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

Management Summary on Port Development Plans

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Contributing Authors

Name	**Organisation**	**Email**
Silviu Meterna	PDR	pdr.office.2020@gmail.com
Werner Auer	EHOO	w.auer@ennshafen.at
Christina Eckmayr	EHOO	office@ennshafen.at
Martin Golias	VPAS	Martin.golias@vpas.sk
Béla Szalma	HFIP	elnok@hfip.hu
Mónika Thury	HFIP	popeiproject@gmail.com
Miroslav Madarac	PAV	Miroslav.madjarac@luv.hr
Alexandru Serban Cucu	AAOPFR	Aserban.cucu@gmail.com
Leonhard Cotiga	AAOPFR	aaopfr@yahoo.com
Boyan Bonev	POB	Boyan.bonev@bulmarket.bg
Srdja Ljesevic	PGA	Srdja.ljesevic@aul.gov.rs
Victor Ceban	UTM	Victor.ceban@tran.utm.md

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2 Introduction

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

First a jointly common structure for a Port Development Plan (PDP) was defined which was used as the basis for the individual documents of the involved ports. All development plans should comply with national/regional economic strategies and regional development plans of the related areas and should be deployed fully in line with the port owners' long-term strategies and investment plans. But the "tailor-made-principle" was the core red line in elaboration of the different documents: each port was invited to find the best way the structure and elaborate the PDP for his special conditions and needs – based on a common comprehensive structure, from which each port picked out what was really of added value for his special framework and status. Furthermore, the operational and business development model should be shared at DR level for further usage of ports in the future.

The Port Development Plans should be established in a STANDARD VERSION, based on the common table of content, written in English – to fulfill the requirement of an output according to the application formular. Additionally, each port could establish an EXTENDED VERSION of the port development plan, completed with specific documents for the port/country in form of annexes or within the normal text, based on special national requirements or other port internal restrictions (if existing) and on the special requirements of the national and/or EU founding programs, for which these documents will be used for applying in various further projects (maybe in English language or in national language). Thus, the extended version could contain the standard version PLUS other additional elaborations, text passages, annexes, documents, information, … which each project partner should consider to be used for his own use or situation, even only for internal use (confidentiality reasons!) and every PP had the option to do these extended parts either in English or national language and even in the document itself or in annexes.

Of paramount interest was, that the elaborated documents shall live further after the project time of DIONYSUS and could be integrated into the management processes of the ports. These investigations of the selected ports or regions should deliver sound papers as the basis for future investment considerations or decisions or descriptions for EU grant applications. These plans should contain development projects with real chances for execution until 2030 (planning horizon for TEN-T) - especially for current period 2023-2030 for CEF-II-program.

3 Scope of the report

This report is a management summary of the elaborated development plans within the DIONYSUS project. All detailed elaborations are documented in the below mentioned output documents or deliverables. The current report shall give a quick overview what has been elaborated, all details can be look up in the corresponding documents.

The involved project partners in the beginning of the project have been:

fasd		
EHOO	Ennshafen OÖ GmbH	Austria
VPas	Public Ports JSC	Slovakia
HFIP	Hungarian Federation of Danube Ports	Hungary
AAOPFR	Romanian River Ship Owners and Port Operators Association	Romania
MT	Ministry of Transport, Infrastructure and Communications	Romania
PAV	Public Institution Port Authority Vukovar	Hungary
POB	Port Bulmarket EAD	Bulgaria
PGA	Port Governance Agency	Serbia
ONMU	Odessa National Maritime University	Ukraine
USPA	State Enterprise Ukrainian Sea Ports Authority	Ukraine
UTM	Technical University of Moldova	Republic of Moldova

Table 1: Involved project partner in work package 4

Within the activities of work package 4 (“Pilot Cases”) the elaboration of the following deliverables and outputs was foreseen (in total 4 deliverables and 16 output documents):

Deliverable D.T4.1.1 Operational & Business Development Model for Danube Region Ports (by VPas)

Deliverable D.T4.1.2 Management Summary on Port Development Plans (by EHOO)

Deliverable D.T4.5.1 Development Plan for Hinterland Infrastructure / Moldova (by UTM)

Deliverable D.T4.5.2 Pruth Fairway Maintenance Plan (by UTM)

Output O.T4.1	Port Development Plan of Ennshafen (by EHOO)
	Port Development Plan of Dunaujvaros 2030 (by HFIP)
Output O.T4.2	Operational & Business Development Plan Bratislava (by VPas)
	Operational & Business Development Plan Komarno (by VPas)
Output O.T4.3	Port Development Plan Calarasi (by AAOPFR)
	Port Development Plan Turnu Magurele (by AAOPFR)
	Port Development Plan Orsova (by AAOPFR)
Output O.T4.4	Port Development Plan Vukovar (by PAV)
	Port Development Plan Bulmarket Port Ruse (by POB)
Output O.T4.5	Port Development Plan Prahovo (by PGA)
	Port Development Plan Backa Palanka (by PGA)
	Port Development Plan Bogojevo (by PGA)
Output O.T4.6	Port Development Plan Reni (by USPA)
	Port Development Plan Ismail (by USPA)
	Port Development Plan Ust-Dunaisk (by USPA)
Output O.T4.7	Integrated Port Development Plan / Republic of Moldova (by UTM)

The selection of the ports was based on several decision criteria such as potential in terms of location, operation, transshipment infrastructure, hinterland connections as well as on factors such as regional economic development, freight flows outlook, business community profiles, etc. These Port Development Plans should comply with National or Regional Economic Strategies or Regional Development Plans of the relevant areas and be deployed from Business Strategies of the port owners. Substantial inputs and documents regarding technical and financial issues, market studies, legal aspects, etc. should be considered and worked out in detail. The pilot case investigations should deliver sound papers which can be the basis for future investment decisions. These plans should contain particular development projects which have a real chance for execution until 2030. Each elaborated plan should be integrated into the normal business papers of the ports and should be prepared in a way that a yearly update is possible. At the same time, these plans could be a central element of the yearly SWOT-analyses and budgeting processes of the ports.

The operation and business development model should 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. Based on the operational & business development model developed within the first two reporting periods 2 concrete applications for ports were foreseen. The model should present a new perspective on how to exploit business

opportunities and how to increase the overall performance of the ports and should ensure the transferability of good practices to the entire DR port community.

An integrated Port Development Plan for Moldova would be developed which summarizes the findings of the infrastructure development plan for the hinterland connections of Giurgiulesti Port and the fairway maintenance plan for the Prut River. The fairway maintenance plan should be developed for the navigable section of the River Prut (used by small vessels of 200-300 tonnes), with a dedicated focus on national needs and short-term measures in order to ensure efficient and effective realization of harmonized waterway infrastructure parameters. A comprehensive plan should be elaborated for the development of hinterland infrastructure and intermodal connections (rail and road) from the Port of Giurgiulesti towards the hinterland. The importance of considering the development of hinterland links and infrastructure in relation to enhanced corridor needs (be it a domestic trade corridor or a transit trade corridor) could be an essential element in the elaboration of this development plan.

During the runtime of the project some unforeseen circumstances have been changed so that the elaboration of the Port Development Plans of Ukrainian ports Reni, Ismail and Ust-Dunaisk have been cancelled; therefore, ONMU und USPA stopped their work as project partners within Work Package 4. Thus, the output documents O.T4.6 have not been elaborated. No further substantial changes happened and the documents have been elaborated according to the application paper.

4 Executive Summary / SHORT OVERVIEW

PORT	SHORT DESCRIPTION	ACTUAL SITUATION	MAIN EMPHASIS
BRATISLAVA	• Most important port in Slovakia, part of TEN-T • Total port area 1,581,300 m2 with 4 basins • Cargo and passenger transport • Trimodal connection with Ro-Ro, container terminal and landing cranes for heavy and oversized goods	• Port authority and owner of the land is VPas, main port operator and owner of the infrastructure is SPAP (Slovak shipping and ports) • Appr. 1,6 Mio t/a waterside transshipment • Appr. 1400 t/a container terminal transshipment	• Solve the current ownership at the port • Move the bulk cargo from the Zimný Prístav to the Pálenisko • Expand transshipments locations and storage areas of break-bulk cargo • Build a terminal for production and transport of alternative fuels and a new passenger terminal & the city marina with water sports facilities in the Zimný prístav
KOMARNO	• Second most important port in Slovakia, part of TEN-T • Total port area 643,000 m2 with 2 basins • Cargo and passenger port • Connection to railway and road	• Port authority and owner of the land is VPas, main port operator and owner of the infrastructure is SPAP (Slovak shipping and ports) • Appr. 40 Tt/a waterside transshipment • Proximity of the city center and cultural heritage to the port	• Renewal of old buildings and port equipment • Installation of green energy (PV) • New loading station and warehouse
DUNAUJVAROS	• Located at the right riverside of the Danube and is suitable for managing large ships • Appr. 440,000 m2 site (land area 52,000 m2 and the water surface used by the port is 381,000 m2) • Extended road, rail and water connections, but small storage capacity (1200 m2)	• Private orientation (two private operators cooperating based on a contract) • Relatively small port but its lifting capacity is great • Appr. 700 Tt/a waterside transshipment	• Efficient transportation (port basin deepening, shore wall extension, expansion of truck waiting areas) • Service improvement (improvement of cargo handling equipment, establishment of an inner traffic engineering network, roofed loading stations) • Safety and security (renovation of the existing shore wall, fire safety) • Low carbon port (installation of PV)

ENNSHAFEN	• Appr 3,5 Mio m2 (port & business park) • TEN-T Core Node with highly developed infrastructure and modern investments • big container terminal and state-of-the-art hinterland connections road/rail)	• strong PPP-orientation (public owned port company and many private operators) • appr. 0,8 Mio t/a waterside transshipment and appr. 350 TTEU/a • high performing logistic and industrial site, huge ongoing investments	• Low Carbon Port (OPS, alternative fuels, energy systems) • Cargo & Core Infrastructure (increasing of transshipment, new cargo, truck-train-ship-shifting, containerization of goods) • Digitalisation (of core port processes) • Basic infrastructure of the while site and cross-sectional items
CALARASI	• Appr 81.500 m2 site for port area • The length of the walled quays / vertical / natural embankment is appr. 830 m • Main type of cargo: agricultural products, raw materials, steel products	• Port infrastructure is owned by the Ministry of Transport & Infrastructure (public property) • Port infrastructure is administrated by the Inland Ports Administration (APDF Giurgiu) under the coordination of the Ministry – administration is granted through a concession contract • Appr. 336.000 t/a waterside transshipment	• Dredging of the Borcea canal entrance (100.000 m3) • Consolidation and modernization of the hydrotechnical constructions (quays) • Implementation of water and electricity networks, incl. vessel supply systems • Repair of the port platform, restore the rail connection and modernize the road connection
TURNU MAGURELE	• Appr. 82.000 m2 port area • The length of the walled quays / vertical / natural embankment is appr. 920 m • The port is connected to national road networks • Main type of cargo: agricultural products, raw material, chemicals, steel products	• Port infrastructure is owned by the Ministry of Transport & Infrastructure (public property) • Port Infrastructure is administrated by the City Hall of Turnu Magurele • Appr. 169.000 t/a waterside transshipment	• Modernisation of hydrotechnical constructions (walled wharves), installation of new systems for tying vessels to the wharf • Rehabilitation of the port platform and modernization of the electricity supply system • Introduction of the water and sewage system • Installation of a photovoltaic system (5 kWp) • Modernization of the rail connection

ORSOVA	• Appr. 50.400 m2 port area • The length of the walled quays / vertical / natural embankment is 1060 m • Road and rail connections do exist	• Port infrastructure is owned by the Ministry of Transport & Infrastructure (public property) • Port infrastructure is administrated by the Inland Danube Ports Administration (APDF Giurgiu) under the coordination of the Ministry – administration is granted through a concession contract • Appr. 126.000 t/a waterside transshipment	• Modernisation of hydrotechnical constructions and the port platform • Modernization of water and electricity networks, including vessel supply systems • Modernization of the handling facilities
VOKOVAR	• Appr 260,000 m2 of port area (state owned) • E-port under the European Agreement on Main International Importance (AGN; OG 16/98) • Status of an international port, which is of economic importance for the Republic of Croatia	• Possibility to manipulate all types of cargo including liquid cargo, bulk cargo, palletized cargo, heavy cargo and containers • 7 berths, 2 of which for liquid and one for cereals, bulk, general, palletized and mixed cargo • Appr. 0,45 Mio t/a waterside transshipment • Good accessible by road and rail, while navigability of the port throughout the year enables the smooth operation of the port	• Maintenance of existing infrastructure, renovation of port structures and facilities • Construction of new terminals for hazardous substances and specialized terminals and waste management capacities • Increasing intermodality by construction of intermodal infrastructure in cargo transport • Construction of communal connections for the supply of alternative fuels
RUSE	• appr. 376,450 m2 (port and business park) • 16 km railway infrastructure • big terminal for dangerous goods (Propane, Butane, crude oil, petroleum products – diesel, gas oil, oils)	• long-term cooperation of public and private sector with firm commitments • appr. 0,5 Mio t/a waterside transshipment • eco-centric view of sustainability in port planning	• digital transformation approach applicable to the core port activities • transition to low carbon (maritime) transport & port operation and reduction of air pollution • increasing of transshipments & cargo, investments in new infrastructure

PRAHOVO	• appr. 55,000 m2 of port area • open shore trimodal port • favourable position – chemical industry in the immediate vicinity, copper production and mining industry in the hinterland area • large chemical park planned in the area next to the port	• landlord port model • two port operators, one for oil and oil products, the other for general and dry bulk cargo • handles raw materials, fertilizers, chemical products, oil and oil products, steel coils, coal copper, etc. • appr. 1,3 Mio t/a waterside transshipment	• reconstruction of the port infrastructure (quay wall, internal rail and roads), construction of additional warehouse space • construction of the green terminal for collection of ship waste materials • additional port operators through concession model
BACKA PALANCA	• appr. 740,000 m2 port area, only small part developed with 3 berths • basin type port with no railway connection currently • favourable position in the developed agricultural and industrial area	• landlord port model • one port operator • handles mostly grain and fertilizers • appr. 0,5 Mio t/a waterside transshipment	• connection to the national railway network and enabling port to be trimodal • multipurpose port – extension of port capacity will enable handling of other type of cargo (general cargo, liquid and dry bulk) • additional port operators through PPP-model
BOGOJEVO	• appr. 90,000 m2 port area • open shore port with no railway connection currently • favourable position in the developed agricultural and industrial area	• landlord port model • one port operator • handles mostly grain and fertilizers • appr. 0,4 Mio t/a waterside transshipment	• connection to the national railway network and enabling port to be a regional trimodal hub • multipurpose port – extension of port capacity will enable handling of different kind of cargo (general cargo, oil and oil products, dry bulk) • additional port operators through concession model

MOLDOVA	• appr. 1,2 Mio m2 (port and business park • the main and only international multimodal hub with a direct connection to the European transport network • strategically important terminals for the national economy (oil, grain, container), with stable road and rail links with the main logistic centers of the country	• appr 1,4 Mio t/a waterside transshipment and appr 2,5 TTEU/a • the main investments in the development of port infrastructure and equipment are made by the European Bank for Reconstruction and Development • the development of the business park is carried out at the expense of private investments of residents	• construction of a universal berth along the bank of the Danube River in order to expand and modernize the port infrastructure • implementation of the low-carbon port program • business park development and attraction of residents • attracting investments from the Republic of Moldova and the European Union for the reconstruction of railways

Table 2: Overview – results of elaborated documents

5 Details about the elaborated ports

In the following the passages of the executive summary section of the cited Port Development Plans are depictured or a condensed version for those, who are to huge for complete presentation within the current management summary.

5.1 Operational & Business Development Plan Bratislava - Slovakia

The position of the Port Bratislava is specific from the territorial point of view, i.e. the port is located in relatively close proximity of competing ports and together with the Port Komárno, which is also owned by VP a.s company, create a possible synergy. This is the reason, why the demand analysis considers not only the individual catchment areas of each port but also the shared catchment area where both ports would try to obtain the same customer. The ports cooperation, their synchronized specialization and the creation of synergies are thus a logical option for the future. Both individual and shared catchment areas form the final catchment area, which focuses only on the relevant territory within the Slovak Republic. The attempt for the penetration of foreign markets in Austria or Hungary would probably be difficult and unsuccessful due to the well-established positions of the ports of Vienna and Komárom.

The current orientation of the Port Bratislava in the realm of freight transport is strongly export-oriented and within the transshipment there is dominated the material like iron ore pellets, sinter ore, fertilizers, diesel, and gasoline. Other commodities are currently marginal. This status is the result of adaptation to the difficult water transport situation in the past decades and the presence of one dominant port operator. Its high specialization and non-standard port operation model originating in problematic legal-property relations prevent the effective development of other transshipment activities considered in the analysis.

In the future, more dynamic development of transshipment activities and their greater diversification are expected. A majority share of transshipment performance remains the same in the currently prevailing bulk goods segments for the metallurgical, steel and petrochemical industries, however, a higher potential in previously underdeveloped segments such as break-bulk goods in the form of cars or container transport is also identified.

Passenger water transport in the port is an area that currently shows higher potential growth but at the same time, its output still stays behind competing passenger ports located near Bratislava. This represents a highly urgent need to solve the current situation in the passenger port which achieves its capacity limits during the peak season. If the passenger port capacity is not tackled, it is probable that despite the dynamic development of this mode of transport, the port will not be able to exploit the resulting development opportunities.

The importance of the cruise segment is based on the fact that the cruise ships currently transit up to three-quarters of the total number of passengers carried in the Port Bratislava. The expected growth in the number of cruise ship passengers is also

supported by the fact that the cruise ships become an increasingly attractive form of tourism. They combine adventure tourism with other active forms of relaxation. The opportunity that the port has not been able to exploit effectively yet is its location in a tourist area in close proximity to two international airports.

Besides the international tourism, there is an opportunity to increase the use of water transport by residents. It is assumed that if the Slovak consumers achieved the similar parametres of expenditures for passenger water transport services as they are in neighbouring Central European countries, it would lead to a massive expansion of the current level. Similarly, with conservative estimates, the planning launch of regular passenger water transport service in Bratislava region can lead to growing number of passengers currently transported by inland water transport in Slovakia and this number can be 4 or 5 times higher. The majority of inland water transport is realized in the Port Bratislava.

The operation model of the Port Bratislava is based on the “Landlord” model whose current form is considered as unusual compared to the established one. The non-standard case arises from the fact that the port managerial activities are limited to the lease of land. Ownership, maintenance and the development of infrastructure are the responsibilities of a dominant operator. It is a paradoxical situation that complicates the port development and the diversification of port operators, because the infrastructure costs are largely irreversible investments. If the operator decides not to continue with the activities in the port, it is impossible (or rather economically inefficient) to allocate these investments to another location (e.g., rail tracks). Conversely, the operator refuses to make large investments in infrastructure if the land where the operations are realized is leased. It leads, on the one hand, to the obsolescence of port infrastructure without the operator's initiative to modernize it and on the other hand, to the landlord's inability to invest in infrastructure (seeing that the infrastructure does not belong to him).

In order to secure further development, the introduction of a full and comprehensive landlord model without such distortions is required. Landlord's activities will not only focus on the lease of land and locations but also on the lease of functional infrastructure. However, to achieve this full-scale landlord model, a settlement of the legal-property relations between VP, a.s. company (in the position of a landlord) and the current dominant operator is necessary. The non-standard distribution of ownership rights is caused by the partial privatization of the ports of Bratislava and Komárno in the past.

In terms of the Port Bratislava, it means a non-standard division of ownership rights between VP, a.s. company as the owner of the land and Slovenská plavba a prístavy (SPaP, a.s.) company, as a dominant operator and the owner of the fleet, infrastructure, and superstructure. The land on which the SPaP, a.s . operates is leased by a long-term fixed contract with VP, a.s. The agreement on the ownership and access to the infrastructure between these companies determines the future development or stagnation of the port.

According to the current valid city plan of Bratislava, the Zimný prístav location is considered to be a development area for water transport. Based on this, there is an opportunity to relocate cargo transshipment activities from the Zimný prístav basins to

another location. It would allow the new spatial arrangement of the cargo and passenger ports in the Port Bratislava.

In the area of cargo port development and its new spatial arrangement, the document proposes the concentration of several transshipment activities into the Pálenisko basin as an option with the greatest potential for the development of transshipment activities in the future with a higher degree of operational efficiency compared to the current performance. The most significant change is the relocation of the dry bulk cargo terminal to the Pálenisko basin to a position where this activity used to be performed in the past. This means a reduction in current transshipment capacity that is not used efficiently, while the new terminal location can be used for both current and estimated future volumes of dry bulk transshipment. However, at the same time, it maintains a sufficient capacity reserve for the future unforeseen fluctuations in the volume of transshipment. Another significant change resulting from the preferred development option is the use of the undeveloped part of the Pálenisko basin in order to create a new break-bulk cargo terminal. It can lead to a considerable growth of cargo transshipment in the future. The intermodal terminal is minimally used in regard to water transport. It primarily serves for transshipment of containers between other modes of transport (road and train). Therefore, the expected growth in demand for container transport on the Danube in the future can be accommodated with its current capacity. The existence of the Ro-Ro ramp in the Pálenisko basin (and its possible modernization) can satisfy the estimated future demand for car transshipment as it was pointed out in the demand analysis. However, the proposed changes require an agreement between the landlord and the dominant operator of the port and therefore, it appears to be implementation-intensive. On the basis of a long-term horizon, this cargo port layout represents an optimal spatial arrangement solution and based on the estimated increase in cargo port performance, it allows the development and diversification of transshipped goods. The Zimný prístav location still gives an opportunity for further development of the passenger water transport segment.

A free area of the Zimný prístav provides new opportunities for passenger water transport. It allows the transformation of the current cargo zone into a new sport and relaxation area and the necessary expansion of passenger port capacities in Staré Mesto location. The preferred option of passenger port development suggests the reconstruction of the current port locations in Staré Mesto and mainly the construction of a passenger terminal in the northern basin of the Zimný prístav location. This would increase the capacity of the passengers carried in the passenger port and at the same time free the landing places in Staré Mesto, which would reach its maximum capacity once the planned regular passenger water transport service in Bratislava region would be launched. At the same time, the allocation of a passenger terminal in this area represents an opportunity for the development of new transport services like the starting or ending point of cruises that have higher impacts on the local economy than only a short stop at the Staré Mesto port. The southern pool in the Zimný prístav location is used for the construction of the city marina, water sports centre and sport boating. Currently, this area is not represented in the port and with the expected increase in the standard of living of the population, it allows better utilization of water area in close proximity to the city as it is assumed in the city plan. Furthermore, the operation of this type of activity would create a new source of income for the VP, a.s.

The development of the right side of the Danube in the form of announced private initiatives such as the LIDO marina or the AUŠPIC marina, which should be primarily used for sport and recreational boating, is also suggested.

Implementation of the proposed measures in a cargo and passenger port will lead to the transformation of the port into a complex and modern port operating with greater efficiency. Moreover, it will also represent an attractive place for foreign tourists arriving in or departing from Bratislava by boat, as well as for local residents who will find there an active form of relaxation and a high level of services.

Proposal for next steps:

1: Settlement of port property relations

2: Standard Landlord model of operation

3: Implementation of the suggested port development options

5.2 Operational & Business Development Plan Komarno - Slovakia

As opportunities for further development of the Danube side, it is possible that, in addition to the locations for the cargo port, will be also build 2 positions for passenger shipping with facilities for tourists and users, including city visitors, will be built, and in the western pool there will be a space for small and tourist vessels with the possibility of renting premises in the refurbished storage facilities by service providers for this type of clients.

The basis will be to carry out a build-up study and procure a spatial decision for all the modifications under consideration and to implement them as needed on an immediate basis. It is desirable for new port facilities to be prepared in such a way that the city's function can be blended with port function. Emphasis must be placed on the handling of goods by means of powered mechanisms and, in the case of loose substrates, with minimum transshipment, along with other dust control measures.

Proposal for next steps:

1. The necessary superstructure legally located on the land of VP, a. s. in the port of Komárno needs to be purchased from the individual owners. It concerns, particularly, a part of the railway siding.
2. To revise all purchased assets and divide them into necessary and unnecessary, also with regard to the feasibility study results. To offer unnecessary assets for sale.
3. On the basis of the feasibility study, to order the documentation for the location of new buildings within the port for variant 5 or for the entire area of Komárno port and to ensure the issuance of a decision on the location of the buildings.

4. To provide building permits for each stage of construction in a step-by-step approach to be proposed in the feasibility study.
5. From the beginning, to monitor and gradually buy lands in the locality Veľký Harčáš.

Placing into the legal framework of the SR

The proposed variant of the technical solution and the operation model is fully in accordance with the law of the Slovak Republic.

VP, a.s. need to settle or terminate lease contracts with existing lessees in the cargo-freight port. This can be achieved by these options:

- financial settlement
- court decision
- expropriation

Possible contacts with Hungary

On the right bank of the Danube, in the City of Komárom, there is a transshipment station used for direct transshipment water – road or railway. Construction and development of Komárno port will not in any way affect the flow of the Danube. Thanks to the bridge being built (and existing one) across the Danube, ports can co-operate. The anticipated volume of goods for Komárno port does not expect any goods to be imported from the territory of Hungary.

Environmental impacts

A detailed determination of the impacts of the chosen variant will only be possible after the current conditions have been verified in the affected area and after the necessary surveys and evaluations.

5.3 Port Development Plan Dunaujvaros - Hungary

Port of Dunaújváros is a public port in the administrative area of Dunaújváros, located at the right riverside of the Danube at section 1578.600 km, suitable for managing large ships. In terms of its construction, it is an inland basin port, and its operation is public. Number of ship berths (continuous in operation) is 6 (95 m each), length of its quays is 563 m, its total land area is 52,000 m2. Water surface used by the port is 381,000 m2.

The port is meeting domestic and international transport needs related to road, rail, river and sea transport, as it has road, rail and water connections, and can handle all kinds of goods arriving at the port by any means of transport.

The city of Dunaújváros is located between the Danube and national highway no. 6. The road connections of the city all run towards highway no. 6., but the M6 and M8 motorways are also both within 3 km distance. The highway no. 62 provides connection

to the county capital Székesfehérvár. Budapest is accessible by the motorway M6 (55 kms) and the highway no. 6. With the handover of the Pentele Danube bridge, which is part of the M8 motorway, road connection was also established to the areas towards Tisza River and the eastern part of Hungary.

The railway connection of Dunaújváros is provided by the „MÁV" Hungarian State Railway's Pusztaszabolcs – Dunaújváros-Paks railway line No. 42. The single-track railway line is electrified up to Dunaújváros. This line is connected to the Mezőfalva-Rétszilas railway line No. 43, which is actually a continuation of line 42 in the direction of Rétszilas. The industrial track running to the Danube Ironworks and the port is connected to the railway line No. 42 at the Dunaújváros railway station in the western part of the city.

By waterway, the Port of Dunaújváros can be approached on the Rhine-Danube Corridor, which is part of the TEN-T network.

The main activities of the Dunaújváros river port are the loading and unloading of goods transported via waterways, storage, maintenance and repair of port equipment, lifting machines and ships, and additional port services. The port is suitable for unloading both bulk and parcel goods from a ship to open railcars or road vehicles, as well as for loading goods from a road vehicle or open railway cars into a ship.

There are two owners of the port territory: ISD DUNAFERR Zrt. (48,000 m2 area), and Centroport Kft. (3446 m2 area). They cooperate on the basis of a contract, taking into account the interests of both parties. The port authority is the same as the main port operator ISD DUNAFERR Dunai Vasmű Zrt..

When comparing the port to Port of Baja and Freeport Budapest we can conclude that Port of Dunaújváros is significantly smaller in size. Nevertheless, its lifting capacity is much better than that of Baja, almost equalling Freeport Budapest. With the development concerned, the storage capacity of the Port of Dunaújváros -that is by far the smallest now – is expected to approach that of Port of Baja.

The port's storage area is 1,200 m2 as of now. Nevertheless, the protection of goods, the increased quality demands, from the weather independent loading of goods, the international expectations, the more efficient use of available capacity makes it necessary to build a roofed loading station and warehouse with cranes in the port area. This development will make it necessary to conduct some transformation on the berths.

Besides, some related developments are also to be implemented in the framework of this project, such as the modification of the shore wall, removal and upgrading of cranes, development of the adjusting railway, and establishing an inner traffic engineering network.

Furthermore, installation of a solar panel system on a surface area of approx. 5,000 m2 (700 kW capacity) on the roofing of the new warehouse is also planned, that would make a significant contribution to the increase of green energy production, thus the transition to a low carbon society.

The area of the planned roofed loading station and warehouse with cranes is approximately 6,000 m2. Besides, a roofed loading station with an area of

approximately 3150 m2 is also planned to be built. At least 3000 m2 of this must be useful storage space. The majority of the remaining warehouse space is taken by the space requirement of the roads and rails needed for loading.

Planned net cost of the development is 25.2 million EUR. The most likely resource for the development is IKOP Plusz (Integrated Transport Development Operative Program Plus) in the framework of the 2021-27 EU planning, as it is the biggest (EU) financial resource for transport related developments, including port investments.

This project directly supports private businesses in the port hinterland, as improved services of the port provide them better logistic solutions. As the services of the port can be used by any businesses, we expect an increase in the number of business entities using the port services. Besides, the improved service level is likely to attract new industrial companies to the nearby area by providing better logistic solutions.

5.4 Port Development Plan Ennshafen - Austria

The Ennshafen port is the newest public port in Austria. It links the main transport routes for international cargo, the Rhine-Main-Danube waterway from west to east and the north-south railway that extends from the North Sea to the Adriatic. Within the Trans-European Transport Network (TEN-T) of waterways, the Ennshafen port is defined as one of two Austrian core nodes in the Rhine-Danube Corridor.

With direct access to motorways and main roads, the Ennshafen port offers ideal road links. Waterways, rail and road connections empower the port as a transport hub for goods and commodities in international logistics operations and for local businesses.

The Ennshafen port is situated in Austria´s strongest industrial region. Serving the largest continuous industrial area on the Upper Danube, the Ennshafen port is a trimodal transshipment centre spanning 3.5 million m2; by water, it connects the business parks of Enns and Ennsdorf to a powerful economic hub.

Located in the heart of Europe, the port is ideally linked to the most important inland ports and sea ports of the continent. The Ennshafen port is a centre of service, logistics and excellence in transshipment and warehousing. Its high-performance infrastructure, roads, quays and railway systems provide companies with neutral access to various modes of transportation. With a quayside extending some 2,500 metres, cargo handling conditions are ideal. Services such as transshipment, heavy cargo transshipment, warehousing, packaging and bunkering are provided by operators located in the Ennshafen port.

As a multi-modal logistic hub, the Container Terminal Enns is a major hinterland terminal for the big sea ports. Spanning some 245,000 m2 and with a capacity of 500,000 twenty-foot equivalent units (TEU), it has some of the most modern transshipment infrastructure in Austria. Block train rail connections, modern gantry cranes and a full range of services ensure optimum container handling.

The roll-on/roll-off terminal offers best-in-class service for heavy lift and project cargo; vehicles and agricultural machines can drive straight on and off vessels, with no need for additional facilities. At the Ennshafen port, special cranes are used to transfer high and heavy goods to heavy duty quays.

The Ennshafen port benefits from a central location in Austria and indeed Europe, with direct access to the Trans-European Transport Network. The port guarantees idea conditions thanks to an efficient infrastructure, roads, quays and railway systems. Upper Austria and the western part of Lower Austria are among the country´s strongest industrial and economic areas, with a key focus on exports. The region also offers a professionally qualified population and high levels of affluence, making it a place to do successful business and live well.

Even the Ennshafen port has got very good development since its founding in 1976, there is need to look into the future and investigate the next upcoming developments and needs for improvement to couple with the upcoming challenges of the next decades. For this reason the current Port Development Plan („PDP“) was elaborated within the framework of DIONYSUS project. As the Ennshafen port is highly developed and has done a lot of investments in basic infrastructure like railways or quays, the current PDP will give the focus on a broad check of items for improvement both in the sense of fulfilling of new upcoming obligations regarding decarbonisation of European business and continuous improvement in special topics and in general.

Therefore, a broad field of action fields have been checked and investigated and screened for needs of future action and developments. A broad field of investigation was given to the involvement of and reflection with target group partners to bring in a broad external sight on the needs of development.

- International framework of regulations and strategies & programmes
- National framework of regulations and strategies & programmes
- Economic situation and market developments
- Clean fuels and green economy, environmental and energy KPIs, CO2-neutrality
- Infrastructure measures, equipment, facilities, digitalisation, automatisation
- hinterland connections, port accessibility by rail and road
- utilities and other services
- recycling and production of green energy
- improvement of water-related items (ship service unit, quay precipitation water, diffuse emissions, surface coverage of port areas, sewer system, ...)
- noise reduction measures (where applicable)
- neighbourhood management system
- business settlement within the port area or nearby areas (industrial development)
- environmental certificates (ISO, EMAS, ...)
- overall financial planning for all predicted/identified investments

The new PDP was aligned along the strategic approach „Ennshafen4.clean“ in compliance with the existing vision and strategy documents of the port and will now be further integrated into the management processes. Thus, a sound development of the port which may fulfill the upcoming challenges of the next decades 2030-2050 shall be supported by this integrated approach and the new PDP will give a systematic check of upcoming investment needs for the port. The new PDP is grouped in the following action fields:

1) Low Carbon Port

a) ongoing

- shore-side electricity
- debottlenecking for railway business
- LNG/CNG developments in the port
- CO2-neutrality plan
- energy cooperation within the port

b) new

- efuels for vessels
- upcoming developments regarding Hydrogen within the port and other power2x applications
- greater implementations of photovoltaics within the port
- renewal of heating system in port building
- sustainable „gas-hub“ situated in the port
- green electricity and new applications of electricity within the port

2) Cargo & Core Infrastructure (increasing of transshipment, new cargo, core infrastructure parts of the port, truck-train-ship-shifting, containerisation of goods)

a) ongoing

- railway debottlenecking
- new concept for Kai21-part within the port
- enhancing the transshipment of agro-products in the Ennshafen port
- optimization work of several smaller port areas (e.g. area around Kai13)
- transshipment of waste and recycling products
- bi-functional system of vessel and rail

b) new

- investigation of options regarding upcoming changes in transshipment („boxes“)

- transshipment of new energy carrier in the port
- pusher within the port – option check
- enhancing of rail-system usage for smaller users
- transshipment of trailers
- new (green) equipment for transshipment processes
- further development of „Seveso-areal“ within the port

3) Digitalisation (digitalisation of core port processes and related processes)

a) ongoing

- PMS installation (port management system)
- preparation for enlargement into a PCS (port community system)
- plannings for new integrated camera system and further port process integration

b) new

- technical support for hybride-meeting equipment
- investigations regarding installment of a „port-card“

4) General topics and basic infrastructure (cross-sectional items and basic elements with the port areal)

a) ongoing

- reliability of waterway transport
- roads and truck traffic within the port
- external road connections (improvements)
- external rail connection (improvements)
- additional free space for growing of the areal
- port certification (environmental standards)
- strategic maintenance and setup of financial reserve system for port infrastructure works
- e-mobility infrastructure within the port
- utilities (renewals and unbundling)
- neighbourhood management
- organisational developments (staff)
- knowledge build for projects

b) new

- waste water treatment of port business
- lack of truck drivers and other specialists

- protection system for port areal
- public transport within the port
- modernisation and new applications for two floors within the port building

The new PDP will be an integrated part of the yearly management cycle and will be investigated for necessary updates within the yearly management review steps.

5.5 Port Development Plan Calarasi - Romania

Călărași port is located at km 94 Borcea branch, on the left bank.

The first port facility in the area dates back to the 1700s. It was used for grain trade that was transported to Istanbul due to the status of the Romanian principalities vis-à-vis the Ottoman Empire.

By Royal Decree no. 706 of March 21, 1879, the Port of Călărași is officially established and dredging works begin at the mouth of the Borcea branch, which will allow larger tonnage vessels to dock in the port. A 91 m high wooden quay and a lower wooden quay, 222 m long, are being built.

Another important moment for the development of the Port of Călărași and port activity was the commissioning of the railway Slobozia - Călărași line, with the terminus Station in the Port. On November 17, 1886, the first train arrived at the Station in Port.

Throughout that period, the main assortment of goods was cereals.

The area of the port territory is 81,505 square meters.

The total length of the walled quays/vertical/natural embankment is 828 m, of which:

- 1 operative berths of 100 ml for passengers;
- 2 berths of 250 ml for cargo operation;
- 1 berth of 100 ml for grain operation;
- 1 waiting berth of 200 ml.

The operating capacity of the Calarasi port is 450,000 tons/year.

Port connections:

- Road: via DN 21 has access to A3 highway Bucharest – Constanta DN 3 Bucharest – Calarasi

- Railway: does not exist.

Two very old gantry crane (one type Bocșa of 16 ft and one of 5 ft) are installed in the port.

The port does not have systems for supplying ships with electricity and drinking water. There is no port lighting system at night.

The port infrastructure is damaged in the most part of it.

The revetment has many cracks, both slopes (below and above the platform) being invaded by vegetation.

Due to the lowering of the water level, the foundation of the quay reached above the water level and there is a risk of erosion of the material under the concrete body at the elevations and velocities of the water in the periods with high flow.

The running path of the cranes is partially blocked by deposits, being necessary to be cleaned and checked it technical condition (settlement, rust, missing segments).

Utilities in the port, fresh water network (with hydrants) and electricity practically do not exist anymore.

At the entrance from the Danube on the Borcea branch there are large deposits of alluvium, approx. 100,000.00 cm which prevents the access of ships to the port for long periods of time.

The last infrastructure maintenance works were carried out in 1995.

From an organizational point of view, the port infrastructure (port land, quays, platforms) is state property and are administered by the River Danube Ports Administration (APDF Giurgiu).

In accordance with the Romanian legislation, the global strategy regarding the port infrastructure development that belongs to the public domain of the state is elaborated by the Ministry of Transport and Infrastructure.

The implementation of this strategy, which includes investment projects as well as infrastructure maintenance and modernization works, is the responsibility of the APDF Giurgiu Investment projects and port infrastructure modernization works are done on the basis of a Feasibility Study developed by the infrastructure administration.

At the moment, for the financing of infrastructure projects, the administrators of this infrastructure can use several financial instruments:

- Large Infrastructure Operational Program 2014-2020 – European funds
  In 2014, the Large Infrastructure Operational Program (POIM) was approved. The POIM strategy is oriented towards the objectives of the Europe 2020 Strategy, focusing on sustainable growth by promoting an economy based on low carbon consumption through energy efficiency measures and the promotion of green energy, as well as by promoting environmentally friendly modes of transport and a more efficient use of resources;
- CEF - on 13 September 2022 was published the 2022 CEF transport call.
  The deadline is 18 January 2023.The 2022 CEF Transport call for proposals makes EUR 5.12 billion available for projects targeting new upgraded and improved European transport infrastructure;
- The Transport Operational Program (POT) will be approved and can be used starting from January 2023

> The general objective of the POT 2021-2027 is to ensure the realization of the investments that meet the development needs of Romania identified in the Partnership Agreement 2021-2027 in accordance with the Country Report and the Country Specific Recommendations, but also with the strategy developed by Romania for the recovery in sustainable way of the gaps in the development of the transport infrastructure, respectively the Investment Plan for the development of the transport infrastructure for the period 2020-2030 (PI).

Currently APDF Giurgiu has signed financing contracts with the Ministry of Transport and Infrastructure through the POIM program for the modernization of a number of only three ports under its administration.

In 2022, the Romanian Ministry of Transport and Infrastructure elaborated the "Investment Program for the development of transport infrastructure in the period 2021-2030. In this program mentioned above, it is provided among others that river ports will be systematized so as to create a primary network of ports whose service area (hinterland) corresponds to an economic potential, as well as a secondary network of ports that ensure the accessibility of specialized goods.

The ports on the primary network are: Constanța, Sulina, Tulcea, Galați, Brăila, Cernavodă, Călăraşi, Oltenița, Giurgiu, Corabia, Calafat, Dr. Tr. Severin, Orșova, Moldova Noua.

Considering the above, it is expected that APDF Giurgiu will prepare a Feasibility Study regarding the development of Călărași port, following that the financing of the works will be done through the POT program.

The main objectives of the project should be:

- dredging the entrance on the Borcea branch;
- the consolidation and modernization of hydrotechnical constructions;
- the implementation of water and electricity networks, including ship supply systems.

As part of the WT 4 activity, a study was developed regarding the traffic evolution of the main categories of goods (cereals, chemical products, construction materials, metal products) in the Călărași port area and the volumes of goods that could be taken through the port over a horizon were estimated of time until 2050.

In the analysis of the current situation, the following information regarding freight transport flows for the base year 2019 was taken into account:

- The database of the Port of Constanta for the year 2019;
- Romania's imports/exports with EU and non-EU countries, in tons/year, by commodity category, Comext 2019;
- Romanian imports/exports by county, in Euros, by product category, 2019;
- RNTM – Romania's National Transport Masterplan.

It is estimated that, in the case of the implementation of an infrastructure modernization project through the port of Călărași, a volume of cargo between 640,000.00 tons in 2024 and 1.21 million tons in 2050 could be attracted.

5.6 Port Development Plan Turnu-Magurele - Romania

Turnu Măgurele Port is located on the left bank of the Danube at Km 597. The port is located at a distance of 5 km from the town of Turnu Măgurele and, in terms of operating capacity, it is the fourth river port in Romania (the ports of Braila, Galati, Tulcea are not taken into account)

In the place where the port is located today, it was a crossing point and also of commercial transactions from ancient times. In 1910, Turnu Măgurele port was considered the fourth Romanian port on the Danube. The stone quay of the port was built in 1906.

In the 1920s, an imposing silo for those times was built according to the plans of the engineer Anghel Saligni. In 1892, the railway between the city and the port was built. With the construction of the Chemical Fertilizer Plant in 1960, the port experienced a spectacular development.

A system of above-ground conveyor belts was installed and runways for gantry cranes were built.

In the Turnu Măgurele port area, the Turnu Măgurele – Nikopol ferry border crossing point between Romania and the Republic of Bulgaria, operational since April 2010, is set up.

The port territory has an area of 8.2 ha and the length of the quay front is about 924 m.

Ships of 1500 and 2000 tons can be moored and operated at the wharf, the ship's access is made directly from the Danube.

The port is connected to the national road network (DN 51 a, DN 54, DN 65A).

In the past, the port was connected to the national railway network, a part of the operated goods was transported by railway. After 1990, the railway connection of the port with the national railway network was closed.

Four gantry cranes (2 x 5 ft and 2 x 16 ft) are installed in the port, but are not functional.

The port does not have systems for supplying ships with electricity and drinking water. There is no port lighting system at night.

The port infrastructure is damaged for the most part. The quay has sectors where the crowning is destroyed and sectors where the crowning is collapsed

The port platform is made of cubic stone. It is 90% destroyed and in certain sectors there are very large settlements.

The access road to the port is in a critical condition. There is only one functional building in the port, that of the Port Authority.

The last infrastructure maintenance works were carried out in 1989.

From an organizational point of view, the port infrastructure (port land, quays, platforms) is state property and are administered by the local authority (Turnu Măgurele City Hall).

In accordance with the Romanian legislation, the global strategy regarding the port infrastructure development that belongs to the public domain of the state is elaborated by the Ministry of Transport and Infrastructure.

The implementation of this strategy, which includes investment projects as well as infrastructure maintenance and modernization works, is the responsibility of the administrators of this infrastructure. Investment projects and port infrastructure modernization works are done on the basis of a Feasibility Study developed by the infrastructure administrators.

Regarding the development of the port superstructure and the carrying out of port operations of loading, unloading and stacking of goods, it is up to private economic operators.

The private operators carry out their activity on the basis of a lease/concession contract of the infrastructure concluded with the port administration.

At the moment, for the financing of infrastructure projects, the administrators of this infrastructure can use several financial instruments:

- Large Infrastructure Operational Program 2014-2020 – European funds
  In 2014, the Large Infrastructure Operational Program (POIM) was approved. The POIM strategy is oriented towards the objectives of the Europe 2020 Strategy, focusing on sustainable growth by promoting an economy based on low carbon consumption through energy efficiency measures and the promotion of green energy, as well as by promoting environmentally friendly modes of transport and a more efficient use of resources.
- CEF - on 13 September 2022 was published the 2022 CEF transport call.
  The deadline is 18 January 2023.The 2022 CEF Transport call for proposals makes EUR 5.12 billion available for projects targeting new upgraded and improved European transport infrastructure
- The Transport Operational Program (POT) will be approved and can be used starting from January 2023
  The general objective of the POT 2021-2027 is to ensure the realization of the investments that meet the development needs of Romania identified in the Partnership Agreement 2021-2027 in accordance with the Country Report and the Country Specific Recommendations, but also with the strategy developed by Romania for the recovery in sustainable way of the gaps in the development of the transport infrastructure, respectively the Investment Plan for the development of the transport infrastructure for the period 2020-2030 (PI).

In 2021, the City Hall of Turnu Măgurele submitted to the Ministry of Transport and Infrastructure a request for the allocation of European funds for the modernization of the infrastructure in the port of Turnu Măgurele.

The request was approved and a financing contract was signed through the POIM program.

The works will start in December 2022 and be completed in 2023.

The main objectives of the project are:

- Modernization of hydrotechnical constructions - walled wharves - installation of new systems for tying ships to the wharf;
- Rehabilitation of the port platform;
- Introduction of the water and sewage system consisting of
  - Drinking water network in the port;
  - Installation of water supply for ships;
  - Modernization of the water supply installation of the firefighting system;
  - Rainwater drainage system for the quay precipitation water.
- Modernization of the electricity supply system:
  - Modernization of the port electricity supply system;
  - Installation of the lighting systems of the port platforms, the access road to the port and the quay area; the lighting systems will consist of poles with a height between 8 and 12 m powered by solar batteries and with the lighting source based on LEDs;
  - 9 sockets will be installed to supply the ships with electrical energy;
  - Installation of a 5kwp photovoltaic system

5.7 Port Development Plan Orsova - Romania

The port is located on the left bank of the bay formed at the confluence of the Cerna River with the Danube, at Km 954, (reservoir Iron Gates 1) in the immediate vicinity of the city of Orşova.

Orşova is historically dated since the time of the Roman Empire, being known as Dierna.

The municipality of Orşova can be considered an old city full of history, but at the same time, Orşova is a newly built town in the years (1966-1971). The old city of Orşova disappeared under the waters of the Danube, due the construction of the Iron Gates I and II dams.

The current city of Orşova is located on the shore of the reservoir of the Iron Gates 1 dam.

The surface of the port territory is 50,439.54 square meters.

The length of the walled quays/vertical/natural shore is 1,060.00 m of which operative front 600 m:

- 100 m - 1 passenger berths;
- 500 m - 5 berths operating goods at the vertical quay.

Four very old gantry cranes (two type Bocșa of 16 ft and two of 5 ft) are installed in the port.

Operating capacity: 1,200,000 to/year

Fresh water supply: missing

Onshore power supply: missing

Port connections:
- Road: DN 6/ E 94 Bucharest - Orşova (364 Km) - Timișoara (194 Km)
  DN 57 Orşova - Old Moldova (111 km)
- Railroad: Bucureşti - Orşova (347 Km) - Timişoara (136 Km)

The port infrastructure – the vertical quay and the platform - is damaged in the most part.

The last infrastructure maintenance works were carried out in 1997.

From an organizational point of view, the port infrastructure (port land, quays, platforms) is state property and is administered by the APDF Giurgiu.

In accordance with the Romanian legislation, the global strategy regarding the port infrastructure development that belongs to the public domain of the state is elaborated by the Romanian Ministry of Transport and Infrastructure.

The implementation of this strategy, which includes investment projects as well as infrastructure maintenance and modernization works, is the responsibility of the APDF Giurgiu Investment projects and port infrastructure modernization works are done on the basis of a Feasibility Study developed by the infrastructure administration.

At the moment, for the financing of infrastructure projects, the administrators of this infrastructure can use several financial instruments:

- Large Infrastructure Operational Program 2014-2020 – European funds
  In 2014, the Large Infrastructure Operational Program (POIM) was approved. The POIM strategy is oriented towards the objectives of the Europe 2020 Strategy, focusing on sustainable growth by promoting an economy based on low carbon consumption through energy efficiency measures and the promotion of green energy, as well as by promoting environmentally friendly modes of transport and a more efficient use of resources.
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  The general objective of the POT 2021-2027 is to ensure the realization of the investments that meet the development needs of Romania identified in the Partnership Agreement 2021-2027 in accordance with the Country Report and the Country Specific Recommendations, but also with the strategy developed by Romania for the recovery in sustainable way of the gaps in the development of the transport infrastructure, respectively the Investment Plan for the development of the transport infrastructure for the period 2020-2030 (PI).

Currently APDF Giurgiu has signed financing contracts with the Ministry of Transport and Infrastructure through the POIM program for the modernization of a number of three ports under its administration.

In 2022, the Romanian Ministry of Transport and Infrastructure elaborated the "Investment Program for the development of transport infrastructure in the period 2021-2030. In this program mentioned above, it is provided among others that river ports will be systematized so as to create a primary network of ports whose service area (hinterland) corresponds to an economic potential, as well as a secondary network of ports that ensure the accessibility of specialized goods.

The ports on the primary network are: Constanța, Sulina, Tulcea, Galati, Brăila, Cernavodă, Călăraşi, Oltenița, Giurgiu, Corabia, Calafat, Dr. Tr. Severin, Orșova, Moldova Noua.

Considering the above, it is expected that APDF Giurgiu will prepare a Feasibility Study regarding the development of Orşova port, following that the financing of the works will be done through the POT program.

The main objectives of the project should be:

- the modernization of hydrotechnical constructions and the port platform;
- the modernization of the water and electricity networks, including ship supply systems;
- the modernization of the internal port railway.

As part of the WT 4 activity, a study was developed regarding the traffic evolution of the main categories of goods (cereals, chemical products, construction materials, metal products) in the Orşova port area and the volumes of goods that could be taken through the port over a horizon were estimated of time until 2050.

In the analysis of the current situation, the following information regarding freight transport flows for the base year 2019 was taken into account:

- The database of the Port of Constanta for the year 2019;

- Romania's imports/exports with EU and non-EU countries, in tons/year, by commodity category, Comext 2019
- Romanian imports/exports by county, in Euros, by product category, 2019
- MNT – Romania's National Transport Masterplan.

It is estimated that, in the case of the implementation of an infrastructure modernization project through the port of Orşova, a volume of cargo between 1,22 million tons in 2024 and 2,32 million tons in 2050 could be attracted.

5.8 Port Development Plan Vukovar - Croatia

The Port of Vukovar Development Plan is a strategic document developed to facilitate the integration of the port into multi/intermodal transport chains and to improve its transport connections.

The plan was prepared in a way that takes into account the conclusions of previously conducted analyses and studies and capitalizes on the results achieved in DTP projects, such as DBS Gateway and DAPhNE, as well as TEN-T/CEF and nationally funded projects through operational programmes.

When preparing the plan, national and regional economic strategies and regional development plans of related areas were taken into account, in full alignment with the long-term investment strategies and plans. Particular emphasis has been placed on increasing energy efficiency and environmental sustainability.

The Port of Vukovar Development Plan has been developed to be the basis for future investment decisions and a central element of the annual SWOT analyses and budget processes of the port of Vukovar.

The port of Vukovar was founded in 1960. It is located at 1.335 km downstream of the Danube River, on the right bank of the coast, and its activity is mainly related to the transshipment of goods in export, import and transit. The favourable position of the port in relation to the Danube River nut enables normal operation throughout the year regardless of the water level of the river, in such a way that even at the lowest water level of the Danube port can be normally operated.

During the Homeland War (from 1991 to 1995) the infrastructure and suprastructure of the port was completely destroyed, and the entire equipment was alienated. For this reason, the operation of the port was disabled during this period.

In the process of peaceful reintegration, the port reconstruction process was launched in 1997. In the following years, the Government of the Republic of Croatia financed

various projects for the purpose of equipment procurement and reconstruction of existing capacities.

The long-standing recession of the last decade has affected the Port's operations and the appearance of other operators and sources of raw materials. Traditional bulk traffic (coal, cereals and iron ore) has decreased significantly, while coal transshipment has increased significantly.

The share of general cargoes in the total transshipment has significantly increased and today in the port there is a bigger emphasis on the transshipment of general cargoes.

Using its potentials, combined with its strategic development objectives, its position, the nature and scope of its activities, the port seeks to attract logistics and manufacturing companies, thus creating the preconditions for exploiting the benefits of multimodality and intermodality.

The core values of the port of Vukovar are aligned with the common core values of the ports of the Danube region, which are focused on excellence and commitment to growth and serving communities by supporting supply chains and economic growth.

The area of the port of Vukovar is managed by the Port Authority Vukovar, while port activities are carried out on the basis of concession contracts with interested operators, based on a previously conducted public tender. The concessionaires directly and indirectly generate their revenues in the port area, thus generating a multiplier effect on the entire national economy.

In the previous period, the Port Authority Vukovar has made significant efforts to develop port infrastructure, with many investments ensured from EU funds, especially for the development of passenger transport infrastructure.

The potential of the port of Vukovar for the realization of cargo traffic is very big, thanks to the position of the port on the Danube River and its connection to the railway and road network. The main constraint is the impossibility of expanding the port, which is conditioned by a spatial constraint, which poses a challenge in cargo manipulation.

Technical facilities and equipment are regularly maintained, however, it should be pointed out that the technology currently used is outdated and should be replaced with a newer one in due course, which will enable bigger activity and development of the port of Vukovar.

For this reason, investments are necessary for enabling the expansion of the port area and increasing capacity in a way that will be adequate for the needs of cargo transport.

Below are the investments in the area of the port of Vukovar and the timeframe for their realization:

Planned project/ investment	Indicative duration and implementation period	Year										
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Construction of a vertical coast in the port of Vukovar	102 months											
Construction of a terminal for the disposal of waste from vessels	48 months											
Construction of the passenger pier Vučedol	36 months											
Expansion of the pier for passenger ships in Vukovar	60 months											
Construction of communal and passenger pier on the Island of Sports in Vukovar	24 months											
Construction of smaller piers for local and tourist ships	48 months											
Project for the construction of a communal pier in Batina	12 months											
Construction of communal connections for the supply of alternative fuels	36 months											
Construction of basic infrastructure in the area of Borovo	120 months											
Construction of office building	24 months											
Construction of biomass terminals	36 months											

Table 3: Investments in the area of the port of Vukovar

The indicative financing plan, six projects are planned to be financed through the state budget, with co-financing from EU funds, while the financing of the project of expansion of the pier in Vukovar and the construction of the pier in Batina is foreseen exclusively from the state budget, i.e. from the Port Authority's own revenues.

Among these projects, the construction of the vertical coast and other port facilities, the construction of the passenger pier Vučedol and the expansion of the pier for passenger ships in Vukovar stand out as strategic projects, i.e. priority projects.

In this context, it is possible to distinguish in particular the project of construction of the vertical coast and accompanying port structures, which together form a functional unit and the basis for performing port activities. The aforementioned expansion would extend the existing coast by 286 metres, which would enable the reception of ships with a load capacity predominantly of 1.000 tons and an additional 600.000 tons/year under the assumption of equipping the terminals with three cranes.

The land part of the port area is planned to be arranged in the form of two separate functional units, within which the construction of a bulk terminal and a general cargo terminal is envisaged.

It is envisaged that the bulk terminal occupies most space of the vertical coast, while the general cargo terminal should occupy a smaller part of the space. However, in kind, it will be possible for part of the horizontal operating surface to be used for manipulative purposes and cargo disposal according to the current need of the concessionaire, and the demarcation between the bulk and general cargo terminals will be flexible.

The realization of this investment is expected to increase transshipment as well as diversification of the transhipped goods, thus achieving progress on diversification and removal of seasonality, and the increase in transshipment figures will have a direct impact on the movement of total revenues, as well as the investment potential of the port.

It should also be pointed out that the planned investments in the development of the port of Vukovar will contribute to the realization of the mission, vision and policies defined in the strategic – planning documents.

Multiplicative effects are expected on the economic impact, job creation capacity and economic development of the wider region.

In the coming period, issues of energy efficiency, environmental and nature protection and climate change have a significant place in the general development of the European Union. For the transport sector, these issues are of extreme importance and in the coming ten-year period, it is necessary to undertake investments that will be directed towards the inland navigation sector, which, in addition to improving connectivity, safety, cohesion, transport efficiency, will also contribute to the realisation of the goals of decarbonisation, increasing the share of sustainable energy sources and alternative fuels and climate resilience.

Investments in port infrastructure, transport and technology aspects, strengthening human resources and information and communication technologies, while removing

procedural barriers, will result in the creation of a competitive, high-performance and modern port, fully integrated into the European transport network and functioning according to the principles of economic and environmental sustainability.

5.9 Port Development Plan Bulmarket Port Ruse - Bulgaria

Inland waterways consists of two equally important elements: links and nodes. For an efficient and reliable functioning of the transport network both elements must be equally developed and harmonized. For the purposes of transforming into efficient and reliable logistics node, infrastructure gaps need to be dealt with in a coordinated manner, which needs to be embedded in the resulting common strategy and Port development plan of PORT BULMARKET EAD.

PORT BULMARKET EAD offers its customers port activities and related commercial services, maintenance and other activities in accordance with the requirements of the Executive Agency "Port Administration", Bulgaria and Bulgarian legislation.

The main processes in the port are the provision of port services:

- handling of general cargo, bulk cargo and oil products.
- ship bunkering and supply of ships with electricity.
- cargo storage

Main port activities are fully in compliance with port mission and vision namely:

“To ensure the efficiency of the port infrastructure managed and the services provided by the Company, taking into account the balance of interests for the development of the port, the needs and expectations of customers, stakeholders and society as a whole.”

The above mission is implied by the responsibilities set out in the Maritime spaces, inland waterways and ports in the Republic of Bulgaria Act and the Statutes of the Company.

Achievement of this ambitious goal bears regional and national importance and is constantly followed by preparation and fulfilment of programmes for construction, reconstruction, rehabilitation, maintenance, development and management of the infrastructure of the Port Bulmarket.

“Through appropriate business planning, in compliance with national and international regulatory requirements, and taking into account the available human and material resources, contribute to the effective and efficient development of the transport system in the region.”

Bulgarian inland ports and Port Bulmarket are part of the national transport system. Their development is part of a wider national strategy.

The port is situated on the bank of the Danube River from km 484.150 to km 484.800 with total length of the coastline - 825 m. The total area of PORT BULMARKET EAD is 37,645 m², as are isolated 7 piers in 4 different terminals, together with the related infrastructure – 16,000 m. together with the developed railway infrastructure. A terminal for dangerous goods is built at the eastern part of the port (berth 7): propane - butane, crude oil, petroleum products (diesel, gas oil, oils), with an area of 3,177 m². The terminal has a floating overload facility with a pump-compressor station to carry out transloading operations. All possibilities for ship-shore transloading and vice versa are provided. The processing of petrol and petroleum products and other liquid cargoes is carried out by two pumps each at a rate of 100 m3/hour situated at the transloading facility. At berth No 6 is situated a second pontoon, which is registered in "Maritime Administration", Ruse, with statute of floating-transloading facility to process petroleum liquid cargoes, vegetable oil and biodiesel from specialized ships (tankers) in licensed customs warehouses and vice versa. PORT BULMARKET EAD is equipped with its own manoeuvre pusher 'STELLA', as well as substitution group for the provision of better and more comprehensive services to its clients. The overall manoeuvre operations of the vessels and servicing of crewless vessels in the region of the port and in particular of the other ports are carried out by the crew of manoeuvre vessel and the team of the substitution group. Powered pusher “STELLA” is certified for the handling of dangerous goods, which allows for the manoeuvre, servicing and provision of crewless vessels carrying dangerous goods. The port is connected through the industrial branch with the railway lines in Ruse and is the owner of this branch - 6 km from Ruse North railway station to Bulmarket railway station and 11 km tracks in the industrial area.

This plan is elaborated as a part of the joint development plans of the Danube ports for operating business models for quality and sustainable development of the region, as well as mechanisms for attracting investments in it. All project results will be in line with the specific transport objectives of the EU, TEN-T and the Cohesion Policy, turning DIONYSUS in a main tool for implementing the European Union Strategy for the Danube Region (EUSDR).

The Port Development Plan aims to stimulate reflection on the future development and sustainability of PORT BULMARKET EAD. It describes and analyses the current strains placed on port, and highlights areas of innovation and change that the port industry will have to tackle in the future. This topic has been chosen in light of current trends and the need to develop new strategies to keep port in the region competitive. As the DIONYSUS' is a continuation of project DAPhNE, it aims to solve the basic regional challenges in the planning and managing of port infrastructure, facilitate the integration of the Danube region towards the smart and sustainable multimodal transport chains. DIONYSUS will help with drafting policies for the development of the Danube transport corridor. The team analyses the existing railway and road infrastructure for access to Danube ports, marks the disadvantages in it and give recommendations for their elimination.

The plan response has the following key objectives:

- Identify opportunities to maximize the use of The Port.
- Improve the image and community perception of The Port.

- Conserve, protect and enhance heritage features and places.
- Improve gateways and entry points, open spaces and streetscapes to enhance the presentation, and accessible amenity for residents, businesses and visitors.
- Optimise economic development opportunities.
- Consider the impact of climate change on Port assets and the development and use of The Port.

Objectives of the plan

The objectives of this document are providing of purposeful and detailed guidelines by implementing of uniform policies for development of the transport corridors along the Danube. The document includes an extensive information about the development of PORT BULMARKET EAD, operational business model for quality and sustainable growth, as well as mechanisms of attracting investments. Moreover, GAP analysis and recommendations are carried out.

An important outcome of the project DIONYSUS is the elaboration of concrete Port Development Plans, including Port Bulmarket - in order to facilitate their integration into multi-/intermodal transport chains. The selection of the port was based on several decision criteria such as potential in terms of location, operation, transshipment infrastructure, hinterland connections as well as on factors such as regional economic development, freight flows outlook, business community profiles, etc. This Port Development Plan complies with National, Regional Economic Strategies and Regional Development Plans of the relevant areas and be deployed in line with the Business Strategies of the port owner. The plan contains particular development projects which have a real chance for execution until 2030.

The elaborated plan is integrated into the normal business papers of Port Bulmarket and prepared in a way that a yearly update is possible.

The Port Development Plan is a necessary tool, which could provide specific measures and directions for investment and improvement that could support EU transport connectivity aims. Its realization is in line with the implementation of Bulgaria's transport strategy 2020-2030 to be supported by the forthcoming multiannual financial framework of the EU.

In order to foster the company effectiveness, the management team of PORT BULMARKET EAD with expertise in the shipping and logistics business has a clear understanding of how the entire supply chain functions, including governmental aspects (customs, immigration, health, and so on), the operations of the private multimodal transportation sector, the required workforce, both technical and operative characteristics (including the maintenance of equipment and infrastructure), as well as aspects of the logistics business (costs, freight, employment, environment, community, etc.).

The Port Development Plan is intended to become a common guideline for all future development decisions of the Port Bulmarket and its users. Therefore, it aims to benefit

the company in carrying out its daily activities, as well as to determine its strategic development.

To achieve this result, outputs are as follows:

- Report - comprising all analyses, recommendations, etc.
- Project-Profiles - giving clear definition of Priority Projects.
- Map-folder - providing a number of different diagrams and maps.
- Assessment – overview of the current situation, assessment of the infrastructure condition and its suitability, impact on the environment, assessment of the legal framework, actual and future plans, market analysis, mission, vision and company's policies and their compliance with the current project.

The Plan consist status quo of European context with the relevance to the port with the main aim to analyse and give an overview on the current status of the transport system, identify the gaps related to the current cargo flows, identify possible solutions and issuing recommendations meant to overcome key bottlenecks in the transport system in particular in relation to the better use and integration of the Danube waterway system and to give recommendation of how these identified gaps could be closed and by whom.

PORT BULMARKET EAD is the largest private port for public transport on the Danube River in Bulgaria. It offers a wide range of services and a great deal of flexibility at the application of complex solutions that may satisfy even the most demanding clients.

The port is for public transport of regional importance, according to the Maritime Space, Inland Waterways and Ports of the Republic of Bulgaria Act. PORT BULMARKET EAD is a port operator and on the basis of Order No 3-76/05.03.2014 of the Maritime Administration Agency, Sofia city, it has been granted access to the market of port services - as a public transport port of regional importance Port Bulmarket, with a reg. code 421100.

It is situated on the bank of the Danube River from km 484.150 to km 484.800 with total length of the coastline - 825 m.

Hinterland connections (road, rail and IWW)

The Location of Ruse Municipality defines it as important national transport and commercial node with border crossing points on the Danube River. Ruse has both railway and river core transport nodes as per the classification of TEN-T. The distance by road from Ruse to Sofia is 331 km, to Varna – 203 km, to Plovdiv – 293 km, to Pleven – 153 km, to Veliko Tarnovo – 107 km and to Silistra – 124 km. The bridge on the Danube River between Bulgaria and Romania connecting the Romanian capital Bucharest stands at 72 km distance. There is railway connection to Bucharest, Kiev, Moscow, Budapest, Bratislava, Prague, Berlin, Warsaw, Sofia, Varna and Bourgas. The flow of vehicles through the bridge is constantly increasing.

Nearby ports:

- Port Ruse, -the biggest Bulgarian river port on the Danube;
- Port terminal Svishtov is the most southern Danube port and is located in the middle of the Bulgarian stretch of the river.
- Port Tutrakan - with local importance and zero cargo volumes over the last years.

Planned industrial and economic developments in the port's hinterland

Strategic plans for the region are focused on acute social problems on a national scale –demographic crisis, aging of the population, emigration of young educated and initiative people, insufficient qualification and weak employment of the population of working age. Plans for future development are based on strategic documents as Strategy Europe 2030, EU Strategy for the Danube Region, Project Ergo mater plan Ruse-Giurgiu, National Development Programme Bulgaria 2030, National strategy for regional development 2012-2022, etc. Some possible positive economic developments are connected with further growth of the Industrial zones, servicing cargo flows for the Romanian capital Bucharest and other Romanian cities, building new open and covered storage areas and establishing new offices of big logistic companies. Some plans were discussed during the years for exploiting the potential and investment in improvement of the railway link between Ruse and Varna. That would generate additional transit cargo flows.

Potential users

Potential users could be importers or companies for transit cargo. Port Bulmarket is working below capacity and could handle additional cargo flows for direct or indirect transshipment. Such cargo types could be vehicles and/ or new automobiles, ro-ro cargo, trailers, dangerous cargo. Lot of possibilities have been discussed for attracting potential users.

Key stakeholders

Main actors of the port sector are: Ministry of transport, information technologies and communication (MTITC), Bulgarian Ports Infrastructure Company (BPICo), Executive Agency Maritime administration (EAMA), Executive agency for exploration and maintenance of the Danube River (EAEMDR). These are the main state structures that participate directly in the development and define the conditions for development and operation of the maritime and river ports in Bulgaria. For the development of Bulgarian ports some other authorities are relevant, such as: Ministry of Finance (Customs), Ministry of Interior (Firefighting Authorities, Civil Protection Authorities), Ministry of Environment and Water (Basin directorates, Regional environment and water inspections), etc.

Competitors

In the region, PORT BULMARKET EAD has the following competitors: Port Complex Ruse AD, Giurgiu Port S.A, Zimnicea Harbor and Port of Oltenita, Lom port.

Target groups involved in the Port Development Plan

In the broad view, target groups are described as any individual or group having an interest in or being affected by the project and the Port Development Plan of PORT BULMARKET EAD .

- Internal players – top management, shareholders and employees.
- External players – different port organizations and supporting industries, terminal operators, stevedoring companies, carrier/terminal operators, other economic interested target group players and trading companies (importers and exporters)
- Public policy players - branch organizations, syndicates, civil society organizations, the press, the general public, Customs, State agencies, Ministries, public-private partnerships, Branch cameras and others affected by the port activity.

Port Infrastructure

The port owns seven berths, quay mechanization, equipped with five electric portal cranes and one pneumatic unit for grain discharging, rear and specialized mechanization and warehouses, detailed described in point 10 g. The terminal already disposes of facilities for the storage and refuelling of LNG-operated river vessels.

PORT BULMARKET EAD is equipped with its own manoeuvre pusher 'STELLA', as well as substitution group for the provision of better and more comprehensive services to its clients. The overall manoeuvre operations of the vessels and servicing of crewless vessels in the region of the port and in particular of the other ports are carried out by the crew of manoeuvre vessel and the team of the substitution group.

Port Bulmarket is also equipped with two specialized forklifts - Kalmar, one is 25-ton and the other 16-ton Kalmar. There is also a 40-ton bridge crane for handling general cargo under the "Customs warehousing" mode and two gantry cranes with a capacity of 20 tons (for general cargo) and 10 tons (for bulk).

The PORT BULMARKET EAD is connected through the industrial branch with the railway lines in Ruse and is the owner of this branch - 6 km from Ruse North railway station to Bulmarket railway station and 11 km tracks in the industrial area.

Most of the equipment is obsolete and there is a need for modernization to effectively run the port operations and to avoid work interruptions due to accidents and repairs.

A critical point for shipping is the water discharge of the Danube into the Bulgarian section, which is an average of 6000 m^3/s. This discharge has declined significantly in recent years and for the period 1982- 2002, it is 465 m^3/s at Novo Selo and 610 m^3/s at Silistra lower, which is 10%. This is due to global climate change on a world scale. Global warming has also led to an increase of the average water temperatures with 0.6° - 0.7°.

Another factor that influences the depth of the navigable part of the river is the sediment transport. After the construction of the Iron Gate Hydrotechnical Complexes,

the amount of sediment discharge decreased from 40 to 50%, which led to increased erosion processes and reduced depths in fairway. Generally, from a hydrological point of view, 2019 can be considered as a low water year. Throughout almost the whole period, water levels were below the average annual. There were 316 days with water levels below the average annual level and the average water level was 225 cm.

Clean fuels for green economy

The company has a great faith in the development of alternative fuels, which is why it became a member of an international consortium of 33 companies from 17 EU Member States at the beginning of 2013.

The consortium has applied for a common project "LNG Masterplan" to supply liquefied natural gas (LNG) in the Rhine, Main and Danube rivers in order to improve the environmental standards of water transport. The project is part of the European Transport Commission's major project 17 and is of the utmost importance for the whole of the European Union. The cost of the project is more than EUR 80 million and is supported unconditionally by the Commission.

PORT BULMARKET EAD has successfully participated in the LNG Masterplan project and has organization and availability of special facilities for reception and treatment of liquid and solid wastes. All actions are according to the plan for management of shipping wastes and ship cargo wastes.

As part of the above-mentioned project, in 2017 PORT BULMARKET EAD completed the construction of a liquefied natural gas (LNG) terminal with capacity of 1000 m3 (4 vertical cryogenic tanks of 250m3 each) on the coast of the Danube River in the territory of Port Bulmarket, in the town of Ruse. The same is to bunker river LNG vessels, to load heavy goods vehicles powered by LNG and to distribute to regions that do not have access to the gas pipe network in the country. In addition, the company purchased several “Iveco” heavy goods vehicles, powered by liquefied natural gas (LNG), as well as semi-trailers for LNG transport and storage. The total investment exceeds 4.5 million Euro.

Environmental and energy KPIs, CO2-situation

The development of shipping needs to be planned in the future, inter alia, in the context of adaptation to climate changes. Inland waterway transport can make a significant contribution to the achievement of environment protection goals, for example reduction of greenhouse gas emissions as set out in the Kyoto Protocol.

With regard to environmental impact, logistical activities in ports are not separated in a single legislative document. Ports are accepted as industrial points, similar to every production company and are obliged to comply with the national and international legislation in force. Policy framework is formed by many laws and by-laws in the Bulgarian legislation.

CO2 Situation

Port Bulmarket has a waste management plan, which covers as follows:

- Grounds for elaboration of the document, including legal background.
- Geographical location of the port.
- Description of the port – general characteristics and size.
- Number and types of ships visiting the port.
- Assessment of the need for waste management.
- Waste disposal procedures.
- Reception facilities.
- Procedures for acceptance, storage, treatment and transport of waste.
- Applicable fees.
- Procedures of reporting of non-compliance.
- Procedures for collaboration with port users and stakeholders.

It is critical to understand the potential impacts on air pollution, greenhouse gases (GHGs), and the people living, working, and recreating near ports.

Port Bulmarket developed a scale assessment to:

- Examine current and future emissions from a variety of diesel sources operating in port areas.
- Explore a range of available strategies to reduce emissions from port-related trucks, locomotives, cargo handling equipment, harbor craft, and vessels; and
- Provide an assessment tool for the government, port and port operators, communities, and other stakeholders to:

  - Inform their priorities and decisions for port areas; and

  - Achieve more emission reductions across Bulgaria.

Digitalisation and Automatisation

In today's global logistics system, a large amount of data and information are needed to ensure that all phases of logistical activity are accurate and fast. The development of information and communications technology has dramatically improved the sharing and exchange of information and data needed for trade and transport, and new technologies that affect business processes and the business environment are emerging from time to time. This evolution is particularly striking in the maritime transport sector, which is responsible for the carriage of around 90% of world trade. Efficient processing of logistics information at ports that are the starting and ending point of import and export logistics activities is critical to enhancing efficiency and securing the reliability of the global supply chain. Digitalisation can have a dramatic impact on the shipping industry in terms of improved productivity and safety, and the creation of new business and services. A smart port should not be considered as just an application of digital technology. Smart ports integrate digitalisation and the 4IR technology, playing a key role in widening and strengthening global trade.

Due to the growing volume of global trade and a consequence of vessel sizes and cargo volumes, PORT BULMARKET EAD has become interested in smart solutions (digital platform) which use the advanced technologies to optimize operations, promote efficiency, and reduce logistics costs. Port Bulmarket is willing to improve operations or facilities for several other reasons including the fact that:

- Port is complex operational environments and is comprised of various stakeholders.
- They want to maximize efficiency for the supply chain.
- Port authorities are taking a more active role in optimizing operations.
- By redefining the mission and role of each stage of a vessel's arrival, Port Bulmarket can significantly improve its efficiency, security, and environmental impact.

5.10 Port Development Plan Prahovo - Serbia

With the transport network consisting of the Danube waterway in the length of 588 km with all its tributaries, along with the road and rail corridors, the Republic of Serbia holds a special importance within the overall European transport policy for the period 2014-2020. The new European policy opens up significant possibilities for better positioning and development of waterway transport in the Republic of Serbia foreseen by the Strategy on Development of Waterborne Transport of the Republic of Serbia, for the period 2015-2025. This Strategy lists the most important investments that are defined and initialised including: construction and reconstruction of Serbian ports, eliminating all critical sectors for navigation on the waterway network, further improvement of intelligent waterway transport systems.

According to the Strategy, the development plans for Port of Prahovo give attention to building and expansion of the quay, purchase of additional portal cranes and enlargement of storage facilities. Bearing in mind the volume of the commodities gravitating towards the Prahovo port hinterland, the need for expanding the port area was also recognized together with the need for construction of a dangerous goods terminal and a container terminal, and putting in operation of the existing or building a new grains silo.

According to the Strategy, the estimated investment for the port infrastructure is 3 million euros, and for the port superstructure 9.8 million euros. The precise funds for investment in the port area expansion will be known after the relevant documentation for Port of Prahovo has been made and adopted. Annex 5 of the Strategy assessed the construction of new port capacities of the Port of Prahovo as a priority project.

Port of Prahovo is located on rkm 861 of the right bank of the Danube. It is an open type port, with an apron area 560 m long. The Port of Prahovo was originally established for the purpose of providing transport services to the industrial complex IHP „Prahovo".

Current annual capacity of the Port of Prahovo reaches almost 3 million tons of dry bulk and general cargo, in the current working setup of the operator who works on a 24/7 basis, that is, from 00:00 hrs to 24:00 hrs, Monday to Sunday. The port enables the reception and transshipment of various types of cargo and all important raw materials that are necessary for the production of mineral fertilizers, and which come from the Black Sea ports along the Danube. The activities at the location of the Port of Prahovo includes: berthing of vessels, loading and unloading of vessels, temporary storage of goods within storage area at terminals.

The port covers area of approximately 55,000 m2. Port of Prahovo is an open type port with minimum available depth of 1.8 m and maximum available depth of 4 m. Berths 3,4 and 5 have minimum available depths of 1.8 m, while berths 1 and 2 have minimum available depths of 2.5 m. Total quay length is 577 m, out of which vertical quay is approximately 322m. Berths 1, 2, 3 and 4 are placed on vertical quay, while berths 5, 6 and 7 are on sloped quay. Consequently, there are 7 berths in total and seven vessels can be served in quay at once. Anchorage has the capacity to accept 75 vessels.

Storage facilities consist of 6500 m2 of open spaces. Port of Prahovo has the following facilities and devices: conveyor belt, pneumatic equipment, one crane of 5 t lifting capacity and 6 gantry cranes of 40 tons lifting capacity per each. Of storage facilities there are open storage area, silo storage and customs warehouse. The loading equipment of the port consists of 2 fork lifters with the maximum lifting capacity of 3 t, 3 fork lifters with the lifting capacity of 3 to 5 t and 4 wheel loaders. There is also one port tugboat for pilotage services. Maintenance and disposal facilities comprises bunkering facilities, fresh water supply and onshore power supply.

At the downstream end of the Port, in the hinterland of berths 6 and 7, there is „Zimovnik“, largely filled with sediment, without function, and it prevents the full development of port activities on this part of the coast. The area of „Zimovnik“ belongs to the water plot of the river Danube (cp no. 5852/1).

Currently, there is two licensed port operators in the Port of Prahovo – PD Elixir Prahovo and NIS AD Novi Sad.

The Port of Prahovo is intended for loading/unloading operations and storage of various types of goods such as cereals, oilseeds, fertilizers, gravel, sand, general cargo and cargo containers. Loading/unloading operations are performed both from vessels to the port quay and from the port quay to vessels, as well as stored cargo to trucks or railways and vice versa.

The terminals provide processing of cargo such as phosphate (bulk), copper concentrate (bulk), coal (bulk), KCl potassium chloride (bulk), road salt (bulk), equipment and parts (general), wire rods (general), fertilizers (bulk), fertilizers big bags (general), monocalcium phosphate MCP (general), monocalcium phosphate MCP (bulk), grains (bulk), scrap metal (bulk), hot rolled sheets (general), limestone (bulk) and gypsum (bulk).

As a typical multipurpose port, the Port of Prahovo handled mostly fertilizers (components and finished products), general cargo, and, to a lesser extent, determined quantities of grains in export and metallurgical products in transit from the North

Macedonia. Top three products handled in the Port of Prahovo are fertilizers and their components, metallurgical products and grains.

Typical port users are from the fertilizers industry, as well as users from the metallurgical and mining industry. Future users will largely remain within this group, while new additions will be the industrial companies that are expected to settle within the industrial-chemical park in Prahovo, which is founded by Elixir group, a well-known fertilizer producer in Serbia and a current operator of the Port of Prahovo.

Port of Prahovo has a single road entrance with two lanes road allowing vehicle access. The road entrance distance from the main road is 5 km. The area of 2000 m2 is intended for parking vehicles. In port area there is no truck scales.

There is one operative rail entrance which connects port to the national railway network with a three loading/unloading rail tracks with overall length of 880 m (360+360+160) and axle load of 20 t. In the hinterland of the port of Prahovo there is a railway station “Prahovo Pristaniste” with the railway tracks of 1100 m length.

The expansion of the existing port by construction of a new port capacities is determined by the Plan of detailed regulation of the "Port of Prahovo" (Official Gazette of the Municipality of Negotin, No. 7/20), ie Amendments to the Plan of detailed regulation of the „Port of Prahovo“ („Official Gazette of the Municipality of Negotin“, No. 20/220 and 1/221 - correction).

Expansion of port capacities of the Port of Prahovo, includes:

- rehabilitation, reconstruction and extension of the operational shore, including one covered berth;
- increasing the territory of Luka by filling in Zimovnik;
- construction of closed storage areas on the enlarged territory of the Port, with a packing room for bulk cargo, other bulk cargo in transport and delivery, general cargoes predominantly but not exclusively related to the chemical industry;
- reconstruction and construction of open floor warehouses for general cargo, containers
- and other packaged goods;
- rehabilitation and reconstruction of silos for cereals and other granular goods;
- modernization of port machinery and other equipment and devices;
- reconstruction and construction of port roads, truck parking lots, car parks;
- reconstruction of the existing and construction of a new access road to the Port;
- reconstruction and construction of industrial tracks of the port railway;
- reconstruction and construction of port infrastructure (installation of water supply, sewerage, electricity and signal network, outdoor lighting);
- construction of an administrative building, workshops with storage of tools and spare parts, control facilities for car entrances and car scales, fences, gates.

The planned expansion of the port area refers also to the construction of a terminal for dangerous goods and the terminal for the reception of used oils and wastewater from ships (Green Terminal).

Downstream from the border of „Zimovnik“, an embankment is planned, partly in the bed of the Danube and partly on the coastal part of the right bank, to the border defined in the PDR. It is planned that the area of „Zimovnik“ and the downstream part of the right bank of the Danube, by embankment at the level of the territory of the Port, will be transferred from the water to the land surface and thus the new territory of the Port will be realized.

In terms of future development, two scenarios (lower and higher), developed within this study, were assumed for the 25 years horizon cargo forecast, both of them being focused around the forecasted GDP growth and import/export forecasts of the International Monetary Fund. Besides the forecasts of typical existing cargoes handled in the port, determined quantities of new cargoes are forecasted, according to the strategic port development plans, such as ship-originated waste oil and bilge waters at the new “green” terminal. In Scenario 1, the total forecasted quantity of all cargoes reached 2.38 million tons, while Scenario 2 forecast revealed a total forecasted quantity of 2.7 million tons of different cargo.

Due to the planned increase in transshipment, capacity expansion of the chemical industry and further modernization of the port, enabling smooth docking of ships at all navigation levels along the entire operational quay is the first and basic requirement. The apron area will be aligned in the direction of berth 1 and will be extended all the way to the winter harbour. This will enable berthing of ships in all navigation levels throughout the whole year. In that case winter harbour will be replaced with the new port area. This will result in the reconstruction of the entire sloping quay into a vertical one and relocation of all crane and railway tracks in the operational quay area downstream from the existing berth 2. Two new railway tracks will be formed and they will occupy area of the rectangle which length extends from existing berth No. 4 to current entrance to winter harbour.

The following types of the terminals are planned in the Port Territory Zone:

- dry bulk goods terminal;
- liquid cargo terminal;
- container terminal;
- hazardous goods terminal;
- general cargo terminal.

The construction of a green terminal is planned as part of the expansion of the port area in Prahovo.

„Green terminal“ will be used for the reception and temporary storage of non-hazardous and hazardous ship waste. The development of the „Green Terminal“ is planned by filling the „Zimovnik“ and part of the coast on the right bank of the Danube.

At the location of the "Green Terminal", facilities for picking up waste from ships and temporary storage are planned. Also, within the Green Terminal, equipment for several types of waste oils, tanks and other accompanying necessary equipment is planned.

This study demonstrated the need for transshipment equipment with sufficient productivity in order to handle the forecasted volumes easily and to enable sufficiently large capacity reserve. In addition, the new “green” terminal will require specialized transshipment equipment, such as pumping systems for bilge waters and waste oils, as well as suitable transshipment device for waste tires handling.

Bulk cargo transshipment capacities

- The future bulk cargo (other than grain) transshipment capacities will have to have such productivity to enable at least 2.8 million tons a year of cumulative bulk cargo handling capacity.

Grain transshipment capacities

- Utilization rate of the existing cargo handling capacities for grains is very low and a large reserve of capacities exists.
- Current physical capacity is enough for the forecasted volumes. It is up to the operator to determine whether any modernization of grain handling equipment is needed.

General cargo transshipment capacities

- Currently, only berth nr. 4 (B4) is used for the transshipment of general cargo, where the existing crane allows for lifting of cargoes of up to 40 tons.
- Currently available capacity at berth nr. 4 is critical. So, the capacity will have to be significantly increased either at the berth 4, or, more likely, at another berth with the appropriate new transshipment device having the productivity at least 1.8 million tons if concentrated at one berth, or 1.7 million tons (cumulative) if distributed over two berths.
- In such a way, the Port of Prahovo will avoid potential congestion effects which may be extremely serious during the peak periods which are either hard or impossible to forecast.
- Liquid bulk cargo transshipment capacities at the “Green terminal”
- Transshipment capacities at the “Green terminal” need to be sufficient to handle the limited quantities of cargo (waste oil, bilge waters from ships).
- These quantities are limited due to the maximal processing capacity of processing facilities, which are estimated to 17,000 tons per year.
- The process of collecting waste oils and bilge waters is performed in such way that a special motorized barge (of typical cargo carrying capacity of 250 tons) visits vessels waiting at the anchorage or being berthed (but without interrupting any loading/unloading operations of berthed vessels) and collects

waste oil and bilge waters through special piping connected to the adequate pipelines onboard the ship from which the residues are taken over.

- Once the collecting barge fills its own tanks, it berths alongside the quay (at the new berth nr. 8) and transfers the waste oil and or bilge waters to the reception tanks on shore.
- Typical capacity of the unloading pumps does not need to be very high as there is no particular need to unload the collector barge quickly. In general, such capacity can be as low as 15 m3/hour, which for a navigable period of 301 day in a year gives the annual capacity of 108,360 m3/year.
- Assuming that the average density of waste oil and/or mixture of oils and fresh water is 990 kg/m3, the total capacity in tons becomes 102,276 tons/year, which is more than enough to cover for the annual quantities of these specific cargoes.

In the case of the Port of Prahovo, it is recommended that the public partner, that is, the Government of the Republic of Serbia with its Ministry of Construction, Transport and Infrastructure invests in the reconstruction and extension of the port infrastructure, while the construction of the suprastructure and equipping of the port for operations will be granted to a potential port operator as a concession.

The Ministry of Construction, Transport and Infrastructure of the Republic of Serbia prepared the Preliminary feasibility study with conceptual design, and a Project for a construction permit for the expansion of port capacities of the Port of Prahovo. A construction permit was issued for the construction of the port infrastructure.

The estimated value of the investment is EUR 58.8 million. Source of financing: 50% from the RS budget and 50% from the framework loan for the development of port infrastructure of the European Investment Bank.

The next steps are the execution of infrastructure construction works, selection of a concessionaire and construction of the port superstructure.

Therefore, the form of concession recommended for the Port of Prahovo reconstruction and extension encompasses the following (among others):

- provision of port services;
- construction of port superstructure, and
- maintenance of port infrastructure.

Reconstruction and construction of the missing primary infrastructure in the Port will significantly improve the operation of the port and its transshipment and operational performance. The construction of a new green terminal for the disposal of ship waste will significantly improve the level of environmental protection.

Capacity expansion of the Prahovo Port through construction of new storage capacities for bulk and general cargo (predominantly, but not exclusively related to the chemical industry) as well as modernization of port equipment, will create additional value for the economy operating in port's hinterland of the Bor district, but also for the companies that operate in eastern Bulgaria and iron industry of North Macedonia.

Further development and construction of new capacities in the Port of Prahovo is expected to enable the port to become qualified for inclusion in the core of the TEN-T river port network.

5.11 Port Development Plan Backa-Palanca - Serbia

With the transport network consisting of the Danube waterway in the length of 588 km with all its tributaries, along with the road and rail corridors, the Republic of Serbia holds a special importance within the overall European transport policy for the period 2014-2020. The new European policy opens up significant possibilities for better positioning and development of waterway transport in the Republic of Serbia foreseen by the Strategy on Development of Waterborne Transport of the Republic of Serbia, for the period 2015-2025. This Strategy lists the most important investments that are defined and initialised including: construction and reconstruction of Serbian ports, eliminating all critical sectors for navigation on the waterway network, further improvement of intelligent waterway transport systems.

According to the Strategy, the development plans for Port of Bačka Palanka are strategically oriented towards building a container terminal, a liquid cargo terminal and a grains handling and storage terminal. To do this, it is essential to build an embankment and a vertical quay in the length of 480 m, as well as a grains silo with a capacity of 60,000 t.

New handling equipment that would increase the capacities and operational railway tracks connecting the port to the national railway network would also be an asset. The implementation of these plans depends primarily on the levels of economic activity in the region and on port area expansion in accordance with the Law. A prerequisite for the expansion is an agreement between the Bačka Palanka Municipality, the Port Governance Agency and the current port operator regarding the property status of the land which could be used to fan out the port area. The rights of use are currently vested in “Port Bačka Palanka” d.o.o. A larger port area is highly important for the growth of port industry in Bačka Palanka and the overall economy in this municipality.

According to the Strategy, the required investment in the port infrastructure is estimated at 5.1 mill. euros, and in the port superstructure at 5.6 mill. euros. The precise amount to be invested in the expansion of Port of Bačka Palanka area will be known after the relevant documentation has been made and adopted.

The port of Bačka Palanka is located on the left bank of the Danube River, rkm 1,295 in the agrarian area of South Bačka. The port covers surface area of approximately 740,000 m2. Port of Bačka Palanka is a basin-type port with minimum available draft of 2 m. Total quay length is 400 m, out of which vertical quay is approximately 65 m and semi-vertical quay is 335 m. Four vessels can be simultaneously accommodated and serviced. Anchorage has the capacity for 30 vessels. Currently, the operator of the Port of Bačka Palanka, company “Luka Bačka Palanka” d.o.o.., operates a portal crane (with

a max. lifting capacity of 12 tonnes and technical capacity of 80 t/hour), a floating crane (with a 6 tonne capacity and technical capacity of 30 t/hour) and a mobile crane grain loader (with a 9-tonne capacity and technical capacity of 50 t/hour) connected to a silo via belt conveyors.

From the point of view of capacity utilization, on the basis of volumes handled in the last seven years, the port has a determined capacity reserve. This, in turn, means that the port has no reason to work overtime from the point of view of potential congestion, taking into account the current and past volumes of handled cargo.

Furthermore, the capacity utilization of the transshipment facilities in the last seven years also demonstrated the average capacity utilization over the years. This means that the port does not need to work any overtimes in order to manage to handle the current volumes, unless specifically requested by the ship operator or cargo owner.

The depth of water in the port basin ranges from 3.93m to 8.86m. The average size of the vessels reloaded in the harbour is 90m in length, 11m in width, with a capacity of 1,500 tonnes and freeboard of 2.5m. The port handles dry bulk and break bulk cargo. Current annual capacity of the Port of Bačka Palanka varies from 722,400 tons to 1,083,600 depending on the number of shifts in a day in a working week that includes Monday to Sunday.

Storage facilities consist of open spaces that cover area of 14,138 m2 and closed spaces of 658.8 m2. The types of cargo handled in the port are bulk commodities including construction materials, metallurgy products, heavy loads and general cargo.

The port owns the tugboat Kapetan Vinarev, which provides maneuvering services to its clients. The Agroport Center which belongs to Port of Bačka Palanka also houses storage capacities for receiving and storing 50,000 tons of mineral fertilizers and 30,000 tons for packaged goods, as well as 30,000 tons of storage capacity for mercantile goods. The centre has a line for packing mineral fertilizers with a daily packing capacity of 450 tons and a line for packing in a "big bag" with a daily capacity of 500 tons. The daily shipping capacity of packaged mineral fertilizer is 2.000 tons.

As a typical agricultural port, the Port of Bačka Palanka handled mostly grains and fertilizers, and, to a much smaller extent, determined quantities of natural aggregates (sand and gravel) and metallurgical products. Taking into account the overall volumes (all cargoes), the share of the Port of Bačka Palanka in the overall cargo volumes handled in Serbian ports was 2.19% in 2021.

Typical users of the Port of Bačka Palanka are from the agricultural industry, namely grain trading companies and importers of fertilizers. Future potential users will largely remain within this group, while new additions will be the oil trading companies and, to a limited extent, companies from the industrial production sector.

Considering the strategic plans of NIS (Oil Industry of Serbia – largest oil company in Serbia) development and preservation of the stability of the energy industry of the Republic of Serbia, it can be expected to have oil and oil products to be unloaded at the port of Bačka Palanka from domestic sources, while it is expected to be competitive in terms of purchase and transport price in relation to foreign sources. This, of course, can

be done only if facilities for handling and storage of oil products are planned in the new, extended port.

Considering the pronounced agricultural production and the growth of the volume of production of the processing industry, it can be stated that there are needs of economic entities for oil and oil derivatives in the immediate hinterland of Bačka Palanka. In this view, the hinterland of Bačka Palanka is seen as a receptive area, that is, the final destination of the flows of this type of cargo. Currently, the transport of these cargoes to the hinterland of the Port of Bačka Palanka is performed by road transport.

Port of Bačka Palanka is characterized by an excellent strategic position thanks to the connection with Pan-European Corridor 7 (a river and canal system of the Rhine-Main-Danube Canal), which connects it with the countries from the North Sea to the Black Sea. The strategic position is contributed to by the immediate vicinity of the Novi Sad-Osijek-Sombor main road, closeness of the Belgrade-Subotica highway at a distance of 45 km and the Belgrade-Zagreb highway, which is 30km away, as well as the railroad track which is just 5 km from the port.

The port is not connected to the national railway network but is distanced about 5 km from the regional railway Bačka Palanka – Gajdobra which is connected with the Belgrade-Subotica railway and further with the Budapest.

The General regulation plan with elements of the Detailed regulation of block number 106 in Bačka Palanka ("Official gazette of the municipality Bačka Palanka ", no 18/2007) and the General Regulation Plan of the settlement of Bačka Palanka ("Official gazette of the municipality Bačka Palanka ", no, 16/11 and 22/12) foresee a construction of new port capacities and expansion of the current port.

According to the port development plans, the industrial track for the port of Bačka Palanka will start from the open track of the railway Gajdobra – Bačka Palanka, in front of the level crossing with the main road (before the overpass from the direction of Gajdobra). The industrial track is brought to the port via a marshalling yard, which is located before the protective embankment of the port complex in Bačka Palanka.

Port of Bačka Palanka should be strategically oriented towards building a liquid cargo terminal and a grains handling and storage terminal and towards converting existing terminal into multipurpose terminal. To do this, it is essential to build a vertical and semi-vertical quay of 360 m length. It is necessary to construct industrial railway trucks in order to connect this port with the national railway network.

Most important characteristics of the liquid cargo terminal are the following:

- The liquid cargo terminal is planned in the port area between the basin and the Danube River along the port basin.
- It is necessary to widen the port basin by forming the new shoreline.
- On the apron area of the liquid cargo terminal, the construction of a semi-vertical quay wall (120m), a pontoon on piles (dolphins) with an access bridge and a system of protection against the spread of spilled fuel are planned.
- Roads and railways as well as supporting infrastructure and associated facilities will be built.

- For the movement of liquid cargo (crude oil and derivatives) pumping equipment is proposed at the terminal.
- Access to the terminal for crude oil and derivatives has to be marked with the waterway signs and markings for day and night navigation supported by berthing rules, signaling and reporting requirements as well as prevention of pollution of water and disposal of waste.
- In order to protect the quay construction and equipment from the impact of the vessel during docking, the front beam and the front piles of the quay are protected by rubber bumpers. The exact shape and dimensions of the pontoon, the layout and number of piles, depend on the adopted equipment.
- The access bridge between the quay wall and the pontoon serves for carrying pipelines, fire-fighting and other equipment necessary for the safe process of refuelling.
- For protection against the spread of spilled fuel, a floating dam is provided. Dam is made of polyester-based laminate, reinforced with glass fibers with a surface layer resistant to liquid cargoes. Flexible connections are used to connect the dam to the pier, which prevents the dam from breaking and sinking during waves. Floating trolleys on rails adjust the dam to changes in water levels and are used to connect the dam with the sloping quay. The positioning of the dam is provided with appropriate concrete weights.
- Collection of spilled oil will be provided by appropriate equipment and depends on the applied method and the manufacturer. A warehouse for the collection of spilled oil, as well as hazardous waste (oily absorbents) is planned to be built and will serve for the temporary disposal of funds until they will be handed over to an authorized operator.
- Liquid cargo storage space will be provided within this terminal.
- For the transfer of liquid cargo and for the supply of fuel to ships, equipment with appropriate connections, pumps and pipelines is planned.
- Most important characteristics of the grains terminal are the following:
- There are two berths at the grain terminal and a 240-meter-long vertical quay wall.
- Loading system that includes chain conveyor, gravity line and mobile loader is proposed to load grains from silos to vessels. The chain conveyor, parallel to operational quay accepts the grain from the silos and moves it to gravity line. Mobile loader is used for movement of grains from chain conveyor to cargo space of vessel. Grains are stowed uniformly over cargo space by translational motion of mobile loader along the rails.
- A hopper loader will be used in combination with a belt conveyor, providing the possibility of direct loading from trucks to vessels.

- A closed storage for grains is planned, ie silos with a total capacity of 60,000 tons. Two silos with filling and emptying equipment, which consists of pipes and compressors of appropriate capacities, are suggested to be installed.
- Silos are used to store grain. They are built of concrete with filling and emptying systems for all three modes of transport (road, rail and water).
- Most important characteristics of the multi-purpose terminal are the following:
- Necessary mechanization for handling general and bulk cargos and containers includes forklifts, mobile self-propelled loaders and a portal crane with swappable handling devices like bulk grabs, hooks/pulley blocks, coil grabs, wire coil grabs, sheet lifters, spreaders, equalising spreader beams, long-hook spreader beam, rotating spreader beam, etc.
- Technology of container handling includes reloading of full and empty containers from/to vessels, wagons and trucks, as well as their storage until further transport. Necessary equipment for reloading of vessels is a quay portal crane and forklifts for handling containers on storage areas. Handling can be done directly or through the storage.
- In addition to the existing roads in the port area, other roads that are in the function of performing the technological process of transshipment, cargo storage and movement of machinery and vehicles within the terminal depend on the layout of other facilities in the terminal area (track layout, layout and area of storages, types of machinery, etc.).

This study demonstrated the need for the new transshipment equipment with sufficient productivity in order to handle the forecasted volumes easily and to enable sufficiently large capacity reserve. For the loading of grains, specialized loading equipment connected to a silo is recommended. In addition, new cargo types will require specialized transshipment equipment, such as pumping systems for liquid bulk cargoes. The existing terminal should be reorganized into a multipurpose terminal with mobile cranes with swappable handling equipment (bulk grab, coil grab, wire coil grab, forks, hook, sheet lifter, magnet lifter, equalizing spreader beam, container spreader, etc.) for the bulk and break-bulk cargo.

In terms of future development, two scenarios (lower and higher), developed within this study, were assumed for the 25 years horizon cargo forecast, both of them being focused around the forecasted GDP growth and import/export forecasts of the International Monetary Fund. Besides the forecasts of typical existing cargoes handled in the port, determined quantities of new cargoes are forecasted, according to the strategic port development plans. In Scenario 1, the total forecasted quantity of all cargoes reached 1.12 million tons, while Scenario 2 forecast revealed a total forecasted quantity of 1.43 million tons of different cargo.

In the case of the Port of Bačka Palanka, it is recommended that the public partner, that is, the Government of the Republic of Serbia with its Ministry of Construction, Transport and Infrastructure invests in port infrastructure, while the construction of the

suprastructure and equipping of the port for operations can be granted to a potential port operator as a concession.

Therefore, the form of concession recommended for the Port of Bačka Palanka extension encompasses the following (among others):

- provision of port services;
- construction of port superstructure, and
- maintenance of port infrastructure.

The implementation of these plans depends primarily on the levels of economic activity in the region and on port area expansion in accordance with the Law.

5.12 Port Development Plan Bogojevo - Serbia

With the transport network consisting of the Danube waterway in the length of 588 km with all its tributaries, along with the road and rail corridors, the Republic of Serbia holds a special importance within the overall European transport policy for the period 2014-2020. The new European policy opens up significant possibilities for better positioning and development of waterway transport in the Republic of Serbia foreseen by the Strategy on Development of Waterborne Transport of the Republic of Serbia, for the period 2015-2025. This Strategy lists the most important investments that are defined and initialised including: construction and reconstruction of Serbian ports, eliminating all critical sectors for navigation on the waterway network, further improvement of intelligent waterway transport systems.

According to the Strategy, the development plans for Port of Bogojevo towards a full port logistics centre should take advantage of the favourable geographic/traffic position of the port and make it a specialized handling and storage terminal for grains and mineral fertilizers, with an intermodal terminal. The plans are primarily concerned with the repair and re-design of the ruined part of the quay, 55 m long, with the construction of the 2.5 km operational railway tracks and their connection to the national railway network. The Bogojevo Municipality town plans and the regional spatial plan of AP Vojvodina include provisions for an intermodal terminal development, which is to be within the port area and treated as a port terminal. A need for new storage facilities and the pertaining port infrastructure has also been recognized (construction of operational railway tracks, connection to the national railway network in a length of 2.5 km, building one more vertical quay, storage facilities up to 100,000 t – the current capacity is 50,000 t). The required investment in the port infrastructure is estimated at 3.2 million euros, and for the port superstructure at 2.4 mill. euros.

The precise level of investment in the expansion of Port of Bogojevo area will be defined after the relevant documentation has been made and adopted. The projection of costs, together with the proposals for financing building designs and port development, will make an integral part of this documentation.

Annex 5 of Strategy on Development of Waterborne Transport of the Republic of Serbia (The Official Gazette of RS, No. 66/2020-10) assessed the construction of new port capacities of the Port of Bogojevo as a priority project.

The port of Bogojevo is located on the left bank of the Danube River from km 1366.73 to km 1367.42. The port covers surface of approximately 90,000 m2. Port of Bogojevo is an open-type port with maximum available draft maintained at 4 m. Total quay length is 276 m, out of which vertical quay is approximately 98 m. Two vessels can be simultaneously accommodated and serviced. Anchorage has the capacity for 17 vessels. The port has silo of 30,000 tons for cereals and 15,000 tons for fertilizer; closed space place of 14,200 m2 and open space place of 10,200 m2 available for port users. The operator of the Port of Bogojevo, company "Luka Dunav Bogojevo" a.d., operates a portal crane and a grain loader connected to a silo via belt conveyors. Technical capacities of this transshipment equipment are as follows:

- Portal crane: 100 t/hour
- Grain loading equipment: 270 t/hour

The port's superstructure includes two roads and one railroad filling hoppers with a total capacity of 700 t/h, a drying plant with a capacity of 40 t/h, a portal crane with a capacity of 20 t, a belt conveyor with an operating capacity of 400 t/h and the required handling and internal transport machinery.

Annual capacity of the Port of Bogojevo varies from 322,500 tons to 722,400 tons with the portal crane and from 870,750 tons to almost 2 million tons with the grain loader, depending on the number of shifts in a day and a number of working days in a week.

As a typical agricultural port, the Port of Bogojevo handled mostly grains and fertilizers, and, to a much smaller extent, determined quantities of natural aggregates (sand and gravel) and metallurgical products. Top three products handled in the Port of Bogojevo are grains, oilseeds and fertilizers. The port of Bogojevo is among the Serbian ports with the largest throughputs of grain. Throughput of other cargoes is being registered every year in the port, among which imported artificial fertilizers make up the largest share. Although a biggest throughput was 536,407 t of various cargoes in 2020, the estimated requests for transportation from the hinterland area of the Port of Bogojevo are much higher and more diverse than the current throughput possibility of this port.

As observed area of the Danube River is natural border with the Republic of Croatia, the planned activities in the Bogojevo port will benefit the business entities in the region of East Slavonia in Croatia, along the right coast of the Danube River. Typical port users are from the agricultural industry, namely grain trading companies and importers of fertilizers. Future potential users will largely remain within this group, while new additions will be the oil trading companies and companies from the construction sector.

Port of Bogojevo has a connection to the national railway network but railway tracks are not in function. The port is 300 m away from the main railway, and 2520 m from the railway yard. Railway section from Bogojevo to state border Erdut connects Port of Bogojevo directly with Croatia and indirectly with Hungary over other railway sections. It is a local railway section and is not electrified. The importance of this section is

reflected in possibility to connect Port of Bogojevo with Port of Vukovar and further with Port of Budapest over the following railway sections which are part of the Mediterranean TEN-T corridor: Osijek – Beli Manastir, Beli Manastir (border) / Magyarboly - Pecs, Pecs – Dombovar, Dombovar – Pusztaszabolcs, Pusztaszabolcs - Budapest Kelenfold (part 1) and Pusztaszabolcs - Budapest Kelenfold (part 2).

On the northeast side, the micro location of the port is limited by the existing state road IIa no. 107, Sombor - Apatin - Bogojevo, while on the southeast side there is a road and next to it a railway bridge over the Danube, towards the Republic of Croatia. The port is 40 km away from the E75 highway, in the direction Belgrade-Budapest.

The expansion of the existing port by construction of a new port capacities is determined by the Detailed regulation plan of the Bogojevo port („Official gazette of Odžaci municipality“ no.4/21). Only a small portion of the designated port area in Bogojevo has been constructed. The existing facilities within the port (management building, silos, warehouses as well as auxiliary and infrastructure facilities) will keep functioning, with possible reconstruction, upgrading, remediation and adaptation. In the unbuilt part of the port area, within planned expansion, the construction of new facilities is foreseen for an increased port functioning.

Port of Bogojevo area is planned to be expanded by building a port basin with apron area. In that way port will be partly a port with the open operational quay and partly a port of basin type for transshipment of various types of cereals, oilseeds, fertilizers, sand, gravel, various cargoes and a smaller number of containers which could develop container transport on the Danube. In addition, a terminal for storage and transfer of oil and oil derivatives is anticipated in the basin part of the port and it will be territorially separated from the rest of the port. Also, there will be a possibility of supplying vessels with a fuel.

In addition to these facilities, port roads with connection to the public road network and railway tracks within the port territory are necessary. Reconstruction of the existing railway section “Bogojevo station - Bogojevo port” is needed. Also, a new, special fire water supply system with a pumping station next to the port basin is missing, as well as new sewage and atmospheric water sewage systems with auxiliary devices.

The apron area is the most important part of the port terminal (length app. 630 m, width app. 15,5 m) and it is planned to consists of several segments which will in time enable an increase of cargo traffic volume to more than 600.00 t. By that increase, the Bogojevo port can be classified into the higher rank of EU Core TEN-T network of the port terminals.

In terms of future development, two scenarios (lower and higher), developed within this study, were assumed for the 25 years horizon cargo forecast, both of them being focused around the forecasted GDP growth and import/export forecasts of the International Monetary Fund. Besides the forecasts of typical existing cargoes handled in the port, determined quantities of new cargoes are forecasted, according to the strategic port development plans. In Scenario 1, the total forecasted quantity of all cargoes reached 1.08 million tons, while Scenario 2 forecast revealed a total forecasted quantity of 1.39 million tons of different cargo.

Within the port area, the following infrastructure objects are planned: terminal for liquid cargo, terminal for bulk cargo, terminal for general cargo and containers. Most important characteristics of these, as well as existing grains terminal are the following:

- Liquid cargo terminal
  - This terminal is dedicated for handling oil derivatives, primarily diesel and unleaded gasoline.
  - Typical equipment for the transshipment of oil derivatives contains a berthing pontoon (where barges are berthed) which follows the water levels and thus enables easier unloading of derivatives from a vessel.
  - Unloading equipment is located on a pontoon itself and consists of working pumps (one for diesel and one for unleaded gasoline), unloading arms, appropriate valves and manifolds. Thereafter, it is connected, via pipelines, to the tanks on shore.
  - Tanks should have appropriate equipment for loading of liquid cargo into tank trucks.
  - Productivity of the unloading equipment of this kind is of 180 m3/h (or 150 t/hour, where 1 t of derivatives is roughly 1.2 m3 of derivatives). With this capacity, the utilization of the transshipment equipment will be satisfactory, and it will provide sufficient capacity reserve.
- Bulk (sand and gravel) terminal
  - it is recommended that the port operator uses the equipment of the company providing the sand and gravel
  - unloading of gravel
    - the transport vessel is usually berthed alongside the unloading bucket dredger which collects the gravel from the barge, lifts it up to the belt conveyor and the belt conveyor (or the system of belt conveyors and hoppers) transports the gravel to the designated place where the storage cone is formed;
    - further separation of gravel of different granulation is done either from the end of the conveyor line (where the unseparated gravel is poured from the conveyor directly into the separation hopper) or from the cone of unloaded gravel;

- unloading of sand
  - the typical way of unloading is through the suction dredger;
  - the dredger sucks the mixture of water and sand from the bottom of the river, transports it through the ship pipes to the cargo area of the vessel, where the sand settles at the bottom of cargo space and the water freely spills over the sides of the vessel;

  - when it is full and drained from excess water, it travels to the berthing pontoon which usually carries the unloading equipment for sand, consisting of the piping, pumping systems, valves and manifolds;
  - the suction dredger berths alongside the berthing pontoon, allowing for the vessel (suction dredger) piping to be connected to the pipes on the pontoon;
  - when firm connection is made, the vessel pumps water into its cargo space making again the mixture of sand and water which is then pumped out of the vessel to the unloading piping on the berthing pontoon;
  - the mixture of sand and water travels through the external piping to the specially prepared areas on shore (the so called “cassettes”) where the water from the mixture is drained back to the river through the soil and the sand settles in the “cassette”;
  - depending on the distance of the berthing pontoon from these “cassettes”, the external piping may be equipped with additional pumps, since the ship pump cannot always push the water-sand mixture very far;
- recommended productivity of unloading equipment is 100 t/hour (sand or gravel) – recommended productivity for sand/gravel unloading provides sufficient capacity reserve for the entire duration of the forecasted period (25 years) and for all forecasted quantities;

- General cargo and container terminal
  - due to the relatively small number of containers forecasted, it is not recommended to equip this terminal with the equipment narrowly specialized for transshipment and handling of containers;
  - a mobile crane with swappable handling equipment (bulk grab, coil grab, wire coil grab, forks, hook, sheet lifter, magnet lifter, equalizing spreader beam, container spreader, etc.) is recommended;
  - Such mobile (auto) crane should have a lifting capacity of 80-100 tons, lifting height of at least 8 metres, capable of making 100 t/hour of productivity when handling break-bulk cargo other than containers and 15 moves/hour when handling containers;
  - if an average 23 tons of payload is calculated for each container, it means that such auto crane would reach the productivity of 345 tons/hour when handling containers only;
  - other equipment for handling general cargo (break-bulk) and containers in the yard behind the quay may include forklifts, reach stackers, etc.;
- Existing grain terminal
- the existing grain terminal (currently the only existing terminal) in the Port of Bogojevo has two berths, one on vertical quay and another one on the sloped quay;

- productivity of the portal crane is 100 t/hour and the productivity for grains (counting both loading devices – with the belt conveyor and pneumatic device) is 270 t/hour.

As for the transshipment equipment, this study demonstrated the need for transshipment equipment with sufficient productivity in order to handle the forecasted volumes easily and to enable sufficiently large capacity reserve. In addition, new cargo types will require specialized transshipment equipment, such as pumping systems for liquid bulk cargoes, or mobile crane with swappable handling equipment (bulk grab, coil grab, wire coil grab, forks, hook, sheet lifter, magnet lifter, equalizing spreader beam, container spreader, etc.) for the terminal for general cargo and containers.

In the case of the Port of Bogojevo, it is recommended that the public partner, that is, the Government of the Republic of Serbia with its Ministry of Construction, Transport and Infrastructure invests in port infrastructure, while the construction of the suprastructure and equipping of the port for operations will be granted to a potential port operator as a concession.

The Ministry of Construction, Transport and Infrastructure of the Republic of Serbia prepared the Preliminary feasibility study with conceptual design, and a Project for a construction permit for the expansion of port capacities of the Port of Bogojevo. A construction permit was issued for the construction of the port infrastructure.

The estimated value of the investment is EUR 48 million. Source of financing: 50% from the RS budget and 50% from the framework loan for the development of port infrastructure of the European Investment Bank.

The next steps are the execution of infrastructure construction works, selection of a concessionaire and construction of the port superstructure.

Therefore, the form of concession recommended for the Port of Bogojevo extension encompasses the following (among others):

- provision of port services;
- construction of port superstructure, and
- maintenance of port infrastructure.

By extension and construction of the new port capacities, connected with the railway infrastructure and by upgrading access road infrastructure, the port itself will enable efficient network connection of waterway, road and railway transport. Thus, it will promote better conditions for combined and intermodal transport, which is one of the preconditions for further service development in the sphere of waterway transport as the cheapest mean of mass loading transport both in internal and international transport, and, by that, the increased turnover in the ports on the internal waterways.

Further development and construction of new capacities in the Port of Bogojevo enables the port to become qualified for inclusion in the core of the TEN-T river port network.

5.13 Integrated Port Development Plan Moldova

The Integrated Port Development Plan [MD] consists of 3 parts:

I. Development Plan for Hinterland Infrastructure
II. Port Development Plans Giurgiulesti
III. Prut Fairway Maintenance Plan

Purpose: The sustainable development of the Giurgiulesti port and transport infrastructure for their integration into the TEN-T.
Objectives:

- Analysis of the status-quo and development prospects of the national economy and IWT / Rail / Road infrastructure.
- Elaboration of IWT / Railway / Road infrastructure development strategies for transformation of the Giurgiulesti port into a multimodal, ecological, modern and integrated logistics complex.
- Elaboration of the GIFP (Giurgiulești Free International Port) development plan until 2030.

The results obtained during the DIONYSUS project can be used by:

- Ministry of Economy and Infrastructure - for making political decisions and developing a strategy for the development of the transport and logistics industry;
- The Naval Agency of the Republic of Moldova - for making decisions regarding the organization, planning and management of the IWT, as well as in the development of regulatory documents;
- The National Road Transport Agency - for improving the regulations regarding the organization of freight transport;
- The State Administration of Roads - for evaluating the development of the road infrastructure;
- The Moldovan Railways - for the improvement of railway infrastructure development plans;
- The Giurgiulesti Free International Port - for the improvement and development of the logistics and transport activity in a sustainable and efficient way;
- The Giurgiulesti Passenger and Cargo Port - for the improvement of the services provided;
- The academic university environment in the field of transport - to improve the teaching process in the river transport discipline;
- Local public administration in the southern region of the Republic of Moldova;
- Shipping companies.

Recommendations for the development of river transport and the port of Giurgiulesti:

- Determination of the development concept of river transport in the Republic of Moldova, based on the system of priorities of the national economy;
- The reconstruction/modernization of railway lines and motorways that will ensure the connection of Giurgiulesti port with the main industrial and logistic centers;
- Construction on the territory of the Giurgiulesti Free Economic Zone or in the region of the port of warehouses, elevators, terminals and factories with large processing capacities of industrial goods and agricultural products;
- Construction of quays on the banks of the Danube and the Prut to increase transport volumes and expand the list of services provided;
- Modernization of port equipment for loading/unloading operations;
- Maintenance of port infrastructure and territory;
- Developing relations with the Moldovan Railway administration and companies with large transport volumes;
- Improving of operational management;
- The implementation of IT in the navigation system and the management of logistics processes;
- Ensuring ecological norms in port activity;
- Continuous training specialists in line with future changes in the IWT sector;
- Creating of attractive environment for investments in the formation of the modern fleet of ships;
- Revision of naval and customs legislation in order to remove barriers to the development of IWT;
- Organization and management of stable operation of the joint container route: Constanța - Tulcea - Giurgiulesti - Galați – Brăila;
- Integration of maritime and IWT logistics;
- Creation of logistics and transport chains;
- Development of cooperative relations with economic agents.

Expected Results of the Implementation of Comprehensive Port Development Plan:

- Improvement of state planning and management in the field of inland water transport, sectoral legislation, application of new organizational mechanisms (concessions, management companies, technological platforms and territorial clusters);
- Increase in port capacities and growth in the volume of cargo transshipment in the port of Giurgiulesti;
- Ensuring the effective development of port infrastructure and increasing the utilization rate of transshipment complexes;

- Increasing of port Giurgiulesti role in ensuring of international commerce of the Republic of Moldova, including countries of the European Union;
- Increasing the level of environmental and transport safety of river transportation in the waters of the Danube region;
- Ensuring the tariff attractiveness of the port of Giurgiulesti by maintaining the amount of port dues per ton of cargo transshipment at a comparable level to the neighbor ports;
- Improving the quality of services provided and the competitiveness of the port of Giurgiulesti by increasing rate of use of specialized complexes and increasing the share of cargo handling services in the total cargo turnover;
- Increasing the level of innovation in the activities of the Giurgiulesti port through the usage of new technologies, resource conservation measures, reducing the negative impact on the environment, and strengthening of the human resources in this industry.

Overall, the project is very important for national policy. It helps to improve transport infrastructure in our country, and to take wise decisions for investment in the development of port and logistics infrastructure. The project includes recommendations for the transport corridor development policy. Project gave strategic directions for development of intermodal transport system infrastructure in the Danube region and its integration into the European transport network. Also, it contains plan for the development of Giurgiulesti International Free Port and advises for tariff policy adoption, traffic volume increase and of transport legislation improvement.

6 Conclusion

Danube ports vary in history, 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, and a result of former investments and availability of funding money or owner´s engagement. Therefore, the elaborated Port Development Plans show great differences and have a great range of urgent or foreseen measures for the next years. But a "common red line" for all documents is, that ports are eager to foster waterway business and strive for continuous improvement of their situation, infrastructure and equipment, even when they start from different levels. This cited red line has also one item, which is part of all development documents – this is improvement of environmental situation and targeted to bring their contribution to the needs in the context of climate change.

These attitude and common approach make good hope that Danube ports business will bring up the next concrete steps of investment and goes into the right direction as it was laid down in the application document of DIONYSUS project.

Port development and waterway business on the Danube River are still alive and are prepared to face the challenges of the upcoming decades.