



T1 INTERMODAL TRANSPORTSOFT MEASURES Version final

D.T1.2.1 Action plan for development of the ICT connection **03/2023**

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This project is co-financed by the European Union under the instrument for Pre-Accession Assistance (IPA II)

This document has been produced with the financial assistance of the Interreg IPA CBC Italy-Albania-Montenegro Programme. The contents of this document are the sole responsibility of (AIT) and can under no circumstances be regarded as reflecting the position of the European Union and of the Interreg IPA CBC Italy-Albania-Montenegro Programme Authorities.

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1. Action Plan – Port of Bar

1.1 Objectives

The port of Bar, the main cargo port in Montenegro, was established in 1906. Total area of the port is 200 ha (including port aquarium 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 1 - Port of BAR position

Information system of the Port of Bar is LUBARIS (LUka BAR Information System) 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 agents, forwarders and other stakeholders of the port (Customs has the ability to review all data in the PCS).

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 and Maritime Single Window.

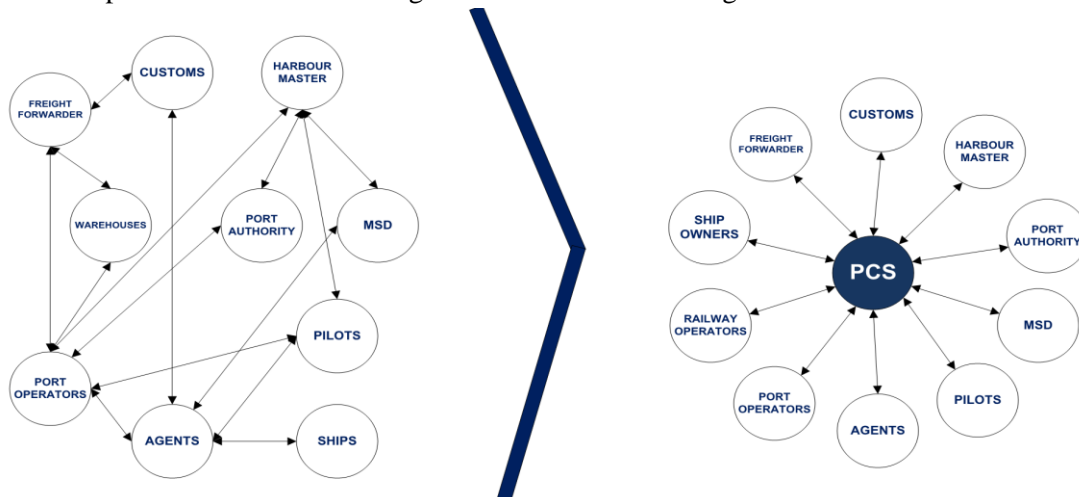


Figure 2 - Schematic Data Flow, Before and After Implementation of PCS

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.)

The PCS offers improved security, cost reduction and potentially more competitiveness for each user.

Port of Bar was a partner in several 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), ADRIPASS, ADRIPASS PLUS and MultiAPPRO PLUS (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 for the Port of Bar was the development and implementation of the 1st phase of the Port Community System (PCS) (Implementation of pilot ICT tools - Integrated Port Management System). Within the 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.

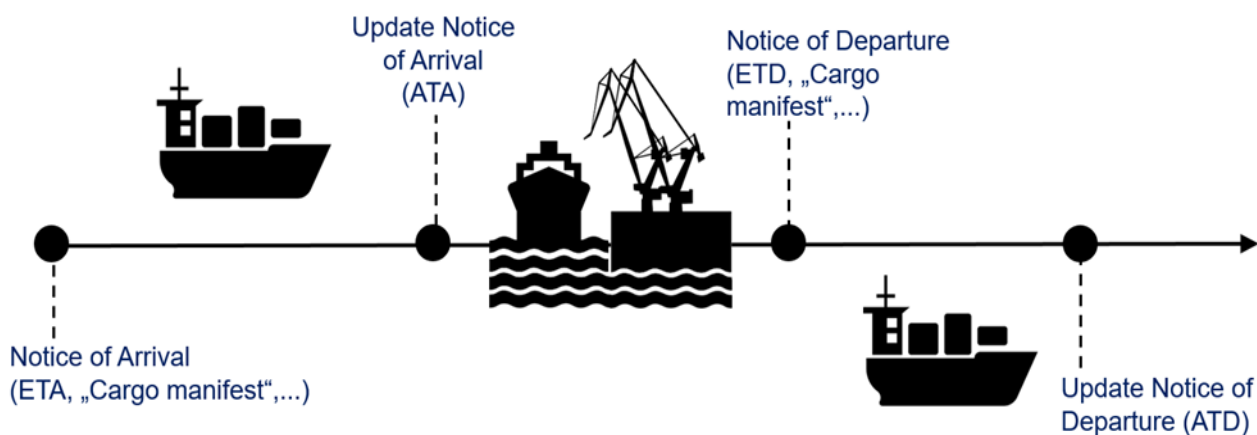


Figure 3 - Illustration of Data Flow in PCS

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).

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.

DIGITALIZATION IN PORT OF BAR (ME) SUPPORTED BY THE EUROPEAN UNION

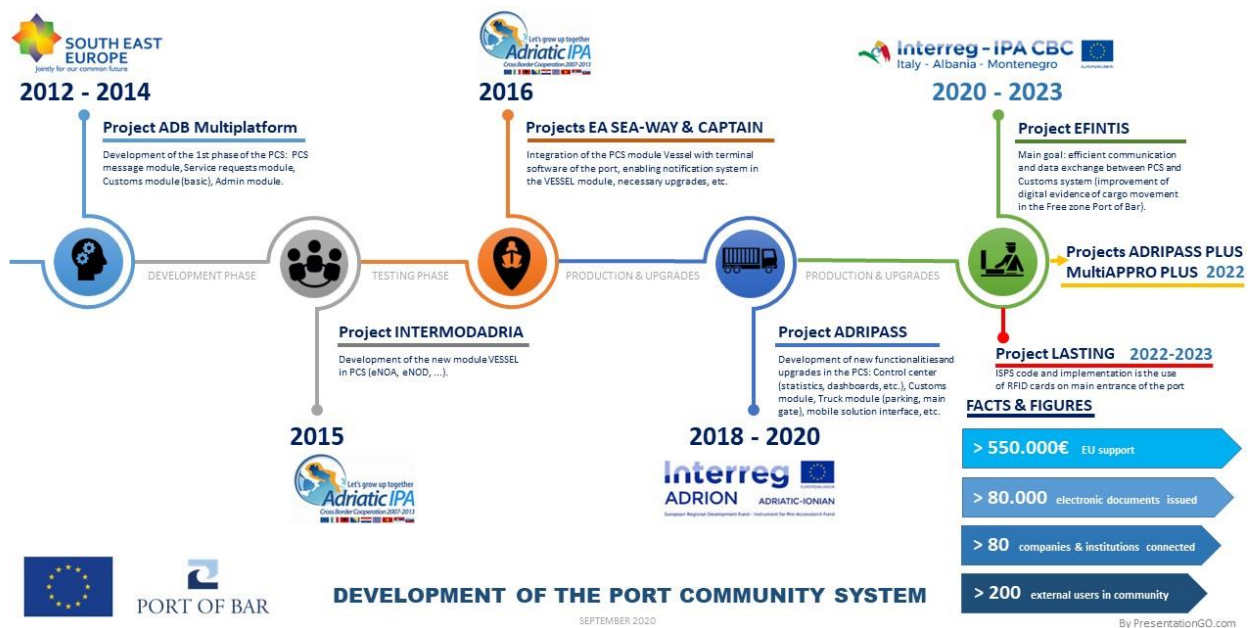


Figure 4 - Timeline, Development of Port community System, Port of Bar

1.2 Development of ICT connection Action Plan

1.2.1 A description of the institutional setup;

For years, as explained above, the Port of Bar has been steadily investing in IT solutions in order to smooth communications and data exchange along the entire supply chain and to increase its capacity. The overall goal is to streamline and digitalize administrative procedures among users of PCS through the development of new modules and functionalities based on interoperability standards of the IT platform currently in use in the port.

The management of these actions is challenging due to the complex and heterogeneous operations of ports, with several operators and processes. The management and control of the interaction/coordination between different types of business actors is quite challenging but is of vital importance for efficient cargo movement while, at the same time, each actor has its own procedures and priorities.

There are two main port operators working at the port area.

The Port of Bar is a joint stock company, in which the State of Montenegro holds 80% 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.



Figure 5 - Port area with 2 port operators

Land and infrastructure, managed by the "Port Bar" JSC:

- 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
- 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.

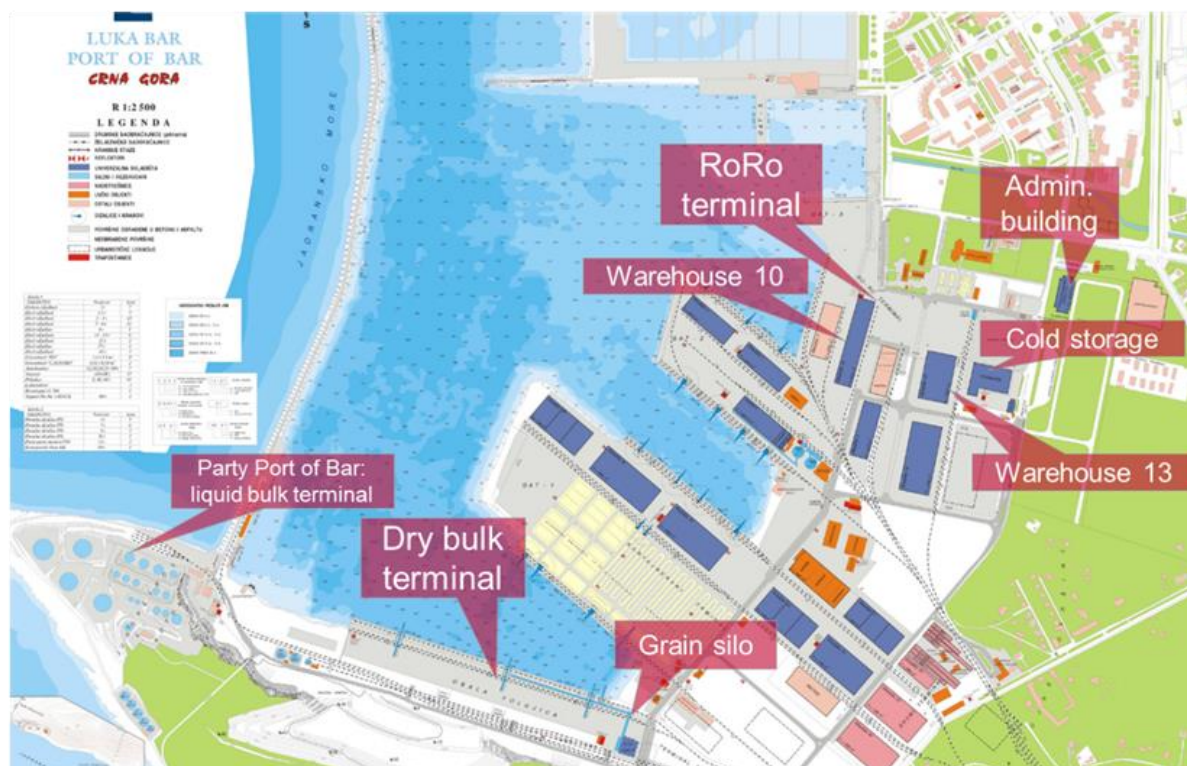


Figure 6 – Port of Bar

The main stakeholders in the port area are those who use services of the PCS: public authorities (Customs Administration 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 companies (Ocean Montenegro D.O.O., La Pluma Bar Pilot & Tugboat Service Montenegro, etc.); etc. Port of Bar is in daily communication with its stakeholders.

Institutional framework

Ministry of Capital Investments

The Ministry of Capital Investments of the Government of Montenegro covers the affairs of the state administration in the field of capital investments, all types of traffic and transport, maritime, energy, mining and hydrocarbons, as well as management and supervision of state companies in the aforementioned areas.

Administration for Maritime Safety and Port Management

The basic activity of the Administration for Maritime Safety and Port Management as a part of the Ministry is to ensure conditions for, and actual performance of, tasks stemming from the international obligations that the State has agreed to by signing conventions, agreements and protocols, related to the safety and security of navigation in the area of responsibility of the Contracting Government.

Regulatory framework

Transport Strategy 2019-2035

Transport development strategy for period 2019-2035 is a document determines current state in the field of transport, defines infrastructural, organizational and operative development targets of the transport system. Specific objective 2.6. Deployment of ITS technologies in the road, rail and maritime transport.

Strategy For Development Of Maritime Economy 2020-2030

Strategy for Development of Maritime Economy is the strategic document that sets development priorities and specific strategic and operational goals, defining at the same time the activities whose implementation can be followed through clearly defined indicators. The strategy develops long term public policies in the field of maritime economy and it is based on the clear understanding of the current state of affairs and principles of consistency, feasibility and harmonization with other existing documents. The aim of the Strategy is to recognize and precisely define directions of development in the sector of maritime economy in Montenegro.

1.2.2 Stakeholder involvement;

Disparity and balance of stakeholders is beneficial to the planning process of creating a sustainable action plan. Lack of a systematic approach to integrate input of a wide range of stakeholders in infrastructure investments might result in the neglect of dynamics and can affect the accuracy of project schedules and estimates which is why it is of the outmost importance for Port of Bar to involve all the key actors in creating a durable plan for development.

The Stakeholders involved are companies, maritime agents, freight forwarders and public institutions. Companies operate in transport sectors, obviously in shipping transport but also in road and rail transport, that connect the port to its hinterland and to inland in general. Public Institutions first of all are the Port Authority and Customs, to which are added local and regional public bodies.

Customs administration

Customs administration focused on sustainable capacity building that enables efficient revenue collection, the flow of goods and people, as well as business operations in accordance with national legislation, international standards and professional ethics for the benefit of all citizens, while respecting human rights and freedoms.

By including Customs as a major stakeholder in port operations, the Customs will have several benefits of improving, digitalization customs procedures and reducing paperwork. Uploading customs documents to the system will provide seamless and smooth operations of trade and provide automated solution to submit customs documents electronically, with no need to have printed multiple copies. The following functionality will ease unnecessary duplication of data, formalize processes of uploading document related to loading and discharge of ships, port operations etc.

Freight forwarders and ship agents

Currently there are 245 users of PCS in total.

The collaboration with all stakeholders is paramount for a success of the Action Plan for the Port of Bar. The port cannot operate in isolation from its institutions, and neither can it conduct its business without integrating its efforts with responsible agencies, government institutions and industrial organizations. In this regard, government support can help to accelerate the commercial viability and technical feasibility of certain, promising measures. Furthermore, a successful stakeholder involvement will lend credibility to the Plan. Ideally, all relevant stakeholders should be engaged throughout the action planning process, from the initial scoping of the plan through implementation and monitoring.

During the implementation of EFINTIS project there were several meetings with Customs administration and other relevant stakeholders in order to inform and include those subjects in the entire process. The plan is to further engage stakeholders in order to reach their higher level of involvement every step of the way. One aspect to be addressed is the means of engaging stakeholders to improve the efficiency and effectiveness of their involvement and to avoid disputes. There are several specific techniques for achieving stakeholder participation:

- Round Table Meetings
- Workshops etc.
- Communication letters about ongoing processes
- Surveys
- Etc.

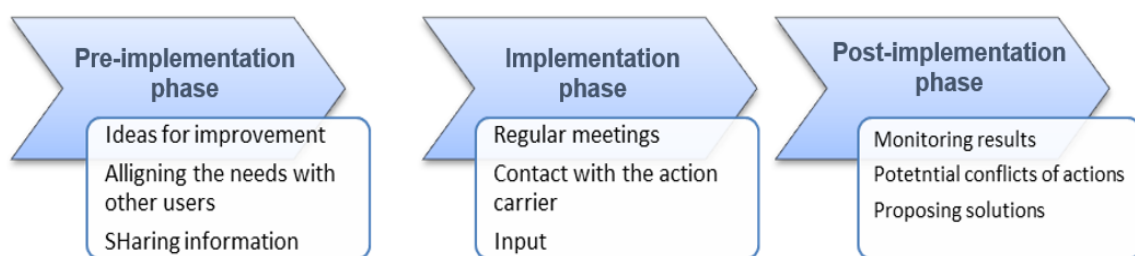


Figure 7 – Stakeholders Engagement Plan

1.2.3 Action Plan implementation;

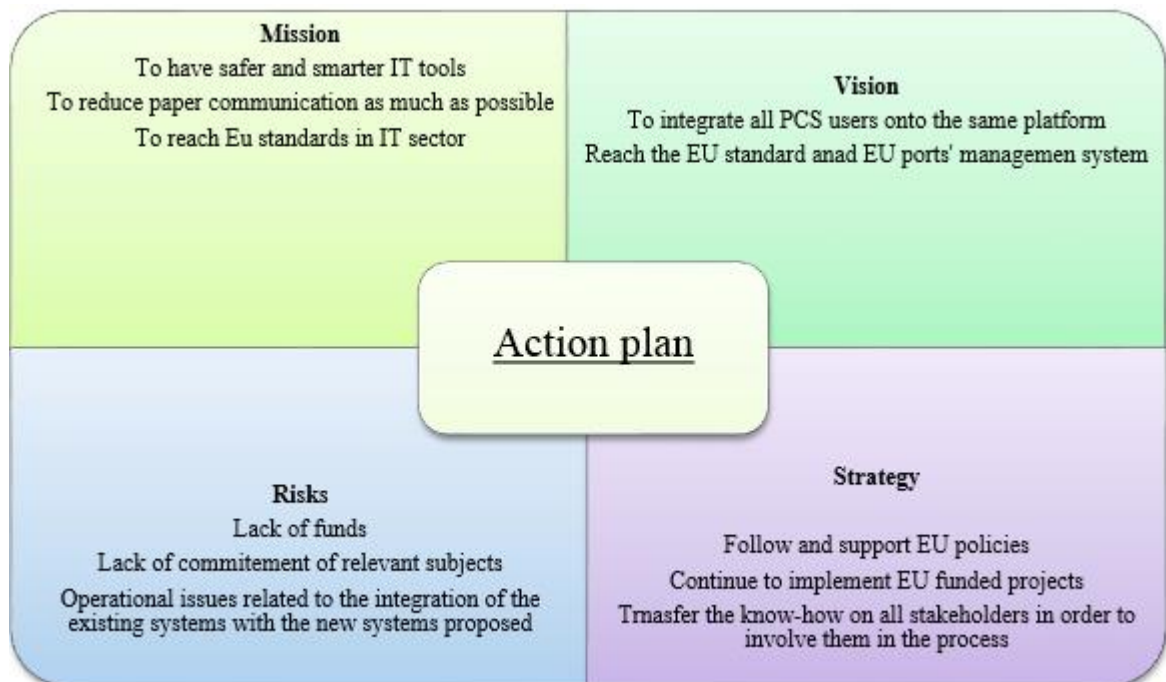


Figure 8 - Action Plan, SWOT

Many action plans aren't successful because they don't allocate appropriate human and financial resources to completing initiatives. In that sense, it is important to allocate the responsibilities prior in order to successfully implement the Action plan and monitor the actions. And in the following table the managements and governance framework is being closely explained.

Personnel

Port of Bar have more than 560 workers. The personnel is administrative, technical, auxiliary and the dockers. Responsible for the implementation of the Action plan is mainly Development Department of Port of Bar and ICT Department with the aid of other sectors inside the port.

The main objectives that are to be covered by the Action plan are upgrades of the existing ICT infrastructure to foster transport digitalization, data sharing and improving communication. However, one of the core aims is to maintain and improve 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 key node in this part of the South-East Europe. Moreover, outcomes by implementing these key actions would be improvement of efficiency, green upgrade of port and its operations and modernization of infrastructure. All of them contribute to development of physical and non-physical infrastructure aimed at improving the role of the port in national and transnational transport chain.

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. The actions that are considered in a future mean that administrative processes will be speeded up by the higher level of digitization, which will automatically have positive impacts on the entire work flow and processes. All the logistic operators involved in processes will have the possibility to have the necessary info just-in-time, thanks to the database that will automatically share the information with the involved stakeholders.

Most of the actions that are to be included in the Action Plan will be more effective as long as carried out jointly with the others. At the same time, bottlenecks are to be positively affected by the implementation of the measures analyzed in the further text of this document.

1.3 Definition of Objectives and Measures

A Port Community System is a system which handles electronic communication in ports between the different users, namely private transport operators, port operators, port authorities, Customs and other authorities etc. Having that in mind, dangerous goods handling represents one of the primary actions to be implemented in the PCS of Port of Bar. Before taking any action, specific measures must be assured in order to allow proper operation of handling dangerous goods, i.e. respecting different safety and security standards, especially in case of handling dangerous cargo, used modes of their transport and so on.

In a general sense, the aim of the following 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. All these actions are very important for future integration with National Single Window.

Main aims of Port of Bar's innovation key actions could be summarized as follows:

- to ensure efficient and secure exchange of working documentation for all subjects in the port community;
- to achieve transparency of services for public authorities and service users, according to their role;
- to improve port operations;
- to increase competitiveness of the port;
- to reduce service costs;

During the before mentioned development process of PCS and IT infrastructure of Port of Bar it became evident what are the next steps of implementation and what are next goals to be reached:

1. Implementation of high-quality cyber security system for protection and monitoring of the information system, with staff training

2. Upgrade of the existing information system in the Port of Bar:
 - Upgrade of the company's existing software LUBARIS (TOS and ERP):
 - Upgrade of the Port Community System with the new modules (truck announcement module, wagon announcement – connection with the railways, etc.)
 - Upgrade of digital infrastructure
 - IoT (Internet of Things) – Internet intelligent devices for the above-mentioned items that will enable the concept of “smart port”
3. Development of missing components of the existing information system in the Port of Bar – development of new software
 - Data Warehouse – MIS and integration with LUBARIS
 - Implementation of software for container terminal and its integration with LUBARIS and the PCS
 - Document management system
 - Digitization of infrastructure management (software and equipment)
4. Implementation of new and upgrade of the existing modern solutions in the field of technical protection.

These actions contribute to the removal of bottlenecks and the bringing of missing links within port and other transport infrastructures, to the optimal integration and interconnection of transport modes, to the efficient use of existing infrastructure and more effective work flow.

1.4 Definition of General Objectives

Table 1 – General Objectives

#	Name of Objective	Description of Objective
1	Implementation of high-quality cyber security system for protection and monitoring of the information system	Cybersecurity is vital because digital assets are valuable and vulnerable. With growth of PCS's functionalities and users there needs to be adequate security measures following those implemented actions.
2	Upgrade of the existing information system in the Port of Bar	<ul style="list-style-type: none"> • Upgrade of the company's existing software LUBARIS (TOS and ERP): <ul style="list-style-type: none"> • Migration of the company's existing software LUBARIS implemented in the Oracle environment and transition to the three-tier architecture. • upgrading of LUBARIS in terms of eliminating all observed functional breaks in the existing software, speeding up the input and processing procedures, updating the user interface, as well as implementing new modules • digitization of equipment in terms of data exchange with LUBARIS related to handling, fuel consumption, functional state of the equipment, ... with realization of all necessary assumptions related to achieving communication with the rest of IS • digitization of data entry related to handling at handling points while using handheld devices, tablets, and similar devices • integration of the existing software in the grain silo with LUBARIS • integration of the existing software in the cold storage (for temperature control by chambers) with LUBARIS • Upgrade of the Port Community System with the new modules (truck announcement, wagon announcement – connection with the railways...) • Upgrade of digital infrastructure: <ul style="list-style-type: none"> • reconstruction of the system (server) room with necessary equipment in accordance with all relevant standards • implementation of high-quality backup system with necessary equipment at a remote location from the existing server room • Expansion of the integrated telecommunications network (optical cables at different locations in the port, WIFI network and/or 5G network in the port...) which would enable the use of tablets, hand held devices, etc. • smart conference rooms • Monitoring center for tracking all main parameters (handling, number of trucks, consumption of water, electricity, etc.) • IoT (Internet of Things) – Internet intelligent devices for the above-mentioned items that will enable the concept of "smart port"

3	Implementation of the new modules/components in the ICT systems of the Port of Bar	<ul style="list-style-type: none"> • Data Warehouse – MIS and integration with LUBARIS <ul style="list-style-type: none"> • Implementation of software for container terminal and its integration with LUBARIS and the PCS • Document management system • Digitization of infrastructure management (software and equipment) <ul style="list-style-type: none"> ○ Digitization of water supply management ○ Digitization of electricity supply management ○ Digitization of monitoring of environmental parameters (air quality, sea pollution and similar) ○ IoT (Internet of Things) – Internet intelligent devices for the above-mentioned items which will enable the concept of “smart port”
4	Implementation of new and upgrade of the existing modern solutions in the field of technical protection	<ul style="list-style-type: none"> • Upgrade of video surveillance system and control center • Detection system on the perimeters (sensors on the fence, ...) • Detection system in warehouses • Monitoring system from the sea • IoT (Internet of Things) – Internet intelligent devices for the above-mentioned items which will enable the concept of “smart port” <p>The integrated functions in the sensors are suited for monitoring the activities inside the port. The sensors also can better detect obstacles and added cameras will upgrade the safety and security in port area</p>

1.5 Definition of Measures and Key Indicators

Following the definition of objectives, detailed measures actions are chosen and indicators to measure the performance in their implementation towards the objectives.

Table 2 - Measures and key indicators

#	Name of Objective	Name of associated Measure(s)	Description of Measure	Definition of Indicators	Implementation Target
1	Implementation of high-quality cyber security system for protection and monitoring of the information system	Development of the high-quality cyber security system in the Port of Bar	New applications related to the cyber security system.	Penetration tests.	December 2025
2	Upgrade of the existing information system in the Port of Bar	Development of the new functionalities in the current ICT systems in the Port of Bar	New applications adopted by the users in port.	Number of users of new IT solutions.	December 2027
3	Implementation of the new modules/components in the ICT systems of the Port of Bar	Development of missing components of the existing information system in the Port of Bar – development of new software	New applications adopted by the users in port and port community.	Number of users of new IT solutions.	December 2027
4	Implementation of new and upgrade of the existing modern solutions in the field of technical protection	Development of the modern solutions in the field of technical protection	New applications adopted by the users in port.	Number of new equipment (video camerras, IoT) related to the field of technical protection.	December 2027

1.6 Monitoring and funding

1.6.1 Monitoring

Monitoring plan to supervise implementation, with the purpose of checking the timely achievement of objectives within established deadlines and measuring performance using the chosen set of indicators.

Table 3 - Monitoring of measures implementation

#	Name of Measure(s)	Start / Deadline	Indicator	Source of Data	Monitoring Schedule	Responsible for monitoring
1	Development of the high-quality cyber security system in the Port of Bar	2023 - 2025	Penetration tests.	ICT systems of the Port of Bar	yearly	ICT and Development department of the Port of Bar
2	Development of the new functionalities in the current ICT systems in the Port of Bar	2023 - 2027	Number of users of new IT solutions.	ICT systems of the Port of Bar	yearly	ICT and Development department of the Port of Bar
3	Development of missing components of the existing information system in the Port of Bar – development of new software	2023 - 2027	Number of users of new IT solutions.	ICT systems of the Port of Bar	yearly	ICT and Development department of the Port of Bar
4	Development of the modern solutions in the field of technical protection	2023 - 2027	Number of new equipment (video cameras, IoT) related to the field of technical protection.	Port of Bar	yearly	Security, ICT and Development department of the Port of Bar

1.6.2 Funding

Needed resources and where possible funding could come from:

Table 4 – Funding of measures

#	Name of Measure(s)	Start / Deadline	Estimation amount	Source of funding
1	Development of the high-quality cyber security system in the Port of Bar	2023 - 2025	750.000	Loans/Grants EU co-financed projects/Own funding /National subsidies/projects
	Development of the new functionalities in the current ICT systems in the Port of Bar	2023 - 2027	2.400.000	Loans/Grants EU co-financed projects/Own funding /National subsidies/projects
2	Development of missing components of the existing information system in the Port of Bar – development of new software	2023 - 2027	1.000.000	Loans/Grants EU co-financed projects/Own funding /National subsidies/projects
3	Development of the modern solutions in the field of technical protection	2023 - 2027	700.000	Loans/Grants EU co-financed projects/Own funding /National subsidies/projects
4	Development of the high-quality cyber security system in the Port of Bar	2023 - 2025	750.000	Loans/Grants EU co-financed projects/Own funding /National subsidies/projects

2. Action Plan – Port of Bari

2.1 Objectives

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 Custom's 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

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 travellers as traveller 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) Wi-Fi network expansion to all ports of Authority network;
- Security and operative video surveillance extension in ports of Bari, Manfredonia, Barletta e Monopoli.

To sum up, the following conclusions that should be taken into consideration for the future activities in the EFINTIS project:

Ports are among the main elements of territorial competitiveness. This is the reason why we expect to improve the services offered to the users, for increasing security and quality of life to those who daily or occasionally interact with the Port.

Furthermore, we will necessarily try to overcome the challenge of quality and territorial integration with a model of governance based on innovation and institutional cooperation:

- new opportunities for port growth
- expansion of intermodal transport services and solutions for passengers
- develop the sustainable mobility and strengthen the collaboration with all possible stakeholders improve
- extend the pre-existing services to other ports of Southern Adriatic Ports Authority

Therefore necessary to have a clear picture of the convergent objectives

- Development and safety of city-port link infrastructures.
- Improvement of reception and transport services for passengers.
- Realization of an integrated information / enhancement system
- Improvement of the competitiveness of economic activities

2.2 Methodology for development of ICT connection Action Plan

The Pcs Gaia is already a tool that can be used by most port stakeholders, but the goal of further and more concrete implementation of ICT connections will continue, through vanguard, to help optimise existing processes, create new business opportunities and transform supply chains and the geography of trade.

2.2.1 A description of the institutional setup;

From an organizational point of view, the implementation of the action plan and the pilot action. In order to the operation resulting from the pilot action, a key actor will be the Harbor Master's Office.

2.2.2 Stakeholder involvement;

Mapping out stakeholders. Deals with the involvement of major stakeholders in the Programme area as a key element for project results' dissemination. The key stakeholders in the area are identified as they affect project activities and outcomes. A table maps stakeholders according to their influence on the project and their level of interest in the project. Stakeholders are also mapped according to their role and the benefit (or conflicts) their involvement could bring, taking in consideration current involvement and strategies to improve their support.

As regards the structural adjustments, AdSP inherited from the former Port Authority numerous projects e contracts in progress which, due to administrative continuity and contractual commitments undertaken, were managed in continuity. From the needs analysis already carried out, possible structural adjustments have already been defined which require the modification of existing regulatory plans.

The final choice of the necessary adjustments and the feasibility and sustainability study of the same will be carried out downstream of the discussion with stakeholders and with local authorities, in order to metabolize and share the choices and development objectives.

- infrastructure adaptation to keep pace with the rapid evolution of the needs of the carriers (dredging of the backdrops, strengthening of the docks, rearrangement of rear - dock spaces, improvement reception of passengers, raising of intermodality.
- Integration, development and accessibility of support services through the use of new technologies.
- Strategic and operational marketing for the cruise and sea highways sectors.
- joining with energy and environmental planning

Table 5 - Port of Bari stockholders list

Local Public Authorities	
Name of the organisation	Address
Città Metropolitana di Bari	Lungomare Nazario Sauro, 29 – 70121 Bari
Comune di Brindisi	Piazza Matteotti, 1
Camera di Commercio di Bari	Corso Cavour n. 2 - BARI
Camera di Commercio di Brindisi	via Bastioni Carlo V n. 4 Brindisi
Provincia di Brindisi	Via De Leo, 3 - 72100 Brindisi
Provincia di Bari	Lungomare Nazario Sauro, 29 – Bari
Regional Public Authorities	
Name of the organisation	Address
ENAC Puglia	Via XXV Aprile, 74 - 71121 Foggia
Dipartimento mobilità, qualità urbana, opere pubbliche, ecologia e paesaggio	LUNGOMARE NAZARIO SAURO, 70100 - BARI
Dipartimento sviluppo economico, Innovazione, Istruzione, Formazione e Lavoro	LUNGOMARE NAZARIO SAURO 70100 BARI
Dipartimento Turismo, Economia della Cultura e Valorizzazione del Territorio	LUNGOMARE NAZARIO SAURO, 70100 - BARI
Sezione infrastrutture per la mobilità - Regione Puglia - Dip. Mobilità, qualità urbana, opere pubbliche, ecologia e paesaggio	VIA G. GENTILE, 70100 BARI
Sezione Traposto pubblico locale e grandi progetti - Regione Puglia - Dip. Mobilità, qualità urbana, opere pubbliche, ecologia e paesaggio	VIA G. GENTILE 70100 BARI
Asset - Agenzia regionale Strategica per lo Sviluppo Ecosostenibile del Territorio	via G. Gentile, 52 - Bari
Infrastructure & Providers	
Name of the organisation	Address
Ferrovie del Sud Est - Autolinee Ferrovie del Sud Est	Giovanni Amendola, 106/D - Bari
Ferrovie Appulo Lucane / Bus Ferrovie Appulo Lucane	C.so Italia n.8 - Bari
Ferrottramviaria	Piazza A. Moro, 50/B - Bari
Cotrap	via Bruno Buozzi, 36 - Bari
Sita	Via Bruno Buozzi, 36 - Bari

STP	V.le Lovri n° 22 - Bari
STP Lecce	via Lecce 99 - San Cesario di Lecce
STP Brindisi	Contrada Piccoli Z.I. - Brindisi
CTP Taranto	Via Del Tratturello Tarantino 5/7 - Q.re Paolo VI
Miccolis Spa	Via delle Mammole, 26/28 - Modugno
Maritime agencies	
Name of the organisation	Address
BARI SHIPPING	info@barishipping.it
BLUMARE	gaiagate@blumare.eu
DISCOVERY SHIPPING	massimo.sciscio@discoveryshipping.it
DOLPHINS	shipping@dolphinsbari.com
MORFIMARE	l.morfini@morfimare.it
P.SANTELIA	santeliatraghetti@gmail.com
PORTTRANS	amministrazione@portrans.it
SEAMED TRADING SHIPPING S.R.L.	john.prudentino@seamedtrading.com
SPAMAT	spamatbari@spamat.it
TITI SHIPPING BARI	croazia@titishipping.it
Banchero & Costa	bancostabr@bcagy.it
Discovery Shipping s.r.l.	info@discoverishipping.it
Elica Srl	brindisi@elicasrl.com
Gorgoni Srl	agency@gorgonishipping.com
Poseidone Srl	poseidone@poseidone.it
Seagate Sas	operations@seagateagency.it
Titi Shipping	info@titishipping.it
Zaccaria & C. Srl	zacmar@tin.it
Albatros	shipping@albatrosweb.it
Seamed Trading	info@seamedtrading.com
Sermar	info@sermar.net
SPG	spg@pgbrindisi.it

2.3 Definition of Objectives and Measures

The action plans has to fulfil the effects of digitalization on maritime transport following three stages:

The objectives of technological innovation in transport are the following:

1. to allow the decarbonization of all modes of transport by promoting energy efficiency
2. to improve the safety and sustainability of the mobility of people and the transport of goods
3. to improve the functioning, management, accessibility, interoperability, multimodality and efficiency of the network.

2.4 Definition of General Objectives

Based on the current state of the art and after the consultation with stakeholders and main actors, port of Bari set defined objectives that will held the development of the ICT Connections Action Plan.

Table 6 - General Objectives, Port of Bari

#	Name of Objective	Description of Objective
1	software and hardware technology upgrade	PCS software and hardware technology upgrade, extension to Brindisi and Manfredonia ports;
2	Front office system development	Front office system development in order to simplify the administrative procedures between port and business users;
3	Gate expansion with automated access control	Gate expansion with automated access control barriers, plates recognition and container tracking;
4	Increase efficiency of the intermodal transport flows	Increase efficiency of the intermodal transport flows in the programme area by upgrading management information systems.

2.5 Definition of Measures and Key Indicators

Detailed measures actions were chosen and indicators to measure the performance in their implementation towards the objectives.

Table 7 - Measures to implement the Action Plan, Port of Bari

#	Name of Objective	Name of associated Measure(s)	Description of Measure	Definition of Indicators	Implementation Target
1	software and hardware technology upgrade	x	x	x	31/12/2022
2	Front office system development	x	x	x	
3	Gate expansion with automated access control	x	x		
4	Increase efficiency of the intermodal transport flows	x		x	31/12/2022

2.6 Monitoring and funding

2.6.2 Funding

Estimation of the needed resources and where possible funding could come from:

#	Name of Measure(s)	Start / Deadline	Estimation amount	Source of funding
1	Interreg			Eu programmes
2	PAC			National funds
3	Interreg			Eu programmes

3. Action Plan – Port of Durres

3.1 Objectives

Durres Port Authority (DPA) is the governing body of the port of Durres. Port Authority Durres is a public juridical person operating under Law 9130 dated 08.09.2003 "On the Port Authority" The Statute of the DPA was approved by DCM No. 596 dated 10.09.2004 "On the approval of the DPA Statute and its reorganization" which also determines the mode of its organization and functioning.

Port of Durres is the main port of the country and account of 78 % of Albanian Maritime Trade. It is an important part of the regional transport network and a key port in the Adriatic Sea for the European Corridor VIII and Corridor X.

Durres Port Authority is the land owner of the port, it is the guarantor of security in the port and define the tariff ceilings that will be used by private operators. DPA is responsible for environment protection, infrastructure development. It guarantees operation rules and the work safety. The private enterprises operate the Terminals and maintain the Port infrastructure.

In Durres Port, are handled all types of cargo including dry bulk, break bulk, general cargo, chemicals, dangerous cargo, containers, cement, minerals, construction material, foodstuff, steel etc.

There are 4 operational terminals in the Port of Durres;

- General cargo terminal owned and operated by DPA,
- Ferry terminal which is given in concession and is operated by AFTO (Albanian Ferry Terminal Operator).
- Container Terminal operated DCT (Durres Container Terminal).
- East Terminal is operated by EMS by concessioner (Albanian Port Operator).

- Ferry or RORO cargoes handled at Durrës port increased from 731,000 tonnes in 2010 to 936,000 tonnes in 2021, an average annual growth of 2.3%, with trade mainly focused on Italy (Ancona, Bari, Trieste) with services carried out by RORO-Pax vessels. The trade is mainly import oriented. Exports were on average 40% of import cargoes;
- The total number of passengers increased from 834,000 in 2010 to 880,000 in 2019, but the Covid-19 pandemic heavily influenced traffic volumes; in 2020 total passengers dropped to 311,000 only but partly recovered in 2021 to 689,000 pax;
- Total number of trucks transported by ferries increased from 68,000 in 2010 to some 82,000 in 2021. The pandemic only marginally influenced the 2020-2021 figures;

A part of traffic of goods handled in Durres Port come from the Port of Bar in Montenegro.

DPA aims to modernize the sharing and exchange infrastructure through the implementation of an Integrated Port Community Information system (PCIS). The implementation of this system is considered by the DPA as a major need for providing organizational and managerial tools that will increase the cooperation, transparency and effectiveness of the Durres Port Community operations and data exchange.

Durres Port of Durres have significantly increased the quality of service provided by implementing several ICT systems increasing security and facilitating administrative procedures.

The Port Authority is monitored 24 hours a day with the CCTV and access control systems, making the port of Durres a high security area in conformity with ISPS code requirements.

Systems for financial management, cargo processing, performance monitoring, fire protection system, weighing system of moving vehicles, energy network monitoring, ship monitoring systems, etc. have been implemented.

Below is a list of the main ICT systems in the Port of Durres.

Durres Port Authority Main IT systems:

I. ISPS → Physical Access Control, CCTV and Radio Communication

Components

Central Monitoring Site (FSPD)

Two main Radio Transmission 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 45 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 approval 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 (ski data and axes 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– Axxess 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 ect.)

Follow-up on real-time over planned budget

Consolidated reporting on overall Enterprise activities (Oracle BI)

IX. *Asset 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 - Main Saver:*

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 integration Integrated 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.

Medium and long-term action plans for the development of ICT systems in the port of Durres are seen an integral part of the strategic development plan of the port for the coming 10 years. They are in line and synchronized with the approved development master plan of the port for the next 10-15 years.

The main objective and objectives of ICT systems in Durres Port are:

- The optimization – maximizing efficiency and reliability in existing systems and processes to reduce the costs of trading.
- Setting up new IT platforms and apps to overcome the obstacles we encounter with existing systems and increase the efficiency to produce opportunities for new services and anticipate the needs and trends of the development of the port and maritime industry.

The action plans have to fulfil the effects of digitalization on maritime transport following three stages:

- Optimization – maximizing efficiency and reliability in existing processes to reduce the costs of trading.
- Extension – moving beyond efficiency to produce opportunities for new services and businesses.
- Transformation – reinventing logistics, trade and business models, based on data-driven revenue streams and shifts in trade flows

Some of the existing information systems in the Port Authority of Durres are not compatible and are not able to meet the important future requirements arising from the establishment of the new standard in port operational and logistics technologies. Current MIS systems in APD and other IT systems consist of a series of local developments that enable data retention but not communication with the parties, for secure and long-term storage of information, and constitute an obstacle to internal developments in the port.

Existing systems present obstacles and challenges including:

- Significant delays in handling port operations
- Decreased quality perceived by port users
- Limits capacity for quick response when unexpected changes are needed; and as a result
- Affects the increase of the operating cost of the port as well as of the operators involved.

Thus, the implementation of new ICT systems is seen as a basic tool for facilitating and simplifying port operations procedures as well as incident management and environmental protection.

3.2 Methodology for development of ICT connection Action Plan

3.2.1 A description of the institutional setup;

Durres Port Authority (DPA) is the governing body of the port of Durres. Port Authority Durres is a public juridical person operating under Law 9130 dated 08.09.2003 "On the Port Authority" The Statute of the DPA was approved by DCM No. 596 dated 10.09.2004 "On the approval of the DPA Statute and its reorganization" which also determines the mode of its organization and functioning.

Our organizational structure has dedicated sectors and unit which determine, plans, develop and implement the digital roadmap for Port of Durres in close collaboration and supported by specialized outsourced IT companies.

3.2.2 Stakeholder involvement;

The Port Community Information System will be one of the key short-term investments that DPA will implement in order to increase the speed of communication, the organizational interaction of the port community with the result of increasing quality, transparency in decision making.

The port authority has held several group and individual meetings with key port community stakeholders to inform and involve them in the development and implementation of PCS, explaining the importance of the system and the direct benefits it will have from its implementation.

DA has set up a dedicated team that will follow the procedures of drafting the terms of reference and tendering, as well as the implementation phases. The group includes specialists from IT and operational sectors, in order to communicate and overcome obstacles that may arise with stakeholder during implementation of PCS.

It is very important that members of the port community agree on the system's requirements. A true sense of community and a general feeling of involvement need to be established. Different prerequisites and interests of multi-national companies and one-person service providers need to be overcome. The success of a PCS can only be maximized if all member groups of the port community realize benefits and thus share information. The PCS is going to be implemented also should not duplicate functions that are already existent in other systems, but rather focus on general operational processes. It is to be considered that the very important that sensitive information in the PCS is safeguarded.

The implementation of the Port community system is seen as an electronic platform that connects the multiple systems operated by many different organizations that make up a seaport community. PCS is used to standardize message exchange among port community members and centralize all port community information as much as possible from which bring:

Benefits for port authorities and other public entities.

- All information according to IMO and EU regulations
- Waste declaration
- Dangerous goods declaration and overview
- Port call optimisation: better ETA predictions of ships by data science

Benefits for agents:

- All declarations for ship and cargo handled in one system
- Providing all information for port dues
- Status off clearance by Inspections, governmental authorities, port authority for ship and cargo
- Safe system for all business-to-business and business-to-government communications in a port.

Benefits for terminals

- All information according to IMO and EU regulations
- All cargo declaration
- Dangerous goods declaration and overview
- Port call optimisation: ETA predictions of ships

Benefits for freight forwarders & cargo owners

- Track and trace your cargo
- Information about: gate in-gate out, loading, unloading, custom clearance, commercial clearance
- All b-to-b communication handled (for instance bill of lading)
- Predictions and deviations of ship arrivals, cargo and inspections

3.2.3 Action Plan implementation;

The APD Action Plan is based on a previous pre investment study regarding the implementation of PCS in port. Currently APD does not have a PCS, there are different systems which operate separately from each other but not as a common system for the port community. The identification of resources needed to implement the Action Plan is based on this finished study. In terms of funding, the first software modules will be funded by the EFINTIS project 80% and 20% by APD (IPA II funds) and the hardware part will be funded by APD.

In terms of organizational infrastructure, the benefits of PCS are well defined in one of the study chapters. Operation of port actors in a single system significantly reduces the time of operations, reduces the level of errors and enables transparency.

The action plan of APD is going to be realized through tendering process based on Public Procurement law of Republic of Albania. APD has opened the tendering procedures for the starting the PCIS implementation.

The full implementation of PCIS will be carried out in several stages. The current procurement procedure involved two main modules of a PCIS system:

- Basic application module (PCIS- Core Module), module that will be installed on the datacentre servers that is owned and managed in its premises by APD.
- Application module related to PCIS ships. (PCS Vessel application module).

This module is one of the most important of the PCIS system, the implementation of which is directly related to the processing procedures of ships in APD. The purpose of the ship operations module is to facilitate the management of documents related to the receipt / departure of a vessel to / from the port and all electronic and / or physical exchanges of documents between stakeholders.

We emphasize that despite the fact that the investment will be carried out in stages, the initial implementation that includes this procedure is seen as part of the complete PCIS system, so the modules implemented by this procedure should provide interoperability and interfaced with modules to be implemented in the future, so are seen as part of the whole and part of a complete PCIS system.

3.3 Definition of Objectives and Measures

The ICT development strategy in the port of Durres for the next 10 years will be focused on the optimising of the existing systems, implementation of new systems and platforms including new services that will to follow the trend of maritime and port industry development.

Priority of major ICT investments in Durres Port will be directed in:

Digital solutions for the port that will includes investment in software tools that enables port authority to manage its port operations more efficiently and safely and reduce costs on the assets. They will encourage collaboration and coordination between all port users, allowing for faster handling of ships, trains and inland transport. This will lead to a strengthening of the Durres port competitive position.

Implementing the Port community system as a crucial step for the port digitalization and the “One platform for port communities” which will serve as a single data entry point that is secure for all your players in the port: customs, terminals, agents, shipping lines et cetera, where all stakeholders and port community members will have their benefits.

Digital solutions for logistic chains

Implementation of digital solutions for shippers, freight forwarders and traders who want to increase their insight and control of their logistic chains.

3.4 Definition of General Objectives

Table 8 - General Objectives, Port of Durres

#	Name of Objective	Description of Objective
1	increase the speed of communication	the first phase of implementation and will largely consist of the establishment of a central Core system for operations management; providing secure and scalable access to the system for key port operators as well as implementing the basic function related to movement management, and allowing navigation tools focused on collecting, processing and exchanging information related to operational processes of goods processing
2	organizational interaction of the port community with the result of increasing quality	
3	transparency in decision-making	
4	strengthening institutional “memory” open possibilities for fully electronic connection with operations management systems in terminals (TOS) as	

3.6 Monitoring and funding

3.6.1 Monitoring

Monitoring plan to supervise implementation, with the purpose of checking the timely achievement of objectives within established deadlines and measuring performance using the chosen set of indicators.

Table 9 - Monitoring plan for implementation of defined measures, Port of Durres

#	Name of Measure(s)	Start / Deadline	Indicator	Source of Data	Monitoring Schedule	Responsible for monitoring
1	Software licenses	End of July 2022 – October 2022			Tendering procedure: 3 months	APD (IT Sector)

3.6.2 Funding

Estimation of the needed resources and where possible funding could come from

Table 10 - Funding possibilities

#	Name of Measure(s)	Start / Deadline	Estimation amount	Source of funding
1	Software licenses	Has started, October 2021	151.000 Euro	EFINTIS/ IPA II
2	Software licenses	Has started, October 2021	151.000 Euro	EFINTIS/ IPA II

4. Action Plan – Port of Termoli

Following the report realized in ACTIVITY T1.1. And based on the analysis of the current state of the art, this document represents the Action Plan for development of ICT tools in port of Termoli. The motivations for this document is to remove previously identified bottlenecks in domain of ICT, to improve ports connections with port community, increase competitiveness, improve the accessibility of the ports in the region, to meet requirements of the logistic community to interchange data among all subjects in the logistics chain in common ICT solutions.

4.1 Objectives

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.

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.

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

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.

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.

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 through 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 questionnaire was drafted by experts with the scope to collect information and data concerning the following aspects:

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

The above questionnaire was sent to a selected number of public and private entities, which can be regarded as key actors within the port of Termoli.

As results, “status quo” of ICT equipment and infrastructure foreseen that all freight/passenger transport companies hold basic ICT equipment, use cloud computing services for data storage and applications, and a software application for billing. Specially, several freight/passenger transport companies interviewed have expressed the interest to dispose of an ICT system for water quality control and water cleaning.

With reference to passenger handling within the port area, the following physical barriers and bottlenecks have been evidenced: a) insufficient number of parking places, b) inadequate passenger signage, c) lack of public baths, d) lack of funding, e) excessive bureaucracy, f) scarce communication among operators and regional authority.

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, port authority and port operators.

Summarizing, the main bottlenecks identified in the port area are the following:

- Infrastructural deficiencies (lengthening of docks, upgrading of car parks, signage, etc.)
- Plant deficiencies (electrical system and port lighting)
- Nautical accessibility problems (need for dredging)
- Cleaning of the port water spaces and improve water quality
- Lack of passenger services (absence of a maritime station and related services)
- Mixed traffic of vehicles entering the port area (access by both citizens and tourists in transit to islands and other ports)
- Absence of access control for vehicles and people in the port area
- Insufficient or non-existent planning
- Lack of coordination between port operators and public administration
- Lack of communication between stakeholders due to lack of digitization

The detection of relevant barriers lacks and deficiencies at ICT level highlighted how the main issues are identified in communication systems and tools for the optimization of operations or digitalization of information to be shared at local level as well as at regional level. The crushing information about lacks and areas of intervention have been collected/grouped in larger categories and catalogued as follows:

- Deficiency of existing ICT technologies for the digitalization of processes and system operability
- Lack or deficiency of the of the existing telematics applications for traffic management
- Lack or poor conditions of the basic utilities (internet, communication systems)

What can be commonly accepted is that there is a general lack of technology and technological processes.

To overcome the bottlenecks connected to the IT domain, this action plan proposes to implement the following technological systems:

- Environmental monitoring system
- Access control system
- Traffic monitoring system
- Energy monitoring system
- Fish market management

Environmental monitoring system

The identified priority of “cleaning of the port water spaces and improve the monitoring of water quality” can be supported by adoption of an Environmental Monitoring System (EMS). Several interviews with stakeholders stressed the relevance of such type of implementation for the pilot foreseen by this project.

The environmental monitoring system (EMS) could consist of an IT platform able to collect, memorize, analyze and predict environmental data (air, water, ground) and a network of sensors able to collect these data. This system could support activities of sea cleaning which are at present made by local fishing and antipollution boats.

The EMS’ design could include several functions like estimates of GHG and pollutant emissions from ships and port installations, soil and sediment pollutant burdens, design of sensor solutions for observing air pollution, GHG emissions, biodiversity, water quality, noise, soil quality and the changes in these terms over the course of the project, design of model for atmospheric pollution dispersion. With this coverage of environmental data, it could be possible to determine background and port activity emission loads to quantify changes in these parameters over timescales.

Moreover, EMS could be used to quantify improvements in environmental quality resulting from operational changes in port areas.

Access control system

The need to “better manage the mixed traffic of vehicles entering the port area (access by both citizens and tourists in transit to islands and other ports)” can be tackled through an access control system.

An access control system is typically implemented through a physical system made by barriers, optical cameras able to recognize plate of authorized means of transport (car, truck, and motorbike), and automatic cash machine (to pay parking). In the past, this system was partially implemented to manage the parking area close to the terminal cruise lines. Today the system is dismissed but the need to manage the vehicle access to the port area remain.

Together with a traditional access control system, it could be suggested to implement other systems able to provide a lighter and flexible solution like the following:

- Access control system with mobile gates: such system could be implemented with mobile devices like smartphone or smart glasses (the camera present on board can be used to recognize automatically plate of vehicle and verify if a vehicle is authorized or not to access to the port area)
- Passenger access control system on ferries: such system could make ticket validation, measure body temperature, verify green pass validity
- Port parking booking system: this system can be used together with the others to implement a reservation to access to the port facility and permit the security control through access control system
- Permit management system: this system could manage the long-term or short-term permission to access to the port facility for citizen, workers, and tourist.

Traffic monitoring system

The priority to better manage the “mixed traffic of vehicles entering the port area” or “to smooth the traffic jams” could be implemented through a traffic monitoring system made by cameras and sensors able to recognize the number of vehicles accessing the port area and variable message signs systems to inform the drivers. Such system should support local operators to better manage traffic. This system could be connected also with the control access to the port area.

Energy monitoring system

Infrastructural and plant deficiencies in port area could be supported through an Energy Monitoring System able to collect real-time data of consumption of the main systems (i.e., public lightning, pumps, etc.) and monitoring their functionalities by monitoring, predicting, optimizing and controlling certain assets. Port area could become an energy hub. Today power generation, distribution with various energy carriers (electricity, heat, fuel), storage and consumption are managed as verticals and are not connected nor collaborative. Even though energy efficiency methodologies and features may be added to some extent, the true potential is not yet addressed. The concept implemented in this project could aggregates real-time data, predictions and control into one common platform to utilize energy assets to maximize penetration of renewables, as well as decrease emissions related to energy.

Fish market management

Fishing companies suggested to renewing the current IT system that manage the fish market. The fishermen cooperative would like to develop a web portal able to set-up a sort of e-commerce platform to extend its sales platform outside its Termoli fish market.

The present Action Plan suggest different solutions to remove previously identified bottlenecks in domain of ICT, to improve ports connections with port community, to increase competitiveness, to improve the accessibility of the ports in the region, to meet requirements of the logistic community to interchange data among all subjects in the logistics chain in common ICT solutions.

This Action Plan will support the definition of the pilot project, foreseen by EFINTIS in work package T2. The pilot project will have to respond to the specific needs of port operators and should be also interface-able with other ongoing projects (especially “Frames port”) in order to create a coherent ecosystem of port IT solutions. It would be also scalable to match with future needs.

Considering the needs of port community, the main solution suggested by the Action Plan is referred to the implementation of an Environmental Monitoring System able to support sustainability goals of the Termoli’s port trough an IT system able to collect, memorize, analyze and predict environmental data (air, water, ground). Such system will allow to evaluate impact of port activities, also supporting activities of sea cleaning made by local fishing and antipollution boats.

4.2 Methodology for development of ICT connection Action Plan

4.2.1 A description of the institutional setup;

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. The Agency for Hospitality and Tourism of Termoli (AAST) participates to the project EFINTIS activities being an instrumental body under control and supervision of the Molise Region. Hence, the key roles and responsibilities that would be involved in the Action Plan implementation should be The Agency for Hospitality and Tourism of Termoli (AAST) and its organizational structure.

Molise Region is responsible for planning, design, implementation and maintenance of infrastructure interventions concerning the port area Stakeholder involvement.

4.2.2 Stakeholder involvement;

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.

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 harbours: Marinucci Yachting
- Trade Associations: Federcoop Pesca (Federation of fishery cooperatives)

Actions and measures will be discussed through direct interview with each stakeholder and during dedicated focus group with all the stakeholders.

The consultation will take place at AAST premises with semestral frequency. Each consultation will be managed through a defined agenda of arguments, a discussion on each argument and a definition of a task list for subsequent implementation. Each year will be implemented a gap analysis to evaluate the level of results reached.

4.2.3 Action Plan implementation;

The Agency for Hospitality and Tourism of Termoli (AAST) will be responsible for identifying key resources necessary for the Action Plan's implementation. The special team dedicated to EU project development will be devoted to upgrading organisational infrastructure, to manage and governance framework, to develop human resources with enhancing technical skills and to define the financial resources needed to the action plan implementation.

The Agency for Hospitality and Tourism of Termoli (AAST) will be responsible for managing and monitoring the implementation of the Action Plan.

4.3 Definition of Objectives and Measures

4.4 Definition of General Objectives

As results, "status quo" of ICT equipment and infrastructure foreseen that all freight/passenger transport companies hold basic ICT equipment, use cloud computing services for data storage and applications, and a software application for billing. Specially, several freight/passenger transport companies interviewed have expressed the interest to dispose of an ICT system for water quality control and water cleaning.

With reference to passenger handling within the port area, the following physical barriers and bottlenecks have been evidenced: a) insufficient number of parking places, b) inadequate passenger signage, c) lack of public baths, d) lack of funding, e) excessive bureaucracy, f) scarce communication among operators and regional authority.

The detection of relevant barriers lacks and deficiencies at ICT level highlighted how the main issues are identified in communication systems and tools for the optimization of operations or digitalization of information to be shared at local level as well as at regional level. The crushing information about lacks and areas of intervention have been collected/grouped in larger categories and catalogued as follows:

Table 11 - General objectives, Port of Termoli

#	Name of Objective	Description of Objective
1	Digitalization of port process operations	Increase the number of existing ICT technologies for the digitalization of port processes operations and system interoperability between stakeholder's systems
2	Port accessibility management	Adopt the use of telematic applications for traffic management and port accessibility
3	Internet connectivity	Increase the availability of the basic utilities (internet, communication systems, cloud)
4	Green port management	Sustainability of port operations, cleaning of the port water spaces and improve the monitoring of water quality

4.5 Definition of Measures and Key Indicators

Detailed measures actions were chosen and indicators to measure the performance in their implementation towards the objectives.

Table 12 - Detailed Measures, Port of Termoli

#	Name of Objective	Name of associated Measure(s)	Description of Measure	Definition of Indicators	Implementation Target
1	Digitalization of port process operations	IT port applications	Software port applications adoption by the users	Number of stakeholders who implement IT solutions to manage port process operations	Year
2	Port accessibility management	IT access solutions	Software and systems adoption to manage the access to the port resources (park, piers, services...)	Number of stakeholders who use IT solutions to access to the port facilities	Year
3	Internet connectivity	Connections	Connections available for port operators	Number of companies who have IT connection ore cloud contracts	Year
4	Green port management	Green port solutions	Software and systems adoption to manage friendly environmental system.	Number of companies who use environmental platform solutions.	Year

4.6 Monitoring and funding

4.6.1 Monitoring

Monitoring plan to supervise implementation, with the purpose of checking the timely achievement of objectives within established deadlines and measuring performance using the chosen set of indicators.

Table 13 - Monitoring plan, Port of Termoli

#	Name of Measure(s)	Start / Deadline	Indicator	Source of Data	Monitoring Schedule	Responsible for monitoring
1	IT port applications	2022/2026	Number of stakeholders who implement IT solutions to manage port process operations	stakeholders	Year	AAST
2	IT access solutions	2022/2026	Number of stakeholders who use IT solutions to access to the port facilities	stakeholders	Year	AAST
3	Connections	2022/2026	Number of companies who have IT connection ore cloud contracts	stakeholders	Year	AAST
4	Green port IT solutions	2022/2026	Number of companies who use environmental platform solutions.	stakeholders	Year	AAST

4.6.2 Funding

Estimation of the needed resources and where possible funding could come from.

Table 14 - Funding Plan for Action Plan, Port of Termoli

#	Name of Measure(s)	Start / Deadline	Estimation amount	Source of funding
1	IT port applications	2022/2026	500.000 €	Public resources / EU funding
2	IT access solutions	2022/2026	400.000 €	Public resources / EU funding
3	Connections	2022/2026	200.000 €	Public resources / EU funding
4	Green port IT solutions	2022/2026	400.000 €	Public resources / EU funding