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Table of Contents

1.	Executive Summary	6
2.	Introduction	8
3.	Container market in the Danube region	9
4.	Market Research	12
4.1.	Freight traffic on the Danube	12
4.1.1.	Freight traffic on the Austrian part of the Danube 2017	12
4.1.2.	Freight transport on the entire Danube 2016	13
4.2.	Obstacles on the Danube and Rhine	13
4.3.	Container Market in Austria	16
4.4.	Container Market in Hungary	18
4.5.	Container Market in Serbia	18
4.6.	Container Market in Romania	21
4.7.	Container Market in Bulgaria	26
4.8.	Container Market in Slovakia	27
4.9.	Best-Practice analyses	29
4.10.	Observation of relevant rail freight market in the Danube Region	29
4.11.	Former projects regarding Container Transport on the Danube	30
4.11.1.	COLD – Container Liner Service Danube / 2006	31
4.11.2.	KoLEG – Study on preparing for a combine regular service Enns/Galati 2012	35
4.12.	Innovations for combined cargo transshipment	36
5.	Decarbonizing strategy	38
5.1.	Europe	38
5.1.1.	Improve truck toll across the EU	39
5.2.	Austria	39
5.2.1.	Climate Strategy Austria	39
5.2.2.	Greenhouse gas targets in Austria	40
5.2.3.	Example Austria as prototype for industrial congested area	41
5.2.4.	Reduce truck transit in Austria	41
5.2.5.	Core Message COLD study regarding environmental balance	42
5.3.	Example regarding emission-free cargo shipping	42
6.	Feasibility Study Empty Container Business	43
6.1.	Requirements & Recommendations	44
6.1.1.	Requirements for a competitive empty container line	44
6.1.2.	Requirements for deeper market observation	44
6.1.3.	Recommendations	45
6.2.	Detailed considerations of Danube Ports	45
6.3.	Market potential for empty container traffic	48
6.3.1.	Liner Scenarios	49
6.3.2.	Market price in competition with rail offers	50
6.3.3.	Conclusion	51
6.3.4.	Decarbonization development	51
6.4.	Summary regarding Empty Container Business	52
7.	Conclusions & Recommendations of the report	52
7.1.	Infrastructure and market	53

7.1.1.	Parallel rail infrastructure _____	53
7.1.2.	Trimodal hubs to connection nodes outside the Danube Region – OBOR _____	53
7.1.3.	Connection to the Adria _____	54
7.1.4.	Small and regional “hub&spoke” concepts _____	54
7.1.5.	Agreements with shipping companies _____	54
7.2.	Empty Container Business _____	55
7.2.1	Conclusion for Empty Container Business _____	55
7.2.2	Empty Container Business and Decarbonization Development _____	56
7.3.	Decarbonization and Sustainability _____	56
7.3.1.	CO ₂ -Resource Accounting _____	56
7.3.2.	NO _x -problem in general and especially in metropolitan areas _____	57
7.4.	Total Summary of the Container Report _____	57
8.	Contribution to output 5.1 new market studies _____	58
8.1.	Market Opportunity _____	58
8.2.	Attractiveness of the market _____	59
8.3.	Cost structure & available infrastructure _____	60
8.4.	Success Factors _____	61
8.5.	Target audience _____	63
9.	References _____	64
Annexes	_____	64
	Annexes I – Empty Container Study (English) _____	64

Table of Figures

Figure 1:	Green Deal for Danube river transport	11
Figure 2:	Freight traffic on the Austrian part of the Danube 2017	12
Figure 3:	Freight transport on the entire Danube 2016	13
Figure 4:	Rail freight in Austria 2017	17
Figure 5:	Transported Container on the Austrian Danube 2013-2017	17
Figure 6:	Handling of Containers in the port of Belgrade	21
Figure 7:	Romania - Container port traffic	24
Figure 8:	Number of transported Containers in Slovakia	28
Figure 9:	Container traffic in European seaports in TEU	29
Figure 10:	Forecast COLD Study	32
Figure 11:	Container Transshipment 4 public ports in Austria	34

Table of Tables

Table 1:	Obstacles on the Danube	15
Table 2:	Obstacles on the Rhine	16
Table 3:	Container Transshipment 4 Austrian ports	16
Table 4:	Container Terminal Enns GmbH (Enns Hafen Port)	18
Table 5:	Container Market in Hungary	18
Table 6:	Container Market in Serbia	18
Table 7:	Handling of containers in the port of Belgrade	21
Table 8:	Container Market in Romania – APDM (Galati Port)	23
Table 9:	Container Market in Romania – Socep SA (Constanta)	23
Table 10:	Container Market in Romania – MPAC	24
Table 11:	Container Market in Bulgaria – BPICo	26
Table 12:	Container Market in Bulgaria – Port complex Ruse JSCo	27
Table 13:	Container Market in Bulgaria – Bulgarian River shipping JSCo	27
Table 14:	Container Market in Slovakia – Public Ports, jsc	27
Table 15:	Detailed considerations of Danube Ports	45

1. Executive Summary

Port development is seen as a catalyst to stimulate economic activity and create employment both for maritime and inland ports. In Europe, port developments relate mainly to building new terminals and upgrading the super- & infra-structure within existing ports rather than developing new greenfield sites. Danube ports need a more general approach to develop into better future.

One special approach in this context is that innovative markets will be investigated in order to identify potential types of (new) cargo that could be transported on the Danube and the special conditions that the ports have to comply with to accommodate these future changes. This will be reflected within the project work of DAPhNE, especially in the output document 5.1b – “New Market Studies”.

The actual report is part of the mentioned output document and summarizes the actual situation and reflects developments of the last decade regarding container transport in the Danube region. As the container business on the waterway system is very well developed on other rivers in Europe and has substantial shares in the modal split, this report also examines this comparison - especially with the Rhine - and examines the possible starting point in the sense of a best practice approach to initiate similar developments on the Danube.

Intention of this work was to provide an update on the general situation regarding container transport on the Danube, a reflection on the development of recent history as well as an outlook on the future and, above all an approach for ports and other partners to develop the future of container cargo to increase Danube transportation. The report aims to identify the approach that will offer real opportunities today and in the next decade for an increase of the modal split on the Danube in view of the dynamically changing environment.

In the preparation of the following detailed chapters very soon we came across various problems and difficulties, why the transport of full containers will not or not quickly gain similar importance on the Danube, as it is the case for example on the Rhine. The reflection with various experts showed, however, that in the short to medium term real opportunities for substantial improvements, especially in the empty container business are realistic. Therefore, this report has been given a special space in this report, as one of the main objectives of the project and in particular of this work package, to identify and elaborate concrete and quickly implementable topics that can be pursued immediately within the framework of the installed platform. There are real opportunities to meet the objectives of the European main topics and, in particular, the “Green Deal for Danube Initiative”.

As a conclusion of the report the full-container transport “to the west” (i.e from Austria to the west via the locks in the Rhine-Main-Danube channel lying in Germany) has actually not really a great chance to increase the full container business in this relation, due to time, effort, cost and fairway problems. Except the empty container business is in principle applicable in these areas of the Danube. Only the empty-container business has got a realistic chance for improvement; this topic was worked out in detail in this report and concrete recommendations were made.

Currently there is an opportunity in the Danube region to develop and establish full container liner services in those areas where a need for container transport will develop from industry in regions with currently insufficient rail capacity. In particular, there is potential in the Danube region downstream from Budapest to Constanta. This potential should be used and monitored further.

All the recommendations elaborated in this report should be followed and developed constructively by the ports on the Danube and their partners. For this purpose, the Danube Port Network (DPN) created within the framework of this project DAPhNE is a good basis for further development of these items. These points should be included in the work plan and the project list of the network and the individual ports (or member states) and further developed by further projects, activities and pilot projects. Special attention is drawn to the strong link with the existing railway lines and to the real opportunities for the future. The measures should not only be pursued as pure waterway measures but should also be pursued and concretely tackled with regard to many synergies that can arise together with the railway systems.

Recommendations for DPN (Danube Port Network)

- investigate the feasibility of the shown model product for an empty container regular service on the Danube in more detail with potential realization partners,
- examine and initiate the creation of the transport policy framework for empty container business compared to railway system,
- meanwhile expand or attract the system of spot traffic for empty container business, because it can respond quickly and easily to concrete customer inquiries,
- common concepts of waterway and rail as a contribution to the developing decarbonization strategies in freight transport, with the goals of reducing emissions and further easing the burden on the road - both for general container business and in particular for empty container business as a first step in the market,
- link the New Silk Road (OBOR – one belt one road) with a direct trimodal Danube logistic hub as a strategically important step and pursue an Adriatic linking strategy,
- coordinated overall strategic planning of rail and waterway development, especially in the lower section of the Danube,
- execution of several developing projects of actors within the DPN (Danube Port Network) – e.g. basic plannings of future alternatives in burden industrial congested areas,
- examine the new technologies in the container sector with regard to new market opportunities even for waterway transport in a trimodal logistic hub.

2. Introduction

Port development is seen as a catalyst to stimulate economic activity and create employment. In Europe, port developments relate mainly to building new terminals and upgrading the super- & infra-structure within existing ports rather than developing new greenfield sites.

As such, much of the reform process has more to do with the organization and operational aspects of ports. Within DAPhNE project WP5 Port Development will assess the situation along the Danube and will focus on 3 pillars that contribute to transforming ports into key-hubs of the European transport network and help trigger the reform process: infrastructure investments, funding sources for stimulating investments and innovation.

The goal is to provide a comprehensive package of the issues to be approached jointly in order to help compensate the unbalanced development level between the Upper Danube ports and the other river sections.

For this, four activities have been planned. In Activity 5.1 the focus will be on means of stimulating the upgrade of the port infrastructure & industrial development. This activity corresponds to the 1st pillar. The second activity will target the issue of financing port investments, as experienced via public-private partnerships (2nd pillar). With regard to the 3rd pillar dealing with innovation two activities have been planned.

Activity 5.2 will focus on public-private partnerships (PPP) for port investments which have become a very interesting and convenient development option in the last 25 years. The most common form of PPP is the operation of a concession agreement.

In Activity 5.3 the consortium will focus on the simplification of the work flow within the ports with the help of a modular port community system. A pilot implementation of this IT system will be planned & implemented in 3 ports along the Danube. Other Danube ports will be able to apply this system by adapting to their own needs the IT model architecture developed by the DAPhNE PPs.

In Activity 5.4 innovative markets will be investigated in order to identify potential types of cargo that could be transported on the Danube and the special conditions that the ports have to comply with to accommodate these future changes. The findings will be reflected in the case studies for new markets - circular economy.

Objectives of the activity 5.4: Most of the Danube ports on the middle and lower river sections are still struggling to compete with their Upper Danube counterparts in terms of cargo types, infrastructure and logistics facilities. Nevertheless, as key to their future development new industrial opportunities like industrial ecology and renewable energy that could provide innovative cargo types and associated services shall be investigated. Industrial ecology, also

referred to as circular economy aims to provide systematic management of material and energy flows, using waste from one process as input for another process.

Normally unrelated industries can exchange the flow of material and energy thus developing a form of industrial symbiosis. Port sites have a great potential for such synergies because of the various types of firms clustered together. The advantages of such collaborations range from pollution prevention, process optimization and waste management to internalization of environmental costs, local economic development and competitiveness. Under the current activity project partners will look into such examples as experienced in the Danube-Rhine region and try to analyze the context that led to their coming true (triggers, facilitating agents, steps in implementation, etc.). The results will be reflected in output 5.1. Furthermore, the project partners will also investigate new types of cargo for the Danube, one particular focus being alternative fuels like LNG. Capitalizing on the work performed in the LNG Masterplan for Rhine-Main-Danube (supply & demand analyses) the project partners will try to estimate the potential for transporting LNG as cargo in the Danube ports.

The container market is also a focal point in this activity, as the transport of containerized freight might bring an increase to the river transport by 2020 or in the following decade. The results will be included in this Danube Container Market Report. Logistics changes in Danube ports as triggered by the Physical Internet concept will be investigated in a special report.

Within this container market report a market research will be made, where a special focus will be laid on the empty container market in scope of a feasibility study. Finally the conclusions will highlight the main results of the container market report as well as recommendations will be made for further steps and treatment order for the Danube Port Network.

3. Container market in the Danube region

Scope of the report and rationale behind this paper

Shipping has considerable potential for combined transport. For many companies, punctuality is more important than the duration of the transported goods. Currently, the waterway system is only used to a small extend compared with the other transport modes (railway and road system). The Danube Region Strategy has a great potential to increase the waterway transport in the future. Following steps must be taken to increase the transportation on the Danube.

- expanding the previously neglected waterway system
- eliminating bottlenecks
- improving waterway maintenance and management
- creating efficient lock management
- integrating shipping into modern logistics chains
- developing ports into multimodal logistics centers
- further developing trimodal Danube ports.

This report summarizes the actual situation and reflects developments of the last decade regarding container transport in the Danube region. As the container business on the waterway system is very well developed on other rivers in Europe and has substantial shares in the modal split, this report also examines this comparison - especially with the Rhine - and examines the possible starting point in the sense of a best practice approach to initiate similar developments on the Danube.

The role of this document is to make an executive summary regarding “The Danube container market” – one of the deliverables of act 5.4 in order to provide a general overview of the innovative markets that are relevant for the Danube in the upcoming period. This paper, together with other parts concerning industrial ecology, LNG as cargo in the Danube ports and the “Danube Ports and the Physical internet”, gives the overall view in Output 5.1 - "New Market Studies" and aims at new market opportunities as well as opportunities for waterway transportation on the Danube and thus show the development of the Danube ports.

Project partners look into examples as experienced in the Danube-Rhine region and analyzed the context that led to their true (triggers, facilitating agents, steps in implementation, etc.). The results will be reflected in output 5.1.b. The New Markets Studies are designed to help all Danube ports to plan future development stages taking into account the progress made in other sectors or rivers.

In particular, this report on "The Danube Container Market" addresses:

- research from relevant studies in recent years
- statistics on container business from the relevant partner countries
- best practice analysis of other rivers, especially the Rhine
- market considerations
- assessment by different experts and market participants
- literature research on innovative approaches for combined cargo transshipment intermodal approaches, modal split, new approaches to barges and crane systems
- environmental aspects and decarbonisation strategy respectively EU-wide objectives
- consideration of the relevant railway market in the Danube region - Competition in the modal split
- feasibility study on empty container business
- conclusions and recommendations

This report is intended to provide an update on the general situation regarding container transport on the Danube, a reflection on the development of recent history as well as an outlook on the future and, above all an approach for ports and other partners to develop the future of container cargo to increase Danube transportation. The report aims to identify the approach that will offer real opportunities today and in the next decade for an increase of the modal split on the Danube in view of the dynamically changing environment.

The recommendations elaborated should be followed and developed constructively by the ports and their partners. For this purpose, the Danube Port Network (DPN) created within the framework of this project is a good basis. These points should be included in the work plan and the project lists of the network and the individual ports (or member states) and further developed by further projects, activities and pilot projects. In particular, attention is drawn to the strong link with the existing railway lines and to the real opportunities for the future. The measures should not only be pursued as pure waterway measures, but should also be pursued and concretely tackled with regard to the many synergies that can arise together with the railway systems.

In the preparation of the following detailed chapters very soon we came across various problems and difficulties, why the transport of full containers will not or not quickly gain similar importance on the Danube, as it is the case for example on the Rhine. The reflection with various experts showed, however, that in the short to medium term real opportunities for substantial improvements, especially in the empty container business are realistic. Therefore, this report has been given a special space in this report, as one of the main objectives of the project and in particular of this work package is to identify and elaborate concrete and quickly implementable topics that can be pursued immediately within the framework of the installed platform. There are real opportunities to meet the objectives of the European main topics and, in particular, the “Green Deal for Danube Initiative”.

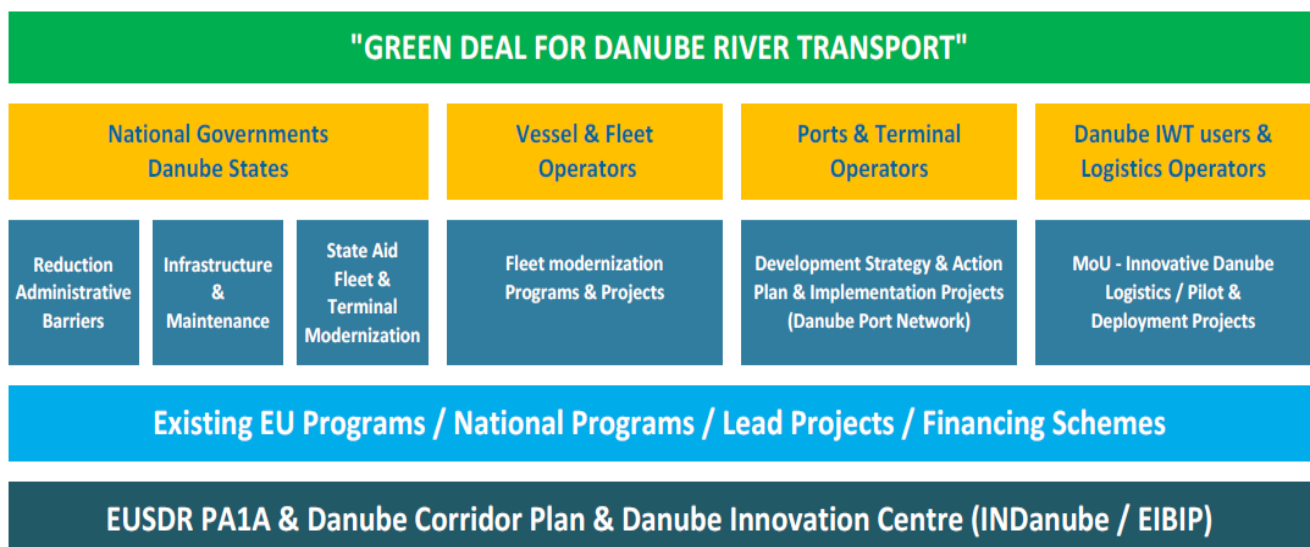


Figure 1: Green Deal for Danube river transport

4. Market Research

This market research was done with regard to the actual situation on Container Market along the Danube and Rhine region. Interviews with stakeholders show the obstacles in waterway infrastructure as well as the competition of this mode of transportation in comparison with the railway system. Nevertheless the feedback of the relevant partner countries via questionnaires also show a potential with regard to market opportunities for inland navigation.

4.1. Freight traffic on the Danube

4.1.1. Freight traffic on the Austrian part of the Danube 2017

In 2017 more than 9.6 million tons of goods were transported on the Austrian section of the Danube. Despite a lengthy closure due to ice at the beginning of the year, good fairway conditions throughout the rest of the year led to an increase of 6.0% or 0.5 million tons in comparison to the previous year. These effects are also evident when looking at the results over the course of the whole year. In 2017, significantly more goods than in the previous year were transported in three quarters.

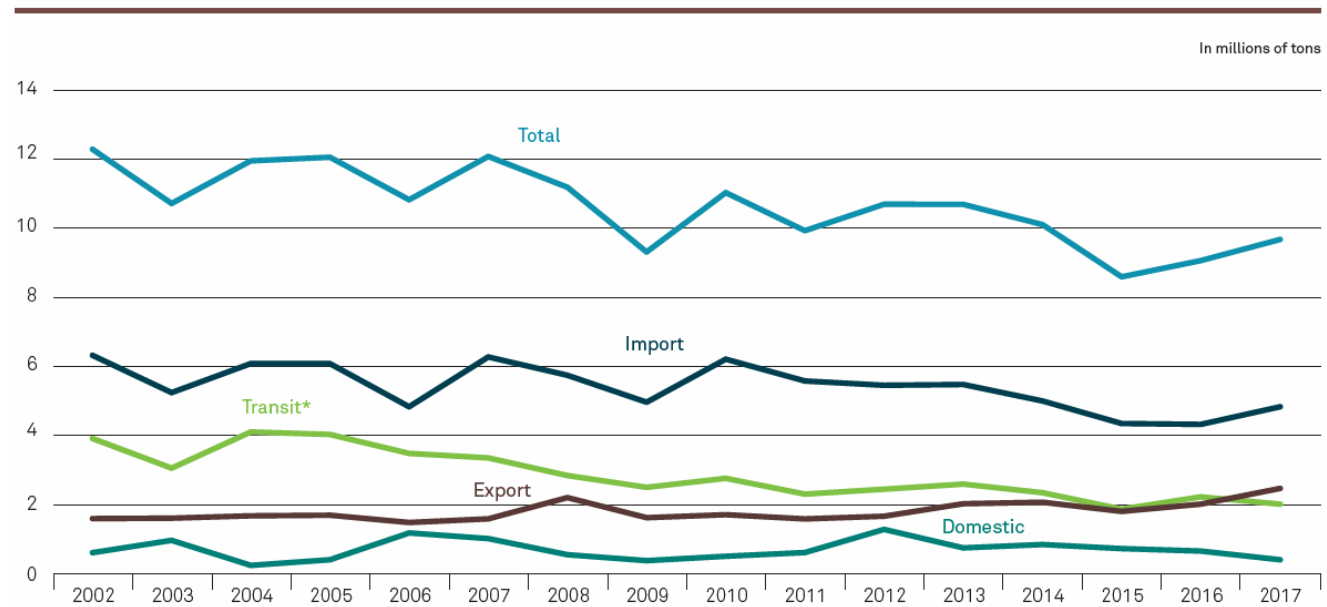


Figure 2: Freight traffic on the Austrian part of the Danube 2017 (Source: viadonau Jahresbericht 2017)

4.1.2. Freight transport on the entire Danube 2016

The most current available figures regarding the volume of freight transport on inland waterways in the Danube region are from the year 2016. This year saw 39.6 million tons of goods transported on the Danube waterway and its tributaries – an increase of 3.2% or approximately 1.2 million tons compared to 2015.

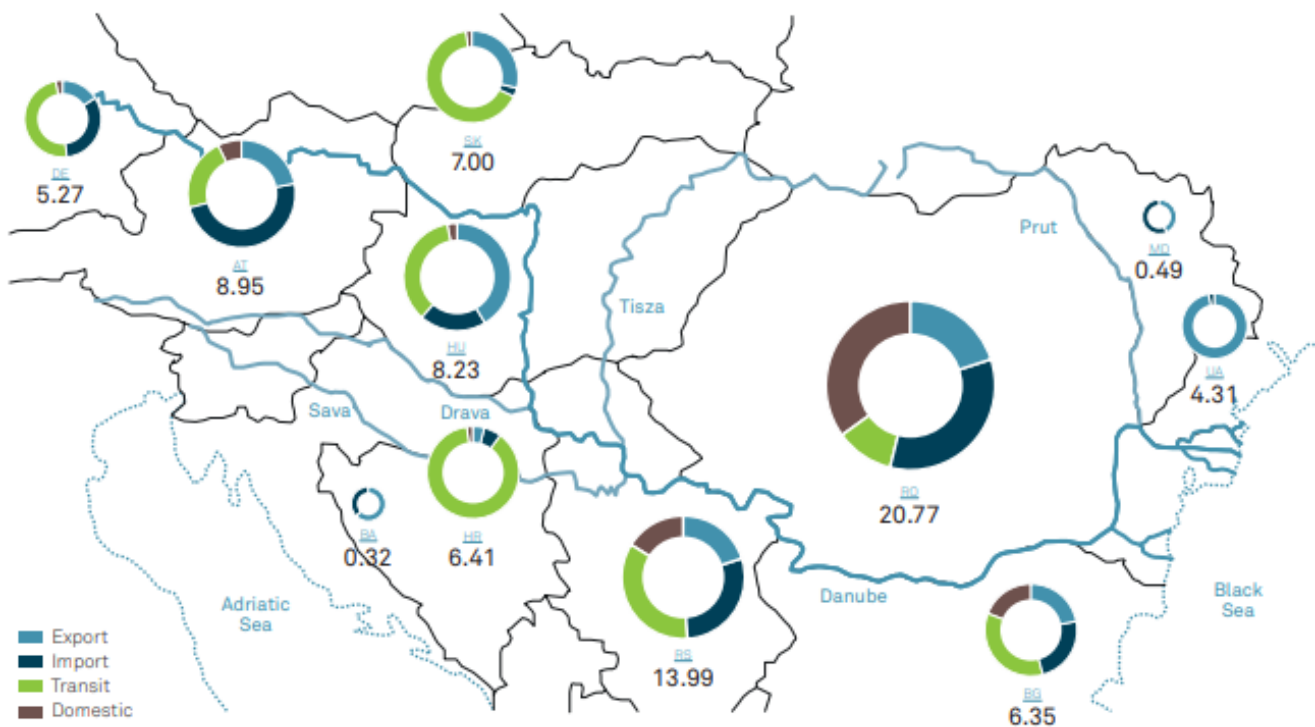


Figure 3: Freight transport on the entire Danube 2016 (Source: viadonau Jahresbericht 2017)

4.2. Obstacles on the Danube and Rhine

Obstacles on the Danube and maintenance of Fairway

There are currently very few container (loaded container) transports on the Danube, because of difficulties in planning transports due to high and low water reasons. Furthermore, there is a shift in the mode of transport due to lock maintenance, natural disasters and the arbitrariness of the property owners and shipping companies. In addition, past wars have contributed their part (Balkans). Currently, measures are being taken to maintain the waterway on the Danube as part of the EU Strategy for the Danube Region. The Declaration on the Maintenance of the Danube adopted by the Transport Ministers of the Danube Region in June 2012, key agreement on navigability between Romania and Bulgaria, promotion of the completion of the Calafat-Vidin bridge between Romania and Bulgaria, which is only the second Danube bridge In the 630 km long section of the river along the border, new research projects on innovative vessels, such as the

project NEWS for the renewal of the Danube fleet and progress in the Bulgarian-Serbian gas interconnection project, support these measures.

New markets and projects for the Danube

Soybean business, recycling economy and biomass such as e.g. agricultural products, fuels and wood chips would be possible new markets for transportation on the Danube waterway. Ports could be integrated into the operational value chain. For example, untreated waste wood could be delivered to the port by inland vessel afterwards stored and processed there for later transport.

Obstacles on the Danube

In addition to the previous researches, we looked for practical input in the cargo transport on the Danube. Our interview partners were professionals in the Danube Waterway business. The result shows that there are many obstacles on the Danube that prevent container transportation on a regular bases on the Danube but there could be a potential for empty container business in the future.

	Vessel length	Vessel width	Page height	Optimal waterlevel	Remark
Kelheim to Passau (DE)	185m	11,4m	6m	2 layer of container (correspond to 2 vessels with 176 TEU and 2 block trains)	Same for Main-Danube channel and Main river
Passau to Komarom (DE-HU)	185m	22,8m	7m	3 layer (correspond to 4 vessel units with max. 176 TEU and 1 layer) 3 layer of containers – correspond to 528 TEU and 6 blocktrains	Route controlled by barrage with locks except flowing route Melk-Krems / Wien-Bratislava and Komarom
Komarom to Budapest	185m	33m	9m	1 layer of container (correspond to 6 vessel units with max. 288 TEU) 3 layer containers condition - correspond to 864 TEU and 8 blocktrains	Free flowing routes with less flow velocity some passages with limits of length and width
Budapest to Prahovo	290m	33m	9m		Free flowing routes with less flow velocity some passages with limits of length and width

	Vessel length	Vessel width	Page height	Optimal waterlevel	Remark
Prahovo - Galati	There are no locks that limit in length and width			3 layers of container (correspond to 9 vessel units with max. 432 TEU with 1 layer /1296 TEU with 3 layers; correspond to 11 blocktrains)	Free flowing routes with less flow velocity as well as changeable fairways
Cernavoda - Constanta	190m	22,8m		4 vessel units with max. 176 TEU with 1 layer – with 3 layers 528 TEU (correspond to 6 blocktrains)	Cernavoda Kanal is regulated by dam and can be used 3 layers. If container transports were handled via Constanta, a running true of Enns - Constanta - Enns would be possible within 16 days.

Table 1: Obstacles on the Danube

Obstacles on the Rhine

On the Rhine there are obstacles in the same form as on the Danube but the advantage of the Rhine is that the large industrial companies are located directly on the Rhine and some are equipped with own port facilities, therefore there is no costly pre- or post carriage of the container. It is transported directly from the producer to the export via the ARA seaports and vice versa. Even the railway infrastructure near the Rhine has not got enough capacity for all the relevant cargo, so the waterway is a real good application of needed demands.

On the Rhine there are ships specially built for container traffic, the so-called Jowi class: 135 m long 17 m wide 6 container widths and 4 layers stacked with max. 398 TEU, and operate between Basel and the ARA ports.

	Vessel length	Vessel width	Optimal waterlevel	remark
Basel to Duisburg	185m	22,8m	Can be used with 3 layers, length and width correspond to 4 vessel units with a maximum of 176 TEU with 1 layer, 3 layers are 528 TEU, which corresponds to 6 block trains.	From Basel to Iffezheim, if the Rhine is impounded
Iffezheim to St. Goar	193m	22,9m	Can be used with 4 layers, length and width correspond to 4 vessel units with a maximum of 176 TEU, 4 layers correspond to 704 TEU, this correspond to 10 blocktrains	Free flowing routes with partly strong flow velocity on the upper Rhine
St. Goar to Gorinchen	270m	22,9m	Length and width correspond to 6 vessel units with a maximum of 288 TEU with 1 layer, 4 layers are 1152 TEU, this correspond to 16 blocktrains	Free flowing route with less flow velocity

Table 2: Obstacles on the Rhine

4.3. Container Market in Austria

Container Transshipment of the 4 Austrian Puplic Ports SUT Containerticker (total TEU)

Enns		Linz		Wien		Krems	
2000	722	2000	131.903	2000	130.680	2000	43.963
2005	129.020	2005	168.070	2005	224.751	2005	39.836
2008	191153	2008	225.161	2008	335.173	2008	42.000
2009	158.646	2009	157.857	2009	290.466	2009	30.600
2010	225.561	2010	183.605	2010	318.990	2010	31.754
2011	277.023	2011	206.518	2011	441.615	2011	32.554
2012	235.515	2012	203.317	2012	424.823		
2013	244.352	2013	196.580	2013	480.000		
2014	283.851	2014	216.282	2014	477.123		
2015	291.023	2015	239.203	2015	488.156		
2016	305.000	2016	216.908	2016	440.863		
2017	354.555	2017	208.453	2017	403.213		

Source: Schifffahrt Hafen Bahn und Technik, SUT Verlags GmbH, Ausgaben April 2009 bis August 2018

Table 3: Container Transshipment Austrian ports

Rail freight traffic in Austria 2017 Transport units, Container

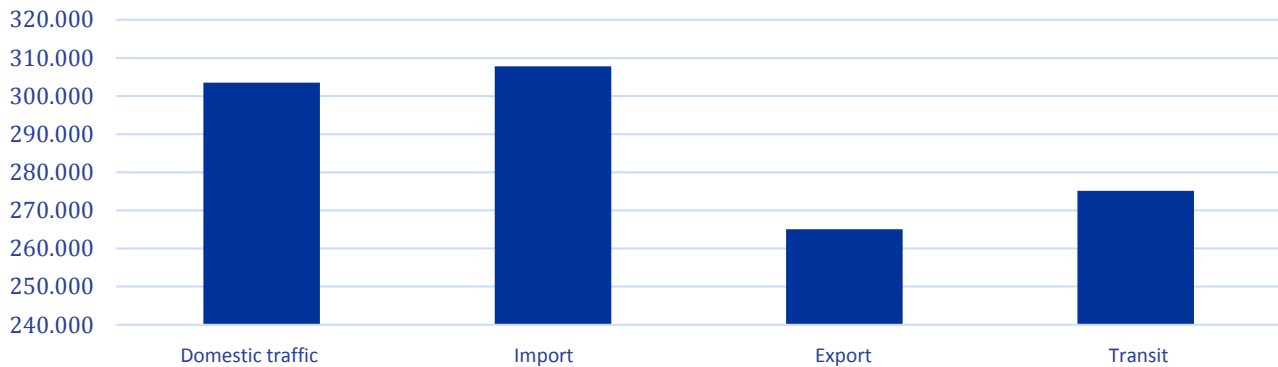
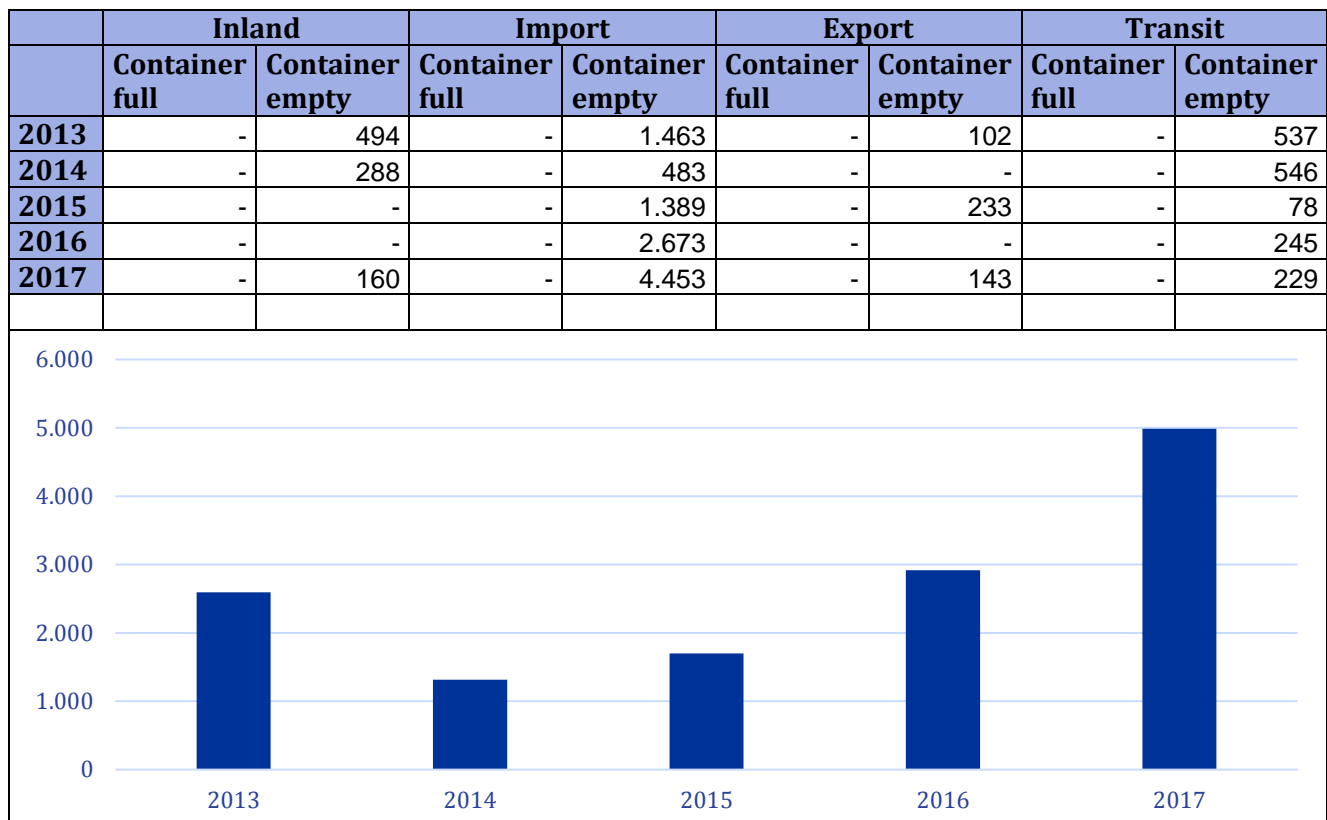


Figure 4: Rail freight traffic in Austria 2017

Transported Container on the Austrian Danube 2013-2017



Source: Q STATcube – Statistische Datenbank von STATISTIK AUSTRIA 2018

Figure 5: Transported Container on the Austrian Danube 2013-2017 (TEU)

Container Terminal Enns GmbH. (Ennshafen Port / Austria)	
Main Industry in the port area and surroundings	Around 60 Warehouse logistics companies in the industrial parks of Ennshafen Port Cargo handling companies (Danubia Speicherei, Fixkraft, Rumplmayr, Container Terminal, RORO Terminal, Fuchshuber, Neumüller, Rauch Recycling) Grain terminals (Fuchshuber, Fixkraft)
Container handling in the last 5 years	2013: 244 TTEU 2014: 284 TTEU 2015: 291 TTEU 2016: 306 TTEU 2017: 355 TTEU
future projects	Feasibility study Empty Container Business within DAPhNE project

Table 4: Container Terminal Enns GmbH (Ennshafen Port)

4.4. Container Market in Hungary

MAHART Container Center Ltd. (Budapest Port / Hungary)	
Main Industry in the port area and surroundings	MOL Warehouse logistics companies (like as EKOL, Láng Autó, Procargo, etc.) bulk freight terminals (like as UD Stahl) steel companies (like as Arcelor Mittal) steel trans-loading companies (Ferroport) Grain terminals (Gabonatárház, Agroterminal, etc.)
Container handling in the last 5 years	2013: 750 TEU 2014: 2480 TEU 2015: 1950 TEU 2016: 4880 TEU 2017: 8210 TEU
future projects	Yes, we are developing Budapest-Regensburg, and Budapest Giurgiu relations.

Table 5: Containermarket in Hungary

4.5. Container Market in Serbia

Port Governance Agency (all ports/Serbia)	
Main Industry in the port area and surroundings	In the Vojvodina region agricultural production is mostly developed. Main export goods are corn and grain and they are commonly transported by IWT in bulk. Export of fruit and vegetable production is also been transported by trucks or in some cases reefer trucks/containers. Fertilizers commonly used in agricultural production are usually transported by IWT, in bulk or packed in bags. Food production companies, such as sugar production plants, flour mills, oil production companies, pasta production companies etc. are using containers in export of goods. Certain factories have railway tracks, thus the railway cars

	<p>are being used, otherwise by means of road transport containers are forwarded to the Adriatic ports.</p> <p>Beside the agriculture, some other industries are located near the Danube river and are restoring the production. Two oil refineries are located in Pančevo and Novi Sad, while the still mill is in Smederevo. Some small percentage of the still mill production is being exported using containers (using railways mostly), but still the most of the raw materials are incoming by IWT in bulk. Majority of final products are shipped by IWT. Fertilizers production companies in Prahovo and Šabac are also using IWT, as much as for bringing raw materials as for final products (mostly in bulk)</p> <p>In recent years, throughout Serbia other different productions are being developed, from automotive industry (car parts) to the textile industry.</p>
reason for no Container business	Unstable navigable conditions of the river Danube throughout the year. No reliable liner service (reliable connection with the sea ports - Constanta)
Container Terminals in Serbia	<p>ZIT (Railway intermodal terminal) is located in the vicinity of the city of Belgrade. So far, there is only one liner service with the Rijeka port and occasional trains from Kopar port. In 2016, nearly 4800 TEUs were transported. No other available data for this terminal.</p> <p>There is also a container terminal in the port of Sremska Mitrovica on the Sava river. It is predominantly railway terminal with the liner service connection with port of Rijeka. No possibility for waterside transshipment (one crane with lifting capacity 6t only). There is no available statistical data.</p>
Available vessel units for transporting the containers	Barges are mostly being used for container transportation on the river Danube so far. Also, some smaller and mid-size self-propelled vessels could be easily customised for container liner services.
quantity of transported goods	In 2017, total of 10,5 mil tons were handled in Ports in Serbia. Out of this number 26% of Sand and Gravel, 19% of Ore, 15,5% of Oil and Oil products, 14% of Grain, 12% of other bulk cargo and 13,5% are other products.
final destination of goods	<p>Destination of major goods in export (grain) is usually Constanta port, than the goods are forwarded to their final destination. (i.e. most of the grains are exported in the Mediterranean region, north Africa etc.)</p> <p>Sand and gravel are transported internally, within the country borders, while the ore and other bulk cargo like fertilizers are imported and their final destination are Serbian ports (Smederevo – ore for the still mill, Prahovo and Sabac – row materials for fertilizers production etc)</p>

Table 6: Containermarket in Serbia

Container traffic on the Danube - Serbia

With the expansion of the global container transportation, first IWT container terminal in Serbia was established at the Port of Belgrade. Terminal area is 12.000m², and for waterside transshipment 50t lifting capacity crane has been used. Forklift with spreader (32t lift capacity) is used for handling units on the terminal. These conditions are allowing handling of 10.000 TEUs on the yearly basis, but the maximum of 12.000 TEUs was reached back in the 1980s.

Ports in Novi Sad and Pančevo also have some random container throughput, but waterside handling is limited with the lifting capacity of portal cranes (27t).

Container market demand in Serbia currently has a volume of 30-50.000 TEUs on the yearly basis. Out of this number, 80% is transported through North Adriatic ports (Kopar, Rijeka), 13% through South Adriatic ports (Bar), 5% through Black Sea ports and 2% through North Sea ports. Even though the factors determining port selection are numerous, efficient hinterland connections and shorter transit times for railway and road delivery are the main reasons for such volume split. Container transport via inland waterways still can't be provided through reliable and efficient liner service, due to the unstable navigable conditions on certain sections of the river Danube. However, in 2005 first container line on the Danube, Constanta – Belgrade – Constanta, was established through the joint efforts of the maritime river agency Jugoagent, Port of Belgrade, ZIM Integrated Shipping Services and Bulgarian Shipping Company (BRP). There were regular weekly departures from Constanta and Belgrade with the 80TEU capacity barges.

In first three years of existence, timetable was followed. Average transit time was between 8 and 10 days. Number of transported containers constantly increased. With the economic crisis interest for the line has decreased, as well as the number of TEUs. Lack of financial sustainability caused inaccurate and rare departures. From regular weekly departures, by the termination of the line in 2010, only three departures for the six months were noted.

Second container line on the river Danube, Budapest-Belgrade-Constanta was launched in 2010. This service was operated by Helogistics holding and was supported by the Marco Polo Program. Operator was fully dedicated to the goal to establish reliable liner service, by using both of his shipping companies (DDSG and Mahart). As the operator had very frequent vessel traffic on the river Danube, he just added container barges to existing convoys. From the start, there was an option of loading/discharging at any port along the way. Transit times in upstream voyages were 8 days from Constanta to Belgrade and 11 days from Constanta to Budapest, while in downstream voyages transit times were 8 days from Budapest and 4/5 days from Belgrade to Constanta. One upstream and one downstream voyage were planned for each week, throughout the whole year. Barges were designed to carry 144 TEUs and web tracking application was available. Alternatives in case of nautical obstacles were anticipated, in order to overcome possible delays in container delivery.

During the first two years, more than 100 upstream and downstream voyages were registered, and total of 6.600 TEUs were transported. Level of usage was constantly increasing. Extension of the line capacity was planned. Unfortunately, the ownership of the company operating the line has changed, and new owners were not interested in this business segment. After two and the half years the line was shut down.

Despite the fact that, by using the Danube waterway, total transport costs per container were lower up to 400 EUR, most of the containerized goods in Serbian import still used ports in Kopar and Rijeka. The reason is that transit time for these goods is very important. In 2010, major Operators have cut their Far East lines to Istanbul. Use of feeder services extended total transit times, and thus neutralized the advantage of Constanta port over Adriatic ports.

Handling of containers in the Port of Belgrade:

	2005	2006	2007	2008	2009	2010	2011
Waterside(TEU)		1220	2602	2374	1018	601	696
Total (TEU)	2471	3702	8182	6817	2787	1627	1492

Table 7: Handling of containers in the port of Belgrade

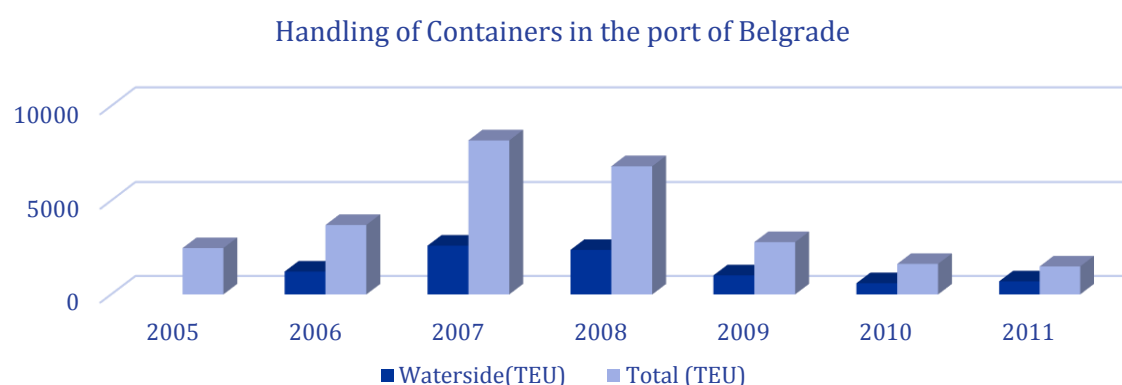


Figure 6: Handling of Containers in the port of Belgrade

4.6. Container Market in Romania

Overview for container traffic in Romania

Intermodal transport is an increasingly important part of the logistics sector and freight unitization is a pre-requisite for intermodality. 'Freight unitization' is defined as the use of standardized packaging units that can easily be transferred from one mode of transport to another without handling the goods themselves. In simple terms, 'unitization' describes how much of the total freight transport has been transported in containers.

Recent trends in the data clearly illustrate the importance and growing role of intermodal transport in Europe. The main focus is on the increasing share of unitization in different modes of transport, in other words the share of goods that are transported containers and other Intermodal Transport Units (ITUs) such as swap bodies, trailers and semi-trailers.

The main types of standardized packaging units, called intermodal transport units (ITUs), are:

- containers;
- swap bodies;
- trailers and semi-trailers.

The share of air freight transport in total freight transport to / from Romania is not significant. However, this mode of transport remains advantageous especially for medium and long distance transport, a fast shipments of goods, small containers, light goods or dangerous goods.

The international trend is the development of multimodal transport air / road goods using both transport modes for both modes air. Therefore, the development of cargo terminals has become an important objective in all airports' strategies classified as European or International.

At present, there are terminals or cargo processing facilities in Romania Henri Coanda airports - Bucharest, Timisoara, Arad and Constanta. Airport Cluj has planned in its strategic development program to build a terminal cargo.

The share of unitisation in total freight transport has increased considerably in recent years. However, this growth in unitisation varies between the different modes of transport. Rail and maritime transport (deep sea shipping in particular, but also short sea shipping) have the highest shares of freight unitisation, both at EU level and in most Member States. By contrast, for road transport the unitisation rate at EU level has remained stable at slightly above 6 % over the last few years.

Comparing road, rail, maritime (deep sea shipping and short sea shipping) and inland waterways transport across all EU Member States, deep sea shipping and short sea shipping had the highest unitisation rate in 16 Member States (only 23 Member States have a coastline). Rail transport had the highest unitisation rates in 8 Member States and road transport in one Member States. Due to data availability at national level, the unitisation rate for maritime transport is calculated on the basis of tonnes of goods transported, whereas for the other transport modes it is based on tonne-kilometres.

The road transport of goods in containers over longer distances (300 kilometres or more) is decreasing in the EU. Measured in tkm, such long-distance container transport fell by 5.0 % from 2013 to 2015. The Romanian maritime ports make great efforts to increase freight traffic. At the end of the first two months of 2017, the quantity of goods handled was 21.08% lower than in the same period of 2016, the gap was reduced to 5.48% after seven months.

Port operators mainly count on good grain harvests in Romania, Serbia and Hungary, but also on increasing demand for hydrocarbons.

In the first seven months of 2017, Constanta, Midia and Mangalia harbors together 30,924,169 tons of freight, with 5.48% less than in January-June 2016. The maritime traffic was 24.25 million tons, down 5.42%, while the river recorded 6.66 million tons, with 5.80% in minus.

Container traffic amounted to 3,802,790 tons of goods, respectively 417,014 TEU, decreasing by 10.52% and 1.97%, respectively.

At present, there are 26 railway terminals in Romania with a capacity of 10,500 TEU in which the S.C. CFR "TRANSAUTO" SA, as combined transport terminal operator and SNTFM "CFR Marfă" SA, as owner²² and national rail freight operator. At present, some of these terminals are closed.

These terminals used for intermodal transport work with equipment and machinery manufactured in the 1970s and 1980s, operations taking place in buildings which do not meet the current requirements, with inadequate access roads, benefiting from security services and limited lighting. Consequently, they can not be exploited at their true potential. In Romania, there are also 19 privately owned industrial terminals / lines loading / unloading containers.

APDM (Galati Port, Romania)	
Main Industry in the port area and surroundings	metallurgical industry
reason for no Container business	The problems identified in the GTMP (The Romanian General Transport Master Plan) are chiefly referred to the lack of dedicated intermodal facilities that limit the development of the port, notably with respect to the traffic of containers. Besides, further improvements were identified for the modernization of the existing bulk terminals, as deemed old, inefficient and not suitable for modern logistics practices. In addition, the GTMP identifies poor, slow and ineffective connections of the port to the national road and rail transport networks. The lack of funds and state aid joins to the other cause.
future projects	The " Galati Multimodal Platform – Stage I –Upgrade of the waterside infrastructure Project is the first stage of the "Multimodal Galati Platform - Removing major bottlenecks through modernization of existing infrastructure and provision of missing connections for the Rhin-Danube / Alps central network" and aims to modernize port infrastructure located in the New Basin Area, within the limits of Galati Harbor. The modernization of the Galați port infrastructure will contribute to strengthening the links between different countries such as Ukraine, Moldova and Romania and will allow for an increase in freight transport along the lower Danube section and the Rhine-Danube Global Corridor within the central transport network.
new Container business on the danube	The project Galati Multimodal Platform is included in the Strategic Development Programme for the Port of Galati (Master Plan of Galati port) in the top priorities for the port development strategy. The main strategic direction recommended in the document is the specialization of the port on container handling.

Table 8: Containermarket in Romania – APDM (Galati Port)

Socep SA (Constanta/Romania)	
Main Industry in the port area and surroundings	Oil&Gas : Petromidia Construction materials: CELCO Steel Products – Alum SA, Arcelor Mittal Galati Food Products Textile products – Romtextil Furniture
Container business	Yes - Umex, Socep, APM Terminal, CSCT Socep - deployment of 1 new STS crane, 2 RTG cranes, 1 Reach stacker, 1 Empty Handler.
future projects	Socep – increase of storage area, technical and mechanical upgrades for existing equipment. Acquiring new equipment for operating containers to railway and vessel.
kind of products	Timber, Grains, Chemical products, Steel products, Construction Materials
quantity of transported goods	From Socep by Danube we have exported empty containers for Budapest around 40 – 60 containers with a frequency of 1 shipment per 2 months. Final destination is Budapest

Table 9: Containermarket in Romania – Socep SA (Constanta)

Maritime Ports Administration Constanta - MPAC (Constanta, Midia and Mangalia ports - Romania)	
Main Industry in the port area and surroundings	<p>The main industry in the Constanta, Midia and Mangalia port area & surroundings is represented by the maritime transport and logistic companies, ship repair yards and tourism. The industries in the port of Constanta, Midia and Mangalia can be grouped depending on the type of terminals existing in these locations: liquid bulk (liquid gas, crude oil, oil products, edible oil, chemical products); bulk terminals (grain, ore and coal, special products – cement, sulphur, etc); RO-RO/ ferry terminal; general cargo terminals; containers terminals; passengers terminal; IWT terminal.</p> <p>The port of Constanta has facilities for operating all types of cargo, on ships up to 300 m (that can pass through the Bosphorus Strait).</p>
Container business	<p>Yes, there is container business in the port area & its surroundings. Moreover, there are 3 such specialized terminals in the port of Constanta (DP World, Socep and APM Terminals).</p> <p>The containers traffic registered in the last 5 years in the Constanta Port:</p> <p>From the cargo traffic in containers point of view, Constanta Port registered in 2012 the largest freight traffic in the Black Sea.</p> <p>Five years ago, only half of the container capacity of the port was used. The demand to increase this capacity before 2025 was limited given the traffic forecast. Also, domestic competition in Constanta port has been limited, but during these years, an increasing number of port operators have been operating containers and thus ensure a steady growth of demand and the development of additional logistical capacity on this segment.</p> <p>Constanta Port competes with neighboring ports mainly for the export of containers, grain and petroleum products. In addition, the planned investments in the development of Danube navigation are expected to improve the medium and long term navigation conditions and facilitate container traffic.</p>
future projects	<p>According to the Constanta Port Master Plan, the mid-term development plan, starting with 2025, provides for the construction of a new container terminal based on the shared use principle. In the long run, two additional tolls will be needed to operate containers, according to the forecast for toll and terminal traffic, and to cover the increasing containerization rate of traditional goods. In order to increase competition between container operators in Port of Constanta, a third potential operator who will manage to secure their own container flows, will be an interesting option. Also, in support of traffic of any kind, the PCS system will be implemented that will make time and traffic formalities more efficient in Constanta port.</p> <p>The Danube River - a major advantage of Constanta Port on the raw materials segment, cannot currently be used for the transport of containerized goods, primarily because of the unpredictability of the depths. To function in normal parameters, liner shipping (on which the shipment of containerized goods is lost) must be predictable. The fluctuation of the Danube, especially during summer-autumn periods, prevents the use of this artery as the Rhine is used in Northern Europe to transport millions of containers.</p>
new business models and studies about it	<p>Presently we do not hold much information regarding the new business models concerning the transport of containers on the Danube. The shipping industry has the potential to become genuinely competitive in the future</p>

	<p>thanks to the new type of vessels powered by electricity or liquid natural gas, and tailored to the demands of today's goods transport, but European countries must abide by the existing agreements and ensure that their waterways meet the agreed standards. Even if the best vessel and the best logistics system exist, they are of no use if the general conditions on the Danube are not met (for example in relation to water depth, bridge height or the technical specifications of locks) and they have not been implemented everywhere. We are currently witnessing the tendency of containerization of cereals in maritime traffic, which can also be translated on river transport on the Danube, as future trend on this sector.</p> <p>We had a Study made last year called "Study on cargo potential on Constanta, Mangalia and Midia Ports", which includes information on container traffic potential in the coming years.</p>
kind of products	Agribulk, vegetables and fruits, edible oils, metallic products, construction materials, wood, oil products, chemical products and fertilizers, ferrous and non-ferrous products etc.
quantity of transported goods	Aprox. 285 mil. tones of above mentioned products, during the last 5 years. The destination for these goods are the EU and non-EU countries.

Table 10: Containermarket in Romania – APDM (Constanta, Midia and Mangalia ports)

Statistic Romania – Port of Constanta

Romania - Container port traffic (TEU: 20 foot equivalent units)

The value for Container port traffic (TEU: 20 foot equivalent units) in Romania was 721,339 as of 2016. As the graph below shows, over the past 12 years this indicator reached a maximum value of 1,411,414 in 2007 and a minimum value of 373,702 in 2004.

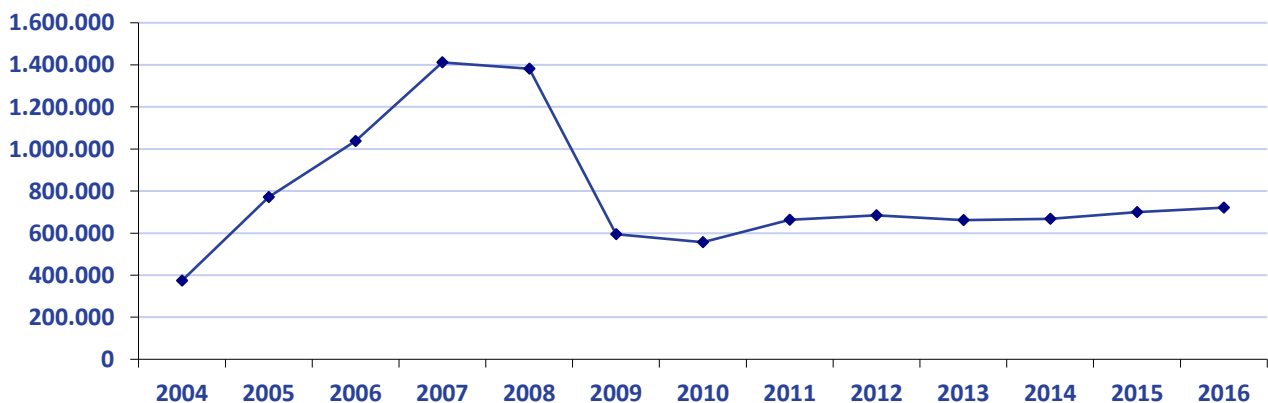


Figure 7: Romania - Container port traffic (TEU: 20 foot equivalent units)

Trends in combined rail / road transport in Romania

There is an increase in the role of logistics operators and shipping houses through integration of intermodal transport services in the supply and sales logistics chain. The development of transport as an extension of the industrial production activity is a conclusion of agreements and cooperation between logistic and logistics operators as well as transport operators with a view to obtaining service and transport contracts.

In Romania intermodal freight transport is very poorly developed and transport the road competes rather than completing rail transport. Rail freight and passenger transport has experienced significant decreases in recent years, and the reversal of this trend will require a variety of interventions, some involving specific strategies, along with those related to infrastructure improvements. The Danube River is a valuable resource for low energy transport but on the Romanian sector the waterway is not properly managed, with many points where the depth falls frequently below the minimum allowable (2.5m) or the navigable waterway does not have the necessary width (180m).

According with MasterPlan of Transport the main objectives of the authorities, are:
Closure of Bucharest Newi cargo terminal and the opening of a new terminal multimodal with an additional capacity in Bucharest, with the possibility of developing one system with three-modal capacity in the future.

Rehabilitation of the multimodal terminal in Iasi, Socola, thus serving this fourth a city that currently does not have its own facilities, and also ensuring a potential transshipment with the Russian railways.

Protecting the Semenic terminal in Timisoara serving this second largest city, which currently has no facilities, a project that has been suspended.

The construction of a new multimodal terminal in Craiova, serving the sixth largest city in size and an important industrial area that currently does not have facilities for user access

Rehabilitating existing terminals to provide an extensive and strategic network for multimodal transport of domestic and international goods in: Cluj Napoca East, Turda, Suceava and Bacau.

4.7. Container Market in Bulgaria

BPICo, Department Operation and Exploitation of port terminals (Port terminal Ruse-west)	
Main Industry in the port area and surroundings	the port is providing loading-unloading activities and storage of cargo (metal products, fertilizers, coal, kaolin, wire rods, etc.)
Container business	there was, but in the last two years no container flow is registered 2013 –no containers; 2014 – 1 218.880 tons containers; 2015 – 321.300 tins containers; 2016 and 2017 – no containers lack of companies wishing to use container transport
Origin of containers	Serbia
Modes of handling containers in port	indirect handling (ship/storage/ automobile); - direct handling (ship/automobile)
kind of products	Bitum for roads
quantity of transported goods	1540.180 tons for period of 5 years; Final destination is Bulgaria

Table 11: Container market in Bulgaria – BPICo, Department Operation and Exploitation of port terminals

Port complex Ruse JSCo (Port terminal Ruse-east)	
reason for no Container Business	The lack of container flow is due to the following: railway transport of containers is faster compared to the river transport; price differences between the two modes for transport are minimal; seasonal fluctuation of the water level of the river Danube
Origin of containers	Containers handled in Port of Ruse-east in the past originated from Austria and Turkey.
Modes of handling containers in port	loading/ unloading activities and storage.

Table 12: Container market in Bulgaria – Port complex Ruse JSCo

Bulgarian River shipping JSCo (Port terminal Vidin-north)	
Container business	Yes, but episodically 2014 – 156 units – empty.
kind of products	mainly dry bulk cargo.

Table 13: Container market in Bulgaria – Bulgarian River shipping JSCo

4.8. Container Market in Slovakia

Public Ports, jsc (Bratislava / Slovakia)	
Main Industry in the port area and surroundings	Transshipment of bulk goods (ore materials, coal, fertilizers, ...), empty containers, oversized goods/Slovak Shipping and Ports; Port services Bratislava; Ferroservis Bratislava Transshipment of mineral oils/Dalby
Container business	YES – only empty container transport Total sum of containers transported in Slovakia in 2016 according to water traffic mode was 1689 containers. The main part of this amount (1211 containers) was related to the transit of containers, 441 containers were related to export, 28 to import and total 9 of containers were related to the inland transport.
future projects	Project of Public terminal of intermodal transport in Bratislava-Palenisko The objective of the project is the construction of technical infrastructure for intermodal transport, which will meet the parameters of the AGTC and the AGC agreement. The terminal is designed to facilitate transshipment between the three modes of transport – road, rai and water. It is also designed to provide for sufficient capacity between Asia and Europe (market potential estimated at 55,000 ITU per year), as well as for sufficient capacity required by the regional logistic chain (volume of the potential market about 270,000 ITU per year). If the terminal is built to the project specification, it will be capable of delivering 105 000 IPU per year within a short time frame. Full performance will not be immediate but its capacity will grow over the years depending on the development of intermodal transport in Slovakia.

	<p>The VTIP is designed as one long terminal in total length of about 750 meters. It consists of the bimodal part (rail/road) in total length of 450 meters and trimodal part (rail/road/water) in total length of 300 meters. Both parts will be operated by two gantry rail cranes and one mobile handling device (MMP). The gantry rail crane in the trimodal part is able to handle 3 boats of "Danube Europe IIb" type with loaded containers in four rows.</p> <p>The bimodal part of the terminal is also served by gantry crane covering 4 operating sidings and 8 rows of the IPU. Assuming top-level hourly output of 40 handling per crane, the estimated time for unloading a Danube-type IIb Europe ship is about 1.5 hour.</p>
kind of products	The majority of transported goods is created by mineral oils, ore materials, transformers, steel rolls, fertilizers, coal
quantity of transported goods	<p>The transported goods are loaded and unloaded by cranes directly on train or ships, not in containers.</p> <p>Year 2017</p> <p>Mineral oils – 560.800 tons / per year - export Ore materials – 1.261.500 tons / per year - export Transformers – 3000 tons / per year - export Steel rolls – 47.000 tons / per year - import Fertilizers – 84.000 tons / per year - export Coal – 77.800 tons / per year – export</p> <p>Final destination is Austria, Germany, Serbia, Bulgaria</p>

Table 14: Container market in Slovakia – Public Ports, jsc

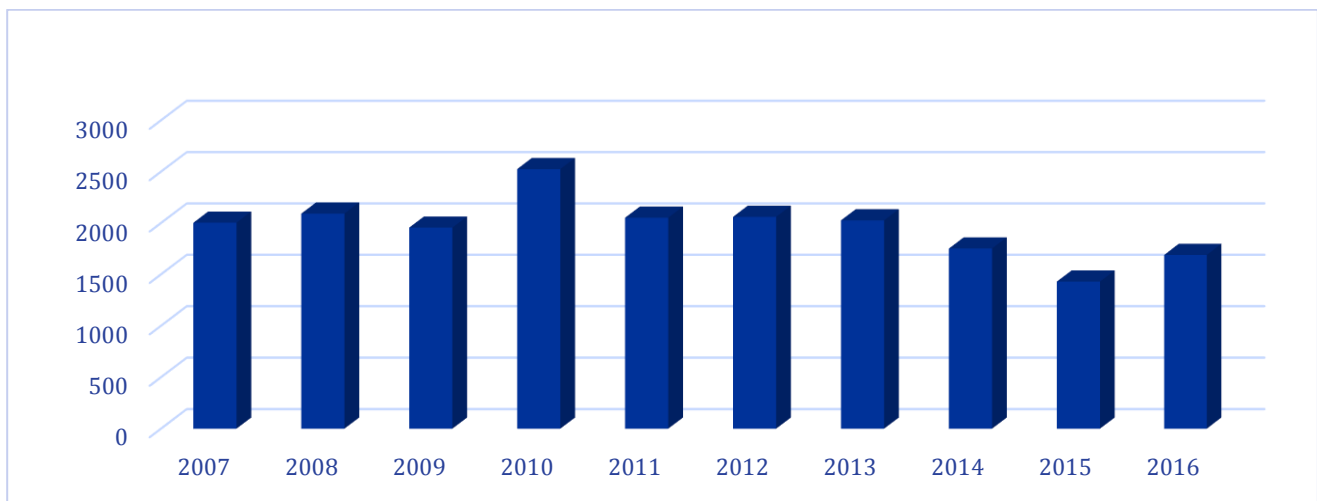


Figure 8: Number of transported Containers (TEU) in Slovakia

4.9. Best-Practice analyses

Following statistics shows that in the Rhine region the Container traffic permanently increases in the last years.

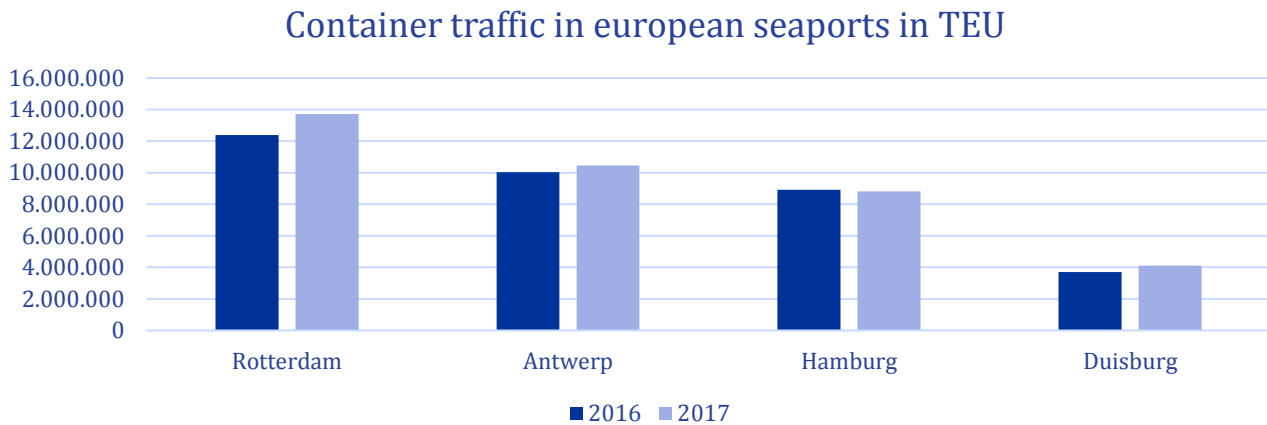


Figure 9: Container traffic in European seaports in TEU

Port of Duisburg: in the biggest European inland port, located on the lower Rhine, around 265,000 container boxes with a total cargo weight of 4 million tonnes were transshipped per inland vessel in the first nine months, compared to 250,000 boxes and 4.1 million tonnes of cargo one year earlier.

Port of Duisburg: 67 % of all containers transshipped per inland vessel in 2017 were loaded; this share had been 64 % one year earlier.

Ten largest Rhine ports: the sum of waterside container traffic in Q1-Q3 2017 was 4 % higher than one year earlier. The result for the entire year 2017 will certainly be much better, as the effects of the Rastatt incident could still be felt in the fourth quarter.

Source: https://www.inland-navigation-market.org/wp-content/uploads/2018/05/MI_Spring2018_Web_EN.pdf

4.10. Observation of relevant rail freight market in the Danube Region – competition in modal split

Cross-border freight transport by rail can be made much easier by removing technical and bureaucratic hurdles. The basis for fair competition in transport is cost-effectiveness and combating social dumping in road freight transport.

Rail needs fair competition

In the EU average, the external costs of truck traffic per tonne-kilometer are seven times higher than rail freight transport. Together with lower social standards in truck traffic, which are also difficult to control, this distorts competition vis-à-vis the railways. In order to transport more goods by rail, fair wages and working conditions and compliance with speed limits and maximum driving times must be ensured in road freight transport. For the railway, technical and administrative hurdles have to be overcome between the EU countries.

Apart from the direct costs for transport companies, many expenses and damages are passed on to others in road freight transport. Overall, all costs of road haulage should take into account damage to the environment and health, external costs, including noise, traffic accidents or air pollution. The external costs of transporting goods by truck in Austria are around 4.5 cents per tonne-kilometer, and inland shipping at 0.9 cents. At 0.6 cents per tonne kilometer, rail is clearly the lowest.

Innovative transports for Europe's economy

On the rail still free capacities can be used. Great potential for efficiency is attributed to "synchronodal transport chains". In the process, transports are planned across all modes of transport and are continually optimized during the implementation in order to switch between modes of transport. Studies on international freight transport to Italy and nationally in the Benelux countries show that synchronodal transport over statically planned multimodal transports can lead to a significant shift from road to rail and inland waterway. Greenhouse gas emissions are reduced by 14 to 28 percent, with cost savings of 4 to 20 percent. The prerequisite is a network of different transport options and willingness to cooperate.

Sources: VCÖ series "Mobility with a Future": "Supporting the Transformation of Mobility and Transport" and "Hidden Costs of Transport", Vienna 2017; Project Combi Coop II; Asfinag 2018

4.11. Former projects regarding Container Transport on the Danube

In the past several studies were dealing with cargo shift from road and railway to waterway system due to the increasing of global exchange of goods. Funding instruments were implemented to support projects regarding liner services on the Danube. The COLD-study examined an assessment of the opportunities and risks of Container Transport on the Danube River between Austria and the Black Sea region. In 2012 the KOLEG study presented a business plan that investigates a combined regular service on the Danube between Port of Enns (Upper Austria) and the port of Galati (RO) that provides a regular, inexpensive and reliable transport offer for shipments between Austria and the Black Sea region. The regular service was designed to support combined transport of mass and bulk goods, containers or High & Heavy products.

4.11.1. COLD – Container Liner Service Danube / 2006

In 2006 the COLD – study examined an assessment of the opportunities and risks of Container Transport on the Danube River between Austria and the Black Sea.

In contrast to other rivers in Europe, the volume of container shipments on the Danube has not been of much significance up to now. In the light of the double digit growth rates in the global transport of goods and the chronic capacity bottlenecks at Europe's major ports and connecting routes in their hinterland, now would be the right time for establishing container transport along the Danube. This study confirms this assessment: the cost benefits of using inland vessels specialized in container transport are significant. A look at the entire supply chain for Europe-Asia shipments shows that the frequently mentioned setback of long transport times is not that severe. Moreover, as the environmental impact balance is good, a win-win situation is possible for all actors.

This study investigates the growing volume of transshipments at the major container ports throughout the world. While this volume was around 100mn TEU (twenty-foot equivalent units) at the beginning of the 1990s, by 2005, the figure had climbed to 350mn TEU. The estimate for 2015 is 600mn to 700mn TEU. A crucial issue for Europe's economy is the capacity to efficiently deliver and collect such container volumes in the hinterland of the sea ports, specifically, in the economic core regions of Europe. Inland navigation can be used effectively for transport in addition to road and rail as the success stories of the Rhine, Rhône, Seine and the Belgium waterways illustrate. The boom at the Black Sea ports could be a great opportunity for the Danube River to trigger a similar development. The Romanian port of Constanta, which is linked to the Danube waterway by the Black Sea Canal, has seen a remarkable rise in container volumes.

The "Market and Peer Analysis" analyzes the existing overseas container volumes of the countries of Austria, Hungary and Slovakia. The estimates of the project team are based on a current total volume of some 700,000 TEU per year (Austria 400,000 TEU, Hungary 200,000 TEU, Slovakia 80,000 TEU). The larger share of containers is transported by shuttle trains, and the smaller share by truck. The rail tariffs were surveyed for the most important connections per TEU and 40-ft. container, including connections to the ports in the Adriatic Sea and truck prices in the Danube region. To assess the future potential of regular scheduled container services on the Danube River, the Austrian Institute for Regional Studies and Spatial Planning (ÖIR) conducted a macro-economic analysis of the flow of goods. The analysis includes transport volumes that could theoretically be containerized transported within the Danube region as well as short sea and overseas connections. The potential of the Danube in the three countries of Austria, Hungary and Slovakia was found to be around 0.65 to 1.15mn TEU until 2010, and by 2020, it could grow to 1.3 to 2.4mn TEU.

The "Inland Navigation Concept" deals with the transport of containers on the Danube waterway. The subjects of waiting times at locks and border crossings, port fees, Black Sea canal fees and possible nautical hindrances were investigated. Two scenarios were developed that represent duration, costs and capacities of container liner services between Krems in Lower Austria and Constanta. The "base scenario" is based on the use of conventional Danube ships and double-stack container loading. The bottom line of this scenario shows that the transport costs per container are the same as by rail. An "optimized scenario" uses ships with larger capacities (triple-stacked containers) adapted for transporting containers and covers the round-trip Krems – Constanta – Krems in 16 days. At a capacity utilization of 75 % the basic costs per container are very attractive.

The ocean carriers as the target group are engaged for implementing a container liner service along the Danube. Using the example of a transport chain between Shanghai and Krems, the duration and costs of the transport variants Hamburg plus rail are compared to Constanta plus inland navigation. This comparison sheds a new light on the frequently mentioned disadvantages of Danube navigation: In the direction of Asia, the shipment took around 30 days in both cases, while imports to Europe took two and a half days longer using the Danube variant. The comparison of the costs of the supply chain is based on the level of ocean freight costs of the first quarter of 2006 (Constanta more expensive than Hamburg) and on a second calculation using equal freight costs, as the equalization is already underway. In the latter case, the cost advantage per container attainable via the Danube is around 20 %.

Moreover, the environmental balance of the variant via Constanta and the Danube is very encouraging: By avoiding more than 4,000 km of deep sea voyage, an average of 16 % less CO₂ is produced per container. The study closes with statements by shipping companies and their agents in Vienna, Budapest, and Belgrade. The basic sentiment revealed is positive if reliability is ensured and the price is right. In the short term, a number of companies are interested in the transport of empty containers along the Danube.

The study also presents recommendations for future approaches. After publication of the study, a first step will be to obtain feedback from ocean carriers and large transshipment companies. A round table will be held to bring together interested companies and to create project alliances. The objective of all actors involved could be stated as the launch of scheduled container services between Austria and Romania in 2007.

Source: COLD I Final Report August 2006 - via donau

Increasing of global container transshipment

The global exchange of goods has increased enormously in the past few decades. This is especially true in the segment of high-value goods, i.e., container shipments where the growth rates are usually double digit. There is a direct relationship between the rising volume of transport and the transshipment figures at international sea ports. While the volume of transshipment was around 100mn TEU (20-ft. container) at the beginning of the 1990s, the figure had climbed to 350mn TEU by 2005. The estimates for 2015 are 600 to 700 mn tEU.

Source: COLD I Final Report August 2006 - via donau



Figure 10: forecast COLD Study regarding global Container traffic

Researches of the COLD study shows that the volume of global container transshipment were permanently increasing from 1980 up to 2004. The estimations till 2015 show that this volume will be doubled and it is unclear whether the ports are able to efficiently deal with these volumes.

Growth of cargo volumes in container shipping

The volume of general cargo, which is decisive for container traffic, is growing faster than total maritime traffic. This development can be seen as a consequence of increasing globalization and a deepening international division of labor. The period from 1990 to 2016 was characterized by a continued expansion of containerized trade, although 2009 saw a drastic decline in volumes due to the global financial and economic crisis [UNCTAD11, p. 21; UNCT16a, p. 18]. However, in 2010 the trading volume increased significantly again and has since settled at a value of 5 percent.

Source: <https://www.forschungsinformationssystem.de/servlet/is/41092/> 2018

Parallel statistics from 2018 shows that the volume of trimodal Container Transshipment of the 4 public ports in Austria also was tripled from 2000 up to 2017 (300 TTEU – 900 TTEU).

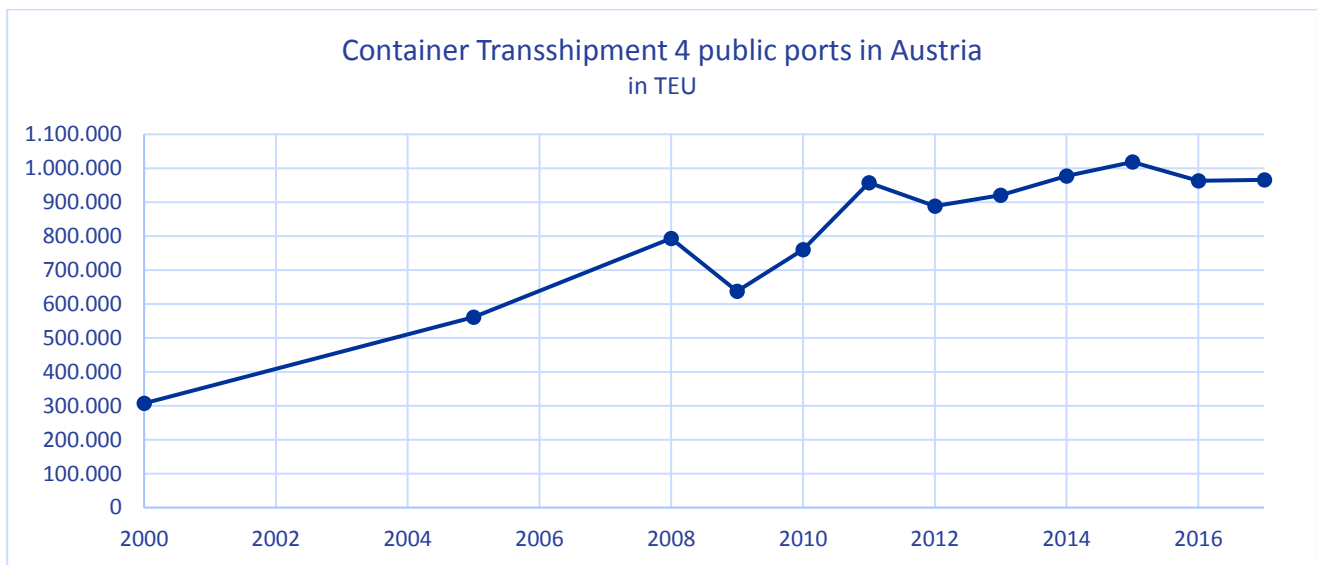


Figure 11: Container Transshipment 4 public ports in Austria

Decreasing of Container transport volumes on the Danube

Whereas the global container transshipment is increasing the transportation of container on the Danube was decreasing due to various reasons. This is also the result out of the questionnaire we sent out to the Danube Partners and their respected ports.

The massive impediments by the two crises in former Yugoslavia must be mentioned, and the nautical and economic difficulties for inland navigation in the western direction (long transport times to ARA-ports passing through more than 60 locks as well as very competitive shuttle train connections). In contrast to the Rhine, the development of container inland navigation was not bolstered by sea ports, i.e. the transport of overseas containers in the hinterland as the basis for scheduled services was lacking.

Forecast of the flow of goods

The COLD study investigated the potential transport volumes of scheduled Danube container services in a macro-economic analysis. The analysis were based on the foreign trade between Austria, Slovakia and Hungary as well as the southeast European countries and overseas region. The results were backed up by a parallel, second forecasting approach based on the already available forecasts for the ports of relevance for Danube navigation. The study arrives at a potential for inland navigation for all three Danube countries for the year 2003 of 180,000 to 280,000 TEU. As early as in 2010, an increase is expected to 650,000 – 1.15mn TEU and by 2020 of 1.3 to 2.4 mn TEU.

The inland navigation potential for Austria is estimated at around 1.25mn TEU by 2020.

The practice of recent years has resulted differently!

Today this estimations are far and away from the actual situation. Many obstacles, that were found out in our actual market research prevent a liner service for its implementation on container transportation on the Danube (topic 4 Market research of the container market report), so that in practice today's traffic of loaded container on the Danube is practically "zero".

4.11.2. KoLEG – Study on preparing for a combine regular service between Enns and Galati / 2012

Much of the traffic flow in the Danube corridor still uses roads and in the last years, the traffic development shows that there is an increasing switch to the railway system due to the investments in that mode of transportation as well as financial support and the advantage of less environmental impacts than with road transportation.

In 2012 the – KoLEG Study served to prepare for a regular service on the Danube waterway, to achieve a sustainable shift from road transport to the waterways.

Initial situation and reasons for the project

Globalization of economic relations continues and Austrian businesses are seeking new sales markets for their products, also in the Black Sea region. The State of Upper Austria leads in Austrian exports accounting for 27 %. Due to this export orientation, industry needs favorable logistics options in combined transport. The aim is to maintain Upper Austria's industrial locations by providing improved logistics options and preventing production facilities migrating to eastern and southern Europe.

Apart from the bulk commodities of iron ore and wood, most shipments between central Europe and Romania and/or the Black Sea region have been handled by road thus far. The number of road transports between Austria and the Black Sea region has grown continually in recent years. Compared with this, Danube navigation offers sufficient capacities and a competitive price level for handling substantial transport volumes, for high and heavy transports, and roll-on roll-off goods, but also for container shipments.

In 2008, the Port of Enns and the Port of Galati signed a cooperation agreement whose object it is, among other things, to make greater use of Danube navigation and to shift goods traffic from the road to the Danube.

The reliability of goods shipping on the Danube is often a point of criticism that shippers put forward against the use of the Danube. The objective of the combined regular service is thus to provide a reliable, regular service that also provides an inexpensive means of transportation for smaller consignments.

The subject of the study is thus the introduction of a combined regular service between the Port of Enns and the Port of Galati (RO) which will not just cover container traffic, in contrast to other offers, but also include the potential of all combined traffic.



In 2011, five different regular services operated on the Danube, three regular container services (one of them was discontinued in March 2012) and two regular RoRo services.

- MainRom Line Logistics Ltd. (Constanta – Giurgiu)
- BRP Bulgarian River Shipping (Constanta – Belgrade)
- HELOGISTICS: HELO 1 (Constanta – Budapest, service now discontinued)

Any line did not service the port of Galati so that Constanta was the only Romanian source and target port.

Actual Development since the completion of the KoLEG study!

All the liner services from the past stopped their services due to the obstacles mentioned in the actual Container Market Report (topic 4 Market Research) or due to ownership reasons based on economic facts. Danube Star is actual the only service between Passau (Austria) – Ruse (Bulgaria) that is running on the Danube with RoRo services and empty container transportation.

4.12. Innovations for combined cargo transshipment

About 95 percent of global trade is transported in containers. The standardized container for goods and raw materials has minimized transport costs and made globalization possible. Container revolution is ongoing and that has a very simple reason: The multifunctional container marginalizes the costs. The container made globalization possible and push it even further by implementing the following innovations in the container sector.

The MOCO-Triple is a 30 ft OT (Open Top) container for the transport of heavy bulk materials such as ores for the steel industry, which can be stacked up to 3 times when empty on rail. Due to the low construction of the MOCO triple, the maximum permissible transport height ("high cube") is optimally utilized. As a result, unpaired flows of goods can also be offered through optimized start-up costs, opening up new markets and relationships.



Foldable containers - horizontally folding Staxxon steel folding containers ensure sufficient resistance and at the same time easy assembly and easy loading and unloading. Five folded, empty containers could thus fit in one place.



The Flexitank is a packaging material made internally of multi-layered polyethylene and polypropylene fabric on the outside, which can transport 12,000 to 26,000 liters of non-hazardous liquids in containers and trucks. In other words, the Flexitank makes it possible to transport liquids with 20-foot containers intended for dry goods. The design in the container makes the Flexitank a more efficient and cheaper alternative for forwarders of liquid goods.



Hirschmann Track and Trace: To monitor the transport and compliance of, for example, cold chains, containers or other mobile machines and systems for locating are equipped with GPS transmitters. The use also serves to prevent theft and to prevent abuse.

Innofreight Solution has developed a modular logistics system for the steel industry in the "SteelLogisticSystem" project. The finished loading frame is tailored to semi-finished products (slabs, blooms and tubes). The frame, that is, a steel plate with high load capacity, is equipped with short or long stakes, depending on whether slabs or pipes are transported. The loading ramps can hold up to 35 tons and are transported by a 80-ft short-coupled wagon, enabling better visibility, simpler and more varied loading and unloading options and additional load securing by means of tie-down. These are handled by a crane magnet. Another goal of the project was to revolutionize the transport of finished products of the steel industry. The CoilTainer was developed for this. This is equipped with 3 recesses (lined with rubber mats) and has 4 retaining arms which are infinitely adjustable and can be applied. A tarpaulin protects the coils from the effects of the weather. The WireTainer was specially developed for wire roller transport. With a length of 20 feet it has 5 loading troughs and is stackable.



Innovation in the Container Business

More and more often bulk goods such as e.g. loading steel remains, biomass, wood chips and round wood are transported into containers that were originally transported loose in ships. International operators as well as supply and demand control investigate into transport concepts in the empty container business as well as possible returns for empty containers.

Innovations are interesting but it also shows that, seen in the short term, those innovations are not having a significant potential to increase container business on the Danube.

5. Decarbonizing strategy

5.1. Europe

The Paris Climate Agreement, which was adopted by 195 states at the United Nations Conference on Climate Change in Paris in December 2015, came into force on 4 November 2016 and provides for a globally binding agreement on climate protection.

Common goals:

- limiting the rise in the global average temperature clearly below 2 ° C above the pre-industrial level and efforts to limit the temperature raise to 1.5 ° C above pre-industrial levels.
- balancing anthropogenic greenhouse gas emissions from the sources and the removal of such gases by reducing in the second half of the 21st century.
- increasing the ability to adapt to the effects of climate change through increasing climate resilience and low greenhouse gas emissions.
- the compatibility of financial flows with the aim of low greenhouse gas emissions and climate resilient development.

As early as 2009 and 2011, the European Council formulated a conditional long-term climate target of 80-95% greenhouse gas reduction by 2050 in line with other industrialized countries. In October 2014, the European Council set the following 2030 targets:

Common targets:

- reduce EU greenhouse gas emissions by at least 40% compared to 1990 levels
- EU-wide increase in the share of renewable energy in gross final energy consumption to at least 27%
- EU-wide improvement in energy efficiency by at least 27%
- cross-border power interconnections of at least 15% of domestic production capacity
- expansion of security of supply and storage capacity in the gas sector

In order to pave the way for the Paris Climate Agreement, the European Commission presented in November 2016 and November 2017, among others, in the "Clean Energy Package" and from 2017 in "Clean Mobility Packages". In line with these proposals, negotiations are currently underway to reshape European legislation on the internal electricity market, the governance of the Energy

Union, renewable energy, energy efficiency, buildings and mobility (negotiations ongoing and unfinished).

5.1.1. Improve truck toll across the EU

In the current infrastructure costing, which is the basis for setting the level of truck tolls in Austria and other EU countries, not all costs caused by truck traffic are taken into account. Although European legislation allows pollution and noise emissions to be included in the toll, this is only partially implemented. Since the beginning of 2017, a surcharge for noise pollution has risen in Austria, depending on the number of axles, from 0.07 cents to 0.2 cents per kilometer during the day and 0.11 to 0.32 cents per kilometer at night.

The surcharge for air pollution is calculated in accordance with the Euro standard for trucks and is between 0.25 and 0.31 cents per kilometer for three-axle trucks during the day. The Euro 6 trucks, which are widely used in transit traffic - 66 percent of all truck kilometers on Austria's motorways and expressways - are exempted from external costs for air pollutants in Austria. In order to cover the harmful effects of transport on the climate or to cover the consequential costs caused by traffic accidents, European law is still lacking.

5.2. Austria

5.2.1. Climate Strategy Austria

An important point in this context is the holistic consideration of the synergies of rail and waterway to optimize all reduction options.

Mobility of the future of people and goods must be maintained, but in the future more sustainable organized. Austria follows the principle avoid-relocate-improve:

- Avoiding unnecessary traffic (such as empty runs, traffic-saving spatial planning or strengthening teleworking)
- Shifting to efficient modes of transport such as public transport, bicycle or walking
- Improve the technologies used to shift to alternative fuels and renewable energy sources.

In terms of mobility, extensive decarbonisation is possible by 2050. Fossil fuels can be largely replaced by conversion to zero emission vehicles and renewable energy sources. In addition to electricity, for those applications that are difficult to electrify, for example, sustainable biofuels or hydrogen produced using renewable energy will be used. In freight transport there is a shift to rail and inland waterway transport. In addition to appropriate economic conditions and behavioral changes, this requires significantly more mobility management and new mobility services as well as digitalization for multimodal networking. The turnaround in mobility is leading to major investment and innovation impulses, but also requires new financing and business models for a networked and integrated mobility of the future.

For implementation in the area of combined transport & freight logistics, the following main points should be noted:

The logistics location Austria is to be strengthened by the development of logistics hubs as well as the securing of the necessary rail infrastructure. The ecological handling of growing flows of goods from Eastern Europe and Asia by rail is also to be strengthened by means of the railway project "New Silk Road".

At the heart of the increased shift to the railways is the analysis of efficient and effective strategies to internalize external impacts on the road. This includes i.a. domestic loading hubs ("hubs" respectively terminals) between rail, road and water transport modes in combined transport for greater relocation of goods to the most energy-efficient means of transport by rail and ship on the basis of "Zielnetz 2025+" and "ÖBB Rahmenplan". Potential innovative combined traffic solutions for medium and long distances relate to loading technology, light wagons and specially designed loading units.

These derivations for Austria as an example location also have a guiding character and, in particular, for the development of container transport in the Danube region, since Austria is a highly developed industrial country and thus provides substantial input into the container business. However, these framework conditions represent important guidelines for all countries in the Danube Region, since container transports cannot be treated nationally and the target corridors and measures from the decarbonisation strategy can only be pursued across borders. The resulting approaches and recommended measures for the development of container transport on the Danube can be found in the chapter below.

5.2.2. Greenhouse gas targets in Austria

Austria will reduce its greenhouse gas emissions by 36% by 2030 compared to 2005. In 2016, Austrian GHG emissions outside the scope of the EU emissions trading system amounted to around 50.6 million tonnes CO₂ eq. The target for 2030 is about 36.4 million t CO₂ eq, which means a decrease of around 28%. During the period 2021 to 2030, a linear target deposit according to the EU Effort Sharing Regulation must be observed. All sectors outside EU emissions trading will contribute to the achievement of the objectives. The focus is on the transport and building sectors, where the greatest reduction potential exists. GHG emissions from companies subject to EU emissions trading will have to be reduced by 43% across the EU by 2030 compared to 2005, thereby also contributing to the achievement of the overall European target. This corresponds to an annual reduction path of 2.2%. Austria aims to phase out the fossil energy industry by 2050.

With a share of 46% of total emissions (outside emissions trading), transport is currently the sector with the highest emissions. To achieve the overall target by 2030, emissions are expected to decrease by 7.2 million t CO₂ eq to around 15.7 million t CO₂ eq (current issue: 22.9 million t CO₂ eq). As a result, Austria can position itself as a pioneer for electric mobility as well as for alternative power units and set strong impulses at federal and state level for a further expansion of public transport. In addition, a path is being taken which is compatible with the goal of a fossil-friendly mobility by 2050, anchored in the government program.

(Source: Österreichische Klima- und Energiestrategie, Juni2018 / Bundesministerium Nachhaltigkeit und Tourismus & Bundesministerium Verkehr, Innovation und Technologie)

5.2.3. Example Austria as prototype for industrial congested area

In Austria, greenhouse gas emissions from road freight transport have more than doubled since 1990, and have risen by only 28 percent in the EU. Truck traffic accounts for around 44 percent of road traffic emissions in Austria. In order to achieve the climate goals, a larger share of rail freight transport is inevitable. For every tonne and kilometer transported, truck traffic in Austria causes 15 times as many greenhouse gases as rail freight. In Austria, more than 90 percent of the energy required in rail freight transport comes from renewable energy sources.

5.2.4 Reduce truck transit in Austria

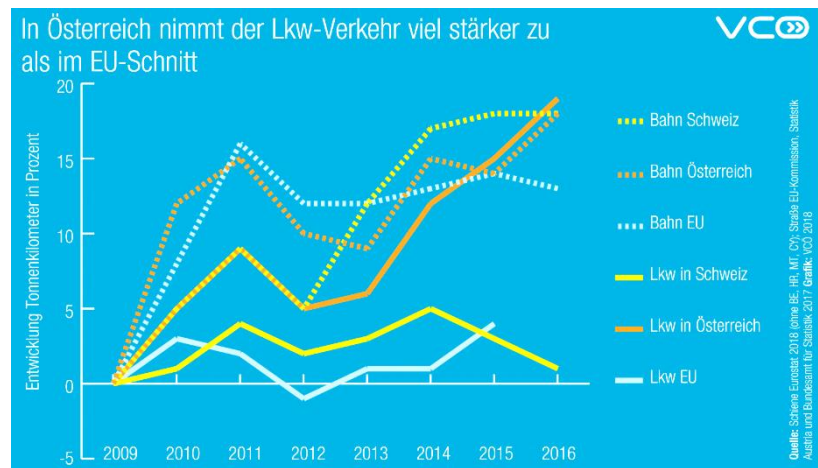
In 2017, the kilometers driven by heavy vehicles on motorways and expressways in Austria increased by 3.4 percent compared to 2016. Those of vehicles under 3.5 tonnes increased by 2.6 percent. Truck traffic increased mainly on the north-south transit routes: Brenner corridor (A12 / A13 plus 6.4 percent), Tauern motorway (A10 plus 6.1 percent) and Pyhrn motorway (A9 plus 6.2 percent).

The situation is different in

Switzerland, where truck traffic through the Alpine passes again declined in 2017, namely by 21,000 to 954,000 trucks. In Austria alone, more than twice as many as in Bremen were burned by Brenner in 2017, with 2.3 million lorries all four alpine passes in Switzerland together. In 2017, more than 150,000 more lorries were on the Brenner route than in the previous year. Compared to the year 2000, truck traffic at Brenner increased by 44 percent.

The transit of the Alps through Switzerland was successfully reduced with the strong expansion of the railway. In addition, external costs for damage to the environment and health in Switzerland are to a large extent included in the truck toll, in Austria only to a very small extent. Since 2001, a toll has been imposed on all roads in Switzerland, in Austria only on motorways and expressways and thus not even two percent of the road network. In the rail network of Austria, rail companies pay for every kilometer the infrastructure usage fee. The tolerance limit for crossing speed limits in Switzerland is 3 to 5 km/h, in Austria more than 90 percent of trucks on motorways drive faster than the maximum speed of 80 km/h, many faster than 90 km/h.

Source: VCÖ factsheet 06/2018



5.2.5. Core Message COLD study regarding environmental balance

Even the cold study has already dealt, in the year 2006, intensively with the topic of environmental balance in transport logistics.

Core message

If one combines the waterway and hinterland routes, the variant via Constanta and the Danube produces 22% less CO₂ per container in exports, 10% less in imports, and on the round trip 15% less.

(Source: COLD I Final Report August 2006)

In order to achieve all these objectives, we need to evaluate existing freight transport processes and realign them accordingly. In this context, the re-sharpening and optimization of the modal split towards CO₂ minimum approaches is of particular importance. Here, in the future, the transport of vessels, even with the additional use of modern low-CO₂ propulsion systems, can gain more importance and assume important tasks in this mix. In this regard, container transport along the Danube waterway should also be given special attention and strategically tackled and positioned.

5.3. Example regarding emission-free cargo shipping

Emission-free cargo shipping on Europe's rivers and canals

PortLiner and H₂-Industries build the first all-electric cargo vessels based on LOHC power storage technology!

PortLiner and H₂-Industries have announced the development and construction of all-electric transport vessels based on the innovative LOHC (Liquid Organic Hydrogen Carrier) energy storage technology for the international shipping fair SMM in Hamburg. The Dutch inland shipping company PortLiner will be the exclusive partner for H₂-Industries' high-performance LOHC technology on inland waterway vessels in Europe.

On diesel engines, which so far dominate the propulsion of ships, can be dispensed with in the future. CO₂ and NO_x emissions are completely eliminated. This will allow freight traffic on rivers and canals to be emission-free and sustainable in the future.

The market for the electrification of European inland shipping is 15,000 vessels, including 7,300 cargo vessels. In Russia there are 29,000 vessels, of which 15,000 are cargo vessels. Finally, China, the largest market, has 195,000 convertible ships. They can all be quickly and effectively upgraded using H₂-Industries' LOHC technology.

Source: <http://www.oevz.com/news/emissionsfreie-gueterschiffahrt-auf-europas-fluessen-und-kanalen/2018>

6. Feasibility Study Empty Container Business

Source: Feasibility Study concerning Empty Container Business on the Danube/ECONSULT 2018

In general the empty container business is highly volatile, as well as it concerns relations, amount of containers and prices. Even if the empty container traffic is organized, whenever possible, on a follower cost principle, but very often below the break even.

The empty container business is dominated by shipping companies, terminals and operators, which are actually not having close relation to the waterway system as mode of transportation on the one hand and on the other side they often don't see the potential of the usage in waterway transportation. From these market participants only limited support is expected due to the lack of great advantages for them in the competitive environment.



An empty container liner service as part of a whole concept for the attractiveness of Danube navigation is considered reasonable.

- to raise the attractiveness of the location in the Danube region, especially of the ports and terminals along the Danube
- consolidation of the gateway function of the terminals on the Danube
- longterm balancing of the increasing capacity constraints on the railway system (especially in the east Danube countries and agglomerations)

The argumentation of CO₂ saving in comparison with road transportation is actually applied, unfortunately not in comparison with the railway system, if the traction with electric energy is occurred by renewable energy resources. In the future technological opportunities in the range of inland navigation have to be taken into longterm consideration.

The establishment of an empty container liner service is in total fundamental more complex (and probably also more expensive) in comparison to a spot product, because of tariffs, schedule etc. and thereby increasing costs (e.g. hold up costs) can be resigned. A functional spot product therefor doesn't constrain the commercial viability of a liner service.

The establishment of a marketable and competitive empty container line could be realized with appropriate handling time and potentially economical conditions that are described in the following chapters.

6.1. Requirements & Recommendations

6.1.1 Requirements for a competitive empty container line

- neutrality is guaranteed
- the right frequency, relation and vessel capacity is guaranteed
- matched basis utilization is guaranteed (also with other goods)
- essential investments are made (also in ports)
- the right market niche is defined
- appropriate accompanying measures (commercialization) are taken

Therefore, all participating partners in the liner service have to be coordinated in a product- and production community.

From contemporary point of view and due to the expert interviews taken in the framework of the study, one cannot definitely expect in short time such extensive cooperativeness between those participating partners. It is advised to set up mid-term and long term actions, measurements as well as objectives.

By means of model observation of the relation (Regensburg) – Enns – Budapest, where later on there has to follow a deeper and more concrete market observation, following requirements are supposed to be fulfilled.

6.1.2. Requirements for deeper market observation

- adjustment in the logistics system, proposal- and production process of all market stakeholders (especially shipping companies and operators)
- flanking measures especially for the adjustment of the benchmark railway-waterway
Following further relations have been evaluated slightly, but from contemporary point of view rated as hard to realize:
- empty container liner service to Constanta or other Danube ports in the south of Budapest.
- empty container liner service western of Regensburg along the Rhine-Main-Danube
- waterway to the Rhine ports or to the northern ports Antwerp or Rotterdam

The difficulty of the realization could be modified if:

- mixed products (e.g. with full consignments) arise in the future
- the basically unpaired transportation in the empty container business is removed
- an empty container product could be transported on the basis of a follower traffic

The subsidy per container for combined transport currently paid by the Republic of Austria for rail freight products gives particularly high support to light and empty container. This aid results in such high payments per container or per train that, without an equivalent settlement on the waterway, a supply of empty container liner service will not currently be economically viable for reasons of competition. For Austria in particular, it is therefore appropriate to discuss with the competent national authorities a possible subsidy product for the waterway transportation.


6.1.3. Recommendations






- to investigate the feasibility of the model product for an empty container liner service on the Danube in more detail with potential implementing partners
- to examine and initiate the creation of the transport policy framework in comparison to the railway system
- In the meantime expand or attract the spot traffic system, because it can react quickly and easily to concrete customer inquiries
- to develop common waterway and railway concepts as a contribution to the decarbonisation strategies in freight transport, with the objectives of reducing emissions and further reducing the burden on the road

6.2. Detailed considerations of Danube Ports

An efficient and cost-efficient handling in the port is - in addition to the question of sufficient market potential - crucial for empty container liner traffic.

The following ports were analyzed in the Germany-Hungary area on the basis of desk research or telephone information (investment requirements and willingness to invest are unknown):

<p>Port of Regensburg</p>	<ul style="list-style-type: none"> • empty container needs in the catchment area • depot near the quay • handling possible, but extra effort required (no crane overlap the quay) • interest and willingness to invest made verbal and without commitment 	
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Port of Schalding	<ul style="list-style-type: none"> • empty container needs in the catchment area • no depot, no handling possibility overlapping the quai, but handling possible • interest made verbal and without commitment 	
Port of Linz	<ul style="list-style-type: none"> • empty container needs in the catchment area • huge depot, handling possible also with crane overlapping the quay • interest unknown 	
Ennshafen Port	<ul style="list-style-type: none"> • high empty container demand in the catchment area, large depot on the quay, capacity for expansion; • transshipment cost-effective, because transshipment crane depot is possible without intermediate lift • Interest exists, investments are not necessary 	
Port of Ybbs (no public port)	<ul style="list-style-type: none"> • empty container needs in the catchment area, existing depot • no transshipment facility for containers to the water, no interest suspected 	
Port of Krems	<ul style="list-style-type: none"> • empty container needs in the catchment area; huge depot with free capacity • Umschlagmöglichkeit über Kaikante mit Kran (Preis € 60,-), Interesse nicht bekannt 	






Port of Vienna Freudenau	<ul style="list-style-type: none"> • Tendency empty container transportation, depots not all directly on the quay, capacity for expansion; • Container handling not cost effective because intermediate lift is required • Interest unknown, willingness to invest not known 	
Port of Bratislava Palenisku	<ul style="list-style-type: none"> • Tendency empty container transportation; small depot with crane directly accessible from the vessel • Interest unknown, investments not necessary, actual spot traffic (?) 	
Port of Győr Gönyü	<ul style="list-style-type: none"> • Empty container needs in the catchment area; no depot, existing quay • No handling facility for container to the vessel, • Interest unknown 	
Port of Budapest MAHART	<ul style="list-style-type: none"> • Tendency empty container transportation, assumption: by 1 major customer relatively busy depot • Handling presumably cost-effective, because without intermediate lift • Interest suspected, investments not necessary, actual repeated spot traffic 	
Port of Budapest METRANS	<ul style="list-style-type: none"> • Terminal directly on the Danube, no quay, handling not possible, from a market perspective, tends to be important 	

Table 15: Detailed considerations of Danube Ports

6.3. Market potential for empty container traffic

The brief analysis of the ports southeast of Budapest showed that there is currently little market potential for empty container traffic!

The combined transport in the area of RO, BG, SRB, southern Hungary and the countries in the direction of GR / TR can be characterized as follows:

Characterization for combined transport

- The network of high-performance terminals, rail links and the demand structure of the economy required for developed combined transport are at an early stage of development.
- Existing rail offers tend to include continental products and - not as a network and often as a company train - operate primarily from and to Western Europe with an insufficient long-term supply potential for liner services.
- From today's point of view, it can not be judged whether or when the economic structure will be so developed that combined transport products, like Western Europe, will be ready for implementation.

An empty container liner service from / to Constanta currently seems difficult:

Difficulties

- Combined traffic in the direction of the Black Sea (possibly to TR or Piraeus) are - despite the weaknesses of the direct land connection - quantitatively small and too slow.
- Until Constanta, the transport time (especially upstream) is so long that it is unsuitable for an empty-container management adapted to the changing needs.
- Port costs in Constanta do not allow competitive prices.

6.3.1. Liner Scenarios

Possible liner scenarios primarily follow the goal of high resource utilization and consequent minimization of unit costs!

Two relations were checked:

Budapest – Enns (-Regensburg) – „interim stops“ after demand

- The relation covers the whole area of the market for which sufficient demand potential can be expected in the medium to long term.
- Essential product parameters:
 - Circulating time 1 week
 - 40 – 45 circulation per year
 - Capacity each direction 5.000 TEU
 - 80% utilization 4.000 TEU
 - Costs per TEU with paired utilization about 125 € (for “part sections” correspondingly lower)

Wien Freudenu – Enns (-Regensburg)

- The relation covers the core area of the market from the point of view of Enns.
- Essential product parameters:
 - Circulating time 54 hours
 - 3 circulation/week = 120 – 130 circulation per year
 - Capacity each direction 9.000 TEU
 - 80% utilization 7.200 TEU (corresponds to 120 TEU/week and direction)
 - Costs per TEU with paired utilization about 60 €

Essential parameters:

- 800-PS-push boat with 1 barge; capacity 60 TEU, assumed annual costs € 0,5 Mio;
- year-round operation on the basis of the transport times published in the Danube Handbook without consideration of failures due to low or high water;
- costs derived from the KoLEG-Study;
- average paired utilization of 80%;

Quotation scenarios are indicative and have to be evaluated

The quotation scenarios are indicative and prepared on a desk-research basis, therefore the evaluation of a concrete feasibility in the following phase has to be evaluated. Since there are no contacts with potential providers, it is unknown whether there is any interest at all from the supplier and that there are sufficient available resources. Issues of utilization risk, provider structure, tariffs, conditions of carriage, marketing activities and costs, neutrality and likely should be checked. In particular, questions regarding the pairing of traffic (possibly return freight through full containers or other goods), low water and likely are open.

6.3.2. Market price in competition with rail offers

In the process, a scheduled liner services offer is assumed (for spot services, other criteria apply, depending on the circumstances of the case):

In view of the limited number of routes, the longer journey time, possibly higher costs in the ports, the ship price must tend to be below the railway price (selling price of the operator).

Purchasing costs of the operator per TEU on the basis of estimated costs for combined traffic block trains:

- Budapest – Enns (train costs with paired utilization about € 7.000): 100 € at 80% utilization
- Freudenau – Enns (train costs with paired utilization about € 4.000): 60 € at 80% utilization

The selling price of the operator to the ship-owner could thus be close to the shipping costs, but hardly lower. In competition or on a last-minute basis, EVU (individual transport companies) and operators also sell well below these costs if full utilization of the "already" trains can be achieved - these prices can then only be kept on the Danube in exceptional cases. A waterway liner service that requires base load capacity is barely marketable as long as rail capacity is sufficient!

There is no problem for spot traffic set up for peak demand!

In the framework of the EU-notified aid system to offset the external costs not internalized in road traffic, Austria pays aid in combined transport to the "train-ordering EVU". This aid provides an incentive to shift freight transport from road to rail. There is no similar aid for the waterway.

The fund will be paid per rail transported container – depending on:

- Distance
- Weight
- dimension of the container (container, swap body or semitrailer)

The fund is e.g. for a 40'' empty container in the relation

Wien Freudenau – Enns: € 49,80

Regensburg or Bratislava or Budapest – Enns: € 43,10

6.3.3. Conclusion

It is unlikely that a waterway offer on the Danube created on regular services will be marketable as long as there is no equivalence of the waterway system with the railway system in the area of aid!

Under the precondition of marketability, an empty container liner service offer would provide a location advantage for the participating ports. In addition to the "new Silk Road", such a liner services offer in combination with railway could significantly increase the attractiveness of the location.

Currently, however, almost all providers and terminals in their infrastructure and in their organization are geared to the railway system and would have to adapt their internal structures only to the new system! As long as there are no bottlenecks on the railways, it is unlikely that such system adjustments will be made, not least because of the rail's extensive network effect, as it limits the flexibility of relational choice. However, it should also be noted here that for such possible strategy changes, an isolated consideration of the empty container sector alone is not constructive.

Perspective and Opportunity

- All forecasts for the development of traffic in the Danube region assume that railway infrastructure will be overloaded in the long run!
- Taking into account this development, a waterway offer as a location argument will be of high value and therefore should remain in the strategic focus!

6.3.4. Decarbonization development

Empty container business and decarbonizing development

The comparison of the modes of transport shows that the ship is the clearest environmentally friendly transport system compared to the truck. The comparison between ship and rail requires careful consideration from an ecological point of view for future important CO₂ balancing because the parallel leading railways are operated with electrical energy and there are future plans for increased generation of electricity from renewable sources.

Shifting freight transport from rail to ship can help to free up scarce rail capacity for priority traffic, thus preventing road traffic from migrating to the road or, as a result of this cascade effect, bringing about a significant improvement in terms of decarbonisation.

Capacities generally on the railway network

By expanding passenger train services (in local and long-distance traffic, the train frequency is constantly being compressed), barely sufficient timetable routes will be available in future for the further growth in freight transport by rail. For example, despite the four-track expansion of the Western Railway, pressure points in subsequent countries will tend to worsen, which is why it

makes sense to relieve the rail of less priority transports in order to handle passenger and freight traffic with high quality.

This is especially necessary to prevent the migration of combined traffic to foreign gateways.

The offer to substitute and supplement further capacities by the Danube that the railway system does not have in the future should be the goal of long-term transport and infrastructure planning!

6.4. Summary regarding Empty Container Business

An empty container liner service offer seems scarcely feasible in the short term, but should remain part of a medium and long-term strategy for the Danube waterway - at the same time as the adaptation of the required framework conditions! In the short term, the expansion of spot traffic seems more efficient and more economical! A medium to long-term strategy should include:

- Reference for a medium-term offer is the section Regensburg - Budapest.
- Longer relations (up to seaports) can be part of a long-term strategy.
- Formation of a corresponding interest / implementation community, especially from those Danube ports that are interested in such a liner service offer.
- Detailed survey of market demand, also with regard to mixed products, because even today, due to the lack of pairing, a pure empty container product can not be realized from today's perspective.
- Definition of investment needs (based on process-oriented planning steps) to ensure rapid and economic loading and unloading in all ports, as well as definition of required resources.
- Definition of the market price in competition (taking into account considerations for the payment of analogous aid, such as rail).

A waterway offer that has already been prepared can help in the short term to be realized of the need arises!

7. Conclusions & Recommendations of the report

From the development of the previous chapters, the following results are summarized and the recommendations formulated from them, which should be followed up in the future, in particular within the framework of DPN (Danube Port Network) strategies and work plans.

Under current conditions, these points provide the promising and potentially possible concrete starting points for increasing, establishing or facilitating increased container transports on the Danube.

As summarized above, the full-container transport "to the west" (i.e from Austria to the west via the locks in the Rhine-Main-Danube channel lying in Germany) has actually not really a great opportunity to increase the full container business in this relation, due to time, effort and fairway problems. Except the empty container business is in principle applicable in these areas of the Danube like described below.

7.1. Infrastructure and market

7.1.1. Parallel rail infrastructure to the water determines the market opportunity of full container business

The development on the Rhine was therefore successful for container business with the barge, because even in the decades of container market implementation, there were no sufficient rail capacities parallel to the river to connect the industrial areas with the seaports. Therefore, there was a forced requirement to switch to the container liner service on the water on these sections, which was successively expanded and established, so that today freight rates of 30% can be achieved in the modal split there.

In the Rhine-Area there was in the past and is today not sufficient capacity of railway system – therefore the port of Rotterdam (Antwerp....) could develop its potential.

Therefore, there is currently an opportunity in the Danube region to develop and establish full container liner services in those areas where there is a need for container transport (industry / seaports) and where there is currently insufficient rail capacity. In particular, there is potential in the Danube region downstream from Budapest to Constanta. Here the window of opportunity should be used and with relevant companies, these container line services should be built up before sufficient railway capacities are built up. As soon as rail capacity is built up, it is very difficult to be competitive with block train solutions in terms of market price and handling time.

7.1.2. Trimodal hubs to connection nodes outside the Danube Region – OBOR

The prestigious project of the old Chinese Silk Road revival movement is designed to boost the expansion of transport and transportation links between Asia and Europe. The new economic belt is supposed to lead by land from Xi'an in central China via Kazakhstan, Iran and Iraq as well as Turkey to Europe. The sea route is to lead from the southeast Chinese Fujian province over Hainan, Calcutta, Sri Lanka to Kenya and finally extend over the Horn of Africa via Athens to Venice.

With a catchment area of around 100 million people, the Danube Region has enormous potential to become Europe's logistics hub. Business opportunities for Austrian companies arise in particular in the traffic connection of the numerous industrial companies on the outer borders of Europe to the European rail network. In order to ascend to European freight hubs on the Danube, the New Silk Road (OBOR) must create a connection to the Danube region and thus to the trimodal hubs.

The connection must necessarily be linked with the Danube, so that a trimodal transfer point "standard gauge wide gauge" from there also directly serve the waterway Danube.

7.1.3. Connection to the Adria

There is an increased container throughput at the southern ports (Trieste, Koper, Rijeka). Here a strong rail connection to the Danube is suggested and then in a medium term also the redistribution and collection of full containers via the Danube waterway is conceivable. From today's point of view this could be quite relevant for the area Hungary-Slovakia-Austria.

7.1.4. Small and regional “hub&spoke” concepts

The hub and spoke system is also called hub spoke system. Simply put, it resembles a spoked wheel. All spokes lead to the center of the wheel, to the hub. This is exactly how the logistical network is structured. Many depots are distributed throughout the country. At the center of the system is a hub. The tours in the logistics system are now arranged so that each depot collects its deliveries and delivers them to the hub at specific times. At peak times, therefore, the deliveries of all depots arrive here. They are sorted in the hub according to their destination and loaded onto the truck that drives the corresponding depot on the return journey.

So, all depots have only one destination, the hub. There they also receive their packages, which are taken on the way back to the depot. There are advantages, as each depot only has to complete one tour (per day) and this tour can be used to full capacity on the return journey. So it is an optimal use of resources and minimal transport costs, as unnecessary tours are avoided. The disadvantage is that there is the possibility that goods "run against the freight". This means that the goods may not take the shortest route. Because even if the destination depot is only a few kilometers away, so does the network, that nevertheless the hub is controlled first and there takes place the loading.

By bundling the flows of goods and merchandise, if necessary, several tours with little traffic are bundled together to form a common transport to the hub and thus better allocate the resulting fixed costs.

Advantages:

- Bundling of transports
- less empty runs
- reduced costs due to high transport load

In the regional / transregional industrial regions along the Danube, individual "hub & spoke" nodes are to be considered and developed together with industry.

7.1.5. Agreements with shipping companies

Compared to the Rhine, the shipping companies for the Danube have not yet developed a sufficient commitment to establish a continuous, closed combined offer on the Danube (combined price from sea transshipment and IWW route transport). Only through such a combination product you can get in the direction of a competitive market price, otherwise the costs for the broken transport

routes result in high costs (individual processes and individual prices result in non-competitive sums compared to offer from a single source). This topic should be addressed by individual shipping companies and initial pilot projects should be developed.

7.2. Empty Container Business

The transport of empty containers can certainly have a realistic chance of being established on the waterway and, above all, concrete steps can be taken quickly. Some recommendation sentences for the realization of concrete steps:

An empty container liner service as part of a total package to increase the attractiveness of the Danube waterway is considered useful to:

- increase the attractiveness of the Danube region, in particular the inland ports and terminals on the Danube
- strengthen the gateway function of the terminals at the Danube sites
- balance the increasing capacity bottlenecks on the rail in the long term (above all in the eastern Danube countries and metropolitan areas)

The offer to substitute and supplement further capacities, that the railway system does not have in the future, by the Danube waterway should be the goal of long-term transport and infrastructure planning!

Under the precondition of marketability, an empty container liner service would provide a location advantage for the participating ports. In addition to the "new Silk Road", such a line offer in combination with rail could significantly increase the attractiveness of the location.

As a long-term perspective and opportunity in this area is noted:

- All forecasts for the development of traffic in the Danube region assume that the rail infrastructure will be overloaded in the long term!
- Taking into account this development, a waterway offer as a location argument will be of high value and should therefore remain in the strategic focus

7.2.1 Conclusion for Empty Container Business

- An empty container line service seems hardly feasible in the short term, but should remain part of a medium and long-term strategy for the Danube waterway - at the same time as the necessary framework conditions have to be adjusted
- In the short term, the expansion of spot traffic seems more efficient and more economical

- A medium to long-term strategy should include:
 - Reference relation for a medium-term offer is the section Regensburg – Budapest
 - Longer relations (up to sea ports) could be part of a long term strategy
 - Formation of a corresponding interest / implementation community, especially from those Danube ports that are interested in such a liner service
 - Detailed survey of the market demand also with regard to mixed products, already because of missing pairing a pure empty container product can not be realized from today's point of view.
 - Definition of investment needs (based on process-oriented planning steps) to ensure rapid and economic loading and unloading in all ports, as well as definition of required resources
 - Definition of the market price in competition (taking into account considerations for the payment of analogous funding, such as rail).
- An already prepared waterway offer can help in the short term when the need arises!

7.2.2 Empty Container Business and Decarbonization Development

The comparison of the modes of transport shows that the vessel is the clearest environmentally friendly transport system compared to the truck. The comparison between vessel and rail requires careful consideration from an ecological point of view for future important CO₂ balancing because the parallel leading railways are operated with electrical energy and there are future plans for increased generation of electricity from renewable sources.

Shifting freight transport from rail to ship can help to free up scarce rail capacity for priority traffic, thus preventing road traffic from migrating to the road or, as a result of this cascade effect, bringing about a significant improvement in terms of decarbonization goals.

7.3. Decarbonization and Sustainability

7.3.1. CO₂-Resource Accounting

If CO₂ targets are fulfilled and successive CO₂ bills or certificate costs are included in the actual price formation in the coming years or proactively used or demanded through self-commitment even without pressure from market participants, then an expansion of the transport routes on the water can take place as well as bringing quite significant increases in the container business on the Danube. The prerequisite for this is that the shipping industry sets itself up in time, tackling its own CO₂ homework, in order to be able to provide a competitively-priced CO₂-based service to the demand carrier in due time. Here are still points in particular of influence and, if possible proactively, steer towards the IWW, which will probably decide in the coming years. Above all, this includes the route by which CO₂ prices will actually end up in the transport processes: at the transporter itself, at the freight forwarders or at the shipping companies.

Therefore it is recommended to get into conversation with ports as well as IWW-operators and other players within the transport chain (major carriers), to establish a “general CO₂ certificate of economics” for combi-products, to develop those topics together and in time, before other modes of transport occupy this topic and have established a strong position in the market.

7.3.2. NO_x-problem in general and especially in metropolitan areas

In general, pressure is currently noticeable in many European metropolitan areas due to the heavy pollution load, in particular with nitrogen oxides and particulate matter. In this context, all diesel-powered vehicles are exposed to an increasing pressure. Since strong industrial areas with high container volumes are often in the focus of attention here, increased emphasis should be placed on the rapid development of shipping towards environmentally friendly modes of transport. This will support the current efforts for LNG / LBG retrofitting of ships to be prepared for the future, when in urban areas along the Danube, real alternatives to container road transport are required due to regulatory environmental constraints and the existing rail capacity for substitution is not suffice. In this case, the transport of containers on modern environmentally friendly vessels could represent a real alternative and thus provide a way out for the relevant logistics processes in air sanitation areas. This measure should also be prepared in due time as part of the DPN work plan, at least conceptually and in terms of planning, by some "hotspot industrial site regions" with already existing high air pollution. An innovation project in this regard could provide essential data base for the future.

7.4. Total Summary of the Container Report

Recommendations for DPN (Danube Port Network)

- to investigate the feasibility of the shown model product for an empty container regular service on the Danube in more detail with potential realization partners
- to examine and initiate the creation of the transport policy framework for empty container business compared to railway system
- in the meantime expand or attract the system of spot traffic for empty container business, because it can respond quickly and easily to concrete customer inquiries,
- common concepts of waterway and rail as a contribution to the developing decarbonisation strategies in freight transport, with the goals of reducing emissions and further easing the burden on the road - both for general container business and in particular for empty container business as a first step in the market
- link the New Silk Road with a direct trimodal Danube logistic hub as a strategically important step and pursue an Adriatic linking strategy

- coordinated overall strategic planning of rail and waterway development, especially in the lower section of the Danube
- execution of several developing projects of actors within the DPN (Danube Port Network) – e.g. basic planning of future alternatives in burden industrial congested areas
- examine the new technologies in the container sector with regard to new market opportunities in a trimodal logistic hub

8. Contribution to output 5.1 “New Market Studies”

8.1. Market Opportunity

Market Opportunity (regarding “Danube Container Market”)

Within this Container Report an actual market research was done with regard to the actual situation on Container Market along the Danube and was also compared to the Rhine region. As well the research as the feedback of interviews with stakeholders and experts for inland navigation showed great obstacles in waterway infrastructure on the Danube but we also found out that there is a potential with regard to market opportunities for the Danube Container Market.

Obstacles:

- high and low water seasons – unstable navigable conditions
- no reliable liner service
- lock maintenance and natural disasters
- engagement and financial power of the property owners and shipping companies
- much shorter transit times for railway and road delivery
- lack of financial support (funds) for waterway - compared with road/railway system

Potentials:

- increasing of global container transportation
- shift of bulk/mass goods into containers
- barges/RoRo vessels are used already for container transportation on the Danube
- investments in the development of Danube navigation
- innovations for combined cargo transshipment
- decarbonizing strategy in Europe
- overloaded railway infrastructure in the long run
- empty container liner service (study “Empty Container Business”) as part of a medium and long-term strategy for the Danube waterway
- trimodal hubs connected to the project “New Silk Road” (OBOR)
- hub&spoke concepts

All forecasts for the development of traffic in the Danube region assume that railway infrastructure will be overloaded in the future. Taking into account this development as well as innovations, a waterway offer as a location argument will be of high value and therefore should remain in the strategic focus.

8.2. Attractiveness of the market (regarding “Danube Container Market”)

As summarized in the report and also as conclusion of the “Empty Container Business” study, the full-container transport “to the west” (i.e from Austria to the west via the locks in the Rhine-Main-Danube channel lying in Germany) has actually not really a great opportunity to increase the full container business in this relation, due to time, effort and fairway problems.

Except the empty container business is in principle applicable in these areas of the Danube.

Currently there is an opportunity in the Danube region to develop and establish full container liner services in those areas where there is a need for container transport (industry/seaports) and where there is currently insufficient rail capacity. In particular, there is potential in the Danube region downstream from Budapest to Constanta. This potential should be used and with relevant companies, these container line services should be built up before sufficient railway capacities are there. As soon as rail capacity is built up, it is very difficult to be competitive with block train solutions in terms of market price and handling time.

With a catchment area of around 100 million people, the Danube Region has enormous potential to become one of the most famous Europe's logistics hubs. Business opportunities for companies in the middle of Europe arise in particular in the traffic connection of the numerous industrial companies on the outer borders of Europe to the European rail network. In order to ascend to European freight hubs on the Danube, the New Silk Road (OBOR) must create a connection to the Danube region and thus to the trimodal hubs.

The connection should necessarily be linked with the Danube, so that a trimodal transfer point “standard gauge wide gauge” from there also directly serve the waterway Danube.

The transport of empty containers can certainly have a realistic chance of being established on the whole waterway Danube and, above all, concrete steps can be taken quickly. Some recommendation sentences for the realization of concrete steps:

An empty container liner service as part of a total package to increase the attractiveness of the Danube waterway is considered useful to:

- increase the attractiveness of the Danube region, in particular the inland ports and terminals on the Danube
- strengthen the gateway function of the terminals at the Danube sites
- balance the increasing capacity bottlenecks on the rail in the long term (above all in the eastern Danube countries and metropolitan areas)

The offer to substitute and supplement further capacities - which the railway system does not have in the future - by the Danube waterway should be the goal of long-term transport and infrastructure planning.

Under the precondition of marketability, an empty container liner service would provide a location advantage for the participating ports. In addition to the "New Silk Road", such a line offer in combination with rail could significantly increase the attractiveness of the location.

8.3. Cost structure & available infrastructure (regarding "Danube Container Market")

As mentioned in the different chapters of the above report detailed cost data have been investigated only for the empty container business because transport of loaded containers on the Danube is actually not practiced due to several reasons and obstacles, which were elaborated in the report. Therefore the whole cost analysis was done for empty container business. Regarding infrastructure it is the same process either to proceed empty or loaded containers and those ports which were investigated in to following have got enough infrastructure to proceed container business in the ports (i.e. ship-to-shore cranes, enough space for container handling, direct connection of container terminals in the ports).

In general the empty container business is highly volatile, as well as it concerns relations, amount of containers and prices. Even if the empty container traffic is organized, whenever possible, on a follower cost principle, but very often below the break even.

The empty container business is dominated by shipping companies, terminals and operators, which are actually not having close relation to the waterway system as mode of transportation on the one hand and on the other side they often don't see the potential of the usage in waterway transportation. From these market participants only limited support is expected due to the lack of great advantages for them in the competitive environment.

Market price in competition with rail offers

In the process, a scheduled liner services offer is assumed (for spot services, other criteria apply, depending on the circumstances of the case):

In view of the limited number of routes, the longer journey time, possibly higher costs in the ports, the ship price must tend to be below the railway price (selling price of the operator).

Purchasing costs of the operator per TEU on the basis of estimated costs for combined traffic block trains:

Budapest – Enns (train costs with paired utilization about € 7.000): 100 € at 80% utilization

Freudenau – Enns (train costs with paired utilization about € 4.000): 60 € at 80% utilization

The selling price of the operator to the ship-owner could thus be close to the shipping costs, but hardly lower. In competition or on a last-minute basis, EVU (individual transport companies) and operators also sell well below these costs if full utilization of the "already" trains can be achieved - these prices can then only be kept on the Danube in exceptional cases. A waterway liner service that requires base load capacity is barely marketable as long as rail capacity is sufficient! There is no problem for spot traffic set up for peak demand!

In the framework of the EU-notified aid system to offset the external costs not internalized in road traffic, Austria pays aid in combined transport to the "train-ordering EVU". This aid provides an incentive to shift freight transport from road to rail. There is no similar aid for the waterway.

The fund will be paid per rail transported container – depending on:

- distance
- weight
- dimension of the container (container, swap body or semitrailer)

The fund is e.g. for a 40'' empty container (example of Austria) in the relation

- Wien Freudenu – Enns: € 49,80
- Regensburg or Bratislava or Budapest – Enns: € 43,10

These figures are critical benchmarks to be reached in order to get a cost structure which can survive under market conditions. More information about this is given in the chapter "recommendations" who to develop this business figures.

8.4. Success Factors (regarding "Danube Container Market")

As only the transport of empty containers can certainly have a realistic chance of being established quickly on the whole waterway Danube in the following only success factors for empty container business are listed. All other processes have to fight with a lot of problems and obstacles so that at the moment you cannot define really detailed success factors for loaded container business. However, these success factors – formulated on a very general level – are part of the general recommendation block of the total report.

An empty container liner service offer seems scarcely feasible in the short term but should remain part of a medium and long-term strategy for the Danube waterway - at the same time as the adaptation of the required framework conditions! In the short term, the expansion of spot traffic seems more efficient and more economical!

A medium to long-term strategy should include:

- reference for a medium-term offer is the section Regensburg – Budapest;
- longer relations (up to seaports) can be part of a long-term strategy;
- formation of a corresponding interest / implementation community, especially from those Danube ports that are interested in such a liner service offer;
- detailed survey of market demand, also with regard to mixed products, because even today, due to the lack of pairing, a pure empty container product cannot be realized from today's perspective;
- definition of investment needs (based on process-oriented planning steps) to ensure rapid and economic loading and unloading in all ports, as well as definition of required resources;
- definition of the market price in competition (taking into account considerations for the payment of analogous aid, such as rail).

A waterway offer that has already been prepared can help in the short term to be realized of the need arises!

Increased container throughput at the southern ports (Trieste, Koper, Rijeka) – here a strong rail connection to the Danube and then event medium term also redistribution/collection of full containers via the Danube waterway conceivable; from today's point of view quite relevant for the area Hungary-Slovakia-Austria.

In the regional / transregional industrial regions along the Danube, individual "hub&spoke" nodes are to be considered and developed together with industry.

Through agreements with shipping companies to establish together a continuous, closed combined offer on the Danube (combined price from sea transshipment and IWW route transport) such a combination product can get in the direction of a competitive market price, otherwise the costs for the broken transport routes result in high costs. Initial pilot projects should be developed!

8.5. Target audience regarding (“Danube Container Market”)

If CO₂ targets are set into force and successive CO₂ bills or certificate costs are included in the actual price formation in the coming years or proactively used or demanded through self-commitment even without pressure from market participants, then an expansion of the transport routes on the water can take place as well as bringing quite significant increases in the container business on the Danube. The prerequisite for this is that the shipping industry sets itself up in time, tackling its own CO₂ homework, in order to be able to provide a competitively-priced CO₂-based service to the demand carrier in due time. Here are still points in particular of influence and, if possible proactively, steer towards the IWW, which will probably decide in the coming years. Above all, this includes the route by which CO₂ prices will actually end up in the transport processes: at the transporter itself, at the freight forwarders or at the shipping companies.

Therefore it is recommended to get into conversation with ports/IWW-operators and other players within the transport chain (major carriers), to establish a “general CO₂ certificate of economics” / combi-products... to develop those topics together and in time, before other modes of transport occupy this topic and have established a strong position in the market.

In order to be attractive for ship owners and customers as receiving and dispatch terminals, each terminal in the site competition - in cooperation with the operators - endeavors to operate its own, as versatile as possible container depot and to bind owners as exclusively as possible to their own location.

In view of the general conditions (difficult conditions west of Regensburg and low demand density south of Budapest), it was assumed that in a "set-up phase" an empty container liner service on the Danube between Regensburg and Budapest could be feasible. In the event of success and market demand a frequency expansion and a service expansion along the Danube should be examined in the "roll-out phase".

It was assumed that regular services in the ports below would carry out partial unloading or partial loading, and if necessary, also load containers loaded in short-haul traffic.



9. References

References are quoted at each topics within this report and mentioned in detail.

ANNEXES

Annex I – Empty Container Study (English)