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DIONYSUS

Integrating Danube Region into Smart & Sustainable Multi-modal & Intermodal Transport Chains

IWT Market observatory

DR report

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4 Abbreviations

Abbreviation	Explanation
IWT	Inland water transport
TEU	twenty-feet equivalent unit
DR	Danube region
IWW	inland waterway
EUSDR	European Union Strategy for Danube Region
HFIP	Hungarian Federation of Inland Ports

CNNR	Central Commission for the Navigation of the Rhine
CEF	Connecting Europe Facility
INEA	Innovation and Networks Executive Agency

5 Scope of the document

The aim of this output is to analyse the trade flows and medium term economic development scenarios for the Danube region. Based on the generated information of cargo flows which have the potential to be transported by IWT, a dedicated monitoring tool, namely the IWT Market Observatory, will be elaborated. This output will provide - by means of market analyses and status-quo reports - a collection of information for the most important market segments with high potential to be developed in the near future such as: demands and availability of containerized transport opportunities considering both the mid-term perspectives and the necessity to be part of the regional and international multi-/intermodal transport chains.

6 Executive summary

In this report, based on previously elaborated DIONYSUS deliverables, interviews with IWT experts and port professionals, we examine status, trends and future development plans of IWT in the Danube Region with an outlook on Hungary. This document is divided into three sections:

- current status of trade and cargo flows in the Danube Region and in Hungary,
- future trends of cargo and trade flows, potentials in the DR and in Hungary,
- strategic steps to be taken in the DR and recommendations made by Hungarian stakeholders to raise the modal share of IWT in order to achieve its potential.

In the EU, the share of road transport is 77,4% total inland freight transport (based on tonne-kilometres performed), while in Hungary it is the dominant mode (85% in 2020) and IWW is only 8.5%. Due to the nature of waterborne transport, the transport of goods

by ship is only an intermediate element in a transport chain involving several modes of transport.

Regarding the current status, we can state that despite of reductions in case of iron ore, metals and coal transport, IWT performance on the Danube decreased less than expected due to the increase of agricultural products. Traffic is more intense near the Black Sea. In the Middle Danube the most common products are related to the metallurgical vertical (45-55% of total traffic).

Considering future trends and cargo flows, potentials of IWT, this output identifies the types of goods that are currently not transported by water. To determine the transportability of the types of goods identified in this way, a conformity assessment system shall be envisaged to filter types of goods not suitable for waterborne transport.

In 2018, the global volume of container traffic increased by 4%, it was down from the 5.6% growth recorded the previous year.

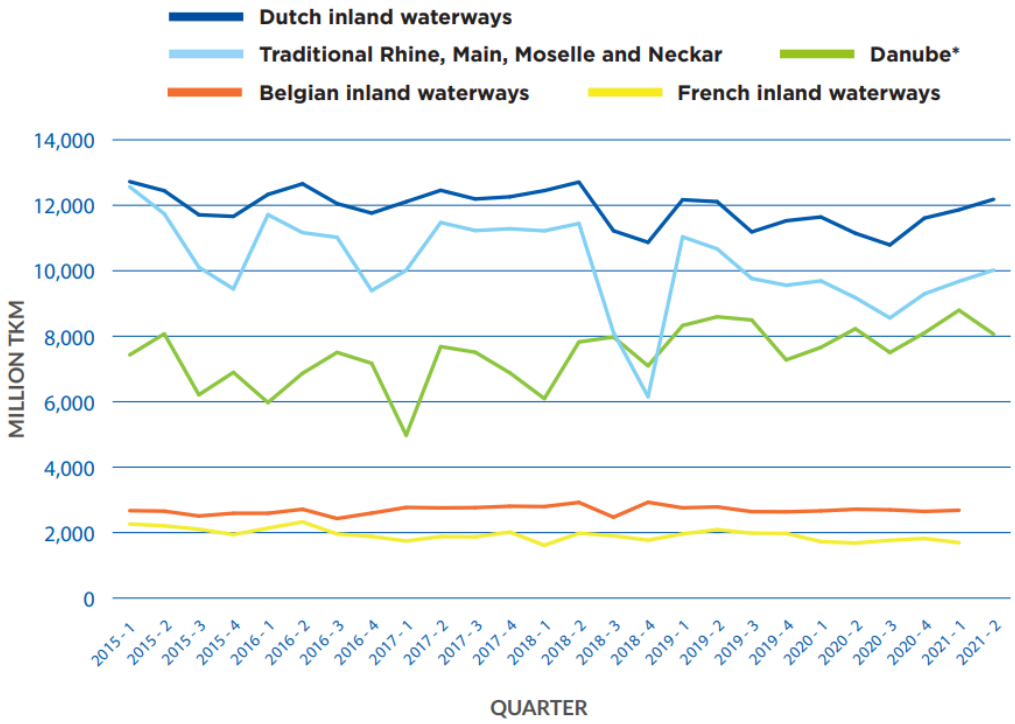
New technologies, such as container liner bags, can divert new types of goods to be carried in a standard shipping container. Liner bags are a clean, safe, and effective packaging solution that transforms containers into reliable and cost-effective alternatives to tank containers, ensuring the lowest logistical costs while the reducing environmental impact.

Finally, the development plans for the IWT sector in Hungary are presented based on the National Port Development Master Plan Strategy and focusing on financing and allocating support and establishing a legal framework for facilitating modal split. The recommendations shall be adapted by other Danube countries as well.

7 Current status of trade and cargo flows on the Danube

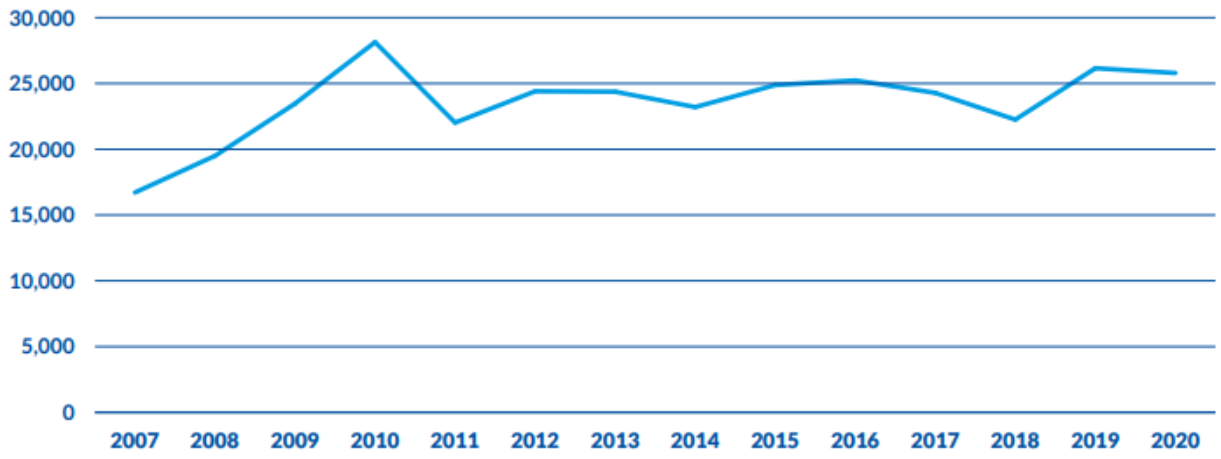
7.1 Current IWT market volumes

1. Figure Shipped volumes on inland waterways in the EU (2015-2021)



Sources: Eurostat [iww_go_qnave], OECD (Ukraine), Destatits (Rhine and affluents), *Danube = TKM in all Danube countries including Ukraine

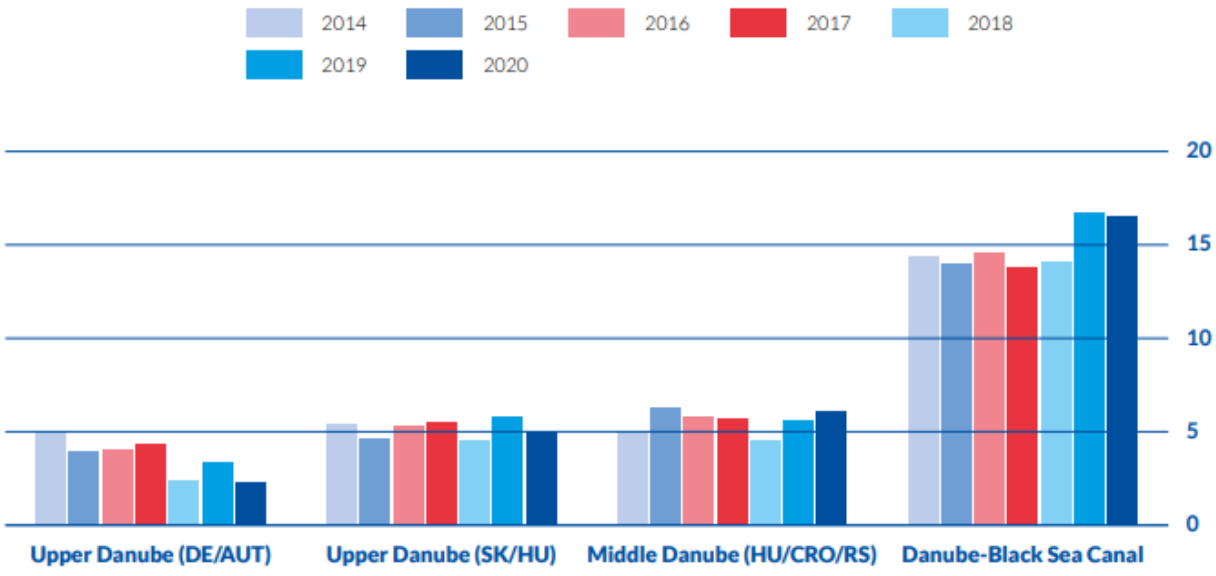
2. Figure: Transport performance in freight transport on Danube (in million tkm)



Source: CCNR Market Observation – Annual report 2021

Despite of reductions in iron ore, metals and coal transport, transport performance on the Danube decreased by only 1,4% in 2020, thanks to a vital upsurge in transport of agricultural products, a significantly better rate than the 10% decline along the Rhine.

3. Figure: Yearly freight transport at different measurement points along the Danube and on the Danube-Black Sea Canal (in million tonnes)

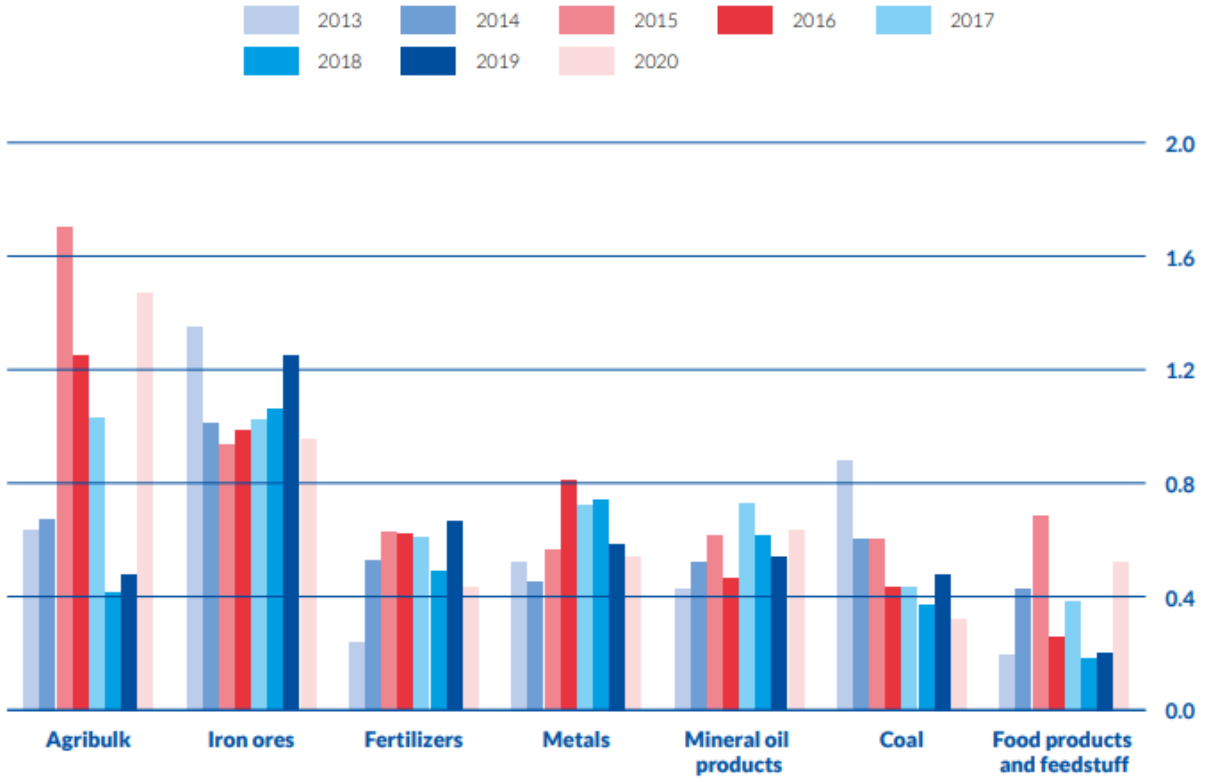


Source: CCNR Market Observation – Annual report 2021

It should also be noted that navigation on both the Danube and the Rhine is sensitive to periods of low water levels, which strongly affects the overall transport performance of both river basins - in 2018, the Danube River's transport performance was reduced by about half.

Danube traffic is more intense near the Black Sea. This is certainly due to better navigation conditions in the Lower Danube region, compared to the Central and Upper Danube.

4. Figure: Goods transport on the Middle Danube (in million tonnes)



Source: CCNR Market Observation – Annual report 2021

The most important freight transport in the Middle Danube is the transport of products related to the metallurgical vertical (iron ore, metals, metal products, steel, coking coal), which account for about 45-55% of the total traffic. This is due to an increase in the demand for metallurgical products as a result of the general increase in economic performance.

Another area of particular importance is the trade in agricultural products, of which grain is the second most important in terms of product volume.

As economic and environmental considerations become more important, combined transport is becoming increasingly important. Combined transport is an intermodal transport where the majority of the transport distance is covered by rail or waterway and the road transport distance is minimised. Only the transport unit containing the goods is transferred between the vehicles of the different modes of transport; the goods remain in the same container or means of transport from the consignor to the consignee. A distinction is made between accompanied and unaccompanied combined transport according to the mode of transport. In the former case, the entire road train and its driver (crew) also "travel" on the train or ship, in the latter case, usually only the trailer (semi-trailer) or uncoupled container is transported by other means.

In the EU, the share of intermodal rail freight in total rail freight is 21.6% (in 2016, based on data from 24 countries), and has been steadily increasing since 2005 (16.5%). In Hungary, the share was 13% in 2016.

7.2 Current cargo flows and trends in Hungary

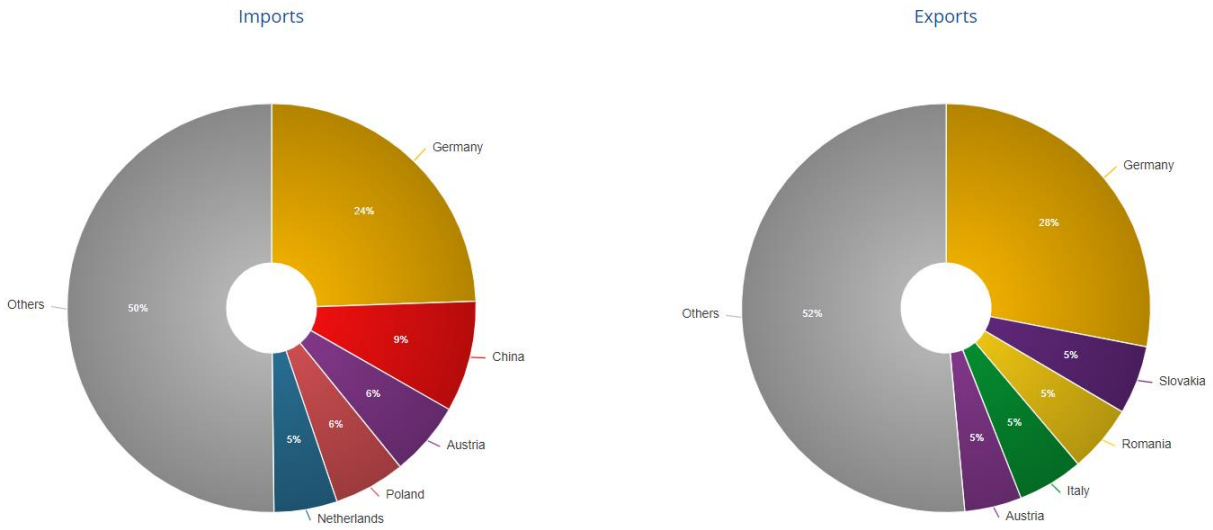
Total imports between 2015-2019, raised from EUR 81.865 million to EUR 104,761 million. Among commodity groups, machinery and equipment has the largest share with EUR 50,779 million. It is followed by processed products (EUR 37,791 million), energy carriers (EUR 8,421 million), food and beverages and tobacco (EUR 5,557 million) and raw materials (EUR 2,212 million)

1. Table: Trade flow in Hungary

Commodity groups	Export (million EUR)	Import (million EUR)
Machinery & equipment	62,659	50,779
Processed products	33,536	37,791
Energy carriers	2,859	8,421
Food, beverages & tobacco	7,538	5,557
Raw materials	2,502	2,212
Total	**109,095**	**104,761**

Source: DT.1.2.1. Summary Report

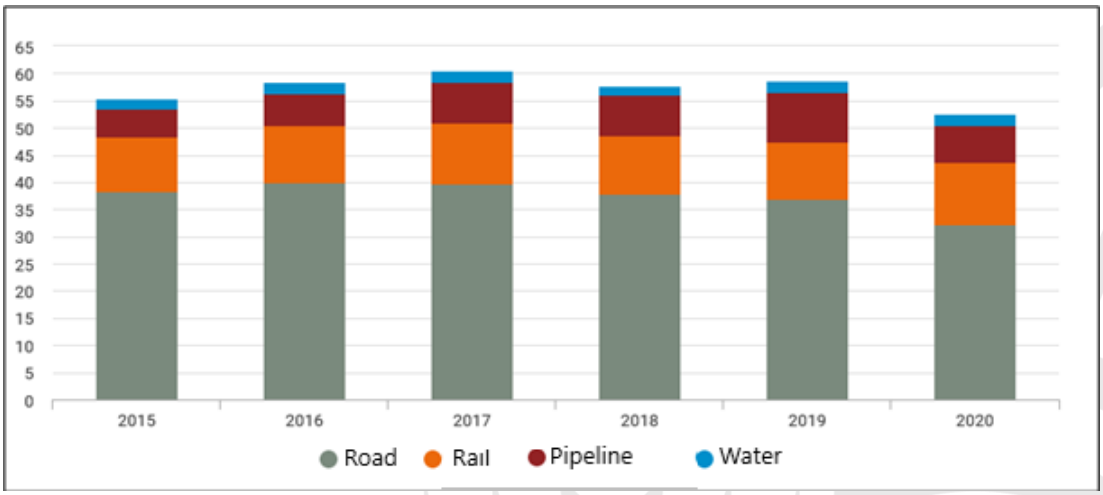
5. Figure: Hungary's most important foreign trade partners and their share of the contry's foreign trade turnover



Source: [Trade in goods by top 5 partners, European Union, 2020 (europa.eu)]

The graph above shows Hungary's main trading partners in terms of both imports and exports. It shows that Germany is Hungary's most important trading partner for both imports (24%) and exports (28%). In terms of imports, China (9%) is still of major importance for Hungary, a share that could even increase in the future due to the projects under the Belt and Road Initiative. In terms of exports, neighbouring countries considered to be the most important export partners.

6. Figure: Distribution of freight transport performance by billion tonne-kilometres



Source: Hungarian Central Statistical Office – Transport sector snapshot, 2020

In Hungary, inland waterway freight transport performance showed a slight upward trend between 2014 and 2017, but declined in 2018, with 6.9 million tonnes of goods transported by inland waterway (2.3% of total goods transported) and 1 608 million tonne-kilometres of goods transported (2.8% of total goods transported). The vast majority of inland waterways transport is international, with a negligible share of domestic transport.

Domestically, road transport is the dominant mode, accounting for 79 tonne-kilometres of freight and 85% of volume in 2020. Internationally, the share of road is much smaller, accounting for 31% of the volume of goods transported in 2020, 9.1 percentage points more than rail, while pipeline transport accounted for 21% and inland waterways for 8.5%.

2. Table IWT by group of goods, 2017

Product	Weight of goods delivered		Performance	
	thousand tonnes	distribution (%)	million tonne-kilometres	distribution (%)
Products of agriculture, hunting and forestry; fish and other fishing products	2587	30,8	533	26,7
Coal and lignite; crude petroleum and natural gas	518	6,2	94	4,7
Metal ores and other mining and quarrying products; peat; uranium and thorium ores	1562	18,6	463	23,3
Food, drink and tobacco products	320	3,8	74	3,7
Wood, articles of wood and cork (except furniture); straw and other plaiting materials; pulp; paper pulp, paper and paper products, printed matter and other reproduced media	38	0,5	11	0,6
Coke and refined petroleum products	1440	17,1	262	13,2
Chemicals, chemical products and chemical fibres; rubber and plastic products; nuclear fuel	909	10,8	220	11
Semi-manufactures; fabricated metal products, except machinery and equipment	890	10,6	292	14,6
Machinery and equipment n.e.c.; office machinery and computers; electrical machinery and apparatus n.e.c.; radio, television and communication equipment and apparatus; medical, precision	23	0,3	9	0,4

and optical instruments, watches and clocks				
Means of transport	37	0,4	11	0,6
Secondary raw material; municipal and other waste	63	0,7	16	0,8
Equipment and material used in the transport of goods	16	0,2	3	0,1
Total	**8414**	**100**	**1992**	**100**

Source: Central Statistical Office - Situation in the transport sector, 2017

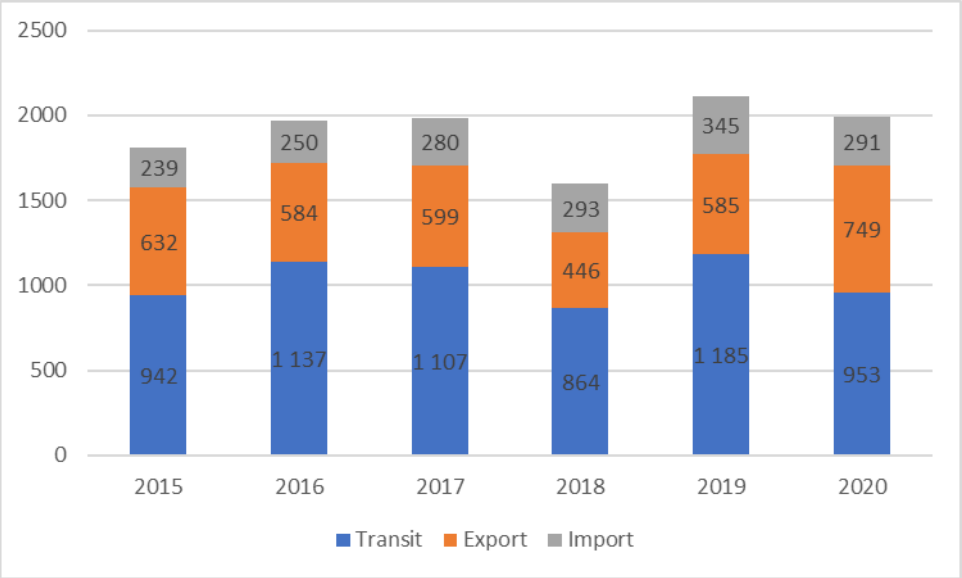
In 2017, 31% of the goods transported by inland waterways were agricultural products (2.6 million tonnes), but a significant share (19% and 17% respectively) was also accounted for by metallic ores and other mining and quarrying products, and coke and refined petroleum products.

Looking at the port's cargo throughput in recent years (total volume loaded and volume of agricultural products loaded) and the performance of agriculture, it can be seen that the weight of goods loaded varies in line with the previous year's crop.

The volume of goods loaded in inland ports is influenced not only by the performance of agriculture, but also by the number of days available for navigation. In Hungary, the average of the last 20 years is 67%, i.e. roughly eight and a half months, when the Danube is open to navigation without restrictions.

For freight transport to be predictable, this period should be longer (300 days per year, i.e. 85-90%). With a water depth of 2.5 metres, which the European Union also expects on the Hungarian stretch, navigation in Hungary would be much smoother.

7. Figure: Evolution of inland waterways freight transport performance by direction (million tkm)



Source: Central Statistical Office - Situation in the transport sector, 2020

In 2020, the total inland waterway transport performance in tonne-kilometres of goods decreased by 5.8% to 1998 million, while the volume increased by 2.5% to 8.8 million tonnes. The performance of import traffic decreased by 16%, inland by 19%, transit by 20% and export by 28%. In 2020, only 8.5% of goods on the Hungarian section of the Danube were carried by Hungarian flag vessels. The nationality of the vessel owned by the carrier is not necessarily the same as the nationality of the transport company. According to EU rules, the performance of vessels must be recorded according to the country in which the vessel is registered. The most important foreign carriers were German, Romanian and Austrian vessels, with 26, 14 and 12% respectively.

According to inland port statistics, in 2018 two thirds of all cargo traffic was with EU member states (in previous years - 2014-2017 - this share was around 80%), with Romania and Germany accounting for the largest share of the total loaded weight. Serbia, a non-EU country, was also an important partner, with a share of 14.5%. In 2018, 31% of goods imported and unloaded in Hungary by inland waterways came from Austrian ports, 30% from Romanian ports and 17% from Serbian ports. The most important destinations for Hungarian exports were Austrian (30%) and Romanian (29%) ports, with 59% of the total 2.4 million tonnes exported (1.4 million tonnes loaded), while Germany's share was 18% and Serbia's 17%.

3. Table Weight loaded in inland ports, 2017-2018 (tonnes)

	Loaded mass	Unloaded mass	Total loaded mass	Loaded mass	Unloaded mass	Total loaded mass
	2017			2018		
Direction of loading operation						
Vessel - vessel	4 443	4 443	8 886	11 462	8 207	19 668
Vessel - road vehicle	1 036 674	451 414	1 488 088	583 079	390 026	973 105
Vessel - shore	2 459 239	1 237 358	3 696 597	2 038 070	1 460 972	3 499 042
Vessel - railway wagon	191 152	414 121	605 273	152 281	555 281	707 770
Total	**3 691 508**	**2 107 337**	**5 798 845**	**2 784 981**	**2 414 695**	**5 199 586**
Packaging						
Bulk	3 462 747	1 995 783	5 458 530	2 587 411	2 304 718	4 892 129
General cargo	215 857	108 674	324 531	190 132	108 016	298 148
20 feet - Container	3 771	18	3 789	585	820	1 405
40 feet - Container	9 073	2 862	11 936	6 763	1 141	7 904
Other containers	59	-	59	-	-	-
Total	**3 691 508**	**2 107 337**	**5 798 845**	**2 784 891**	**2 414 695**	**5 199 586**
By port of loading						
Baja Országos Közforgalmi Kikötő	498 328	145 976	644 304	234 631	112 117	346 749
Csepeli Országos Közforgalmi Kikötő	417 070	705 341	1 122 411	246 080	672 129	918 209
Győr-Gönyű Országos Közforgalmi Kikötő	104 430	63 001	167 431	34 428	71 219	105 647
Other inland ports	2 671 680	1 193 019	3 864 699	2 269 752	1 559 229	3 828 981
Total	**3 691 508**	**2 107 337**	**5 798 845**	**2 784 891**	**2 414 695**	**5 199 586**

Source: Central Statistical Office - Situation in the transport sector, 2018

94% of the total weight loaded was in bulk, 5.7% in other general cargo, and the share of containerised transport was less than 2 thousandths. The total number of containers loaded in inland port traffic in 2018 was 2,732 (three quarters of which were 40-foot containers), of which 2,030 were loaded and 702 unloaded. The reason for the decrease in 2018 was the low number of days of navigation due to the low water level of the Danube.

Due to the nature of waterborne transport, the transport of goods by ship is only an intermediate element in a transport chain involving several modes of transport. In 2018, 16.2% of goods continued their journey to the customer by road, 23.0% by rail, 0.3% by ship, immediately after unloading from the ship, and 60.5% had not yet left the ports at the time of the survey. Of the goods loaded, 20.9% arrived by road, 5.5% by rail, 0.4% by ship and 73.2% had been stored in the port for some time before loading.

The supply disruptions caused by the pandemic COVID-19 affected the inland navigation sector in Hungary partly rather indirectly, with one of the major challenges being the lack of manpower in the sector. This labour shortage is partly directly in the operation of ports and vessels, and partly indirectly in the road transport sector, where driver shortages cause disruptions in the delivery of transported goods.

8 Potential to be transported by IWT

The objective of this chapter is to present the potential of inland waterway transport, both from regulatory and technological point of views.

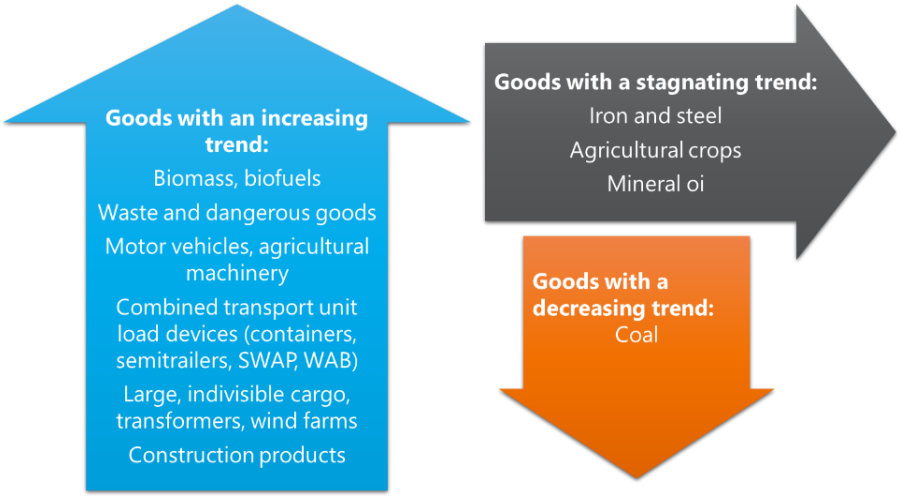
8.1 IWT potentials based on Hungarian National Port Development Plan

The situation analysis of the National Port Development Plan Strategy divides the transported goods into 3 groups. The groups include both the sets of goods already transported on water and goods that can potentially be transported on water. In the identification, it can be distinguished on the basis of transport volume:

In order to provide opportunities for expanding the potential commodity base and extending the existing commodity base, the strategy calls for a separate growth action plan for each of the three identified groups, depending on the transport trend of the particular commodity.

1. In view of the relatively low cost of inland waterway transport and the predictability of the commodity base, the strategy aims to reduce the specific freight rate in order to increase the transport of goods with decreasing tendencies on inland waterways.
2. With regard to goods with stagnant tendencies, the strategy is based on the distinction from other modes of transport, emphasizing the low level of environmental burden of waterborne transport compared to other transport modes, taking into account the proportion of energy required to move the mass of goods in the group.
3. During the establishment of an entry/development action plan related to the volume of commodities with growing tendencies, it is necessary to focus on the development of a so-called ‘goods-friendly’ transport, the relatively low transport costs and the sustainable transport system due to the low environmental impact.

8. Figure: Inland waterway transport trends of commodities



Source: National Port Development Plan Strategy

Transport solutions for potential and compatible goods

The examination identifies the types of goods that are not currently transported by water. In order to determine the transportability of the types of goods identified in this way, the strategy envisages the development of a conformity assessment system as a research and development activity, with the help of which the type of goods not suitable for water transport can be filtered.

The fit testing system analyzes the types of goods that can be transported from 3 perspectives:

- Characteristics of the goods-producing industry:
  - Current situation of the industry in the region (in terms of timeliness of entry)
  - The position and bargaining power of other modes of transport in the given industry
  - Calculate a fixed cost and compare the costs of other modes of transport that work with the industry
  - The degree of commitment of the identified competitors to the industry
- Costs of establishing a relationship with the industry:
  - Government policy related to industry
  - Entry capital requirement
  - The expected reaction of the industry

  - The ratio of the cost of acquiring the required technology to the expected profit
- Characteristics of the transport technology related to the given goods:
  - Existence of transportation technology
  - Manufacturer and concentration of transport technology
  - Existence of substitute technology

The matching test system developed by these criteria can be used to develop credible proposals for access to the transport system of the potential commodity industry, which ports can use at their own discretion.

8.1.1 Conclusions from DIONYSUS DT 1.2.3 Summary report DR Countries[1]

Infrastructure needs for the IWT market development

FAIRWAY - Cargo is transported along the Danube over an average distance of about 2400 km. In order for these shipments to be transported in an economic way, a stable and reliable fairway is needed. Close international cooperation and coordination in this respect is required. Waterway administrations all over the Danube region seek to make the Danube fairway accessible during the whole year. Within the framework of the EU Strategy for the Danube Region, a Fairway Rehabilitation and Maintenance Master Plan for the Danube was developed in cooperation with the waterway administrations and representatives of private shipping companies. This document identified the most critical locations in the waterway network and, more importantly, draws up proposals for their elimination.

PORTS -Digitalization holds great potential for making maritime transport chains more efficient, flexible and agile. It thus opens up the possibility for ports to meet the challenges of globalization, demographic change and urbanization.

With the help of digital solutions, the efficiency of the operation of a single port and its specific transport chains can already be increased, complex processes simplified or energy consumption reduced. In the international environment of the maritime, digital networking of ports offers additional opportunities to improve efficiency and safety along the entire transport chain. Through the targeted exchange of information and data, ports can develop and use new business models.

[1] Source: DIONYSUS DT 1.2.3 Summary report, page :132

ADMINISTRATIVE BOTTLENECKS[2] – The European Strategy for the Danube Region addresses both the authorities involved in border controls and the shipping companies and vessel operators along the rivers. It is a declared objective of the European Union to increase the modal share of sustainable transport means and especially inland waterway transport. However, shipping companies operate with low profit margins and administrative obligations have a negative effect on transport costs and travel time. A time-efficient and transparent border control system is an effective means to increase the competitiveness of Danube navigation and to actively support modal shift.

Findings by countries

Bulgaria

Inland waterway transport (IWT) is an environmentally friendly alternative to other transport modes and the increase in its use is seen as favourable. The significant contribution that this efficient, safe and sustainable mode of transport can make towards mitigating the negative effects of the transport sector as a whole is indisputable.

Reliability is a crucial factor in logistics chain. As operators rely on just in time delivery for their operations and with the gradual improvement of the transport hubs they require, amongst others, accurate and up-to-date information on fairways, blockages and maintenance.

Further actions and support are needed to unlock the full potential of inland waterway transport as an efficient, safe and sustainable transport system. As stated in the Council conclusions “Inland waterway transport – exploiting its full potential” adopted on 3 December 2018: “With the EU goal to shift freight by 30% from road to rail and water by 2030 and by 50% by 2050 to ensure sustainable mobility, the long-term goal is to turn inland waterway transport into a synchromodal partner in the hinterland of seaports and in continental transports.”

[2] DIONYSUS DT 1.2.3 Summary report, page :132

Hungary

There are several identifiable opportunities for IWT in Hungary, which, with the right regulatory framework and optimalisation of the support environment, could benefit the country's society in the long term, both economically and environmentally.

It is important to focus on those products that have been and are expected to continue to be increasingly important for river freight transport in recent years, namely:

Biomass, biofuels, waste and dangerous goods, motor vehicles, agricultural machinery, combined transport unit load equipment (containers, semi-trailers, SWAP, WAB) large, indivisible loads, transformers, wind turbines, construction products.

Preparing for the increase of volume of transport of these products is essential, both in terms of infrastructure and regulatory environment, while at the same time digitalization of the river systems, ensuring environmentally friendly transport and improving working conditions, are also key aspects.

Republic of Moldova

GIFP is the only RM port through which goods are exported and imported.

The port is strategically important for providing the country with vital goods and developing the economy. The port does not carry out transshipment of goods delivered from other inland RM ports.

The increase in the volume of cargo transshipment in the port is directly related to the successful foreign trade of RM with other countries, and above all with the maritime powers and the countries of the Danube region.

Another important factor for the growth of the IWT potential is the consolidation of cargoes to the volumes of the corresponding vessel carrying capacity.

The analysis shows that the growth of IWT potential can be realized by increasing the volume of transportation of agricultural products. To achieve this goal, it is required to create a modern infrastructure for the storage of products for agricultural producers, to develop a transport infrastructure, as well as to create logistics firms providing high-level services.

Analysis of logistics supply chains (export / import) of goods in RM through GIFP allows us to conclude that at the moment, the main water transport corridors are:

- Danube, providing communication with the countries of the Danube region with which RM carries out foreign trade, primarily with Romania, Bulgaria, Serbia;
- Danube and Sea (Black, Mediterranean and others) through which foreign trade is carried out primarily with countries such as Turkey, Italy, Greece, Spain, Syria, Russia and China.

To increase the transshipment of goods at the GIFP port, technological innovations should first of all be introduced for container transport. Container shipments in the direction of China, USA, Turkey, Georgia, which are carried out from Giurgiulești through the port of Constanta, are promising for the growth of volumes.

Analysis of the structure of cargo transported through GIFP allows us to conclude that the main and traditional for IWT are liquid and bulk cargo: oil products; vegetable oil; grain & seeds and others.

Analysis of RM's foreign trade made it possible to identify a number of promising directions and types of cargo that would increase the potential of IWT. For its implementation, it is necessary to develop new transportation technologies, as well as transport and logistics infrastructure.

The growth of the potential of the IWT due to the optimization of the costs of transportation and port services, as well as due to the correct tariff policy, has prospects. However, in our case, this prospect can be realized only through the redistribution of transportation volumes carried out primarily by road transport or through other ports (Odessa, Constanta).

At the moment, there are no problems with the legislation, regulations and administrative procedures that would significantly affect the potential of IWT in RM. The status of a free economic zone allows GIFP to carry out its economic activities quite efficiently.

Romania

Potential for IWT for Romania is identified first in relation with imports and exports of 4 Romanian regions, that have a good accessibility to the Danube ports, from/to DR countries. Based on the current trade flows, the IWT potential to be attracted above the existing traffic is estimated to 1.57 million tonnes per year.

Regarding the trade flows of the DR countries with the Black Sea countries, the IWT potential to be attracted above the current traffic is estimated to 821 thousand tonnes per year.

Thus, it can be concluded that the total potential to be attracted above the current flows is estimated to 2.4 million tonnes per year.

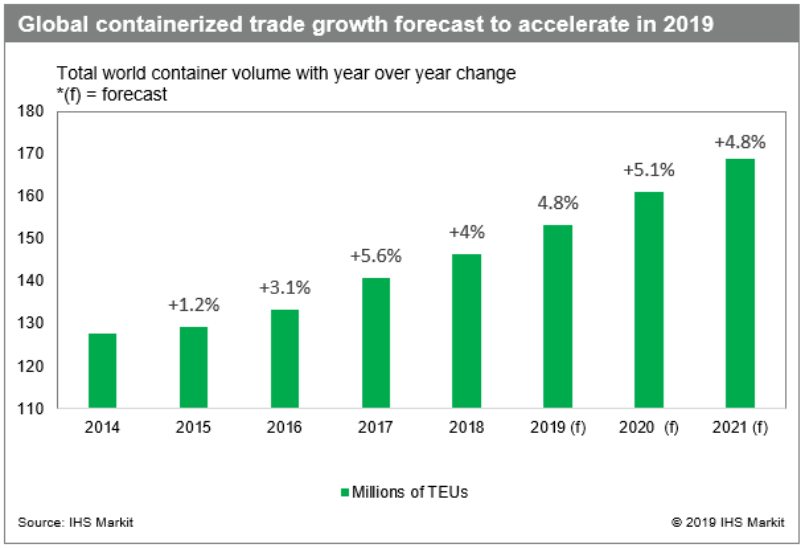
8.2 Containerized IWT potentials

The potential of containerized inland waterway transport is far from being exploited, so in this study we will focus more on mapping this area. To this end, we review global and DR trends and introduce technology that can contribute to the future expansion of the container market.

8.2.1 Container shipping global forecast

Data from IHS Markit[3] show that while 2018 global volume increased by 4 percent to 146.4 million TEU, it was down from the 5.6 percent growth recorded the previous year.

9. Figure: Global container trade growth (base year 2014, 2014-2021)



Source: IHS Markit

But the declining growth is expected to turn around in 2019, with demand from the five largest container exporting nations — China, the US, South Korea, Japan, and Thailand — growing at a rate of about 4.8 percent a year through 2025 before slowing to 4.3

[3] Source: https://www.joc.com/maritime-news/global-container-growth-forecast-rebound_20190425.html

percent by 2030, according to the latest IHS Markit Trends in the World Economy and Trade report.

8.2.2 Potentials for new cargo types in shipping containers with liner bags

New technologies, such as container liner bags can divert new type of goods to be carried in a standard shipping container.

Liner bags are a clean, safe and effective packaging solution that transforms containers into reliable and cost-effective alternatives to tank containers, ensuring the lowest logistical costs and reducing environmental impact:

- Protect goods from external agents and contaminations
- Reduce total handling costs: easy and fast to install – load – discharge – dispose
- Maximize container payload
- 100% waterproof
- 100% recyclable

Fields of application[4]

Food and Feed: Barley, cocoa, corn, fishmeal, flour, ground nuts, lentils, milk powder, nuts, peas, rice, salt, seeds, soya beans, starch, sugar, tea leaf, wheat, grain, flour, cattle feed, mixed grain feed, etc.

[4] Source: http://www.eceplast.com/category/liner-for-container/

Chemicals: ABS resin, aluminium, certain fertilizers, glass beads, nylon polymer chip, polyester granules, PE granules, PP granules, PVC powder, PTA powder, soda, catalysts, pigments, zinc powder, detergents, carbon black.

Minerals: Anhydrite binder, bentonite clay, gypsum, silica, talcum powder, tri-poly phosphate, vanadium slag, aluminum fluoride, bleaching earth, titanium dioxide, zeolite, cement, lime, chalk.

Wastes: organic waste, residue sludge and ashes from industrial and organic processes.

9 Economic development scenarios for the Danube Region

We summarize the desires defined by Hungarian stakeholders (HFIP and external experts) to decision makers in the respective ministry for transport, currently called Ministry for Innovation and Technology. We recommend the Hungarian development plans to be adapted by other Danube countries.

9.1 Development plans, desired state in the Hungarian Danube section

Hereby the development plans for the IWT sector in Hungary are presented based on the National Port Development Master Plan Strategy and focusing on financing and allocating support and establishing a legal framework for facilitating modal split. The recommendations shall be adapted by other Danube countries as well.

National Port Development Master Plan Strategy completed in 2019 aims facilitating modal shift and declares the followings on a strategic – policy level:

Hungary's goal is to transfer 30% of road transport to other modes by 2030, and 50% by 2050 e.g.: rail or waterway due to effective, eco-friendly cargo transportation corridors, and IWT to reach 10% of total national freight transport volume by 2030 in line with the guidelines defined in the White Book 'Roadmap to a Single European Transport Area' published by the European Commission. To achieve this, appropriate infrastructure development is necessary, and incentive of modal shift is also essential. Increasing the role of waterborne freight transport can only be achieved in coordination with other modes of transport and integrated into the combined and intermodal transport system.

Strategic objectives shall be achieved by implementing a complex approach with financial incentives and the shaping of the regulatory environment.

- financial support system,
- regulatory framework for the transport of oversized goods.

9.1.1 Encouraging IWT – financial support

The aim is to contribute to the presented strategic objective by introducing a system of financial support that facilitates the shift of freight transport by road to IWT.

9.1.1.1 Defining the sum of grant

When determining the amount of aid per transport performance, several factors are worth of examination, including environmental and economic impacts.

As the first step, we estimated the economic benefits of IWT to determine the potentially justifiable maximum amount of aid, i.e., the external cost savings of IWT instead of road freight kilometres.

The methodological basis was provided by the Handbook on the external costs of transport 2019 issued by the European Commission, in which the external costs of each mode of transport were determined. Based on this, external costs per tonne-kilometre of the means of transport used for the transport of bulk goods typically transported on IWW in Hungary were compared.

Mode of transport	Accident	Air pollution	Climate impact	Noise pollution	Traffic conflict	Refuleling	Habitat	Sum
Road transport	0,07 €-cent	0,44 €-cent	0,41 €-cent	0,01 €-cent	4,30 €-cent	0,10 €-cent	- €-cent	**5,33 €-cent/km**
IWT	0,10 €-cent	1,84 €-cent	0,20 €-cent	- €-cent	- €-cent	0,09 €-cent	- €-cent	**2,23 €-cent/km**

In relation to the two modes of transport examined, the difference of EUR cent 3.10 / freight-tonne-kilometre i.e., the amount of aid potentially equal to the amount per tonne of freight per km can be justified in terms of economic benefits. To determine the potential budget, we calculated an average mileage equal to half the length of the Danube section in Hungary, and the average traffic volume of the last 3 years were taken into account. Based on this, the inland cargo transport generates an annual economic benefit of EUR 38,794,375 compared to road transport, which means HUF 13,578,031,298 at the exchange rate of 350 HUF/EUR.

In determining the actual amount of aid, the concept of aid planned for competing rail transport was taken as its basis – there is no such aid scheme in force in Hungary – so the two aid schemes can be assessed together.

In the case of IWT, the average subsidy of more than 25 tonnes of freight per tonne-kilometres, between 30-100, between 101-250 km were taken into account, which are EUR 24.95 per 1,000 km.

The basis of the proposal would be 80% of this value, i.e., EUR 19.96, which is EUR 0.01996 per km.

Based on the 3-year improvement of port traffic, the base value of the support system at the time of introduction was set at 6,002,069 tonnes, compared to which is expected that is 20% increase in volume as a result of the proposal.

The target value is thus 7,202,483 loaded tons, for which the estimated total amount is EUR 29,974,286 at an exchange rate of HUF 340 per year, covering half of the Danube section in Hungary (208.5 km).

9.1.1.2 Method of allocating aid

The method of allocating aid for goods transported by IWW also follow the Western-European practice. The beneficiary of the subsidy amount is the owner of the goods, whose goods are loaded at a Hungarian inland freight port and the goods cross the national border for export and import.

The freight tonne-kilometre is determined based on the border section of the port of loading and the IWW. It is important that the system provides support only for the Hungarian section.

Transit traffic, i.e., when transporting goods without touching a domestic port for loading purposes, is not eligible for aid. In each case, the weight of the goods is indicated in the river bill of loading and/or loading list certified by the port, which is based on a certified measurement report.

Since all the information needed for applying for grant are created in the port, namely the quantity of goods, distance to / from sender or receiver port, customer, thus ports will be able to handle and administrate grants.

In order to compensate increasing administrative burden, ports charge a 5% handling fee, with the remaining amount being passed on to the beneficiary.

The Hungarian Danube ports are obliged to use the subsidy to reduce the service fee for those who order loading directly. By doing so, discount is given directly to the shipping and goods-owning company in proportion to the performance actually carried on IWW. The requirement for the transparent display of subsidies and fees in the billing system helps to implement this principle.

9.1.2 Encouraging the combined transport of oversized goods by IWW

Integrated transport is a movement of goods (in one and the same loading unit or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes. It is hence a type of multimodal transport. Multimodal freight transport refers to the carriage of goods by at least two different modes of transport.

The aim of the proposal is to encourage modal shift of oversized goods from the current road transport towards combined road and IWW, whereas circumstances and weather allow and economic benefits support to do so.

Under the proposal, when authorizing oversized goods, it would be mandatory to examine the availability of inland ports for the combined transport of goods by IWW between the point and place of destination that can be used for the transport of goods. As a thumb rule, if such combined transport solution is available and the total length of the road element of the combined transport does not exceed 50% of the available pure road transport mode, the carrier would be obliged to use IWW combined transport. An exception to this obligation is if navigation conditions (water level of the Danube) at that time does not allow the transport of the given goods.

10. Figure Combined transport including IWT and road/rail

Source: Inland Waterway Transport Reader, 2016

With this measure, a significant volume of cargo traffic could be diverted from road to IWW without any public support, without budgetary expenditure, by means of a mere regulatory instrument, and in the case of goods which are the greatest burden on road infrastructure and other road users.

10 Investigation of current situation to find probable development scenarios

10.1 Navigation conditions

It is common knowledge that Danube is not a reliable transit route by means of water depth, and this is the main burden that withholds Danube to be integral part of European logistic chains. Until this problem is not solved there is little to no chance to increase notably the share of IWT in the Danube section of the Rhein-Danube corridor. Therefore, this is the most important issue when it comes to set up development scenarios.

Although there are shallow sections in almost each country a distinction must be made whether river regulation has political aspect in the state in question because politics elevates the risk of unfavourable consequence from navigation's viewpoint.

The implementation of Fairway Rehabilitation and Maintenance Masterplan was prepared in the framework of Danube Region Strategy. The implementation of the masterplan was monitored in the National Action Plans, which were prepared and updated in the framework of FAIRway Danube project. The last update, issued in May 2021 stated:

"Especially on the Lower Danube, where the worst nautical bottlenecks are usually located, fairway conditions have been gradually improved in recent years through maintenance dredging and extensive fairway marking activities."

Indeed, Bulgaria and Romania elevated the quality of river maintenance activities, and the report reflects to that fact. Accomplished river regulation works in Croatia, Serbia, Slovakia, and Austria shows that politics and legal, social conditions in these countries also does not hinder river regulation plans and fairway maintenance. In contrast with these countries' river regulation is a sensitive environmental and political issue in Germany and Hungary.

Germany

The website of *Priority Area 1A — To improve mobility and multimodality: inland waterways of the EU Strategy for the Danube Region* contain valuable information on the status of fairway development of the critical German section[5]:

"The German federal waterway Danube between Straubing and Vilshofen in Lower Bavaria is a major bottleneck of the Trans-European Rhine/Meuse-Main-Danube inland waterway axis in particular with regard to draught. While the rest of the waterway axis has been adapted to 2.5 m draught almost all year round, this value is only attainable 144 days per year for the (free flowing) section from Straubing to Vilshofen due to alternating water levels. In low water periods only 1.6 m draught (or less) is possible.

A variant study (conducted 2008-2013) compared the two remaining variants (named A and C2.80) regarding impacts on navigation and environment in order to provide a secure basis for an informed political decision.

Germany and Bavaria agreed on the realization of Variant A aiming to increase the possible draught loaded at low navigable water level by at least 20cm in subsection 1, from 1.60m to 1.80m, and the number of days per year with an effective draught of 2.50m by 56 days to 200 days/year. (This would correspond to fairway depths of 2.20m.) *In subsection 2 the possible draught should be increased by at least 25cm.*

The plan approval decision for the section Straubing-Deggendorf was issued in 12/19. For the critical section Deggendorf – Vilshofen plan approval procedure started in 2018, but is still ongoing. "

Although the targeted water depth is not fully in line with the requirement of Article 15 of the TEN-T regulation that forsees the minimum requirement of draught of 2.5 m, this will be a significant improvement for IWW transport.

[5] https://navigation.danube-region.eu/upgrade-of-the-danube-between-straubing-and-vilshofen-pursuing-variant-a/

Hungary

The Hungarian Danube stretch has severe navigability problems. There are shallow sections where suitable water depth cannot be ensured at LNWL with dredging because riverbed is made of rock or other hard material (Nyergesújfalu, Dömös, Budafok). These sections are functioning as small natural dammings, therefore they cannot be eliminated without negative side effects. On the other hand, past river regulation works, industrial dredges in the eighties and damns built upstream to the Hungarian section generated still ongoing unfavourable riverbed development processes. Riverbed is deepening on long sections, but riverbed of the sidearms does not follow the deepening of parent branch, therefore gradually drying up, water table decreases alongside of the river, just to mention a few consequences.

> *"Ongoing project: „Improving navigability on the Hungarian section of the Danube: extended study to* ***prepare implementation*** *is a* ***precondition for the implementation*** *of any physical interventions aimed at improving the navigability and at eliminating the IWW bottlenecks on the Hungarian section of the Rhine-Danube Corridor. The elaboration of the technical assessment study already started.*
>
> *Duration of the grant contract was elongated, yet elaboration of the implementation plans has been suspended in early 2022. Any further delay jeopardizes the goals of the Action, and the actual implementation of the planned works.*
>
> *For the evaluation of this possible failure, it is necessary to investigate the Kvassay Jenő Masterplan (National Water Strategy). Since it was released in 2015 no major river regulation work was executed on the Danube. It contains a very important statement which sheds light on what to expect in terms of river regulation even if the plans of the project won't be implemented:*
>
> ***"Danube riverbed deepens constantly; low water levels and related ground water levels are lowering. This process already caused significant ecological damages; therefore, the mitigation of these damages will enforce technical interventions regardless of the goals of navigation**.[6]"*

[6] DT 2.2.3. Chapter 6.3.

Slovakian-Hungarian border section

Two feasibility studies were initiated to prepare actual works on the border section, both co-funded by various EU programmes. End date of the Slovak project is 10.2022, although the PA1A website states:

"The public procurement was cancelled in August 2019 for internal objections and JASPERS´s recommendation, who identified an inadequate description of the Terms of Reference of the Feasibility study, which could result in the successful tenderer providing incomplete outcomes and could result in the study results not being funded by EU funds. A new public procurement procedure is planned."[7]

The *Hungarian project's*[8] planned end date is 9.2022. However, elongated deadline of the grant contract already passed by, yet elaboration of the implementation plans has been suspended since early 2022. The website of the implementing body contains no further information. At the present situation the project's completion could be financed only by the state.

Implications

It is most likely that no significant works will be completed in the medium term to improve navigational conditions on these critical Danube sections (Straubing-Vilshofen, Slovak-Hungarian border section, Hungary). However, sudden changes in political judgment of the issue still may occur in any of the above-mentioned countries causing a more favorable attitude to river regulation works from IWT's perspective. Such unforeseen changes may galvanize life into preparation works and speed up financing and implementation.

The interim result of the above-mentioned Hungarian feasibility project and Kvassay Jenő Masterplan predicts decreasing discharge and more frequent extreme water regime on the Hungarian section of the Danube due to climate change's strengthening effects. It is more than likely that worsening water regime will not be limited to the Hungarian section.

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[7] https://navigation.danube-region.eu/danube-feasibility-study-phase-i-technical-measures-to-provide-required-fairway-parameters-between-rkm-1880-260-and-1708-200-of-the-danube/

[8] https://navigation.danube-region.eu/improving-navigability-on-the-hungarian-section-of-the-danube-extended-study-to-prepare-implementation/

10.2 Political aspects of river regulation works

Since the very beginning of its existence, the Priority Area 1a of the EU Strategy for the Danube Region exerts an influence on international transport politics through political statements issued every second year since 2012.

The website of the Priority Area 1a of EU Strategy for the Danube Region reports about the singing of the last Danube Ministerial Conclusions (June 2022). It is worth to read as it summarizes how politics is related to the issue at hand:

"The Danube waterway serves as a backbone for the Danube Region and its economy. Competitive transport services on the Danube highly depend on the provision of minimum fairway parameters. As large parts of the Danube are free-flowing, efforts to eliminate infrastructure bottlenecks not only require structural river engineering measures but also – and of even higher importance – effective and continuous waterway maintenance.

After seven years of implementation, the Fairway Rehabilitation and Maintenance Master Plan for the Danube and its navigable tributaries (first endorsed in 2014) was updated in 2021/2022 by the waterway administrations and Ministries of Transport of the Danube region. The Master Plan highlights national needs and short- to medium-term measures in order to ensure the efficient and effective realisation of harmonised waterway infrastructure parameters along the entire Danube and its navigable tributaries within the existing legal framework. ***Since 2014, several of the measures proposed in the Master Plan have been implemented in various transnational and national implementation projects and several necessary investments have been made, in many cases with the support of EU co-financing. More than 75 million EUR have been invested through EU co-financed projects*** *within the Connecting Europe Facility, the national Operational Programmes and the Instrument for Pre-Accession (IPA). However, complementing the new equipment (e.g. purchasing dredging equipment) and in particular securing sufficient and regular operational budgets at the national level remain to be the key challenges for the next years.*

Upon invitation of EU Transport Commissioner Ms Adina Vălean, the Danube Ministers of Transport, with the exception of Hungary and Bosnia and Hercegovina, reconfirmed their commitment to implement the Fairway Rehabilitation and Maintenance Master Plan by signing the Danube Ministerial Conclusions 2022."

These political statements do not claim commitments beyond already existing national and international obligations to maintain its fairway, yet Hungary have signed none of the six of them. Germany chose a more sophisticated way to stand up against joint will of the EU and other riparian states: Germany declared that fairway depth of 2,5 m is neither developable nor maintainable in the free-flowing section between Starubing and Vilshofen. As it is presented in the previous chapter Germany still intended to improve fairway depth, although target value of 2.25 m is not sufficient for reliable navigation.

10.3 Interviews

Two enterprises were watchfully picked to be requested an interview. One of them is Plimsoll Zrt, established in 1992. Main activity of the company is bulk- and general cargo forwarding, offering complex system of road-, rail-, river- and deep-sea transport. A Romanian transportation company, TTS Bucharest (Transport Trade Services) has a 51% stake in Plimsoll. Its 100% subsidiary, Fluvius Limited, specialized to inland waterway transport operates six self-propelled ships on the Danube as well as on several German inland rivers. The CEO and two colleagues are lecturers at Budapest University of Economics, and University of Technology and Economics among other institutions.

The company was picked for the reason they have expertise in complex forwarding business using all transport modes, at the same time has first-hand account of vessel operation.

Capt. Szalma Botond, CEO kindly shared his experience and thoughts on Danube IWT problems and future possibilities:

- Inland navigation needs:
  - transport route
  - vehicle
  - workers
  - logistics background
  - cargo

  If only one of those is missing, there will be no transportation.
- Maintenance of the Danube fairway is not only governmental duty, it is duty of the national governments and the European Commission. Danube Commission is not suitable for that task. Austria and Germany fulfilled 90-95% of the mission,

still struggling with their green organizations. Slovakia accomplished their goals instead of Hungary, without Hungary. There is nothing to speak about without transport route. It does not matter how good infrastructure you implement; it is dead without proper transport route.

- Background of cargo. There is still cargo, but it is shrinking, decreasing. In the last three decade there were two wars and a bunch of low water periods. Market loses its trust in IWT. In the nineties permission of the UNECE needed for transporting iron ore through Serbia; the permission was issued in New York. NATO destroyed Danube bridges (in Serbia); navigation become impossible for several months. Factories, importers, exporters still had to work; they had to find other business or find other means of transport. They returned on the Danube after the war because it is more favorable, better option, but with lower turnover.
- States stand up for national railway companies. I cannot compete with a Deutsche Bahn, or a Rail Cargo Austria even considering navigation's better situation, capacities. The German state helps the DB with several millions, or even billion Euros every year. The same goes with Rail Cargo Austria, if it has – let's say - 30 million Euro negative balance, it is put in next year's budget because it is state owned.
- Road transport companies complaining about road conditions, nevertheless network of European motorways and expressways has been built/completed at last – which means they have got routes.
- Biggest fully developed problem is IWT crew shortage. I've been stressing this for at least fifteen years. We train our crew on our vessels, state does not facilitate training, there is nothing to wait for. Trained crew go over to river cruising ships, German and Dutch freight vessels. In German and Dutch traditional family-owned business fathers' generation were captains, while sons do not want to live on the road, but they willing to keep the vessel. For the thousand Euros they are offering on me they flee. There is no club fidelity, people come here, they learn the profession and they learn the river they are navigating on; then comes Swiss river cruising company and they pay 4500 Euro salary per month even for rest periods.
- You can increase turnover if you can increase reliability. You will not be competitive until you do not provide. You may not call service when the consignee gets his cargo with two days delay. Then you have shifting, transshipment, putaway; and in wrong case there is contamination in the cargo.

For instance, there is corn in the middle of the fertilizer – this fertilizer company will give up IWT transport, and will go for direction trains which is more expensive, slower but otherwise does not gives the headache.

The other company is Mahart Container Terminal (MCC), which is the only actually trimodal container terminal in Hungary, located in Csepel Freeport.

They have a regularly, bi-weekly running barge service from Constanta with potential stopping at Galac and Beograd. They have regularly running barge projects from MCC up to Austria for the main Austrian ports like Wien, Enns, Linz. On spot basis they are able to handle barges from/to Regensburg and Bratislava. They also handling block trains in several relations (including China) and semi-trailer rail projects as well. Mr. Fábián Zoltán, CEO kindly gave an interview on recent and future possibilities of Danube IWT. His remarks are under the following headings:

- Danube could facilitate intra-European container traffic. These relations require reliable, accurate logistics, which recently cannot be accomplished in a significant part of the year. We made SPOT transport business to Constanta with pre road haul – vessel arrived on the dot, because there was a vessel and favorable water levels as well, but fairway cannot provide that in the whole year.
- We are running container vessel every fortnight towards Constanta; however, it does not run during low water periods. We transport mostly empty containers to Cernavoda. A fee must be paid for navigating on the Danube-Black Sea Canal, and besides that security must be paid for empty containers. Freight charges cannot always cover security.
- Container traffic in Constanta decreased slightly since sanctions has been put on Russia for invading Crimea. However, in the recent situation part of the cargo arrives to Reni and Izmail in containers (part of cereal, sunflower oil, starches for food, woodenware, sunflower expeller in containers or big-bags, part of fertilizer), and transported onwards through Constanta. This year container traffic of Constanta's three container terminal will be around 1,3 million TEU in contrast to later years' cca. 650.000 TEU.
- South arm of the Transcontinental Silk Road will not be functioning for a long time (China-Kazakhstan-Ukraine-Slovakia/Hungary). War in Ukraine destroyed/damaged significant portion of railway infrastructure (marshaling-yards, bridges), reconstruction will take a long time. An already working

alternative route[9] leads through the Caspian Sea by train-ferry, then Azerbaijan, Georgia, Black Sea – Constanta. Trains arriving to Constanta usually consist 44-48 pieces of 40-foot containers. Two of these trains needed to load a self-propelled container vessel. It is rational, but there is a lot of problems to be solved. We tried it, unfortunately the consignor did not want to wait for the second train to arrive. At present railway travel time is not shorter (Constanta – Budapest), fast-moving self-propelled vessel arrives in 6 days, railway is not faster than that.

- Commodity supply will not increase for Danube IWT until the duration of proper navigation conditions will be only 200 days instead of 365. There is no chance for reliable transport, or just in part of the year. Commodity supply will also grow if railway service becomes inaccessible. Railway is a kind of unpredictable, but IWT can still overtop it.
- If Danube would have a proper fairway, IWT could go for intra-European traffic. There is a significant traffic from the direction of Balkans, between Turkey and EU. It comes on road and on railway, on railway 45-foot containers or cranable semi-trailers are used. This traffic could be facilitated with platform vessels, carrying unaccompanied cargo. This February we brought (to Csepel Freeport from Constanta) 48 pieces of loaded semi-trailers for a Turkish forwarder as an experiment. There is also a RO-RO ramp in Baja port and Győr-Gönyű port, they could handle such freights, if navigation conditions would have been predictable. MCC could accomplish this carriage because in February there is already no possibility of being ice on the Danube, but water levels are still high enough.
- It is commonly stressed that around 900 thousand truck drivers are missing in Europe. This shortage will not cease soon, therefore parties in the logistic chain must find alternatives to compensate that sooner or later, especially if transport demand will not decrease. IWT could be part some of these alternatives.
- There is a new trend of containerizing bulk goods like cereal, fertilizers, etc. This trend's advantage is the same as its disadvantage from IWT's perspective: all

9 https://caspiannews.com/news-detail/azerbaijan-gets-attentions-as-new-eurasian-transit-and-transport-route-starts-developing-2018-7-30-10/
https://jamestown.org/program/new-caspian-black-sea-transit-corridor-boosts-geostrategic-importance-of-south-caucasus/

transport modes can handle containers; more predictable, accurately, and sometimes even at lower freight rates.

10.4 Railway transport in the Rhein-Danube corridor

Railway transport is the closest competitor for IWT in terms of capacity, price, and travel time. Therefore, it is inevitable to investigate the situation and outlook of railway transport in the Rhein-Danube transport corridor. Fortunately, there is an organization, namely the *RFC 9 Rhine-Danube Rail Freight Corridor*[10] - consists of eight Infrastructure Managers and one Allocation Body from seven countries (Austria, Czech Republic, France, Germany, Hungary, Romania, Slovak Republic) - that is willing to establish an attractive East-West Corridor by connecting the industrial centers between Strasbourg and the seaport of Constanta and also Cierna and Tisou as entry point from the Ukraine. Doing so it has prepared a Transport Market Study[11], finalized 07/04/2020. In the next two chapter important and instructive facts of the Transport Market Study are highlighted from the perspective of IWT.

Figure 11 Rail freight corridor Rhein-Danube

[10] https://rfc-rhine-danube.eu/who-we-are/
[11] https://rfc-rhine-danube.eu/wp-content/uploads/2021/04/TMS_RFC_9_RHD_FINAL.pdf

10.4.1 Freight traffic

The following table shows the net tons of freight within the corridor. The international trains are separated into the three train types of Block Trains, Combined Trains, and Single Wagons.

from / to	Austria	Czech Republic	France	Germany	Hungary	Romania	Slovakia
Austria							
BT				6,542,617	4,266,924		1,991,231
CT				5,182,324	1,662,255	97,780	782,238
SW				2,934,399	614,176		614,176
Czech Republic							
BT				1,232,667			4,741,027
CT				97,780			97,780
SW				545,935			1,023,627
France							
BT				121,370			
CT				70,401			
SW							
Germany							
BT	5,784,053	1,137,846	94,821				
CT	4,791,205	97,780	97,780		586,678	195,559	9,778
SW	2,456,706	477,693					
Hungary							
BT	5,215,130					4,646,206	
CT	1,564,475			782,238		195,559	
SW	477,693						
Romania							
BT					4,551,386		
CT	97,780			195,559	293,339		
SW							
Slovakia							
BT	2,180,872	5,594,412					
CT	880,017	488,898		9,778			
SW	545,935	477,693					

Figure 12 Freight volume in tons regarding BT, CT, and SW in 2017

Category	2017	2022	Absolute growth	Relative growth
BT	48,100,600	52.748.600	4.648.000	8,81%
CT	17,084,100	18.875.100	1.791.000	9,49%
SW	10,168,000	11.192.300	1.024.300	9,15%
Total Tons	**75,352,700**	**82,816,000**	**7,463,300**	**9,01%**

Figure 13 Comparison tons regarding BT, CT, and SW – 2017 and 2022 (forecast)

After subtracting volumes of relations cannot be facilitated by IWT (E.g., Slovakia-Czech Republic) remains around 62,5 million tons of cargo, which is nearly twice as much as Danube IWT's transport performance.

Forecast predicts 9% increasement in cargo volume compared to 2017 (see fig. 13), while Danube IWT transport performance fluctuated and was about 3% higher in 2020 compared to 2017 (see Annex 1, Fig.2).

As for the future, while there is seemingly no unresolvable bottleneck hindering further development of Single European Rail Network, Danube fairway development is hanging in the balance in Hungary and Germany.

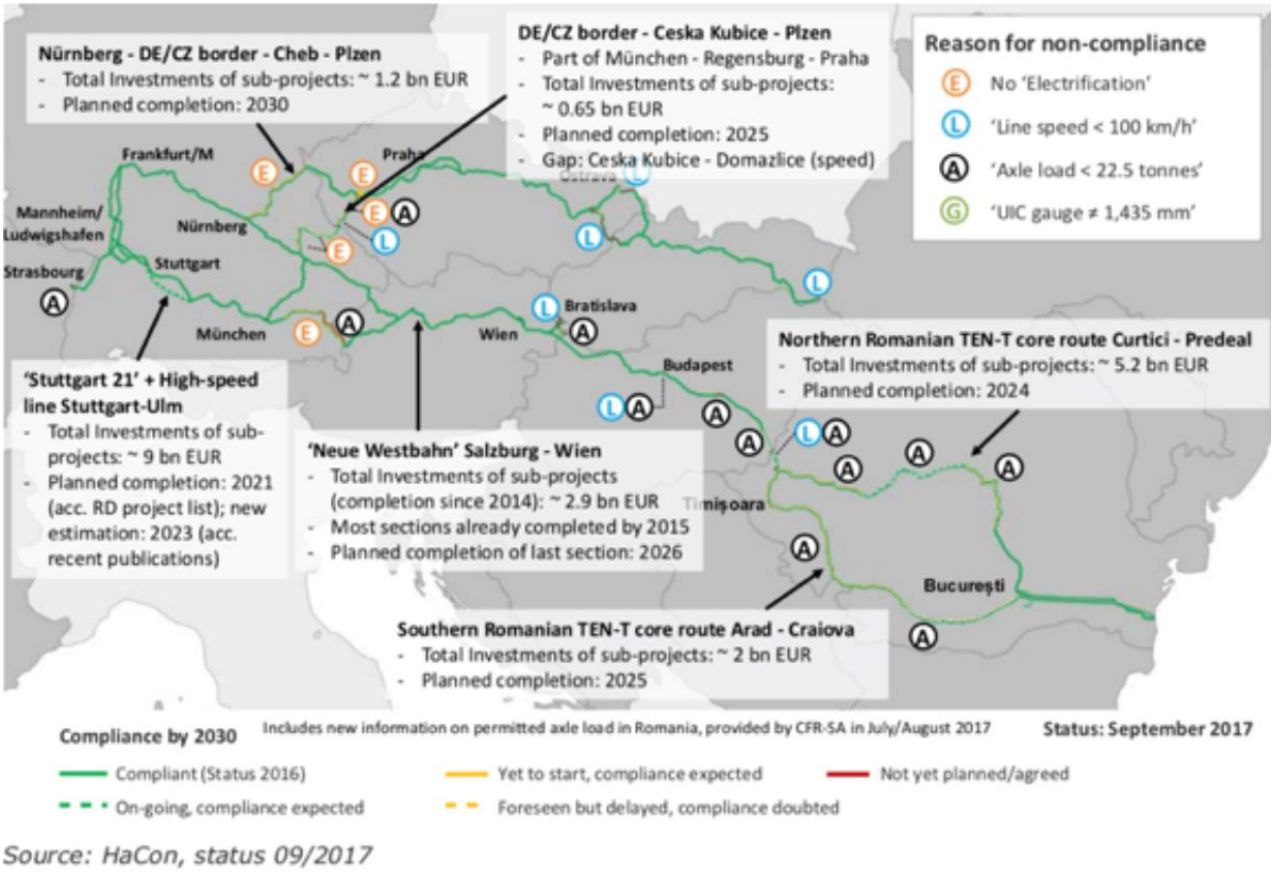
10.4.2 Infrastructure development

The Transport Market Studies chapter 3.5.4.1. presents most important infrastructure development projects and planned achievements:

"According to the CNC Workplan, 2018 the compliance prospects for 2030 for the railway links are as follows:

- *Electrification: 97%*
- *Line speed >= 100 km/h: 96%*
- *Axle load >=22.5 t: 92%*
- *Train length >=740m: 68%*
- *ERTMS: n.a. (6% in 2016)*

Also, along other parameters (e.g., line capacity, single track sections, strong inclines) significant progress is expected. An overview, along with the most projects that will provide long compliant infrastructure stretches is provided by the following figure."



Source: HaCon, status 09/2017

Figure 14 Rail link compliance (from CNC Workplan, 2018) Source: Transport Market Study

Sum of the displayed projects in Fig 14. is almost 21 billion Eur. Unfortunately, no information was found on IWT infrastructure development project's total cost, nevertheless European Commission published information on the CEF EU funded projects in the Rhein-Danube Corridor. According to the report of INEA (CEF support to Rhein - Danube Corridor, May 2020[12]) transport related project's CEF funding is as follows:

[12] https://ec.europa.eu/inea/sites/default/files/cefpub/cef_transport_2020-corridor-i_rhine-danube_metadata.pdf

"IWT

The inland waterway portfolio in the Rhine Danube Corridor consists of 27 Actions, receiving €241.2 million in CEF Transport funding, which aim at establishing and maintaining a good navigation status along the Danube and the Sava rivers."

Rail

"The railway portfolio in the Rhine-Danube Corridor includes 35 ongoing Actions receiving an overall CEF Transport funding of €2.91 billion. Actions targeting railway sections absorb the largest proportion of CEF funds (close to €2.3 billion). Moreover, interventions on several junctions and nodes are receiving a significant support (above €300 million)."

The actual cost of IWT projects is 311.023.358 Euro, while rail projects' total cost is 6.264.246.541 Euro according to the report. Rail exceeds IWT by one order of magnitude in CEF EU funded projects, and there is no reason to believe that the actual proportion in the case of all investments is significantly diverge in favour of IWT.

10.5 Development Scenarios

As it is presented in chapter 10.1 and 10.2 river regulation is a political, or at least social policy issue in Germany and Hungary. The famous Straubing-Vilshofen section has been argued about for decades now, and only step taken forward is that the Deggendorf – Vilshofen section's plan approval procedure started in 2018, but still ongoing. In Hungary the first study which aimed to prepare plans for river regulation works in favour of navigation started in 2005. Elongated grant contract of the third of these projects ended in 9/2022 yet no information on the outcome, if any (the project was suspended in early 2022).

It is more than likely that no significant works will be completed in the medium term on the critical sections of Hungary and Germany. It seems like that the competent European Coordinator also has the same opinion on that matter. The report "*Rhine Danube Fourth Work Plan of the European Coordinator – Karla Peijs (May, 2020)* contains the following in chapter 6.5 (*Modal shift and impact to decarbonisation*):

"A negative modal shift is expected for IWW freight transport as well, falling from a current modal share of 13.8% to 12.2% in 2030. Being an environmental friendly mode of transport, it is desirable that more of the growth in freight transported is accommodated by IWW transport. However, ***the Danube suffers from various***

bottlenecks and capacity issues that need to be addressed before its full potential can be unlocked. This includes poor maintenance for some locks and insufficient fairway draught on the free-flowing sections. *To improve the IWW capacity supply in the future* ***all bottlenecks are to be relieved*** *and all necessary fairway maintenance works need to be coordinated until 2030 and beyond."*

Considering the results of the present investigation it is not an overstatement to declare that the most probable development scenario is that Danube will not have a reliable and proper fairway from Kelheim to Constanta and Sulina at least until 2030. Main consequence is that riparian states cannot give the market what it needs the most. Yet there is little to no room left in exploiting available fairway depth by means of even more advanced telemetric and GIS systems (RIS).

On the other hand, commitment and already accomplished goals of other riparian states will contribute to further improvement of navigation conditions. The EU is also showing commitment to support IWT transport on the Danube not only with policies, but also financial support.

The investigation showed that reliable fairway is far the most important issue hindering the *unlock Danube's full potential*. Therefore, it seems to be pointless pile up other scenarios which are different only in point of far lesser issues.

11 Market Observatory Tool

The Market Observatory Tool's aim is to give detailed information on the trends and actual cargo flows from different perspectives, which helps to evaluate the recent situation and to predict the probable trends of near future. Only reliable, annually publisehed data source were chosen. Content of some chosen data sources varied partially over time, therefore only data of unvarying parts were used.

The following table shows the chapters and their data sources.

General performance	CCNR - Annual report,
Danube transport at specific measurement points	Danube Commission - Market Observations
Danube transport by cargo segment	Danube Commission - Market Observations

Danube transport at riparian states	ViaDonau – Annual Report on Danube Navigation in Austria
Fairway conditions	FAIRway project - National Acton Plans[13] Danube Commission - Market Observations
Danube port's services	ViaDonau – Danube Logistics Portal

Annual reports and market observations are published usually in Q2 and Q3, therefore Market Observation Tool may be finalized expectedly end of Q3.

12 References

- CCNR, Market Observation – Annual report 2021
- CCNR, Market Insight: Inland Navigation in Europe, 2021 November; available at: Market-Insight_Q3_EN_Web.pdf (inland-navigation-market.org)
- Central Statistical Office - Situation in the transport sector, 2020
- Central Statistical Office - Situation in the transport sector, 2018
- Central Statistical Office - Situation in the transport sector, 2017
- European Commission, EU Strategy for the Danube Region – Action Plan 2020, available at: EUSDR ACTION PLAN SWD(2020)59 final.pdf (kormany.hu)
- Eurostat [iww_go_qnave], OECD (Ukraine), Destatits (Rhine and affluents), *Danube = TKM in all Danube countries including Ukraine
- Hungarian Central Statistical Office – Transport sector snapshot, 2020
- IHS Markit
- Inland Waterway Transport Reader, 2016
- National Port Development Plan Strategy
- Trade in goods by top 5 partners, European Union, 2020 (europa.eu), available at: Trade in goods by top 5 partners, European Union, 2020 (europa.eu)

Other resources:

- DIONYSUS DT.1.2.1. Summary Report
- DIONYSUS DT 1.2.3. Summary Report
- DIONYSUS DT 2.2.3. Danube Ports Investment Needs Report

[13] The last National Action Plans were published in 2021 when FAIRway ended.