groups mainly travelled on the Rhine (and its tributaries) and the Danube which were the most frequented rivers in Europe. Moreover, higher-priced river cruise voyages were notably sold in overseas markets, USA and Canada being over-represented.[50, 51]

As regards the French national rivers and canals, the level of activity was higher in 2023 than in 2019 and a complete reversal of the trend in terms of attendance (+20.14% compared with 2022) was observed.[52] In addition to this, small vessels enabling the transport of two to 12 people are developing more and more. Operators offering this type of service are intent on innovating and resolved to protect the environment, using for instance electric propulsion.

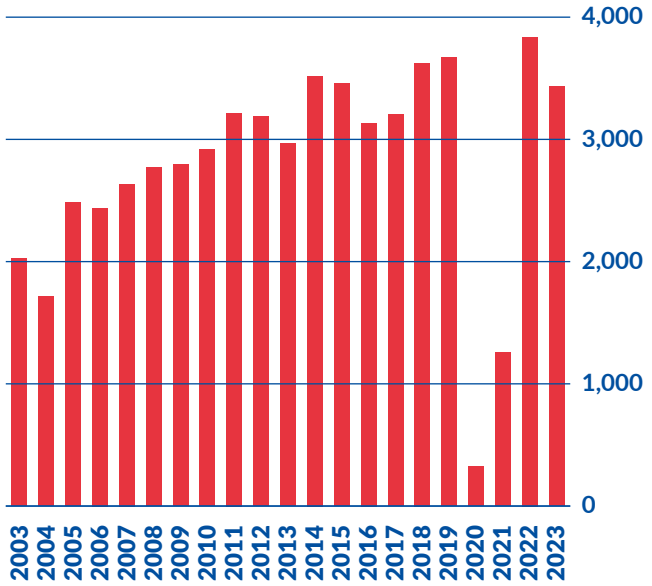
The yearly cruise vessel movement figures for the Danube, Rhine and Moselle confirm the positive tendency which has emerged since 2021. In terms of vessel movements, the cruising activity on the Upper Rhine was +0.6% above the level of 2019. However, the cruising activity on the Upper Danube (at the Austrian-German border) and the Moselle were respectively -6.4% and -1% under the pre-pandemic levels of 2019.

The utilisation rate of the river cruise vessels passing the locks is also a key indicator in assessing the recovery of the river cruise sector. The year 2023 confirmed the positive evolutions already observed in 2022, as suggested by the data obtained for the Danube river cruise sector (see following box - focus on capacity utilisation in the river cruise sector).

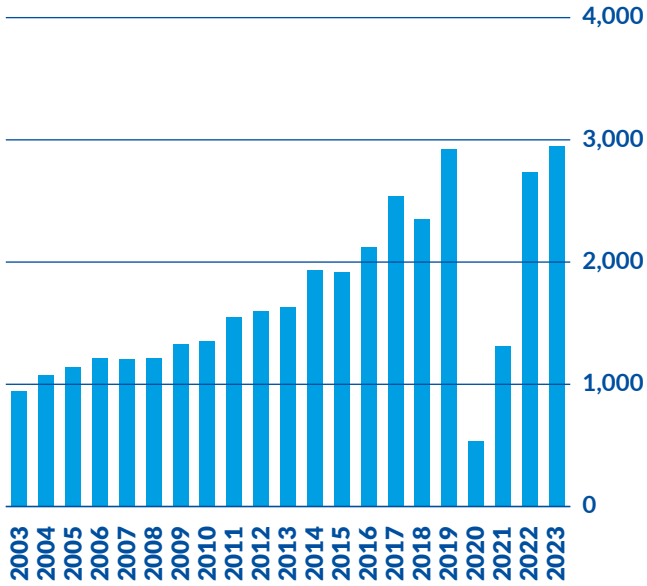
[49] According to IG river cruise, the most relevant cruising areas in Europe which were used for the survey and which can be understood as "European rivers" are the Rhine and tributaries (Meuse, Main, Moselle, Neckar, Rhine-Herne Canal), the Danube and tributaries (Drava, Tisza, Sava, March, Raab), French rivers (Seine, Marne, Garonne, Dordogne, Lot, Rhône, Saône, Loire), and the Douro.
[50] Part of this price difference between passengers from Europe and passengers from overseas can be explained by the longer length of stay of the latter.
[51] Source: IG RiverCruise, Der Fluss-Kreuzfahrtmarkt 2023
[52] Source: Baromètre de l'activité tourisme fluvial, édition 2024, Entreprises fluviales de France – E2F

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

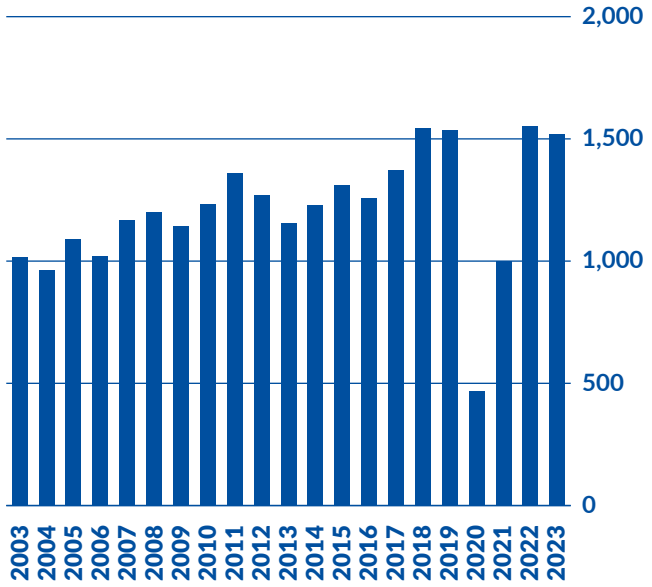
Danube



Rhine



Moselle

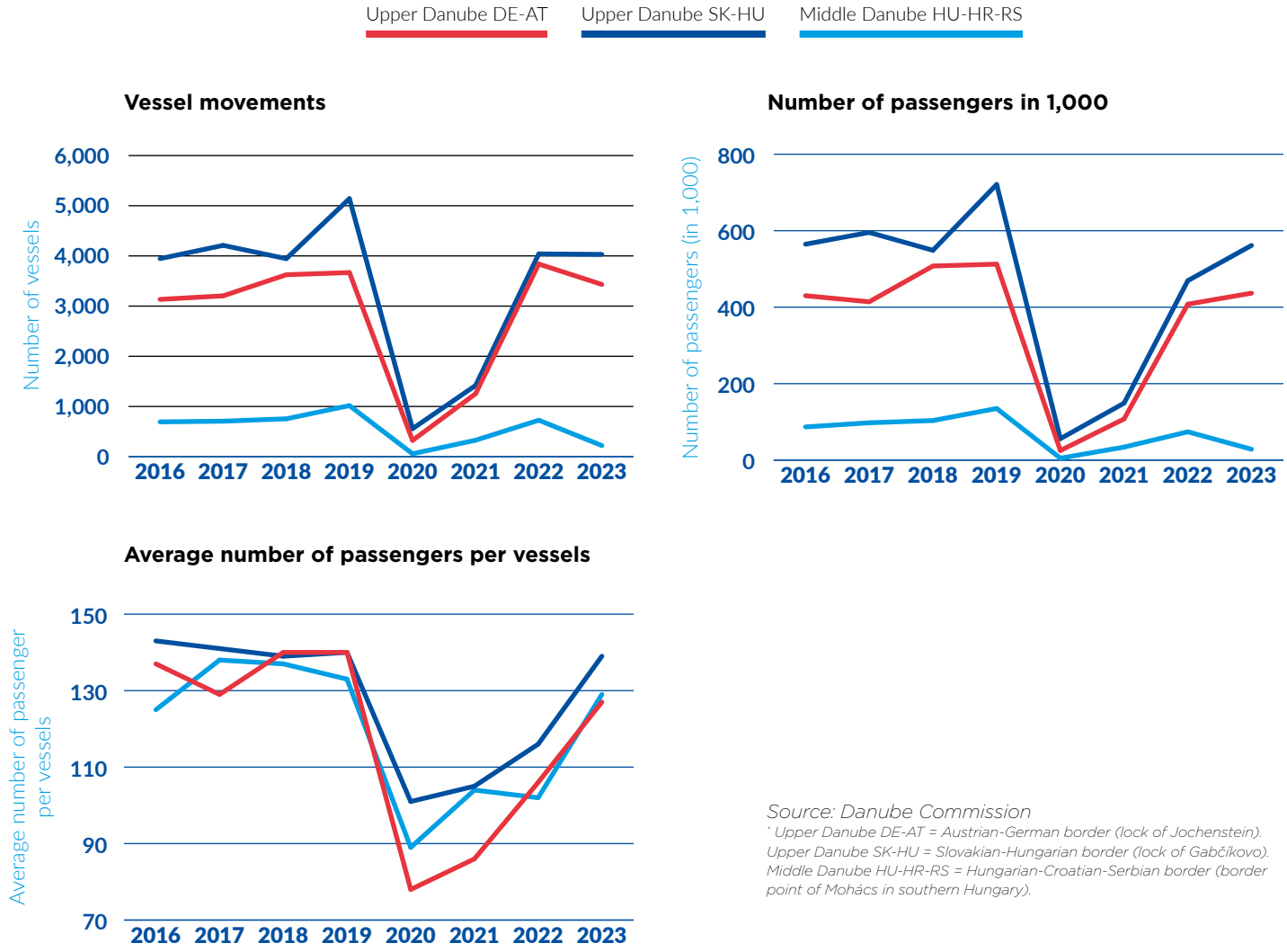


Sources: German Waterway and Shipping Administration (WSV) and Moselle Commission

** Danube = Upper Danube, Austrian-German border (lock of Jochenstein). Rhine = Upper Rhine (lock of Iffezheim). Moselle = lock of Koblenz.*

For three geographical points along the Danube (two on the Upper Danube and one on the Middle Danube), data regarding vessel movements and the number of passengers is available from 2015 onwards. This geographical distinction makes it possible to observe differences in cruising intensity on the different stretches of the Danube. The analysis shows that the activity is the highest on the Upper Danube. Cruising activity on the Middle Danube south of Budapest is lower than on the Danube stretches upstream of Budapest.

FIGURES 8, 9 AND 10: **EVOLUTION OF VESSEL MOVEMENTS AND PASSENGER NUMBERS PER STRETCHES OF THE DANUBE AND AVERAGE NUMBER OF PASSENGERS PER VESSEL ***



Source: Danube Commission

** Upper Danube DE-AT = Austrian-German border (lock of Jochenstein). Upper Danube SK-HU = Slovakian-Hungarian border (lock of Gabčíkovo). Middle Danube HU-HR-RS = Hungarian-Croatian-Serbian border (border point of Mohács in southern Hungary).*

For the three measurement points along the Danube, the data indicate a slight decrease in the number of vessel movements for all three points in the year 2023. However, an increase in the number of passengers transported for two out of three measurement points can be observed. The higher number of passengers and the lower number of vessel movements implies a higher average number of passengers per vessel.

Most of the passenger traffic in the Sava and Kupa river ports is recorded at the Port of Belgrade in Serbia. Since 2015, the number of river cruise passengers recorded by the Port of Belgrade (passenger terminal) has increased constantly, 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 important eastern European capitals.

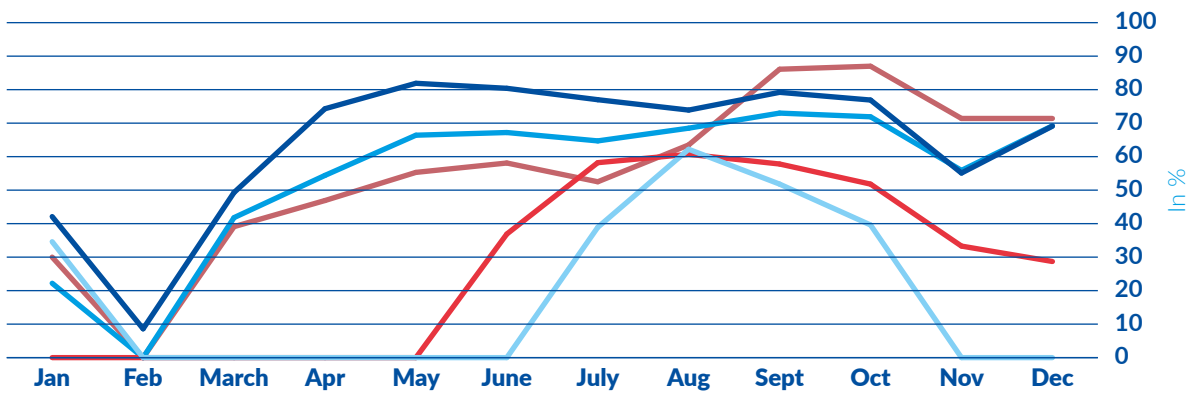
As is the case in other regions, passenger traffic suffered from the Covid-19 pandemic. In Belgrade, only 561 passengers were recorded by the port in 2020. Passenger traffic has been increasing since 2019 to reach 74,750 passengers in 2023, a figure which remains below the pre-pandemic levels (104,000), yet figures show a positive sign towards a return to normality. In 2023, Serbia opened a new passenger terminal in Sremska Mitrovica and Šabac. This should certainly support the development of passenger transport in the region. Navigability conditions on the waterways also remain an obstacle for the further development of passenger transport in this region.[53]

FOCUS ON CAPACITY UTILISATION IN THE RIVER CRUISE SECTOR

The analysis of the capacity utilisation of a fleet enables a thorough overview to be carried out of how the supply/demand relationship evolves throughout the years.

The degree of capacity utilisation of river cruise vessels on the Upper Danube can be calculated on the basis of data provided by the German Waterway Administration on river cruise vessels passing the lock of Jochenstein (German-Austrian border) on the Danube.

FIGURE 11: **DEGREE OF CAPACITY UTILISATION OF RIVER CRUISE VESSELS ON THE DANUBE** (IN %) *



Source: German Waterway Administration
** At the lock of Jochenstein (German-Austrian border)*
Capacity utilisation = ratio of number of passengers divided by passenger capacity

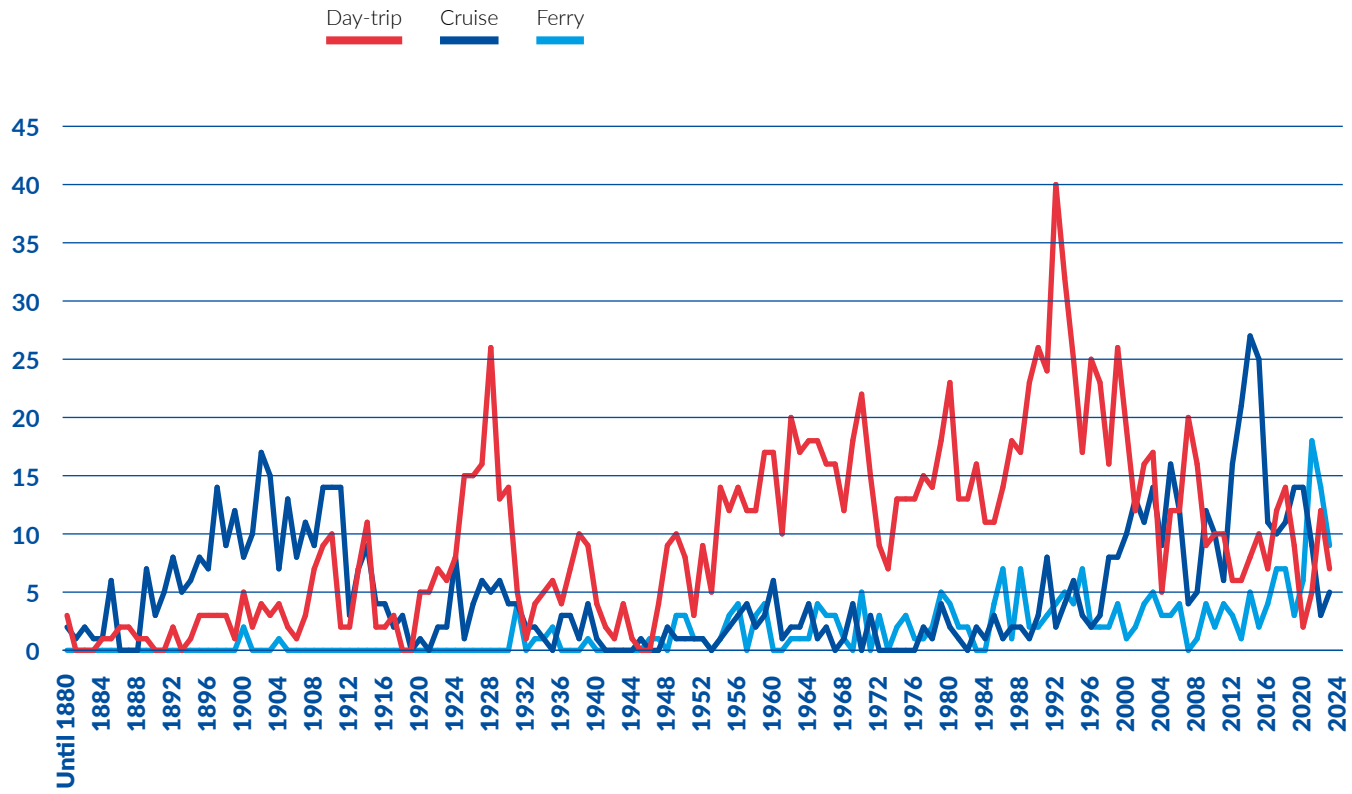
This figure brings to light the recovery of the river cruise sector on the Danube.[54] The catch-up phenomenon for capacity utilisation which had been observed in 2022 was confirmed in 2023. Furthermore, between August 2023 and September 2023, the capacity utilisation experienced a peak leading to higher values than before the pandemic, as illustrated in the figure above.

[53] 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.
[54] Such data were not available for the Rhine and the Moselle.

AGE STRUCTURE
OF THE RHINE PASSENGER FLEET

Concerning the passenger fleet, it is divided into passenger ferries, river cruise ships, and passenger day-trip vessels. The figure below depicts the current fleet and its evolution over time. However, it is worth noting that inactive vessels may be included in these figures, and some of the newest vessels may not be accounted for. Most passenger ferries and day-trip vessels (which represent 76% of all passenger vessels) were constructed in the 20th century, but there has nevertheless been significant newbuilding activity in the 21st century. The river cruise new build activity remains lower in 2023 compared to the pre-Covid crisis.

FIGURE 12: **COMMISSIONING YEARS FOR THE RHINE PASSENGER FLEET OVER TIME** (NUMBER OF INLAND VESSELS)



Sources: IVR, CCNR analysis
Note that one river cruise vessel and six day-trip vessels have an unknown year of construction. The database of IVR accounts for active vessels but also includes some inactive vessels, in particular those commissioned in earlier years.

08

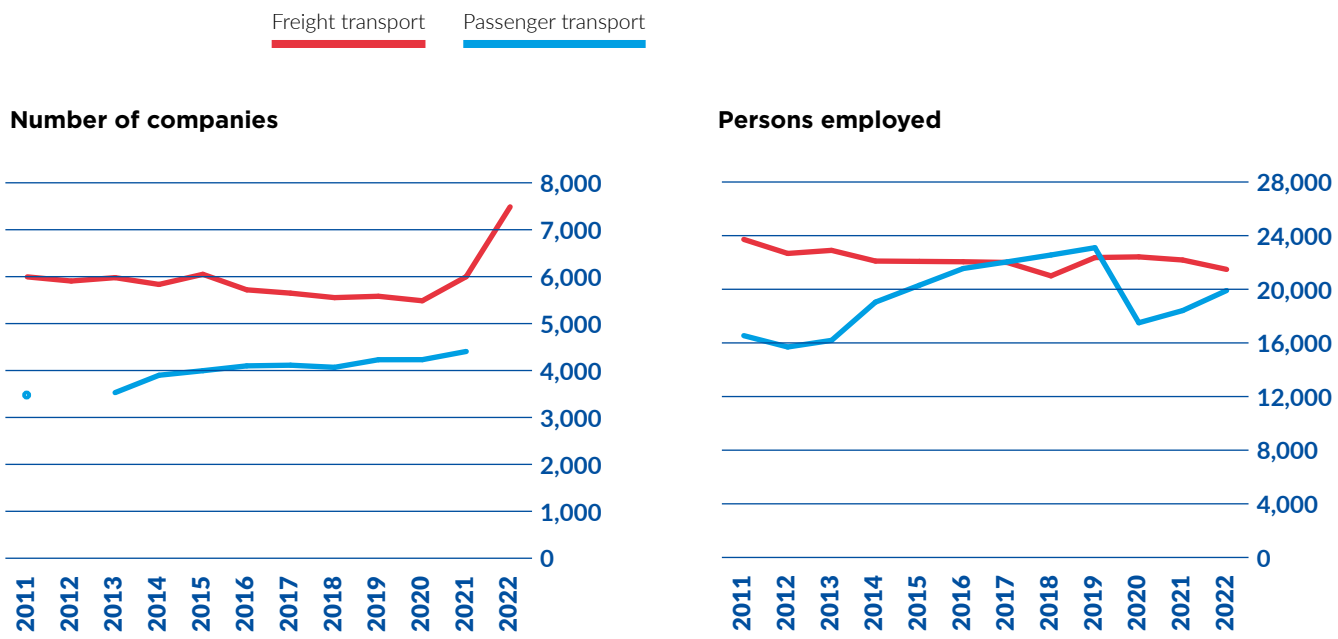
COMPANIES, EMPLOYMENT, TURNOVER AND PERSONNEL COSTS[55]

- **According to Eurostat figures, 5,486 IWW freight transport companies were active in Europe (EU-27 plus Bosnia-Herzegovina, Serbia and Switzerland) in 2020. Around 88% (4,809 in absolute numbers) are registered in Rhine countries. In 2020 the number of employed persons in freight transport was 22,417. Rhine countries account for 75%, Danube countries for 17% and companies in countries outside the Rhine and Danube regions for 8%.**
- **The number of IWW passenger companies in Europe (EU-27 plus Bosnia-Herzegovina, Serbia and Switzerland) was 4,406 in 2021. The geographical distribution shows that 42% of them are registered in Rhine countries. Southern Europe accounts for 26%, eastern Europe for 17% and Scandinavia for 11%. The total number of persons employed in European IWW passenger transport amounted to 19,908 in 2022.**
- **In 2022, a turnover of approximately 7.5 billion euro was registered for IWW freight companies in the EU-27 (plus Switzerland and Serbia), which represents an increase of +25% compared to 2021. For IWW passenger companies, approximately 2.8 billion euro was registered in 2022, an increase of +72% compared to 2021.**

[55] The topic related to crew shortage was further analysed and developed in the thematic report 2023 on labour market, available at: https://inland-navigation-market.org/year-n-1-archive/?lang=en

Most data for this chapter are available until 2022.

FIGURES 1 AND 2: **DEVELOPMENT OF NUMBER OF COMPANIES AND EMPLOYMENT IN FREIGHT AND PASSENGER TRANSPORT IN THE INLAND WATERWAY TRANSPORT SECTOR IN EUROPE ***



Sources: Eurostat [sbs_na_1a_se_r2] until 2020 and [sbs_sc_ovw] from 2021 onwards
** Data for 2021 and 2022 in freight transport are estimated*

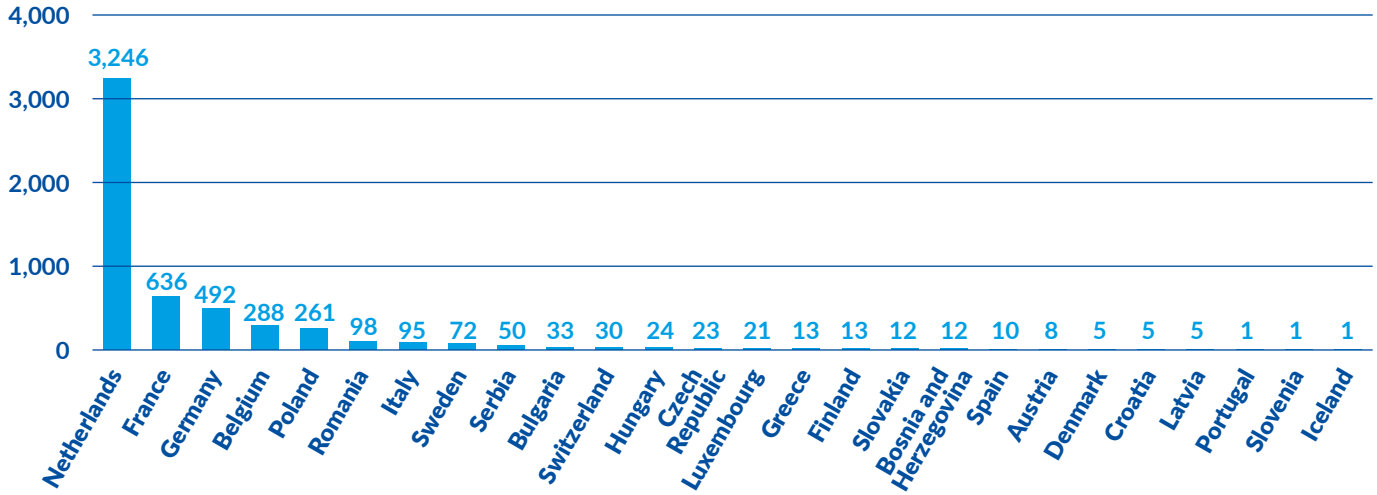
COMPANIES
AND EMPLOYMENT IN FREIGHT TRANSPORT

According to Eurostat figures, 5,486 IWW freight transport companies were active in Europe (EU-27 plus Bosnia-Herzegovina, Serbia and Switzerland) in 2020.[56] Around 88% (4,809 in absolute numbers) are registered in Rhine countries.[57] In the Netherlands alone, 3,279 IWW freight companies are counted, which represents 60% of the total number in Europe and 68% of the number in Rhine countries.

The number of companies in Danube countries is relatively low (201 which is equivalent to a share of 4%), compared to the share that the Danube has within total transport performance on EU-27 inland waterways (18%). It should be mentioned that companies in the Danube region have a far higher number of employed persons on average than companies in the Rhine region. Eastern European countries taken together (including Danube countries) account for 9% of all IWW freight companies in the EU-27, and southern European and Scandinavian countries account for 2% each.

[56] *Latest Eurostat figures for the overall number of enterprises in the freight transport sector [sbs_na_1a_se_r2] are available for the year 2020 while per country they are available also for 2021 and/or 2022 [sbs_sc_ovw].*
[57] *The Netherlands, Germany, Belgium, France, and Switzerland*

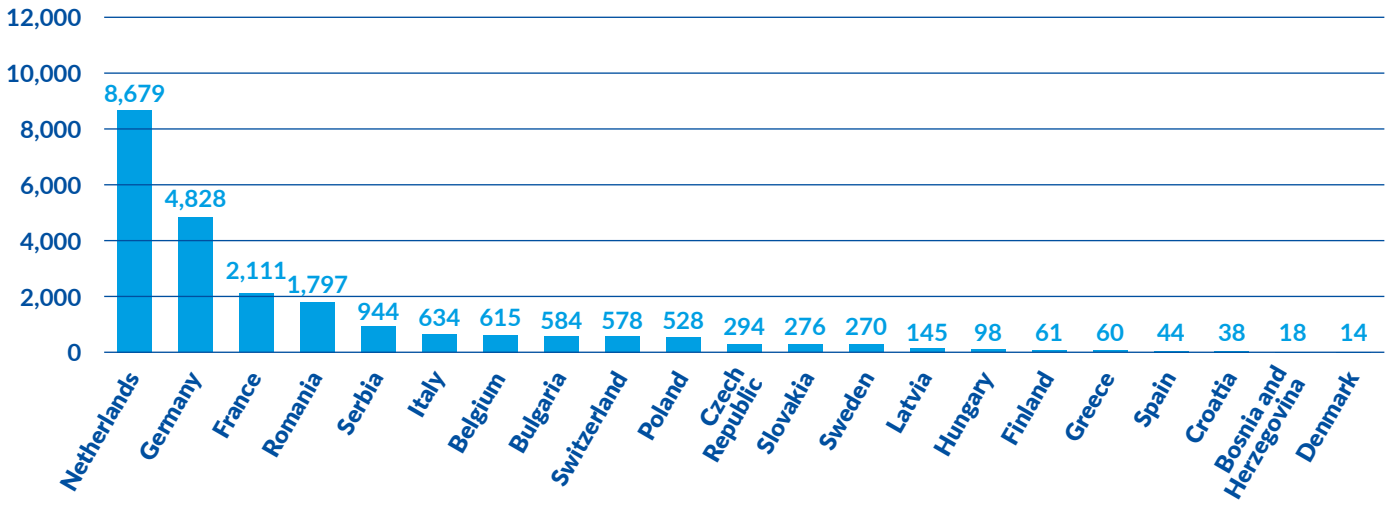
FIGURE 3: **NUMBER OF COMPANIES IN IWW FREIGHT TRANSPORT IN EUROPE IN 2022 ***



Source: Eurostat [sbs_na_1a_se_r2] and [sbs_sc_ovw]
** Data for Belgium and Serbia refer to 2020.*

The number of employed persons in freight transport includes self-employed, helping family members and employees. The total number of this variable was at 22,417 in 2020.[58] Rhine countries account for 75%, Danube countries for 17% and companies in countries outside the Rhine and Danube regions for 8%.

FIGURE 4: **NUMBER OF PERSONS EMPLOYED IN IWW FREIGHT TRANSPORT IN EUROPE IN 2022 ***



Source: Eurostat [sbs_na_1a_se_r2] and [sbs_sc_ovw]
** Data for Belgium and Serbia refer to 2020.*

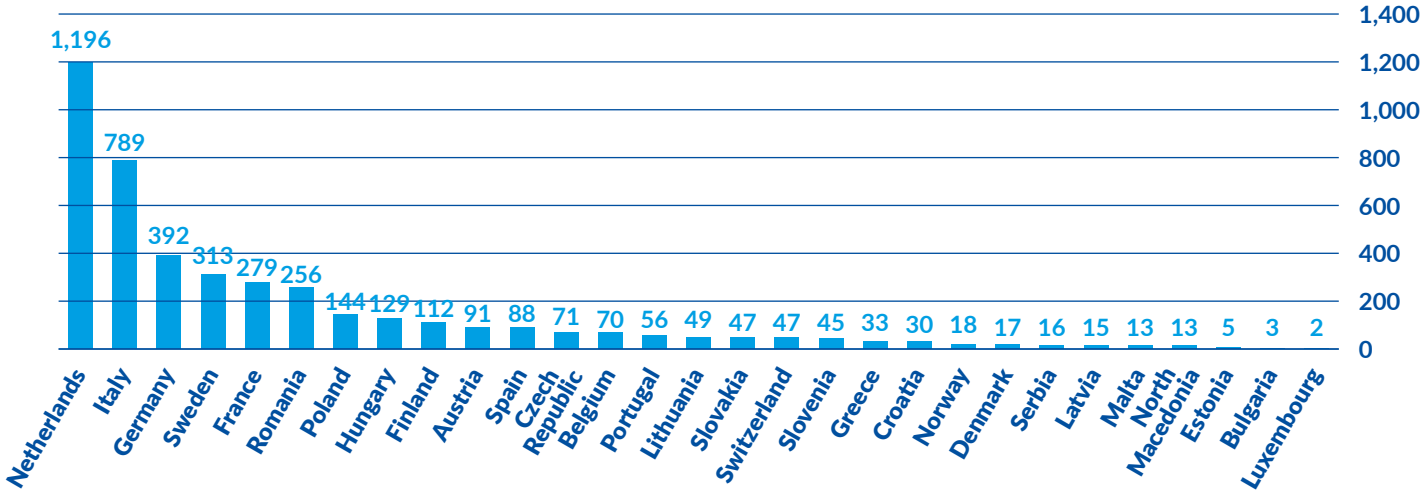
It should be noted that figures obtained from national labour market institutions or from other national offices might differ substantially from figures obtained from Eurostat, due to different statistical labour market concepts. For cross-country comparisons, Eurostat is treated as the preferred source because data are harmonised across countries and are thus comparable.

[58] Latest Eurostat figures for the overall number of employed persons in the freight transport sector [sbs_na_1a_se_r2] are available for the year 2020, while per country they are available for 2021 and/or 2022 [sbs_sc_ovw].

COMPANIES
AND EMPLOYMENT IN PASSENGER TRANSPORT

The number of IWW passenger companies in Europe (EU-27 plus Bosnia-Herzegovina, Serbia and Switzerland) was 4,406 in 2021.[59] The geographical distribution shows that 42% of them are registered in Rhine countries. Southern Europe accounts for 26%, eastern Europe for 17% and Scandinavia for 11%. Danube countries are considered in this sense a part of eastern Europe. If they were counted separately, they would represent 12%.

FIGURE 5: **NUMBER OF IWW PASSENGER TRANSPORT COMPANIES IN EUROPE IN 2022**

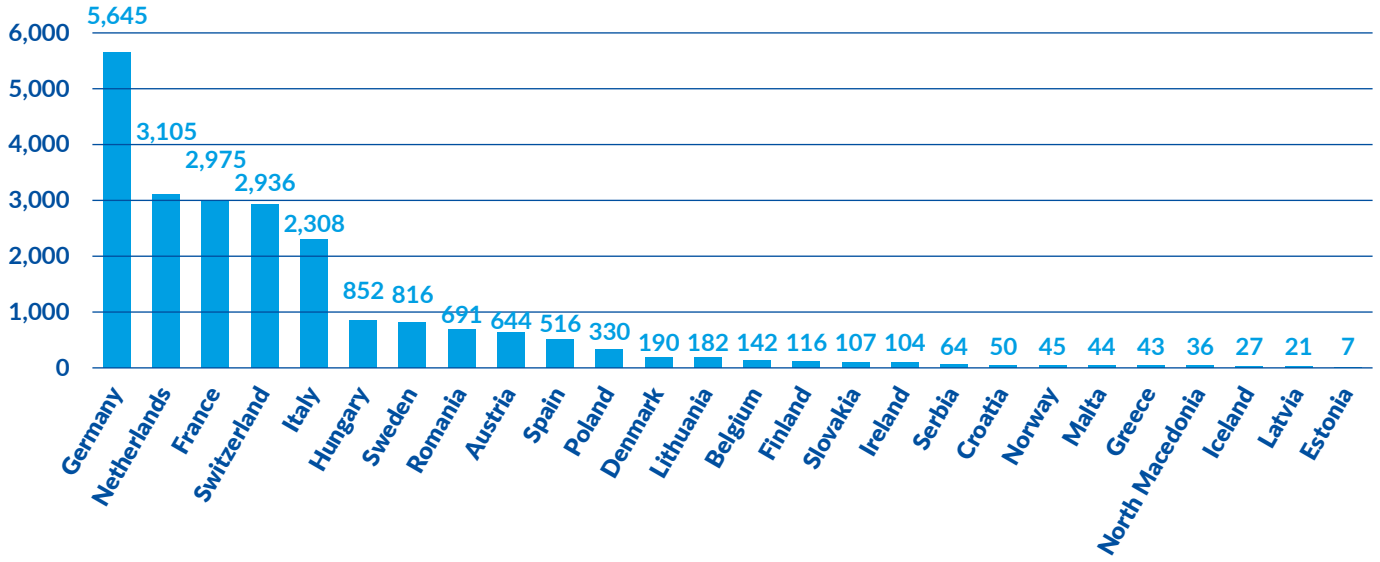


Source: Eurostat [sbs_sc_ovw]

The total number of persons employed in European IWW passenger transport amounted to 19,908 in 2022 and was therefore +8% higher than in the previous year. The explanation for this increase is the recovery from the Covid pandemic, which had led to a sharp decrease in passenger transport and had an impact on employment.

[59] *Latest Eurostat figures for the overall number of enterprises in the passenger transport sector are available for the year 2021, while per country they are available for 2022 [sbs_sc_ovw].*

FIGURE 6: **NUMBER OF PERSONS EMPLOYED IN IWW PASSENGER TRANSPORT IN EUROPE IN 2022 ***



Source: Eurostat [sbs_sc_ovw]
** Data for Malta refer to 2021.*

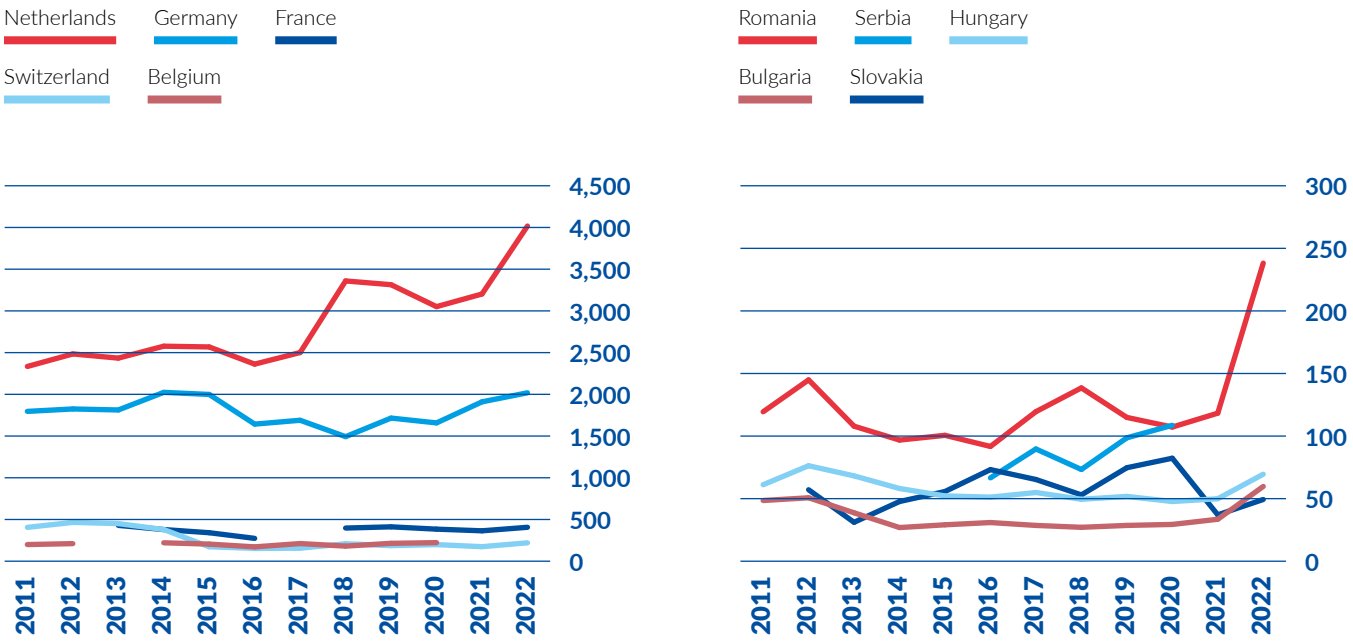
In the order of 74% of all persons employed in EU inland waterway passenger transport are employed in Rhine countries. The share of Danube countries amounts to 12%.

II TURNOVER

TURNOVER IN IWW FREIGHT TRANSPORT

In 2022, for IWW freight companies in the EU-27 (plus Switzerland and Serbia), a turnover of approximately 7.5 billion euro was registered, an increase of +25% compared to 2021 (6.0 billion in 2021). Rhine countries[60] accounted for approximately 6.9 billion euro (92% of the turnover in the EU-27, plus Switzerland and Serbia), an increase of +18% compared to 2021.

FIGURE 7: **ANNUAL TURNOVER IN IWW FREIGHT TRANSPORT IN RHINE AND DANUBE COUNTRIES** (IN MILLION EURO) *



Sources: Eurostat [sbs_na_1a_se_r2], [sbs_sc_ovw], Centraal Bureau voor de Statistiek (CBS-NL) for data before 2021, Swiss Federal Tax Administration (FTA-CH) for data before 2021, CCNR estimation based on data from Eurostat for France for the year 2019.
For Switzerland and the Netherlands, a break in the data can be observed from 2021 onwards. This is due to the use of Eurostat figures from 2021 onwards derived form a new database [sbs_sc_ovw]. Turnover data were missing in the former Eurostat database [sbs_na_1a_se_r2] for these two countries, leading to the use of national databases from CBS and FTA for years before 2021. Therefore, for these two countries, data available up until 2020 cannot be compared with data from 2021 onwards.

** The value for Dutch companies for data until 2020 are an estimation based on net turnover data for the entire inland navigation sector in the Netherlands. Therefore, the statistical office CBS estimates that 92% of total turnover is related to freight transport. Value for Swiss companies for data until 2020 was converted into euro according to the yearly average exchange rate.*

[60] *Including an estimated value for Belgium for 2022.*

TABLE 1: **TURNOVER IN IWW FREIGHT TRANSPORT IN RHINE COUNTRIES** (IN MILLION EURO)

	2021	2022
Dutch companies	3,202	4,017
German companies	1,910	2,019
French companies	364	406
Belgian companies	222	259
Swiss companies	174	220
Rhine countries *	**5,872**	**6,921**

Source: Eurostat [sbs_sc_ovw]
** Values for Belgium were estimated.*

Turnover generated in inland waterway freight transport companies registered in Danube countries amounted to 570 million euro in 2022, an increase of +51% compared to 2021.

TABLE 2: **TURNOVER IN IWW FREIGHT TRANSPORT IN DANUBE COUNTRIES** (IN MILLION EURO)

	2021	2022
Serbian companies	109	109
Romanian companies	118	238
Hungarian companies	50	69
Slovakian companies	37	49
Bulgarian companies	33	60
Austrian companies	27	43
Croatian companies	2	2
Danube countries *	**376**	**570**

Source: Eurostat [sbs_sc_ovw]
** Values for Serbia were estimated.*

Within European regions outside of the Rhine and Danube area, the countries with the highest turnover (all values for 2022) are Italy (59 million euro), Sweden (52 million euro), Poland (52 million euro) and the Czech Republic (36 million euro).

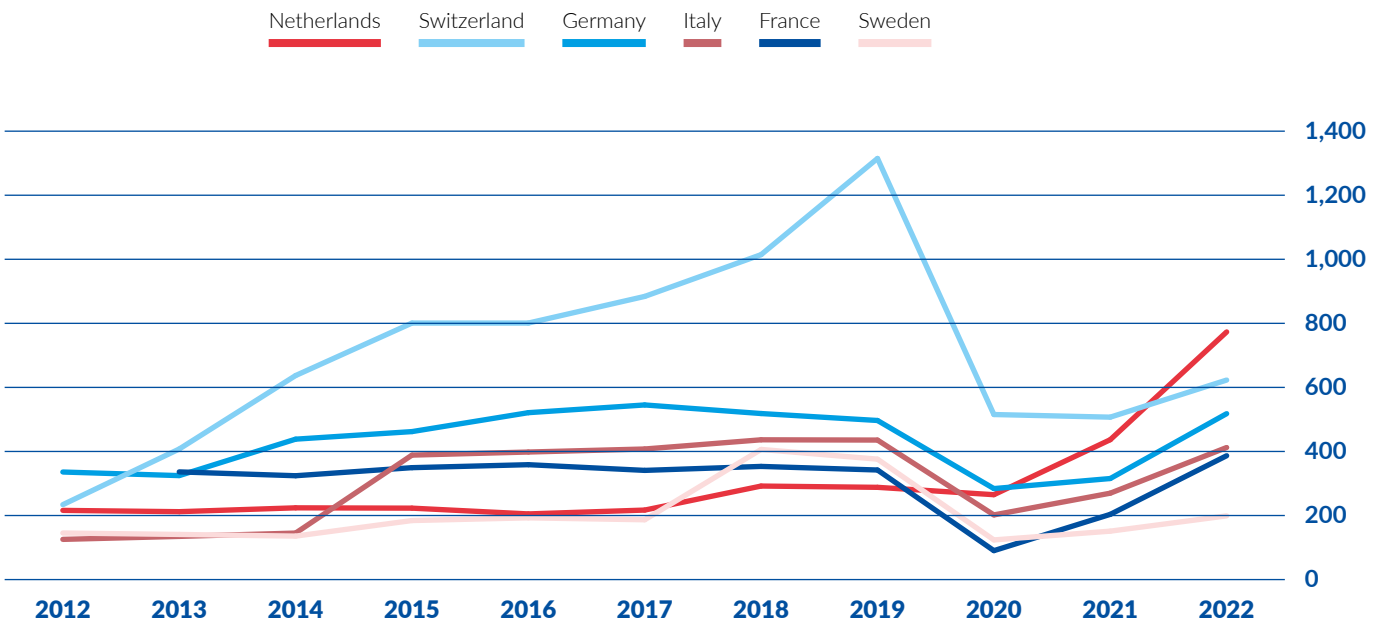
TURNOVER IN IWW PASSENGER TRANSPORT

Regarding the turnover in EU (plus Switzerland and Serbia) for IWW passenger companies in 2022, approximately 2.8 billion euro was registered, an increase of +72% compared to 2021 (1.6 billion in 2021).

Rhine countries accounted for approximately 2.3 billion euro, an increase of +58% compared to 2021 and a share of 83% within total IWW passenger turnover in Europe.

It is important to note that the following turnover figures include those generated by all passenger market segments (day trips, river cruises or ferries). For some countries, the turnover figures are based almost entirely on river cruise activities or day trip activities.

FIGURE 8: **ANNUAL TURNOVER IN IWW PASSENGER TRANSPORT IN MOST RELEVANT COUNTRIES** (IN MILLION EURO) *



Sources: Eurostat [sbs_na_1a_se_r2] until 2020, [sbs_sc_ovw] from 2021 onwards, Centraal Bureau voor de Statistiek (CBS-NL) for data before 2021, Swiss Federal Tax Administration (FTA-CH) for data before 2021 and CCNR estimation based on data from Eurostat only for France for the year 2019.
For Switzerland and the Netherlands, a break in the data can be observed from 2021 onwards. This is due to the use of Eurostat figures from 2021 onwards derived form a new database [sbs_sc_ovw]. Turnover data for these two countries were missing in the former Eurostat database [sbs_na_1a_se_r2], leading to the use of national databases from CBS and FTA for years before 2021. Therefore, for these two countries, data until 2020 cannot be compared with data from 2021 onwards.

** The values for Dutch companies for years until 2020 are an estimation based on net turnover data for the entire inland navigation sector in the Netherlands. In this instance, the statistical office CBS estimates that 8% of total turnover is related to passenger transport. Value for Swiss companies until 2020 was converted to euro according to the yearly average exchange rate. Data unavailable for many countries until 2020.*

TABLE 3: **TURNOVER IN IWW PASSENGER TRANSPORT IN RHINE COUNTRIES** (IN MILLION EURO)

	2021	2022
Dutch companies	437	773
Swiss companies	507	623
German companies	315	518
French companies	204	387
Belgian companies	11	24
Rhine countries *	**1,474**	**2,325**

Source: Eurostat [sbs_sc_ovw]
** The value for Belgium for 2021 was estimated.*

Danube countries accounted for approximately 168 million euro, an increase of +77% compared to 2021.

For companies in Danube countries, the existing data[61] show significantly lower values than in Rhine countries. This can be explained by lower wage levels in Danube countries. Lower wages and therefore lower personnel costs imply lower total costs, especially in passenger transport which is quite labour-intensive. Lower total costs, in return, imply lower price levels and therefore also lower turnover figures.

As a second explanation, it should be recalled that large parts of the activities in passenger transport on the Danube, in particular river cruising, is carried out by companies from the Rhine region.

TABLE 4: **TURNOVER IN IWW PASSENGER TRANSPORT IN DANUBE COUNTRIES** (IN MILLION EURO)

	2021	2022
Austrian companies	56	104
Hungarian companies	26	31
Romanian companies	11	20
Slovakian companies	n.a	11
Serbian companies	2	n.a
Croatian companies	n.a	2
Danube countries *	**95**	**168**

Source: Eurostat [sbs_sc_ovw]
** Without missing values.*

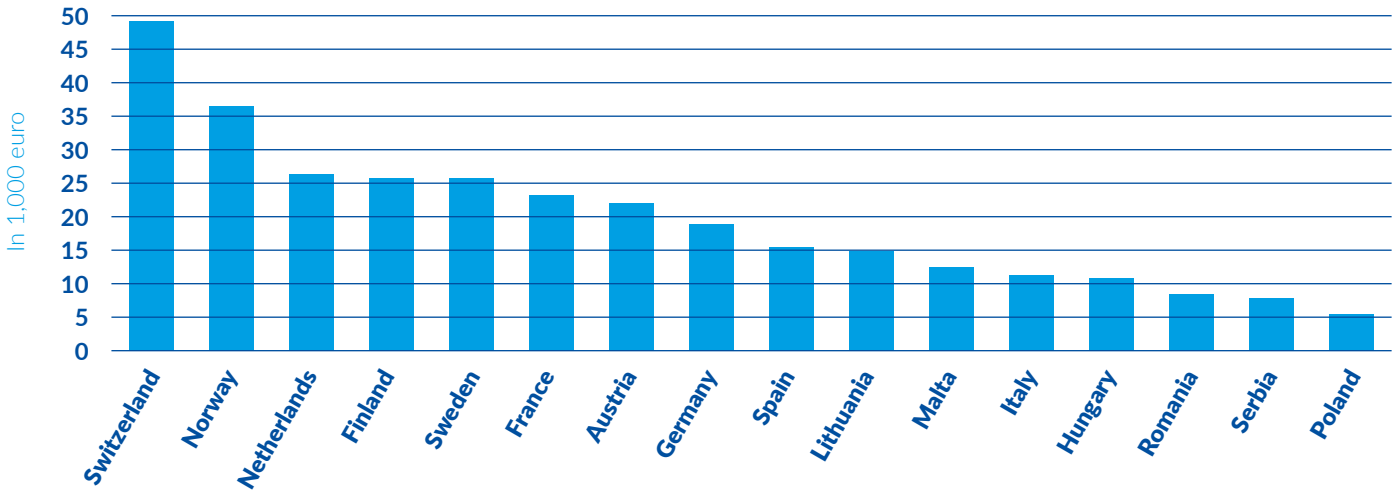
[61] For several Danube countries, turnover data in the Eurostat SBS database is missing for confidentiality reasons. Similarly, the turnover values reached low levels that could not be displayed.

Two countries in Europe outside the Rhine and Danube region with a considerable level of turnover in IWW passenger transport are Italy (402 million euro in 2022) and Sweden (199 million euro in 2022). It can be noted that for Italy, the turnover is almost entirely generated from day trips activity. Both countries registered a considerable increase in 2022 due to the recovery from the Covid pandemic.

UNIT LABOUR COSTS
PER PERSON EMPLOYED

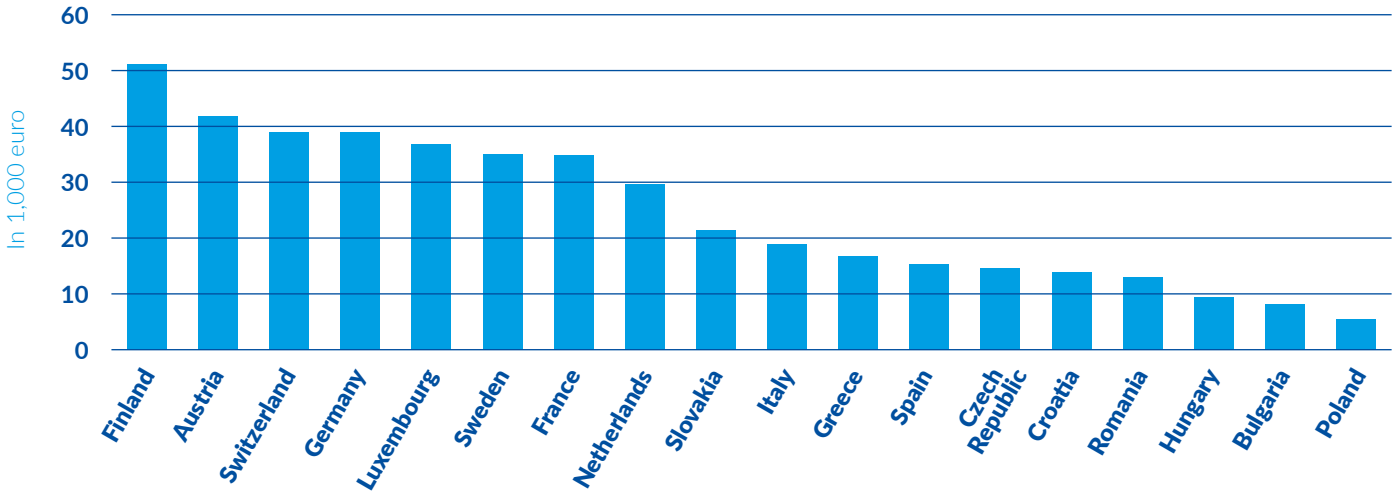
In inland waterway transport, the level of unit labour costs per person employed depends upon the region in Europe. The highest values in IWW passenger transport are observed in Switzerland and in Norway. For IWW freight transport, the highest values are found in Finland and in Austria. In general terms, unit labour costs per person employed are relatively high in northern and western Europe, and relatively low in eastern Europe.

FIGURE 9: **UNIT LABOUR COSTS PER PERSON EMPLOYED PER COUNTRY IN IWW PASSENGER TRANSPORT IN 2021**



Source: Eurostat [sbs_sc_ovw]

FIGURE 10: **UNIT LABOUR COSTS PER PERSON EMPLOYED PER COUNTRY IN IWW FREIGHT TRANSPORT IN 2021**



Source: Eurostat [sbs_sc_ovw]

09

OUTLOOK FOR INLAND WATERWAY FREIGHT TRANSPORT AND RIVER CRUISES

- The year 2023 saw a strong decrease in steel production, but a small increase in iron ore transport, in both Rhine and Danube countries. Steel production is expected to rebound in 2024, although remaining less active than prior to the pandemic. Although the prices of most of the main agricultural goods decreased worldwide, their production in Europe stagnated. The chemicals sector is still suffering from economic and geopolitical uncertainty, but early signs of a recovery from 2025 are visible, though uncertain.
- The last six years have been difficult for container transport in Europe due to the pandemic, the war in Ukraine, the low water episodes in 2018 and 2022 and more recently the stagnation of world trade. A recovery may be on the horizon, however, as early 2024 figures suggest an end to this long-lasting decline and the return to growth, however slow it may be.
- The long-term forecasts point to a stagnation or slow rise of the output in almost all main market segments across Rhine and Danube countries. The most notable exception is coal, where the demand will probably continue to decrease, as European countries strive to move towards renewable energy sources.

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

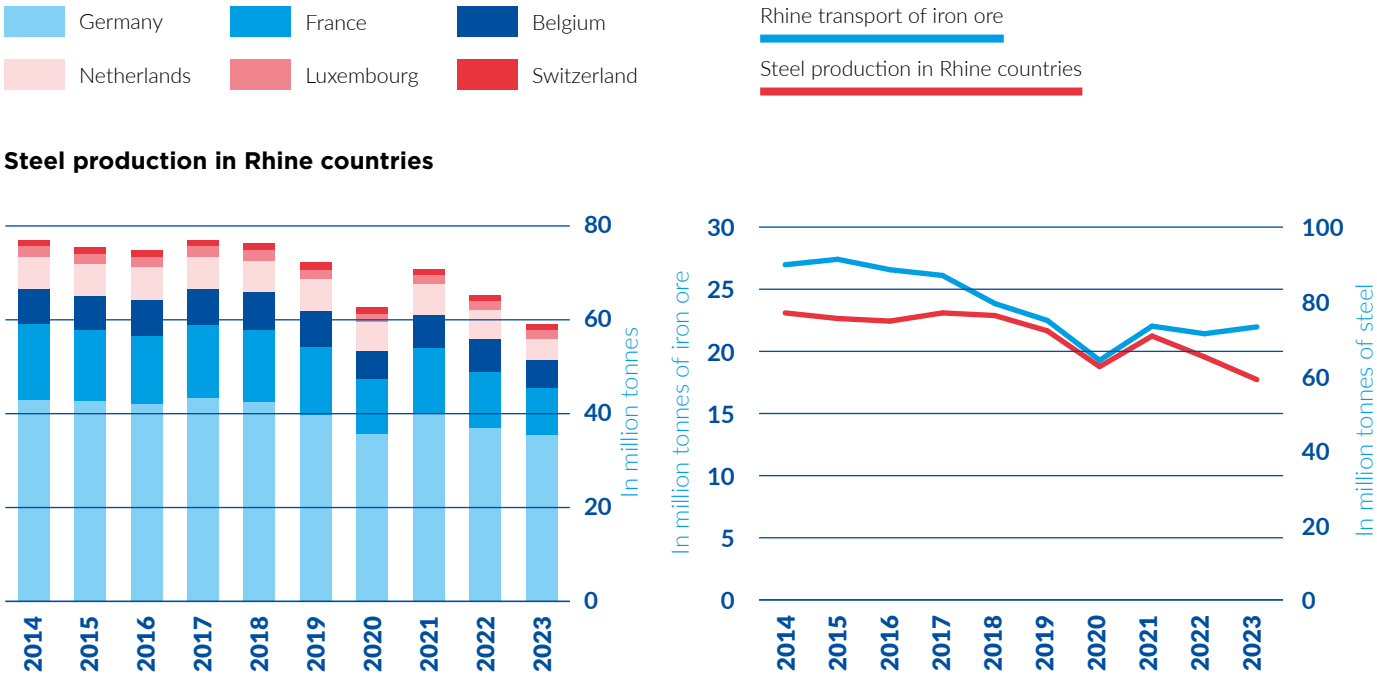
SHORT-TERM OUTLOOK
FOR IWT MARKETS IN RHINE AND DANUBE COUNTRIES

STEEL AND IRON ORE

On the entire Rhine, around 17% 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% for the Middle Danube.

Iron ore transport on the Rhine in general follows the same downward trend as steel production, despite a small divergence in 2023, due to a replenishment of stocks for iron ore. Steel production in Rhine countries decreased by -9.4% in 2023 compared to 2022, while transport of iron ore on the entire Rhine increased by +2.5%.

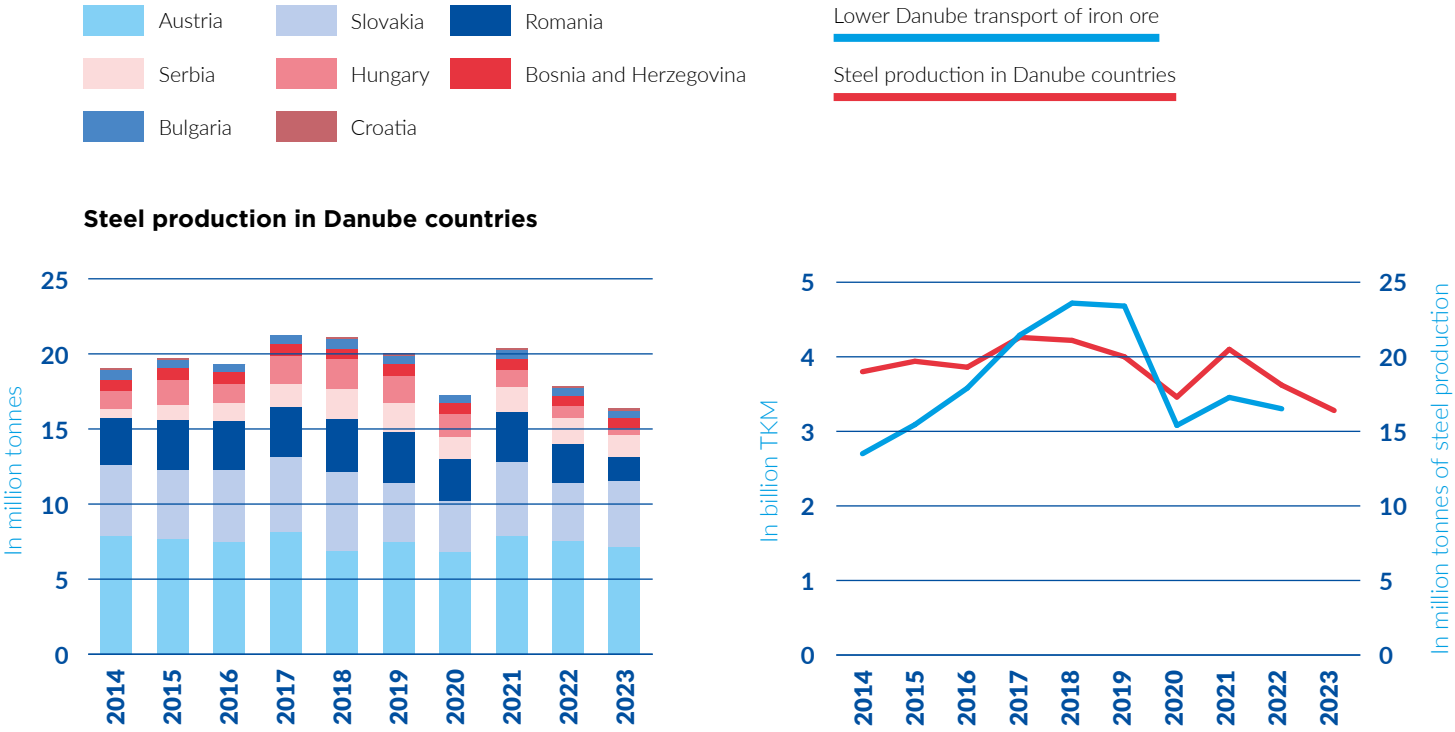
FIGURES 1 AND 2: **STEEL PRODUCTION IN RHINE COUNTRIES AND TRANSPORT OF IRON ORE ON THE ENTIRE RHINE**



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

Steel production in Danube countries[62] amounted to 16.4 million tonnes in 2023, a decrease of -8.2% compared to 2022.

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



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

Outlook for the iron ore and steel segment

According to Eurofer, 2023 was still marked by persistent negative factors such as the conflict in Ukraine or rises in energy prices and production costs, which led to a contraction of steel demand (-9%). Improvements are foreseen for 2024 but volumes are still expected to be below pre-pandemic levels.

However, despite these persisting adverse factors, steel-using sectors' output has continued to grow in 2023 (+1.1%). Nevertheless, in 2024, steel-using sectors' output is projected to drop (-1%), mainly due to the second recession in a row in the construction sector, before picking up again in 2025 (+2%).

As to developments observed in 2023 and foreseen in 2024-2025 for important steel-using sectors:

- The construction sector has experienced a negative trend throughout 2023 (-1%) due to multiple factors. This should continue impacting the sector in 2024, with a stronger drop foreseen (-1.9%). A recovery is expected in 2025 (+2.7%).

[62] *Without Ukraine*

- The automotive sector's output remained below the pre-pandemic levels in 2023 due to rising trade tensions and a downturn in the manufacturing sectors. But there has been a continued output increase since Q2 2022 which was linked to consumer resilience. Indeed, demand for EU passenger car vehicles has improved consistently throughout 2023, supported by easing energy prices. However, the sector is foreseen to experience a marginal contraction in output in 2024 (-0.4%) and a modest growth in 2025 (+0.8%).[63]

The World Steel Association points out that the global economy continues to show resilience despite persistent economic downturns such as geopolitical uncertainties, high inflation and high costs. However, in the near future, the negative impacts of these factors are predicted to take their toll on global steel demand growth which should remain weak, as well as on market volatility which should remain high.

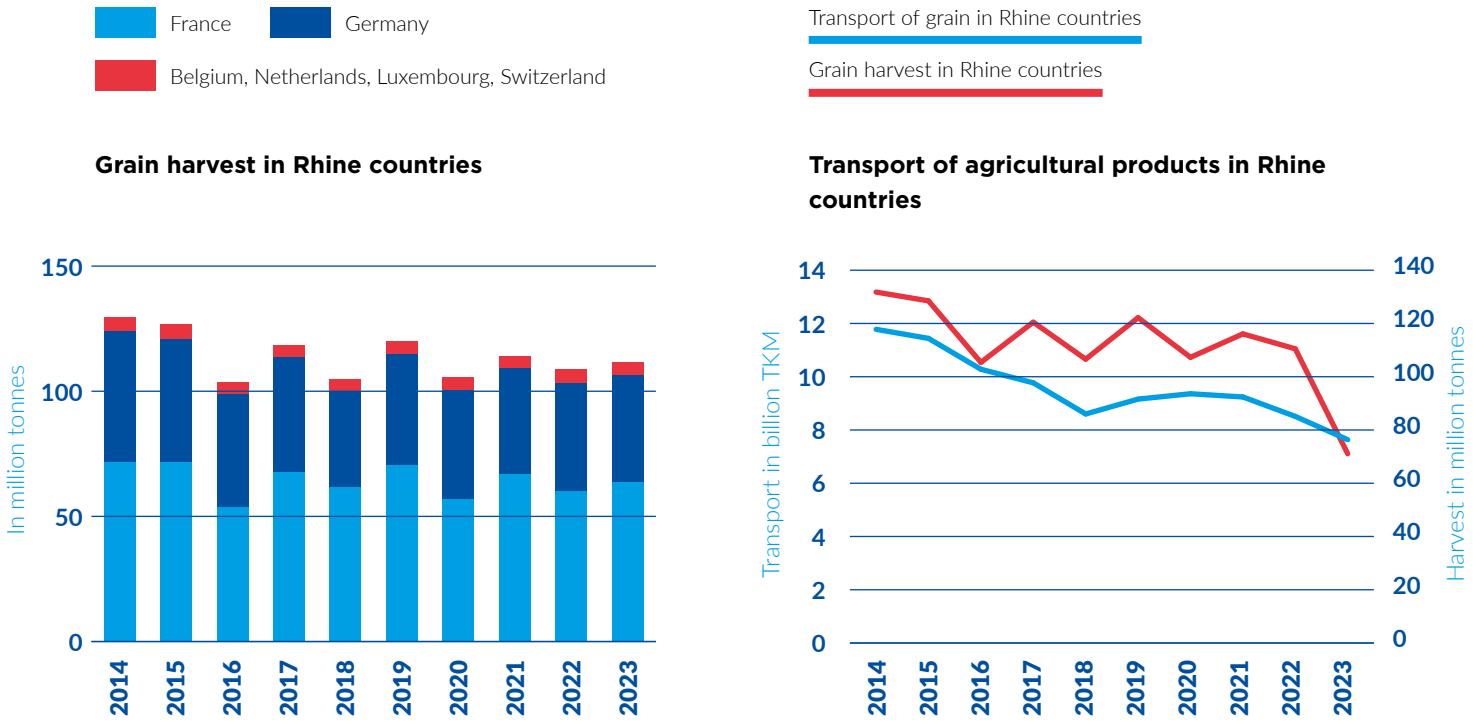
The EU remains the region currently facing the biggest challenges, which resulted in a major drop in the region's steel demand in 2023. However, the World Steel Association foresees a rebound of demand (+1.7%) in 2024 and a more meaningful recovery in 2025 (+5.3%).[64]

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. This effect is due to the stockpiling of harvest products.

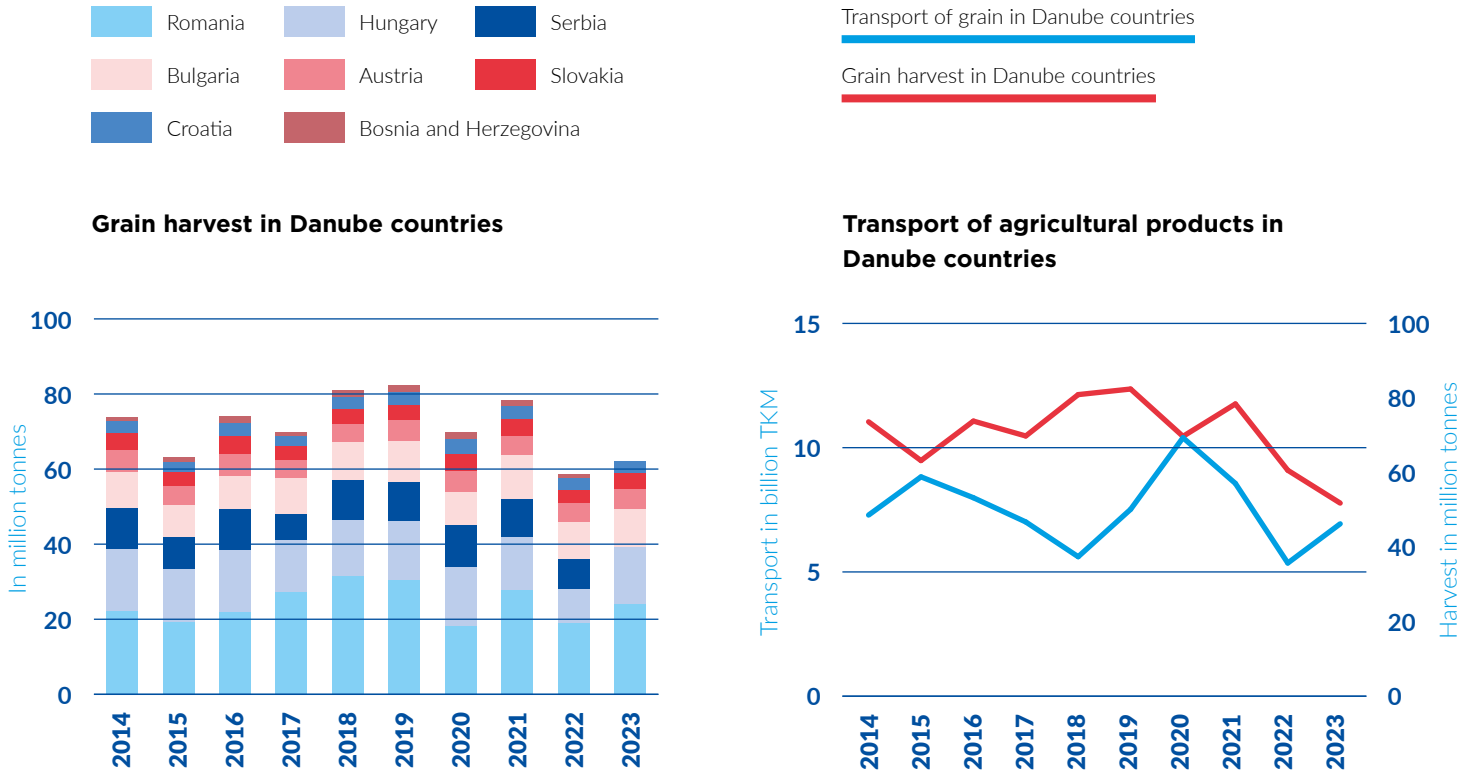
[63] *Eurofer, Economic and steel market outlook 2024-2025, second quarter, April 2024: https://www.eurofer.eu/assets/publications/economic-market-outlook/economic-and-steel-market-outlook-2024-2025-second-quarter/Economic-Report-Q2-2024_final.pdf*
[64] *World Steel Association, worldsteel Short Range Outlook April 2024, 9 April 2024: https://worldsteel.org/media/press-releases/2024/worldsteel-short-range-outlook-april-2024/*

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



Source: Eurostat [apro_cpsh1] and [iww_go_atygo]

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



Source: Eurostat [apro_cpsh1] and [iww_go_atygo]
Missing data for Serbia in 2023

Outlook for the agri-food segment

The war disrupted the Ukrainian and Russian grain exports, mainly due to the closure of Ukrainian ports on the Black Sea, and sanctions imposed on Russia. The increase in prices for agricultural commodities that followed lasted until the end of July 2022. In August 2022, the Black Sea ports were reopened. The supply shortage disappeared, bringing prices down to their pre-crisis levels. Until the end of 2022, maize and barley prices remained at the pre-crisis level, while wheat prices continued a downward trend.[65] Between April 2023 and April 2024, prices for barley, maize and soft wheat followed a downward trend.[66]

Wheat

For soft wheat[67], an increase is observed on a worldwide scale, as well as for the EU-27 and for France. The situation is very different for hard wheat[68]. In the harvest season 2023/24, worldwide harvest volumes of hard wheat have reached their lowest level since 2001/02. Smaller harvest volumes are observed for major exporting countries. Also in the European Union, the harvest volume of hard wheat is below the five-year average.

Barley

Worldwide production is foreseen to decrease in the 2023/24 season, to 146 million tonnes. Also, in the EU-27, barley production is smaller compared to the five-year average. In France however, an increase is observed.

Maize

Harvest results are expected to increase by +6.1% in the 2023/24 season on a worldwide scale. In the EU-27 and in particular in France, harvest production is smaller than in the 2022/23 season.

TABLE 1: **HARVEST VOLUMES IN THE SEASON 2023/24 COMPARED TO FIVE-YEAR AVERAGES**

Harvest season 2023/24 in million tonnes	World	EU-27	France
Soft wheat	**758.4**	**125.6**	**35.0**
5-year-average	750.0	124.1	34.4
Hard wheat	**31.4**	**7.0**	**1.3**
5-year average	34.0	7.6	1.5
Maize	**1,227**	**62.3**	**11.9**
5-year average	1,157	66.4	12.2
Barley	**146.0**	**47.5**	**12.3**
5-year-average	154.0	52.4	11.6

Sources: FranceAgriMer April 2024, Banque CIC agriculture, European Commission, Service de la statistique et de la prospective (SSP) du Ministère de l'Agriculture et de la Souveraineté alimentaire (France)

[65] *Source: FranceAgriMer (2023), Note de conjonctures mensuelle sur les filières grandes cultures, March 2023*
[66] *Source: FranceAgriMer (2024), Note de conjoncture mensuelle sur les filières grandes cultures, April 2024*
[67] *Soft wheat is generally suitable as a raw material for flour and baked goods, such as bread and bread rolls, but is also used to produce malt, animal feed and starch.*
[68] *Hard wheat is primarily used for the production of pasta.*

CHEMICALS

As in 2022, the European chemical sector in 2023 continued to be impacted by the consequences of the war in Ukraine, in particular higher costs of energy and feedstock, the recession in Europe, and inflation – although decreasing – affecting the entire chemical value chain overall. Ultimately, while many in the chemical industry had anticipated a modest rebound in production in 2023, several chemical companies revised their expectations downwards. This phenomenon was worldwide and did not only affect the EU. Chemicals production worldwide grew by +2.3% in 2023, a result mostly attributable to Russia, China, and India while the usually strong USA chemicals sector, for example, has only grown by +1%.[69]

Within the total transport performance, the share of chemicals amounts approximately to 17% on the Rhine and 11% on the Danube. The transport performance for chemicals in Rhine countries has remained at somewhat stable levels over the last five years, with significant drops in 2018 (low water effect) and 2022 (as a consequence of the war in Ukraine and the low waters).

In Rhine countries, chemical production came under heavy pressure in 2019 and 2020 from the Covid-19 pandemic, after which it recovered slightly in 2021. However, in 2022, the invasion of Ukraine was followed by important increases in the price of the sector's petrochemical input factors, causing chemical production to drop sharply in 2022. This phenomenon continued in 2023. Indeed, the chemicals sector is very resource-intensive and the largest energy consumer in Europe, being severely impacted by the repercussions of the war.

In Danube countries, the decreasing trend which had already started in 2022 for chemical production, continued in 2023.

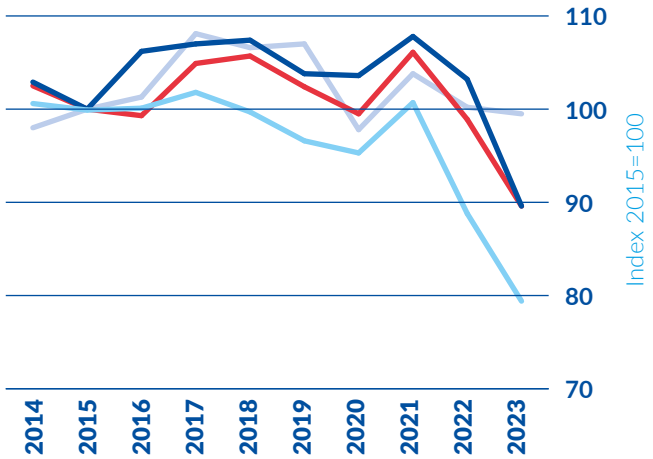
For both rivers, the trend in transport demand roughly followed the trend in production.

[69] *Source: Deloitte, 2024 chemical industry outlook (last consulted on 10.04.2024). Available at: https://www2.deloitte.com/us/en/insights/industry/oil-and-gas/chemical-industry-outlook.html*

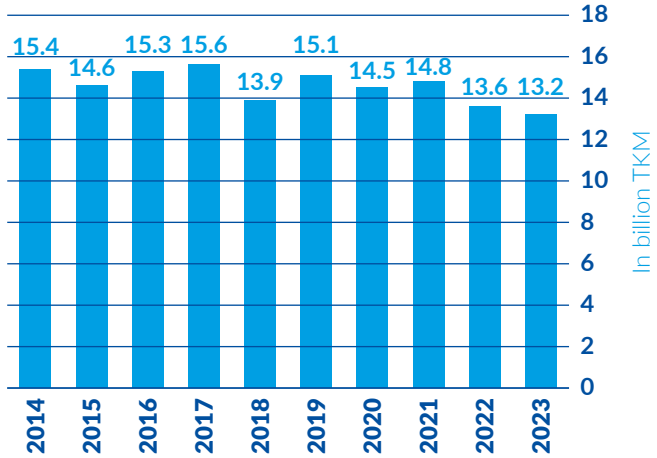
FIGURES 9, 10, 11 AND 12: **INDEX OF CHEMICAL PRODUCTION AND TRANSPORT OF CHEMICAL PRODUCTS IN RHINE AND DANUBE COUNTRIES**

France Netherlands Belgium Germany

Index of chemical production in Rhine countries

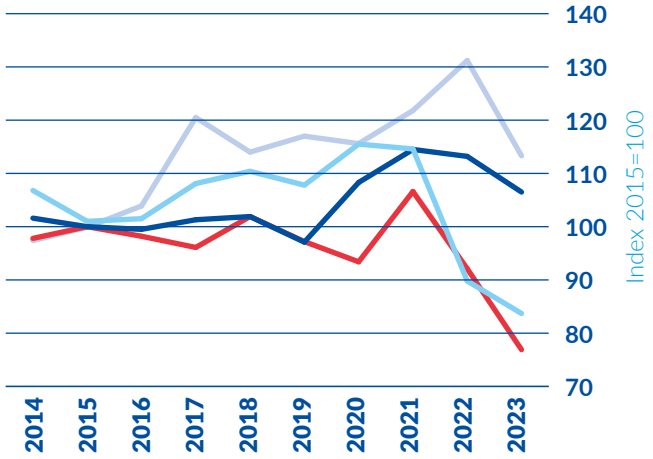


Transport of chemical products in Rhine countries

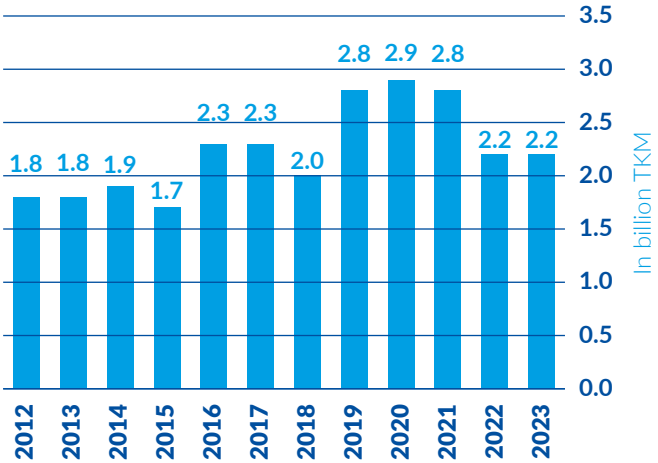


Romania Hungary Bulgaria Austria

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

Given that 88% of all chemical products in the EU are produced in only eight countries, of which four are Rhine countries (Germany, the largest producer, followed by France, the Netherlands and Belgium), the development of the chemical sector in Rhine countries strongly influences the EU chemical sector. Overall, in 2023, chemical production in the EU fell by -8% compared to 2022, an even larger decline than in 2022 compared to 2021 (-6.2%).[70]

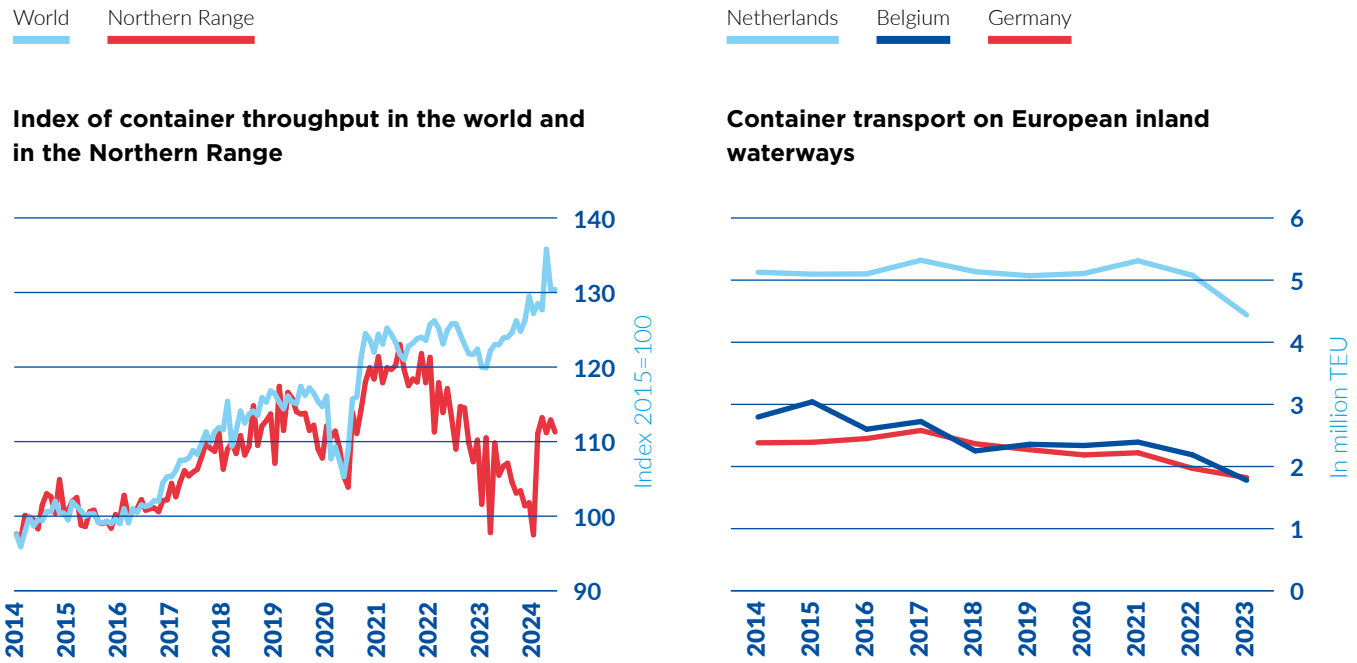
Any precise forecast is difficult to establish as the war in Ukraine is still ongoing, creating much uncertainty in the price and availability of energy (mainly gas) and feedstock. Moreover, the main drivers of the chemical sector, such as the automotive industry and the construction sector, have risen slightly or remained stagnant since October 2023 and May 2023 respectively. Despite this mixed outlook, confidence in the chemicals sector started to rise again in February 2024 as the trade balance is slowly recovering, and destocking seems to be coming to an end.[71] Confidence is still low however and remains well below its pre-war Ukraine levels, with 45% of companies not expecting any improvement until 2025 at the earliest, and 15% of these being unprofitable[72]. Indeed, energy prices remain high, with gas prices in Europe having stabilised at 50% over their pre-war levels despite a year-long fall that started in August 2022. The American and Chinese competition is strong, as energy prices are much lower (3.9x lower in the USA than in Europe[73]), creating an additional hurdle on the way to recovery. Moreover, a rebound of chemical production is expected for the American chemical industry, which should grow even stronger in 2025 and 2026 as some materials and chemicals are needed to support the energy transition, from battery materials and refrigerants to solvents and lubricants.[74]

CONTAINERS

Container transport in inland navigation has been declining for several years. The years 2018 and 2022 witnessed two extended periods of low water levels that restricted navigating the Rhine more in terms of volumes and led to a certain reverse modal shift regarding container transport. Moreover, the invasion of Ukraine by Russia in 2022 had a significant impact on trade either directly – by hindering Ukraine's capability to trade – or indirectly – by causing a cascade of geopolitical fragmentations that weakened trade between countries which sided with Russia and those that opposed it.[75] Finally, in the aftermath of the pandemic, the consumption of goods has slowed down, while the consumption of services has increased, which also contributed to a negative impact on container transport.

[70] Source: CEFIC Chemicals Trends Report (last consulted on 10.04.2024). Available at: https://cefic.org/cefic-chemicals-trends-report/
[71] Ibid.
[72] Ibid.
[73] Ibid.
[74] Source: Deloitte, 2024 chemical industry outlook (last consulted on 10.04.2024). Available at: https://www2.deloitte.com/us/en/insights/industry/oil-and-gas/chemical-industry-outlook.html
[75] IMF World Economic Outlook, April 2024

FIGURES 13 AND 14: **INDEX OF CONTAINER THROUGHPUT IN THE WORLD AND IN THE NORTHERN RANGE** (2015= 100) **AND IWW CONTAINER TRANSPORT IN EUROPE** (IN TEU)



Sources: RWI/ISL Container Throughput Index, Eurostat [iww_go_actygo]

Despite these difficult circumstances, a recovery might be on the horizon as container transport in Northern Range ports[76] witnessed significant increases in container throughput: +3 percentage points in February and +11.2 percentage points in March 2024[77] (compared to January and February 2024 respectively). These figures point to an end of the long-lasting decline in container throughput in these European maritime ports that started in November 2023, after the first attacks by Houthi rebels on cargo ships in the Red Sea. Furthermore, maritime transport growth is expected to grow in line with trade, stabilising at around +3% per year from 2024 onwards in the short term. However, this growth for container transport remains low compared to the pre-pandemic average of +4.9%[78] and, regarding Europe, might also be partly due to the arrival of vessels avoiding the Red Sea and to the economic recovery in the Eurozone.

The outlook for container transport in inland navigation is thus mixed, as geopolitical tensions remain high, and Europe is still recovering from a difficult macroeconomic context. While a short-term recovery appears possible, expectations should be moderated, with growth expected to remain lower than previously predicted as well as lingering uncertainty.

[76] *The expression 'Northern Range' designates the concentration of European maritime ports located along the North Sea, most of which are among the most active in the world. These Northern Sea ports mainly refer to Antwerp, Rotterdam, Le Havre, Zeebrugge, Hamburg, and Bremen/Bremerhaven. Together, they give an indication of economic development in the northern Eurozone and Germany.*
[77] *RWI/ISL Container Throughput Index, last consulted on 29.04.2024. Available at: https://www.isl.org/en/services/rwiisl-container-throughput-index. Note that global container throughput is an important indicator for international trade and economic activity.*
[78] *IMF World Economic Outlook, April 2024*

OUTLOOK FOR RIVER CRUISES

The new building activity for river cruises in Europe remained low in 2023, and the active fleet shrank from 410 vessels in 2022 to 408 in 2023. Order books are however filling up, with an increasing number of cruise vessels being planned to be put in circulation in 2024 and 2025; this may mark the beginning of a reversal of the downward trend in the construction of new river cruise vessels observed since 2019.

At the European level, business expectations for the upcoming season are positive as an increase in the number of river cruises is foreseen for the 2024 season. In addition, in line with the increase in passenger numbers, higher revenue is also expected for the 2024 season.[79]

Concerning projections for 2024 in France, on the one hand, the river cruise branch is optimistic as to the development of their activity, on the other hand, half of the operators feel worried about a decrease of reservations during the Olympic Games, a deterioration of margins due to higher operating costs and staff shortage. Nevertheless, these obstacles should not hinder investment, as 78% of the managers who took part in the survey expressed their will to invest in modernising or renewing boat installations and equipment.[80]

[79] *Source: IG River cruise, Der Flusskreuzfahrtmarkt 2023*
[80] *Baromètre de l'activité tourisme fluvial, édition 2024, Entreprises fluviales de France – E2F*

LONG RUN OUTLOOK
FOR IWT MARKETS IN RHINE AND DANUBE COUNTRIES

Transport demand in IWT is derived from the development of underlying economic sectors and branches such as the construction and the energy sectors, the steel industry, the petrochemical and chemical industry, etc. In order to analyse the long-term development of transport demand according to goods segments, it is therefore crucial to look at long-term trends for the production of the respective goods.

The forecasts below were established on the basis of data from Oxford Economics from January 2024. These forecasts do not therefore take into account events which took place after this date.

TABLE 2: **SHARE OF MAJOR GOODS SEGMENTS WITHIN RHINE TRANSPORT**

Product segment	Share in % in 2022	Share in % in 2023	Average share 2014-2023 in %
Mineral oil products	20.4	22.1	20.6
Chemicals	16.8	16.2	15.2
Sands, stones, gravel	16.4	17.2	17.3
Container	11.2	10.2	10.9
Coal	9.5	7.3	9.0
Agribulk and food products	9.4	9.4	9.2
Iron ore	7.3	7.9	7.6
Metals	5.0	5.0	4.8

Source: CCNR calculation based on Destatis and Rijkswaterstaat

For the Danube, the major goods segments with the highest shares are agricultural products, food products and iron ores. Due to a great deal of missing data, it is not possible to indicate the exact shares per goods segment for the Danube.

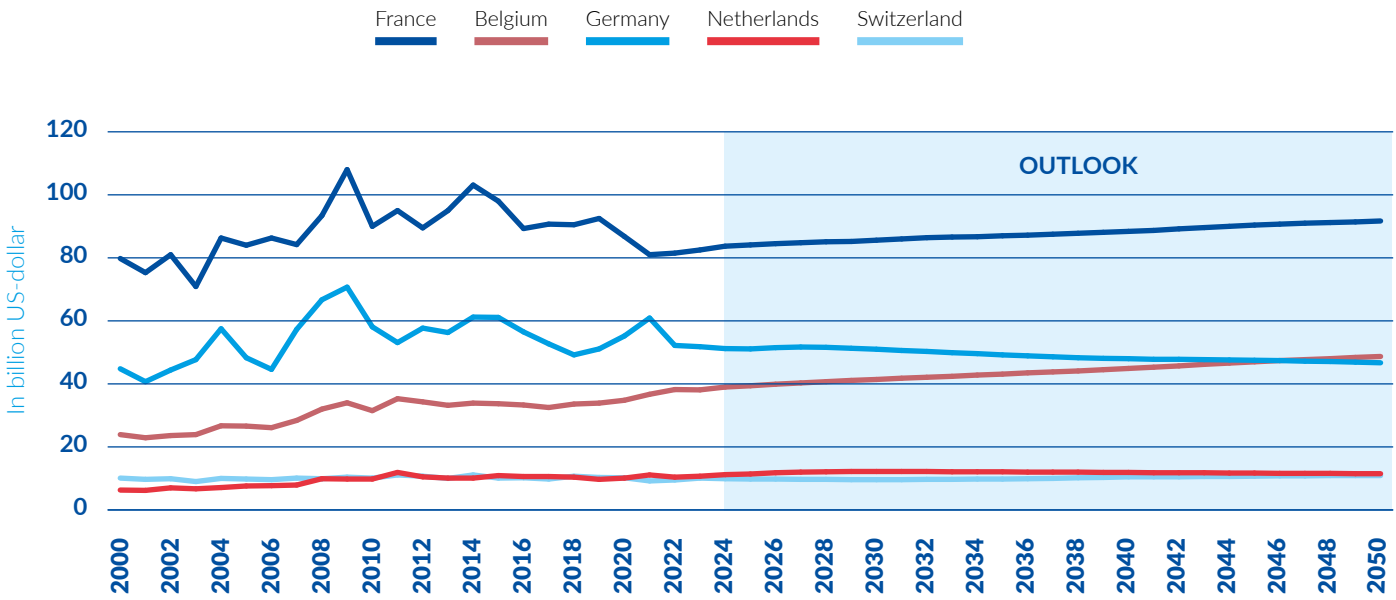
AGRICULTURE, FORESTRY AND FISHERIES

A strong correlation between harvest results and inland waterway transport of agricultural products has been found. As an example, Germany witnessed the rise in both these variables between 2008 and 2014 before falling, then somewhat stabilising in 2019. The same kind of correlation has been observed in France between 2014 and 2019.

While IWT is the preferred mode of transport for long-distance shipping of agricultural and food products according to large shipping companies interrogated as part of a *Royal HaskoningDHV* study, the 2020 decade is likely to witness a decline in its use. Indeed, the period 2020-2030 is seen as a transition period for agriculture, with a trend towards smaller scale, more localised production. This tendency, coupled with a reduction in the number of small vessels (in which grain is most often carried), could negatively affect the volumes of agricultural products travelling on inland waterways.

Long-term forecasts for the production of agricultural products foresee a decreasing trend in Germany, but an increasing trend in France, Belgium, the Netherlands and Switzerland. The gross real output in this sector is foreseen to decrease by -10% between 2023 and 2050 in Germany. For France, a growth of +11% is expected, +28% for the Netherlands, +7% for Belgium and +8% for Switzerland.

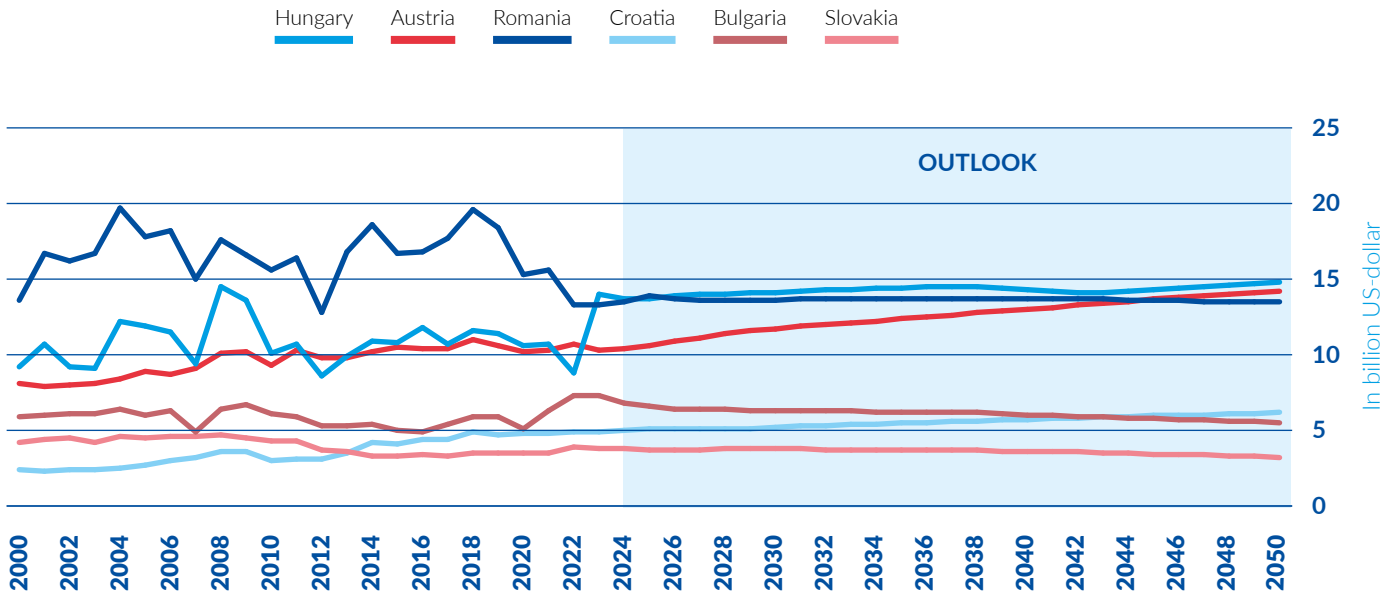
FIGURE 15: **REAL GROSS OUTPUT OF AGRICULTURAL, FORESTRY AND FISHERY PRODUCTS IN RHINE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

The output of the sector is forecast to fall by -24% in Bulgaria and by -15% in Croatia between 2023 and 2050. It is however expected to increase in Austria (+38%), Slovakia (+25%), Hungary (+6%) and Romania (+2%) in the same time period.

FIGURE 16: **REAL GROSS OUTPUT OF AGRICULTURAL, FORESTRY AND FISHERY PRODUCTS IN DANUBE COUNTRIES** (2015 PRICES IN DOLLAR)

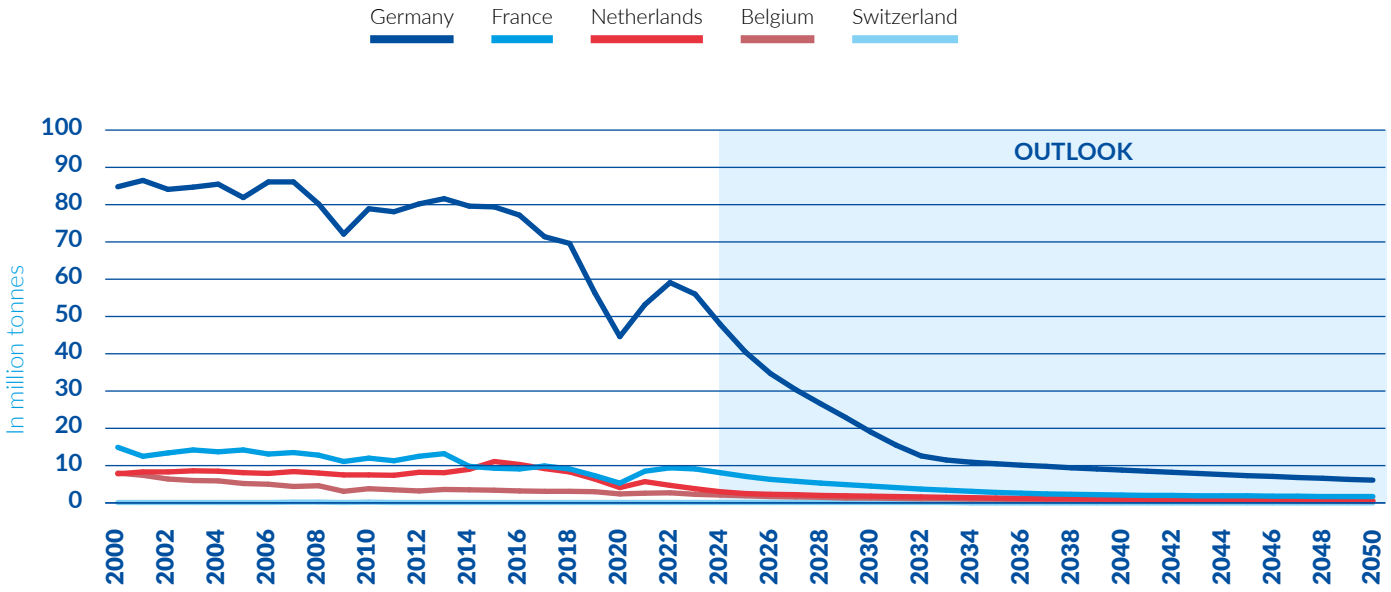


Source: Oxford Economics

COAL

The volume of coal transported on inland waterways is expected to decrease strongly in the next two decades, as European countries progress further in their energy transition. Germany, for example, has planned to close all of its coal power plants by 2038; as a result, the country's coal imports fell significantly in 2019 (-15%), despite a slight increase in global trade of coal (+0.7%). The same dynamic has been observed in France, as well as in all Danube countries, where coal consumption is forecast to fall to historically low levels in the long run, even for major consumers such as Bulgaria and Romania. In western Europe, Germany has the largest coal consumption and is dependent on coal imports, which are, to a large extent, transported on the Rhine. Despite a short run boom in coal consumption in 2022, the long run outlook for coal demand is negative. Until the year 2050, the outlook for domestic coal demand points to a -89% decrease in Germany. For France, the expected decrease is -82%. For the Netherlands, the reduction is -86%, -73% for Belgium and -68% for Switzerland.

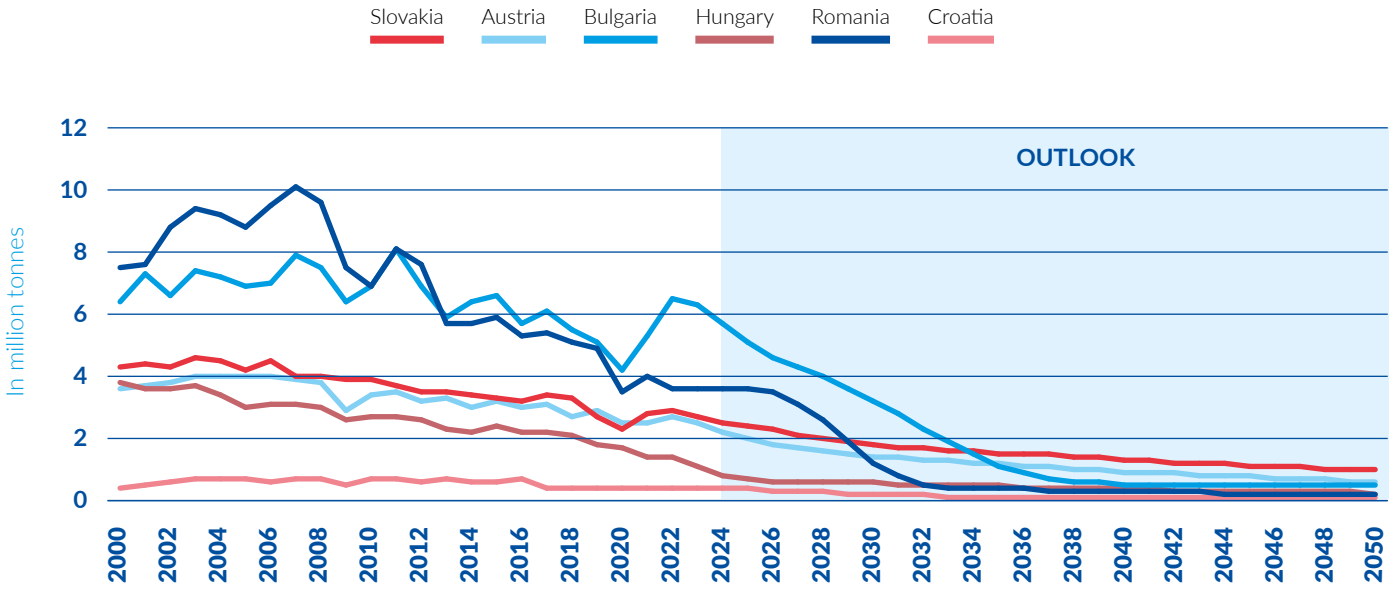
FIGURE 17: **COAL, DOMESTIC DEMAND IN RHINE COUNTRIES, ANNUALISED**



Source: Oxford Economics

As for the Rhine countries, coal consumption in the Danube region is expected to follow the same downward trend despite a slight uptake during the Covid-19 pandemic. From 2023 to 2050, the domestic demand for coal is forecast to fall by -75% in Austria, -86% in Croatia, -79% in Hungary, and -64% in Slovakia. The two countries where demand is currently the greatest (Romania and Bulgaria) are expected to witness an even more severe downtrend (-95% and -93% respectively).

FIGURE 18: **COAL, DOMESTIC DEMAND IN DANUBE COUNTRIES, ANNUALISED**



Source: Oxford Economics

CONTAINERS

It is estimated that about 75% of traded goods are shipped by sea.[81] Container transport, in turn, is the dominant mode of transport in maritime trade: nearly 66% of goods transported by sea are containerised[82]. In the absence of more specific data, and because container transport on inland waterways tends to reflect seaborne container transport and world trade, we are thus using the sum of all imports and exports of goods per country as a proxy to analyse the evolution of container transport on the Rhine. Danube countries are excluded, as container transport on the Danube is exceedingly rare. Similarly, we will use information related to world trade for our outlook for container transport in Europe.

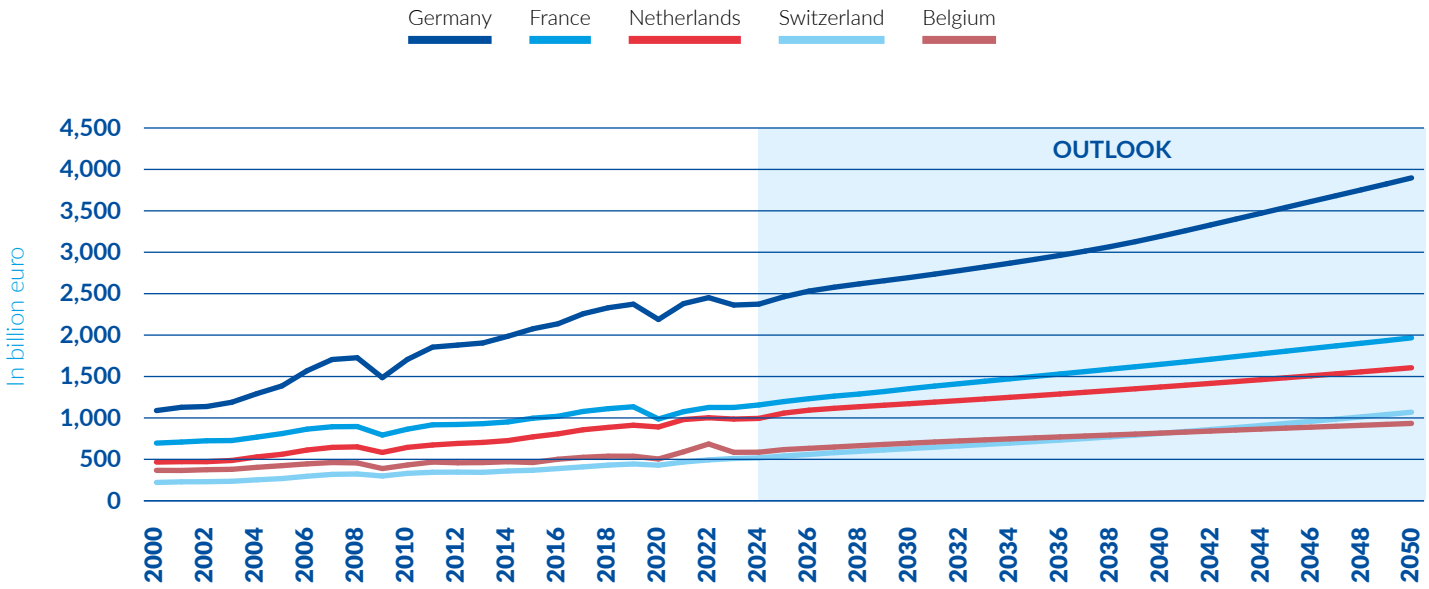
Container transport is likely to experience a steady growth in western Europe. The highest growth rate between 2023 and 2050 is expected to be seen in Switzerland (+109%). Germany should remain the country with the highest trade value, with an increase of almost +65% in the value of both its exports and imports. The growth of trade value in other western European countries is forecast to be similar to Germany's, with an increase of +60% in Belgium, +63% in the Netherlands, and +75% in France.

World trade is expected to recover from the current economic slowdown and geopolitical tensions and grow in volume at a steady rate, despite a structural rearrangement of trade flows due to the said tensions. Indeed, recent years have seen a marked interest in friendshoring and onshoring. The underlying reasons behind this are not only linked to the pandemic and the war in Ukraine, and with the concerns they caused regarding the apparent weakness of supply chains, but also to environmental concerns.

Whether friendshoring will last and change the face of world trade in the long run is difficult to say. If it does, it will certainly cause an increase in container trade within Europe, as most European countries are geographically close to each other and generally entertain cordial diplomatic relations within the EU, making friendshoring and onshoring in the future likely. According to the IMF, trade growth between blocs – defined as western countries on the one hand and China, Russia, and countries that sided with Russia following its invasion of Ukraine on the other hand – has decreased by -4.9 percentage points on average between two periods: following Russia's invasion of Ukraine (from Q2-2022 to Q3-2023) and the five years leading up to it (from Q1-2017 to Q1-2022).[83]

[81] *Source: Verschuur, J., Koks, E.E. & Hall, J.W. Ports' criticality in international trade and global supply-chains. Nat Commun 13, 4351 (2022): https://doi.org/10.1038/s41467-022-32070-0*
[82] *Source: UNCTAD Review of Maritime Transport, 2023*
[83] *Source: IMF World Economic Outlook, April 2024*

FIGURE 19: **YEARLY SUM OF REAL IMPORTS AND EXPORTS OF GOODS IN RHINE COUNTRIES** (2015 PRICES IN EURO)



Source: Oxford Economics
Switzerland's exports and imports value was converted from 2015 Swiss francs to 2015 euros. France's exports and imports value was converted from 2014 euros to 2015 euros using the European Central Bank's reported inflation rate of 0.03%.

CHEMICALS

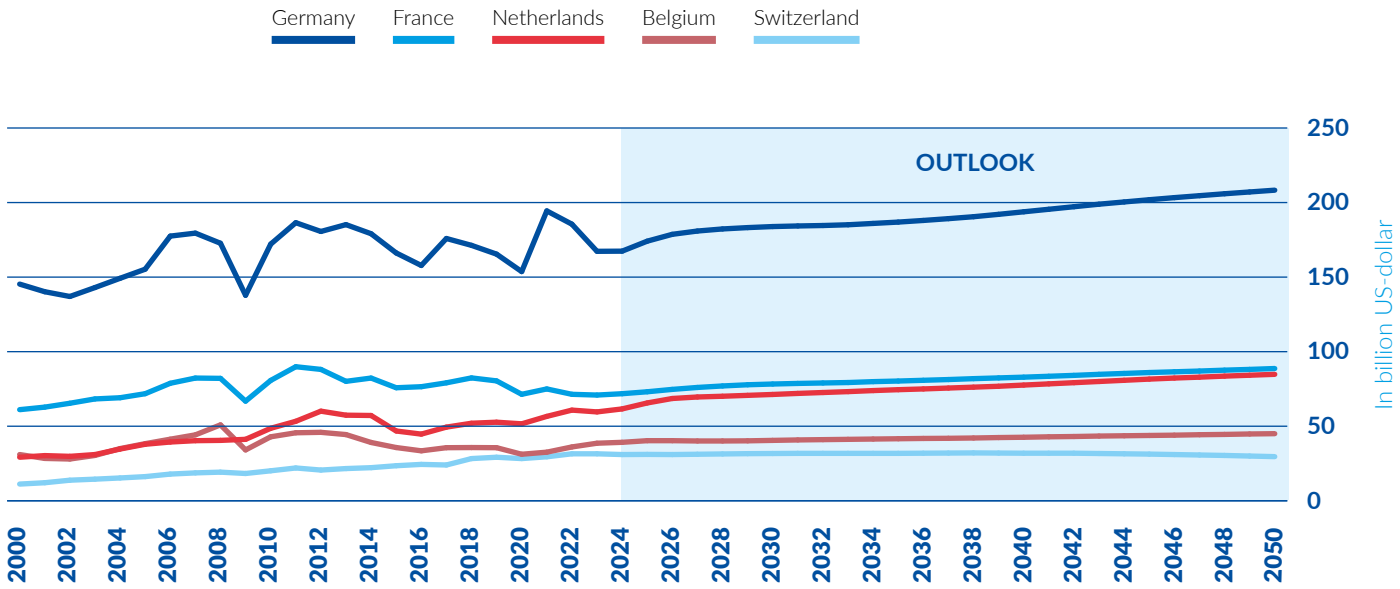
Inland waterway transportation is likely to remain in a strong position for the transport of chemicals, as other modes of transport are generally not considered viable, with the exception of pipelines. The chemical industry supplies clients from many economic sectors, especially in agriculture (fertilizers), plastics, automotive, construction, and paper and pulp industries. Moreover, the worldwide trend towards reindustrialisation and friendshoring is planned to be encouraged by the European Commission's Green Deal Industrial Plan, which should ensure consistent outputs for the chemicals industry.

The transport of chemicals is a growth market in IWT. This is confirmed by the development of chemical production in Europe. It can be expected that the transport of chemicals on inland waterways will grow in line with the growing production of chemicals. Moreover, the chemical industry is estimated to support more than 75% of all emission reduction technologies needed to reach the 2050 net-zero goals, which will likely drive demand and production in the coming decades.[84]

In Germany and France, real gross output of chemical production is expected to grow by +25% between 2023 and 2050. A growth rate of +42% is foreseen for the Netherlands and of +17% for Belgium. For Switzerland, a decrease of -6% is foreseen.

[84] *Source: Deloitte, 2024 US chemical industry outlook (last consulted on 10.04.2024). Available at: https://www2.deloitte.com/us/en/insights/industry/oil-and-gas/chemical-industry-outlook.html*

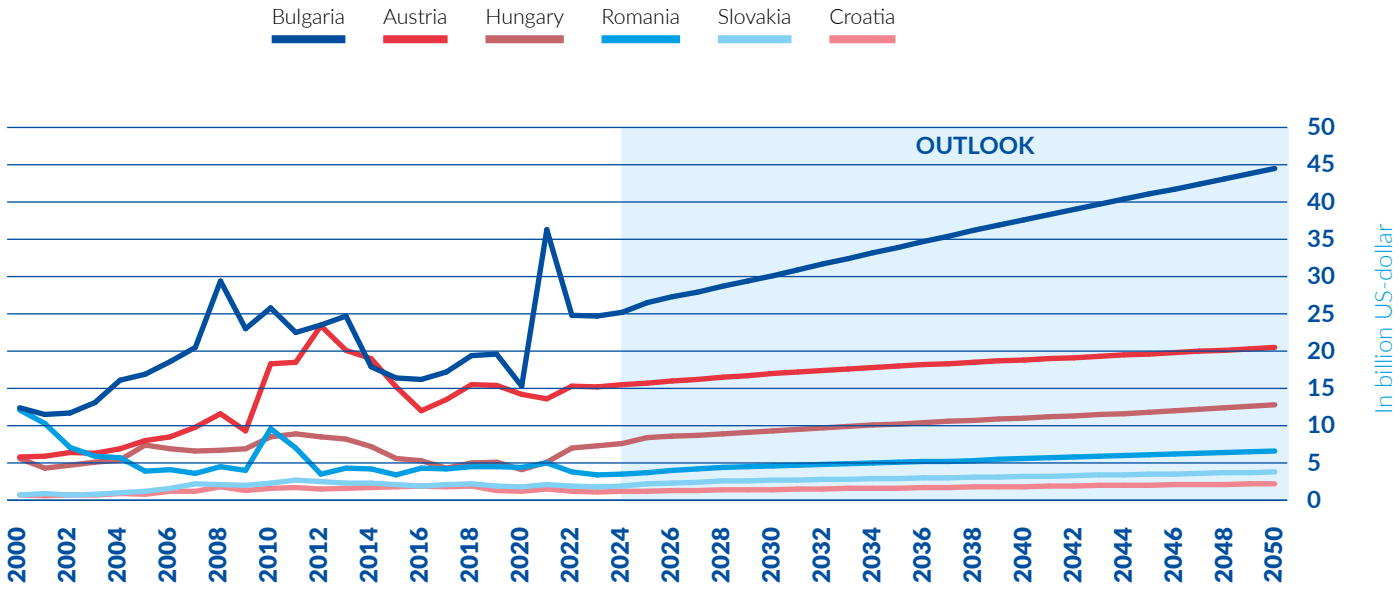
FIGURE 20: **REAL GROSS OUTPUT OF CHEMICALS IN RHINE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

Bulgaria, currently the biggest chemicals producer in central and eastern Europe, is expected to experience a sharp increase in its sectorial output by 2050, placing it well ahead of the other countries, with a growth rate of +80%. While the other countries are foreseen to witness similar or even greater growth rates, their production is likely to remain far behind Bulgaria's: +34% for Austria; +76% for Hungary, +92% for Croatia, +98% for Romania, and +113% for Slovakia.

FIGURE 21: **REAL GROSS OUTPUT OF CHEMICALS IN DANUBE COUNTRIES** (2015 PRICES IN DOLLAR)



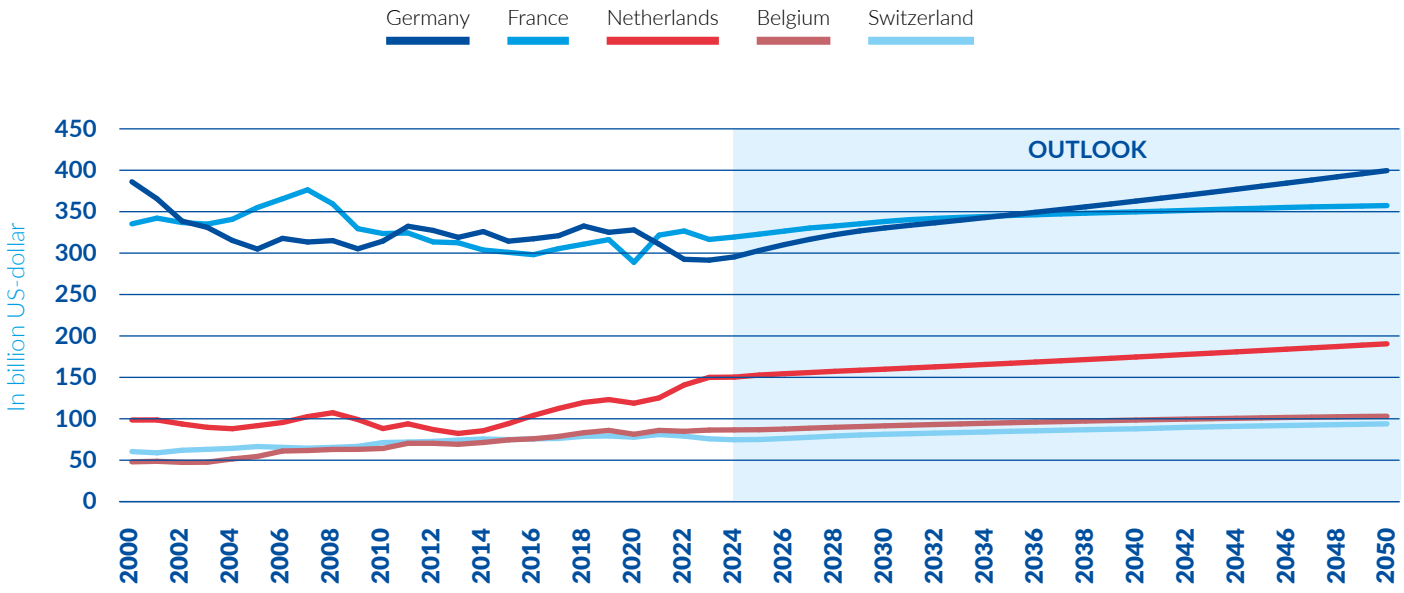
Source: Oxford Economics

CONSTRUCTION MATERIAL, SAND, STONES, GRAVEL

Shippers believe that inland waterway transport will remain the main mode of transport for construction materials such as gravel, sands, stones and others. No major modal shift is expected, but as larger companies are being created by mergers and acquisitions, the number of smaller concrete mortar plants and smaller sand and gravel companies along small waterways is expected to diminish. As larger entities concentrate along the waterways and look for more economies of scale, the demand for smaller vessels should also decrease. The upcoming years anticipate a surge in sand and gravel availability due to dredging efforts to expand rivers, coinciding with a growing demand for materials for dike reinforcement in the face of climate risks.

The transport demand depends strongly on the activity of the construction sector. According to the outlook of Oxford Economics, the inflation-adjusted real output in Germany will grow by +37% between 2023 and 2050. For France, the expected growth rate of real output in the construction sector is +13%, +27% in the Netherlands, +19% in Belgium and +24% in Switzerland.

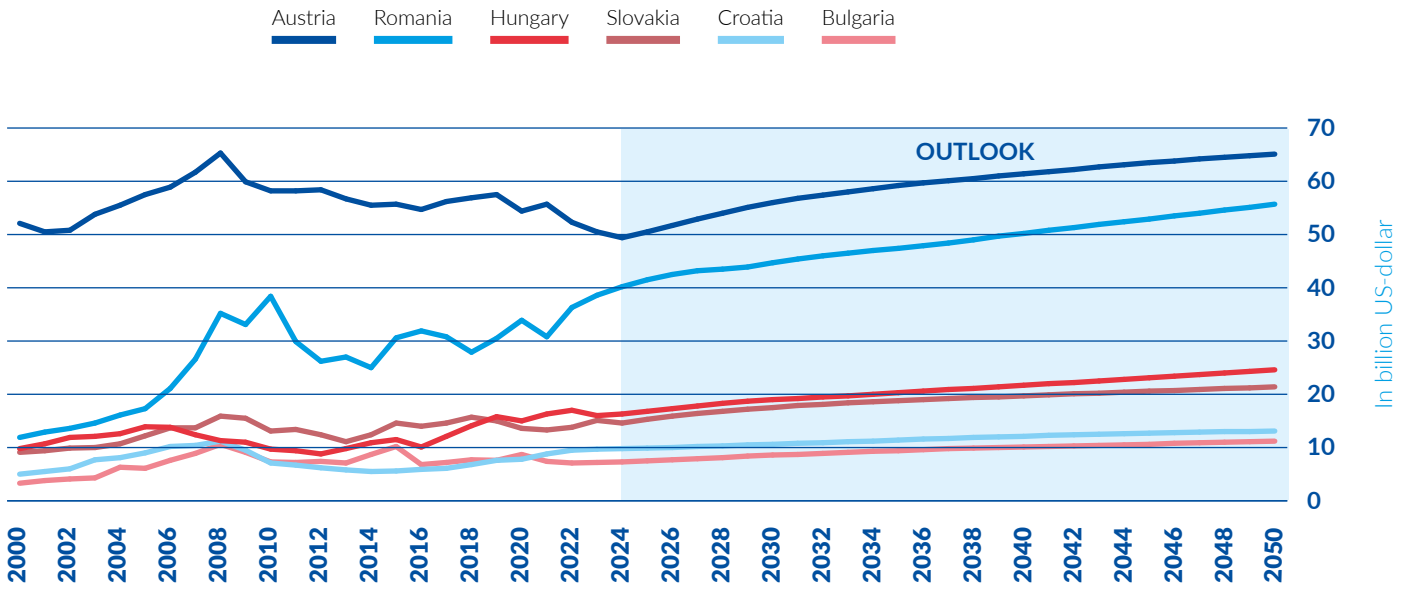
FIGURE 22: **REAL GROSS OUTPUT IN THE CONSTRUCTION SECTOR IN RHINE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

The construction sector is expected to grow by +56% in Bulgaria, +36% in Croatia, +54% in Hungary, +44% in Romania, and +42% in Slovakia between 2023 and 2050. Austria's construction sector, currently the biggest in central and eastern Europe, is forecast to catch up and be followed closely by Romania's, with respective growth rates of +29% and +44% in the same time frame.

FIGURE 23: **REAL GROSS OUTPUT IN THE CONSTRUCTION SECTOR IN DANUBE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

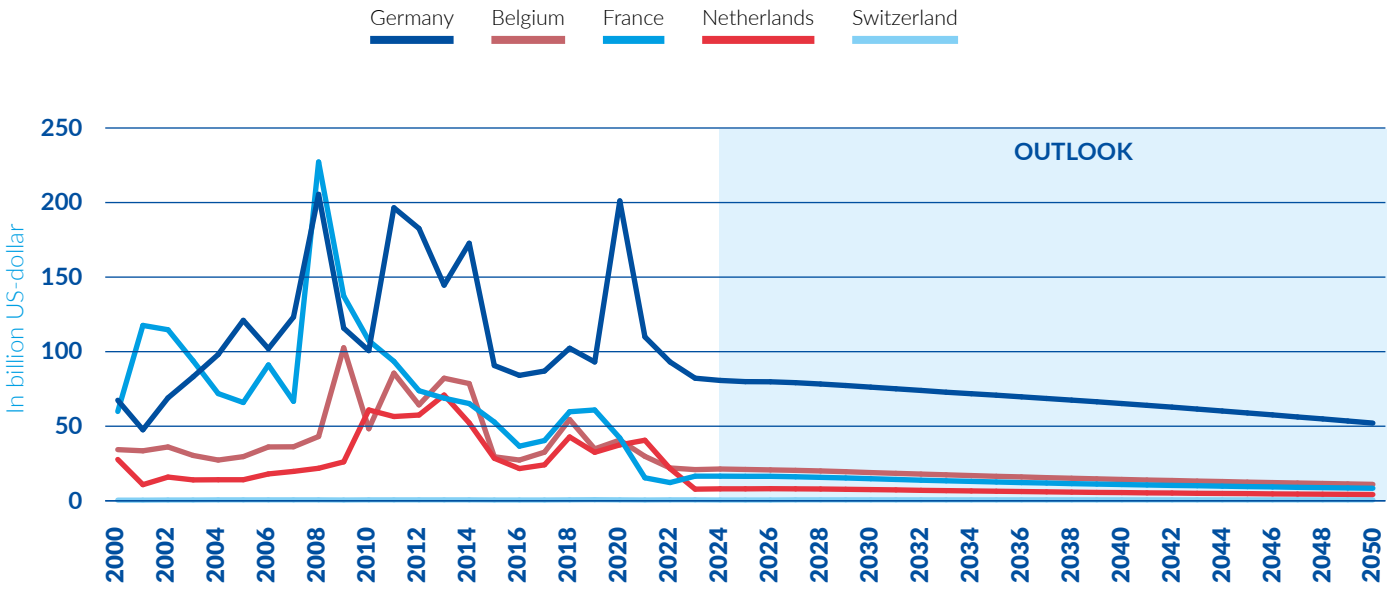
PETROLEUM PRODUCTS AND COKING COAL

As countries progress through their energy transition, the demand for oil products is however expected to continue its current downward trend, leading to a decline in its transport through inland waterways. Even though there are financial and technical barriers to the development of carbon neutral propulsion technologies, it is assumed that oil products will gradually be phased out from the propulsion mix in the next two decades. Data from the port of Antwerp shows that mineral oil products volumes have been declining continuously since 2013, while the volume of transported chemicals has risen greatly.

For the production of petroleum products (liquid fuels, heating oil) and coking coal or coke, a decrease is foreseen until 2050. This is explained by the gradual transition to alternative energy sources in the transport sector which is expected to lead to a decrease in the demand for petroleum products (refined liquid fuels). Concerning coking coal, a transition towards carbon free steel production is likely, which is also expected to lead to a decrease in the demand for coking coal in the future.

For Germany, the outlook shows a decrease in the production of both products together of -37% until 2050. For France, a decrease of -49% is foreseen, and a decline of -47% for the Netherlands and for Belgium. Switzerland has a very low production level of petroleum products, which is the reason for rather high imports via the Rhine.

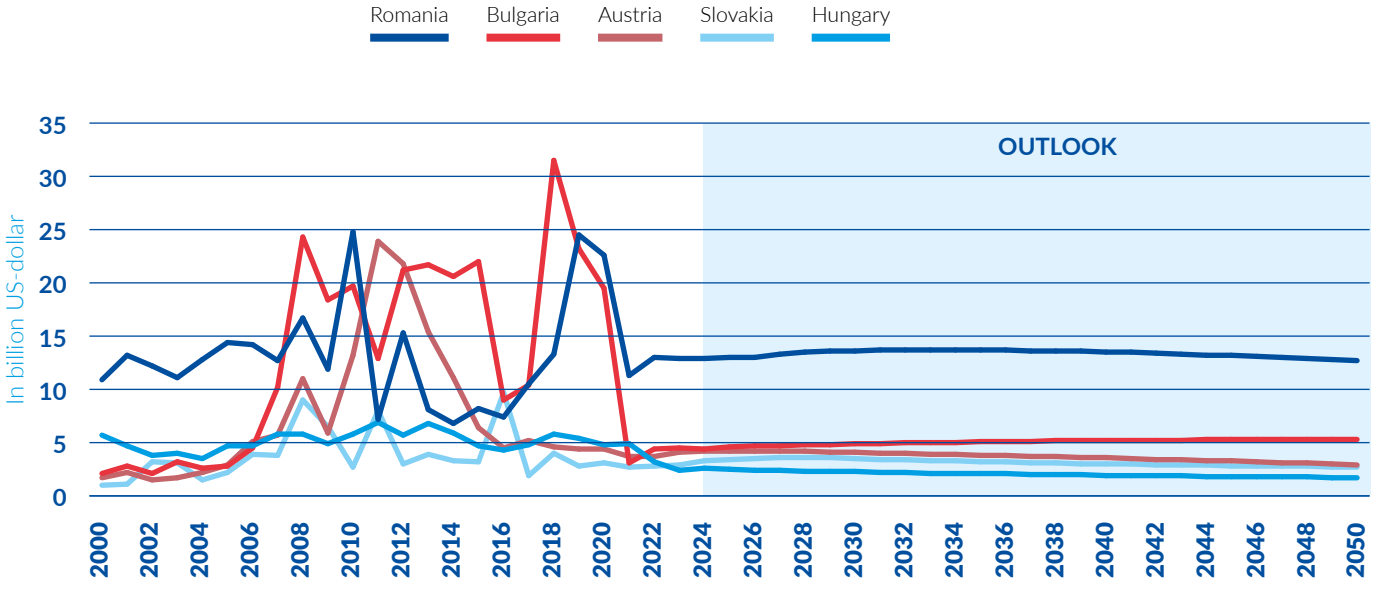
FIGURE 24: **REAL GROSS OUTPUT OF COKE AND REFINED PETROLEUM PRODUCTS IN RHINE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

A similar outlook is foreseen in eastern Europe and Austria, with a decline in petroleum products and coke production: -2% in Romania, -8% in Slovakia, -26% in Hungary, and -29% in Austria. The only country where these sectors are expected to grow by 2050 is Bulgaria, with a +17% growth rate.

FIGURE 25: **REAL GROSS OUTPUT OF COKE AND REFINED PETROLEUM PRODUCTS IN DANUBE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

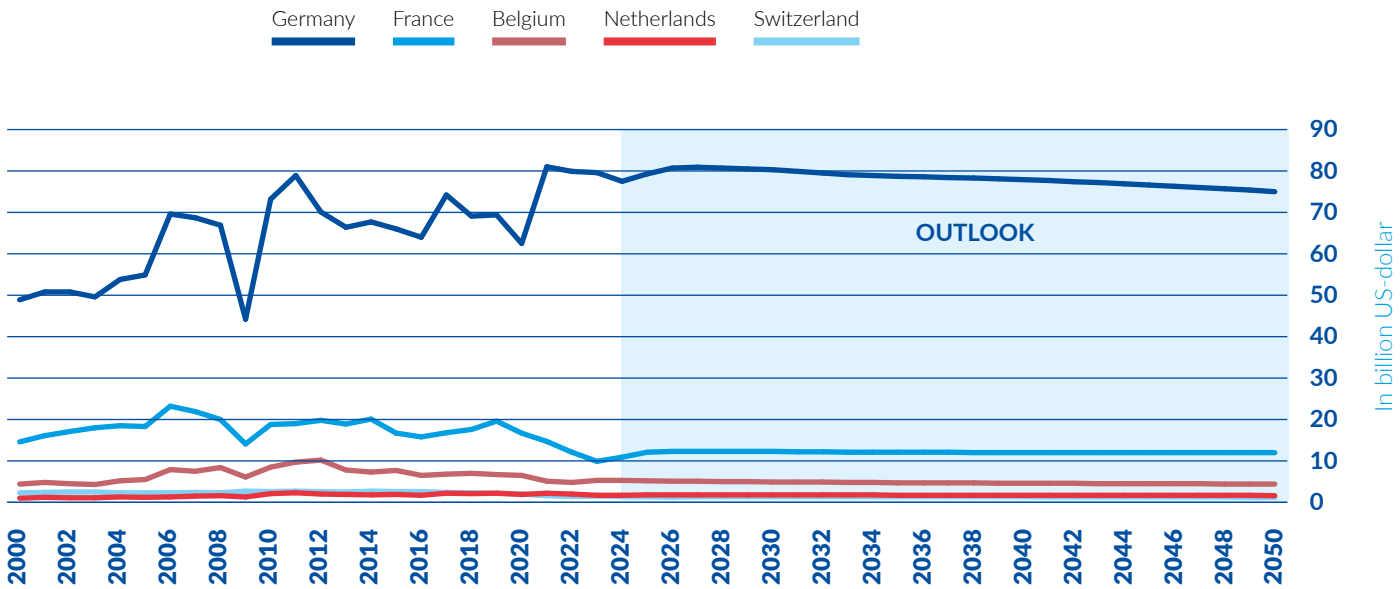
STEEL AND IRON ORE

As a circular economy is expected to play a more important role in the future, Dutch shipping companies have communicated strong opinions on higher metals recycling rates and a subsequent decline in steel demand and production across western Europe. This could cause a decline in the transportation of steel, but also iron ore, as it will likely be replaced by recycled steel and less emission intensive production technologies. However, the demand for high quality steel is increasing in developing countries, which could make steel remain an important input in European industry.

In cases where steel production is located along inland waterways, a high waterborne transport of iron ore, coking coal and steel products is observed. Germany is the largest steel producing country in Europe and the Rhine is an important transport route for iron ore and steel products.

Between 2023 and 2045, the outlook for German steel production points to a slight decline by -6%. For France, an increase of +22% is foreseen but based on a much lower absolute level of steel production. For the transport of iron ore and steel on inland waterways, the Belgian, French and German steel production is of high relevance as the steel industry in these countries is often located along inland waterways. This is not the case for Dutch and Swiss steel industry.

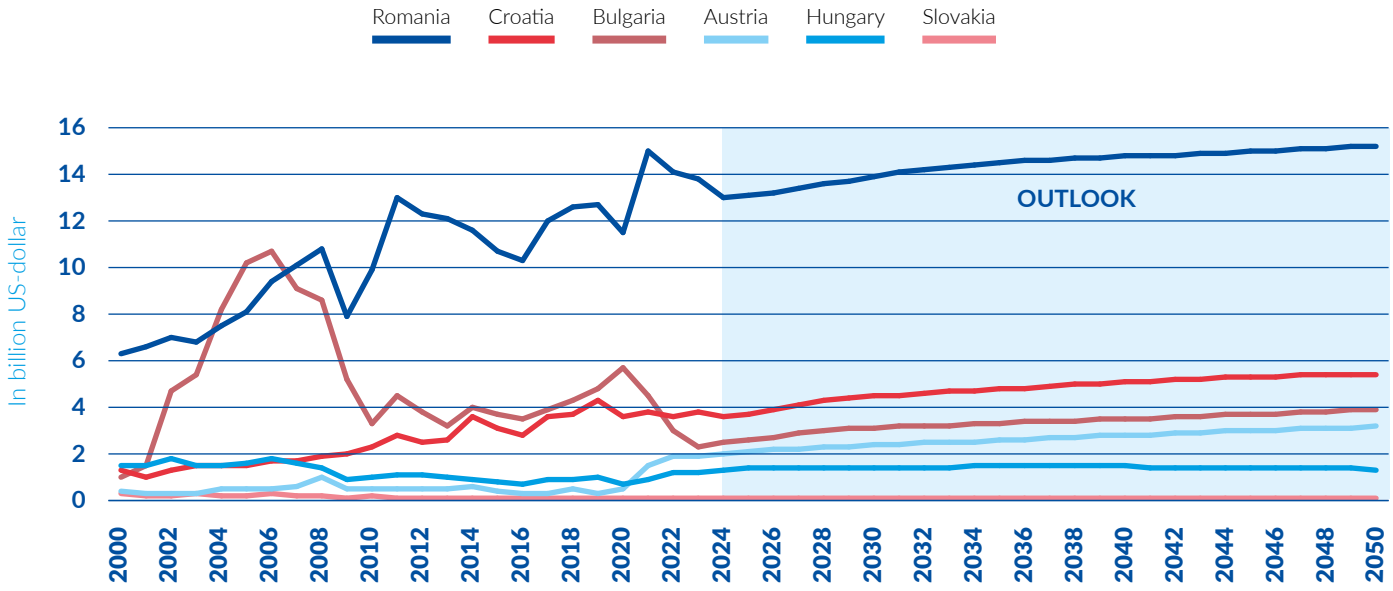
FIGURE 26: **REAL GROSS OUTPUT OF IRON AND STEEL IN RHINE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

Austria is expected to remain an important player in the steel sector along the Danube, with an +11% growth rate between 2023 and 2050. Romania's steel production, after two sharp drops in the early 2000s and in 2020, is forecast to recover by 2050, growing by +68%. The forecasts from Oxford Economics point to high growth rates across central and eastern Europe: +47% for Hungary, +67% for Croatia, +47% for Bulgaria, and +44% for Slovakia.

FIGURE 27: **REAL GROSS OUTPUT OF IRON AND STEEL IN DANUBE COUNTRIES** (2015 PRICES IN DOLLAR)



Source: Oxford Economics

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.

BLACK SEA GRAIN INITIATIVE: initiative on the Safe Transportation of Grain and Foodstuffs from Ukrainian ports. It is an agreement between Russia and Ukraine made with Turkey and the United Nations (UN) during the 2022 Russian invasion of Ukraine. It was signed on 22 July 2022 and was set to expire on 19 November 2022. On 17 November 2022, the UN and Ukraine announced that the agreement had been extended for a further 120 days. In March 2023, Turkey and the UN announced that they secured a second extension for at least another 60 days. In May 2023, the deal was once again extended for 60 days, expiring on 18 July.

BN: billion

CAPACITY UTILISATION (in passenger transport): ratio of the number of passengers divided by the passenger capacity in a given year, in percentage points. The analysis of the capacity utilisation of a fleet makes it possible to provide a thorough overview of how the supply/demand relationship evolves throughout the years.

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.

CORE INFLATION: general increase in the consumer price of goods and services, excluding those that are often more volatile, such as energy and food prices.

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

DANUBE SOLIDARITY LANES EU-UKRAINE: lanes aimed at facilitating the forwarding of agricultural produce from Ukraine, but also bilateral trade in goods and access of Ukraine to international markets and global supply chains making sure much needed cereals reach the world market.

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).

EQUIVALENT FLOW: equivalent flow values (indicated in the unit m^3/s) measured against the benchmark levels are recalculated every ten years as flows within a 100-year time series. The equivalent flow values are then used to recalculate the corresponding equivalent water level (EWL) values against the benchmark levels every ten years.

EQUIVALENT WATER LEVEL (EWL): refers to the water level occurring along the Rhine at an equivalent low water flow falling below the long-term average for 20 days per year.

EU: European Union

EUROPE: European inland navigation in this report includes five countries that are not members of the European Union – United Kingdom, 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.

EUROPEAN TRADING HUB: a dynamic market area for gas trading in the heart of Europe.

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.

FRIENDSHORING: refers to the observed trend for countries to favour trade with, and to locate economic activities, in countries that share the same political standards. The term was coined by US Secretary of Treasury Janet Yellen during a press conference held on 13 April 2022, and has since been re-used in academic writing and in reports by several organisations, including the IMF.

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.

HEADLINE INFLATION: general increase in the consumer price of goods and services, including those that are often more volatile, such as energy and food prices.

INDUSTRIAL TRAFFIC: refers to the traffic that exists directly between the industries located in the port area (such as BASF, AIR LIQUIDE, EUROCHEM…) and the hinterland.

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

IWT: Inland Waterway Transport

IWW: Inland Waterways

LNG: liquified natural gas

LOWER DANUBE: stretch of the Danube from the Iron Gates on 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 on 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

MMBtu: Million British thermal unit

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.

NET TURNOVER (this definition applies only to the turnover data in the Netherlands in the report, the source of which is the CBS statistical office): business returns, excluding VAT (value added taxes) from the selling of goods and services to customers. Turnover is calculated after deduction of discounts, bonuses, returnable deposits and on-charged freight costs.

NORTHERN RANGE: designates the concentration of European maritime ports located along the North Sea, most of which are among the most active in the world. These Northern Sea ports mainly refer to Antwerp, Rotterdam, Le Havre, Zeebrugge, Hamburg, and Bremen/Bremerhaven. Together, they give an indication of economic development in the northern Eurozone and Germany.

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.

Q1/2/3/4 : first/second/third/fourth quarter

RED SEA CRISIS: the incident of 19 October 2023 when the Houthi movement in Yemen started attacking merchant vessels in the Red Sea and caused hundreds of ships to alter their course and sail through the Cape of Good Hope to avoid attacks. This led to a significant drop in international container transport at the end of the year 2023.

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, 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 (Eurostat definition): it comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. It includes all duties and taxes on the goods or services invoiced by the unit with the exception of the VAT invoiced by the unit to its customer and other similar deductible taxes directly linked to turnover; it also includes all other charges (transport, packaging, etc.) passed on to the customer. Price reductions, rebates and discounts as well as the value of returned packing must be deducted.

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, on the border between 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
GUS	Główny Urząd Statystyczny	Statistics Poland	Poland
INSSE	Institutul National de Statistica	National Institute of Statistics	Romania
Lietuvos statistika	Lietuvos statistika	Statistics Lithuania	Lithuania

BOOKS, JOURNAL ARTICLES AND STUDIES

Original Name	Country
A. Hader, The River Cruise Fleet Handbook (May 2024)	Europe
CEFIC Chemicals Trends Report. Available at: https://cefic.org/cefic-chemicals-trends-report/	Belgium
Deloitte, 2024 US chemical industry outlook (last consulted on 10.04.2024). Available at: https://www2.deloitte.com/us/en/insights/industry/oil-and-gas/chemical-industry-outlook.html	World
Entreprises fluviales de France – E2F, Baromètre de l'activité tourisme fluvial, édition 2024	France
Eurofer, Economic and steel market outlook 2024-2025, second quarter, April 2024: https://www.eurofer.eu/publications/economic-market-outlook/economic-and-steel-market-outlook-2023-2024-second-quarter/	Europe
FranceAgriMer (2023, 2024), Note de conjonctures mensuelle sur les filières grandes cultures, March 2023 and April 2024	Europe
IG RiverCruise - Der Fluss-Kreuzfahrtmarkt 2023	Europe
IMF World Economic Outlook, April 2024	World
Port of Rotterdam (2024), https://www.portofrotterdam.com/de/nachrichten-und-pressemitteilungen/rotterdamer-hafen-2023-vollstaendig-im-zeichen-des-wandels	The Netherlands
RWI/ISL Container Throughput Index. Available at: https://www.isl.org/en/services/rwiisl-container-throughput-index	World
UNCTAD Review of Maritime Transport 2023	World
Verschuur, J., Koks, E.E. & Hall, J.W. Ports' criticality in international trade and global supply-chains. Nat Commun 13, 4351 (2022): https://doi.org/10.1038/s41467-022-32070-0	World
viadonau, several annual reports available at: https://www.viadonau.org/newsroom/publikationen/broschueren	Europe
Worldsteel Association, Worldsteel Short Range Outlook April 2024, 9 April 2024: https://worldsteel.org/media/press-releases/2024/worldsteel-short-range-outlook-april-2024/	World
WTO Global Trade Outlook, April 2024	World

OTHER SOURCES

Original Name	English Name	Country
Administrația Canalelor Navigabile (ACN)	Administration of the Navigable Canals (ACN)	Romania
Association française des ports intérieurs (AFPI)	French association of inland ports (AFPI)	France
Banque CIC agriculture	CIC Bank agriculture	France
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
Donaukommission	Danube Commission	Europe
Eidgenössische Steuerverwaltung (ESTV)	Federal Tax Administration (FTA)	Switzerland
European Steel Association (Eurofer)	European Steel Association (Eurofer)	Europe
EUROSTAT	EUROSTAT	EU
FAIRway project	FAIRway project	EU
FranceAgriMer	FranceAgriMer	France
Insights Global	Insights Global	The Netherlands
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
Land Niederösterreich	Federal State of Lower Austria	Austria
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
National fleet register of Luxembourg	National fleet register of Luxembourg	Luxembourg

Original Name	English Name	Country
Organisation for Economic Co-operation and Development (OECD)	Organisation for Economic Co-operation and Development (OECD)	World
Oxford Economics	Oxford Economics	World
Ports mentioned in the report	Ports mentioned in the report	Europe
R.A. Administratia Fluviala a Dunarii de Jos Galaţi (AFDJ)	Galaţi Lower Danube River Administration, A.A.	Romania
Rijkswaterstaat	Ministry of Infrastructure and Water Management	The Netherlands
Service de la statistique et de la prospective (SSP) du Ministère de l'Agriculture et de la Souveraineté alimentaire	Department of Statistics and Foresight Analysis (SSP) of the Ministry of Agriculture and Food	France
Statistikamt Nord	Statistical Office for Hamburg and Schleswig-Holstein	Germany
Department for Transport	Department for Transport	United Kingdom
viadonau	viadonau	Europe
Voies Navigables de France (VNF)	Navigable Waterways of France (VNF)	France
Wasserstraßen-und Schifffahrtsverwaltung des Bundes (WSV)	German Waterways and Shipping Administration	Germany
World Steel Association	World Steel Association	World

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