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DIONYSUS

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

Operational & Business Development Model for Danube Region Ports

Deliverable D.T4.1.1

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Table of Contents

Table of Figures

Table of Tables

Abbreviations

Abbreviation	Explanation
AFID	Alternative Fuels Infrastructure Directive
AGN	European Agreement on Main Inland Waterways of International Importance
CEF	Connecting Europe Facility
DBS	Danube – Black Sea
DPN	Danube Ports Network
DR	Danube Region
DTP	Danube Transnational Programme
EBU	European Barge Union
EFIP	The European Federation of Inland Ports
EIWTP	European Inland Waterway Transport Platform
ESO	European Skippers Organization
EU	European Union
EUSDR	European Union Strategy for the Danube region
ICT	Information and Communications Technology
IWT	Inland Water Transport
LBG	Liquefied Bio-Gas
LNG	Liquefied Natural Gas
PPP	Public-Private Partnerships
RED	Renewable Energy Directive
SLA	Service Level Agreement
TEN-T	Trans-European Transport Network
VPAS	Public Ports JSC
WFD	Water Framework Directive

Abbreviation	Explanation
WPT4	Work Package T4

Disclaimer

Conclusions and data from deliverables of project DIONYSUS and project DAPhNE are used as source materials for this report. Full list of references is listed at the end of this report.

Final version of this report is available to access on project DIONYSUS' website https://www.interreg-danube.eu/approved-projects/dionysus.

1 Summary

Danube ports vary in size, location, conditions of their infrastructure, superstructure and equipment, availability of storage, the way they are managed and operated. Their development is also dependent on the local political and economic situation, prospects of investments and availability of funding options.

The theoretical operation and business development model presented in this report is a tool to guide Danube region ports' future development. The model recommends steps and actions on how to exploit business opportunities and how to increase the overall performance of a port.

The majority of the Danube region ports are publicly owned and privately operated. Most of the port land is owned by state, regional or other public entities. Approximately half of the analysed ports infrastructure and superstructure is also owned or co-owned by state, especially in the middle and lower regions of Danube. Almost all of the ports are governed by a public entity that acts as a port authority.

Most common partnership of public and private sectors is the use of concession (landlord) model, either as a concession for construction, a service concession or a concession for use of public property. As this is the most prevalent model, it is understandable that the most revenues come from the lease of land and concession fees. In some ports, there is also income from services provided to the vessels, where these services have not been outsourced.

As most of Danube ports are faced with the lack of free space, any planned developments should be focused mainly on upgrading of port infrastructure, superstructures and equipment, fleet modernization, digitalization, environmental solutions, education and training.

Any sort of development is depended on availability of sufficient funds and therefore an increased level of public-private partnerships is expected in the future in order to optimize investments, with landlord port model being the prevalent type of partnership. The choice of PPP model will depend on local economic and regulatory situation, as well as on individual port's objectives and characteristics.

Important aspect when forming public-private partnerships is to apply non-discriminatory principle in order to prevent monopolistic behaviour and promote competition and thus increase the efficiency of port operations.

Even though most ports are operating in the landlord model, the responsibility for business development should not be passed fully onto the port operators. The port owners and authorities should create conditions that would ensure the fruition of the business opportunities. This can be achieved by providing the necessary infrastructure, ensuring physical access to the port areas and premises, providing access to concessions based on non-discriminatory principles, and by setting up standards of operation for concession holders.

Opportunities for business development can be identified within the pool of existing customers or within the port's catchment areas or they can arise as a result of cooperation with other ports or inland waterway organizations. Coordination between official port entities and other stakeholders is therefore important as it can help to

increase the competitiveness of waterborne transport as an alternative to road transport and promote intermodal logistics.

Apart the competition from other modes of transport, there is there is also competition among the ports themselves as Danube ports and their catchment areas can overlap due to their proximity to each other.

Ports, in theory, have the ability to handle most types of cargo, materials and goods however the actual port utilization is highly dependent on economic attributes of their hinterland and catchment area. Regional inequalities (following the geographical division of the Danube into upper, middle and lower regions) are also due to historical, political and economic situation.

It is expected that in the next few years traditional industry segments, such as agriculture, metallurgy, petrochemistry, construction and automotive, will continue to be the dominant cargo transported on inland waterways. However long-term outlook predicts increase in transport of heavy and oversize cargo and Ro-Ro cargo on waterways, as well as gradual shift toward new industry segments, such as waste and recycling products, renewable materials, LNG, hydrogen and other alternative fuels, biomass. Transport of empty containers along the Danube and establishment of regular container routes is also envisioned.

The main areas for future and general trends seen in the port business development are focused on multimodality, automatization, digitalization and sustainability, as well as on offering wide array of customer oriented and value-added services and focus on new markets.

Business development model should reflect strategies defined in port's strategic plan or its masterplan and should be backed up by the right partnerships and marketing tools. To outline business development strategy, port should understand its current situation, market, competition and future developments.

2 Introduction

2.1 Project Objectives and WPT4 overview

Project DIONYSUS focuses on creating better connected and energy responsible Danube region by supporting environmentally friendly and safe transport systems and balanced accessibility of urban and rural areas. The project will address main regional challenges in infrastructure governance and planning highlighting key actions needed to support Danube transport, port infrastructure planning. It builds on the results of DAPhNE project on port infrastructure development and Danube Ports Network cooperation.

The project's overarching goal is to facilitate integration of the Danube Region [DR] into multimodal and intermodal freight and passenger transport systems. In this context, Danube ports must be seen as key elements of the extensive DR transport system, which are essential to help achieve this overarching goal.

In this regard, the future development of Danube ports shall take into consideration the transport corridor development requirements and perspectives of the TEN-T policy. Accordingly, the project will carry out a multi-layered assessment (the infrastructure layer, the transport market layer and the logistics & port services layer) across different levels of infrastructure planning and governance (local, national and regional) in line with Danube Inland Waterway Transport [IWT] market, trade (volume and structure) considerations and realities, with a particular focus on Danube port-related infrastructure needs.

As a result, it will highlight, promote and carry out activities across levels of governance in line with relevant specific objectives of EU policies (Transport, TEN-T and Cohesion) in order to ensure scope and development priorities alignment among port planning, overall transport infrastructure planning and national plans for Regional Economic Development benefiting Danube Region ports.

Also, the project aims to further strengthen DR connectivity with the EU Eastern Partnership and with Black Sea riparian countries by addressing transport infrastructure connectivity. Ports digitalization capabilities shall be assessed at the corridor level and dedicated measures proposed.

Work package T4: Pilot Cases

Port development is a strong instrument to reach a catalyst function for stimulating economic growth and create jobs in the Danube Region. The main objective of WPT4 is the elaboration of concrete port development plans as well as operational and business development plans and models for strategically relevant DR ports in order to facilitate their integration into multi-/intermodal transport chains as well as improve their transport connections/links towards the hinterland.

For this purpose, all findings of previously investigated WPs are reflected in this last work unit that delivers state-of-the-art development models and plans contributing to enhanced connectivity and following a transnational (corridor) approach. It acknowledges all findings of previously performed analyses and studies and capitalizes

on the results delivered by Danube Transnational Programme [DTP] projects such as DBS Gateway and DAPhNE as well as TEN-T/CEF and nationally financed projects through operational programs.

2.2 Objectives of Deliverable D.T4.1.1

Deliverable D.T4.1.1 Operational & Business Development Model for Danube Region Ports

The operation and business development model for Danube Region Ports shall guide ports' future development while considering overarching principles such as efficient transportation systems for goods movement, modern and efficient cargo handling equipment and storage facilities, skilled workforce, economic growth, commitment to environmental stewardship, safety and security, etc.

To this end, project partner Public Ports JSC [VPas] will develop an operational & business development model as a theoretical concept and bring it to a concrete application for the ports of Bratislava and Komarno.

The model will present a new perspective on how to exploit business opportunities and how to increase the overall performance of a port. The close public-private cooperation in the DIONYSUS consortium, as well as the planned interaction with experts from the Danube Region, will ensure the transferability of the elaborated model to the DR port community.

3 Strategic Context of Inland Water Transport

3.1 European and International Strategies and Policies

Trans-European Transport Network

The Trans-European Transport Network [TEN-T][1] policy addresses the implementation and development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals. The ultimate objective is to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU.

Besides the construction of new physical infrastructure, the TEN-T policy supports the application of innovation, new technologies and digital solutions to all modes of transport. The objective is improved use of infrastructure, reduced environmental impact of transport, enhanced energy efficiency and increased safety.

Connecting Europe Facility

The Connecting Europe Facility [CEF][2] is a key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.

The European Green Deal

Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal[3] shall transform the EU into a modern, resource-efficient and competitive economy, ensuring:

- no net emissions of greenhouse gases by 2050;
- economic growth decoupled from resource use;
- no person and no place left behind.

The main goal of the Green Deal is making Europe the first climate neutral continent in the world. All 27 EU Member States committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels.

[1] Source: https://ec.europa.eu/transport/themes/infrastructure/ten-t_en

[2] Source: https://ec.europa.eu/inea/en/connecting-europe-facility

[3] Source: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

Alternative Fuels Infrastructure Directive

The Alternative Fuels Infrastructure Directive[4] [AFID] requires Member States to set targets for alternative fuels infrastructure and develop corresponding measures for reaching those targets under their national policy frameworks. While the Directive clearly specifies the overall needs for road infrastructure and ports, it does not provide a common methodology to inform target setting and measure development.

Renewable Energy Directive – Recast to 2030

The Renewable Energy Directive [RED II][5] promotes the goal of increased use of renewable forms of energy. The overall EU target for Renewable Energy Sources consumption by 2030 has been raised to 32%. Member States must require fuel suppliers to supply a minimum of 14% of the energy consumed in road and rail transport by 2030 as renewable energy.

Natura 2000

Natura 2000[6] is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right. It stretches across all 27 EU countries, both on land and at sea. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats.

In regard to Natura 2000, the European Commission has also published a guidance document[7] that concentrates on the construction, maintenance and upgrading of infrastructure projects related to commercial inland waterway transport. The guidance document is designed principally for use by competent authorities and developers responsible for inland waterway infrastructure developments, as well as impact assessment consultants, Natura 2000 site managers and other practitioners who are involved in the planning, design, implementation or approval of inland waterway plans and projects.

European Union Strategy for the Danube region

The EU Strategy for the Danube Region[8] [EUSDR] is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, in order to address common

[4] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014L0094

[5] Source: https://ec.europa.eu/jrc/en/jec/renewable-energy-recast-2030-red-ii

[6] Source: https://ec.europa.eu/environment/nature/natura2000/

[7] Source: Guidance document on Inland waterway transport and Natura 2000 https://ec.europa.eu/environment/nature/natura2000/management/docs/IWT_BHD_Guidelines.pdf

[8] Source: https://danube-region.eu/

challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

Water Frame Directive

Water Framework Directive[9] [WFD] is a single piece of framework legislation addressing the need for a more global approach to water policy. Water protection is one of the priorities of the European Commission. European Water Policy should get polluted waters clean again, and ensure clean waters are kept clean.

WFD is to achieve the following key aims:

- expanding the scope of water protection to all waters, surface waters and groundwater;
- achieving "good status" for all waters by a set deadline;
- water management based on river basins;
- "combined approach" of emission limit values and quality standards;
- getting the prices right;
- getting the citizen involved more closely;
- streamlining legislation.

NAIADES III action plan

The European Commission presented on 24 June 2021 the NAIADES III Action Plan[10], a programme to boost the role of inland waterway transport in mobility and logistics systems, in line with the European Green Deal and the Sustainable and Smart Mobility Strategy, which set the goal of increasing transport by inland waterways and short sea shipping by 25% by 2030, and by 50% by 2050.

The Commission will help inland waterway managers to ensure a high level of service (Good Navigation Status) along EU inland waterway corridors by 31 December 2030.

The Commission is proposing actions in the following areas:

- shifting more freight to inland waterways;
- transition to zero-emission inland waterway transport;
- smart inland waterway transport;
- more attractive and sustainable jobs in inland waterway transport.

[9] Source: https://ec.europa.eu/environment/water/water-framework/index_en.html

[10] Source: https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/naiades-iii

Inland waterway transport agenda for Europe 2021-2027

A new Inland Waterway Transport Agenda for Europe 2021-2027[11] is addressing challenges and ambition towards 2050 that will contribute to a climate neutral economy and create an attractive and future-oriented workplace:

1. Moving more transport to inland waterways and
2. Zero-emission inland navigation.

The main action areas in which to tackle the two core challenges were identified during the brainstorm session of the Naiades II Implementation Expert Group on 9 September 2019:

- People: create an attractive workplace with high social, qualification, safety and security standards;
- Fleet: enable the transition towards zero-emissions and decarbonization of the fleet while safeguarding competitiveness and safety;
- Infrastructure: achieve the continuous and reliable navigability of the trans-European inland waterway network and ensure swift links to other modes while assuring sustainability of infrastructure, protecting the environment and adapting to climate change;
- Digitalization: develop and use digitalization as an instrument to support the developments towards smart and sustainable jobs, fleet and infrastructure connected to other transport modes and sectors.

European Agreement on Main Inland Waterways of International Importance

European Agreement on Main Inland Waterways of International Importance[12] [AGN] is a coordinated plan for the development and construction of a network of inland waterways of international importance, based on agreed infrastructure and operational parameters (E Waterway Network).

3.2 European Inland Waterway Initiatives

The European Federation of Inland Ports

The European Federation of Inland Ports[13] [EFIP] brings together nearly 200 inland ports and port authorities in 18 countries of the European Union, Switzerland, Serbia and Ukraine.

[11] Source: http://www.ebu-uenf.org/wp-content/uploads/N3-Inland-Waterway-Agenda-for-Europe_final-Dec-2019-003.pdf

[12] Source: https://www.parlament.gv.at/PAKT/VHG/XXIV/I/I_00681/imfname_184466.pdf

[13] Source: https://www.inlandports.eu/

EFIP highlights and promotes the role of European inland ports as real intermodal nodal points in the transport and logistic chain, combining inland waterway transport with rail, road, and maritime transport.

EFIP serves as the "nodal point" between the inland ports and the European institutions. In that respect, EFIP exchanges information about recent policy developments to its members. And at the same time, EFIP informs the European policy makers about what is going on in the inland ports. Finally, EFIP ensures the exchange of information and opinions among its members.

European Inland Waterway Transport Platform

The joint European Inland Waterway Transport Platform[14] [EIWTP] was established in 2018 thanks to continuous efforts of the European Barge Union [EBU] and the European Skippers Organization [ESO].

As an extension of EBU and ESO, EIWTP aims at a stronger positioning of Inland Navigation in European and National Transport Policies by an intensified contribution to various governing bodies, working parties and standard setting committees.

At the same time EIWTP will encourage innovation with respect to the fleet's technical progress leading to even more environmentally friendly vessels. Facilitating access to financial instruments of all kinds should bring leverage to this progress.

Inland Navigation should become more respected and better integrated in Europe's Transport System and should be at the forefront when it comes to preparing this system for 2030 and beyond. Making EIWPT more effective and efficient with the help of disruptive innovation and digitalisation in general will be key in this evolution.

Digitalisation of the IWT sector - River Information Services and other projects

River Information Services (RIS) are modern traffic management systems enhancing a swift electronic data transfer between water and shore through in advance and real-time exchange of information. These services are designed to enhance safety and efficiency of IWT by optimising traffic and transport processes.

The standardisation and its harmonisation in European countries aim to better fulfil the RIS Objectives as follows[15]:

- enhancement of safety in inland ports and rivers;
- enhance the efficiency of inland navigation - optimize the resource management of the waterborne transport chain by enabling information exchange between vessels, locks, bridges, terminals, and ports;
- better and more effective use of the inland waterway infrastructure - providing information on the status of fairways;

[14] Source: https://www.inlandwaterwaytransport.eu/

[15] Source: https://ris.cesni.eu/30-en.html

- environmental protection - providing traffic and transport information for an efficient calamity abatement process;
- better integration of IWT into multimodal supply chains trough accurate and timely information to support transport management.

Currently ongoing digitalisation projects and initiatives:

- RIS Corridor Management Execution
- Digital Inland Waterway Area
- Synchromodal Traffic & Transport Information Services
- Masterplan Digitalization of Inland Waterways
- Integrated Port Information System in Hungary
- Towards a green and sustainable ecosystem for the EU Port of the Future

3.3 Danube Region Initiatives and Projects

Danube Ports Network

Danube Ports Network[16] [DPN] was launched in the framework of the DAPhNE project, as an initiative which has emerged in response of a real need to address and reduce the development and innovation gap between the ports situated on the Rhine-Danube Corridor, aiming towards cooperation strengthening between inland and maritime ports in the Danube Region.

DPN brings together public and private sea and inland ports and terminal operators from the Danube Region willing to engage in a long-term, active and coordinated cooperation process benefiting the port industry and regional economy at large.

In the framework of DIONYSUS, DPN is at the heart of coordinated project capitalisation tasks that contribute to efficient project implementation, knowledge-creation and transfer, as well as to synergies with EU transport policy initiatives and other port development related projects.

Project DAPhNE

DAPhNE – Danube Ports Network[17] aimed to facilitate a balanced development of Danube Ports as eco-friendly, well accessible multimodal hubs for the transport system of the region and to turn them into buzzing economic centres functioning as catalysts for economic growth and creation of high value jobs.

The project established a well-managed working platform that tackles the most urgent insufficiencies with the help of guidelines, recommendations and concrete pilot

[16] Source: https://www.danubeports.eu/

[17] Source: http://www.interreg-danube.eu/approved-projects/daphne

activities based on good practices leading into an overall development strategy and action plan for the Danube ports.

The activities aimed to improve port legislation, funding of port investments (State Aid Schemes and Public-Private Partnership models), port administration processes, port business strategies as well as port infrastructure & industrial development strategies. Special attention is paid to human capacity building and eco-improvement options for the port sector.

An innovative port IT community system (electronic platform that connects multiple systems operated by a variety of organisations within the port area) was tested in real-life and new markets for Danube ports were analysed (business development determined by arising opportunities from circular economy, usage of alternative fuels, transportation of Liquefied Natural Gas, distribution of renewable energy).

Project DANTE

Improving Administrative Procedures and Processes for Danube IWT or DANTE[18] was aimed at identifying and eliminating administrative barriers for inland waterway transport on the Danube and its navigable tributaries as a joint initiative of the private sector and the national public authorities responsible for these barriers.

Good practices and guidelines for effective administration of IWT activities were developed with regard to the identified barriers.

DANTE focused on five thematic areas where administrative barriers are most evidently reducing efficiency of IWT operations, which are:

- Border Police, Tax & Customs;
- Navigation / traffic control authorities;
- Port authorities / administrations;
- Waterway and Canal administrations;
- Other relevant authorities imposing barriers (e.g. health control, disaster management, etc.).

Project DANUBE STREAM

The objective of the Danube STREAM[19] project was to establish and maintain an efficient and environmentally friendly transportation network (Danube and its navigable tributaries) by further developing effective waterway infrastructure management.

To achieve a higher utilization of waterway transport in the region, the project consolidated the quality of waterway infrastructure and waterway maintenance.

[18] Source: http://www.interreg-danube.eu/approved-projects/dante

[19] Source: http://www.interreg-danube.eu/approved-projects/danube-stream

Project DaHar

The overall aim of project DaHar - Danube Inland Harbour Development[20] was to support the integration of inland navigation within the transport logistics chain by investigating and using the multimodality potentials of ports and port areas in middle-sized South-East European port cities along the Danube.

The main project activities included:

- a careful analysis of multi-modal cargo transport development;
- an intensive exchange of other partners' expertise in formulating the development potentials of individual ports;
- development and testing of RIS pilot projects;
- synthesizing the accumulated knowledge with stakeholder participation;
- drawing up an integrated strategy for the functional specialization of ports in the logistic chain;
- developing concrete action plans for individual ports based on the common strategy.

DBS Gateway Region Project

DBS Gateway Region project[21] was aimed at supporting the Danube-Black Sea region to become an attractive gateway region for maritime and inland waterway transport between Central Europe and the Black Sea, the Caspian region and the Far East by facilitating the cooperation within and with the region and its actors. The joint effort improved accessibility of both the ports and the regions and strengthen interoperability between maritime and inland waterways as well as with their hinterland.

[20] Source: https://navigation.danube-region.eu/dahar-danube-inland-harbour-development/

[21] Source: http://www.interreg-danube.eu/approved-projects/dbs-gateway-region

4 Operational & Business Development Model

The Danube River is the second longest river in Europe flowing from the Black Forest in Germany to the Black Sea passing through or bordering ten countries.

Danube region can be geographically divided into:

- *Upper region*: Germany, Austria, Slovakia, Hungary;
- *Middle region*: Hungary, Croatia, Serbia;
- *Lower region*: Bulgaria, Moldova, Ukraine, Romania.

Following on previous deliverables of project DIONYSUS, this report will concentrate (where possible) on analysis of 20 selected ports along the Danube:

- Austria: Ennshafen and Vienna;
- Slovakia: Bratislava and Komarno;
- Hungary: Budapest, Dunaújváros and Baja;
- Serbia: Bogojevo, Backa Palanka and Prahovo;
- Croatia: Vukovar;
- Bulgaria: Lom and Ruse;
- Romania: Drobeta Turnu-Severin, Giurgiu, Galati and Constanta;
- Moldova: Giurgulesti;
- Ukraine: Reni and Izmail.

4.1 Operational Models of Danube Region Ports

There are four basic port operational models that could be applied in inland ports and their overview is listed in the table below.

Operational model	Land and basic infrastructure owner	Superstructure owner	Administration	Operators
Service port model	Public	Public	Public	Public
Tool port model	Public	Public	Public	Private
Landlord model	Public	Private	Public	Private
Private service port model	Private	Private	Private	Private

Table 1: Overview of basic port operational models[22]

[22] Source: Masterplan Bratislava

The majority of the ports are publicly owned and privately operated. Most of the port land is owned by state, regional or other public entities. Approximately half of the analysed ports infrastructure and superstructure is also owned or co-owned by state, especially in the middle and lower regions of Danube. Almost all of the above ports are governed by a public entity that acts as a port authority (administration). Only one of the ports is fully privately owned and privately operated (port of Dunaújváros).

The table below summarizes the ownership structure of the selected Danube ports (land, infrastructure, superstructure), their administration and their mode of operation.

Port	Land	Infrastructure Superstructure	Administration	Operation
Ennshafen, AT	Region	State (basic infrastructure) Private	Regional government	Private
Vienna, AT	Municipality	Municipality	Municipality	Private
Bratislava, SK	State	Private	State	Private
Komárno, SK	State	Private	State	Private
Budapest, HU	State	State	State	Private and public
Dunaújváros, HU	Private	Private	Private	Private
Baja, HU	State Municipal Private	State Municipal Private	State Municipal Private	Private
Bogojevo, RS	State	Private	State	Private
Bačka Palanka, RS	State	Private	State	Private
Prahovo, RS	State	Private	State	Private
Vukovar, HR	State (85%) Private Municipality	State (85%) Private Municipality	State	Private
Lom, BG	State	State (infrastructure) Private	State	Private

Port	Land	Infrastructure Superstructure	Administration	Operation
Ruse, BG	State	State	State	Private and public
Drobeta Turnu Sererin, RO	State	State	State	Private
Giurgiu, RO	State Municipal	State Municipal	State	Private
Galati, RO	State	State	State	Private
Constanta, RO	State	State	State	Private
Giurgulesti, MD	State	Private	Private	Private
Reni, UA	State	State Private	State	Private
Izmail, UA	State	State	State	Private and public

Table 2: Overview of operational models of Danube region ports

4.2 Business Development in Danube Region Ports

Business development could be defined as set of tasks and processes that help to create a long-term value for an organization by implementing growth opportunities within markets. A business model than describes how an organization creates, delivers, and captures value, in economic, social, cultural or other contexts. The term is used for a broad range of aspects of a business, including its purpose, business process, target customers, offerings, strategies, infrastructure, organizational structures, sourcing, trading practices, and operational processes and policies.[23] Simply put, business model represents how the business proposes to earn money.

In the area of inland waterways and inland ports, the business development depends on many internal and external factors. Apart from global economic and political risks, such as changes to European and international policies and regulations, economic and market trends and geopolitical situation, the business development opportunities will depend on the attributes of the port's catchment area.

[23] Source: Business Model Generation, Alexander Osterwalder, Yves Pigneur, Alan Smith, self-published, 2010

In order to find out what are the deciding factors in driving business in Danube ports and what are their main sources of revenues, a short survey was sent out to project partners. This chapter concentrates on selected ports along the Danube that have participated in the survey, or it was possible to research the type of information needed. Analysis includes data and information on following Danube ports:

- Austria: Ennshafen and Vienna;
- Slovakia: Bratislava and Komarno;
- Hungary: Budapest and Banja;
- Serbia: Bogojevo, Backa Palanka and Prahovo;
- Croatia: Vukovar;
- Bulgaria: Lom and Ruse;
- Romania: Drobeta Turnu-Severin, Giurgiu, Galati and Constanta;
- Moldova: Giurgulesti;
- Ukraine: Reni and Izmail.

As most of the selected ports operate on the landlord model, the most revenues come from the lease of land and concession fees. In some cases, there is also income from services provided to the vessels, where these services have not been outsourced. These could include all or some of the following: navigation aids, pilotage, towage, mooring, bunkering, ship repairs, utility services, waste management and environmental services.

Services related to the cargo are in most cases outsourced to operators.

Even though most ports are operating in the landlord model, the responsibility for business development should not be passed fully onto the port operators. The port owners and authorities should create conditions that would ensure the fruition of the business opportunities. This can be achieved by:

- providing the necessary infrastructure,
- providing physical access to the port areas and premises,
- providing access to concessions based on non-discriminatory principles,
- setting up standards of operation for concession holders.

Overview of provided services and activities by port authorities and port operators in the selected ports is listed in the table below.

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
Ennshafen, AT	• port development, including development of railway capacity with the port area, LNG/CNG infrastructure, shore-side electricity supply and digitalization; • leasing land, buildings and offices; • collecting payments for the use of the port; • operation of the RO-RO Terminal; • providing navigation and vessel services.	Land, buildings and logistics centre offices lease and rental fees Fees for landing vessels, electricity, drinking water, waste disposal	1 Container terminal operator; 10 Transshipment companies; 60+ business in Business Park Enns and Business Park Ennsdorf;	• domestic and foreign transport of goods by IWW; • transshipment and storage of goods; • heavy cargo transshipment; • warehousing; • packaging; • bunkering; • services in domestic and foreign container transport, including storage, sales and leasing, cleaning and repairs of containers.	Dry bulk Container Break bulk High & heavy cargo Petroleum products Ro-Ro cargo Liquid bulk Moisture sensible break bulk
Vienna, AT	• port development; • leasing storage space, offices, buildings; • operates the harbours in Freudenau, Albern and Lobau, • providing navigation and vessel services (mooring,	Transshipment of cargo Land, buildings and logistics centre lease Fees connected to vessel services	One operator 14 port users	• cargo related services, transshipment of goods, storage and warehousing; • services in domestic and foreign container transport, including storage, sales and	Dry bulk Container Break bulk High & heavy cargo Petroleum products

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	bunkering, waste collection, utilities); • collecting payments for the use of the port.	Wharfage and Demurrage fees Warehouse and storage services Customs clearance services		leasing, cleaning and repairs of containers; • customs and trucking effort.	Ro-Ro cargo Liquid bulk Crude oil
Bratislava, SK	• ensuring the readiness and securing construction work at the public ports in Slovakia while developing long-term and short-term concepts for their development; • assuring operation, maintenance and repairs as well as evidence of facilities, structures and installations inside the public ports; • leasing land inside the public ports;	Land lease Fees for landing vessels and loaded goods	1	• domestic and foreign transport of goods by IWW; • transshipment and storage of goods; • renting of land and warehouses; • maintenance, repairs, reconstruction and construction of vessels, lifting and other devices; • services in domestic and foreign container transport, including cleaning and repairs of containers;	Dry bulk Container Break bulk High & heavy cargo Petroleum products Ro-Ro cargo Liquid bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• collecting payment for the use of the public ports; • establishing the conditions for the development of multimodal transport, including handling of multimodal cargo units.			• operation of parking areas; • supplying all vessels with fuels, spare parts; • operation of public customs warehouses, forwarding, provision of guarantees to secure customs debt in customs procedures; • purchase and sale of diesel as a fuel for vessels in water transport.	
Komárno, SK	same as Bratislava	same as port of Bratislava	1	• domestic and foreign transport of goods by IWW; • transshipment and storage of goods; • renting of land and warehouses.	Dry bulk Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
Budapest, HU	• port development including green logistics park; • leasing of property, including warehouses, storage space and offices; • providing navigation and vessel services (landing, mooring, wintering); • collecting payments for the use of the port; • complete services of warehouse logistics, railway operation, and shipping services; • operation of Ro-Ro ramp and container terminal.	Land and property lease Fees connected to vessel services (navigation, utilities, waste management) Land and property lease Transshipment and port services	10	• domestic and foreign transport of goods by IWW; • transshipment and storage of goods;	Dry bulk Container Break bulk Petroleum products Ro-Ro cargo Crude oil
Baja, HU	• port development, including green terminal; • navigation and vessel services; • operation of Ro-Ro ramp;	Port and quay utilization fees, Ro-Ro charges	5	• domestic and foreign transport of goods by IWW; • transshipment and storage of goods; • heavy cargo transshipment;	Dry bulk Container Break bulk High & heavy cargo

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• collection of payments for port use.			• warehousing; • packaging; • bunkering; • services in domestic and foreign container transport, including storage, sales and leasing, cleaning and repairs of containers.	Petroleum products Ro-Ro cargo
Bogojevo, RS	• port and water transport development;	Concessions for port operation Land lease Port and vessel services fees Cargo transshipment fees	1	• providing port services; • reloading and unloading of goods; • warehousing and storage; • warehouse rental; • packaging of mineral fertilizers.	Dry bulk Break bulk
Bačka Palanka, RS	Same as port of Bogojevo	Same as port of Bogojevo	1	• Nautical services: mooring and unfastening of vessels, piloting, maneuvering, reception and handling of vessels at anchorage,	Dry bulk Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
				supplying vessels and crew; • Transport services: loading, unloading, reloading, transfer and stowage of cargo, storage, disposal and transport operations depending on the type of cargo, preparation and consolidation of cargo for transport.	
Prahovo, RS	Same as port of Bogojevo	Same as port of Bogojevo	2	No mention of providing any type of port services on either of the operators' websites.	Dry bulk Container Break bulk Petroleum products Liquid bulk Crude oil
Vukovar, HR	• organization and supervision of vessels docking and maneuvering in port;	Concessions for port operations Land lease	4 (Luka Vukovar d.o.o. being the main concessionaire)	• mooring and unmooring of vessels;	Dry bulk Container Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• control of port traffic and incoming/outgoing vehicles; • maintenance of common structures of the port in the port area; • maintaining order in the port, a high degree of safety and environmental protection in the port; • construction and modernization of port structures; • property management in the port area; • management of free zone in the port area; • conducting of procedures related to granting concession; • supervision of port operators and port users; • port development.	Port and vessel services fees Transshipment fees		• embarkation, unloading and trans-shipment of goods; • storage and transport of goods; • embarking and disembarking of passengers; • other economic activities (e.g. supplying ships, offering services to passengers, piloting and hauling, maintenance of port mechanisation, port-agency jobs and freight forwarding business, trade, parking vehicles, quality and quantity control of goods)	High & heavy cargo Petroleum products

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
Lom, BG	• construction of ports and port terminals; • maintaining existing and building new approach channels, port water ways, sea and river landfills for the disposal of dredging mass, protective facilities, technical infrastructure, including access infrastructure; • management of state ownership in public transport ports; • responsibility for the availability, implementation and maintenance of port area security plans; • ensuring access to ports; • construction and maintenance of facilities serving the ship traffic control system and	Transshipment services fees Warehouse services fees Navigation and vessel services fees	1	• transshipment services; • warehouse services; • maneuvering services; • passenger and pontoon services; • electricity and water supply, cleaning of vessels; • repairs and other technical services; • customs.	Dry bulk Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	information and the Bulgarian river information system; • navigational provision for navigation in the territorial sea, inland sea waters, canals and aquator of ports.				
Ruse, BG	Same as port of Lom	Same as port of Lom	3	• transshipment services; • storage; • maneuvering services; • passenger and pontoon services; • electricity and water supply, cleaning of vessels; • repairs and other technical services; • customs.	Dry bulk Container Break bulk Ro-Ro cargo Liquid bulk
Drobeta Turnu Severin, RO	• port development; • maintenance and management of port infrastructure;	Concessions for port operation Land and property lease	3	• cargo related services; • storage and warehousing.	Dry bulk Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• traffic coordination; • navigation and vessel services (mooring, utilities, waste management, bunkering); • port and naval transport security.	Transshipment fees Port and vessel services (navigation, waste management, utilities) fees			
Giurgiu, RO	Same as port of Drobeta Turnu Severin	Same as port of Drobeta Turnu Severin	3	• cargo related services; • storage and warehousing.	Dry bulk Container Break bulk Crude oil
Galati, RO	• port development; • port land lease; • maintenance and management of port infrastructure; • traffic coordination; • navigation and vessel services (mooring, utilities, waste management);	Concessions for port operation Land and property lease Port and vessel services (navigation, utilities, waste management) fees	8 Cargo operators and other businesses Shipyard	• cargo related services; • storage and warehousing; • ship maintenance.	Dry bulk Container Break bulk High & heavy cargo Petroleum products Liquid bulk Crude oil

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• port security services.				
Constanta, RO	• port development; • traffic coordination of maritime and river vessels; • navigation and vessel services; • collecting of payments for the use of the port; • port land lease; • maintenance and management of port infrastructure; • transshipment services, including containers; • control actions of loading/unloading activities.	Concessions and permits Land and property lease Transshipment and port services Fees connected to vessel services	39	• all cargo related services, including containers; • storage and warehousing.	Dry bulk Container Break bulk High & heavy cargo Petroleum products Ro-Ro cargo Liquid bulk Crude oil
Giurgiulesti, MD	• port development, including Ro-Ro terminal; • navigation and vessel services (maneuvering,	Transshipment and port services Transportation services	Same as port authority + 2 (Oil product terminal and Grain terminal	Same as port authority (only activities related to cargo)	Dry bulk Container Break bulk

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	utilities, waste collection, mooring, bunkering); • collecting of payments for the use of port; • transshipment services, including containers; • storage and warehousing, • port internal logistics, • transportation services, • documentation services.	Rental services (mainly lease of land)	have different operators)		High & heavy cargo Petroleum products Liquid bulk Crude oil
Reni, UA	• port development; • traffic control; • navigation and vessel services.	Concessions for port operation Transshipment fees Transport services	11	• transshipment and cargo related services	Dry bulk Container Break bulk High & heavy cargo Petroleum products Ro-Ro cargo Crude Oil
Izmail, UA	• port development; • traffic control;	Concessions for port operation	6	• transshipment and cargo related services	Dry bulk Container

Port	Port authority core activities	Income sources	Number of operators	Port operators core activities	Cargo type handled
	• navigation and vessel services; • mooring, bunkering; • port security.	Transshipment fees Transport services			Break bulk

Table 3: Overview of services and activities

4.3 Stakeholders

As mentioned above, in most Danube ports, both public and private subjects are involved in port development, management and port operation. The table below lists the institutions commonly associated with functioning of ports as well as businesses using the port services and other institutions related to port activities.

Public Sector	Private Sector
Government Regional administration Municipality	Port operators Terminal operators Logistics service providers
Ministry of transport Ministry of environment Port authority	Shipping companies Cargo owners Forwarding companies Ship owners
Civil services Transport authority Waterway authority	Security companies
Utility companies Waste management companies Road / railway transport companies Inspection companies	
Chamber of Commerce Port Operators Associations Federation of Ports	

Table 4: Public and private sector stakeholders

The government's main role is to be the regulator for customs, vessel inspections, economic regulations. The government is also responsible, via relevant state institutions (e.g. Ministry of transport), for providing access to the port and road and rail infrastructure construction.

Port authority's role is to develop, plan and manage port's land and basic port infrastructure as well as common port facilities.

Private sector is responsible for providing cargo handling services including labour and equipment, managing of terminals and providing services to vessels. Port users, such as shipping companies or ship owners, also tend to be private subjects.

More detailed overview of port activities and most common division of individual responsibilities of public and private subjects can be seen in the figure below.

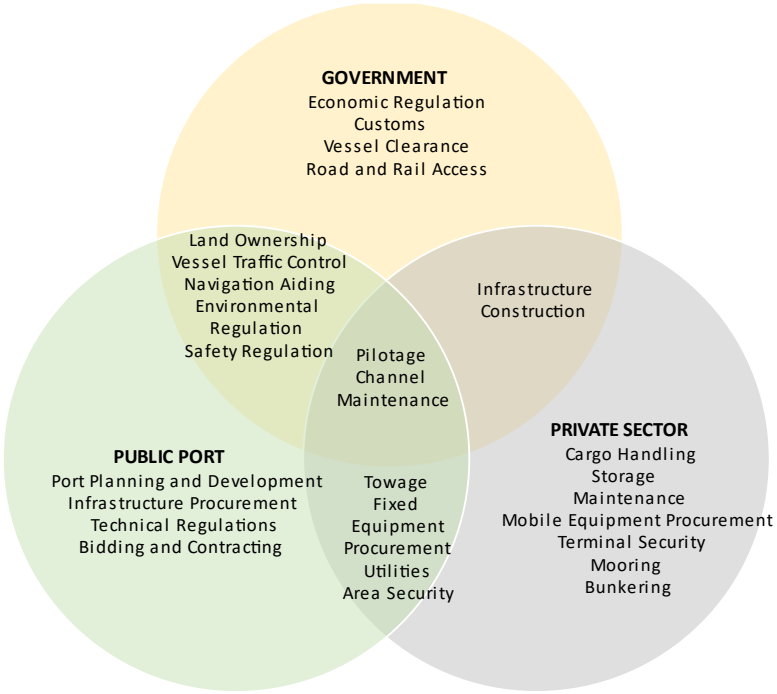

Figure 1 Responsibilities for port activities[24]

Port operation and the role of private sector

Involvement of private sector in port operation in order to increase its efficiency is notable through following activities:

- providing of efficient and cost-effective services for port users;
- response to changes in cargo-handling technologies;
- response to dynamic requirements of port users;
- enforcement of labor discipline.

Private sector is generally responsible for following services and activities:

- cargo handling and storage (bulk, liquid, non-bulk, heavy);

[24] Source: Asian Development Bank, Developing Best Practices for Promoting Private Sector Investment in Infrastructure – Ports (2000), available online: https://www.adb.org/sites/default/files/publication/27906/ports.pdf

- consolidation and packaging;
- maintaining and operating of equipment;
- maintenance of superstructure;
- procurement of mobile equipment;
- ensuring terminal security and compliance with health and safety rules;
- mooring services and bunkering;
- management of waste.

Private sector can also be, depending on the level of cooperation with public sector - be it the port owner or port authority, involved in:

- port infrastructure construction;
- procuring of fixed equipment;
- distribution of water and electricity;
- ensuring area security;
- towage and pilotage.

Business development is largely dependent on the operational model of the port and relationships among relevant stakeholders involved. Port owners or port authorities can decide to delegate the business development entirely to the operators and make it their responsibility to attract the customers and increase the trade flows to the port. They could implement monitoring and controlling mechanisms, such as SLAs and review them in regular intervals to achieve set business goals. In this case, the cooperation of all subjects is vital to achieve results.

Other ways port owners or authorities can increase trade flow to their port is by:

- attracting the right operators,
- cooperation with other Danube ports,
- joining inland waterway initiatives and associations.

Opportunities for business development can be identified within the pool of existing customers or within the port's catchment areas or they can arise as a result of cooperation with other ports or inland waterway organizations.

Coordination between official port entities and other stakeholders is important as it can help to increase the competitiveness of waterborne transport as an alternative to road transport and promote intermodal logistics.

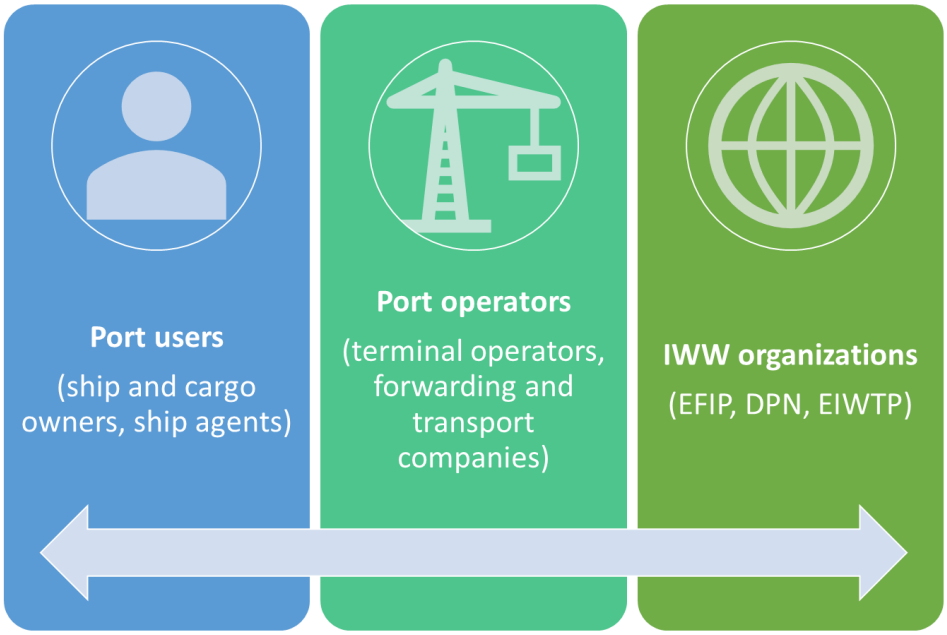

Figure 2 Business development opportunities

5 Danube Region Ports Analysis

5.1 Trend Analysis

The evolution of ports and their functions has changed in the past 80 years from simple loading and unloading services (first generation ports) to sophisticated and complex hubs offering wide economic activities, including logistics, processing and manufacturing, often as a part of industrial parks or free zones (fifth generation ports). Brief description of the evolution of ports can be found in the table below[25]. Most of the Danube ports could be categorised as second to fourth generation of ports with various level of industrial and logistic activities. [26]

Generation	Period	Characteristics
1st generation	prior to 1960	Independent operations within the port, simple services with low added value, mainly loading, unloading, storage and navigation services.
2nd generation	1960-1980	No connections between different types of operation within the port, expansion of services including cargo processing, industrial and commercial services.
3rd generation	after 1980	Port integration with the transport and commercial chain, further expansion of services covering cargo and information distribution and logistics operations. Increase automation and use of technology.
4th generation	after 1990	Development of the logistic function, creation of duty-free zones and logistic parks. Increase in quality of provided services and use of automation, integration with rail and road transport.

[25] Source: A.Kaliszewski, Fifth and sixth generation ports – Evolution of economic and social roles of ports (2018), available online: https://www.researchgate.net/publication/324497972_FIFTH_AND_SIXTH_GENERATION_PORTS_5GP_6GP_-_EVOLUTION_OF_ECONOMIC_AND_SOCIAL_ROLES_OF_PORTS

[26] Source: D.5.1.3: Guidelines for industrial development initiatives in ports (2018), available online: https://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/b18d6ffc220bb6b66426ecb4e5b0d9e04eb4e9b7.pdf

Generation	Period	Characteristics
5th generation	after 2010	Full integration of port services with port's mission. Focus on high level of quality services, increased efficiency, further application of IT solutions. Creation of advanced duty-free zones and logistic parks.

Table 5: Evolution of ports

Many of the Danube ports were in the past fully owned, managed and operated by public sector. Ports were traditionally managed and operated by a single, usually state owned, company. This has changed in the last few decades and in most cases the public sector is nowadays responsible for the administration of the ports and private sector for port operation. In other words the public sector has a role of planner, facilitator and regulator, while the private sector acts as operator, service provider and, in many cases, developer.

The objective behind the move towards Public-Private Partnerships [PPP], not only in the Danube region ports, was to introduce commercial behaviour and achieve optimal utilization of private capital (needed for construction and maintenance of infrastructure).

Cooperation between public and private sectors aims to achieve following objectives:

- increasing the efficiency of public port operations;
- improving service level with higher safety and security levels;
- increasing operational efficiency;
- accelerating growth traffic;
- promoting competition among ports;
- accessing skills, technologies and innovation;
- accessing capital;
- increasing cost effectiveness;
- balancing risk allocation;
- efficient asset management;
- improving the quality and capacity of infrastructure;
- reducing operating subsidies;
- downsizing government bureaucracy;
- removal of political influence on port operation.

PPP in ports can be defined as a long-term contractual agreement, where the public and private sector agree to deliver a project or a service that is traditionally provided by the public sector, by means of risk transfer and risk share.[27]

There are significant market and legal differences, and no specific legislation is covering PPP in the Danube riparian countries and any cooperation between the parties is usually a result of an agreement under the corporate or general business law.

Depending on the regulatory frameworks, available funding options through capital markets, local market and commercial opportunities for private partners, local requirements and limitations as well as public perceptions, the individual countries are facing their own set of issues when it comes to implementation of PPP.

Summarization of the main issues and possible solutions as identified in the "*Report on PPPs in the Danube Region*[28]" is listed in the table below.

	Main Issues	Solutions
Austria	none identified	N/A
Slovakia	• lack of funding opportunities through PPP projects; • poor awareness of the PPP projects possibilities; • existing long-term lease agreements of land; • unclear determination of payments.	• creating a comprehensive information system on PPP funding opportunities; • introduction of a positive PPP test covering all major public investment project. This could help to identify projects where the PPP approach would yield significant benefits; • termination of long-term lease agreements; • defining a method for determination of payments for individual PPPs.
Hungary	• some of the conditions in existing concession	• change of existing concession contracts;

[27] Source: Report on PPPs in the Danube Region, http://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/2aa87be390da40885598ca70cded926e795fdc24.pdf

[28] Source: Report on PPPs in the Danube Region, http://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/2aa87be390da40885598ca70cded926e795fdc24.pdf

	Main Issues	Solutions
	contracts have not been agreed upon, i.e. termination conditions.	• future concession contracts to cover all eventualities.
Croatia	• different landowners, frequent problems with privately owned land; • strict concession rules; • no concessions on demand in inland ports, • old infrastructure; • complicated procedure for concessions contracts changes; • maximum PPP contract length sometimes too short for big investments.	• all land in public port should be State owned to enable concession granting processes to be more efficient; • concession granting rules should be more flexible; • Inland Navigation and Inland Ports Law should give more opportunities for concessions on demand; • quality infrastructure could be built through concession contract; • allow longer duration of PPP contracts.
Serbia	• poor awareness of the PPP projects possibilities in port sector; • spatial planning, port area determination and land property issues must be solved before preparation of the Concession act; • maximum contract length is limited to 30 years; • concession fees are increased for the fee for the operational use of the port.	• promotion of Port Concession projects; • increase of the maximum contract length in line with PPP Law (50 years); • creating a clear methodology for the determination of the concession fee.
Romania	• lack of funding opportunities through PPP (reduced funds); • lack of experience in implementing a PPP;	• better promotion and transparency off PPP; • creating a clear and structured guide for applying the law;

	Main Issues	Solutions
	• existing long-term lease agreements of land.	• trainings on PPP funding opportunities; • creating a regional institution responsible for tracking and assisting with PPP.
Bulgaria	• investment in infrastructure projects does not return as revenue of the National Port Authority (BPI Co.) • BPI Co. does not have the power to exercise control over the concession contracts nor take measures where there is failure in fulfilment of concessionaire's obligations; • existing concession contracts do not fully comply with the new legislation in force; • outdated equipment, poor maintenance of port infrastructure and superstructure; • lack of transparency regarding the financial structure related to the management and operation of the ports, incl. concession contracts; • commercial and financial risks are considered too great for the concessionaire; • claiming period for damages caused by force majeure is too long;	• grant the autonomy to BPI Co. in determining the amount of the concession fees and the port dues. BPI Co. should collect concession fees and use them for further port development; • amendment of existing concession contracts to transpose new legislation and to terminate contracts with state-owned port operators. All ports should be operated by private companies; • BPI Co. should be directly involved in the entire concession procedure; • motivate concessionaires to renew and maintain all the assets that are granted for operation; • collect feedback from concessionaires on the concession procedures and contracts. Improvements may be introduced in that could make the concession procedure and contracting more effective.

	Main Issues	Solutions
	• difficulties to correct any non-compliance in the initial conditions specified in the tender dossier.	
Ukraine	Information not available	Information not available

Table 6: Overview of main issues and possible solutions connected to PPP

Considering the differences between countries, be it legal, economical, geographical or political, and their individual issues, the public-private partnerships and the conditions of their implementation in Danube ports have been adapted to the local situation. For most countries transitioning to market economy, the first contracts and agreements between public and private subjects were developed with little or no legal precedence or strategic analysis. Therefore implementation of public-private projects in the Danube region has been done to a varying level of success and unfortunately in some cases the process created problems in the future, requiring considerable efforts to mitigate the consequences.

As a result, there have been situation where:

- private operators have excess control over activities within the port;
- long-term lease agreements don't provide significant investments and are difficult to renegotiate or terminate;
- involvement of private subject doesn't improve the quality of services provided and fails to attract new business;
- good utilization of port assets isn't achieved.

Various PPP schemes have been applied in Danube ports and their overview is listed in the table below.

	Available PPP schemes	Applied schemes in ports
Austria	No limitations	Standard contracts in form of renting and transshipment, operator contracts, and other.
Slovakia	No specific PPP regulation for ports	Concession for construction works Service concessions

	Available PPP schemes	Applied schemes in ports
Hungary	No specific PPP regulation for ports	Asset management contracts Concession contracts Long-term lease contracts
Croatia	Concession	Concession for port services Concession for the right to exploit common good Concession for public works
Serbia	Concession for providing of port services Concession for public works	Concession for providing of port services Concession for public works
Romania	Concession	Concession of works Service concessions
Bulgaria	Concession	Concession for construction Service concession Concession for use (of property)
Ukraine	Information not available	Information not available

Table 7: Overview of PPP schemes applied in the Danube ports

Most common partnership of public and private sectors is the use of **concession model**, either as a concession for construction, a service concession or a concession for use of public property. The scheme is prevailing where the land and infrastructure are public property and the public subject acts as a landlord. The exception being Austria where port companies and authorities are corporatized and work under the common corporate law, and therefore are free to enter any kind of agreement with other public or private partners, including the lease of land, infrastructure, or the right to operate port.

Concessions are used to transfer port assets (raging from a section of the quay wall and undeveloped areas to fully developed terminal) to the private sector for a stipulated period of time through a leasehold. This arrangement can include the lease of equipment as well (cranes, loaders etc.). Private sector assumes responsibility for maintenance of the structures and the equipment.

Even though it is expected in the next decades for the role of the public port to decline as the role of the private sector increases, there are certain functions that cannot be easily transferred to the private sector[29]. The most important function is to act as an advocate of the public interest and to ensure health, public safety, and environmental protection as well as to guard the borders and enforce its legal codes. Public sector will also likely remain responsible for the development and maintenance of basic port infrastructure, such as navigational channels, breakwaters, wharves, and road and rail access to ports.

Another reason why public ownership of the port land is likely to continue is the scarcity of sites available for port development, which is also the case of the Danube region, with the exception of Constanta. Ports of Vienna, Vukovar or Giurgiu have almost no available space for further port development, port of Enns has about 50 ha and port of Bratislava 95 ha.

It is important to note that where public sector regards ports as strategic object for national transport infrastructure, the primary objective of private sector is to have autonomy in the management of resources and the provision and pricing of port services. This includes the right to decide on the quality of the services to be provided and the right to differentiate the quality of service, in order to meet specific requirements and to develop new value-added services for port users. The other primary objective is to earn a return on investment and to generate a sufficient cash flow to sustain the activity. Most private operators seek to increase their profits by reducing their costs by improving productivity and asset utilization.

5.2 Weaknesses and Risks of the Danube Region

Danube ports are located along an important European multimodal transport corridor, the “Rhine-Danube Core Network Corridor”. All Danube ports are directly connected with the seaport of Constanta, which gives them a comparative advantage over other transport routes in terms of cost efficiency, generalized transport costs and cost of externalities. Many Danube ports are also connected to the rest of the national and European transport networks by road and rail.

Growing industrial production near Danube creates an opportunity to use it to their advantage, by offering the industry a quick, competitive and reliable service and the benefits of the economies of scale offered by inland waterway transportation. Other opportunities of the Danube port industry are new markets and cargo flows that are emerging along the transport route from the Far East (“One belt one road”).

Unfortunately Danube ports also have weaknesses, such as low utilization of the available port capacities, as well as lack of resources for provision and improvement of high-quality road and rail connections of ports with the rest of the network.

[29] Source: Asian Development Bank, Developing Best Practices for Promoting Private Sector Investment in Infrastructure – Ports (2000), available online: https://www.adb.org/sites/default/files/publication/27906/ports.pdf

Other main issues include:

- lack of development plan and long-term port policies and strategies;
- limited funding of long-term developments;
- insufficient lobbying for ports and IWT;
- insufficient condition or missing railway and road connections;
- direct competition with rail and road transport;
- poor technical condition of the infrastructure in the ports;
- old port equipment and lack of equipment for container handling;
- old vessels / fleet – diesel engines and diesel-powered electrical generators;
- insufficient investments in port infrastructure and new handling technologies;
- lack of implementation of RIS and digitalization;
- lack of skilled workforce.
- persisting issues with navigation depths on the Danube;
- environmental concerns;
- unstable market conditions and demand for port services;
- competition between ports;
- relocation of heavy industry and decline of industrial production.

Overview of weaknesses and risks identified by DR countries as reported in the *"Danube Ports SWOT Analysis"*[30] is listed in the table below.

	Weaknesses	Risks
Austria	• low-capacity utilization; • capital intensity; • business models; • lack of expansion space; • public economic situation; • railway infrastructure; • railway bottlenecks; • low investment capacity of vessel owners; • small market sector; • insufficient lobbying for ports and IWT;	• road and rail transport competition; • containerization of cargo; • outdated laws; • decentralized production; • lack of skilled workforce; • overcapacity; • rail bottlenecks.

[30] Source: D.6.1.1: Danube Ports SWOT Analysis (2018), available online: http://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/031d094bc4507556bd1aabc6271bb04b2fb8b86a.pdf

	Weaknesses	Risks
	• relocation of heavy industry; • small strategic dimensions; • slow business development.	
Slovakia	• long transport times in IWT; • low transport capacities; • lack of awareness of the possibility to use IWT by logistic operators.	• rail transport competition; • dependence of weather and hydrological conditions; • development of port of Koper as the main logistic hub for Slovak car industry in maritime transport.
Hungary	• road and rail links are cumbersome; • navigational depth of the Danube; • limited number of sheltered loads; • no equipment for container loading.	• lack of skilled workforce; • road and rail transport competition; • avoidance by clients to use IWT due to uncertain water levels.
Croatia	• all ports are defined as of state interest which guarantees state investments even for ports with no development perspectives; • no clear criteria for inland port development plans; • infrastructural projects are not prepared for EU funding; • different port landowners.	• lack of clear strategies and development plans; • navigation and accessibility issue for some vessels; • turbulent economy.
Serbia	• inadequate port infrastructure; • old equipment; • lack of equipment for waterside handling of containers and heavy cargo; • lack of storage space;	• Danube navigability; • unstable market and demand for port services; • competition by road and rail transport; • lack of skilled workforce.

	Weaknesses	Risks
	• focused mostly on agricultural industry – lack of diversity.	
Romania	• no efficient way to exchange information between port subjects (need for integrated IT system); • lack of logistics centers and limited supply of logistic services; • inadequate port infrastructure; • no port development plans / masterplans; • navigation issue due to water levels; • insufficient hinterland connections; • insufficient dredging systems.	• significant delays in development of road infrastructure; • low attraction to invest in Romania; • navigational level of Danube; • decline of industrial production in the region; • high competition between ports.
Bulgaria	• unsatisfactory condition of the port infrastructure and hinterland connections; • low utilization of existing capacities; • lack of intermodal links; • lack of integrated transport systems; • insufficient storage; • limited role of private sector in terminals without concession.	• competition from other ports and existence of alternatives routes through other countries; • lack of skilled workforce; • negative public attitudes towards construction investments; • insufficient investments into port infrastructure and port equipment.
Ukraine	Information not available	Information not available

Table 8: Overview of Identified Weaknesses and Risks

5.3 Competition Analysis

The competition faced by ports is part of the general competition for the transport of cargos between their origin and destination, whether it is competition between ports serving common hinterland or competition to multi-modal routes.

According to the statistical data available from the Eurostat Database[31] (latest data are for 2019 and only available for the EU countries), inland water freight transport represents only 2.4 – 5.2 % of all freight transport in countries of the upper Danube region. In Bulgaria and Romania, which are located closer to the Black Sea, this share increases to average 30 %.

In comparison, rail freight transport ranges for all countries between 21 % and 31 % and road freight transport, unequivocally the dominant form of transport, from 45 % in Romania and Bulgaria to over 65 % in the rest of the countries.

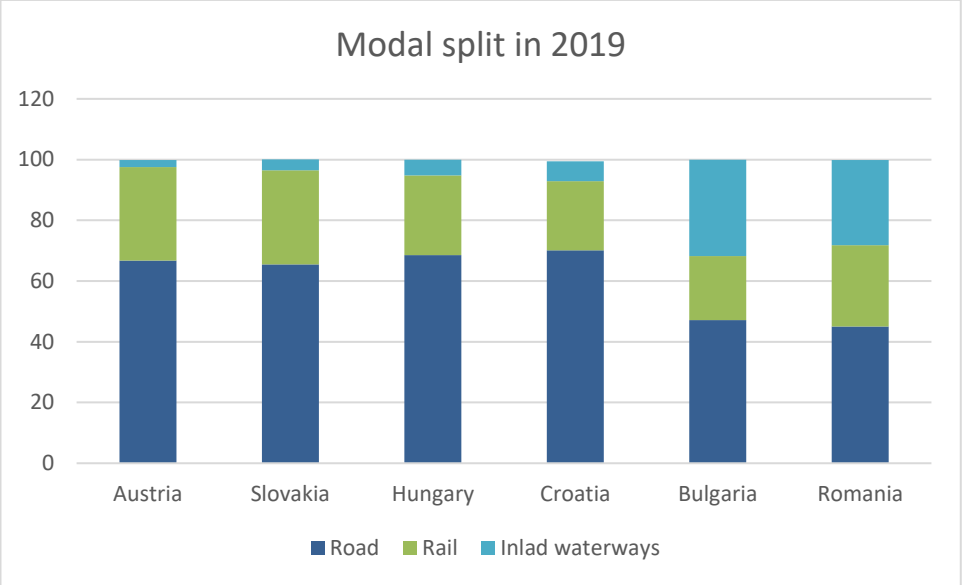

Figure 3 Modal split in 2019

Danube inland ports, due to the large distance to Constanta (only seaport on Danube), rarely handle intermodal containerised cargo over water. Containers are generally handled on land, mostly carried by railway (ports of Enns, Vienna, Bratislava, etc.) or ports are only handling empty containers (port of Budapest). This is also due to being geographically closer to North Sea and Adriatic ports with established railway connections.

Many ports in the Danube region are however focusing their development on intermodal facilities despite no established intermodal (container) transportation nor regular liner shipping services on the Danube and these are used mainly as bi-modal

[31] Source: Eurostat https://ec.europa.eu/eurostat/web/main/data/database

(road and rail). It is important to remember that ports and their hinterland connections are essential to development of the entire inland waterway transport system and are crucial for the competitiveness of the whole region. It is therefore vital to integrate the port system into a multimodal transportation network and create good quality and efficient connections to road and rail infrastructure.

"Transport Infrastructure Status Quo report"[32] demonstrated that the current status of transport infrastructure is generally in average to good condition for the analysed riparian countries. The technical conditions of different port assets, and road and rail infrastructure understandably vary from country to country, and even within each country, however in many cases the existing infrastructure continues to evolve with incoming investment into transport infrastructure.

Other port development projects include extension of quay length and therefore waterside capacities, improvement and extension of internal railway capacities and internal roads, investment into specialized transshipment and handling equipment (including heavy lift capacities) as well as "green" facilities and solutions.

According to the "*Status of port infrastructure development along the Danube*"[33] the average utilization of port capacities is, in most cases, under 50 %. This can be considered a positive result in terms of business development however is more likely an indication of outdated procedures and equipment or other limitations, some of which have been stated in table 2.

Overview of available port facilities and infrastructure assets of Danube ports is summarized in the table below. Many countries have however stated issues with outdated equipment, technologies and generally poor maintenance of port infrastructure and superstructure by the current port operators.

To modernize and further develop ports and their facilities, as well as increase the effectivity of the port operation, it is necessary to find a balance between the public and private entities so both of them benefit from the situation.

Port	Infrastructure Assets / Port Facilities	Modality
Ennshafen, AT	Cargo handling equipment Heavy handling capacity Container terminal	Trimodal Road-Rail

[32] Source: D.T.1.1.2 Transport Infrastructure Status Quo (2021), available online: https://www.danubeports.eu/images/D_T1.1.2_DIONYSUS_DR_Transport_Infrastructure_Status_Quo_Report_Final_v1.0_2021-05-29.pdf

[33] Source: Status of port infrastructure development along the Danube (2017), available online: http://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/73f53f59745d05389b91577ed0a17ed0f17a6b07.pdf

Port	Infrastructure Assets / Port Facilities	Modality
	Storage and warehousing	
	Ro-Ro terminal	
	Bunkering	
	Fuelling station for LNG trucks	
	Logistics	
Vienna, AT	Cargo handling equipment	Trimodal
	Heavy handling capacity	Road-Rail
	Container terminal	
	Storage and warehousing	
	Ro-Ro ramp	
	Bunkering	
	Logistics	
	Car terminal	
	Passenger harbour and marina	
	Haven and winter harbour	
	Customs office/ customs clearance	
	Police station	
Bratislava, SK	Cargo handling equipment	Trimodal
	Heavy handling capacity	Road-Rail
	Container terminal	
	Storage and warehousing	
	Ro-Ro terminal	
	Bunkering	
	Anchoring of vessel carrying dangerous goods	
	Passenger harbour	
	Empty containers storage	
	Ship maintenance and repairs	
Komárno, SK	Cargo handling equipment	Trimodal

Port	Infrastructure Assets / Port Facilities	Modality
	Storage and warehousing Customs warehouse Fuelling station (trimodal)	Road-Rail
Budapest, HU	Cargo handling equipment Heavy handling capacity Container terminal Storage and warehousing Bunkering Ro-Ro terminal	Trimodal Road-Rail
Dunaújváros, HU	Cargo handling equipment Heavy handling capacity Storage and warehousing	Trimodal
Baja, HU	Cargo handling equipment Heavy handling capacity Container terminal Storage and warehousing Customs office Ro-Ro terminal Waste collection Ship and container repairs	Trimodal
Bogojevo, RS	Cargo handling equipment Storage and warehousing	Road
Bačka Palanka, RS	Cargo handling equipment Storage and warehousing	Road
Prahovo, RS	Cargo handling equipment Storage and warehousing Bunkering Ro-Ro ramp Customs warehouse	Trimodal

Port	Infrastructure Assets / Port Facilities	Modality
Vukovar, HR	Cargo handling equipment Heavy handling capacity Container terminal Storage and warehousing Bunkering	Trimodal
Lom, BG	Cargo handling Heavy handling capacity Storage and warehousing Ro-Ro terminal Bunkering Anchoring of vessel carrying dangerous goods	Trimodal
Ruse, BG	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Ro-Ro terminal Bunkering LNG terminal and fuelling station	Trimodal
Drobeta Turnu Severin, RO	Cargo handling Storage and warehousing Bunkering	Access to Road and Rail but no transshipment equipment for intermodal transport
Giurgiu, RO	Cargo handling Container terminal Storage and warehousing Bunkering Shipyard Passenger berths	Access to Road and Rail but no transshipment equipment for intermodal transport

Port	Infrastructure Assets / Port Facilities	Modality
Galati, RO	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Bunkering Waste collection Ship maintenance Customs office Shipyard	Trimodal
Constanta, RO	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Ro-Ro terminal Bunkering Customs office Anchorage of vessels carrying dangerous cargo Waste collection and treatment station Shipyard Customs office Passenger Terminal Waste collection	Trimodal River and sea vessels
Giurgiulesti, MD	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Bunkering Empty containers storage	Trimodal River and sea vessels

Port	Infrastructure Assets / Port Facilities	Modality
Reni, UA	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Ro-Ro terminal Bunkering Fuelling station	Trimodal River and sea vessels
Izmail, UA	Cargo handling Heavy handling capacity Container terminal Storage and warehousing Ship maintenance and repairs Anchorage of vessels carrying dangerous cargo Fuelling station	Access to Road and Rail but no transshipment equipment for intermodal transport River and sea vessels

Table 9: Overview of port facilities of Danube region ports

Apart the competition from other modes of transport, there is there is also competition among the ports themselves. Danube ports and their catchment areas can overlap due to their proximity to each other.

The catchment area represents an area, where companies that could potentially be interested using the port services for transport or transshipment of their commodities and their products reside. The radius of the ports' catchment area is usually up to 120 km, however for Danube ports, due to their proximity to each other, it could be recommended to reduce the radius.

The main attributes and factors that determine business opportunities in the port's catchment area are:

- geographical location and proximity to other national or international ports,
- size of the area in km^2,
- hinterland connections - infrastructure and road and rail connection within the area,
- industries and companies based within the area,
- export or import orientation of the companies,

- type of products the companies produce and their suitability for waterway transportation,
- type of cargo, e.g. dry bulk, liquid bulk, break bulk, containers.

How well the port can satisfy the demands of existing and potential customers within its respective catchment area will depend on the internal factors and the ability to adapt to the customers' demands. The main factors are:

- physical accessibility of the port,
- services offered by the port,
- providers of the services (and their business models),
- relationships between operators and other port service providers (individual management or cooperation between various subjects),
- port owner's attitude to outsourcing of services,
- monitoring and enforcing standards of port services,
- superstructure and equipment available for vessel and cargo services,
- storage capacities,
- type of cargo handled in the port (transshipment technology available),
- complexity of administrative procedures for customers,
- competitive fees,
- quality of services provided,
- competitive advantage to other ports or modes of transport,
- port objectives and investments in port development (e.g. to provide more and higher quality services, ability to handle different types of cargo, etc.),
- marketing and advertisement.

Ports, in theory, have the ability to handle most types of cargo, materials and goods however the actual port utilization is highly dependent on economic attributes of their hinterland and catchment area. Disparities, and therefore sources of competition, between Danube ports are mostly due to:

- location of the port on the Danube and its proximity to port of Constanta (only seaport on the Danube),
- hinterland connections – road, rail access to the port,
- state of port infrastructure, superstructure and equipment for cargo handling and plans for their development,
- total port capacity for cargo handling and cargo storage,
- potential for economic development within port's catchment area,
- level of cooperation among port stakeholders.

Regional inequalities (following the geographical division of the Danube into upper, middle and lower regions) are also due to historical, political and economic situation.

Upper regions are generally more developed and concentrate on providing high-level value-added services as part of industrial and economic clusters focused on

streamlining off all processes, implementation of IT tools, automation and digitalization. Focus of the lower region is mostly on development and implementation of strategies and policies to support the use of inland waterway transport and development and investments into the port infrastructure in order to offer competitive advantage.

Competitive advantage may look different for each port depending on their characteristics, where bigger established ports may provide more services at better price/quality ratio and smaller ports may specialize in niche market or customer segment.

5.4 Demand analysis in Danube region

The cargo transportation market at the beginning of 2020 was stable, following on positive results of 2019 (that were significantly higher compared to 2018). Relatively stable conditions and positive forecasts were expected for the main industries (metallurgy, chemistry) and agricultural sector as the main producers making use of the waterway transportation.

However due to the impact of COVID-19 pandemic and general worldwide economic decline it had caused, the cargo volumes have been affected. Transport performance in inland waterways decreased by around 8 % within Europe. Despite the global situation, the transport performance on Danube decreased only by 1.4 %. This was largely due to increased transport of agricultural products.[34]

The volumes of cargo transported in 2020 in cross-border transport and total volume of cargo handled at Danube ports in riparian countries is summarized in the tables below.

Region	2018	2019	2020	2020/2019
Germany/Austria	2,424	3,321	2,332	70.2 %
Slovakia/Hungary	4,487	5,833	5,011	85.9 %
Hungary/Croatia/Serbia	5,425	6,694	6,113	109.5 %
Black Sea Canal	14,115	16,741	16,507	98.6 %

Table 10: Volume of cargo in cross-border traffic (in thousand tons)[35]

[34] Source: CCNR Annual report 2021 - Inland navigation in Europe, Market observation (2021), available online: https://inland-navigation-market.org/wp-content/uploads/2021/09/CCNR_annual_report_EN_2021_WEB.pdf

[35] Source: Danube Commission, Market observation for Danube navigation: Results in 2020 (2021), available online: https://www.danubecommission.org/dc/en/danube-navigation/market-

Country	2016	2017	2018	2019	2020
Austria	7,493	7,981	6,123	6,452	6,645
Slovakia	1,968	2,127	1,542	1,664	1, 553
Hungary	5,438	5,799	5,200	6,064	6,742
Croatia	677	632	592	814	948
Serbia	8,412	6,390	7,429	9,735	8,164
Bulgaria	7,013	5,570	4,923	5,385	5,431
Moldova	886	1,591	1,889	1,299	1,185
Ukraine	6,680	6,277	6,067	5,629	4,055
Romania	25,096	23,785	24,680	28,474	27,307

Table 11: Volume of cargo in ports (in thousand tons) [36]

Statistics collected show that mass bulk cargo (mostly agricultural produce, coal, fertilizers, oil and metal products) is predominant type of cargo on the Danube. Upstream transport consists mostly of iron ore, coal, fertilizers and metals. For downstream transport, grain, foodstuff, petroleum products and fertilizers are the major segments.

Breakdown of the most dominant cargo for each country handled at their ports is shown in the table below.

observation-for-danube-navigation/market-observation-for-danube-navigation-results-in-2020/

[36] Source: Danube Commission, Market observation for Danube navigation: Results in 2020 (2021), available online: https://www.danubecommission.org/dc/en/danube-navigation/market-observation-for-danube-navigation/market-observation-for-danube-navigation-results-in-2020/

Country	Cargo segments
Austria	Metal products Iron ore raw materials Petroleum products Chemical products Agricultural products
Slovakia	Iron ore raw materials Petroleum products
Hungary	Agricultural products Petroleum products Iron ore raw materials Coal Metal ores
Croatia	Agricultural products Iron raw materials Coal Metal products
Serbia	Construction materials Iron ore raw materials Agricultural products Oil and petroleum products Coal and lignite
Bulgaria	Iron ore raw materials
Moldova	Agricultural products Petroleum products Construction materials Coal Containers
Ukraine	Iron ore raw materials

Country	Cargo segments
Romania	Metal ores
	Agricultural products
	Chemical substances
	Coke and refined petroleum products
	Metal products
	Coal and lignite

Table 12: Cargo segments handled in Danube ports[37]

Iron ore, steel, metals and metal products and coal account for around half of all the goods transported on the Danube and between 2014 and 2019 followed an increasing trend. However a decrease in demand for raw materials as well as reduction of EU import quotas, caused a suspension in activities of the metallurgy sector.

On the other hand, agricultural segment helped to stabilise Danube transport in 2020 thanks to large volumes of agricultural grains and other products transported mostly on the middle and lower regions.

Transport of petroleum products and products of chemical industry were relatively stable in 2020.

5.4.1 Outlook on Danube freight transport

It is expected that in next few years traditional segments will continue to be the dominant cargo transported on inland waterways, mostly:

- agricultural produce, grains, fertilizers, feedstuff,
- metal ores, iron, steel, coal,
- construction materials,
- chemical and petrochemical products and oils,
- automotive industry products and machinery.

It is also expected that the cargo transport will continually recover within the next three years as all traditional industries assume increase in production, demand and activity. For agricultural products, the forecast will be dependent on harvest results.

[37] Source: Danube Commission, Market observation for Danube navigation: Results in 2020 (2021), available online: https://www.danubecommission.org/dc/en/danube-navigation/market-observation-for-danube-navigation/market-observation-for-danube-navigation-results-in-2020/

Long-term outlook predicts increase in transport of heavy and oversize cargo and Ro-Ro cargo on waterways, as well as gradual shift toward new industry segments, such as:

- waste and recycling products, renewable materials,
- LNG[38], hydrogen[39] and other alternative fuels, biomass.

Transport of empty containers along the Danube and establishment of regular container routes is also envisioned and has been a subject of the Container Market Report[40].

Summary of long-term outlook on cargo segments is listed in the table below.

Segment	Potential	Outlook
Chemicals	high	Inland waterways remain the preferred mode for chemicals.
Building materials	moderate / high	Moderate growth on established routes, potential for increase in urban areas.
Metals and metallurgy	neutral	Will depend on the pandemic, potential growth in emerging markets.
Coal	neutral / declining	Gradual decline due to environmental concerns and phasing out of coal in the energy sector.
Mineral oil products	neutral / declining	Gradual decline due to environmental concerns and switch to "green" fuels.
Agricultural produce	high	Strong dependency on harvest results but it is expected that inland waterways remain the preferred mode for this segment.

[38] More information on LNG available in the DAPhNE report "LNG as cargo in the Danube ports: (2018), available online: https://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/9bbdcb44ec4a6a34f1d1a74a2716cc64e9e26665.pdf

[39] Hydrogen as an alternative type of fuel is currently an attractive topic, especially in terms of ecology and emission reduction. It is therefore recommended to perform a deeper analysis of its possible use in water transport.

[40] Source: DAPhNE Container Market Report (2017), available online: https://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/4de36ced26e9abb44bf1ce89536e2178c4ed0bfe.pdf

Segment	Potential	Outlook
Containers	high	Will depend on external factors (especially navigational conditions on Danube). Potential for long-distance routes as well as transport of empty containers.
Heavy and oversize cargo	high	Inland waterways are ideal for transport of heavy cargo – large capacities compared to other modes of transport.
Secondary materials, recycling	high	Change towards more efficient circular economy, increase in reuse and recycling of materials.
LNG, hydrogen, biofuels and other alternative fuels	high	Gradual transition from coal and mineral oils. High potential for inland waterway transportation: - modernization of the fleet (ecological vessels), vehicles and machinery used in ports, - service stations for ships, trains, lorries and machinery, - transport of alternative fuels.

Table 13: Long-term outlook on cargo segments

Estimation of potential volume of cargo and expected demand for individual ports is dependent of several factors, such as the port's cargo handling capacity, equipment and storage capacity, production volumes in relevant industry segments and their proximity to the port, modal split and the share of water transport market and other.

5.5 Analysis of Business Opportunities

Ports are nowadays becoming dynamic industrial centres creating extensive logistic networks that enable trade and information flows between various stakeholders via intermodal transport links and digital and IT solutions.

One of the suggested solutions for Danube ports is establishment of hybrid logistics zones that is in greater detail described in DAPhNE report *"Guidelines for industrial*

development initiatives in ports".[41] This is of course not a suitable solution for all ports as many of them have limited availability of land or are located in close vicinity to city centres as well as problematic water levels on Danube, but it offers interesting ideas and points of view on the future of ports and their business policies.

The main areas for future and general trends seen in the port business development are focused on multimodality, automatization, digitalization and sustainability, as well as on offering wide array of customer oriented and value-added services. List of the focus areas and why they can offer business opportunities for ports is summarized in the table below.

Focus area	Reasons for business opportunity
Multimodality	It is expected that the modal split will move from road to rail or water transport by 20 to 50 % by 2050 as a result of changes in EU and international policies regarding transport and environment. EU supports the development of water transport and there are EU funds available for the development of transport infrastructure.
Automatization and digitalization	Implementation of "smart shipping solutions" into port activities by taking advantage of existing ICT tools helps to optimize the whole supply chain and speed up processing of customers and therefore not only giving added value to the customers but also increasing the volume of cargo that can be processed at the port. Many of the tools, such as GPS tracking of vessels and cargo, digitalization and automation of port processes and minimalization of physical administration tasks are already implemented in many ports. What could be even more beneficial is harmonization of these tools along all ports in Danube and creating so a strong competitive advantage for inland waterway transport as a whole. Setting up of digital IT operations centres in ports to monitor all activities in port related to vessels, cargo but also infrastructure and port security systems is also beneficial to streamlining of operations, identifying and reacting to possible issues.

[41] Source: D.5.1.3: Guidelines for industrial development initiatives in ports (2018), available online: https://www.interreg-danube.eu/uploads/media/approved_project_public/0001/27/b18d6ffc220bb6b66426ecb4e5b0d9e04eb4e9b7.pdf

Focus area	Reasons for business opportunity
	Another area that could increase the quantity of processes cargo and overall quality of provided services, is the modernization of port equipment. Modernization and digitalization have also a side effect in attracting better qualified labour and in return higher quality of services provided. Streamlining of operations in conjunction with the move towards rail and water transport can also benefit a wider port area, removing bottlenecks and congestions in cities.
Sustainability	In line with changes to environmental policies, move from carbon-based fuels to increased support of renewable and alternative sources of energy, as well as lowering of acceptable emission limits and raising fines for their violations, ports have several options how to adapt their business operations. Introduction of principles of circular economy could be a suitable solution in ports with several stakeholders, where all participants will aim to reduce waste and pollution through sharing, reusing and recycling of materials and products, e.g. complex waste management (recycling and reuse of secondary raw materials), a waste product of one producer might be a useful source for another one (transformation of residual heat to heating, wood chips into biomass etc.). Implementing environmentally sustainable solutions to port functions could also attract new industries and investors: • building of LNG terminals including fuelling stations and storage (in return, this also supports the cargo fleet modernization and modernization of the supporting vessels), • building of hydrogen fueling stations (primarily for hydrogen powered vehicles[42]) and hydrogen storage, • alternative renewable energy production for the port (photovoltaic, hydroelectric power), reducing the dependency on the national grid and potential income in case of surplus production,

[42] Hydrogen-powered vessels are currently built mainly for the passenger transport (yachts) and to a limited extent. Hydrogen-powered vessels for use in maritime transport are currently tested, for instead by PowerCell Sweden in Europe (https://powercell.se/en/start).

Focus area	Reasons for business opportunity
	• providing the conditions of import, storage, and transshipment of biomass for energy purposes, • waste collection from vessels and its subsequent processing (recycling, reusing etc.). Introduction of "polluter pay principle" or "emission fee" in order to promote sustainability, reduce pollution and combat climate change.
Value-added services	Value-added service can be defined as a premium service offered to customers at no additional price. The added value is usually achieved by implementation of various solutions in the "background", such as modernization of equipment, digitalization of processes, simplifying the administrative tasks, training of port labour force and port professionals. Offering wide variety of complementing services to customers in one place and simplification of the procedures needed to be performed by the customer also contributes to added value for customers. This can be achieved by creation of industry clusters or hybrid zones within the port. Collection and analysis of customer data (existing and potential customers within port's relevant catchment area) and their needs should become a base for planning of business development. Ports should also initiate marketing activities to promote port services and water transport as a viable alternative to other modes.
New markets	Cooperation with other Danube ports, membership in associations or organization supporting inland waterways development offer new opportunities and access to new markets or initiatives, such as: • establishment of scheduled container transport service along Danube (suitable for collection and transport of empty containers), • increasing the volume of Ro-Ro vessels and cargo along Daube (as these are suitable for the fluctuating water levels and conditions), • exploitation of the competitive advantage in transport of heavy cargo compared to road and rail transport,

Focus area	Reasons for business opportunity
	• possible new opportunities connected to new transport routes along "One belt one road" and port of Constanta, • new industry segments (alternative energy, biomass, LNG, hydrogen) create opportunities not only for transport but also for port development, • establishment of logistic, industrial or hybrid economic zones within ports, or increase of storage capacity.
Passenger ports	In cases where passenger harbour is part of the port, providing high quality services and modern amenities to passengers are the minimum to attract more business and cruise traffic. Passenger ports should work in close cooperation with the municipalities to increase interest in tourism in general by intensive marketing and advertising, offe r interesting tourist opportunities – activities, attractions, bundles or packages (e.g. boat and bike tour, museum entries, theatre tickets, special offer for holidays). Other possibility is to incorporate inland waterways and their ports for public transport by establishing a river bus service.

Table 14: Focus areas for business opportunities

6 Recommendations

Because of their importance to national and even global economy it is essential that ports are operated efficiently, with their infrastructure being well developed and services adapted to the dynamic market demand.

Most of Danube ports are faced with the lack of free space for further port development (the only exception being port of Constanta), therefore any planned developments should be focused mainly on:

- upgrading of port infrastructure, superstructures and equipment;
- fleet modernization;
- digitalization (RIS, smart shipping);
- improvement and streamlining of services;
- environmental solutions (clean fuel facilities, port handling equipment using alternative fuels, use of solar power, waste management);
- education and training.

Any sort of development is depended on availability of sufficient funds, which tend to be scarce if only public sources are involved. Therefore an increased level of public-private partnerships is necessary in order to optimize investments.

The appropriate PPP model will depend on many factors, including:

- port authority's or government's objectives;
- level of government's commitment to necessary reforms to implement PPP models;
- level of private sector already involved in port-related activities;
- type of services requiring private sector management;
- potential for creating financially viable activities;
- potential to provide skilled labor and manage large scale commercial operations;
- competitiveness of the private sector.

Based on the information from riparian countries as well as considering trends and individual and overall development needs, it can be concluded that the most suitable option for private sector involvement in public port operations and investment is the prevailing **landlord port model** for most of the ports in DR as this can accommodate different forms of public-private partnerships.

This model represents a broad framework where public sector retains control over the port regulation and remains the landowner and the owner of basic infrastructure. Private sector than takes over providing port services, while both share responsibility for capital investment and related risks.

Important aspect when forming public-private partnerships is to apply non-discriminatory principle in order to prevent monopolistic behaviour and promote competition and thus increase the efficiency of port operations. The cooperation with public port authorities should not be limited but open to multiple subjects where

possible. Transparency in public procurements, bidding process and contracting is a must.

PPP model can be applied in various forms depending on the attitudes towards the scope of responsibilities and autonomy in port management and operation. These fall into three main categories, as are listed in the table below.

Fourth main category of PPP agreements represents full divestiture or full privatization which would allow permanent transfer of port assets including the port land to private sector and is therefore very rare.

Category	Limited port oversight	Active port involvement
Outsourcing	Franchises	Subcontracting of services Management contract Lease of equipment
Restructuring	Capital leases Open competition	Subsidiaries
Partial divestiture	Concessions Long-term leases Sale of movable assets	Joint ventures Special purpose companies Minority equity partners

Table 15: Overview of suitable forms of PPP agreements[43]

Outsourcing involves the transfer of specific port activities from the public sector to private sector with aim to reduce operating costs and increase efficiency by utilizing labour and equipment supplied by private sector.

Restructuring includes the transfer of the port's businesses to the private sector for agreed fee, most commonly by leasing the port facilities including the licence of the right to provide services to third parties. This model also means the transfer of responsibility for maintenance of port facilities and for collection of charges. Public sector retains the ownership of the port's major capital assets and regulatory authority.

Partial divestiture, most commonly in a form of concession or long-term lease, involves the transfer of assets for an extended period (20-40 years) or joint ownership between the public sector and private investors.

[43] Source: Asian Development Bank, Developing Best Practices for Promoting Private Sector Investment in Infrastructure – Ports (2000), available online: https://www.adb.org/sites/default/files/publication/27906/ports.pdf

Due to significant market and legal differences in riparian countries it is not possible to apply the same type of PPP model for every country. The chosen form will therefore have to take into account :

- regulatory and institutional frameworks;
- available funding options through capital markets;
- local market & commercial opportunities for private partners;
- local requirements, considerations and limitations;
- focus areas for development.

Whatever the applied form of PPP, the contract should clearly define:

- the objectives of the transaction (i.e. transfer of assets, responsibilities, maintenance);
- duration of the agreement;
- payment terms;
- the rights and obligations of both parties;
- controlling and monitoring mechanisms;
- liabilities for damages and mitigation measures;
- procedures for extension of the contract;
- termination conditions, including early termination.

It is also important to note that there are no specific regulations related to PPP schemes in most of the countries. It is therefore recommended, on national level, to prepare and implement comprehensive regulatory framework for public-private partnerships. This should include, but is not limited to, comprehensive information system on PPP funding opportunities and guidelines on financial modelling and risk matrices.

For a successful public-private partnership, there also needs to be improvement in processes connected to port administration, such as:

- managerial planning;
- integrated management policy;
- planning and control of risks;
- communication with port stakeholders;
- simplifying procedures in ports;
- reporting and monitoring;
- ships' moving monitoring;
- dedicated knowledge management system;
- common user services provided by the waterway administrations;
- improved waterway management tools;
- electronic customs clearance.

It could also be recommended to harmonize practices along the Danube, for example via common platform for collaboration between port administrations for the Danube riparian countries. This could result in:

- development of common rules on the Danube;
- avoid duplicating ship inspections by mutual recognition of the results of inspections performed by the other authority;
- improved communication between the authorities;
- development of procedures to be followed by all authorities in ships' inspection;
- development of a common database with the results of inspections and related follow up.

Recommendation for port operation

Effective port operation depends on effective cooperation of all subjects involved, mainly the port operator(s), port authority and government, and on fulfilment of their defined roles and responsibilities.

Area of improvement	Responsible subject	Recommended solutions and actions
Efficient transportation	Government Port authority	Multi-modality of ports Road and rail access to port and connections to hinterland Developed port infrastructure
Streamlining of services	Port authority Port operators	Vessel traffic control and monitoring Implementation of RIS systems Digitalization and smart shipping Digital tracking of cargo Simplification of administrative procedures
Economic growth and competition promotion	Port authority Port operators	Prevention of monopolistic behaviour and monopoly pricing Non-discriminatory approach to bidding and contracting for concessions Accommodation of multiple providers of complementary and competing services

Area of improvement	Responsible subject	Recommended solutions and actions
		Unbundling of services to multiple providers Complex offer of port services (high quality services provided in timely manner, adequate capacity, competitive fees, qualified labour)
Environmental solutions	Government Port authority Port operator	Environmental regulations Port planning and development Fleet modernization (alternative clean fuel such as LNG, hydrogen), building of fuelling stations and storage solutions for alternative fuels Implementation of "green" measures (LNG, waste management, alternative energy sources, noise and pollution reduction)
Security and protection	Port authority Port operator	Technical regulations Digitalization and implementation of RIS systems Vessel traffic control Aid to navigation, pilotage, towage Safety regulations Risk policies Implementation of safety measures (monitoring and control of port areas and facilities, digital tracking of goods, containers and cargo, insurance policies)
Cargo handling equipment	Port authority Port operator	Port planning and development Procurement and investments into modern equipment determined by the type of cargo handled at ports or terminals

Area of improvement	Responsible subject	Recommended solutions and actions
		Marketing strategies and business plans to attract customers in order to utilize available capacities Maintenance and repairs of equipment
Storage and warehouse facilities	Port authority Port operator	Port planning and development Construction and maintenance of warehouses and storage facilities depending on the goods type (bulk, liquid, gas). Marketing strategies and business plans to attract customers in order to utilize available capacities Maintenance and repairs of facilities
Human resources	Port operator	Educational and training programmes Competitive wages Suitable working conditions

Table 16: Overview of recommendations for port operation

Danube ports vary in size, location, conditions of their infrastructure, superstructure and equipment, availability of storage, the way they are managed and operated. Their development is also dependent of the local political and economic situation, prospects of investments and availability of funding options. To devise a one-fit-for all business model or business plan for Danube ports is therefore not feasible.

However it is possible to recommend a set of steps to find the best business development model for each port, e.g. defining a plan for business operation, identifying sources of revenue and potential customers, deciding on key activities and key partners.

There are several aspects that ports need to consider, mainly:

- financial factors (investment costs, funding options, value for money, rentability, possible revenues, return of investments),
- social factors (land area expropriation, interference or possible damage to other businesses, assets, cultural or historical sites),

- environmental factors (increase in traffic volumes, impact on air, soil and water quality, ecosystems and biodiversity, human health, increase of noise pollution and climate change risk, waste management),
- other factors (accessibility to the port and connections to hinterland, feasibility of the proposed developments, stakeholders and their responsibilities and rights).

Business development model should reflect strategies defined in port's strategic plan or its masterplan and should be backed up by the right partnerships and marketing tools. To outline business development strategy, port should understand it's current situation, market, competition and future developments. It can be recommended to undergo following steps when defining a business model:

1. Analysis of current situation
2. Market and business opportunities analysis
3. Future developments
4. Finding the right stakeholders
5. Marketing and advertisement

Focus area	Characteristics
Current situation analysis	• existing capacities, facilities and equipment, • internal infrastructure and hinterland connections, • existing operators and partners, • range and level of services provided, • human resources, • current revenue streams, • cost structure, • weaknesses and strengths, competitive advantage.
Market and business opportunities analysis	• industries and business within the catchment area, • current demand and business forecast, • competition analysis of other transport modes, • potential industries and companies to shift to IWT, • opportunities arising from international cooperation, • focus on improving competitive advantage,

	• identification of value propositions.
Future developments	• future goals and objectives (as defined in strategic or business plans), • planned improvements and developments, • new legal and environmental requirements, • new initiatives and services (automation, digitalization), • identified areas for development, • building on existing strengths and elimination of identified weaknesses.
Finding the right stakeholders	• attracting subjects, investors and service providers to achieve set objectives and goals, • creating attractive environment and offering interesting opportunities for potential new operators and developers, • mitigation of financial and operational risks.
Marketing and advertisement	• implementation of active marketing and advertisement strategies, • communication with existing and potential customers, • focus on competitive advantages.

Table 17: Overview of steps for port business development

After completing the current situation and market analysis, the ports should be able to answer following questions:

1. Who are the customers, or what customer segment the port wants to target?
2. How are the customers reached, and are there alternative distribution channels available? Can the port access these channels?
3. What products and services are being provided, and are there services that could add value for customers? What are the services and products customers are interested in?
4. What are the revenue streams?
5. What is the value proposition for provided services, what services create value for customers and partners? Is there a competitive advantage for the port?
6. What activities needs to be maintained to deliver services and added value for the customers?
7. What are the key resources (e.g. material, intellectual, financial, human) needed to provide services? Who are port's key partners?
8. Is there investment required to maintain current level of service?
9. How much does it cost to maintain the value chain, what are the biggest costs?

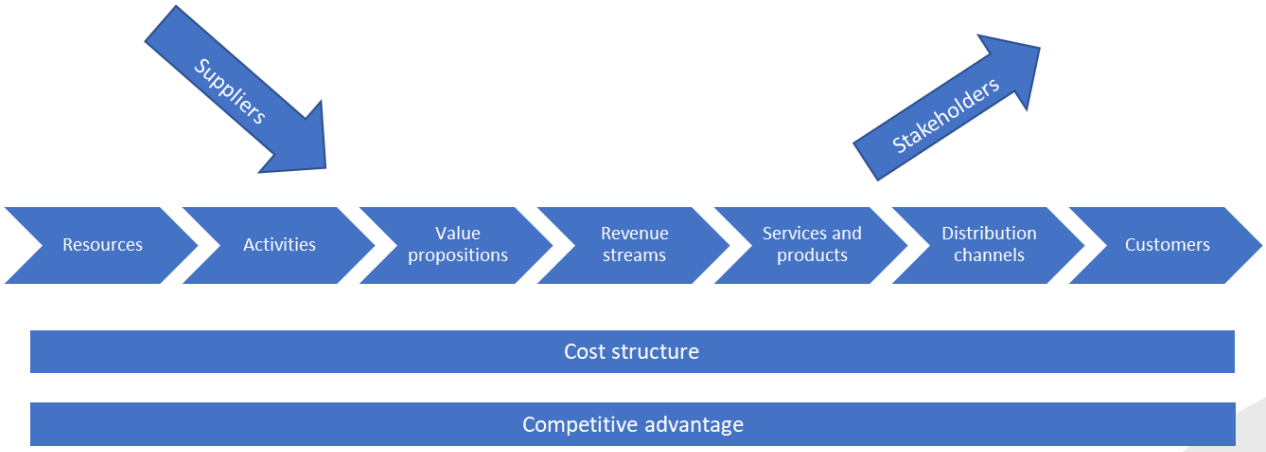

Figure 4 Business model[44]

Ports should also be able to identify business opportunities, either for existing customers or for potential customers. Tools, such as business model above, can be useful to identify what resources and actions needs to be taken by the port to best address these opportunities. Ports should regularly monitor, analyse and evaluate their

[44] Based on: A. Osterwalder and Y. Pigneur: Business Model Generation (2010) and its interpretations.

position in the market, identify opportunities and adapt to external developments (legal, regulatory) as well as promote their services to achieve business growth.

7 Conclusion

Port governance/administration and port operation functions in the countries of the Danube region are in general clearly separated and performed by different entities, where port administration is performed by a public subject and operating functions are usually transferred, with some exceptions, to private sector.

Based on the information from riparian countries, as well as considering trends and individual and overall development needs, it can be concluded that the most suitable option for private sector involvement in public port operations is the prevailing landlord port model for most of the ports in Danube region. Considering the differences between countries, be it legal, economical, geographical or political, and their individual issues, the public-private partnerships and the conditions of their implementation in Danube ports need to be adapted to the local situation.

Ports are nowadays becoming dynamic industrial centres creating extensive logistic networks that enable trade and information flows between various stakeholders via intermodal transport links and digital and IT solutions. Main areas for future and general trends seen in the port business development are focused on multimodality, automatization, digitalization and sustainability, as well as on offering wide array of customer oriented and value-added services.

Any port developments should be focused mainly on:

- upgrading of port infrastructure, superstructures and equipment;
- fleet modernization;
- digitalization (RIS, smart shipping);
- improvement and streamlining of services;
- economic growth and competition promotion;
- environmental solutions (clean fuel facilities, port handling equipment using alternative fuels, use of solar power, waste management);
- education and training.

Danube ports vary in size, location, conditions of their infrastructure, superstructure and equipment, availability of storage, the way they are managed and operated. Their development is also dependent of the local political and economic situation, prospects of investments and availability of funding options.

Business development model should reflect strategies defined in port's strategic plan or its masterplan and should be backed up by the right partnerships and marketing tools. To outline business development strategy, port should understand it's current situation, market, competition and future developments. It can be recommended to undergo following steps when defining a business model:

1. Analysis of current situation
2. Market and business opportunities analysis
3. Future developments
4. Finding the right stakeholders
5. Marketing and advertisement

Opportunities for business development can be identified within the pool of existing customers or within the port's catchment areas or they can arise as a result of cooperation with other ports or inland waterway organizations.

It is expected that in next few years traditional industry segments, such as agriculture, metallurgy, petrochemistry, construction and automotive, will continue to be the dominant cargo transported on inland waterways. However long-term outlook predicts increase in transport of heavy and oversize cargo and Ro-Ro cargo on waterways, as well as gradual shift toward new industry segments, such as waste and recycling products, renewable materials, LNG, hydrogen and other alternative fuels, biomass. Transport of empty containers along the Danube and establishment of regular container routes is also envisioned.

Ports should regularly monitor, analyse and evaluate their position in the market, identify opportunities and adapt to external developments (legal, regulatory) as well as promote their services to achieve business growth.

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