T.2.1. The Action Plan

Interreg
ADRION
ADRIATIC-IONIAN
European Regional Development Fund - Instrument for Pre-Accession II Fund

NEWBRAIN

PP7 Port of Bar

Port of Bar H.Co:

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[Port of Bar logo]
### Document Control Sheet

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1. SUMMARY

The Action Plan – PP7 Port of Bar is produced as a deliverable of the WPT2.1 – Detailed action plan definition in each node within the NEWBRAIN project. In first five chapters, the plan deals with the role of the port of Bar as a crucial transport node in this part of the Mediterranean. In particular, it tackles general territorial, economic and logistic aspects of the country of Montenegro as a whole. Further in the text, the role of the port is analysed in terms of logistic node and its needs, main obstacles which are recognized to be of utter most importance for the development and improvement of the core node, such as the port of Bar.

Chapters 4 and 5 deal with the role which the port has both in local and SEETO networks. Given the favourable conditions for development of various transport modes and connections with hinterland, development of rail and road connections are mentioned as the most promising and prosperous links that would enable and influence the development of the node. In addition, the port of Bar is also a part of the SEETO Comprehensive Network as a core port, as it will be shown in text below. In chapter 6, the role of the port is examined through its role in the TEN-T network. The Port of Bar is included as a port which is of regional importance by being integrated to the regional transport TEN-T network.

Within the NEWBRAIN project, Main design for rehabilitation of the Volujica quay (554 m in length) is prepared. Therefore, chapter 7 contains the summary of the main bottleneck in the Port of Bar – construction of the Volujica quay, which has deteriorated and degraded rapidly in the past several years. In further text, the following development projects are mentioned, three of them of national importance, and 2 of them which are significant for the development of Port of Bar in general. Each one of them is related to the methodology of the project NEWBRAIN. Chapters 9, 10 and 11 deal with the roles of the projects which contribute to implementation to the TEN-T network, coherence with general objectives of EUSAIR pillar 2 and conclusion on the importance of the mentioned Action plan for the port of Bar as node.
2. THE TERRITORIAL, ECONOMIC AND LOGISTIC CONTEXT OF THE NODE

Territorial

Montenegro is located in the west-central Balkan Peninsula. It has a coast on the Adriatic Sea to the south-west and is bordered by Croatia to the west, Bosnia and Herzegovina to the northwest, Serbia to the northeast, Kosovo to the east and Albania to the southeast. Its capital and largest city is Podgorica, which represents an administrative and economic centre of the country while Cetinje is designated as the old royal capital and historical centre.

Montenegro covers an area of 13,812 km². According to the 2011 Census, Montenegro has a total population of 620,029, of whom about a third live in the capital city, Podgorica. This is 1.3% more than in 2003, in which the previous census was conducted. Of the total population in 2011, the smallest number of population lives in the Coastal Region, i.e. 148,683 (24.0%).

According to the available data, the population of Montenegro increased by about 63% in the period between 1948 and 1991. Population growth varies by region; the smallest increase was recorded in the Northern region of Montenegro, and the number of population in the Central and Coastal regions doubled.

The average population density is 44.9 inhabitants/km², while the highest population density was recorded in the Coastal Region (Tivat municipality, 307,64 inhabitants/km²). In the territory of Montenegro, one of the significant processes is the internal migration of the population. Thus, the Coastal and Central regions are the areas of intense immigration of residents from the northern parts of the country.

The Montenegrin coast covers an area of 2,440 km² and is one of the most densely populated areas of Montenegro. The coast is 293.5 km long with 117 beaches, with a total length of 73 km. The sea for Montenegro represents very important tourism, economic, and biological resource. The general direction of coastal extension is northwest-southeast, with some major and minor deviations.
Economic

The Gross Domestic Product (GDP) in Montenegro was worth 5.45 billion US dollars in 2018. The GDP value of Montenegro represents 0.01 percent of the world economy. GDP in Montenegro averaged 3.43 USD Billion from 2000 until 2018, reaching an all time high of 5.45 USD Billion in 2018 and a record low of 0.98 USD Billion in 2000.

Growth projections in the Western Balkans region for 2018 have been revised upward and are now estimated to reach 3.5%. Growth was stimulated by higher public investment and consumption, while countries with higher growth rates boosted them mostly by investment and exports. Over 90,000 jobs were created in the first half of 2018, with new employment mostly in industry and services.

At 3.8%, Montenegro’s growth is projected to be 1 percentage point higher, although still lower than last year. Growth in Bosnia and Herzegovina continues to be stable at an estimated 3.2%. Serbia’s economy has rebounded to 3.5% growth after last year’s weather-related slowdown. Macedonia’s growth also rebounded to 2.5%, as investor confidence was restored.1

Montenegro’s economic growth model in the period 2019–2021 continues to be under the strong influence of the investment cycle, which will have a dominant impact on economic flows. Public finance consolidation measures will also influence the development of economic activities, as well as measures aimed at the optimisation of the state administration. A lack of diversification in the Montenegrin economy is an important factor limiting multiplying effects resulting from investments. The value of investments and imports is at a historically high level, and the baseline scenario has the assumption that investments will remain at such a level, but will not experience more sizeable growth given the limited options for the state to borrow further and the low availability of domestic savings for such a purpose. Starting from the above-stated and in line with the Montenegro’s baseline scenario contained in this year’s Economic Reform Programme, the annual real economic growth rate will be 2.8 percent in 2019, 2.3 percent in 2020 and 2.4 percent in 2021. According to the low-growth scenario, the average annual real economic growth rate in the period 2019–2021 will be 1.73 percent.

The low level of the economic activities in port hinterland is a main identified bottlenecks related to the market of the port (current level of the economic activities are not near of the level in ex-Yugoslavia). In addition, sometimes political issues have caused the problems. At the moment the stakeholders have noticed lack of integration of the port hinterland system.
Logistic
Port of Bar is the main cargo port in Montenegro and the port was established in 1906. The area of the port covers 200 ha (including port aquatorium with cca. 90 ha and its depth up to 14m). According to the Detailed Urban Plan for the port area, additional 400 ha are dedicated for further development of port area. The Port of Bar is situated at the entrance to the Adriatic sea, precisely at 42˚05' of the North latitude and 19˚05' of the East longitude, at a distance of 976 nautical miles (nm) to Suez canal and 1190 nm to Gibraltar.

Position of the Port of Bar

The Montenegrin sea ports system is managed according to landlord port model introduced by law on ports which was put into force in the year 2011. Currently, at the area of the port of Bar two principal operators are functioning, “Port of Bar” H.Co. and “Port of Adria”. Both companies are shareholding companies. In the “Port of Bar” H.Co. major percentage of

1 Source: WorldBank
shares are owned by the Government of Montenegro (54.05%) and in the “Port of Adria”, major shareholder is Turkish company “Global Ports Holding”, owning 62% of shares.

The current situation in Bar regarding the port area/port operators

Integrated with the Belgrade - Bar railway and road traffic network, the Port represents a very important link in the chain of intermodal transport. The Port is a junction of the trunk road M–24 Herceg–Novi–Bar–Ulcinj and the road Bar–Podgorica–Belgrade. The Bar is a point of departure of the railway line Bar - Belgrade. Bar has great potentials as a regional importance port. The quality of the port infrastructural links with its hinterland has a strong influence on the current port capacity utilization rate.
“Port of Bar” H. Co

As mentioned before, Port of Bar is a holding company in which the State of Montenegro holds the majority of shares – 54.05%. The stakeholders of the remaining 45.95% shares are citizens, employees of Port of Bar, different legal entities and privatization funds. The main activity of Port of Bar is handling and storage of dry bulk cargo, liquid cargo, special cargo, Ro-Ro and general cargo, passenger traffic and stuffing and stripping of containers. In addition, Port of Bar is a Free zone at almost whole of its area, which enables the possibilities of organizing the manufacturing and other activities by using the advantages which the operation in the Free zone regime provides. Capacity of the “Port of Bar” H.Co. is ~2.7 million tonnes of different types of cargos, per year.

Land and infrastructure, managed by the "Port Bar" H.Co.:
- 48.8 ha of infrastructural arranged space;
- 25 ha of infrastructure partially arranged space - space for expansion of Free zone;
- 96.8 ha of infrastructure and unregulated area the area of Bigovica;
- operative quay with draft up to 14.0 m, length of 834.4 m;
- operative quay with draft 5.0-11.0 m, length 1573 m;
- electro-energetic, water and sewerage, telecommunication infrastructure;
- road and railways;

The following specialized terminals exist in the “Port of Bar” H. Co.:
- Liquid cargo terminal,
- Dry bulk cargo terminal,
- Ro-Ro terminal and,
- Passenger terminal.

In addition, in Port of Bar there are several facilities purposed for handling operations and storing general cargo (closed storage, cold storage, etc.).

Dry bulk cargo terminal
Dry bulk cargo terminal is located on the Volujica quay and equipped with:
- three gantry cranes with 12 t capacity;
- mobile Harbour Crane Liebherr LHM 550 with 144t; capacity
- grain loading tower (hourly capacity 300 t/h)
Operational quay of the terminal is 550 m with water depth of 14 m. It is specialized for acceptance and dispatch of all types of ores, concentrates, as well as other types of bulk cargo. The area of the open storage space on concrete base extends to 27 000 m².

Grain silo with capacity of 30 000 t is situated within the dry bulk cargo terminal. Closed conveyer belt, 250m long, is installed and designed for reception and dispatch of grain to/from the silo. For cargo ship unloading operations 12t gantry cranes are used while for loading operations, pursuant to technical capacities of automated silo lines, 300t/hrs loading tower is used. The silo, equipped with temperature and humidity measurement system avails with 16 silo cells as well as 9 inter-cells.

Volujica quay in Port of Bar

**Liquid cargo terminal**

Liquid cargo terminal - installed storing facilities for liquid cargo are: 23 reservoirs for oil derivatives on the Volujica hill with total capacity of 116.600 m³ owned by Jugopetrol –
Kotor (Montenegro) and Montenegro Bonus – Cetinje (Montenegro);

- 2 reservoirs for leach, total capacity of 10,000 m$^3$ (owned by KAP – Podgorica (Montenegro));
- 1 reservoir for oil, capacity 1,400 m$^3$ (owned by the Port of Bar);
- specialized discharging point for acetic acid, 600 t/h capacity (owned by the MSK Crna Gora (Montenegro).

Water depth directly in front of the quay wall is 12 m. The navigation channel of the port is more than 14 m deep.

**Ro–Ro terminal**

Ro–Ro terminal is designed for acceptance, storage and dispatch of Ro–Ro cargo units (complete road vehicles or parts of vehicles-trailers and semi-trailers). Open storage area with asphalt-concrete paving’s completely secured without contact with handling flows of other cargo. The terminal is located on the Quay 3. Handling operation is carried out through operational quay which is 270 m long (berth 26 and 31) and water depth amounts to 10 m. Surface of the terminal: 2.2 ha with further extension to 6 ha.

**Passenger terminal**

The Port of Bar possesses specialized terminal with modern facility for services to the passengers and five berths for passenger ships and ferryboats. Directly beside the terminal there is a space for road vehicles that carry out Ro–Ro traffic through this terminal. Handling operation is carried out through operational quay which is approx. 400 m long and water depth 4-5.9 m.

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Regarding the port infrastructure development, in the following list are some of the future project in Bar (long term development plan of the Port):

- development of the Liquid cargo terminal – building new terminal in the Bigovica bay with capacity of 250 000 m$^3$; building reservoirs for acetic acid;
- development of the Dry bulk cargo terminal – extension of the operational quay for additional 400 m; extension of the open storing area; building silos for bulk cement; improvement of the cargo handling technologies at the Terminal (modernization of existing equipment, purchasing new equipment, etc.);
- development of the Grain terminal – building the second phase of the grain silo of 30 000 t capacity;
• development of the General cargo terminal – building new warehouses, building a new cold storage facility, improvement of the cargo handling technologies (purchasing new equipment, ...);
• development of the Ro-Ro and passenger terminal – extension of the operational quay for additional 440 m, etc.
• development of activities in the Free Zone – development of different trade and industrial programs;
• development of environmental protection system in the Port – building facilities for reception and treatment of waste waters from ships; improvement of the solid waste management system; etc.

“Port of Adria”

Port of Adria is a multipurpose port featuring quay length of 1,440 m with dedicated terminals for container ships, general cargo ships, Ro-Ro and cruise ships. It covers the total area of 518.790 m² with nine berths. Whole area of Port of Adria is within the Free zone regime.

As for the Port of Adria, there are three following specialized terminals:

- General cargo terminal
- Container terminal
- Timber Terminal.

**General cargo terminal**

General cargo terminal with surface of 12.300 sqm is located on Quays 1 and 2 that are, in terms of space and technically, qualified and equipped for acceptance and dispatch of all types of general cargo.

General cargo terminal includes closed and open storage systems, handling-operational and traffic surfaces. On the terminal there are complete horizontal and vertical mechanical equipment with 15 portal cranes with carrying capacity ranging between 3÷20 t and quay that is 1 370 m long with average depth of sea up to 10 m. It is specialized for acceptance and dispatch many final or semi-final products.
Container terminal
The length of the operational quay is 330 m (with two berths for container vessels), the depth of the aquatorium is 12 m. The sea bottom can be dredged to the level of – 14 m. The soil below the level – 12 m consists of sandy material with layers of clay. The Terminal occupies the area of 45 900 m².

Timber terminal
Timber terminal covers the area of 5,86 ha and encompasses several subsystems for: acceptance and despatch of transportation vehicles, loading, unloading and transhipment, storing sawn wood, wood products, sorting and forming units for despatch, drying of woods and others. Capacity of the terminal ranges from 40 000 to 60 000 m³/year, depending on type and shape of wood products. The terminal includes 23 400 m² of covered space.
3. THE LOGISTICS NODE AND ITS MAIN NEEDS

Railway and road infrastructure did not have adequate treatment in Montenegro in the last 40 years, primarily because of economic situation. But in the recent years, following the Transport Development strategy, the main projects are revitalization of the railways and building the first motorway in Montenegro. These projects have great importance for the further development of the port. Starting from the fact that development of the Port depends very much on a lot of external influential factors of different nature and intensity of influence, at first will be mentioned important national and regional development projects from the field of transport and logistic which have to be taken into account:

- Building Motorway Bar – Belgrade;
- Building Adriatic-Ionian Motorway in Montenegro;
- Reconstruction and modernization of the railway Bar – Belgrade;
- Building inter-modal terminals at the railway stations in Bar, Podgorica and Bijelo Polje;
- Development short sea shipping links with Adriatic ports; etc.

![Geographic Position Links with Hinterland](image)

Railway and road distances from the Bar to the main regional centres
Montenegro is connected with European railway network through the regional network (Western Balkans) which doesn’t have uniform capacities and properties, links are missing both within a single transport mode as well as between different modes of transport. The harmonization of the development of the Western Balkans network is extremely important since the development of the Regional Transport Network in the Balkans has been intensified, the projects to be invested in by 2020, as well as the further links of the regional network with the TEN-T network and the corridors have been defined. The Memorandum of Understanding for the Development of the Basic Regional Transport Network in South East Europe (SEETO1 Memorandum) was signed in Luxembourg on June 11, 2004, by the governments of Montenegro, Croatia, Bosnia and Herzegovina, Macedonia, Albania, Serbia and Kosovo, as well as by the European Commission. The mission of the Memorandum was the cooperation on the development of the main and auxiliary infrastructure on the multimodal basic regional transport network in South East Europe and the improvement of policies in this area in order to achieve faster progress in development.

The successor to this Memorandum will be the Treaty establishing the Transport Community (in the Western Balkans region), signed by the Prime Minister of the Western Balkans six in Trieste in 2017. The agreement on the establishment of a transport community (signatory parties from South-East Europe: Albania, Bosnia and Herzegovina, FYR Macedonia, Kosovo*, Montenegro and Serbia) shall serve the following purposes:

- Better and faster integration of transport markets;
- Better treatment of transport operators in a non-discriminatory manner in terms of their access to transport infrastructures;
- The desire of each individual South-East European (SEE) partner country to comply with its transport laws and related issues with EU law, including the future development of the Union’s acquis;
- To provide significant technical support, including better addressing the challenges and needs of environmental protection and the fight against climate change;
- To enable the development of the transport sector in a sustainable manner;
- To ensure a more adequate view of the social dimension of the transport community and the establishment of a social dialogue structure among the JIE Contracting Parties;
- To support the resolve of candidate countries and potential candidates to come closer to the European Union and enforce its legal framework, especially in the field of transport.²

² Source: Transport Development Strategy of Montenegro 2019
4. THE ROLE OF THE NODE IN LOCAL NETWORKS

The Port of Bar is in position 42° 5' N, 19° 5' E. As the main port of the Republic of Montenegro, it is located in the southern part of the Adriatic Sea. The port area is located west of the Town of Bar. The port of Bar, as practically the only cargo port in Montenegro, which performs almost all of maritime traffic, has capacities and development potentials (length of the operational coast, depth of the waters, connection with the railway and a large area for expansion), which gives it regional status. In addition, the Port of Bar, as a modern port, offers great opportunities for further development of combined transport and interconnection of all regions, since the necessary road-railway infrastructure is located in its hinterland.

Rail connections
Port of Bar is a point of departure of the railway line Bar – Belgrade (Serbia). Railway network in Montenegro consists of three railroads and they are as follows: Vrbnica-Bar (part of the railroad Belgrade-Bar on the territory of Montenegro); Podgorica-Nikšić; and Podgorica-Božaj (part of international railroad Podgorica-Shkoder (Albania) at the territory of Montenegro).

The Port of Bar is the final station of the Belgrade-Bar railway, completed in 1975. as one of the major engineering and construction achievements in former Yugoslavia. The railway Belgrade–Bar is a standard gauge railway, 476 km long. Of this length, 301 km of the railway goes through Serbia, and 175 km through Montenegro. It passes through 254 tunnels of total length of 114 km and over 435 bridges of total length of 14 km.

When it was built, a train took approximately 7 hours to go from Belgrade and Bar, while now it takes 11-12 hours, due to speed restrictions, as the railway cannot safely sustain the projected speeds prior to thorough reconstruction. Bar – Vrbnica (the latter at the Montenegro – Serbia border) is the most important section of the Montenegrin rail network. As a whole, rail is an important part of the Montenegrin economy, accounting for almost 60% of all freight and 10% of passenger travel (source: WBIF - Orient/East-Med Corridor (R4): Montenegro – Serbia Rail Interconnection). At present, Bar-Belgrade railway does not meet modern rail transport requirements with regard to railway transport, speed, service level and reliability. This situation has led to efforts to start rehabilitation of the railway infrastructure (the main priority regarding transport in Montenegro is reconstruction and upgrade of railway infrastructure).
Road connections
Total length of Montenegro’s roads is approximately 7,000 km, of which around 1,850 km consists of main and regional roads, while the remaining length consists of local roads. Currently, there are no motorways in Montenegro and main roads connecting major urban centers have single carriageways, with one lane per direction (and occasionally a third overtaking lane). Remaining road network includes regional and local roads of lower design standards. Montenegro’s railway network consists of three (mostly) electrified, standard gauge railway corridors with a total length of 150 km. It connects the Port of Bar with Podgorica and Serbia (Belgrade-Bar railway), the cities of Podgorica and Nikšić (Podgorica – Nikšić railway) and Podgorica with Albania (Podgorica-Shkoder railway). The railway line to Albania offers exclusively freight service.
Almost 600 km from the total length of the main road network belongs to the international E-road network. Main road M-2 is a part of the roads E65 and E80, while M-18 belongs to the road E762. Main road M-21 belongs to the European road network labelled as E763 and it connects Bijelo Polje with Belgrade. The existing road E763, roads E65 and E80 up to the border with Croatia represent the corridor of the planned Motorway Belgrade – South Adriatic.

Development of road transport and transport infrastructure implies the construction of several key roads, i.e. motorways and main roads which with their transport-exploitation fiscal and technical conditions would provide integration of Montenegrin transport network into the TEN-T network.

The planned Motorway network consists of:

- Motorway **Belgrade** – South Adriatic through Montenegro: Boljare – Mateševci – Bratonožići - western bypass of Podgorica – Bar.
  - Connection of the Motorway Belgrade - Bar with Kosovo, the part through Montenegro: Andrijevića – Murino – Bjeluha (the border with Kosovo).
- Section through Montenegro of the **Adriatic-Ionian Motorway**: the border with Republika Srpska in the area of Trebinje – Čevo – Podgorica – Božaj (the border with Albania).
The Port of Bar is a junction of the trunk road M–24 Herceg–Novi→Bar→Ulcinj and the road Bar→Podgorica→Beograd.

Namely, two most important strategic roads by which Montenegro should have been connected to the surroundings are included in the indicative extension of the basic regional transport TEN-T network on the area of Western Balkans. The Port of Bar will be connected with the corridors X and VII by the route 4 (Bar-Belgrade), and routes 2b will enable intersection with the route 4 and transverse connection of corridors Vc and VIII across the territory of Montenegro.

The Motorway from Bar to Boljare is 169.2 kilometres long. Almost over 40% of the total length consist tunnels, bridges and viaducts. This Motorway construction is the greatest engineering construction project in Montenegro and one of the biggest projects being implemented in the European market. The route will require the construction of 42 tunnels, 92 bridges and viaducts. The average daily, or annual traffic on the existing road from Bar to the border with Serbia, in certain sections ranges from 5,100 to 8,300 vehicles with distinct seasonal annual intensity that reaches up to 20,000 vehicles.
Works on the construction of Bar-Boljare Motorway started officially on 11 May 2015. The construction of the priority section Smokovac – Uvač – Mateševo will last four years. It will represent a milestone in economic development and consideration of further development directions. The contract period for construction of Smokovac – Uvač – Mateševo section is 48 months and the works have started on 11 May 2015, and it is expected that the contractor, Chinese company CRBC, will complete the construction of this section, 41 kilometres long, with 45 bridges and viaducts and 32 tunnels, within the defined deadline. At the moment, sections from Smokovac to Mateševo (part of the Bar – Belgrade Motorway) is under construction and it is the most demanding section of the Motorway Bar – Boljare which is to connect Montenegro with its hinterland. According to the existing plan, this segment will be completed by 2019.
5. THE ROLE OF THE NODE IN THE SEETO NETWORK

The Action is also in line with the South East Europe 2020 (SEE) and the main EU Policy, the White Paper on Transport. For the SEE, the expected results will contribute to tackle the priorities of Integrated growth, Sustainable growth and Governance growth. By developing the SEETO Route 4 and improving maritime and inland waterway transport sector modes, the Action contributes to the objectives of the White paper to achieve a genuine trans-European transport network (TEN-T) via new financing and new tariff rules for infrastructure, the reduction of greenhouse gas emissions through modal shift and new technologies or the integration of the transport sector into the global market to protect European interests.

Indicative extension of the TEN-T road network to the Western Balkan (source SEETO)
Concrete proposals for the establishment of the core regional transport network on Montenegro’s territory are:

- SEETO roadway 4: Bar-Boljare Motorway (border with Serbia);
- SEETO roadway 1: Adriatic-Ionian corridor (fast traffic route along the coastline), as a connection to Croatia and Albania;
- SEETO railway line 4: Bar-Vrbnica railway (border with Serbia);
- SEETO railway line 2: Podgorica-Tirana railway (link with Albania)
- **Port of Bar**;
- Podgorica airport

In parallel with the planning and implementation of the investments, it is equally important to create the conditions for opening of the transport market, notably the railway market that would benefit consumers in terms of providing a better and more efficient service. In this regard, a set of soft measures has been agreed in Vienna in 2015 with the set targets for aligning technical standards and formalising cross-border operation between the networks.

Montenegro has already achieved a good progress, while pending issues are mainly related to adoption of network statement for the Port of Bar and adoption the of road safety inspection standards Guidelines in the national legislations.

Montenegro’s Transport Development Strategy and the Strategy for Development and Maintenance of Public Roads are based on Memorandum of Understanding for development of the regional comprehensive transport network. Montenegro, as a signatory country of the MoU, has obligation to implement routes defined by SEETO Annual Plans through the strategic documents.

Since the railway line Bar - Vrbnica is part of the international railway Belgrade - Bar (SEETO Route 4) which connects the Port of Bar with the Pan-European corridors VII and X (Multi Annual Plans 2010-2014) it represents the most important transport line for the economy of Montenegro.

The Port of Bar is also a part of the SEETO Comprehensive Network as a core port.

The favourable transit position of the Western Balkans region and existing SEETO Network offer great potential for the development of intermodal transport, both internally among the countries and internationally. However, intermodality in the region is underdeveloped. The main problems that the development of the intermodal transport in SEE region is facing
refer to the following issues:

- Institutional issues - weak institutions, inadequate organization, non-existence of relevant associations, limited strategic foresight.
- Planning process - insufficient support to the comprehensive and wide-ranging planning process in the logistic transport chains.
- Operational issues, which comprises weak coordination and cooperation among stakeholders in the transport chain, as well as a lack of policy initiatives by governments for intermodal transport organization.
- Lack of infrastructure facilities - inadequate and weakly developed suitable infrastructure or superstructure, old mechanization and equipment.
- Economic constrains – lack of the concentration of considerable transport volumes at a reduced number of terminals to enhance intermodality in the region.
- Tariff policy issues, which do not stimulate the use of intermodal transport.
6. THE ROLE OF THE NODE IN THE TEN-T NETWORK

TEN-T consists of ten Trans-European corridors that have their own branches and imply multimodality and competition different forms of transport on them, the basic principles underlying TEN-T’s reliance on existing transport routes, addressing them through building missing links and widening bottlenecks, as well as connecting major cities and industrial centers, ports and airports, adequate roads to reduce time and transportation costs.

TEN-T was designed in the 1990s by the European Conference of Ministers of Transport, whereby Montenegro, despite its significant transit position in region, did not receive adequate treatment because of political events that took place in Yugoslavia at that time.

Direction Bar - Belgrade, which in all the studies and plans of the region until the 90's figured one of the most important routes for connecting the Adriatic with Central Europe (Bari - Bar - Belgrade - Budapest) completely was ignored, as was the Adriatic-Ionian Motorway connecting seven countries (Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania, and Greece), although in professional circles had a favored status and was supported by strong economic argumentation. Failure to include the above significant strategic directions for connecting Montenegro with the region and the EU is a problem in securing financial resources for development of Montenegrin road infrastructure, given the fact that giving priority to the EU corridor projects over all other projects. However, further development of the transport network in the area of South East Europe, or further the development of TEN-T followed under the coordination of infrastructure groups of the Stability Pact and with the participation of financial institutions at the way a new detailed study was done (Regional study infrastructure for the Balkans - REBIS). The aim of REBIS was to harmonize regional development needs and opportunities for Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kosovo, respectively UNMIK, Albania and North Macedonia, and its result is emergent Core Networks that made the implementation possible a number of infrastructure projects in the region. So, though strategic Motorway routes significant for Montenegro Bar - Boljare and the Adriatic-Ionian Motorway, not included in TEN-T Montenegro is an opportunity and support for the development and improvement of road infrastructure sought with its participation, both in the High Transport Group and through recent regional initiatives to modify the Core Network, to integrate these routes into the core regional transport network.

Pursuant to Protocol IV on Land Transport under the Agreement on stabilization and association with the European Union, integration with the TEN-T will run over the Basic Transport Network at Southeast Europe. By route 4 from that network, the Port of Bar will
connect with corridors X and VII, and routes 2 and 2b will provide intersection with route 4 and cross-linking of corridors Vc and VIII across the territory of Montenegro.

Based on the concept of high-standard road connectivity of Montenegro with the region and beyond, that is, the realization of the Motorway construction project in Montenegro, with the inclusion of private equity in the road sector, when in the aspect of fitting a Motorway construction project from Bar to Boljare at Core Network, under the auspices of the MoU for the development of Basic regional transport networks in Southeast Europe, this one the Motorway is an alternative to the existing route 4 through Montenegro.

Indicative extension of the basic regional transport TEN-T network (source: ec.europa.eu)
Port of Bar is one of the essential elements of transport, and therefore the economic system of Montenegro, through which almost complete trade of goods is carried out overseas. By indicative extension of the basic regional transport TEN-T network on the area of Western Balkans, the Port of Bar is included in the list of ports of regional significance.

Montenegro has the opportunity to promote the connection Bar–Belgrade via combined maritime-railway transport mode in order to give access to the Balkans and South Central Europe hinterland and gain competitive advantage compared to the already established alternatives TEN corridor through Croatia, Bosnia or Albania.
7. BOTTLENECKS

Inland connection
The quality of the port infrastructural links with its hinterland has a strong influence on the current port capacity utilization rate. When the railway Bar – Belgrade was built, a train took approximately 7 hours to go from Bar to Belgrade, while now it takes 11-12 hours, due to speed restrictions, as the railway cannot safely sustain the projected speeds prior to thorough reconstruction. Bar – Vrbnica (the latter at the Montenegro – Serbia border) is the most important section of the Montenegrin rail network.

As a whole, rail is an important part of the Montenegrin economy, accounting for almost 60% of all freight and 10% of passenger travel (source: WBIF - Orient/East-Med Corridor (R4): Montenegro – Serbia Rail Interconnection). At present, Bar-Belgrade railway does not meet modern rail transport requirements with regard to railway transport, speed, service level and reliability. This situation has led to efforts to start rehabilitation of the railway infrastructure.

In addition to the railway infrastructure, road infrastructure bottlenecks are missing motorway links with inland countries. In order to reduce to minimum these bottlenecks from the domain of road connections, the definitive priority is the development of the Montenegrin Motorway Network.

Port infrastructure
The Volujica quay is the largest quay/quay in the Port of Bar. In addition, it contains 3 berths with total length of 554m and sea depth of 14m (on others quays the sea depth is 6-12m). Due to aggressive environment and low level of the maintenance, corrosion of the construction has been noticed. Accordingly, surveys from the Faculty of Civil Engineering from Podgorica (1999) and the Civil Engineering Institute from North Macedonia (2012) stated that the condition of a part of quay was critical and an urgent rehabilitation was proposed. Before infrastructure investment in quay reconstruction,

Main design for the 1st phase of the reconstruction of the quay Volujica is be prepared within the NEWBRAIN project. The proposed infrastructure project will eliminate significant existing risksof different nature and will enable the fulfilment of conditions for maintaining the level of the existing capacity unchanged – if the existing part of the operational quay (554m in length) is not rehabilitated, the existing capacity would be endangered.
In order to fully assess the current state of damage to the reinforced-concrete quay structure, in the period 17/09/2012-- 30/09/2012, the expert team of the Construction Institute "Makedonija" from Skopje performed a detailed visual inspection with photo documentation of all structural elements, and assessed the degree of damage to the existing reinforcement and concrete. In addition, prior to the preparation of the Main design for the rehabilitation of structural elements of the structure on the operative quay, the Designer was required to carry out the structural survey of the structure once again in order to compare the condition of the structure recorded in 2012 and the condition recorded in 2019. To this end, the same expert team of the Institute conducted the full structural survey of the condition of the Volujica quay once again in the period 01-08/04/2019, and the study of the surveyed condition is an integral part of this technical documentation.

In addition to structural survey, in April 2019, concrete cores (the so-called core samples) were taken from the quay to determine the compressive strength of concrete but also the chloride content in the concrete cross section. The core samples were taken from the
positions from which they were also taken in 2012 in order to compare the results. In addition to core samples from the longitudinal girders, the core samples from the roadway slab were also taken. The results of concrete testing (compressive strength and percentage of chloride in the cross section) are given in the laboratory testing section, which is also an integral part of this technical documentation.

The general conclusion after comparing the condition in 2012 and the condition in 2019 is that the structure further degraded by some 5-10%, with the degradation of the surface of structural elements surveyed in 2012 being even higher today.

The main causes that contributed to such poor condition of the structure are certainly aggressive environmental conditions (immediately above the level and constant adverse impact of saltwater) and some errors in the construction of the structure (especially regarding the thickness of protective layers of concrete). These causes are described in more detail in the “Structural Condition Survey and Assessment Study” prepared in 2012, which is also an integral part of the technical documentation for rehabilitation.

After summarizing the structural damage in the period 2012-2019 and the preparation of the base of all structural elements with the marked damage, the following conclusion is generally reached:

- The first structural element closer to the root of the quay is in a good condition, we can even say that it is in a very good condition and it requires almost no rehabilitation measures, but as we head towards the open sea (towards the primary breakwater), the damage becomes greater and greater.
- When we look at the damage by structural elements, we come to the conclusion that Structural element IV (between axes 34-44) and Structural element V (between axes 45-55) are in the worst condition, followed by structural elements 111, VI and VII which are also in a bad condition.
- When we look at the damage by structural members of the structure, the conclusion is that the longitudinal girders are the most damaged, while the transverse girders and the roadway slab are in a much better condition.
- Reinforced concrete piles that are below the sea level are in a good condition, only parts of the pile which are affected by the constant change of the sea level due to tides are problematic. As for longitudinal secondary girders, the damage is greatest in the girders in axes A and B, then girders F and J in the line of piles, as well as girders G, H, and girders I and J above which there are railways with regular track.
• As for the main transverse girders, minor damage is visible only in the girders in the axis 26 of the Structural element 111, 32, 46 in the Structural element V, and the girder in the axis 61 of the Structural element VI and the girder in the axis 77 of the Structural element VII.

• As for the roadway slab, all fissures and cracks (in accordance with the positions given in the graphic drawings) must be rehabilitated. Given that useful loads on the quay also increased, additional static-seismic analysis has shown that, due to their rigidness, the main and transverse girders take over almost all new loads.
8. THE SELECTED PROJECTS

The selected projects in line with NEWBRAIN methodology request that will be mentioned in the following text are:

1. Reconstruction of the construction of the quay Volujica (554m in length) and construction of the extension of the quay Volujica (166 m in length) in the Port of Bar;
2. Extension of the quay at the Passenger Terminal of the Port of Bar;
3. Adriatic Ionian Motorway/Expressway;
4. Rail Route 4 (Bar-Vrbnica) - Reconstruction of railway line;
5. Completion of Road Route 4, section Mateševo-Andrijevica.

Three projects (3,4 and 5) are national projects and in this document main facts will be presented and focus will be on development projects in Port of Bar (projects 1 and 2).

8.1 PROJECT 1: Reconstruction of the construction of the quay Volujica (554m in length) and construction of the extension of the quay Volujica (166 m in length) in the Port of Bar

8.1.1 THE DESCRIPTION OF THE INTERVENTION

Project “Reconstruction of the construction of the quay Volujica (554m in length) and construction of the extension of the quay Volujica (166 m in length) in the Port of Bar”, basically, represents realization of activities which can be systematized within the following three components:

- **Project 1 component**: Rehabilitation of the construction of the built part of the quay Volujica 554 m in length, according to the Main rehabilitation project – elimination of the existing damages to the construction of the operational quay, provision of approved work load of 6 t/m² and installation of the system of cathodic protection of the quay construction;

- **Project 2 component**: preparation of project documentation and carrying out work on extension of the operational quay Volujica for 166m (width 30m); design and installation of the system for cathodic protection for this part of the construction of operational quay; design and construction of an open warehouse in the hinterland of the operational quay dimensions 166m x 50m; design and construction of necessary infrastructure (electric power, water and sewerage, railway tracks) for a new part of the operational quay; deepening of the aquatorium with the extension of the operational quay, in the belt of 100m, 14m in depth, all in accordance with the elements of spacial-planning.
documentation for Port area;

- **Project 3 component**: design and installation of the system for suppression of dust from stacks of stored dry bulk cargo on the quay Volujica (in the complete zone, in the hinterland of the operational quay 720m in length (554m + 166m)); design and installation of systems for collection and treatment of surface waste waters in the whole open warehouse, in the hinterland of the operational quay 720m in length (554m + 166m).

![Volujica quay in Port of Bar (source: Google earth)](image)

The mentioned infrastructure project “Reconstruction of the construction of the Volujica quay (554 m in length)” when implemented should eliminate the risk to people and material goods which exist due to construction damages of the built part of the quay Volujica; provide optimization of approved workload of the construction of the operational quay per unit area and provide adequate use of the existing and introduce new means of port equipment of higher productivity (with the aim of improving the level of quality of services at the Terminal for dry bulk cargo and general improvement of the position of “Port of Bar”
Holding Company in the market of handling and storage of dry bulk cargo services; increase the capacity of the Terminal for dry bulk cargo by approx. 30% and form basis for attracting new cargo flows, with increase in technological possibilities for activating transhipment concept in the “Port of Bar” Holding Company (which is present only a little, and with which current defects/limitations in capacity of infrastructure links of the Port with the hinterland could be solved) and enable that the Terminal for dry bulk cargo in the “Port of Bar” Holding Company is developed into a terminal of regional significance; eliminate dust emission in the air from stacks of stored cargo and, while performing handling operations, enable functioning of the system for dust suppression, as well as eliminate sea pollution by application of system for collection and treatment of surface waters in the zone of storing cargo and performing the manipulations with cargos; increase in the level of incomes of the “Port of Bar” Holding Company, and thus increase in incomes both for entities who are direct participants in port operation (agents, forwarding agents, shipping companies, road haulers, rail haulers,…), and incomes of municipal budget (based on increased surtax, real estate tax, …) and State budget (revenues from the reimbursement on the use of quay, taxes and contributions on salaries of employees,…); etc.

A brief description of the structure on the Volujica operative quay

The structure of the quay on the Volujica operative quay is a semi-prefabricated reinforced-concrete structure of a “grill” type consisting of the main transverse girders, secondary longitudinal girders over which a 22cm thick reinforced concrete monolithic slab was poured, which serves to connect the structural system into one whole, to transfer all vertical loads to the main and secondary girders, as well as to provide the necessary horizontal rigidity of the quay structure. A 15cm thick asphalt concrete road surface was laid over the reinforced-concrete slab.

The width of the quay structure is B = 30.25m, while the current total length of the quay is L = 554m, and it was built in two phases (II and III). The structure of the quay, built in Phase II, the first part, is divided into 5 structural elements, each 79.2m long, which are mutually dilated with dilations d = 5cm, while Phase II in the second part includes the structure of the quay, 158.40m long, which is divided into two structural elements, of which the first is 123.60m long and the second structural element is 34.8m long.

The reinforced-concrete grill rests on 3 (three) rows of bored "BENOTO" piles with 9.00m (8.50m) spacing between them over the main girders (transverse girders), while at the end of the quay towards Volujica hill, the girders rest in the L axis over the 30cm thick
reinforced-concrete wall (shear wall). The piles, depending on their position, have different height between 8.00-20.00m and according to the data that can be seen in the projects, they are driven into the seabed up to a depth of 1.5-2.0m, and are made of steel pipes with an internal diameter of <P1180mm and 1Omm thick sheath filled with concrete. Only the upper (top) part of the pile is reinforced with classical reinforcement at the connection with the structure. All piles of the quay structure on the Volujica quay are protected by cathodic protection, which is unfortunately not operational.

The specific feature of the quay structure on the Volujica quay is that the entire reinforced-concrete structure is anchored into the rock mass of Volujica hill with a reinforced-concrete beam on the old part and a reinforced-concrete grid on the new part which enables that the effect of all oblique forces acting in the horizontal level of the upper surface (impacts of ships, mooring of ships, as well as seismic forces) is transferred from the structure to the rock mass of the quay.

When looking at the quay structure from the upper side, the roadway structure is made of asphalt concrete, in which 3 pairs of rail tracks are placed (lowered), as well as a crane track for a large crane with an outreach of \( L = 28.00 \text{m} \), a crane track for the crane with \( L = 10.50 \text{m} \), then a conveyor belt, as well as a roadway (road) for 6.00m wide loading vehicles.

**Technical solutions for reconstruction**

Technical solutions for reconstruction (rehabilitation, since with this project we restore the structure to the so-called design situation) are divided depending on the degree of damage, so we distinguish several types of rehabilitation measures that will be elaborated in the continuation of this project.

Depending on the degree of damage, all structural elements are classified into three categories or TYPES of damage, as follows:

- **Type 1** - major damage to the elements,
- **Type 2** - medium damage to the elements,
- **Type 3** - minor damage to the elements.

**Type 1 Damage**

This type of damage includes the most severely damaged elements in which the concrete parts of the elements have fallen or are prone to falling off. The reinforcement is visible and heavily corroded. The cross-section of the main bars is greatly reduced due to corrosion, and some of the bars are completely cracked. Beam hangers are generally quite cracked.
and separated from the concrete element and higher. The elements that have damage of this category on one part and the TYPE 2 category damage on the other part or have no damage at all are also classified in this category. These elements are marked with red colour on the layout of structural elements. The characteristic damage of this TYPE is shown in the pictures in the 2012 study, and was confirmed when the structure was surveyed in 2019.

It should be mentioned that due to structural degradation in the last 7 (seven) years, some of the structural elements that were marked with the ochre colour in 2012 as the elements with medium damage are now in even worse condition and in the 2019 study they are marked with the red colour, i.e. as the elements with major damage.

**Type 2 Damage**

This type of damage includes medium-damaged elements in which protective layer of concrete has partially fallen off or cracked. The reinforcement is visible and corroded on the surface. In some cross-sections, the beam hangers are broken or are not in the concrete cross-section. Cracks of about 0.3mm in width filled with carbonized items have been registered in the RC slabs. These elements are marked with the ochre colour in the layout of the structural elements.

**Type 3 Damage**

This type of damage includes less damaged elements in which the protective layer of concrete is partially cracked. The reinforcement is less visible and corroded on the surface. Cracks less than 0.3mm in width filled with carbonized items have been detected in the RC slabs. These elements are marked with the yellow colour in the layout of the structural elements.

**Rehabilitation solution**

When choosing a rehabilitation solution, the following conclusions and conditions have been used as a starting point:

- that the RC structure of the quay has suffered extensive damage which threatens its stability and safety,
- These are extremely unfavourable exploitation conditions and aggressive environment,
- To ensure adequate static safety of the Quay structure,
- To ensure adequate durability, i.e. to extend the life of this structure as much as possible,
To strengthen the structure of the quay so that it can bear increased live loads,
That the proposed solution is acceptable in economic terms. When choosing a rehabilitation solution, the Designer opted for the rehabilitation and strengthening of all structural elements in the same manner, taking into account the needs and the manner of using the quay.

Rehabilitation of TYPE 1 Damage
For this type of damage to the girders, a rehabilitation solution has been selected, which consists of the widening of the cross section in the area where the damage has been registered. The thickness of the newly added concrete (the so-called jacket) was adopted at 10 cm at the bottom side and 8-10 cm at lateral sides. This thickness is dimensioned so that it is possible to place the necessary reinforcement and ensure a suitable protective layer. The height of the widening depends on the height of the damage and it ranges from 35 to maximum 45-60 cm in longitudinal girders, while in the case of transverse girders, this height is smaller and is approximately 25 cm. The rehabilitation should be carried out according to the details given in the design (see graphic annexes). This rehabilitation solution applies to all damaged longitudinal girders (girders in axes A, B, D, E, F, G, H, I, J, K), as well as to a couple of transverse girders in axes 66 and 61.

Rehabilitation of TYPE 2 Damage
The rehabilitation solution of medium damage would be carried out by the same procedure as the rehabilitation solution of major damage, except that the damage is of lower intensity here and the rehabilitation is carried out without an additional concrete cross section, i.e. within the existing dimensions of longitudinal and transverse girders. In this type of rehabilitation, the order of rehabilitation activities is identical to that in Type 1 rehabilitation.

Rehabilitation of TYPE 3 Damage
The entire surface of the concrete with visible traces of leaching, dissolving and precipitation of marine chlorides should be cleaned by the sandblasting or hydro demolition procedure. The damaged areas should be checked after cleaning for chloride content (which should not exceed 0.4% of the estimated amount of cement, in accordance with the EN 206-1 standard). If, even after cleaning, the percentage of chloride relative to the cement mass is greater than 0.4%, additional removal of contaminated concrete should be carried out until the required condition is met. Anti-corrosion protection of the entire reinforcement should be carried out with special anti-corrosion agents resistant to existing aggressive impacts, etc.
8.1.2 INVOLVED SUBJECTS AND STAKEHOLDERS

Involved subjects and stakeholders in the following intervention are: Ministry of Transport and Maritime Affairs, “Port of Bar” H.Co., Maritime Safety and Port Management Department of Montenegro.

8.1.3 THE MATURITY LEVEL OF THE PROJECT

The project is in the 1st phase. In the NEWBRAIN project Main design for the “Reconstruction of the construction of the Volujica quay (554 m in length)” has been prepared. The tender procedure for the 1st phase has started in December 2019 and in 2020 works shall start. In addition, in the NEWBRAIN project Elaborate of detailed geotechnical investigation for the extension of Volujica quay was prepared and this is a first step before preparation of the Main design for the extension.

8.1.4 THE TIME FRAME

Time frame for realization of 1st phase is 2020 - 2037.

8.1.5 THE INVESTMENT AND THE MANAGEMENT COSTS

Overall price for realization of the project is 13.150.000 € and estimation of the 1st phase is 5,2 million euros.

8.1.6 THE FUNDING SOURCES

Own sources (“Port of Bar” H.Co.) and bank loans will be used for the funding of the implementation of the 1st phase of the project.

8.1.7 THE CONSTRAINs

The main constraint is limited sources of investment funds as at the moment the Port of Bar need to finance this project from its own sources.

8.1.8 THE FAVOURABLE CONDITIONS

Favorable conditions include: improving inter-modality, providing connection to TEN-T corridors, contribution to improvement of the safety and security conditions, improving the
characteristics, capacity of the infrastructure, impact on the annual traffic demand growth (traffic of freight and persons), improving accessibility, impact on the environment (possible mitigation measures, climate change limitation actions), contribution to overall economic growth (effects on economic environment of the country and countries in the area), improving transit / transport facilities, mobility, access to new markets, jobs, education, definition of the project - adequate solution, contribution for solving the transport needs, and many more.

1. Improving inter-modality
Port of Bar is a sole intermodal hub in Montenegro which connects maritime, road and rail transport. Proposed infrastructure project has a direct impact on improving intermodality in the Port of Bar and therefore in Montenegro. Expected increase in capacities on the quay Volujica by 30% affects directly the maritime transport (the infrastructure capacity for reception of the ships will be increased), the rail transport railway (tracks which are located on the quay Volujica will also be extended) and the road transport (roads on the coast and in the hinterland, which are used for serving ships and warehouses on the quay Volujica, will be extended).

2. Providing connection to TEN-T corridors
The project is directly linked to the TEN-T corridors (indicative extension of the Main TEN-T network to region of Western Balkans). Extension of the two Trans-European corridors, Mediterranean corridor and corridor Middle East – Eastern Mediterranean directly include the Port of Bar as a part of Main network on the territory of Montenegro (indicative extension of the Main (CORE) TEN-T network to the region of Western Balkans).

3. Contribution to Improvement of the safety and security conditions
The project improves safety in the Port of Bar. The proposed project eliminates a significant risk to people and material goods which exist due to construction damages of the built part of the quay Volujica. Surveys from the Faculty of Civil Engineering from Podgorica from 1991 and the Construction Institute Macedonia from 2012 stated that the condition of a part of infrastructure (quay) was critical and an urgent rehabilitation was proposed. This project would ensure safe work on the quay Volujica.

4. Improving the characteristics the infrastructure
The project improves characteristics and capacities of the existing infrastructure (the existing infrastructure is rehabilitated and upgraded with a new one). The project envisages the repair of the existing infrastructure (the Volujica quay 554m in length) as well as the
upgrading (the extension of the existing quay for new 166m with all supporting facilities – roads, railway tracks etc.).

5. Impact on the annual traffic demand growth (traffic of freight and persons)
The project affects directly the growth of traffic demand. With the proposed infrastructure project, the capacities of the “Port of Bar” H.Co., in relation to the current handling capacity and storing dry bulk cargo, increase by 30% and a further increase in handling volume is enabled. Besides, the proposed infrastructure project enables the fulfilment of conditions for maintaining the level of the existing capacity unchanged – if the existing part of the operational quay (554m in length) is not rehabilitated, the existing capacity would be endangered.

6. Improving accessibility
Since the project is significant as it enhances connectivity among regions and impact on other countries in the region, the proposed project has a direct influence on connecting the Port of Bar with other ports because it influences the increase in accessibility of the Port of Bar. The proposed infrastructure project refers to the quay where the depth for berthing ships is the biggest (up to 14m) and it increases the capacities on this quay by 30% and at the same time the rehabilitation of the existing infrastructure is performed (the reception of more ships in the Port of Bar is allowed, ...). Market of the “Port of Bar” H.Co. consists mostly of countries of the region (Serbia, Kosovo, B&H), therefore the improvement of accessibility of Bar as a destination would impact on the possibilities of broader cooperation with business partners in the region.

7. Impact on the environment (possible mitigation measures, climate change limitation actions)
The project affects the improvement of protection from negative effects on the environment. One of the components of the proposed infrastructure project is related directly to the aspects of environment - emissions in the air (from stacks of stored cargo) and letting into the water (surface waste waters) – the project implies design and installation of the system for suppression of dust from stacks of stored dry bulk cargo on the quay Volujica and design and installation of the system for collection and treatment of surface waste waters on the whole open area. These new systems would contribute to a significant reduction of negative influences which dry bulk cargo has on the environment, especially taking into account the fact that there are no such systems in the Port of Bar currently.
8. Contribution to overall economic growth (effects on economic environment of the country and countries in the area)

The project contributes to the overall economic growth. Increasing capacities of the Port of Bar (one of the direct planned project results) affects positively the economic environment in Montenegro and countries in the region: growth of volumes of cargo handling (which could be enabled based on the realization of the project) in the Port of Bar affects the income growth of all entities, directly or indirectly, involved in the port business, including the increase in budget revenues for the Municipality of Bar and the State Budget through increased revenue from different taxes, incomes from concessions, etc.

9. Improving transit / transport facilities, mobility, access to new markets, jobs, education

The project will affect the improvement of: regional markets, regional mobility, possibilities for employment, new investments. By improving the condition of the existing infrastructure and construction of a new one, the following prerequisites are met: attracting new flows of goods, full application of transhipment concept in the Port of Bar (whose current use is at a low level), and, consequently, an increase in revenue from performing port activities, and they open a space for new investments in different segments of the port system.

10. Definition of the project - adequate solution, contribution for solving the transport needs

The project will contribute to fulfillment of growing transport needs in the region, in the domain of transport of dry bulk cargo and liquid cargo. In line with the fact the realization of the project increases the capacity of the Terminals for dry bulk cargo and liquid cargo in the Port of Bar, the initial technical prerequisites for meeting the growing transport needs in the region are met, taking into account the current and realistically expected future potential of the relevant market.
8.2 PROJECT 2: “Extension of the quay at the Passenger Terminal of the Port of Bar”

8.2.1 THE DESCRIPTION OF THE INTERVENTION

Project “Extension of the quay at the Passenger Terminal of the Port of Bar” includes construction (extension) of the operative quay 432 m in length and 30 m in width, as an extension of the existing berth 54, on the inner side of the secondary breakwater.

Passenger terminal in Port of Bar

The existing sizes and spatial arrangement of berths at the passenger terminal indicate that berths 44, 51, 53, and 54 are suitable for mooring very small cruisers up to 5,000 BT and up to 100 meters in length. At the front berth 52, the mooring of even such small cruisers would almost completely block the passage to the eastern pool of the passenger terminal, which is temporarily used as a marina, and thus, the berth 52 was not taken into account in the capacity calculation. Berths 44 and 51 with 97.5 meters long shoreline can accommodate slightly smaller vessels than berths 53 and 54 that have 107.5 meters shoreline, and could
individually accommodate even a smaller proportion of cruisers falling in the category from 5.000 to 10.000 BT.

Extension of the quay at the Passenger Terminal will improve accessibility of the port with focus on medium/large Ro-Pax ships (with deeper draft) and cruise ships in Bar. According to the national plan, building on a new part of the quay will be followed with the building of supporting facilities (new building, roads, etc.).

The construction of the new part of the quay at Passenger terminal

The construction of the extension of the coast of the passenger terminal at the Port of Bar is represented by a supporting wall-type structure made of concrete blocks. The basic structure consists of large prefabricated concrete elements stacked on top of each other, and side by side in systematic order, on a thin submarine stone embankment, forming a massive vertical wall. The geometry of each block is different for every distinctive block type. Six types of stone blocks were designed on the construction of the passenger terminal at the Port of Bar, i.e. block B1-block B6, and a discharge bolic and block guard. The concrete blocks stacked on top of each other without overlapping, so the wall acts as a series of fastened columns, which allows the realization of differential settlements along the
track. The chamber space which, when the blocks are stacked side by side, is filled with stone material along with its entire height. At the end of the settlement, an altitude section is concreted, which aligns and connects the differently assembled parts of the prefabricated wall.

Above the concrete blocks at the top of the wall above the sea level, a reinforced concrete roof beam, 170 cm of height, was designed along the entire length of the terminal, which serves to connect the blocks into one spatial unit. Fenders and poles for mooring ships are anchored in this beam at the same time.

The connection of the transverse and longitudinal walls of the terminal was made using a 600/360 cm concrete ring block. Behind the concrete block supporting wall is a stone embankment. The upper end of the supporting structure above the sea level ends with a freestanding concrete prism of 1-20 kg over which a layer of gravel (d=30 cm thickness) is placed, and over which a reinforced concrete slab of d=20 cm thickness is poured.

As tourism is defined as the highest development priority of all industries in Montenegro, there are interesting development possibilities in relation to the passenger market. In particular, the Adriatic cruising market may provide opportunities for growth of passenger traffic through Port of Bar. Future infrastructure development of the current infrastructure (extension of the existing quay) will be prepared as an additional step forward to the improvement of the accessibility of passenger ships in Port of Bar.

The Adriatic market may provide opportunities for growth of passenger traffic through Port of Bar as in Montenegro tourism is defined as the highest development priority of all industries. These activities will contribute to initial preparation for decision making process in Port of Bar for future development and investments, directed at improving accessibility and introduction of new maritime lines (cruise and Ro-Pax lines) in Port of Bar.

Improving accessibility of the Port of Bar for medium/large passenger ships, favoring the new maritime connections in Adriatic region is one of the main priority in the development plan of the Port of Bar. Currently, limitation at the Passenger terminal is the depth of the sea and length of current quay and new infrastructure for medium/large ships is needed.
8.2.2 INVOLVED SUBJECTS AND STAKEHOLDERS

Involved subjects and stakeholders in the following intervention are: Ministry of Transport and Maritime Affairs, Municipality of Bar, “Port of Bar” H.Co., Maritime Safety and Port Management Department of Montenegro, Barska plovidba JSC.

8.2.3 THE MATURITY LEVEL OF THE PROJECT

The project is still in progress, the Main design has been prepared within an EA-SEAWAY project (IPA ADRIATIC programme) but at the moment, investigation of innovative and less expensive designs is in considerations.
8.2.4 THE TIME FRAME

Time frame for realization of project is from 2020-2037.

8.2.5 THE INVESTMENT AND THE MANAGEMENT COSTS

Overall price for realization of the project is approx. 14.000.000 €.

8.2.6 THE FUNDING SOURCES

Funding of the implementation of the project is not specified yet.

8.2.7 THE CONSTRAINS

The constraints that may be an obstacle for extension of the quay at the Passenger Terminal are listed as follows:

- uncertain financial sources for investing in planned port infrastructure
- bottlenecks on roads Bar – Sutomore, coastal main road Tivat – Bar, connectivity in direction Lepetane – Cetinje via Lovćen
- great interest of other ports for becoming a “port of call” cruising port
- strong competition in cruising sector due to attractiveness of the Adriatic Sea and the region as well as attempts of other destinations on the Adriatic to take part in the market
- unorganized tourist offer with insufficient capacities and inexperience of inland carriers in road transport
- lack of experience in cruise ship sector
- development of cruising and intercity ship (SSS) lines may cause a formation of potential danger of “conflicts``- confrontation of sea port and city concerning traffic jams etc.

8.2.8 THE FAVOURABLE CONDITIONS

Favorable conditions for the development of the project are:

- natural resources and cultural sights in hinterland of Bar – an important factor for attractiveness of cruise ship destination
• return of market progress of cruising
• quality of existing port development platform that provides implementation of its own know-how in cruising destination development
• tourism attractiveness and ecologically unspoiled micro location
• entrepreneurial potential in the region
• geographical location within the entrepreneurially active micro region of Montenegro
• immediate proximity of the city center
• development of strong partner relations with other cruising destinations on the Adriatic as well as possibility of attracting a part of cruise ships that tend to go to Port of Dubrovnik. Due to its overloading, they may be interested in Port of Bar
• greater interest of cruise ship guests for new and attractive cruising destinations
• anchorage of 31-47m in depth, size and proximity of adequate anchorage
• building of adequate inland infrastructure and development of line seaside passenger transport – transversal and longitudinal connectivity (Montenegro, Croatia, Albania, Italy...)
• quality, expertise and commitment of human resources alongside high level of management motivation
• flexibility and adaptability of port service with regards to mobility of workers and unification of management functions within one operator – Port of Bar JSC
• relative financial strength in the region and long-term stability
• successful partner relations with local, regional and national public authorities
• continuity of development projects and high efficiency in the EU project implementation, as well as established partner relations with maritime transport subjects in the whole region and further
• sufficient inland infrastructure for the needs of Passenger terminal
• specialized information office
• ATMs, restaurants, bars
8.3 PROJECT 3: “Adriatic-Ionian Motorway/Expressway”

8.3.1 THE DESCRIPTION OF THE INTERVENTION

Development of the Adriatic-Ionian corridor is of great importance, as it will pass through a number of countries in the region and of EU countries, and will connect Montenegro with Central and Western Europe, as well as enable a stronger development of seaports in several countries. This corridor should contribute to significantly greater integration of the Montenegrin territory, and usher a connection to the regional and European road network. The Adriatic-Ionian motorway shall make tourist destinations on the coast more accessible, but also in the central region for domestic tourists, and for all those from the European and other areas.

The coastal variant of the Adriatic-Ionian expressway (Route 1) goes along the Montenegrin coast, and aims to improve connectivity within the region as well as the region with the EU. This is a strategic project for the region of Southeast Europe and the Balkans. Part of the Adriatic-Ionian corridor that passes through Montenegro, from the border with Croatia to the border with Albania, is about 108 km. It consists of the bypass system around the coastal towns of Bar and Budva, Tivat, Herceg Novi and the major construction feature, a high bridge crossing over the Boka Kotorska Bay – Verige bridge. (Source: Transport Development Strategy 2019-2035)
From the perspective of Montenegro, priority regional projects are Adriatic-Ionian corridors, i.e. a fast road and gas pipeline, as well as modernisation and expansion of railway infrastructure as a prerequisite for more economic integration and movement of people and goods and linking to European corridors, PM Dusko Markovic said. (Source: Adriatic-Ionian corridor – a priority for Montenegro, 26/02/2018, CDM)

8.3.2 INVOLVED SUBJECTS AND STAKEHOLDERS


8.3.3 THE MATURITY LEVEL OF THE PROJECT

The project is still in development phase (minor parts of the motorway/expressway have the technical documentation finished).

8.3.4 THE TIME FRAME

Time frame for realization of project is not yet determined.

8.3.5 THE INVESTMENT AND THE MANAGEMENT COSTS

Estimated cost of design, supervision and construction of the expressway in its entirety is 1.013 billion euros. Because of financing constraints, segmentation and phase construction of certain sub-branches is necessary, which has been identified in earlier documents. For this complete road section along Montenegrin coast a general project and a feasibility study have been conducted in 2008/2009. (Source: Transport Development Strategy 2019-2035).

8.3.6 THE FUNDING SOURCES

The funding sources for the construction of Adriatic-Ionian corridor are: state budget, EU/WBIF funds, loans, private sources/PPP, concessions.

8.3.7 THE CONSTRAINS

Funding of the project.
8.3.8 THE FAVOURABLE CONDITIONS

The completion will provide a high capacity corridor of high quality that connects central Europe and northern Italy with the Ionian peninsula through Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania and Greece.

The benefits of implementation of the project will be:

- solving the main bottlenecks that limit the development of all parts of the involved countries along the corridor;
- integration, interconnection and interoperability of transport modes including the road, rail, air, inland transport;
- development of the “green corridor”, a concept which would involve utilization of “greener” technologies and techniques, all in favor of environmental protection;
- development and upgrading intermodal solutions and service optimization;
- determining the investment options and further developments in the region;
- development of managerial structures and future policies.
8.4 PROJECT 4: “Rail Route 4 (Bar-Vrbnica) - Reconstruction of railway line”

8.4.1 THE DESCRIPTION OF THE INTERVENTION

The railway line Vrbnica-Bar is a part of the international railway line Belgrade-Bar, connecting the Port of Bar and Montenegro with the countries of the Western Balkans and Central Europe. In the SEE network (SEETO comprehensive network), it is identified as a route 4.

Opening of the Bar - Vrbnica railway line in the 1970s was the biggest undertaking of railway construction in Europe at the time. As far as maintenance is concerned, it is among the most expensive and most complex in Europe. Route 4: (Belgrade) -Vrbnica -Bar railway line is single track for mixed transportation. It was built in the period from 1952 to 1976 in phases.

The total length is 454,8km, of which 167,1km is in Montenegro and 287,4km in Serbia. This is a unique railway line in Europe that climbs more than 1000 meters to Kolašin from 12 meters above sea level in Bar. The highest gradient is on the section Bijelo Polje-Podgorica of 25%.

Every fourth kilometre of the railway passes through tunnels. The railway line is completely electrified by a single-phase 25 kV, 50 Hz system. The projected speed is 80-120 km/h, however maximum speed is not achieved on any part of the track. Unstable slopes and tunnels, as well as frequent breaks on the contact network represent a serious problem. Due to all these obstacles in certain sections, the capacity of the railway line is also reduced. Many of the railway elements are now at the end of their economic life, therefore it is very important to timely plan projects and provide money for their reconstruction, the implementation of which should have a positive impact on the overall state of the railway infrastructure.

Approved loans of the international financial institutions of the EBRD and the EIB and the IPA and WBIF funds are intended for the reconstruction and modernization of the aforementioned railway line in order to increase the level of security and safety of the railway traffic and fully meet the interoperability requirements for overhauled sections, increase the speed of trains and at the same time reduce the time of passenger and cargo
transportation, raise the competitiveness of the railway itself compared to other competitive railway lines and other modes of transport, as well as valorise the capacity of the Port of Bar.

Over the past 10 years, around EUR 70 million were obtained from the international financial and donor institutions on the railway line Vrbnica - Bar, i.e., about 40% of the superstructure equipment was repaired, there is still space for further improvement of the situation on the railway line in the following period. (Source: http://www.zicg.me/piu/eng/opsteopruz.html)

Today, there are only 40 trains on the Podgorica – Bar line, and both speeds and cargo loads have declined. Structural weaknesses and poor signalling have led to speed restrictions being introduced on about two thirds of the line, reducing capacity significantly compared to when it was first built. The line also poses important safety risks: a total of 210 emergencies were recorded in the period January 2008 to December 2012. Moreover, faulty signals reduce the reliability of the system and caused about 250 hours of lost operation in 2012. As part of a separate, but complementary, investment due to be implemented between 2020 and 2022, signalling will be replaced on around 11 km of line in Bar. The Government of Montenegro has budgeted for further modernization works on the railway track for the 2020 – 2025 period. Works on the signalling system in Podgorica as well as on some of the slopes have already started. Additional EU assistance is being provided for designing structural improvements to the bridges, for any additional studies required and for tendering the works. (https://wbif.eu/storage/app/media/Library/9.Sectors/5.Transport/26.Updated-Summary-Sheet-for-2015-CA-Transport-Project-in-Montenegro.pdf)

With respect to the Vrbnica-Bar line, so far, its northern part has been rehabilitated: Vrbnica-Kolašin (53.2 km), with additionally contracted overhaul of Kolašin-Kos (10.9 km) and Kos-Trebešica (7.3 km, with 56 secured financing) for a maximum speed of 75-80 km / h. Remaining works include the general overhaul of the line’s remaining 96 km (Trebešica-Bar), preparation of the main project for rehabilitation of existing signalling in Podgorica station and concrete bridges (a total of 91 bridges), preparation of the main reconstruction and rehabilitation project for 106 tunnels, procurement of equipment for maintenance of railway infrastructure, (14 steel bridges, 91 concrete bridge, 12 slopes and landslides in a total length of 3km), reconstruction of the track and facilities at three stations, reconstruction of the existing signalling and contact lines along the line and modernization of the security system and video surveillance. There is technical documentation for most of the phases of
the project for the preparation of the tender or implementation of the tender procedure. (Transport Development Strategy, with Action Plan 2019-2020)

8.4.2 INVOLVED SUBJECTS AND STAKEHOLDERS

Government of Montenegro, Ministry of Transport and Maritime Affairs, Ministry of Finance, Railway Infrastructure JSC.

8.4.3 THE MATURITY LEVEL OF THE PROJECT

The project is still ongoing.

8.4.4 THE TIME FRAME

The estimated duration of the project is 15 years.

8.4.5 THE INVESTMENT AND THE MANAGEMENT COSTS

The estimated price for realization of the project (Rail Route 4 (Bar-Vrbnica)) is EUR 138mn (source Italferr) but as some works has been finished and reconstruction is ongoing current estimation is not available.

8.4.6 THE FUNDING SOURCES

Funding of the project will be provided through state budget, concessions, PPP, donations, loans, EU funds.

8.4.7 THE CONSTRAINTS

- access routes to the markets of Serbia and beyond depend on the competition with both neighboring countries, i.e. Albania and Croatia;

8.4.8 THE FAVOURABLE CONDITIONS

- enhanced safety and reliability of rail transport for around 850,000 passengers using the Bar – Vrbnica railway route on an annual basis.
- passenger and cargo rail carrying capacity considerably increased, and travel times
reduced by 1h to 2h, contingent on additional fleet investments.
- lower operational and maintenance costs for the railway operators, giving better services to passengers and cargo operators alike.
- the investment will facilitate regional trade and integration and thus have a positive impact on the economy in the region.
- CO2 emissions will be reduced. 
- increased travel speeds
- higher corridor capacity
- safer operations
- travel convenience
- rehabilitation and modernization of the railway track
- remediation of slopes
- rehabilitation of landslides, tunnels, concrete bridges and electro-works
- new jobs created during construction;
8.5 PROJECT 5: “Completion of Road Route 4, section Mateševo-Andrijevica”

8.5.1 THE DESCRIPTION OF THE INTERVENTION

Bar-Boljare motorway corridor represents the basic connection in the north-south direction, and it also provides the appropriate connections to Serbia, Bosnia and Herzegovina and Albania through the existing road network system. The connection of Bar with the TEN-T Corridor X (which passes through Serbia), i.e. the Bar-Belgrade motorway, not only is the strategic 20 orientation of Montenegro for connecting with Central Europe, but also represents a direction that has special significance for the Port of Bar and the overall economic development Montenegro.
Section of the Road Route 4, Mateševo-Andrijevica, is foreseen to be 21 km long. In general, works on the construction of Bar-Boljare Motorway started officially on 11 May 2015. The Motorway from Bar to Boljare is 169.2 kilometres long. This will be one of the most expensive motorways per km in Europe, because tunnels, bridges and viaducts make up over 40% of the total length. This Motorway construction is the greatest engineering construction project in Montenegro and one of the biggest projects being implemented in the European market. The route will require the construction of 42 tunnels, 92 bridges and viaducts. The average daily, or annual traffic on the existing road from Bar to the border with Serbia, in certain sections ranges from 5,100 to 8,300 vehicles with distinct seasonal annual intensity that reaches up to 20,000 vehicles.

8.5.2 INVOLVED SUBJECTS AND STAKEHOLDERS

The Government of Montenegro, the Ministry of Transport and Maritime Affairs, Ministry of Finance, Monteput.

8.5.3 THE MATURITY LEVEL OF THE PROJECT

The technical documentation is still in development phase and starting of activities is planned for next few years.

8.5.4 THE TIME FRAME

The time frame for the realization is 2 years.

8.5.5 THE INVESTMENT AND THE MANAGEMENT COSTS

Overall price for realization of the project is 273mn €.

8.5.6 THE FUNDING SOURCES

Funding of the project will be provided through state budget, EU/WBIF funds, loans, private sources/PPP.
8.5.7 THE CONSTRAINTS

Funding of the project (The International Monetary Fund (IMF) believes that the rush to complete the highway from Bar to Boljari will endanger state finances, that is, fiscal sustainability, and that completing the highway through new loans would require new fiscal adjustment measures – source International Monetary Fund).

8.5.8 THE FAVOURABLE CONDITIONS

According to the Ministry of Transport, these are the favourable conditions for construction of the Road route 4:

- to ensure safe and secure transport;
- to ensure the quality of the maintenance of transport infrastructure;
- to ensure effective transport;
- to contribute to economic development;
- to minimize negative effects to the environment;
- to improve international cooperation and European integration;
- to harmonize regulations from the field of transport with regulations of the European Union;
- to share experience both with countries form the European Union and countries in the region related to the transport and maritime transport;
- to meet requirements from membership in international organizations;
- to develop and strengthen capacities in the Ministry of Transport and Maritime Affairs.

9. THE CONTRIBUTION OF THE SELECTED PROJECTS TO IMPLEMENT THE TEN-T NETWORK

The Trans-European Transport Network (TEN-T) was established in order to facilitate the flow of goods and people between EU Member States faster and easier. The overall objective is to bring different parts of Europe geographically and economically closer through the development of railways, roads, port terminals, airports, inland ports, and traffic management systems.

The ultimate objectives of TEN-T are to create the missing links on the transport network, remove bottlenecks and eliminate the technical barriers existing between the transport networks of EU Member States, to strengthen the social, economic and territorial cohesion of the EU and to contribute to the creation of a unified European transport area. These goals will be realized through the construction of new transport infrastructure, the adoption of innovative digital technologies, the use of alternative fuels, the introduction of universal standards and the modernization and upgrading of existing infrastructure and frameworks.

What is common to all of development strategies in Montenegro is that they all consider the Port of Bar to be a strategic port of national interest and they focus on the development of a transport system that they consider to be an impediment to faster economic development. Emphasis is placed on greater use of rail and alternative modes of transport in order to relieve road traffic. One of the significant measures is the improvement of the inland connections with the Port of Bar and infrastructure projects in the Port of Bar, which would encourage multimodality in Montenegro.

Taking into account the fact that in defining the Main Transport Network, the Western Balkan countries were guided by the guidelines and presented methodology for establishing a Main Network in the EU territory (Main Trans-European Transport Network TEN-T), with a time horizon until 2030, hence a dynamic has also been determined for the realization of the National Single List of Infrastructure Projects (SPP), which has a dominant influence on the coverage of funds when it comes to the implementation of strategic documents. Within the SPP, projects were prioritized focusing mainly on key corridors that would connect Montenegro with the region and beyond with the EU. Placement on the TEN-T network is one of the preconditions for co-financing projects by EU instruments. At the moment three above mentioned projects related to the rail and road transport are part of the National Single List of Infrastructure Projects (SPP) and one project related to the port infrastructure (Reconstruction of the quay Volujica) is candidate for this list. One of the barriers for further development of the port is the fact that port infrastructure is not recognized as priority project on the list (SPP).
Specific goals of EUSAIR pillar 2 serve to strengthen the position of maritime transport, especially when it comes to security and safety for both passengers and freight transported by maritime transport, to improve connections between the ports and hinterland, and strengthen the role of each port in a chain of transport and stabilize its role. Having in mind all of this, **Pillar 2 focuses** on three main topics it explores: **1. maritime transport**, **2. intermodal connections** to the hinterland and **3. energy networks**.

Major projects in Montenegro are port infrastructure and Motorways. As such, they directly fall under the two topics which are stressed out by the Pillar 2, thus contributing to overall economic growth and sustainability of the country.
11. CONCLUSIONS

Implementing these project for Montenegro will mean firstly, and most importantly as the candidate for the EU admission, compliance with EU directives and standards. Montenegro is already in the process of harmonizing national regulation with EU regulation in all segments of national policy, so it is with transport sector.

Improvement of a transport system as a whole may help in contributing the fulfillment of another objective of EU Strategy – decrease of emissions and reduction of greenhouse effects. It is achievable through redistribution of share in transport of cargo and passengers in Montenegro modal shifts. Potential for the development of this kind of low carbon and environmentally friendly transport options is a common element of all 5 projects. Montenegro has a status of ecological state and the projects and actions are focused on assuring the reduction of GHG emissions. Reducing emissions in will help sustainable development of low-carbon tourism that should transform the offer, improve the quality of services, enhance energy efficiency of tourist facilities, generate additional revenues, which would help strengthen Montenegro’s international position on the tourist map.

Economically, these projects are meant to facilitate the trade inside and outside Montenegro borders with great positive effect on national economy with new incentives for investment projects, with private - public partnerships. Better connections, fluent transport flows and facilitation of the passenger maritime connections should influence higher tourism level but also entrepeneurising potential for entire Montenegro country. This way, when implemented, these projects will ensure good connectivity, easy travel and environmentally friendly solutions for travelers. These projects will support Montenegro’s internal and external integration by improving connectivity between its main cities and between Montenegro and neighboring countries solely by improving road infrastructure and services between important tourist destinations along Montenegro's Adriatic coast facilitating the flow of goods and people, reducing transportation costs and travel times, while at the same time enhancing safety and reliability of transport.

The general conclusion is that Montenegro is on its way to improve its transport performances and state of transport infrastructure while also continuing to pursue the policy of creating an environmentally favorable conditions.

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