Interreg - IPA CBC
Italy - Albania - Montenegro
EFINTIS

WPT1 - Intermodal transport soft measures **Vesion: final**

Deliverable D.T1.1.1 – REPORT ON CURRENT SITUATION IN INVOLVED PORTS

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1. Introduction

The European Commission has been actively promoting increased automation and better use of ICT. The core vision is to enable seamless information exchange to streamline transport operations, increase safety, improve competitiveness and reduce the environmental impact.

The use of advanced information and communication technology (ICT) in the maritime transport sector is not a new concept. In the future connection between ships and ship and shore will be seamless.

Digitalization and communication technologies will create new services to support shipping and logistic chains will become more integrated for all modes of transport. In the maritime transport sector, vast amounts of data that are available will support new opportunities to improve ship operation, safety, security, and logistics.

The future poses many challenges but also offers many new opportunities for the maritime sector. Today´s challenges for the sustainable development of maritime transport include maintaining competiveness in a global environment, optimal use of energy sources, and minimizing its environmental impacts, particularly with regard to pollutants and greenhouse gas emissions. Satisfying humanity's growing needs for food, energy, water, organic or mineral resources presents another grand challenge.

Technologies can help in solving the environmental challenges for shipping and improving operational efficiency and sustainable technologies will assist ocean space exploitation and protect the environment. The current speed of innovation is rapid, particularly with the introduction digitalization and the new transformative technologies of cyber physical systems. However, predicting which of these technologies will transform shipping, logistics, and manufacturing is a challenge in itself.

By integrating of the area covering by the EFINTIS project, in growing flows of goods and passengers, the ports have become an important factor in continuous growth of the trade. At the moment it is easily recognized problem of different level of ICT development within the region and lagging behind north EU ports. In addition, level of cooperation between main actors in maritime transport sector is not on optimal level. By being such, ports are facing common challenges with regard traffic and freight flows on one hand and constant demand by stakeholder to improve port services in terms of digitalization of services in order to avoid paper documentation and to save time regarding administrative procedures on the other.

The effect of COVID-19 pandemic is raising many important questions regarding logistic and transport. Considering project orientation towards digitization of processes in the ports and development of the ICT tools within the port community, it is to expect that these project activities and results will allow transport businesses to maintain a level of normalcy in affected industry. In addition, ICT tool will allow interchange data between all subjects in the logistic chain avoiding physical communication and paperwork and as a smart working tool, it can rapidly be adapted to changes in surroundings systems.

ICT is today an enabler to numerous other key areas at the heart of European strategy for economic growth and well-being. The overall global market for ICT and related communication is enormous and Internet has today become a vital part to our daily life and development of our societies; not only as an enabling infrastructure, but even more so as a key driver for our future change. Pace is increasing as ICT and communication becomes an integral part of almost anything we do and as a result - traffic demand is doubling every year together with an increased mixture in traffic, all placing enormously high requirements on the behind systems – We have moved from society of human communication only, into a world of Internet of Things.

1.1. Aim of A.T1.1

- Preparing detailed report on state of the art of ICT tools and existing ICT infrastructure in involved ports.
- Analysis on current state of the art of ICT communication in port community (procedures), demands of today that need to be met and possibilities for further upgrade.
- Special focus on identification of bottlenecks in domain of ICT in involved ports.

1.2. Activity Timeline

AT1.1: Start 07/2020 – End 05/2021

1.3. Working Group

Partner Name	Person Responsible
LP - Port of Bar	Rade Stanišić
PP2 - Albanian Institute of Transport (WPT1 Coordinator)	Florjan Xhelilaj
PP3 – Southern Adriatic Sea Port Authority	Alessandro Renna – Evangelia Piteni
PP4 – Durres Port Authority	Vegim Hoti
PP5 – Autonomous Agency for Hospitality and Tourism of Termoli	Matteo Apollonio Lorella D'Amico – External Experts assigned by AAST

2. General Description of involved PORTS

2.1. Case of Italy (SOUTHERN ADRIATIC SEA PORT AUTHORITY)

The Southern Adriatic Sea Port Authority gathers together the Ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli all along the west Adriatic coast of Italy. The five-port infrastructure includes 57 quays of approximately 10km of total quay length, all connected to the rail and road network and served by two major international airports.

The newly formed Southern Adriatic Sea Port Authority is a public body having as its primary task to direct, plan, coordinate, promote and control port operations and commercial and industrial activities in the port. Located in the Puglia region, the Authority's geographical scope comprises several ports: Bari, Brindisi, Manfredonia, Barletta, and Monopoli.

Figure 1 - Aerial view ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli

The carriers calling these ports ensure, among other things:

- Feeder, Ro-Ro and Ro-Ro-Pax connections for regional and extra-regional export imports;
- Transportation of cars and passengers to and from countries on the other Adriatic shore;
- Transit and embarkation of foreign tourists on cruise ships;
- Loading and unloading of raw materials and energy sources, as well as of various materials.

2.1.1. Port of Bari

It is traditionally considered Europe's door to the Balkan Peninsula and the Middle East, and is a multipurpose port able to meet all operational requirements.
The port of Bari is located in the city center, covers about 260 thousand square meters, and is between the historic city center and the San Cataldo area. Historical port and rich in historical and cultural relevance including the Bourbon dock.

Figure 2 - Bournon Dock - Port of Bari

The main features of the port of Bari are the following:

- 285 hectares of basin.
- Docks equipped for all types of commercial traffic (dry and liquid bulks, containers, goods in packages, steel products, etc.)
- Docks serving ro-ro and ro-pax ferry boats (Albania, Greece, Croatia and Montenegro)
- Docks serving cargo (from/to Mediterranean Sea and Black Sea)
- Docks serving cruise ships and related accommodation
- Port Core along the Helsinki-Valletta corridor
- Services of mooring, pilotage, security, and other services related to passengers
- Port Community System (GAIA)
- PMIS - Port Management Information System
- Collection and disposal service for ship-generated waste and cargo residues

<u>Infrastructural analysis:</u>

The port of Bari is located north-west of the old city and its boundaries are included to the west by the dock San Cataldo and to the east from the new Foraneo dock. Due to its location, in the south-east of Italy, it is traditionally considered the gateway to Europe to the Balkan Peninsula and the Middle East. The current configuration of the Port of Bari is the result of a series of interventions that have followed over time as new needs arose or particular trends emerged in the sector maritime transport.

The port area extends for about 285 hectares with a total development of operational docks of approximately 3,800 ml, affected by different and heterogeneous types of traffic in transit, which have the exchange both of goods (conventional, black and white bulk, Ro-Ro and cars and steel products), both of passengers (cruises and ferries), increased in recent years thanks to the new Terminal structure Cruises, and ferry traffic with Croatia, Montenegro, Albania and Greece.

The port area is separated from the rest of the city by a perimeter fence, which delimits the basin.
The stretch of water of the Port of Bari of approximately 209 hectares is artificially protected by the Molo Foraneo dam (breakwater), which opposes the actions generated by the marine weather climate of the neighborhood, and in particular by the waves coming from the main wind. In the Port of Bari the following docks are identified in Darsena di Levante, Darsena di Ponente, Darsena Interna and Darsena Vecchia.

It is possible to make a brief description of the port area starting from the Internal Dock with the " Molo S. Vito " which allows the mooring of ferries for extra-Schengen destinations and the " Vecchio Molo Foraneo " used for the mooring of nautical vessels, tug boats, moorers and firefighters (docks 1 to 9). Next is the Darsena di Ponente used for mooring ferries with Schengen destination and cruise ships (docks 10 and 11). Continuing in the Darsena di Levante, the docks "Deposito Franco" and "Molo di Ridosso" are used for the mooring of cruise ships and ferries to Schengen, while on the Mezzogiorno quay there are grain silos (docks 12 to 15). Also in the Darsena di Levante, close to the I and II arm of the new outer dock, there is an area divided into two areas, the first of which is rectangular in shape and the second towards the east in the shape of a "crescent" which houses the large part of the port's commercial activities (docks 16 to 23).

Proceeding counter clockwise there is the third arm of the new breakwater which is used to stop no operational ships (docks from 24 to 31a) and the IV and V arm of the new breakwater which currently have the exclusive function of defending the port. The Marisabella area follows, where the fill provided by the Port Master Plan. partially built, it is currently used for parking vehicles awaiting boarding on ferries while work is in progress to complete the aprons of the entire Pizzoli-Marisabella area.

2.1.2. Port of Termoli

Located in a natural bay of the Adriatic coast, in the Molise Region, the Port of Termoli is classified by Italian Law 84/1994 as a port of regional and interregional economic relevance. It is administered by the Molise Region, which is responsible for planning, design, implementation and maintenance of infrastructure interventions concerning the port area. The Agency for Hospitality and Tourism of Termoli (AAST) participates to the project activities being an instrumental body under control and supervision of the Region.

The port is adjacent to the historical centre of Termoli (Borgo Vecchio), an ancient seafaring village built on a promontory dominating the Adriatic Sea.

Port infrastructure stands at the foot of the fortified historical nucleus; the total surface of the port basin is 360.000 square meters while the maximum depth of seabed amounts to 6 meters.

The inner basin is protected by a large breakwater that extends from the eastern part of the city towards the open sea, delimited by 3 main infrastructures, characterized by different use:

- south pier (partially quayed) ⟹ yachting, shipyards, commercial activities
- shore quay (1st and 2nd sections) ⟹ fishing boats
- north pier (1st and 2nd sections) ⟹ passenger and ferry boats, fishing boats

Figure 3 - Aerial view, Port of Termoli

Termoli is classified as a multifunctional port and its operations are mainly related to tourism (passenger & ferries, yachting), fishing, commercial activities and shipyards.

Along the south pier it lies the touristic port "Marina of San Pietro". Open to the public all the year, it has a mooring capacity of 300 boats with a maximum length of 30 meters. The touristic port system is completed by the presence of two other ports for yachting, respectively located at north "Marina Sveva" and south "Marina di Santa Cristina" of Port of Termoli.

The north-east pier is used for passenger and ferry boats connecting the city to the Tremiti Islands, a protected marine reserve of great naturalistic interest, visited by thousands of tourists every year.

A recent study published by the Italian Ministry of Transport[1], estimates for the period 2016-2019 an average yearly flow of 200.000 passengers, around 3000 cars and more of 19.100 linear meters of goods moved along the route Termoli-Tremiti (40 nautical miles long). It is worth saying that the route is heavily affected by seasonality, with traffic peaks during summer and lower flows over winter. The ship connection service is operated by the companies TIRRENIA, NLG (Navigazione Libera del Golfo) and GS Travel.

In the table below recent data on passenger flows Termoli-Tremiti, published by the Italian Institute of Statistics:

Table 1 - Passangers flows, Termoli - Tremiti Islands

Year	Embarked Passengers	Disembarked Passengers	Total
2018	96.000	100.00	196.000
2019	105.000	103.00	208.000

**Source: ISTAT 2021*

Over the summer it is active a fast ship connection service with the Croatian coastline (Termoli-Ploce), operated by GS Travel.

Termoli port has an extensive fishery activity with a volume of fish catch amounting to 585 tons in 2020 (source: federcoopesca termoli). A fleet of about 63 fishing vessels are moored at the shore quay, entry quay and north pier while in the south pier is located the municipal fish market, an important centre for fishery commerce. It is very well know in the area for the fish auction which takes place every day, considered as the cheapest one in the south of Italy.

The port is embedded into the city of Termoli, second largest city of Molise in terms of population (32.484 inhabitants), important also for its industrial area. Established in the 70s around the FIAT Powertrain Technologies plant, it still represents the core of economy of low Molise and coastal area. COSIB (Consortium for industrial development of Valle of Biferno) is the public entity in charge of management of businesses located in the industrial area, amounting totally to 130 enterprises and belonging to the automotive, chemical and agro-industry as well as craft, trade and service sectors. Total people employed in the cluster are 4800. Within the Valle of Biferno industrial cluster it is located the dryport (interporto) of Termoli, included by the Transport

Ministry into the National Plan of Dryport for its potential development as a logistic interchange node of national relevance, able to serve a wide area along the north-south and east-west axes of freight logistics corridors. In this context, Termoli port, retro-port and dryport together with Valle of Biferno industrial area, play a crucial role in the development of the Adriatic Special Economic Zone (SEZ). The SEZ was established in 2019 by both, Molise and Apulia regions, with the aim to enhance competitiveness and growth of the South Adriatic Sea area, by means of investments in ports and logistics infrastructures.

[1] I servizi di collegamento marittimo per il trasporto di persone e merci con e fra le isole maggiori e le isole tremiti, pgg. 136-140 https://www.mit.gov.it/sites/default/files/media/notizia/2020-08/RELAZIONE.pdf

Within a regional transport system relying mainly to the road network (still weak and inadequate to support economic development of the Region and to attract investments) the connectivity system of Termoli Port benefits from the presence, along the north-south axis, of three main transport infrastructures of national relevance:

1. Motorway A14 "Adriatica" Bologna-Bari-Taranto, 2nd meridian axis of Italy, included into the European route E55, connecting Helsinborg to Kalamata. Molise section extends for 35 Km
2. Highway SS 16 "Adriatica": extending from Veneto to Apulia along the Adriatic Sea Coast and crossing Molise for 35 Km, including Termoli bypass (SS709) connecting the city to the industrial area
3. Railway line Bologna-Bari, Termoli railway station: crossing Molise littoral for 35 Km, it is a double track railway line, partially electrified. Termoli is an important node for inner and costal rail connections, along both north-south and east-west axes. At present, the port is not linked with the railway line

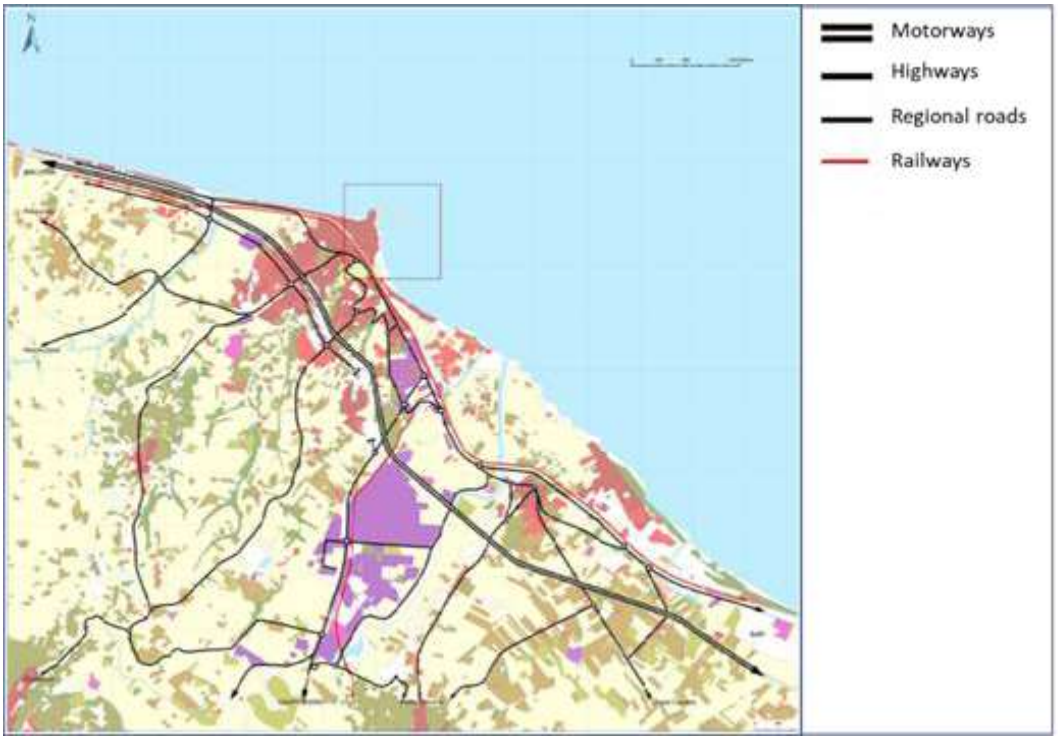

Figure 4 - Termoli Port Connectivity System (Rail, Highway, National and Regional Road Network

Connectivity between Port of Termoli, the inner part of the region and neighboring regions is complemented by road and rail networks, shown in figures below:

Figure 5 - Regional Internal Road Network

Figure 6 - Regional Internal Rail Network

As regard to maritime connections, Termoli Port' freight transport is really poor and only relating to some exchange with Apulia region while transnational maritime connections between Molise and the opposite littoral of the Adriatic Sea, they are restricted to seasonal passenger ship services connecting Termoli to Ploce. However, in a perspective of future improvement of passenger traffic between the two sides of the Adriatic Sea, the Port of Termoli can definitely play a competitive role, considering its proximity to ports of Ploce and Split, in comparison with neighboring ports of Vasto, Pescara and Ortona that are all further away from Croatian ports.

Figure 7 - Termoli and Middle Adriatic Sea Ports

Lastly, it could be useful to mention that Molise Region, together with coastal regions of Marche, Abruzzo and Apulia, have recently signed a Memorandum of Understanding with the aim to share a common strategy and a unitary position, in view of the revision of the EU regulation for Trans European Network of Transport (1315/2013). The strategy identifies four main priorities which could really contribute to fill the infrastructural gap affecting transport networks of the Adriatic regions involved, along both east-west and north-south axes, as well as to strengthen their economies. Priorities include the following strategic intervention:

1. Corridor I, Baltic – Adriatic: extension of the corridor along the entire Adriatic-Ionian Coast (blue line in the figure below) by completing or strengthening road and rail infrastructures
2. Corridor 5, Scandinavian – Mediterranean: north- south extension of the corridor (pink line, in figure)
3. Enhancement of east-west connections linking Spain, Italy and the Western Balkans (red line, in the figure below)
4. Enhancement of port infrastructures to improve connection among the two side of the Adriatic and towards Central Europe

Figure 8 - TEN_T networks and potential extensions in the Adriatic Sea Area

With reference to port infrastructure, the priority interventions identified by the MoU will address reinforcement of maritime interconnections in the Adriatic sea (both for passengers and goods) as well as the development of the Motorways of the Sea among the two sides of the Adriatic and towards the North Adriatic Port system, with future possible extension of intermodal sea-land transport, also along the east-west axis.

Before closing the introductory section, it is worth mentioning that Molise Region has recently approved a New Regulatory Plan for the port, which foresees to double the total surface of the port basin (from 360.000 to 844.000 square meters) as well as substantial changes of actual layout, including a new distribution and rationalization of port functions and services

Figure 9 - Termoli Port, present status and distribution of function areas

Figure 10 - Termoli Port, New layout and distribution of function areas

The new plan aims at improving the city-port relations by providing citizens with a more attractive and usable waterfront. The infrastructural interventions for the enlargement of port basins (inner and outer) will allow access to the port by larger ships, will improve safety of port operations and should also solve the issue of harbor silting. The plan includes also interventions for a more sustainable urban mobility, by restricting heavy traffic crossing the city only to vehicles strictly functional to the port activity.

2.2. Port of Durres

Durres Port is the largest port of Albania and now defined as the main gate of the VIII corridor. One of main investment in the port, was construction of passenger terminal with all facilities, with funding of about EUR 22 million. The Ferry Terminal is provided with a concession, and the Port Authority benefits 49% of the revenues generated from the services provided in it, as well as a lease for the area provided to the concessionaire. The ferry terminal have connections to Bari, Brindisi, Ancona and Trieste. The terminal has recently been modernized, is one of the most modern in the Mediterranean. More than 800,000 passenger, 160,000 cars and 65,000 trucks pass the terminal annually.

The port of Durres, beyond its physical dimension, is the story; it constitutes reality and no doubt that in the future will be an important factor in the life of not only the City of Durres but also the whole country and the region. Always important as a strategic point, on the shore eastern Adriatic, the port has developed over the years as a privileged institution to have special attention.

Its geographical coordinates are: latitude 410 19.2' N and the longitude 190 27.2' L. It is located in the North of Durres Bay, along the shoreline 1.4 km with a land area of about 650,000 square meters, and water area of 67 000 square meters. Port of Durres has the quay length of 2,275 m, the basin depth of 7.5 to 11.5 m. Entrance to the port is realized through an access channel with a depth of 8.5m, 1.8 km in length and width of 104 m.

Durrës Port is 300 m from the city center and 500 m from railway. It is 33 km from Mother Teresa, Tirana Airport, which is the only airport in Albania. Being the largest port of Albania with a processing volume of about 5.5 million tons per year, the number of ships arriving to/departing from port is considerable. Also regular ferry lines have been operating with Italy by a daily service.

Port of Durres which handles roughly 78% of the country's seaborne trade in tonnage terms and 75% of all the export and import trade of the country, and this makes the Port of Durrës be the most important seaport in Albania and, together with Bar in Montenegro, the most important within the Western Balkan region. Moreover, Port of Durres is part of Core Network and the main gate to Corridor VIII. The port has also become an attractive cruise ship tourism destination with thousands of tourists visiting the ancient City of Durres as part of their Mediterranean tours.

Durrës Port Authority is a public juridical person operating under the Law no. 9130 dated 08.09.2003 "On the Port Authority". The Statute of the APD was approved by DCM No. 596 dated 10.09.2004 "On the approval of the APD Statute and its reorganization" which also determines the mode of its organization and functioning.The Law creates conditions to operate as an independent self-founding authority, consequently increase the opportunities to respond quickly and directly to the port users' needs and new challenges as EU candidate country. "Landowner Port" is the status of DPA, where port services and superstructures will be realized by private operators. And the only responsible and coordinating authority for port activities such as loading and unloading, maintenance of infrastructure and superstructure, maintenance of the aquarium, maintenance of equipment and buildings and in conjunction with the shipping companies, carries out the distribution and distribution of the goods. Its mission is "Performing an efficient management to provide the shipping Community and users of the Port Facilities, a quality service and reliable, for the transfer of goods from maritime to land based transportation modes at a competitive prices in accordance with the international regulations for environmental protection".

Durres Port Authority (DPA) governing bodies are:

- Governing Council,
- Executive Directory, headed by the General Director, who is responsible for the day-to-day operations and management of the port.

Based in the Law no. 9130 dated 08.09.2003 “For the Port Authority” Durres Port Authority are supported in its activity by Consultative Council.

The PDA is a legal entity, responsible for all port related activities, i.e. cargo handling, maintenance of nautical and port infrastructure and superstructure, equipment and buildings and to carry out loading and discharging operations together with the associated storage and receiving of goods to and from road and rail.

Port of Durres handles all types of cargo including dry bulk, break bulk, liquid bulk, general cargo, chemicals, dangerous cargo, containers, Ro-Ro, heavy lift cargo etc. It consists of imports of various kinds of goods such as wheat, cement, fuels, construction material, foodstuff, containers etc, and exports of minerals like chrome ore, Ferro-chrome, scrap, containers and general cargo.

With 2.2 kilometers of operational quay and 11 berths the Port of Durres is capable to handle about 78% of Albania’s total international maritime traffic. The port of Durres currently has a commercial capacity over 5 million tons of bulk and general cargo.

Figure 11 - Port of Durres, Satellite View

2.3. Port of Bar

The Port of Bar, the main cargo port in Montenegro, was established in 1906. Total area of the port is 200 ha (including port aquatorium with cca. 90 ha and its depth up to 14m). Capacity of the port is ~5 million tons of different types of cargo, per year. The exact location of the port is at the entrance to the Adriatic Sea, more 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.

The Port represents a very important link in the chain of intermodal transport. The following contribute to the fact: it is integrated with the Belgrade - Bar railway and road traffic network, and represents a junction of the trunk road M–24 Herceg–Novi – Bar - Ulcinj and the road Bar – Podgorica – Belgrade as well as it is a point of departure of the railway line Bar – Belgrade; Podgorica airport is cca. 50 km far away whereas Tivat airport is also cca. 50 km far away.

Figure 12 - Port of Bar position

The Port of Bar is a joint stock company, in which the State of Montenegro holds 54% of shares. Besides “Port of Bar”, there is one more port operator in the port area - “Port of Adria”. The Port of Adria (Global Ports Holding owns 62.09 % shares in Port of Adria) is a multipurpose port. The port covers a total area of 518,790 m2 with nine berths and has an annual handling capacity of 150,000 TEU and 2.3 million tons of general cargo.

Land and infrastructure, managed by the "Port Bar” H.Co.:

- 48.8 ha of arranged space;
- 25 ha of partially arranged space - space for expansion of the 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;
- power, water and sewerage, telecommunication infrastructure;
- road and railways.

The current capacity of the Port of Bar is 2.7 million tons per year. Port of Bar has great potentials as a port of regional importance, and as a port significant for South East Europe. It is worth mentioning that the quality of the port infrastructural links with its hinterland affects the capacity utilization rate of the port. Thus, management of the port dedicates its efforts to decreasing under-utilization of existing Port capacity on one hand, and increasing those capacities to new levels on the other.

The port itself is a multifunctional port, as the following specialized terminals can be found in its area:

- Liquid cargo terminal,
- Dry bulk cargo terminal,
- General cargo terminal,
- Ro-Ro terminal,
- Grain silo, and
- Passenger terminal.

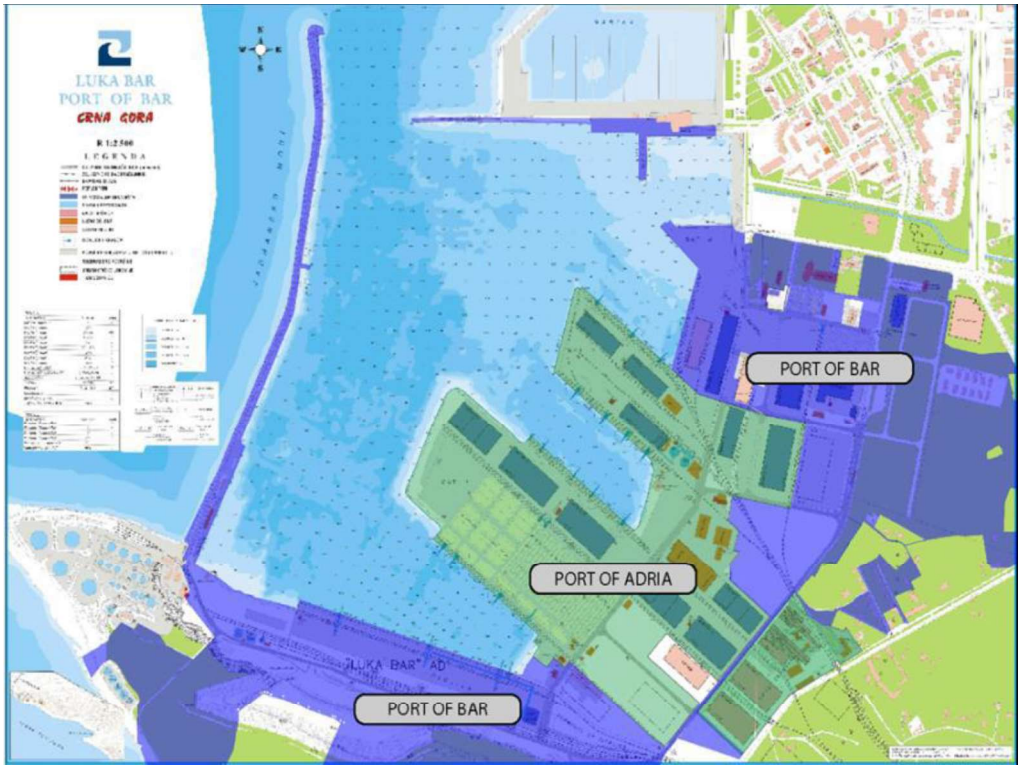

Figure 13 - Map of the area of the two main operators in the port

3. State of the art of ICT tools in involved ports

3.2. Case of Italy

3.1.1 PORT OF BARI

The Port Community System (PCS) of the Port of Bari is called GAIA – Generalised Automatic exchange of port Information Area – and was developed within the GAIA project co-funded by the Interreg Italy-Greece Cross-Border Cooperation Programme 2007-2013.

The Port Community System is an IT platform that allows the intelligent and secure exchange of information between public and private entities of the maritime-port cluster. the PCS optimizes, manages and automates port and logistics services by creating efficient processes, reducing the time requ-.lired for procedures and minimizing the use of paper documents.

GAIA is the Port Community System of the Port of Bari with which some port processes are managed digitally and with which innovative information services are offered to passengers and operators as well as free wi-fi internet connection in the passenger parking areas. GAIA constantly monitors the entire port process in real time, for each ferry ship departing from the Port of Bari, from the Security Card issuing procedure until the ship arrives at the destination port. It provides information on the status of boarding, on weather conditions, on the arrival and departure times of ships and, through the tracking function, notifies passengers of the exact position of ships during navigation and arrival times.

All travel information is thus displayed directly on users' mobile devices, such as smartphones, tablets, notebooks, allowing constant and timely updates on boarding times and any ship delays, free of charge, making the travel experience and stay in a more peaceful city. Detailed information, in particular on road conditions, is also made available to road hauliers who, through these services, can thus decide on the best possible route to reach their intended boarding, as well as request online authorizations for access to the port and areas. of security.

All the information generated by Gaia is also accessible in the port through special interactive kiosks. The use of GAIA has, in fact, revolutionized port activities by improving the work of operators, information management and the movement of passengers and vehicles, facilitating security checks by the police force.

Within the project, seven modules were activated:

1. GATE, access control system for passengers and vehicles. The Gate module, with the introduction of the Security Cards and Access Authorizations equipped with barcodes, has speeded up the procedures for boarding passengers and vehicles, has regulated the access of authorized personnel to the port, increased navigation safety and improved the effectiveness of border controls;
2. PASS, functionality dedicated to port operators for the online management of requests for access to port areas subject to the regulation of security plans. Using PASS, it is no longer necessary to go physically to the Port Authority or PFSO offices and no more paper requests and / or copies of documents are required. With PASS, shippers and dealers can make online requests on behalf of third parties who receive access authorization directly on their smartphone via email. This service, also available for all UIRNET-affiliated vehicles, has drastically reduced the average time for

receiving a port access authorization, has completely eliminated the circulation of paper forms and copies of documents and simplified the control procedures at the gates .

3. SHIPS, ship tracking system. Using the AIS data provided by the ships, also thanks to the cooperation with the national system of the Port Authorities, the system allows to elaborate in real time the arrival and departure forecasts of the ships in the Ports of the Levant both for the benefit of passengers and port services. .
4. IRIS, multichannel information system. It publishes the information processed and generated by the various GAIA subsystems on the LED information panels, kiosks, touch screens, TVs as well as on the public portal of the Body.
5. TRAVEL, support portal for passengers in transit in the Port of Bari. With the functionality, itineraries and tourist routes are available in the province of Bari and in Puglia.
6. GAIA, App for mobile devices (iOS and Android smartphones). This service makes the information published on the Travel portal and in the Iris form available on mobile devices. The navigator, selecting the topics of his interest, will be updated with push notifications on the latest information published or on any changes to routes and itineraries and will be able to consult the detailed map of the port of Bari to easily reach the rest areas and the embarkation docks.
7. Data Warehouse, business intelligence tool. It is a digital archive which, through innovative semantic analysis techniques, allows the processing of all the data of the GAIA system in order to assist, suggest and dynamically support the decision-making processes of the local, regional and national authorities in the field of maritime transport and of intermodal logistics.

Also, GAIA has the following features:

1. ALERT, it is a real-time notification system of events generated by GAIA PCS. Through Alert module, Coast Guard and Border Police activate automatic searches of people and vehicles present in the system.
2. DATA TRAFFIC, it enables the electronic submission of administrative information relating to passengers and vehicles (arrivals and departures from Bari). Allows Port Authority to use the data for statistical and billing purposes.
3. STATISTICS, Automatic analysis on integrated data/archives retained by GAIA sub-systems, real time elaboration of ESPO data models, Data Warehouse
   GAIA is composed of the following hardware:

1. Server
   a. 3 Data centers
   b. 25 racks 12Units/42Units
   c. 20 phisycal servers
   d. 60 virtual servers
   e. 460GB ram
   f. 30 power supply units
2. Networking
   a. 1 firewall
   b. 20 optical switches
   c. 3 km optical fiber
   d. 20 wi-fi antennas
   e. 70 wi-fi palm systems
   f. 1 automatic/integrated gate
3. Security & Anpr cameras
   a. 60TB storage space

   b. 7 anpr cameras (on port security gates)
   c. 10+180 security cameras
4. Storage
   a. 5 storage units
   b. 60 Hard disks
   c. 100 TB of space capacity

Concerning the interoperability with other IT systems and related upgrades, GAIA connected to:

- 2011: shipping companies
- 2013: document management system
- 2014: Uirnet – Italian Logistic Platrom
- 2015: intelligent gates
- 2016: container terminal
- 2017: Port Management Italian System (PMIS – Coast Guard)
- 2019: AIDA customs

The communication between GAIA and other systems is made by web services based on ESB. The system has been certified since 2014 by Italian Agency for Digitalization.
GAIA interoperates with heterogeneous systems by means of orchestration services (modelling processes inside the system).
Currently, GAIA has 1845 users:

- 115 public bodies - Customs Agency, Port Network Authority, Health Ministry, Public Works Administration, Environment regional agency
- 197 police and security authorities - Coast Guard, Border Police, Customs Police, Security Guards
- 512 Shipping and Port operators - Agencies and Shipping companies, Concessionaires, Port enterprises, Pilots, Mooring men
- 1021 logistics users - Road transport and shipping operators

Some figures about GAIA operations:

1. Ferries
   - Registered: 4,200,000 passengers; 2,100,000 vehicles; 6,300,000 gate transits
   - real-time security card issue during check-in operations at the agency
2. Authorisations:
   - 400,000 authorizations managed; 20,000 active; 9 mln registered accesses
   - 3-minute average time to request and obtain the authorization
3. Database transactions:
   1. More than 10 mln of daily transactions; about 300 simultaneous users
   2. 10 Production databases; 2 test database; 1 replica database
4. Service continuity:
   - 17,150 departures managed and 27 control gates simultaneously active with a 99.95% coefficient of service continuity

All in all, GAIA can be interpreted as a big data warehouse for the following functions:

1. Data volumes - Databases for GAIA PCS and services working
2. Data sources - Unstructured and unconventional data, linked to GAIA PCS (eg. IoT and environment sensors, anpr cameras)
3. Pelagus - Italian Coast Guard Headquarters connection for Vessels automatic identification system (AIS system)
4. ISMAEL - Prediction system of environment impact of logistic activities on ports
5. S.D.I. - Interoperability with inter-force police national system
6. TAPIN - Data warehouse and data exchange with Greek ports (Igoumenitsa, Patras, Corfu)

GAIA – future scenarios

Recent and future developments of GAIA include:

1) Interoperability with AIDA Customs IT service:

The project was designed by Port Authority with the aim to develop interoperability services between AIDA Customs system and GAIA Port Community System, in order to:

- Speed up the transit of goods in port logistic nodes
- Digitalize customs procedures linked to the transit of goods
- Manage in real time the goods flow in port facilities, working on actual critical moments
- Automate the ports procedures of goods gate-in/out
- Get information about customs payment and tracking of goods status

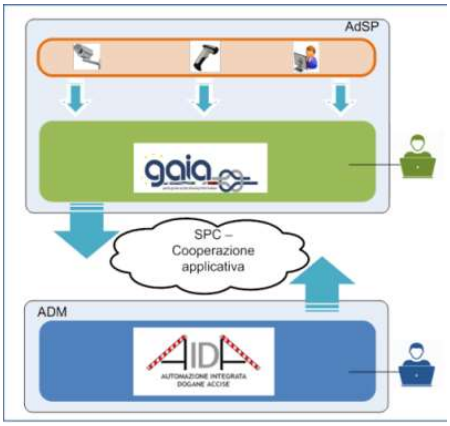

Figure 14 - Gaia and AIDA interoperability scheme

2) Testing of 5G

Bari will be the first 4.0 port in Italy able to improve security, access control and logistics by using IoT solutions coupled with digital automation, which are important steps specifically for cloud robotics and intelligent transportation systems.

Use cases examples:

- Security services (face recognition)
- Information services (people counting and density estimation)
- Port logistic services (container IoT)

3) Installation of eGates

In order to improve security at the border (European entry exit system EU EES 2017-2226) a EES border control solution will be experienced in the port of Bari able to:

- verify and collect departing passengers identity with the cooperation of Border Police;
- enable fast and convenient border clearance process for any type of travelers as traveler pre-check;
- Give real-time information to Italian Authorities and VIS system (Visa Information System);
- Cooperate with PCS GAIA

4) GAIA 2.0 evolution

The PCS GAIA 2.0 project is composed by 5 actions which will allow the Port Authority to upgrade the application/system infrastructure:

- PCS software and hardware technology upgrade, extension to Brindisi and Manfredonia ports;
- Front office system development in order to simplify the administrative procedures between port and business users;
- Gate expansion with automated access control barriers, plates recognition and container tracking;
- Public (passengers) and business (port operators) WiFi newtork expansion to all ports of Authority network;
- Security and operative video surveillance extension in ports of Bari, Manfredonia, Barletta e Monopoli.

5) Environmental energy monitoring system VEGA

The AdSP MAM, in line with the provisions of the Environmental Energy Planning Document of the Port System, adopted with Resolution no. 383 of 02.10.2019, starting from January 2020 had started a process of analysis, study and design aimed at " acquisition of an environmental monitoring system capable of serving the ports of Bari, Brindisi, Barletta, Manfredonia and Monopoli, both from the point of view of energy and environmental policies, a system now officially active.

The priority objective of the Port Authority is to make the most of technological innovation to implement and optimize traffic, while safeguarding environmental resources.

Figure 15 - VEGA System

The VEGA system was developed as part of the activities envisaged by the Interreg Italy-Croatia 2014-2020 community project "SUSPORT - SUStainable PORTs", with the aim of improving the energy sustainability of maritime and multimodal transport in the port area, through development of joint action plans aimed at coordinating all the main actors involved in the maritime transport sector.
In order to continue the virtuous path of reuse of the Entity's IT architecture and with a view to harmonizing those processes that are transversal to port procedures, VEGA has also been integrated into the application architecture of the Port Community System GAIA, a system that today governs all information concerning the transport of people and goods, through the interoperability between systems managed by other entities and shared among all the subjects belonging to the port community.

VEGA, in addition to acquiring data from the main environmental monitoring devices such as sound level meters, air quality control units, meteorological stations, multi-parametric probes, current meters, wave meters and tide gauge, is able to manage and acquire data and information according to innovative paradigms such as the IoT (Internet of Things), allowing the main actors, through the use of the integrated DSS (Decision Support System) functions, the effective programming of the movement of goods, the prevention of risks deriving from traffic congestion, the overall reduction the environmental impact resulting from the activities. All this will be made possible also thanks to the real-time data exchange with the GAIA PCS system, which has been operating for years in all ports of the network for port operations for the transit and control of passengers and goods.

The system, designed and developed to be completely configurable based on the monitoring needs that may differ from each application port, provides advanced consultation dashboards through which heterogeneous data can be interpolated, such as the impact factor of infrastructural works on the main environmental monitoring benchmarks.

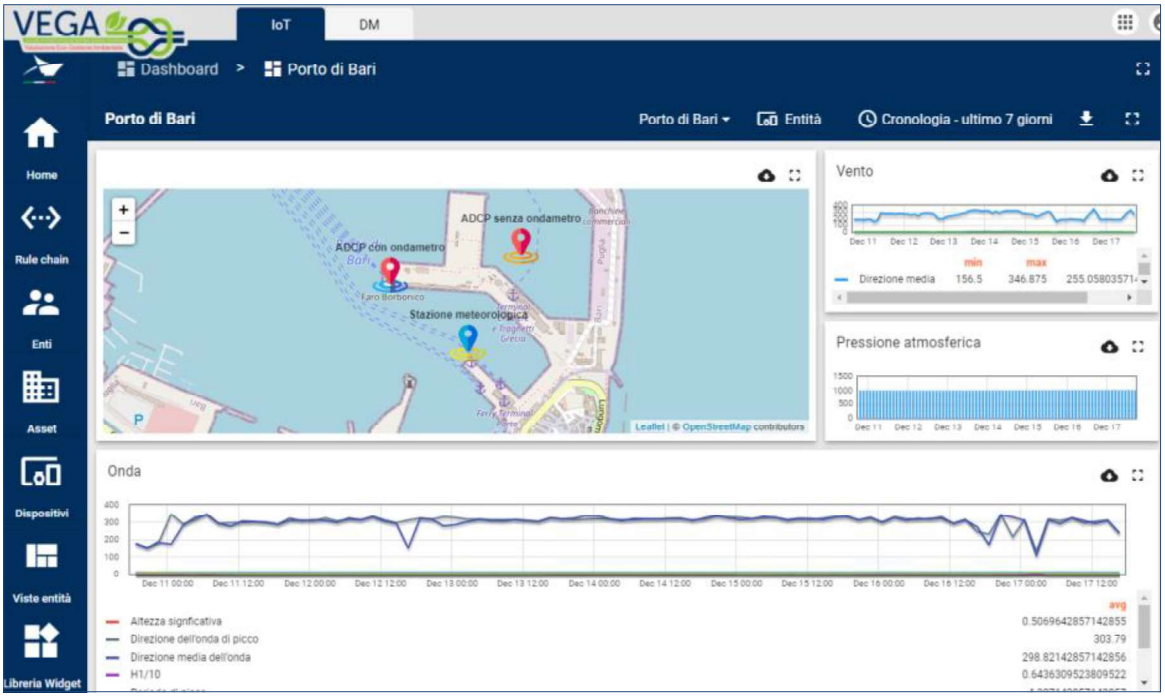

Figure 16 - VEGA System, Dashboard

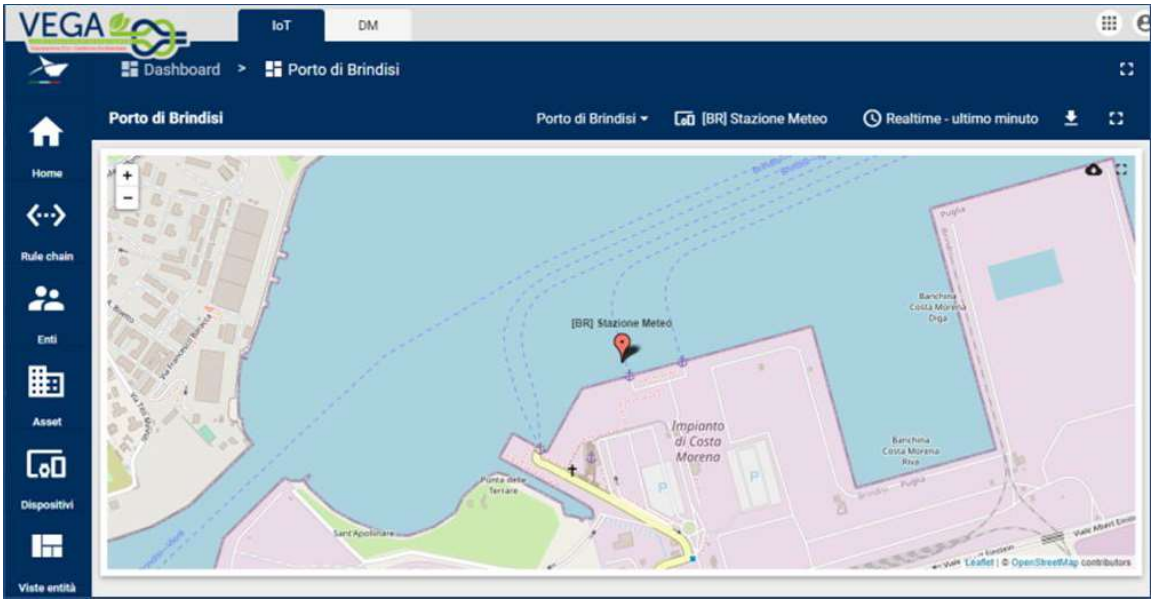

Figure 17 - VEGA System, Port of Bridnisi

Through the functionalities of the VEGA system and future investments to make the physical port infrastructures "intelligent", the Entity will continue the path of energy resource efficiency with the aim of being among the first Italian ports able to manage public infrastructure services, based on the real need for use.

VEGA will facilitate the process of upgrading infrastructure and energy efficiency in the ports of the AdSP through technological innovation and environmental protection, objectives outlined by the Port Authority reform law.

3.1.2 PORT OF TERMOLI

Methodological approach

The analysis of the state of the art of ICT tools in the port of Termoli has been designed and conducted by external experts with the support of AAST. A preliminary activity was carried out to set-up appropriate tools (questionnaires) for the acquisition of relevant data and information, including an indicative list of public and private entities to interview. According to the guidelines produced by the WP leader (AIT), the questionnaires were including also specific questions related to potentials for innovation, even though it was evident from the beginning of the analysis that the limited operations of the port together with the lack of an actual freight activity do restrict interventions addressing certain kinds of technological innovations.
A first questionnaire was drafted by experts with the scope to collect information and data concerning the following aspects:

1) Status quo of the ICT infrastructure, equipment and applications in use by the main port operators (computers and devices, software applications, telecommunications networks etc)
2) Limitations, barriers and bottlenecks hindering operations and information exchanges
3) Current technological and infrastructural needs in the ICT domain
4) Priority intervention/ICT solutions to improve operations

The above questionnaire was sent to a selected number of entities which can be regarded as key actors within the port of Termoli. Below the list of selected entities:

Public entities:
- Agency for Hospitality and Tourism of Termoli (AAST)
- Termoli's Coast Guard Office
- Municipality of Termoli
- Molise Region (ufficio lavori marittimi e portuali)

Private entities:
- Freight/Passenger Transport companies: 1) Guidotti Ships 2) GS Travel 3) Navigazione Libera del Golfo 4) Franmarine srl
- Managing Companies of yacht harbors: Marinucci Yachting
- Trade Associations: Federcoop Pesca (Federation of fishery cooperatives)

Results from interviews

"Status quo" of ICT equipment and infrastructure

All freight/passenger transport companies hold basic ICT equipment (desktop and laptop), use cloud computing services for data storage and applications, and a software application for billing**.**

Barriers and bottlenecks

With reference to passenger handling within the port area, the following physical barriers and bottlenecks have been evidenced:

- insufficient number of parking places
- inadequate passenger signage
- lack of public baths
- lack of funding and excessive bureaucracy
- scarce communication among operators and regional authority

Innovations and technological advancement

To overcome barriers and bottlenecks evidenced above, as a first step, some of interviewed entity highlighted the need of a technical table to set-up a plan of interventions for the port, involving the Region, harbor authority and port operators. Moreover, for creating a basis of an effective integration of the port in the regional socio-economic context, the pre-requisite is the development of port itself.

ICT solutions for improving operations

All freight/passenger transport companies interviewed have expressed the need to dispose of an ICT system for water quality control and water cleaning.

A second questionnaire was drafted with the specific aim to collect inputs and views on key factors and challenges which may contribute to design the Future of the Port of Termoli, taking also into consideration opportunities arising from the EU strategy and new funding programs 2021-2027 on sustainability and digitalization of ports in the Adriatic Ionian macro-region. Feedbacks from this second questionnaire are illustrated in the paragraph 4.4 "Indications for innovations"

Moreover, in order to complete the picture on ICT state of the art within the Port, it was useful to do insights on EU past and current projects which have funded or are presently funding the implementation of ICT solutions for the Port. The projects EASY CONNECTING, EA-SEA WAY and TISAR, implemented under the CBC IPA_ADRIATIC Program (2007-2013) and already closed, included the deployment of the following ICT tools:

Web Service and IP Network Platform conceived as a service for the port. It was implemented as an open platform supporting information exchanges and interoperability among stakeholders and set-up to manage also video surveillance and access control within the port area

Touch Screen Information Totems to provide information on public transport connections as well as touristic and public utility information

Deployment of a **database in GTFS format** concerning the offer of regional transport. With the geo-referencing of local public transport (TPL) routes. The regional Travel Planner (with Google Transit algorithm) was integrated with the Travel Planner of the Adriatic Macro-region

Ongoing projects SUMO, ALMONIT and FRAMESPORT, funded by INTERREG IPA CBC 2014-2020, foreseen the procurement/deployment of the following ICT solutions:

1) Acquisition of two **2 Variable Message Signs** (TEIMS - Traffic and environmental monitoring system) to provide information on traffic conditions, means of transport and environmental information in the area of the port and railway station of Termoli

2) Acquisition of **technological equipment** to be positioned on boats **for** conducing **real time environmental monitoring campaigns** during navigation.

3) Development of a **software prototype for identification and booking of berths** in yachting harbors and marinas of the Adriatic Sea, aiming to enhancing yachting activities of the area

Results of analysis conducted on ongoing projects allowed to pre-identify possible links among the ICT platform which will be developed by EFINTIS and the others ICT solutions which will be deployed for Termoli port system, including touristic ports, by SUMO, ALMONIT and FRAMESPORT projects. The opportunity to create links and operational synergies among ongoing EU actions will be further investigated by experts and AAST.

3.3. Case of Albania (DURRES PORT AUTHORITY)

Durres Port Authority Main IT systems:

I. ISPS –> Physical Access Control, CCTV and Radio Communication

Components:
Central Monitoring Site (FSPD)
Two main Radio Transition stations
Central management for access control on person and vehicle.
CCTV, LPR cameras on all gates

Functions:
Compliance with ISPS requirements
Central control and monitoring on port territory;
Logs collection on all entrances on port.
Logs on rejected access
Register CCTV imaged for more than 30 days;

II. Electronic Checking and e-Transit control

Components:
Installation on gates and within terminal for self service
On-line communication with agencies, real time update of bookings.
Control on verification and embarkation process.

Functions:
Passenger and vehicle improved processes.
Boarding and embarkation control
Procedure control on all embarkation
Automatic control on income

III. Gate access control

Components:
Central system for the administration of vehicle access and parking Electronic Approvement and deny on access
Electronic control on income
Gate access control of APD through RFID readers (used for long-term permits) and barcodes (used for short-term permits); turnstiles (skidata and axess tmc)
UHF key tag detectors for distance reading and identifying of vehicles in entry /exit gates.
Workstations, scanners and printers for printing permissions

Functions:
Electronic system for application, approval, issuance, renewal, revenue collection as well as cancellation of daily and long-term permits;
Online application for port entry permit to APD
Offer port entry and exit control as well as in the internal areas of port(different terminals).
Provide support for electronic invoice and reconciliation with bank payments

IV. Office Automation – Mail Server, Print Server, File Servers Web Site

Components:

Mail server.

"Content filtering" for security and content control inside and outside the port

Files and printers exchanging

IP telephony, direct phone for every number, telephone traffic control.

Functions:

E-mail exchange between employees and connected institutions outside.

Security control as well as communication content inside and outside the port.

Billing for each internal number

V. ESRI/GIS – Territory Management on the Port

Components

ESRI – GIS editor and web GIS View for GIS information on Port Assets

Consolidation and centralized view on port building and territory

Functions:

Better control on building and investments

Connection between assets and location on port area

VI. Protocol and archive electronic system

Components:

Central system for recording written documentation in the protocol and the APD archive.

Centralized database for information storage

Scanning equipment and licenses

Functions:

Management of Documents and communication processes DMS (Document Management System), which serves for the electronic archive of documents and technical documents of APD (from 2012 up to date)

System for storing, distributing written protocol documentation (incoming, outgoing and internal documents) and technical for APD.

Workflow information system that serves to reflect / convert electronically the internal practices of APD

VII. Human Resource monitoring System

Components:

Time attendance system - PTM

Workplace presence reading terminals installed in APD– Axess TMC

Central Data Recording System for APD employees.

A system for calculating employee salaries by the time they are present at work

Functions:

The system measures the time and the presence in work of APD employees

It has a central database for registration of the APD organigram, appointment of employees, personnel data such as: name, surname, birth year, time of commencement of work, trainings, evaluations etc.

Payment Calculation System.

VIII. Financial management System, and Business Intelligence Reporting

Components:

Modern integrated Web Platform
Accounting, Budgeting and Cash Management
Electronic Invoicing and
Revenue collection
Financial Reporting over Oracle BI
Procurement Management
Inventory Management

Functions:

Real time control over Enterprise Resources (inventory, cash, Asset and ...)
Follow-up on real-time over planned budget
Consolidated reporting on overall Enterprise activities (Oracle BI)

IX. Assets inventory System

Components

Central system for storing data on internal and external assets;
Asset labeling printers

Functions:

Keeps asset data such as asset code, denomination, value, and location;
Is interfaced with "JDE oracle" system for financial asset data
Linked to GIS for evidencing asset location in APD territory

X. Asset Management - MainSaver:

Components:

Asset maintenance over main assets of port
Asset maintenance schedule
Inventory used records
Keep information on all records
Follow buying process

Functions:

Follow asset maintenance and consumed inventory
Follow maintenance costs and performance on privatized maintenance services
Account asset expanses by cost centers
Check inventory availability

XI. WIM – Management and Control

Components:

LPR and Access control integrationIntegrated WIM
Central database for WIM results and link to the LPR and Access control Logs
Speed process, quicker result access to agencies and authorities

Functions:

Integrated and logs on all activity
Electronic check on overweight (over 12 Tons for Axe)
Full control on income.

3.4. Case of Montenegro (PORT OF BAR HOLDING COMPANY)

In Port of Bar, there is an information system called "LUBARIS" which covers all working processes in the port. This system was introduced in 2001. Lack of communication with other ICT systems (ICT systems of the Customs, agents, forwarders, rail companies...) was recognized as one of the main disadvantages of this ICT system. Within 2014, Port of Bar has introduced Port Community System (PCS framework and module Disposition) and in this first phase PCS has established connection with Customs, forwarders and other stakeholders of the port.

According to the International Port Community Association (IPCSA, 2011), a PCS is defined as a electronic platform that connects multiple systems operated by a variety of organizations that make up a seaport community. It is shared in the sense that it is set up, organized and used by firms in the same sector – in this case, a port community. Two key characteristics of a PCS are:

- *It shall be neutral and open electronic platform enabling intelligent and secure exchange of information between public and private stakeholders or in order to improve competitive position of the sea port community.*
- *It shall optimize, manage and automate port and logistics efficient processes through a single submission of data and connecting transport and logistics chains.*

PCSs in Europe have a long tradition. The first to be established in ports in Germany, France and UK began to operate in the late 70s or early 80s. Countries such as the Netherlands and Spain started their PCSs in the 1990s or at the turn of the century.

The PCS in Bar is still developing, in other words, the PCS does not have all modules yet. Port of Bar has always strived to innovations and to meet all requirements related to it, as in this case with the PCS. Its efforts are devoted to implementation and development of the PCS so as to improve the accessibility of the port, meet requirements of the logistic community, improve port operations and increase competitiveness, interchange data between all subjects in the logistics chain in common IT solutions, avoid paper, formalize processes in the port community, be prepared for implementation of the EU legislation (EU Directive 65/2010, etc.) and Maritime Single Window.

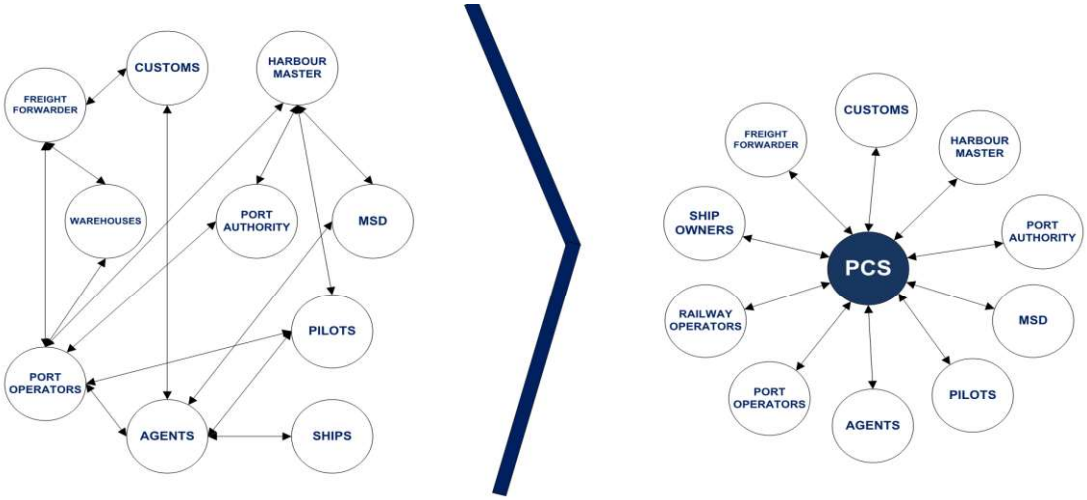

Figure 18 - Schematic Data Flow, Before and After Implementation of PCS

***PCS**s in general provides a huge range of services and key features, easy, fast and efficient EDI information exchange, re-use and centralization, available 24/7/365.*

Port Community System is a centralized and automated system for exchanging of information and documentation between organizations and marine transport authorities. The system provides:

- Receipt of messages from senders or sender systems in real-time
- Verification of conformity of messages
- Sending replies to the sender
- Transformation of messages into a format, which is expected by receivers
- Platform independence
- Recording of messages into a database - "message repository"
- Sending messages to receivers (xml format, un/edifact, flat file messages, etc.)

With all of these services come many advantages. The core benefits for all parties involved are higher efficiency and speed regarding port processes, particularly through automatization and the reduction of paperwork. In this way, ***PCS**s* contribute to sustainable transport logistics and support the ambitions to meet global carbon reduction requirements. The ***PCS*** offers improved security, cost reduction and potentially more competitiveness for each user.

Port of Bar was a partner in four EU co-funded projects through which the PCS system was developed, integrated and upgraded. Those projects were ADB Multiplatform (IPA SEE Programme), EA SEA-WAY, INTERMODADRIA, CAPTAIN (IPA ADRIATIC Programme) and ADRIPASS (ADRION Programme).

ADB Multiplatform project was implemented in order to develop and promote environmentally friendly, multimodal transport solutions from the ports in the SEE programme area to inland countries and regions along a selected pilot transnational network. The main output of the project was the development and implementation of the 1st phase of the Port Community System (PCS) (Implementation of pilot ICT tools - Integrated Port Management System). The developed Port Community System became a centralized and automated system for exchanging of information and documentation among stakeholders and maritime transport authorities. Moreover, the PCS has improved port operations and increased competitiveness of the Port of Bar.

Within the **ADB** project, the port developed the core of the system, as well as the main modules (modules Disposition and Customs). Disposition is a basic document for all activities related to the cargo movement. It also represents a main connection among Customs, forwarders/agents and port.

Further development of the PCS was done in the **EA SEA-WAY** project (output Innovative ICT system&infrastructure). Main achievement was implementation of activities referred to electronic exchange of all relevant information related to ship's arrival and departure resulting in usage and exchange of ship information (arrivals, departures, etc.) on different types of ICT systems, introduction of IMO FAL forms (as attachments), etc.

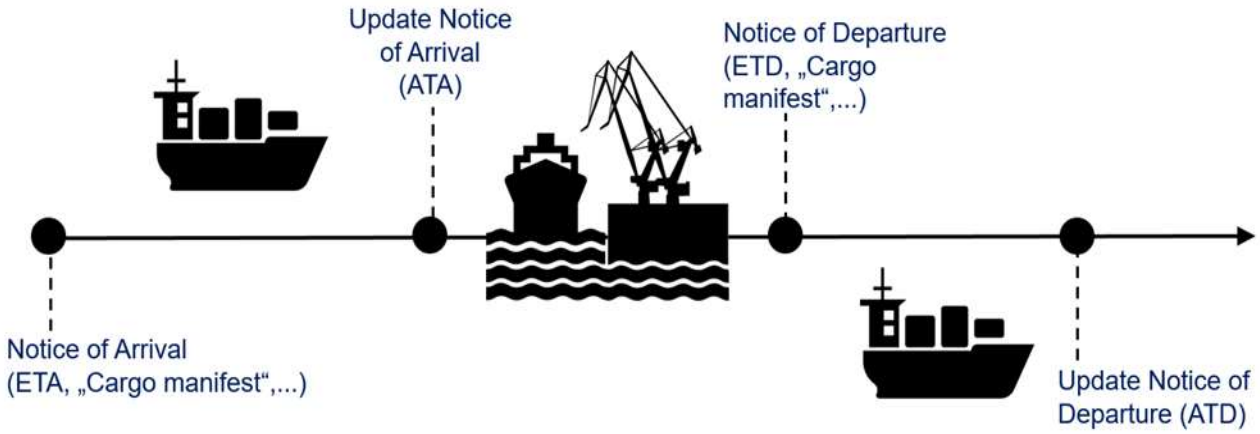

Figure 19 - Illustration of Data Flow in PCS

The implemented ICT/IT tools (Port Community System) were upgraded within **CAPTAIN** project. The goal of this upgrade was to ensure efficient up-to-date exchange of information delivered by machine generated emails about different actions in the PCS (e.g. for Ship announcement, berthing requests and Pilot requests on different milestones, etc.). This kind of data exchange was necessary as the port needed to involve different stakeholders or maritime authorities in the PCS (lack of their IT solutions forced us to exchange some data by emails).

Finally, in **ADRIPASS** project, pilot action of the Port of Bar intended to improve the planning capacities of transport stakeholders and policy makers concerning the multimodal transport accessibility and network efficiency in Montenegro. This pilot action contributed to better use of available data in the PCS as a part of the pilot was devoted to development of the PCS which is related to the statistics, dashboards, etc. Better communication between different types of stakeholders has been achieved through the end-user-oriented pilot actions (upgrade of the GUI, mobile solutions for the PCS, etc.).

The following modules have been updated through ADRIPASS project:

1. “Control center” (statistics, dashboards, etc.)
   This part of the PCS is dedicated to the statistics (report, dashboards, etc.) for the users of the PCS. The statistics is related to the ships and cargo data.
2. “Customs module”
   One of the main stakeholders of the port is Customs and this upgrade is in line with previous requests by Customs officers in terms of better use of the PCS by the stakeholders.
3. “Truck module”
   Truck transport is very important in the port and port business. Through this upgrade, the PCS collects data for the truck transport in the port and integrates it with other parts of the PCS.
4. Mobile solution/application
   In this upgrade, the PCS users are allowed to enter/see/analyze some of the available data on mobile phones/tablets.
5. User interface (better GUI, user friendly)
   The PCS was developed in 2014 and up to now we have collected some requests by the end user for the future upgrades. This part is dedicated to the users’ requests and it supports them in their usage of the PCS.

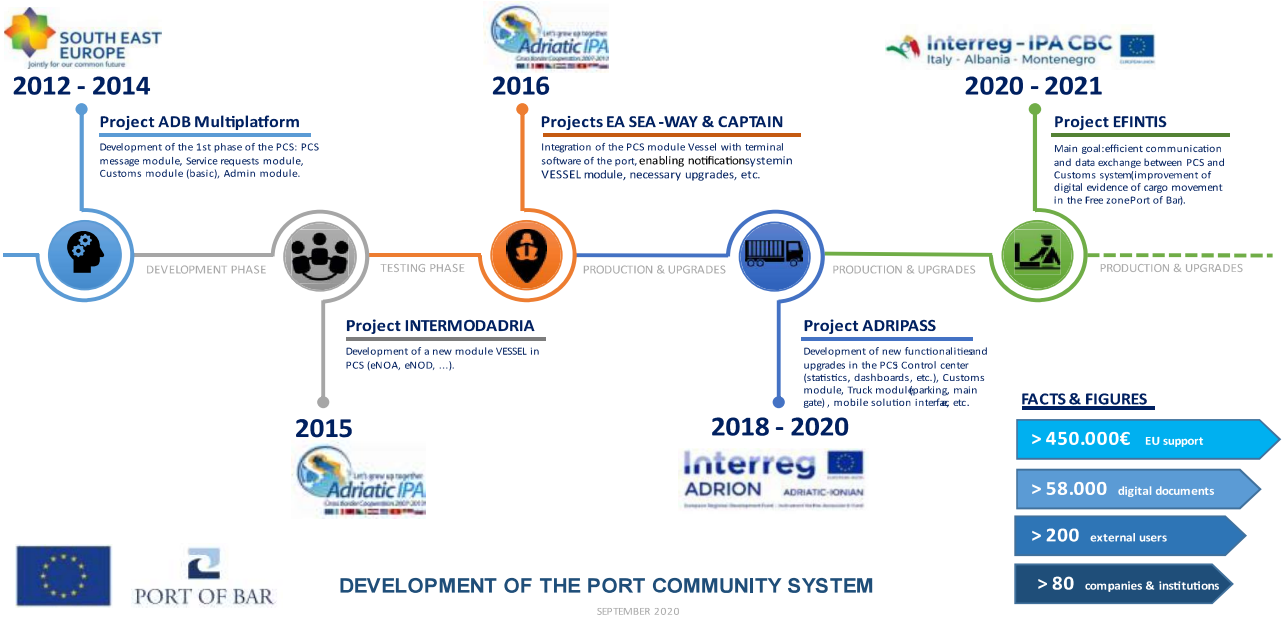

Figure 20 -Timeline, Development of Port community System, Port of Bar

The main stakeholders in the port area are those who use services of the PCS: public authorities (Customs Administration of Montenegro, Maritime Safety Department of Montenegro, Harbour Master's Office); forwarders (Jadroagent, Logicar D.O.O., Formont, Nimont, etc.); agents (Interlog D.O.O., Jaadroagent, Barska plovidba AD, etc.); harbour towing company (Ocean Montenegro D.O.O.); etc. Port of Bar is in daily communication with its stakeholders. Currently, the port has registered 86 companies with 216 users of the PCS.

4. Indication of the innovations

Following the analysis of the current situation and processes, the action will proceed with initiatives where prototyping, piloting and finally public demonstrating of the interoperability solutions envisaged among key stakeholders. The new ICT tools and improved ICT tools will be applied to improve the availability of information at the destination ports in order to enable the analysis of this information and arrange the appropriate inspection activities in the port by the different public authorities.

4.1. Case of Italy

4.1.1. PORT OF BARI

EFINTIS Project expected innovations: Pilot Project No. 2: ADSPMAM – (SASPA)

The pilot project of the ADSPMAM – (SASPA) will focus on further improvement of current Port Community System - GAIA in order to remove obstacles and introduce new technologies in port.

4.1.2. PORT OF TERMOLI

EFINTIS Project expected innovations: Pilot project no. 4 - AAST

The activities of Port of Termoli includes the design and development of a telematics platform that allows the interconnection and interoperability with other ports involved into the project to support the exchange of information regarding transports of goods and passengers.

Other innovations:

As mentioned in the methodological approach a questionnaire dedicated to challenges and potentials for innovation was designed and distributed. The first part of the interview was focusing on **key innovations** to be introduced in the different policy areas: transport, port-city, port, R&D, spatial planning and communication.

Feedbacks received provide some indications relating to port, R&D and spatial planning policies which can be summarized as follow:

1) The morphology of port area heavily hinders the development of Termoli as a commercial port. Thus, realistic perspectives of port system's development may primarily concern yachting and medium/small sized fishery activities. Touristic ship services connecting Termoli to Tremiti Islands and Termoli to Ploce will remain one of major activity of the port.

2) Development of R&D activities within the port area could take advantage from the presence of the "Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise" (Regional Authority and Research Institution for animal health and food safety). The Institute is specialized in health of fish species, hygiene of fish food and safeguarding of marine ecosystems. It carries out research, laboratory analysis, diagnosis, and technical advice to different stakeholders and hosts the research centre for marine ecosystem and fisheries. Support and reinforcement of such specific research domain could be decisive for the shaping of the Port of the Future.

3) The new regulatory plan for the port, recently approved by the Regional Authority (see par. 2.4) has introduced some important planning and infrastructural innovations which are however perceived by several stakeholders as interventions oversized, given the present conditions of the port. Anyhow, if interventions will be realized they can really contribute to re-design the Port of Termoli, giving it a growth perspective.

The second question was relating to the **key enablers** for the Port of the Future, to be selected among a list of factors including customer free zone, hinterland connectivity, logistics hubbing, automation and traceability of operations. Only two main enablers have been indicated as strategic for Termoli: automation and traceability of operations.

Last part of the interview was dedicated to the identification of **challenges**. Feedback received focuses on the improvement of the operational efficiency of fishing activities, by means of a centralized system able to regulate and coordinate fishery sale and aiming at a better control of fishing ships operations, within the port area.

4.2. Case of Albania (*DURRES PORT AUTHORITY*)

EFINTIS Project expected innovations: Pilot project no. 3 – Port of Durres

Pilot project of the Port of Durres will be establishment of the 1st phase of the Port Community System (PCS). Development of the PCS will follow results of the pre-investment study which was implemented within ADRIPASS project (ADRION programme).

ADRIAPASS Study Overview:

The current Management Information Systems (MIS) used in DPA and other community member systems represent an obstacle in the capability of Durres Port Community (DPC) to adapt to new market conditions or provide efficient services.

The Port of Durres (DPA) aims to modernise the sharing and exchange infrastructure through the implementation of an Integrated Port Community Information system (PCIS). The Port of Durres considers the implementation of the PCIS a significant need for providing organisational and managerial tools that will increase the cooperation, transparency and effectiveness of the Durres Port Community operations and data exchange.

In the study made by ADRIPASS project the PCS is treated as a tool for messages exchange of a commercial and logistic nature, with B2B (Business to Business) character. The above mentioned PCS utilisation aims to improve the usage of maritime transport resources by supporting maritime transport stakeholders to establish and manage a competitive business network, also ensuring interoperability with other neighbour's ports.

The preliminary study of PCS as a product of the project is a step forward and represents an added value for Durres Port Authority as a leader in the PCS implementation process, providing an important contribution to the preparation of the documents needed for the procurement process of the system.

The development of a competitive PCS will contribute to increasing the efficiency and speed of Port Community processes by monitoring all logistics chain steps, which means lower costs and competitive operator growth; also it brings DPA operation as near as possible to the Directive 2010/65/EU.
This study includes all the necessary information starting with an introduction of Durres Port Authority, an explanation of the current situation, of the objectives and goals and a detailed analysis of the expected results. Also, the study includes SWOT analysis and an analysis of a PCS system including its functional design (detailed analysis for vessel, truck, rail, staff, geographic area to be covered, target groups or stakeholders, legal basis and system security).

The vessel related operations module is seen as a tool to manage administrative requirements associated with receiving ships in port, including services provided by tugboat and pilots, vessel mooring information including additional vessel services during its stay in port and obligations related to its departure.

The truck module will include all operating regarding arriving trucks that will have to be announced via PCS. Terminal operators will then have access to the list of announced trucks with all relevant information about the cargo.

The rail related operation module will handle all arriving rail wagons that have to be announced by the responsible party via
PCS Integration Platform, which will validate received information, sent by rails other systems (for ex. TOS).

- The study also includes a budget analysis for the PCS implementation and specifications regarding hardware and the components of the study are:
- Software - distribution, installation and integration of an application (information system).
- Hardware equipment - the delivery and installation of hardware equipment.
- System Implementation Services - This will include the testing and demonstration of system use, as well as DPA assistance in the testing process as well as functional acceptance.
- Training - Part of the project is the training of DPA staff in terms of the technical and operational aspects of system use.
- nitial support (on-site) -the support in place for the system special module's starting activities, as well as the DPA control on the initial activities related to the use of the system.
- Support on-site - part of the project is the technical and functional support and support of system operation. The support will be provided remotely or on the delivery note to the Bidder's technical staff (creation and maintenance of an assistance center).

One of the most important points, explained in the study, is the security of the PCS. The security elements applied mustbe of a high standard and have a broad application in similar institutions. For this, the database and the application are required to meet a set of conditions under technical terms.

The system is minimally required to integrate with LDAP as the active directory. This integration will serve as a minimum for the administration of users, groups, roles, and operations on documents or group of documents in accordance with technical specifications. Any user should be logged while the system should support the implementation of security standards in the creation and administration of users in accordance with ISO 27000 (as well as subsequent versions). Documents and information security should minimally include defining and modifying rights for each document, group / type of document, the structure and categories of documentation. Unauthorized access will not be allowed and any attempt to break should be documented. Users of the PCS should only get Access to data they are entitled to view. This point is a guarantee for the stakeholders who will be included in the system.

As a result of the study DPA has obtained the following results:

- Identify members who will interact in PCS.
- Identification of administrative and operational procedures as well as the services that the PCS system must provide.
- Ensuring interaction with other neighbouring ports.
- Analysis of the existing IT system to identify the necessary interventions by PCS.
- Defining functionality groups

4.3. Case of Montenegro (*PORT OF BAR HOLDING COMPANY*)

EFINTIS Project expected innovations: Pilot project no. 1 – Port of Bar

Pilot project of the Port of Bar will focus on further development of current PCS in line with recommendations by Customs Administration of Montenegro (improvement of digital evidence of cargo movement in the free zone of the Port of Bar and tracking of cargo entrance or exit from the port).

Other innovations:

Port of Bar, as mentioned before, has always strived to innovations and transformation, which would ultimately improve and enhance port operations, while creating more efficient and proper business environment for its end-users. Considering aforementioned actions it is necessary for the port to develop and upgrade its PCS which means important interventions on the entire port's system for the adoption of solutions that will fit the needs not only of port's operators but also of other stakeholders involved in the logistic chain.

Supporting these changes is a precondition for the development of modernized port as recognized transport and logistics center. However, in the short-term period, priority should be given to further reforms with a special focus on soft measures that complement the development of infrastructure and improve the quality of transport services.
Improvements of infrastructure and ICT innovation represent key actions in order to improve port's general performance. The main objectives include upgrades of the existing ICT infrastructure to foster transport digitalization, data sharing and improving communication. However, one of the core aims is to maintain a multimodal transport network. Special attention and efforts through these actions should be devoted to maintenance and promotion of multimodal transport infrastructures that serve to transport of people and goods, and they shall be seen as an objective of the growing demand for mobility in growing economic developing areas of the Western Balkans. This as a major challenge hampers the development of freight transport in Port of Bar as important node in this part of the South-East Europe. Moreover, outcomes by implementing these key actions would be improvement of efficiency, upgrade of ICT and port operations.

Digitalization and automation have the potential to change the way traffic flows are organized and managed. Moreover, they generate business opportunities and open the way for innovation, new services and business models. They enable cooperation between all actors, real-time management of traffic and cargo flows, simplification and reduction of administrative burden, and allow better use of infrastructures and resources, thereby increase efficiency and lowers costs. The digitalization of transport and transit procedures creates significant efficiencies for the industry and governments. Real-time access to critical data and information is helpful on making mobility and transport more effective and also provides a more predictable and transparent business environment. The goal is to foster growth,

competitiveness, jobs and the internal market, in particular through making better use of the opportunities offered by digital technologies. Specifically, such tools could improve the use of existing resources. In view of supporting process of digitalization and improving interoperability in passenger and freight transport, it is necessary to develop a comprehensive digitalization strategy for the transport sector.

Another key objective is implementation and active utilization of tools that would facilitate changes across transport sector, which is an inevitable prerequisite for delivering change in industry in general. Digitalization of transport sector should be a key driver in transport industry, which would include connecting clients, consumers and stakeholders, smart IT infrastructure, seamless mobility solutions, proper and efficient data management. These innovations could be drivers to both public and private actors to willingly put efforts in developing seamless multimodal solutions and options.

Digitalization as well as overall safety and security in the port are the most promising topics to be included in top priorities for the future, and all efforts should be devoted to realization of those activities. By improving digitalization, the real operation improvement of the port community will be continued. Moreover, with these improvements, predictability and reliability of port services will be enhanced. In addition, as the PCS is upgraded, security and safety of the port system will be of uttermost importance, in order to avoid malicious cyber-attacks. Specific PCS upgrades are mentioned in the following paragraphs, as they are planned to be implemented in the near future.

Development of PCS module related to the handling of dangerous goods

Port of Bar has planned to invest in innovation related to providing services of handling dangerous cargo, and it will provide many advantages to the PCS end-users. The major benefits recognized are higher efficiency and sustainability while performing handling of cargo. Automatization and the reduction of unnecessary paperwork would lead to such benefits. The plan is to have PCS module for handling dangerous cargo as a contribution to sustainable transport logistics between various stakeholders of port's services and as a support to efforts of meeting carbon reduction requirements. The mentioned action would contribute to providing coordination among port authority, Port of Bar and end-users; digitalization of port procedures so as to improve efficiency and reliability of port services related to specific services; improvement of ICT infrastructure that would enable enhancement of port services and improvement of safety and security of port operations; environmental protection will be guaranteed as the higher level of protection will be secured.

Uploading customs documents to the system or full/partial integration with customs IT system

As PCS represents a system which enables efficient, easy and transparent exchange of reliable data, one of the key actions Port of Bar will deal is uploading customs documents to the system. In such way, it will enable key actors in maritime industry to not only be involved within the processes concerning their businesses, but also to be informed about data relevant to their scope of work. Uploading of documents (or full/partial integration with customs IT system) shall contribute to seamless exchange of information between the Customs and other parties operating in the port. In this way, the end-users will avoid time-consuming operations and unnecessary loss of valuable time.

Informing external agents about cargo status

Informing external agents about cargo status is necessary for PCS full operation and is one of the actions deriving from using PCS. Since each stakeholder in maritime industry has its role according to the specific work it performs, whether it is a forwarding agent, the Customs, etc. informing about cargo status is an option which should be provided to end-users nevertheless. The aim is to provide them with detailed and precise data regarding cargo status, control and tracking through the whole logistics chain in order to perform their duties with no loss of time or efforts, or to lessen them to a certain level. In this key action, external agents could have access to an adapted version of a report, with possibility to search their data, and have access to strictly defined areas. In addition, certain external agents could receive PCS messages, e-mails or EDIFACT messages containing previously defined data. In such way, errors in these reports could be reduced, and services could become automated, extra paperwork could be avoided.

Electronic signature / approval of port's documents

One of the innovations will also be an electronic signature. The electronic signature provides complete and secured signing of port documents. Modern problems require electronic solutions which would minimize the level of unnecessary paperwork, and improve port efficiency at the same time. In addition, Port of Bar devotes its efforts to cyber security, which is a core practice of protecting port system, network, and port programs from digital attacks. As cyber security has been an inexhaustible topic for several past years, significant efforts should be devoted to resolving such issue that could interrupt normal business processes of the port, and change or even destroy sensitive information stored for port end-users. Therefore, electronic signature is one of the ways of overcoming these obstacles which could hinder overall port performance and lead to disruption.

Electronic approval of port’s documents could help in avoiding duplicates, providing real-time, authentic documents that could not be altered or changed in any way, thus contributing to growing challenges in IT sectors in many ports are facing nowadays. However, it should be noted that implementing effective measures against cyber-attacks are particularly challenging these days, and the necessary steps such as digital approval of port’s documents should be considered with great care.

Railway module

Since railway is a transport mode usually connecting a port with hinterland, it represents an important link in intermodal transport chain. Without innovations and upgrades of railway module in Port Community System, there is no development in the transport chain which includes port as well. Upgrade of the Railway Module in Port Community System of Port of Bar will not only be important to the port itself, but to the railway network in Montenegro. Moreover, upgrade of this module in close cooperation with the stakeholders will improve multimodal transport and services in the region. In addition, the railway module would help in improving environmental protection, paving the way for future innovations related to this segment of development. Moreover, the mentioned would enable better harmonization of traffic legislation related both to railway and port.

Module Vessel in line with EU regulation and integration with MSW

At the moment, in Montenegro, a tender procedure for the implementation and testing of the **National Maritime Single Window (MSW)** in Montenegro on reporting formalities for ships arriving in and/or departing from ports is open. As integration with MSW is very important for the Port of Bar and stakeholders. One of the possibilities is an upgrade of the module Vessel and integration with the MSW (more data will be available upon finalization of the tender procedure related to the project Establishment of a National Maritime Single Window in Montenegro financed by the EU funds).

The Port of Bar main effort will be establishment of the connection/integration with the customs IT system but, as this is not only related to the Port of Bar but also to the national institutions and regulation, detailed specification of the pilot project will be prepared after consultation with all stakeholders. Future scenarios also include smart port concept and new technologies like automation and innovative technologies, industry 4.0 port, Artificial Intelligence (AI), Internet of Things (IoT), blockchain, big data, etc.

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In a general sense, the aim of these actions is to improve port operations and increase competitiveness between the port and the hinterland and with these actions, Port of Bar will improve the accessibility of the port and meet requirements of the logistic community. Besides general improvement of port operations and increase of competitiveness of the port the aims of these improvements are to reduce costs, to ensure efficient and secure exchange of working documentation for all subjects in the port community and to achieve transparency of services for public authorities and service users.

In the framework of the aims to develop ICT solutions for the upgrade of actual administration and optimization of operational efforts, the efforts of Port of Bar are mainly concentrated on developing tools able to improve the operational status of the links and optimize the flows between different types of transport nodes and the hinterland, supporting at the same time multimodality.

The Adriatic-Ionian Region, after the EU three last enlargements (2004-2007-2013) has been subject of intensive cooperation among its partners and continuous support from the European Commission. Especially regarding connectivity, through the Berlin Process initiated in 2014 and the consequent Summits, the indicative extension of the Comprehensive and Core TEN-T in WB6 that had been included in the TEN-T Regulation 1315/2013 of the European Parliament and of the Council on Union guidelines for the development of Trans-European Transport Network. The total amount of €13.5 billion has been invested to the Indicative Extension of the TEN-T Comprehensive and Core Network to the WB6 during the period 2004 - 2017. Investment in road infrastructures prevail but recently there is a change in the trend towards more rail investments. In terms of shares of sources in project financing the biggest share at 38% is financed through IFI loans, followed by the National Budgets with a share of 29%. Extending the TEN-T core network corridors to the WB6 ensures closer integration with the EU as well as the basis for leveraging investment in infrastructure, such as EU support through the Western Balkans Investment Framework (WBIF) and the Connecting Europe Facility (CEF). Improving connectivity within the Western Balkans, as well as between the Western Balkans and the European Union, is a key factor for growth and jobs and will bring clear benefits for the region's economies and citizens.

HINTERLAND CONNECTIVITY / INFRASTRUCTURAL BOTTLENECKS

Hinterland connectivity plays an important role in organization of port's business, as it enables development of port services. Being the most important cargo port in Montenegro, Port of Bar has devoted its efforts to further expanding its business operations with relevant stakeholders with the aim of ultimate utilization of its total capacities. In order to achieve that, significant efforts are devoted to improvement of hinterland connectivity. The following infrastructure projects represent high priority not only for Port of Bar, but for Montenegro as a country as well:

- construction of highways,
- revitalization of railway, and
- extension of the quay at the Passenger Terminal of the Port of Bar.

Therefore, in order to improve its regional status as a port, the mentioned factors must be taken into account. Specifically, these are the exact projects which will have profound effect of port's hinterland connectivity: construction of Bar – Belgrade highway; construction of Adriatic-Ionian highway; reconstruction and modernization of the railway Bar – Belgrade and extension of the Passenger terminal in the port.

However, it must be noted that these are external factors that do not only depend on Port's willingness to invest in these infrastructure projects. Many external factors of different nature and intensity may coordinate the realization of these projects. The Port itself has capacities and potentials for further development of connectivity (length of the operational coast, depth of the waters, connection with the railway and a large area for expansion).

Construction of highways

Total length of Montenegro's all main and regional roads is in total about 1.850 km. These kilometers can be divided into main and regional roads on one side, and local roads on the other. Montenegro's main and regional roads mostly involve two-lane roads with occasional overtaking lanes.[2]

The most important highways to be constructed are the Bar – Boljare highway and Adriatic-Ionian highway.

The **Bar – Boljare highway** from Bar to Boljare is the greatest engineering construction project in Montenegro. The highway from Bar to Boljare is 169,2 kilometres long. Almost over 40% of the total length consists of tunnels, 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.[3] It will connect the Adriatic coast with the rest of the Balkan peninsula, and parts of Montenegro (southern, central and northern). It will also connect Montenegro with Serbia, Bosnia & Herzegovina. Works on the construction of Bar-Boljare highway started officially on 11 May 2015. The highway consists of the following phases: phase 1: Smokovac - Mateševo, phase 2: Mateševo – Andrijevica and bypass Smokovac – Tološi – Farmaci; phase 3: Andrijevica - Boljare and phase 4: Podgorica – Đurmani. The construction of the section Smokovac – Uvač – Mateševo is a top priority and is underway. It will represent a milestone in economic development and consideration of further development directions.

[2] Source: Transport Development Strategy – Montenegro 2019-2035
[3] Source: Transport Development Strategy – Montenegro 2019-2035

Moreover, it will include Montenegro in the European transport network. The works on construction of Smokovac – Uvač – Mateševo section have started on 11 May 2015, and the deadline was 48 months. Currently, the section is 41 km long and will include 20 bridges and 4 interchanges. Section from Smokovac to Mateševo represents the most demanding section of the highway Bar – Boljare which will connect Montenegro with its hinterland. Section of the Road Route 4, Mateševo-Andrijevica, is foreseen to be 21 km long. About 92% of the highway is completed and will be completed by the end of 2021.

Figure 21 - Matesevo - Andrijevica Higway

As for the **Adriatic-Ionian expressway** (Route 1), it planned to go along the Montenegrin coast, and it 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. It aims to connect the Central Europe with and Northern Italy with Ionian peninsula through Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Albania and Greece. The total length of the highway 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 Bay – Verige bridge.[4] The highway will have the following major points: Herceg Novi – passage through the Boka Bay – Tivat - Budva – Bar – Ulcinj – Sukobin.

[4] Source: Transport Development Strategy – Montenegro 2019-2035

Figure 22 - Adriatic - Ionian Higway (Photo: Monteput)

Revitalization of railway

The rail network of Montenegro has a length of 250 km and consists of single-track lines of category D4 and a standard gauge (1.435 mm). For most of its length (225 km), the network is electrified. It has an allowable axle load of 22.5 t. Rail infrastructure includes 121 tunnels of a total length of 58 km, 120 bridges, 9 galleries and 440 culverts. The network consists of three railway lines converging in Podgorica. In total, Montenegro has 18.4 m of railway lines per km2 and 0.40 km per 1000 inhabitants.

The Bar – Border with Serbia (Belgrade) railway line is the backbone of the Montenegrin railway system. It is fully electrified and features the highest railway viaduct in Europe (the Mala Rijeka viaduct) and the 6.2 km long Sozina tunnel. About one-third of the Montenegrin part of line is in a tunnel or on a viaduct. The Nikšić-Podgorica line (56.6 km long) was thoroughly reconstructed and electrified during 2006-2012 period, with passenger service reintroduced. Operating speeds on the Nikšić-Podgorica line range between 75 km/h and 100 km/h. The Podgorica-Shkoder railway, which extends to Tirana, has been used exclusively for freight transport. There are plans to reconstruct the railway and introduce passenger traffic between Montenegro and Albania.

Figure 23 - Railway System in Montenegro

Since 2006, a total amount of EUR 123.1 million was invested in rehabilitation and modernization of Montenegros railway infrastructure, for the overhaul and electrification of the Nikšić – Podgorica line and the overhaul of the (Belgrade)-Vrbnica-Bar line. 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 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. The estimated duration of the project is 15 years. There is technical documentation for most of the phases of the project for the preparation of the tender or implementation of the tender procedure.

The upgrade and modernization of the Podgorica – Tuzi railway line has been included in Montenegro's single project pipeline (SPP) for the next 15 years. However, no detailed technical studies or relevant works have been initiated so far. Any progress on that project is directly related to actions undertaken by the Albanian side. Also, the SPP considers the expansion of the Podgorica – Nikšić railway line to Trebinje in Bosnia & Herzegovina, following the over 40 years abandoned narrow-gauge line corridor between Nikšić – Bileća and Trebinje (formerly known as Dalmatian and Zelenika railway).

Large number of upgrades of Montenegrin railways is underway or is in the planning stage. Priority is given to main railway corridors for passenger and freight transport, between Bar, Podgorica and Bijelo Polje (border with Serbia). Plans for upgrades of other railway corridors with Albania and Bosnia and Herzegovina are in preparation, although their realization is not expected before the time horizon of TDS (2035). Also, all such plans are greatly dependent on relevant railway projects in neighbouring countries, which are supposed to be aligned with and attached to projects conducted in Montenegro. [5]

In addition, future plans are related to the opportunity to promote the railway connection Bar–Belgrade by using combined maritime-railway transport mode so as to provide full access to the South Central Europe hinterland and obtain competitive advantages which could be used as an alternative to the already established alternatives - TEN-T corridors through Croatia, Bosnia or Albania.

[5] Source: Transport Development Strategy – Montenegro 2019-2035

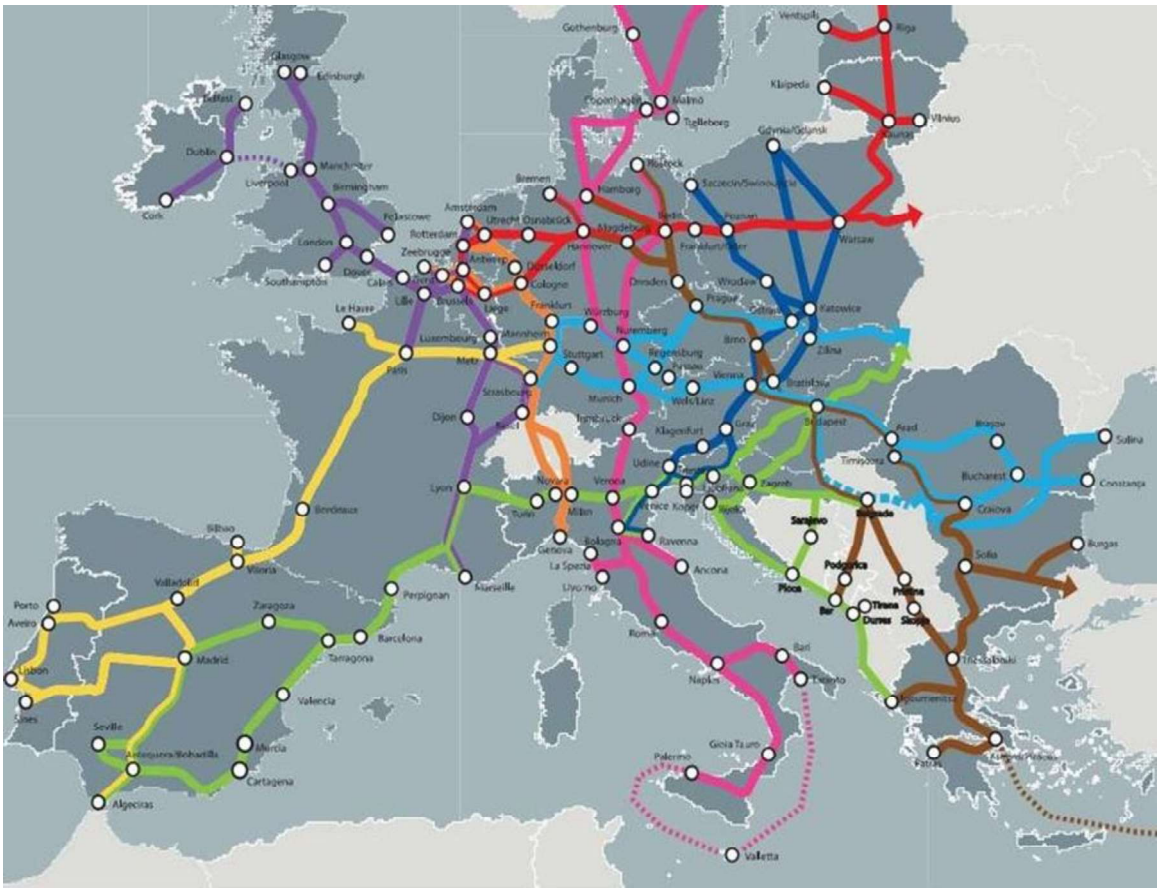

Figure 24 - Indicative extension to the Core Network Corridors.
**source: www.researchgate.net*

Better infrastructure would create the preconditions for better transport connectivity, which is crucial for development. Investments in the infrastructure must also be followed by investments in different means of informing, application support, and supporting technologies.

ECONOMIC AND BUSINESS BARRIERS

Economic growth in the Western Balkans has strengthened to an estimated 3.5%. In most of the region, growth projections for 2018 have been revised upward. Kosovo and Albania are expected to grow at 4% this year. 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 (source http://www.worldbank.org)

The low level of the economic activities in port hinterland is a main identified bottleneck related to the market of the port (current level of the economic activities is not near to the level in Yugoslavia). In addition, political issues have sometimes caused the problems. At the moment the stakeholders have noticed lack of integration of the port hinterland system.

Figure 25 - Market of the Port of Bar

The favorable 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 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.

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.

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 condition.

5. General Conclusions

5.2. Case of Italy:

5.2.1. Port of Bari

Port Community System (PCS)

Called GAIA – Generalized Automatic exchange of port Information Area **– was developed**

GAIA – future scenarios

- Interoperability with AIDA Customs IT service
- Testing of 5G
- Installation of e-Gates
- GAIA 2.0 evolution
- Environmental energy monitoring system VEGA

5.2.2. Port of Termoli

Several studies and projects completed

1. Web Service and IP Network Platform
2. Touch Screen Information Totems
3. Deployment of a database in GTFS format with the geo-referencing of local public transport (TPL) routes**. The regional Travel Planner (with Google Transit algorithm)**

Ongoing projects, foreseen the procurement / deployment of the following ICT solutions:

1. Acquisition of two 2 Variable Message Signs (TEIMS - Traffic and environmental monitoring system)
2. Acquisition of technological equipment to be positioned on boats for conducing real time environmental monitoring campaigns during navigation.
3. Development of a software prototype for identification and booking of berths in yachting harbors and marinas of the Adriatic Sea, aiming to enhancing yachting activities of the areas integrated with the Travel Planner of the Adriatic Macro-region.

Near future possible:

- Links among the ICT platform which will be developed by EFINTIS and the others ICT solutions which will be deployed for Termoli port system, including touristic ports, by other projects.

5.3. Case of Albania:

Port of Durres

Current ICT tools

- ISPS – Physical Access Control,
- Electronic Checking and e-Transit control
- Gate access control
- ESRI/GIS – Territory Management on the Port Components
- Human Resource monitoring System
- Financial management System, and Business Intelligence Reporting
- Assets inventory System & Asset Management
- Management and Control Electronic check on overweight

Future planned to develop:

- Establish and implement the Albanian Vessel Traffic Monitoring and Information System (VTMIS)
- Establish and implement the Long Range Identification and Tracking System (LRIT)

5.4. Case of Montenegro:

Current ICT tools

- Information system called **"LUBARIS"** which covers all working processes in the port.
- **Port Community System** is introduced and started first phase-connection with Customs, forwarders and other stakeholders of the port.
- **Several EU project Port Community System was developed, integrated and upgraded**

Pilot actions is developing several modules through ADRIPASS and other EU financed projects:

- Control center (statistics, dashboards, etc.)
- Customs module
- Truck module
- Mobile solution/application
- User interface (better GUI, user friendly