

## PoWER PLUS



# FORESIGHT QUESTIONNAIRE

PoWER PLUS is a project funded by the Interreg V-B Adriatic-Ionian Cooperation Programme (ADRION) which involves 8 partners located in 6 different countries.

It aims at performing a foresight process in order to detect the main issues which may be affecting Adriatic-Ionian ports in the short- to mid-term in the light of the Covid19 outbreak and related economic crisis. The results of these processes will be used to update and, therefore, enhance the main results produced by the former PoWER project, i.e. The PoWER Methodology for building innovation supply Chain, The PoWER Strategy for evolving ports into Innovation Hubs, and the ICT Platform "[PoWERports](#)".

This questionnaire is the first step of the aforementioned foresight process, dedicated to the collection of experts' views on possible future scenarios related to the port areas involved in the project (Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, and Serbia) also in consideration of the wider situation and trends in the Adriatic-Ionian area.

The questionnaire has been developed with reference Next Generation EU and Agenda 2030 goals - which apply both to sea and river ports - and is articulated in 62 questions divided in four sections:

1. Towards smart ports: digital transition of services and processes in the port system;
2. The port in the territory: valorisation of the waterfront and new opportunities for regenerating the physical spaces in the port - city interface;
3. Ports in the Adriatic-Ionian area;
4. The port environment after the Covid19 pandemic outbreak.

Your precious contribution will help the PoWER PLUS team to grasp the complexity and the specificity of the port areas located on the sea and the rivers of the Adriatic - Ionian Region.

Your participation in the survey is on voluntary basis. Your contribution and those of the other experts involved will be consulted and processed by the PoWER PLUS team in order to draft a project document called "Factsheets on local scenarios". The original questionnaire you filled in will be annexed to the abovementioned Factsheets and made available on the PoWERports platform upon your authorisation.

Thank you very much for your time and cooperation. Your feedback is very important to us!

### Disclaimer

This document has been produced with the financial assistance of the European Union. Its content is the sole responsibility of the PoWER PLUS project partners and can under no circumstances be regarded as reflecting the position of the European Union and/or ADRION programme authorities.



By filling in and sending back this document to your contact person you authorise the PoWER Plus team to consult it and process it in order to draft the project deliverable T1.1.2 “Factsheets on local scenarios”. This document will open-access and will be delivered, for prior validation, to the funding Programme’s authorities.

Moreover, the PoWER Plus team would like to annex a copy of this document, in its original version, to the abovementioned Factsheets and to make it available on the PoWERports platform.

If you wish, the filled-in questionnaire can be published in anonymous form.

I give my permission to the PoWER PLUS project team to annex a copy of the questionnaire I filled in to PoWER PLUS Project’s deliverable T1.1.2 “Factsheets on local scenarios”.

I give my permission to the PoWER PLUS project team to make available a copy of the questionnaire I filled on the PoWERports platform.

I wish my contribution is made available only in anonymous form.

Please, fill in the following table with your data. If you checked the box related to the anonymization of your contact data, they will be consulted only by the PoWER PLUS Project team and not diffused.

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## 1. TOWARDS SMART PORTS: DIGITAL TRANSITION OF SERVICES AND PROCESSES IN THE PORT SYSTEM

A tentative classification of port services in terms of Technological Readiness Level has been made considering 4 macro sectors characterised by a more advanced digital perspective:

- A) Vessel & Marine Navigation;
- B) e-Freight & (Intermodal) Logistics;
- C) Passenger Transport;
- D) Environmental sustainability.

This classification is showed in Tables 1, 2 and 3.

*Table 1 Technological readiness - in standardisation*

Technological readiness - in standardisation	
Service	Enabling functions
A.1 - Vessel Traffic Management	Accurate Vessel Positioning (terrestrial and satellite), Full information about cargo, Low-Rate Vessel-Port bi- directional communication
A.5 - Berth allocation and docking	Accurate Vessel Positioning (terrestrial and satellite), Accurate Bathymetric Data, Low-Rate Vessel-Port bi- directional communication
B.1 - Freight Management and Control	Containerized and General) cargo pervasive monitoring and control in port areas (docks, warehouses, stores).
B.3 - In-port Smart Navigation	Real-time communication Port-Terminals- Trucks

1. According to your experience and knowledge, do you think the table above (Table 1) should be updated? If so, please, propose your version in the table below.

Technological readiness - in standardisation	
Service	Enabling functions
A.1 - Vessel Traffic Management	Accurate Vessel Positioning (terrestrial and satellite), Full information about cargo, Low-Rate Vessel-Port bi- directional communication, for inland ports
A.5 - Berth allocation and docking	Accurate Vessel Positioning (terrestrial and satellite), Accurate Bathymetric Data, Low-Rate Vessel-Port bi- directional communication
B.1 - Freight Management and Control	Containerized and General) cargo pervasive monitoring and control in port areas (docks, warehouses, stores), <b>Optimize the use of container equipment technology to optimize trucking</b>

B.3 - In-port Smart Navigation	Real-time communication Port-Terminals- Trucks Integrated planning for containers and inland navigation
C.4 Online check in	On line check in service for passenger, Smart mobility (should be in standardized technology)
D.3 - Refuel options	Real time data on best options for refuel

2. Please, provide a view on the current situation of the services listed in the table above according to your knowledge. You can address only the services you are familiar with.

While many ports already have various IT strategies, just few of them have strategy for climate change adaptation and mitigation.

Ports are becoming increasingly automated and optimized, thanks to the contamination between ICT and robotics as well as to the integration with other attractors located towards the hinterland and oversea.

Vessel navigation in inland ports should be expanded with data on water depth. Data from early warning system, in context of climate changes, should be also connected to navigation system.

Container dimensions, classification, and sealing are fully standardized. Communications related to the management of containers in port terminals have been standardized. On the contrary, the specifications related to general cargo is poorly standardized. Other aspects, from data aggregation to event building, securing and sharing, is left to the open market so that stakeholders can rely on efficient platforms and services for tracking and tracing of goods along the (intermodal) logistics chain.

Some ports provide to passengers access to multimodal mobility services, single journey planning and ticketing options for the user, as well as the provision of reliable and advanced travel information from the planning phase until the end of journey. Some aspects may be improved such as on line check in. Services related to Port-Vehicles-Pedestrians real-time communications are still within the scope of state-of-the-art technologies but not yet realized in full scale.

Protocols and methodologies for carbon footprint calculations are well developed. However, majority of ports do not monitor their carbon foot print. Monitoring of water pollution is in place in some ports. Elements of circular economy in ports operation are not introduced on appropriate level.

Table 2 Technological readiness - not yet in standardization, facing technological challenges

Technological readiness - not yet in standardization, facing technological challenges	
Service	Enabling functions
A.3 - Water Incident	Accurate Vessel Positioning (terrestrial and satellite), IoT- based distributed network
A.4 - Suspicious Vessel / Maneuver	Accurate Vessel Positioning (terrestrial and satellite), Vessel-Port bi- directional communication
B.2 - Gate Automation	Accounting for users, vehicles and goods
B.4 - Freight Routing	Port-to-Port, Port-to-Road, Port-to-Railways communications

B.5 - Incident at Landside	Distributed monitoring network
C.1 - Info mobility and journey monitor	Journey planner and manager (booking, payment), JIT information delivery
C.2 - Integration with Traffic Control Centres (TCC)	Port-to-road full-fledged data exchange
C.3 - In-port Smart and Autonomous Mobility (including safety)	Real-time communication Port-Vehicles-Pedestrians
D.1 - Pollution Level (including of CO <sub>x</sub> and noise)	Distributed monitoring network
D.2 - Road Traffic Level	Distributed monitoring network

3. According to your experience and knowledge, do you think the table above (Table 2) should be updated? If so, please, propose your version in the table below.

Technological readiness - not yet in standardization, facing technological challenges	
Service	Enabling functions
A.3 - Water Incident	Accurate Vessel Positioning (terrestrial and satellite), IoT- based distributed network
A.4 - Suspicious Vessel / Maneuver	Accurate Vessel Positioning (terrestrial and satellite), Vessel-Port bi- directional communication
A.6 Early warning system	Connection with early warning system (precipitation, winds, tidal wave, tsunami etc.)
B.2 - Gate Automation	Accounting for users, vehicles and goods
B.4 - Freight Routing	Port-to-Port, Port-to-Road, Port-to-Railways communications
B.5 - Incident at Landside	Distributed monitoring network
C.1 - Info mobility and journey monitor	Journey planner and manager (booking, payment), JIT information delivery
C.2 - Integration with Traffic Control Centres (TCC)	Port-to-road full-fledged data exchange
C.3 - In-port Smart and Autonomous Mobility (including safety)	Real-time communication Port-Vehicles-Pedestrians
D.1 - Pollution Level (including emission of CO <sub>2</sub> and noise)	Distributed monitoring network
D.2 - Road Traffic Level	Distributed monitoring network
D.4 Resource efficiency	Energy consumption, share of renewables, level

	<b>of circularity</b>
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4. Please, provide a view on the current situation of the services listed in the table above according to your knowledge. You can address only the services you are familiar with.

Currently, the attention in transport and transshipment activities is concentrated mainly on CO2, NOx, PM, and noise. Nevertheless, especially in port areas, there are more sustainability issues to deal with such as external safety, wildlife, water quality, soils and sediments, and other sustainability issues.

Operational indicators in majority of cases do not include sustainability indicators such as carbon footprint, water pollution, energy consumption, circularity etc. The focus is on tons per ship-hour in port, waiting time, service time etc.

Port-related operations require consumption of energy/fuel, which in turn also result in emissions of GHG. Implementation of adequate methodology for monitoring of energy consumption and related GHG is needed for benchmarking and development plans. Overall resource mainly is not monitored.

*Table 3 Technological readiness - beyond state of the art, not technologically consolidated*

Technological readiness - beyond state of the art, not technologically consolidated	
Service	Enabling functions
A.2 - Vessel maneuvering in port waters	Accurate Vessel Positioning (terrestrial and satellite), Accurate Bathymetric Data, Real-Time meteo-marine monitoring, HD video sources on vessel & port.
D.3 - Dynamic pricing (all services) to Vessels, Terminals	Distributed monitoring network

5. According to your experience and knowledge, do you think the table above (Table 3) should be updated? If so, please, propose your version in the table below.

Technological readiness - beyond state of the art, not technologically consolidated	
Service	Enabling functions
A.2 - Vessel maneuvering in port waters	Accurate Vessel Positioning (terrestrial and satellite), Accurate Bathymetric Data, Real-Time meteo-marine monitoring, HD video sources on vessel & port.
D.3 - Dynamic pricing (all services) to Vessels, Terminals	Distributed monitoring network
<b>B.6. Blockchains</b>	<b>Effectively link together a wide variety of port and intermodal stakeholders such as customs, freight forwarders, carriers etc.</b>

6. Please, provide a view on the current situation of the services listed in the table above according to your knowledge. You can address only the services you are familiar with.

Ship maneuvering simulators are used for predicting the navigation safety in restricted areas (ports and channels) and training. Some ports has been planning to reduce the port restriction and start attending a new class of container ships with bigger maximum length based on results of the simulation.

Application of ship maneuvering simulators can give important support for engineers during the design of new facilities in ports.

Dynamic pricing of services at ports follows model adopted by other consumer-facing transport sectors such as airlines and railways. At present, most ports charge for container terminal handling charges through a contractual pricing mechanism. Under this mechanism, terminal and shipping company negotiated and signed a contract about terminal handling charges for the next year. Application of blockchains would make easier dynamic pricing of services at ports.

7. In your opinion, which of the following sectors need innovation the most?

Please, put an "X" next to them; there is no limit to the number of sectors you can check.

#### ENERGY

- Efficiency of buildings
- Efficiency of industrial processes
- Production of renewable energy X
- Port Grid

#### INNOVATION AND NEW TECHNOLOGIES IN ALL TRANSPORT MODES

- Deployment of alternative fuels infrastructure - Directive 2014/94 /EU - 22 October 2014 X
- LNG Retrofit (Realization of a network of points of refuelling for LNG (Liquefied Natural Gas)
- Electrification of port docks
- Construction of LNG-powered ships X

#### SEA-RELATED SOURCES OF RENEWABLE ENERGY

- tidal and sea waves X
- hydrogen X
- off-shore wind power
- on-shore micro-wind power

#### ENERGY EFFICIENCY IN PORTS' ACTIVITIES

- more efficient processes X
- more efficient behaviours
- more efficient buildings
- more efficient infrastructures (e.g.: lighting)

#### ROBOTICS AND AUTOMATION FOR

- increasing efficiency X
- increasing safety X
- increasing comfortability
- monitoring and improving the flows of goods

- savings in time
- savings in fuel X
- savings in personnel X

#### **AUTONOMOUS VEHICLES (LAND, AIR, WATER)**

- driverless trucks and vans for logistics X
- drone planes
- for cargo transport
- for parcel delivery services
- drone ships

#### **INTERNET OF THINGS AND BIG DATA**

#### **SIMULATION AND VIRTUAL REALITY**

#### **CYBERSECURITY**

### **8. If other, please, specify**

In addition, resource efficiency based on circular economy urgently need innovation from technological and business model point of views (for example better utilization of containers, handling of spoiled goods etc.).

Also, innovations towards increase of climate change resilience of ports are urgent due to increase of frequency of extreme weather conditions.

### **9. With reference to the sectors you indicated in question(s) 7 and 8, is their innovation hindered from a lack of infrastructure? Please, substantiate your answer.**

So far, innovation in production of renewable energy (RES) was hindered mainly because of energy market where RES were not competitive and some technologies were not commercialized. Further innovations are needed to integrate RES in ports. Innovations in the field of alternative fuels and LNG-powered ships were hindered from a lack of infrastructure on majority of ports. Similar reason hindered innovations in hydrogen in combination with lack of zero marginal costs energy sources needed for hydrogen production. Innovations in the field of robotics and automation have been focused on functionality as the first phase of development. Now, focus should be made on upgrade focusing on increasing of energy and time efficiency.

Importance of driverless trucks and vans for logistics has been seen during pandemic of COVID 19. Currently, there is strong driving force for innovation in that sense. Ports can be excellent innovation hub for driverless trucks and vans due to build infrastructure and achievements can be transferred to other services.

### **10. With reference to the sectors you indicated in question(s) 7 and 8, which are the main developments and improvements you consider relevant? Please, substantiate your answer.**

In the context of pandemic of COVID 19 the most relevant developments and improvements are to achieve unmanned automated terminal and unmanned crane quay. The second priority is improvements towards decarbonisation which can be achieved by combination of RES and hydrogen infrastructure.

11. With reference to the sectors indicated in question(s) 7 and 8, which are the Key Enabling Technologies (KET)<sup>1</sup> scientific research should focus on? Which KET could bring the most disruptive innovation? Please, substantiate your answer.

The key enabling technologies for decarbonisation of ports are production, storages and filling of hydrogen produced from intermittent RES such as solar and wind energy. Reliable and safe logistic of hydrogen is the most disruptive innovation which can throw out fossil fuels.

Innovation in driverless vehicle technologies can make significant change in ports logistics. Driverless vehicle have synergy effects with decarbonisation technologies (for instance refueling of driverless vehicle by hydrogen). Innovations in the field of robotics and automation from safety point of view are needed for successful implementation of decarbonisation and driverless vehicle technologies.

12. Which are the innovative interventions you consider most urgent and relevant according to you? Which results you expect they would have?

Integration of RES technologies is the most urgent since this is trigger for improvement of other aspects such as energy efficiency and driverless vehicles. It is difficult to supply inefficient processes and equipment by RES. It means that interventions in RES would spur innovations in other fields.

13. A digital twin (DT) is a realistic digital model simulating or “twinning” the life of a physical asset; each digital twin is linked to its physical twin allowing to establish a bijective relationship between the DT and its physical twin; a DT follows the lifecycle of its physical twin to monitor, control, and optimize its processes and functions and to predict future statuses.  
How can the digital twin and other technologies be useful for making ports smart?

DT enables optimization of processes in ports saving time and energy. DT can provide benefits for operational maintenance reducing the costs and bottlenecks.

DT is also useful to simulate future scenarios to enable ports to re-evaluate its data, efficiency and resource requirements.

14. If you have additional comments, please write them here.

Motivation and education of ports staff are key factors for successful implementation of innovations combined with international cooperation.

15. If your previous contributions are referred to a specific port or area, please, let us know.

<sup>1</sup> The Commission defines KETs as “knowledge intensive and associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. They enable process, goods and service innovation throughout the economy and are of systemic relevance. They are multidisciplinary, cutting across many technology areas with a trend towards convergence and integration. KETs can assist technology leaders in other fields to capitalise on their research efforts”  
<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0341:FIN:EN:PDF>

The elaboration provided is general.

**16. Briefly describe a FUTURE SCENARIO (25-30 years) related to ports as Innovation Hubs, also in the light of the topics addressed in the previous questions.**

**With “scenario” we mean a narrative story describing how the situation should be in the future also including your hopes and fears.**

**You can either refer to a specific port area or, more in general, to Adriatic-Ionian Ports.**

It is expected that trade routes, the competitive position of stakeholders, ecosystems, and the cargo distribution will be different as we know it today. Changes are especially driven by pandemic COVID 19 and war in Ukraine.

Increased use of technology and increased collaboration are moving even more strongly to the forefront as dependencies on large labour forces systems are reduced. Strategies will also be focusing increasingly on diversification for increased climate change resilience, emphasizing spatial use strategies and niche markets. COVID 19 pandemic showed that certain markets (container and automotive) are once again amongst the first hit in situations of global crisis. The one trend which became more uncertain, due to Covid 19 and market pressures, is the increased focus on sustainability in wide sense.

The shortage of space in the existing urban ports demands to increase the space productivity within a port. Efforts to reduce the carbon footprint and improve the environmental performance of ports remain highly important. Societal pressure on environmental performance is expected to increase further. It will influence on change of type of goods in ports, share of fossil fuels will decrease, especially coal. Brcko port still highly depends on coal market. This will be changed in mid term.

Due to the new trade routes (shorter supply chain) Adriatic-Ionian ports will become more important. Growth of inland ports in the region also can be expected. However, this growth will be limited by climate changes and real growth will depend on increase of climate change resilience of the ports. Inland ports in the region are highly vulnerable on climate changes.

Ports are increasingly implementing innovations in the entire value chain with a wide range of used technologies. Results of that will be decreasing costs (means competitiveness), increasing comfortability for users of ports services and reducing pollution. Technologies like robotics and IT are needed to increase productivity. This would result in more automatic, digitalized and connected supply chains where less physical labor force is needed.

In the context of innovation, ports, including Brcko port, can become innovation hub for different technologies. Among that, ports have big potential to be innovation hub for renewable energy such as heat pumps (water and ground based), solar technologies, winds etc. In order to demonstrate that, technological park should be constructed within ports. Because of that and some other contents (restaurants, parks etc.), citizens will be attracted to visit and spend some time in ports. In this way, they will support further development and transformation of ports and the same time to provide additional income.

In the long term perspectives, ports should become “open laboratory” for research of information and renewable energy technologies and its application for heating, cooling,, lighting and transport. As renewable energy technologies innovation hub, research and development of new technologies (including energy efficiency) should take place in ports.

After initial transformation in Innovation hub, ports will attract scientists and entrepreneurs to conduct research and development of innovative renewable energy sources and energy efficiency technologies driven by modern IT applications.

The main challenge is how to change traditional paradigm of ports management and authorities as well as ordinary citizens. They consider a port to be just point for reloading of goods and passengers. Long term obstacle to become “open laboratory” is complicated administrative procedures for permitting of any activities in public facility such as port.

The best action for overcome of the above described obstacles is involvement of ports in international research and development projects, visits and presentation of best practices of transformation of ports in innovation hub (technological one or any other).

17. Which are the main forces that could drive to the scenario you described? Which would be the main actors involved? Which actions should be taken to realize the future scenario you described?

The main drivers to the described scenario will be pressure for space productivity, global decarbonisation mechanisms, needs for increase of climate changes resilience and technological development (for instance robotics and RES technologies). The main actor for changes will be entrepreneurs with support of authorities. The main actions should be undertaken by authorities (adoption of legal framework to motivate ports for innovation, change in spatial planning, adoption of ambitious environmental sustainability targets).

18. What are the main obstacles and risks to the scenario you described? (within 1500 characters, spaces included)

The main risk to the described scenario is capability of ports to adapt on climate changes and to increase climate change resilience. The second risk is lack of educated people for implementation of the scenario because of the current reputation of ports (high pollution, majority of jobs are low quality etc.). Additional risk is change of geo-political relation in the world where some ports can lose their importance.

## 2. THE PORT IN THE TERRITORY: VALORISATION OF THE WATERFRONT AND NEW OPPORTUNITIES FOR REGENERATING THE PHYSICAL SPACES IN THE PORT-CITY INTERFACE

1. Which is your opinion on the relationship between a city and its port?  
If you are referring to a specific city/port please let us know.

Ports and cities are strongly connected. Many cities have grown around ports. Historically, development of such cities was depended on development of ports. As a result of the growth of port activities, their other industries and urban economies, have rapidly grown. A few hub port cities become global cities. In last time, in some case coherence is impaired due to diversification of activities in cities. Urban centers will keep growing, resulting in an increased pressure on the, already scarce, space. The space scarcity at times requires ports to move their activities from their historical center location towards locations further outside the city.

Nowdays, connection between ports and cities getting new elements such as spatial planning, tourism etc.

2. Which is your opinion on waterfront enhancement as an opportunity to reconnect cities with their ports?

Waterfront enhancement has great potential for enhancement of climate change resilience of cities

providing, at the same time, new opportunity for tourism development. Waterfront enhancement can make synergy in the process of urban renewal in terms of residential, transports, public spaces and quality of the environment.

3. **Is a territorial waterfront with an integrated transport system consisting of the three-track coastal light rail (tramway), cycling and pedestrian roads, and coastal navigation a good solution for transport and mobility along the territorial waterfront? Please, substantiate your answer.**

Waterfronts should be both physically and visually accessible for locals and tourists of all ages and income. Described integrated transport enables access to every social group providing good basis for clean environment and integration of port area in city infrastructure.

4. **In case you are involved in a port development process, please, describe your experience in relation to Blue Economy development.**

N/A. In general, potential for Blue Economy in Bosnia and Herzegovina is low.

5. **A renewed development of port economy, that considers the city with the port in the same system, would be able to drive overall competitive economic development in the current global economic challenge. What is your opinion?**

Yes, for sure such development would be able to drive overall competitive economic development because of compatibility and synergy between a port and a city services. Only by such approach, conflict between development of a port and a city can be avoided.

6. **Did you experience Integrated Logistics Areas (ILA) or Special Economic Zones (SEZ)? Do you think that ILA and SEZ can be considered as complementary to the port systems? Please, substantiate your answer.**

I did not have experience with development and operation of ILA and SEZ. However, it is complementary with the port systems depend on available space and what kind of activities can be accommodated.

7. **Do you believe that the Special Economic Zones ("SEZ") can represent an opportunity for the development of the territories of the less developed regions? Please, substantiate your answer.**

SEZ in Brcko showed good results in certain time (it is not closely connected with the port). In general, it is opportunity especially for less developed regions. However, success depends on many factors such as transport connection, infrastructure, types of advantageous offered etc.

- 8. Do you think that the Special Economic Zones ("SEZ") could be rethought in an ecological key? Please, substantiate your answer.**

SEZ should be rethought in ecological key. However, it is not limitation for their development. Conflicts between local people and authorities over SEZ implementation has to be avoided. In some cases implementation of these zones produce winners and losers which is serious problem. Demand for land to develop infrastructure for SEZ has increased the pressure on forests and agricultural areas.

- 9. Which subjects should primarily participate in the decarbonisation effort of the Port-City System? Please, substantiate your answer.**

Primary role has management of a port and city authority. Higher level authority should create enabling environment for decarbonisation introducing appropriate mechanisms such as emission trading system, obligation system for energy efficiency and incentives for RES. These are precondition for attracting private investors to decarbonisation business in ports.

- 10. What and how much is currently being done for the depollution and decontamination of the Port areas?**

In comparison to situation 2-3 decades ago improvement is obvious. It varies from port to port. In developing countries which did not adopt modern legal framework for depollution, achievements are significantly lower.

In Brcko port there is not serious issues related to pollution. Unfortunately it is consequence of low rate of development of the port. During some part of a year, the port is not in function due to low level of water. Therefore, environmental impact is not big, but there is a lot of potential for its reduction. The first issue is that there is no system for monitoring of pollution.

- 11. Is the economic and social development of traditional relations with neighbouring countries via the Adriatic-Ionian ports feasible? Please, substantiate your answer.**

It is feasible due to traditional relations and infrastructure which was built to support the whole region (it is especially related to Western Balkan). The second thing is similar culture, languages etc. Each country separately is small market for any kind of goods, therefore cooperation in that sense is even imperative.

- 12. Do you think that the seas and rivers of the Adriatic-Ionian area could be main players in the Mediterranean geopolitics? Please, substantiate your answer.**

Seas and rivers in the area can be one of the main players in geopolitics, along with some other natural resources and infrastructure. Importance of rivers have been growing because of pressure to use them for energy generation, increasing demand for water for irrigation, needs for accumulation for prevention of floods and providing water for humans and animals during dry season, increasing demand for water for fire protection etc. At the same time, many of these rivers have high value for tourism. Specific position of rivers in the region is that they bring pollution from one country to another one preventing operation of some existing hydro power plants.

13. In your opinion, which of the following sectors need innovation the most? Please, put an “X” next to them; there is no limit to the number of sectors you can check.

#### **SOCIAL SCIENCES**

- Social innovation
- Social inclusion and discrimination
- Gender studies
- Inclusive or participation processes X
- Facilitation for innovation X
- On field researches
- Surveys and data analytics

#### **PUBLIC ADMINISTRATION**

- Economic development strategies
- Public procurement: works X
- Public procurement: services X

#### **ENTREPRENEURIAL INNOVATION**

- Start-ups X
- Internationalization
- Digitalization (e.g. additive manufacturing)
- Industrial design
- Service design
- Internal organization

#### **BUSINESS**

- Investing and trading
- Commerce
- Crafts
- Small and Medium industries
- Large industries
- Services (logistics, software, consultancies, etc.)
- Restoration
- Tourism and Leisure X

#### **EMPLOYMENT DECREASE**

#### **NEW SUITES OF SKILLS X**

#### **SEA-RELATED SOURCES OF RENEWABLE ENERGY**

- tidal and sea waves
- hydrogen X
- off-shore wind power
- on-shore micro-wind power

#### **BLUE GROWTH**

- Fishery and aquaculture
- Green shipping
- Exploitation of marine resources
- Innovation in tourism X
- New solutions for environmental resilience X

#### DE-CARBONIZATION OF PRODUCTS AND PROCESSES

##### SCIENTIFIC RESEARCH

- Theoretic or base research
- Applied research X
- Private R&D investments

##### CULTURAL PRODUCTION

- Digital sector
- Traditional sectors (e.g. theatre or cinema)
- Heritage preservation
- Design professions
- Journalism, books and essay writers

##### SUSTAINABILITY

- Circular economy X
- Innovative products
- Waste management and recycling
- Intelligent mobility X
- Disposal of ballast water sediments in the port area - art. 5 of the Ballast Water convention, in progress ratification)

#### 14. If other, please, specify

#### 15. With reference to the sectors indicated in questions 13 and 14, which are the main obstacles to their development?

In the region of Western Balkan the main obstacle is lack of investment in research and development. The countries allocate little money for research and development. Consequence is that many researchers left the region. The second obstacle is absence of enabling environment for innovation from legal, economic and other aspects of view. Introduction of innovation is very complicated, change of business as usual practice need a lot of efforts.

In addition, curriculum in high education in the region is not enough innovation oriented; new methods of learning are not sufficiently represented.

Approach to development of strategic document is top - down, participatory approach is not present

where ordinary citizens would give contributions. Due to that, citizens do not feel a strategy as their own and because of that implementation is hard, even when a strategy itself is good.

- 16. With reference to the sectors indicated in questions 13 and 14, which are the Key Enabling Technologies (KET) scientific research should focus on? Which KET could bring the most disruptive innovation? Please, substantiate your answer.**

The key enabling technology for RES integration is hydrogen technology. For majority of the rest, the main precondition is change of way of thinking.

- 17. With reference to the sectors indicated in questions 13 and 14, which results would the adoption of the disruptive technologies described in the question above (n. 16) lead to?**

Results of adoption of hydrogen technologies in combination with intelligent mobility and circular economy would be decarbonisation of energy system enabling development of many start-ups and deployment of untapped tourism resources (especially in protected areas and areas where there is no adequate infrastructure).

- 18. Briefly describe a FUTURE SCENARIO (25-30 years) related to ports and their cities/ territories, also in the light of the topics addressed in the previous questions.**

With “scenario” we mean a narrative story describing how the situation should be in the future also including your hopes and fears.

You can either refer to a specific port area or, more in general, to Adriatic-Ionian Ports.

Serving as innovation hub ports will contribute a lot to better living conditions in cities. Potentials for synergy between port and city will be more and more deployed. Space in ports will be used in more efficient way providing space for RES generation, tourism and free-time activities (walking, recreation, restaurants). In places where ports are not able to move from the city, penetration of city activities and its services to ports will be more intensive. It will be enabled by smart technologies and change of goods mix reloaded in ports. Environmental restriction will reduce impact of ports on environment which leads to change in perception of ports by citizens. Therefore, port areas will get new contents.

- 19. Which are the main forces that could drive to the scenario you described? Which would be the main actors involved? Which actions should be taken to realize the future scenario you described?**

The main driver for described scenario will be growth of cities - urban areas. Local spatial planners should be the main actors. Revision and reshaping of local spatial plans is required action and opening of ports and urban area for private investors through public private partnership.

- 20. What are the main obstacles and risks preventing the realisation of the scenario described?**

The main risk to the described scenario is lack of skilled and educated spatial planners and willingness for reforming of public administration. Risk specific for Western Balkan is depopulation meaning lack of the main driver - growth of urban areas.

21. If you have additional comments, please write them here.

### 3. PORTS IN THE ADRIATIC-IONIAN AREA

1. **In your opinion, what is the untapped potential for enhancing energy efficiency in Adriatic-Ionian ports?**

According to the energy audits conducted in Brcko port, the biggest potential for energy efficiency is replacement of old equipment for loading and unloading of goods. Then, potential is in energy renovation of buildings. Generally speaking, potential is in introduction of energy management systems in ports.

2. **Which are the main drivers towards that enhancement increasing energy efficiency? Which the main obstacles?**

The main driver is reduction of operational costs and avoidance of bottlenecks in operation due to break of old equipment. Lack of money for investment is the main obstacle. Also, lack of vision of development of ports is serious obstacle (example is Brcko port).

3. **With reference to the two previous answers, which are, in your opinion, the main challenges ports, free zones and the global shipping industry will have to face? What should be done to mitigate their negative impacts?**

The main challenge for ports, free zones and the global shipping industry is decarbonisation (switching to renewables) and climate change resilience. In the second row of challenges is reduction of needed labour force, then improvement of productivity comes (better space efficiency and digitalization of services).

4. **How does the development of ports affect the local community? Please, refer both to the city- and the wider region-level.**

In some places development of ports and local community is tightly connected. Two-ways connection is obvious when it comes to labour force. Development of ports can attract people to city providing labour force for port. Ports support and benefit local, regional and national economies through their role in creating jobs and transporting goods. They can also partner with communities to offer workforce development programs, protect the environment and coordinate on land use planning to incorporate community amenities. Ports play important roles in adaptation of cities on climate change and vice versa. Port cities are usually the gathering point between import and export trade, and between industry and tourism.

Although ports have a positive impact on increasing local employment opportunities and promoting local and regional economic growth, port activities impose a great negative impact on environmental pollution and ecological degradation

5. **Do you think that in the Adriatic-Ionian area water transport is underdeveloped as compared to other types of transport? What if compared to other geographical areas?**

Yes, it is underdeveloped. Especially, inland ports based water transport is underdeveloped in comparison with Western European one. One of the reason for that is small number waterways (navigable rivers) and

poor maintenance of the waterways.

6. **Climate change is requiring a quick and resolute transformation in all sectors (e.g. industry, society, organization, urbanization, etc.). How could Adriatic-Ionian ports and their cities contribute?**

The first contribution of the ports to the transformation is climate change mitigation by intensive decarbonisation. It should be implemented building new infrastructure which will support decarbonisation. Then, they can contribute by implementation of measures towards increase of climate change resilience (for example waterfront renewal, establishment of early warning system etc.). All noted aspects which can be applied in ports and port cities can be adapted and transferred to other area.

7. **If you have additional comments, please write them here.**

No additional comments.

8. **Briefly describe a FUTURE SCENARIO (25-30 years) related to Adriatic-Ionian port areas, also in the light of the topics addressed in the previous questions.**

**With “scenario” we mean a narrative story describing how the situation should be in the future also including your hopes and fears.**

**You can either refer to a specific port area or, more in general, to Adriatic-Ionian Ports.**

Due to the change of supply chains caused by pandemic of COVID 19 and change of geopolitical situation in the world, ports in Adriatic-Ionian area will grow in the future. Europe will rely more on domestic supply chains where relatively small ports (sea and inland ones) have opportunity for development. New activities and infrastructure in ports will be introduced. Some of the ports will play the role in natural gas supply of broader area (especially South East Europe). It includes construction of new infrastructure.

All these transformation will happen along with activities aiming increase of climate change resilience of ports and their cities. The region is highly exposed to climate changes; therefore authorities have to put a lot of efforts to raise resilience on climate changes. Inland ports in the region is even more vulnerable to climate changes, not only due to extreme weather but also due to increase of water demand which can cause significant changes in time of operation on annual basis. Investment to increase rivers navigability will be needed (even currently it is needed in case of Brcko port). Also, significant investment will be needed in increasing waterfront and adaptation of accompanying infrastructure in ports (sewage system, electricity supply due to increase of cooling demand etc.).

The positive impact on development of the ports in the region will have commercialization of innovation in big ports in the world (especially in Europe). Transfer of these innovation and technologies will reduce costs of operation and pollution and increase comfortability and integration of ports in their cities.

Significant effort will be done towards introduction of robotics and automation technologies in order to reduce labour force in ports. It is important from two aspects (i) lack of labour force and reduction of costs (ii) resilience on pandemic situation.

Decarbonisation will have impact on ports as well. Increase of electro mobility will be combined with installation of RES technologies along with energy storages. Ports will become prosumer of electricity. Advantage in this context is climate conditions which are in favour of generation of energy from solar technologies (relatively big number of sunny hours during a year). Price of energy will drive significant improvement of energy efficiency.

Type of goods transported over the ports will be changed. For instance, coal has the biggest share in Brcko port still. In the mid term it will be changed.

Risk for such optimistic scenario is lack of investments in resilience on climate changes. Many authorities

in the region are not aware on the coming climate changes. It can cause delay in needed investments. Also, currently there are some other priorities for ports which can slow down investments. Additional risk is that management of ports will not recognized opportunities described above (transfer of innovations, prosumer concept, intensive integration in cities development etc.). Lack of educated staff in some part of the region for manage ports is also risk (BiH is such case) and depopulation trends.

Some of the ports will not be able to find new market niches. For example, Brcko port has to find alternative to coal and urgently decrease dependency on coal transport.

**9. Which are the main forces that could drive to the scenario you described? Which would be the main actors involved? Which actions should be taken to realize the future scenario you described?**

The main driving forces for the described scenario is climate changes, decarbonisation mechanisms, change of global geopolitical relations and possibility of new pandemic. The main actor should be authorities to create enabling environment for implementation of scenario by opening of the ports for private investments and for research and development activities in the ports (connection with education and research institutions). Authority should play role in innovations transfer as well.

**10. What are the main obstacles and risks preventing the realisation of the scenario described?**

The main obstacle is lack of awareness of the authorities that new environment is opportunity for development of the ports and their new roles.

**11. If you have additional comments, please write them here.**

Education and trainings of local authorities are the most important in overcoming of the obstacles.

#### 4. THE PORT ENVIRONMENT AFTER THE COVID19 PANDEMIC OUTBREAK

1. According to your knowledge, which are the main challenges that affected ports and port cities after the Covid19 pandemic outbreak?

The main challenges are change of global supply chains and requirements for autonomous operation with minimum role of labor force.

Increase of energy prices has imposed an additional challenge - reduction of costs. However, it can be considered as opportunity as well since land ways of transport is more negatively impacted by increase of energy price.

2. What impact had/have lockdown actions on vessel traffic??

The COVID-19 pandemic has resulted in unparalleled global impacts on mobility in general. Passenger vessel traffic was impacted more than freight one. Fortunately, after finishing lockdown the traffic recovered. Currently, result of lockdown is new challenges and opportunities for ports which influence vessel traffic as well. Passenger vessel traffic did not recovered yet.

3. What role can port authorities play in managing the emergency? Has their role changed only temporarily or will it be changed for good? Please, substantiate your answer.

Authorities of ports have to play central role in managing the emergency. Ports are or have to be equipped with early warning system and they have resources for evacuation. Supply in emergency via ports in some cases much more reliable (for instance in pandemic trucks are more vulnerable because of higher dependency on labour force). Their role has been changed for long time taking into account potential of new pandemic and expected climate changes.

4. How are the relations between port and city changing?

Traditionally, relationship between ports and cities is self-reinforcing, where increased port activity led to more urban activity and increased urban activity led to the growth in port activity. Nowadays, the relation getting added value in the sense of quality of activity in both port and city. Namely, ports becoming innovation hubs providing new quality of development of cities. Infrastructure of ports becoming more integrated in city infrastructure. From other side, development of cities makes pressure for efficient use of space in ports or move ports far from cities centres.

5. How the port-urban landscape is changing?

The ports' landscape traditionally has always been associated to the crains and smokestacks of the factory nearby ports, thus contributing to associate image of a city to negative and environmentally critical opinions and considerations. New urban planning has challenge to change this image starting from change of urban waterfront and insertion of new contents into ports (RES technologies, green areas etc.).

6. What are the previously existing problems, limitations or needs which the pandemic has emphasized?

Pandemic emphasized low rate of automation of the processes and high dependency on labour force of majority of the processes. Pandemic also emphasized vulnerability of intermodal transport, especially trucks connection to ports. Underdevelopment of railway transport in Western Balkan is obviously issue in pandemic conditions.

**7. How could the Covid19-related emergency become an opportunity to grow for port areas?**

COVID 19 will spur innovation in ports towards reducing dependency on labour force and external energy supply resulting in reducing costs of operation. Final result will be increase of competitiveness of maritime transport and motivation for development of intermodal transport. Opportunity is also change of supply chains caused by COVID 19 which can increase importance of some ports serving more local and regional economy.

**8. Is the ecological footprint of port cities going to decrease? Please, substantiate your answer.**

In general, yes. However it very depends on local circumstances. Use of cleaner vehicles, higher requirements for emission from ships, modern heating systems, modern monitoring systems and management systems resulted in reducing ecological footprint. However, there is more space for improvement in sense of less use of fossil fuels and reduction of water pollution.

In recent years many ports calculate their Carbon Footprint and report it, each port uses its own method and there is not any unified and complete method to calculate Carbon Footprint.

**9. Briefly describe a FUTURE SCENARIO (25-30 years) related to port areas' post-pandemic situation, also in the light of the topics addressed in the previous questions.**

With "scenario" we mean a narrative story describing how the situation should be in the future also including your hopes and fears.

You can either refer to a specific port area or, more in general, to Adriatic-Ionian Ports.

In post-pandemic situation development of ports should take into account possibilities for new pandemic situation and how to react in such case. It means adoption of needed procedures and protocols for such cases. Operation of ports in pandemic situation has to be simulated regularly (adapted shifts, control of health of employees etc.). Health protection of employees has to be top priority. In parallel, level of robotization and automation will be increased driven not only by potential of pandemic but also driven by technological development.

Self-supply energy in emergency will be also one of the priorities of future development. Unmanned operation of energy system will contribute to resilience of ports on pandemic situation. However, climate changes will be the main driver for future scenario. Many actions towards climate change resilience are compatible with resilience on pandemic situation. First of all it is less dependency on labour force.

**10. Which are the main forces that could drive to the scenario you described? Which would be the main actors involved? Which actions should be taken to realize the future scenario you described?**

As it is stated previously, climate changes will be the main driver for future scenario of ports development, especially in the region. Local and port authorities should be the main actors involved.

**11. What are the main obstacles and risks preventing the realisation of the scenario described?**

The main obstacle is lack of awareness of the authorities that new environment is opportunity for development of the ports and their new roles. Opportunities and new trends have to be recognized by ports and local authorities. If it would not be the case, there will be lack of investments and consequent reduction in sustainability.

**12. If you have additional comments, please write them here.**

No additional comments.