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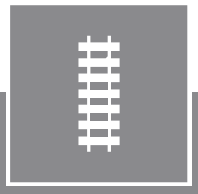

T2 PILOT PROJECTS

DT2.1.1 First report on realization of pilot projects and development study

PROCUREMENT PLAN FOR THE PILOT PROJECT REALIZATION (MARCH 2021)

1. LP (Port of Bar)

No	Budget Line	Amount (Euro)	Item	Type	Procedures	Planned publication date	Planned Contract signature
1	External expertise	155.000,00	Pilot project (Upgrade of PCS)	Service	CNP	apr.21	jun.21
2	Equipment	14.500,00	Server	Equipment	Single tender	apr.21	May 21

2. PP2 (AIT)

No	Budget Line	Amount (Euro)	Item	Type	Procedures	Planned publication date	Planned Contract signature
1	External Expertise and Services	50.000,00	Technical assistance in realization of the project tasks forseen in WPT2 (Study)	Service Contract	simplified procedure involving at least three candidates	19.04.2021	31.05.2021

3. PP3 (ADSPMAM)

No	Budget Line	Amount (Euro)	Item	Type	Procedures	Planned publication date	Planned Contract signature
1	External expertise	168.000,00	Pilot project	Service	n.5 offer request	2021	NA

4. PP4 (DPA)

No	Budget Line	Amount (Euro)	Item	Type	Procedures	Planned publication date	Planned Contract signature
1	External expertise and services	151.000,00	1	Service contract	National	3.6.2021	NA

5. PP5 (AAST)

No	Budget Line	Amount (Euro)	Item	Type	Procedures	Planned publication date	Planned Contract signature
1	External Expertise and services	103.215,50	realization of the pilot project. The pilot project of Port of Termoli include engagement of external experts for analysis, design, development of a new telematic platform	Works, supply and services	Competitive negotiated procedure according to art. 36 of the D.lgs. 50/2026 ("Public Contract Code") through a Public Notice published on organization website	15.5.2021	15.7.2021

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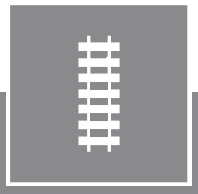

T2 PILOT PROJECTS

T2.1.1 Second report on realization of pilot projects and development study 09/2022

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1 Ex-ante situation – Background of the pilot action

1.a) Port of Bar

Bar is the central port of the Montenegrin port system and Port of Bar, being the only multimodal hub, which connects three transport modes – maritime, rail and road transport – holds a crucial place in Montenegrin transport system. The capacity of the port in Bar is nearly 5 million tonnes and at the moment cargo throughput is about 2,2 million of tonnes. The port, as practically the only cargo port in Montenegro, has capacities and development potentials (length of the operational coast, depth of the waters, connection with the railway and a large area for expansion), which gives it regional status Integrated with the Belgrade - Bar railway and road traffic network, the Port represents a very important link in the chain of intermodal transport. In addition, the Port of Bar, as a modern port, offers great opportunities for further development of combined transport and interconnection of all regions, since the necessary road-railway infrastructure is located in its hinterland.

As the main port of the Montenegro, it is located in the southern part of the Adriatic Sea. As a multipurpose port (freight and passenger port), cargo handling is the main business of the port and further ICT development is necessary to be in line with relevant national/EU strategies.

Port Community System (PCS) in Bar was developed in 2014. Port of Bar was a partner in several EU co-funded projects through which the PCS system was developed, integrated and upgraded: ADB Multiplatform (IPA SEE Programme), EA SEA-WAY and CAPTAIN (IPA ADRIATIC Programme), ADRIPASS (ADRION Programme). PCS has improved port operations and increased competitiveness of the Port of Bar and PCS will be integrated with the future National Maritime Single Window in Montenegro.

The PCS in Bar is still developing. Main stakeholders of the port using PCS are: public authorities (Customs Administration of Montenegro, Harbour Master's Office) forwarders, agents, harbour towing companies, etc. At the moment more than 80 companies and institutions are connected and there are more than 200 external users in port community. The effect of COVID-19 pandemic is raising many important questions regarding logistic and transport and developed PCS allow interchange data between all subjects in the logistic chain avoiding physical communication and paperwork and as a smart working tool.

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 the PCS has established connection with Customs (as a user who can check all activities), forwarders and other stakeholders of the port. The PCS in Bar is still developing, in other words, the PCS does not have all modules yet.

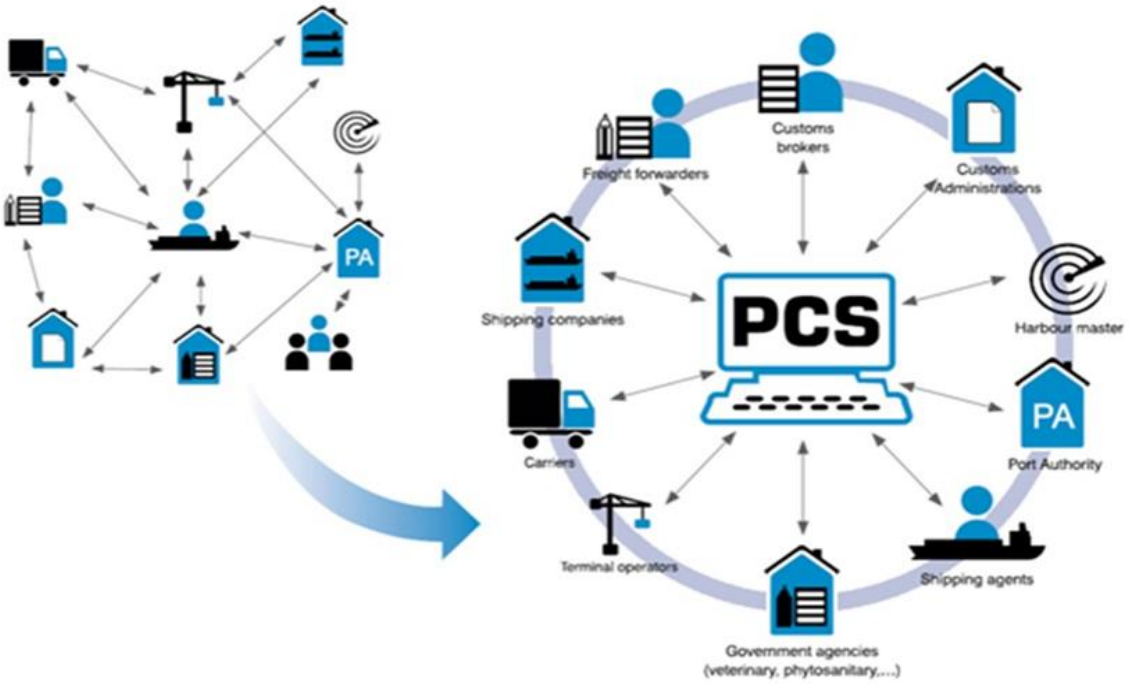


Figure 1 - Flow of information before and after implementation of the Port Community System

Port of Bar working team has started analysing the current status and operations in the Port Community System, previous demands by stakeholders (forwarders, agents, customs etc.), the status of IT systems integration with LUBARIS (Port of Bar IT system) and with future National Maritime Single windows as well as with Customs IT system. In addition, analysis of possible upgrades in accordance with the above items and available budget has started.

In previous periods working team had meetings with the operational department of the Port of Bar and with the several stakeholders, in particular focus will be on the meeting with Customs Administration. All these meetings were necessary to improve and specify definitions of the upgrades and to meet stakeholders' demand.

The overall objectives of the implementation of the PCS in Port of Bar and its upgrades were:

- 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;
- etc.

1.b) Southern Adriatic Sea Port Authority

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. Furthermore, SASPA has developed the VEGA system within the activities foreseen by the strategic project "SUSPORT - SUStainable PORTs" financed by the Interreg Programme Italy-Croatia 2014-2020 Programme with the objective of improving the energy sustainability of maritime and multimodal transport through the development of joint action plans aimed at coordinating all the main actors involved in the maritime transport sector. This futuristic application aims to improve the energy sustainability of maritime and multimodal transport in the ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli of the Southern Adriatic Sea Port System Authority as well as to strengthen its action to protect the environment in its ports. Within the framework of the "SUSPORT" project, phase 2 of the project was concluded with the acquisition of new environmental monitoring devices to meet the needs of all ADSPMAM ports. The system, designed and developed to be fully configurable with respect to monitoring needs, provides advanced consultation dashboards, through which heterogeneous data can be interpolated, such as the impact factor of infrastructure works on the main environmental monitoring benchmarks.

In according with DEASP and for the purposes of calculating the emissions of maritime traffic in the AdSP MAM ports, reference was made to the available registers, divided by freight and passenger / ferry traffic, within which the following main data were available:

- Name of the ship
- Gross tonnage
- date and time of arrival at the port
- date and time of departure (data not always reported)
- Port of competence
- Passengers and embarked vehicles

Starting from these data, using databases available on the net (marinetraffic.com and others), all the information necessary to calculate the fuel consumption of the ships inside the port area in the maneuvering conditions (for an assumed time equal to 30 minutes for mooring and 30 minutes for restarting) and during the mooring period (during which the ship's auxiliary powers are considered active according to IMO (2014) - Procedure for calculation and verification of the Energy Efficiency Design Index). The data searched were:

- Engine power
- Engine fuel
- Motor operating speed
- Maximum speed of the ship in knots
- Year of construction
- type of ship
- size of the ship
- DWT of the ship
- Maximum draft

Regarding the speed of rotation of the engine, where not available, it has been assumed that it runs at medium speed. Cruise ships not equipped with slow diesel engines were all considered to be electrically powered.

In order to estimate the draft of the ships during the maneuvering phases, the TPC (tonnage per centimeter) was calculated starting from the width, length and Block coefficient of the ships in the list. For freight ships it was assumed that they traveled with an average load compared to the maximum transportable. For passenger ships, on the other hand, knowing the number of vehicles and passengers embarked, an estimate was made on their average weight, which was then used to estimate the draft.

The speed of the ships in port, indispensable for the calculation of the instantaneous power of the engines according to the Jalkanen formula reported in the calculation procedure in paragraph 7.1.5 of the Susport document D.3.2.1, was assumed to be equal to 5 knots.

In the few cases in which it was not possible to trace the date and time of departure of the freight ships from the registers, only the maneuver time was calculated for the purpose of calculating the CO2 emissions.

The calculation of the annual CO2 emissions of freight ships was carried out starting from the average daily emission for each port, calculated over a period of approximately 40 days, assuming that this type of traffic for the ports of the AdSP MAM does not have a high seasonality. The CO2 emission coefficient was derived from IMO MEPC 66/21 / Add.1 Annex 5, and equal to 3,206 tons of CO2 per ton of fuel (Marine Diesel) used.

This made it necessary to develop an application system to estimate the amount of greenhouse gases emitted by ships calling at the ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli.

1.c) Port of Durres

In the port of Durres, several ICT systems have been implemented to increase security and facilitate administrative procedures, that have significantly increased the quality of service provided by the port today.

The Port Authority is monitored 24 hours a day with the camera system, making the port of Durres a high security area. 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. The following is a list of the main ICT systems in the Port of Durres

Durres Port Authority Main IT systems:

- **ISPS code related systems –> Physical Access Control, CCTV and Radio communication** communication network.
- 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.

I.Logs collection

Components:

- Central Monitoring Site (FSPD).
- Radio
- 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:

- 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 improvement 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 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.

1.d) AAST 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. Termoli is classified as a multifunctional port and its operations are mainly related to tourism (passenger &

ferries, yachting), fishing, commercial activities and shipyards. 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. Since August 2022, the port of Termoli has become part of the port network authority of Bari, Brindisi, Manfredonia, Barletta, Monopoli.

The current situation 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:

- Deficiency of existing ICT technologies for the digitalization of processes and system operability
- Lack or deficiency of the of the existing telematic 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.

The deliverable D.T1.2.1 - Action plan for development of the ICT connection, described the solutions able to remove the 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.

1.e) Albanian Institute of Transport

Ex-ante situation – Background of the study

Extensive and efficient transport infrastructure is essential for well-functioning economies and the development of regions and cities. When designed effectively, transport networks can be an engine for productivity and improved quality of life for citizens. “Effective modes of transport –

including high-quality roads, railroads, ports, and air transport – enable entrepreneurs to get their goods and services to market in a secure and timely manner and facilitate the movement of workers to the most suitable jobs.

Transport infrastructure investment has always been a fundamental engine of economic development. The facilitating role of transport infrastructure with respect to trade for instance can be traced back in history.

Transport infrastructure allows regions and cities to leverage benefits from agglomeration and concentration by expanding commuting opportunities for their workers. This creates benefits for places and for workers who can access better-matching and better-paid jobs without bearing the burden of moving to a different place. Intra-urban and suburban transport infrastructure serves to integrate rural regions into the local labor market of the cities located in their proximity, thereby creating a greater variety in job opportunities and raising the living standards of their inhabitants.

Transport infrastructure brings firms closer to a larger customer base and a larger pool of workers, which can stimulate hiring and investment by local firms. For instance, a firm that gains access to a broader market thanks to the reduction in transport costs that accompanies improved transport infrastructure might decide to invest more resources to enhance its competitiveness. Alternatively, a firm facing an increase in demand might choose to tap into its unutilized capacity and hire more local workers in order to serve an expanding market. An increase in production will cause an increase in the density of local economic activity further reinforced by productivity spill-overs among neighboring firms.

I. Albanian Freight transport analysis, based on ANTP3-National Transport Plan

Freight flows, in the socioeconomic analysis includes a description of freight traffic in Albania, and a characterization of main commodities transported in the country, the information is crucial for follow phases of the Multimodal. Freight transport model use a “surplus and deficit” methodology analyzes present / future demand in the intermodal transport performance system.

The ANTP3 model attempt to identify the main commodities produced and consumed in Albania at the level of TAZ, to determine the main movements of freight traffic. The main commodities imported have increased their demand in the past years, being the machineries, equipment and spare parts the ones with greater increase. Nevertheless, minerals, fuels and electricity imports, although the exports have also been heavily reduced, which indicates an internal adjustment in the balance between supply and demand for Multimodality.

Table 1 - TAZ and Population used for the modeling

TAZ	Name	Pop 2018
1	Tropoje	18,617
2	Mallakaster	25,999

TAZ	Name	Pop 2018
3	Belsh	18,364
4	Berat	53,893
5	Devoll	25,482
6	Bulqize	27,551
7	Mat	24,364
8	Cerrik	25,842
9	Skrapar	10,330
10	Delvine	8,188
11	Divjake	32,909
12	Dropull	3,055
13	Durres	192,997
14	Elbasan	133,436
15	Kolonje	10,559
16	Fier	115,917
17	Finiq	11,347
18	Fushë Arrës	7,197
19	Gjirokaster	25,009
20	Gramsh	22,816
21	Himare	8,425
22	Kamez	122,909
23	Kavaje	47,297
24	Kelcyre	5,332
25	Klos	14,670
26	Konispol	8,885
27	Malesi e Madhe	29,957
28	Korça	72,484
29	Kruje	65,924
30	Has	15,235
31	Kuçove	28,871
32	Kukes	43,542
33	Kurbin	42,394
34	Lezha	60,107

TAZ	Name	Pop 2018
35	Libohove	3,198
36	Librazhd	29,267
37	Lushnjë	80,374
38	Maliq	39,828
39	Memaliaj	9,295
40	Patos	22,057
41	Peqin	24,609
42	Permet	9,258
43	Diber	54,394
44	Pogradec	58,688
45	Poliçan	9,833
46	Prrenjas	24,213
47	Puke	10,758
48	Pustec	3,138
50	Roskovec	20,888
51	Mirdite	20,242
52	Rrogozhina	26,127
53	Sarandë	21,798
54	Selenice	17,669
55	Shijak	30,707
56	Shkoder	131,804
57	Tepelena	7,805
58	Tirana	810,572
59	Ura Vajgurore	24,504
60	Vau i Dejes	29,335
61	Vlora	112,969
62	Vora	30,094

II. Traffic forecast – Future Scenarios- based on ANTP3

The following table summarizes the main results for the base year and for the projected year 2038.

Table 2: Total number of tons transported and general performances in the base year and in the year 2038

	Base year 2018 ANTP 3	Year 2038 ANTP 3
Tons transported yearly basis	17, 085,737	40,437,620
Total truck vehicles per day	9,249	20,615
Total trucks x km per day	1,109,071	2,665,675
Average trip length in km.	119.9	129.3

In this version of the Plan, the resulting growth of the number of tons transported is set in 4.4% annually in the period 2018-2038. At the same time the number of trucks x km are foreseen to have an annual growth of 4.5% in the same period due to a continuous increase of the trip distance in 0.04% per year.

One of the main factors for the development of intermodal transport of goods is the establishment and operation of logistics nodes or as it is otherwise known logistics terminals of goods. Terminals are points of exchange within the same modal system or between different modes of transport and ensure the continuity of flows of goods through their transfer.

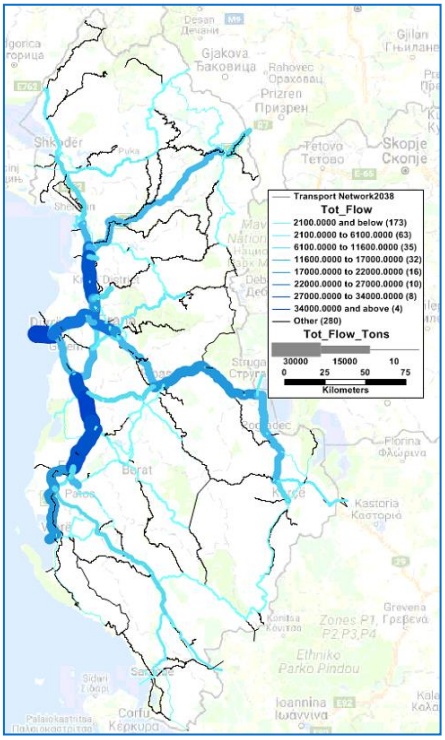


Figure 1 - Total daily tons of freight flow in the Year 2038

III. Albanian National Transport Plan subsectors and interaction

ANTP-3, Sub-sector Plans have common topics and even proposals that involve two or more modes of transport. This is obvious for Intermodal Transport, which is indeed conceived by the combination of modes, particularly in freight transport but also for passengers. The coordination between modes is playing an increasingly role both in terms of infrastructure development and related services. Thereby, nowadays a maritime port extension cannot be conceived without efficient connections with road and/or rail; and also in the metropolitan transport the development of intermodal terminals facilitates passenger travels with relevant time savings and optimization of mobility.

Nevertheless, the positive impacts in terms of intermodality and combined transport for the national economy are particularly tangible in logistics. Thereby, the contribution of the transport infrastructures and measures to facilitate modal interchange are crucial to reduce logistics costs with the subsequent impact on the market and the regional economy. For this reason, the sectoral administrations should be involved in a committed and encompassed policy to improve intermodality. In this way, the ANTP3 make an effort to identify those related projects of different sub-sectors that shall be considered in the context of the Intermodal development. Thereby, particular proposals could be included both within sub-sectors and intermodal strategies. The objective is to reinforce the synergies when coordination among modes is carried out.

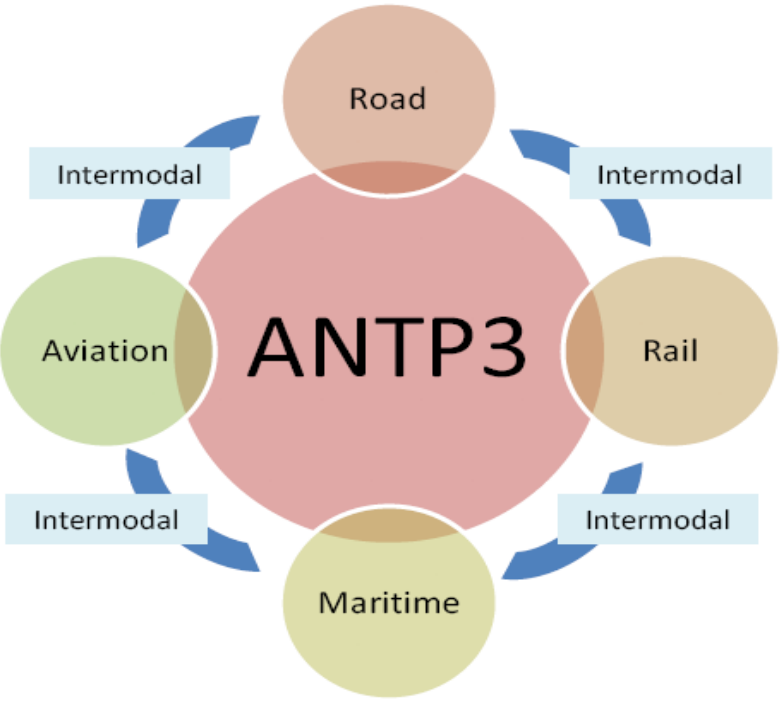


Figure 3 - Albanian National Transport Plan subsectors and interaction

SWOT ANALYSIS – PORT OF BAR

STRENGTHS	WEAKNESSES
• Creates added value for the Port of Bar • Experience in project implementation and use of EU funds • Co-financing of the port ICT infrastructure development with the EU resources • Increases cost-efficiency • Eco-friendly solution, reduces paper communication • Access to the PCS anywhere that has internet connection • Skilled IT team	• Questionable commitment of all important subjects • Lack of funds for the digitalization • Habituation in using paper documentations • Transport as a priority has been removed from some of the Interreg programmes
OPPORTUNITIES	**THREATHS**

• An important step towards future integration to Maritime Single Window • Stronger future collaboration among users • The rising awareness after COVID-19 pandemics for larger funds in digitalization • Market demands for constant ICT upgrading • Inclusion of the Port of Bar as a core port and main railways and roads in indicative extension of TEN-T network • Economy development and increase in trade in the regioin • Inclusion of the Port of Bar development in Transport Development Strategy of Montengro 2019-2035, Strategy for Development of Marritime Economy 2020-2030 • Implementation of the National Maritime Single Window in Montenegro	• Different level of development of ICT tools among users • Doubts about new technologies • Possibility of lack of willingness for transparence and exchange of some services and documents • Cybersecurity is not on optimal level (there are no implemented standards)

SWOT ANALYSIS – Southern Adriatic Sea Ports Authority

In an overall perspective view, a formulation can certainly help by means of a SWOT analysis in order to highlight, even instantly, the strengths and weaknesses as well as the opportunities and threats of our port system.

SWOT Analysis **Objective:** **Sustainable development of the AdSP MAM ports**				
Helpful to achieving the objective			***Harmful to achieving the objective***	
	Strengths		**Weaknesses**	
Internal origin (attributes of the organization)	1	Good level of infrastructure in the port areas, in particular as regards Bari and Brindisi	1	Definition of guidelines of the Green Public Procurement for AdSP
	2	Institutional and social partnership	2	Existing constraints, in particular for the port of Brindisi
	3	Intermodal potential for the location of port areas near major roads and railways	3	Awareness, at all levels of AdSP, of the principles of sustainability

SWOT Analysis Objective: Sustainable development of the AdSP MAM ports				
Helpful to achieving the objective			*Harmful to achieving the objective*	
	Strengths		**Weaknesses**	
	4	Adoption of DPEASP according to ministerial guidelines	4	
	5	Started process for the definition and certification of the Energy Management System and Environmental Management System	5	
	Opportunities		**Threats**	
External origin (attributes of the environment)	1	Availability of economic resources assigned for strengthening and development interventions	1	Delays in the authorization process for the realization of new investments
	2	Recognition of the Customs Free Zone in the port area of Brindisi	2	Risk of impact of the energy transition and decarbonisation on port traffic
	3	Port areas included within the Special Economic Zones	3	High political/social conflict in the territories on environmental issues
	4	Presence of large companies in the rear port area of Brindisi and Manfredonia	4	Impact of the COVID-19 pandemic on port traffic
	5	Presence of small and medium-sized business districts in the rear port area of Bari, Barletta and Monopoli	5	Difficulty in directing the activity of port operators towards sustainable development

SWOT ANALYSIS – PORT OF DURRES

Existing IT systems in the port community of Durres are not able to meet the significant requirements arising from the deployment of the new PCIS system to perform community formalities. The IT systems used today in the Port community are outdated and seriously limit the possibilities of introducing more transparent and automatic procedures in the transport logistics chain in the Port Community.
Restrictions on information systems in the Durres Port Authority are increasingly hindering the possibilities of encouraging APD interaction flows with other members of the port community, as a starting point for starting port procedures for port formalities, by the owners of ships, carriers

of goods and / or their representatives, with regard to information concerning cargo and passenger operations.
The current MIS systems in APD and other IT systems in the Port of Durres consist of a series of local developments that enable data retention but do not ensure communication between the parties, secure and long-term storage of information, becoming an obstacle to internal developments in port.
Implementation of a Port Community Information System - PCIS is seen as a basic means of communication and organizational interaction resulting in increased quality, transparency in decision making as well as facilitation and simplification of operations, port procedures as well as incident management and environmental protection.
Older 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.

Port community users today demand interactions with the Port Authority and between them to be simple, fast, error-free and automated, reducing paper documents and their workload as much as possible.

Currently, the day-to-day operations cooperating with each other, between the APD and the member entities of the Port Community require time and need a lot of human resources. Finalization of various port procedures in which there is a lot of human interaction which leads to human errors that reduce the quality of service provided by APD or by community members.

ASSUMPTIONS AND RISKS
Project Assumptions:

- The Contracting Authority will make available to the economic operator all information related to the configurations of existing IT systems with which PCIS will be interfaced and integrated, documents, regulations and materials necessary for the implementation of the project;
- Information exchanged between the parties must remain confidential;
- The staff of the economic operator must be able to work in an environment with different work disciplines;
- Relevant staff of the contracting authority and the economic operator must be communicative and able to cooperate and find consensus;

Risks:

- Failure to issue licenses on time;

- Service interruptions during PCIS system implementation and testing;
- Low level of cooperation between members of the working group at the Contracting Authority;
- Low level of cooperation between the staff of the contracting authority and that of the economic operator;
- Non-compliance with deadlines

SWOT ANALYSIS - Agency for Hospitality and Tourism of Termoli (AAST)

The deliverable D.T1.2.1 - Action plan for development of the ICT connection, described the solutions able to remove the 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.

Considering the needs of port community, the main solution suggested by the Action Plan was 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 environmental data (air, water, ground). Such system will allow to evaluate impact of port activities in terms of carbon footprint due to the maritime traffic.

2 Pilot action description

2.a) Port of Bar

As it is noted in the AF "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)" and after the meeting with stakeholders (in particular Custom Administration) and analysis of all requests (internal and external) the final specification of the actions/upgrades were made.

The draft version of the new functionalities were prepared:

New PCS functionality - Connection with Customs IS

By adding new functionalities to the existing Port Community System the following should be enabled:

- changes in applications which will enable entering the missing data, preparation and sending XML messages towards Customs IS with the request for obtaining the status of MRN number for cargo specified in a work order. Structure of XML message should cover all specificities which all respective types of cargo handled in Port of Bar JSC can have.
- receipt of XML message as a response by the Customs IS about the status of MRN number for which the request has been sent,

- implementation of bussiness logic within the PCS module related to the work order, in line with customs procedures, which will enable or disable specific actions related to the cargo based upon the recieved status of MRN number,
- By using Truck module within the PCS, it shall be possible to make changes in applications or to develop new applications which will enable entering the required data, preparing and sending XML messages towards the Customs IS with the request for receiving the status of MRN number for cargos which are placed on trucks that are subject to analysis in this module. The system analysis should define the potential development of application through which forwarding agents would have to announce trucks to enter the gate of the Free Zone of Port of Bar with the minimal amount of data.
- receipt of XML message as a response by the Customs IS about the status of MRN number for which such request was sent,
- implementation of bussiness logic within the Truck module in the PCS, which will, based on the status of MRN number, enable procedures with trucks in accordance with both customs and internal port procedures.

New PCS functionality – Dangerous Goods basic module

Dangerous goods basic module functionalities wil be developed as follows::

- Advanced pre - notification for all dangerous goods arriving by sea or land
- Alert management system for IMDG cargo
- UN code list for IMDG
- Reporting tool
- IMDG History tool

New PCS functionality – User interface upgrade (better GUI, user friendly)

Correct and upgrade GUI in terms of end users requests.

Some of the new functionalities will be defined in this month. With all these upgrades, PCS will meet some of the demands of the national authorities (in particular Customs Administration of Montenegro) regarding operations in the port as a free zone. All these upgrades are very important for future integration with National Maritime Single Window and in accordance with future sharing data between ports and/or national and international institutions/authorities.

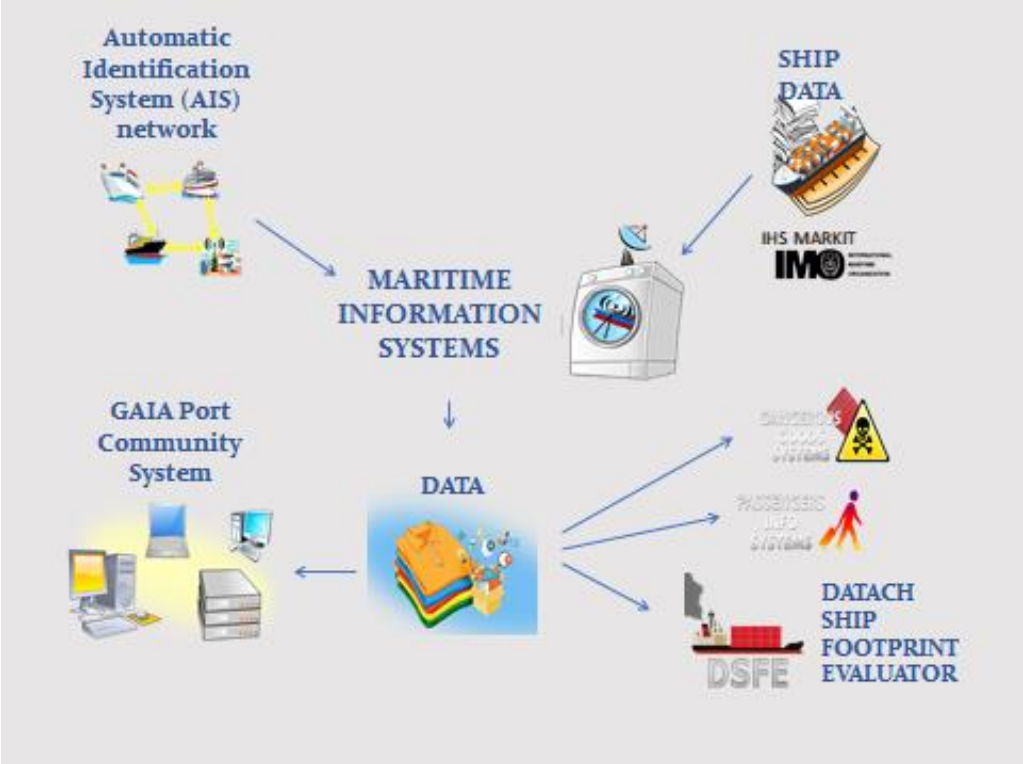
Note, sine the tender has not been published yet there is a possiblity of deviations in developing new PCS funcionalities.

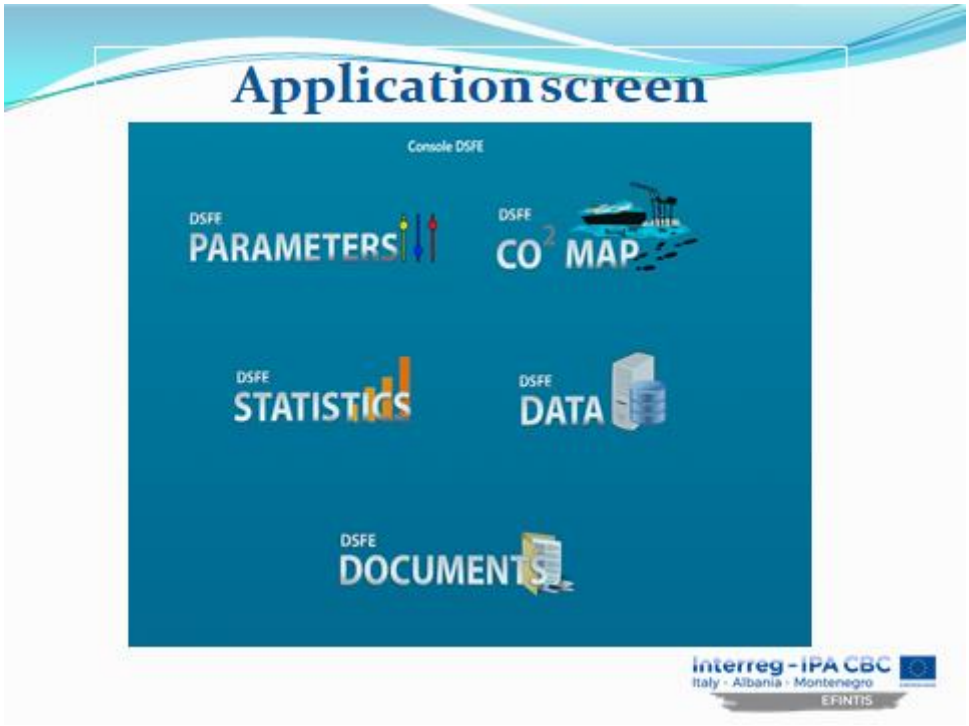
2.b) Southern Adriatic Sea Ports Authority

With the pilot action of EFINTIS we will acquire an application to be integrated into the GAIA PCS, for the real-time processing of the polluting emissions produced by ships up to the calculation of the Carbon Footprint.

The processing will take place using the AIS (Automatic Identification System) traces that allow to establish the exact position and movements of the ships and the IHS Markit (global information company) certified ship registry and formulas that the IMO makes available to the international community.

- ✓ The final data will be stored in the GAIA PCS database and will be made available to the port community through historical and real-time reports.
- ✓ The implementation of the pilot action, by President's Determination No. 148 of 3rd May 2022, was entrusted.
- ✓ The contract was launched on 1st June 2022.
- ✓ Finalization, with the drawing up of the testing report, is scheduled for 1st September 2022.




Application screen
Console DSFE
DSFE
PARAMETERS
DSFE
CO2 MAP
DSFE
STATISTICS
DSFE
DATA
DSFE
DOCUMENTS
interreg - IPA CBC
Italy - Albania - Montenegro
EFINTIS


Anagrafica Navi
Autorità di Sistema Portuale del
Mare Adriatico Meridionale
interreg - IPA CBC
Italy - Albania - Montenegro
EFINTIS

Figure 4 - list of ships intercepted by the DFSE system

2.c) Port of Durres

The main objectives of the pilot action are the realization of a procurement procedure with all the necessary elements for the implementation of an Information System for the Port Community of the Port of Durres in order to increase the speed of communication, organizational interaction of the port community with the result of increasing quality., transparency in decision-making and strengthening institutional "memory"

Establishment of a Port Community System, as an information system for the management of port logistics operations with open possibilities for fully electronic connection with operations management systems in terminals (TOS) as well as national systems with single maritime windows (NMSW);

This procedure includes 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.

The full implementation of PCIS will be carried out in several stages. The procurement procedure that APD is opening for this purpose will include the two main modules of a PCIS system:

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

2.d) AAST Termoli

The main objective of the pilot action is to develop a standard ICT solution to enable and facilitate the exchange of information between ports and transport operators, in order to improve the management of freight and passenger traffic in the area of cooperation between Italy, Albania and Montenegro.

This pilot represents the design and development of an IT platform for environmental monitoring integrated in the port context. The environmental monitoring system design include several functions like estimates of GHG and pollutant emissions from ships and port installations.

The software is based on a microservices architecture, able to manage IOT protocols, support analyzes on big-data and create the digital twin of the port environment through the representation of the port in a 3D and 2D maps, highlighting the ships, their routes and the interested systems inside the port.

The platform collects all the vessel info in a database thanks to AIS (Automatic Identification System) data provided by Marine Traffic service in order to show the vessels positions, routes in a near real time modality and evaluate their CO2 emissions inside the port (the so called carbon footprint). This platform is a convergence for the data collection and analysis that may evolve over time thanks to the addition of new information sources, whatever sensors or databases.

The pilot system has been designed to collect and analyze, useful information for assessing the impact of port activities, to support sea cleaning activities and analyze carbon footprint emissions. It is also open to exchange data with other platforms presented in the ports when required.

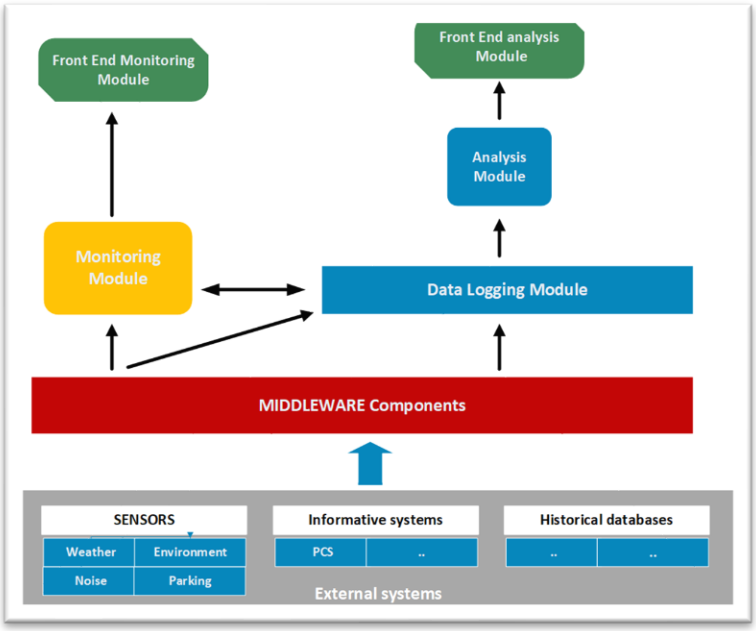


Figure 5 - System Architecture

Here above is explained the system architecture realized. The architecture is based on open modules on the purpose to collect data and make analyzes, defining alerts, presents graphics reports on the main KPI selected by the users.

2.e) Albanian Institute of Transport

According to the Application form and the implementation of Deliverable D.T2.2.5, the Albanian Transport Institute drew up a study with the aim of covering and finding state-of-the-art solutions for the development of intermodal logistics centres in Albania and possible ICT connections between them. In particular, it will have the following objectives:

- Development of intermodal logistic centers in Albania.
- Proposal of advanced ICT tools, to improve logistic performance connections through the logistic centers
- Designing the Pilot Action of developing the ICT communication platform among the users and logistic centers in Albania.

3 Stakeholders

3.a) Port of Bar

Port of Bar is the main cargo port in Montenegro. The port has started developing its Port Community System in 2014. Information systems of the main stakeholders (agents, forwarding companies) are at a low level, and therefore, integration between the PCS and stakeholders' information system is not possible at the moment but this fact allows development of the PCS functionalities in accordance with stakeholders needs (mainly forwarders' and agents' needs). In addition, we have Harbour Master Office Bar as a standard user (for the moment Custom it is just

a monitoring user). At the moment we have more than 80 companies and institutions as a users of the PCS and also more than 200 employees from these companies and institution use the PCS.

3.b) Southern Adriatic Sea Ports Authority

In the first draft of the Energy and Environmental Planning Document (DPEASP) of the Southern Adriatic Sea Ports Authority, there was an important involvement of the stakeholders and port operators in the phase of study and identification of the objectives, in such a way that the port communities shared the choices that will be adopted in the immediate future. In fact, the DPEASP identifies the energy-environmental sustainability objectives of the ports; the interventions and measures to be implemented to achieve the objectives; the program of interventions, even partial ones over a fixed period of time; the process of monitoring actions aimed at verifying the results achieved.

In updating the DPEASP underway, stakeholders and port operators will also be involved in the process of identifying the energy needs and related sources of emission of the entire port area, as defined by the Port Regulatory Plan in terms of both territorial perimeters and activities, also involving companies operating in port areas:

- companies authorized by the AdSP to carry out port operations;
- companies authorized by the AdSP to carry out port services;
- companies that have received from the AdSP the concession of state-owned areas and docks included in the port area.

Such involvement will be ensured through the administration of specific questionnaires aimed at both the definition of future scenarios relating to any activities planned for the reduction of energy consumption and CO2 emissions, and the definition of the Carbon Footprint aimed at the acquisition of further data relating to means of transport (land and sea) and to the facilities and equipment used by the organisations involved in the Port network.

		POWER OF INFLUENCE	
		LOW	HIGH
INTEREST	LOW	– Customs – Border Police – Guardia di Finanza	– Ministry of Transport and Infrastucture – Coast Guard – Apulia Region – Enviromental Department Arpa – Politechnic of Bari
	HIGH	–	– Agencies – Industries – Logistic enterprises

3.c) Port of Durres

In the current phase of PCS implementation in the Port of Durres, stakeholders are not involved as this implementation step involves only the purchase of Core and Ship Cargo modules. Stakeholders will be involved in the implementation of the systems in the module related to the ship and cargo.

3.d) AAST Termoli

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)

• ARPA Molise, the environmental public institution

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)

3.e) Albanian Institute of Transport

Stakholder involved during the study development through direct contacts and during informatin gathering. Since AIT is the authority who manages the Albanian National Transport Plan all dat gathered through interviews were used for the development of this study.

The main public Authorities:

- Ministry of Infrastructure and Energy,
- Durres Port Authority,
- Road Authority,
- Albanian Railways,
- Port of Shengjin,
- Port of Vlore,
- Port of Sarande.

The main participants of intermodal supply chains:

- Shippers,
- Road carriers,
- Rail carriers,
- Container terminals,
- Intermodal operator,
- Freight forwarders.

4 Resources

4.a) Port of Bar

The first part of the pilot project was related to the purchase of the server for the PCS and the contract was signed in May 2021. Contracting price for the server after realization of the single tender procedure was 12.650€ and the savings will be transferred to the other part of the pilot project. The installation of the server and all adjustments were finalized in 2021 and all current softwares were "transferred" to the new server.

The available budget for the upgrade of the PCS is 157.400€ (BL external expertise) and the the tender was published in August 2022 for the extenal expertise BL (upgrade of PCS).

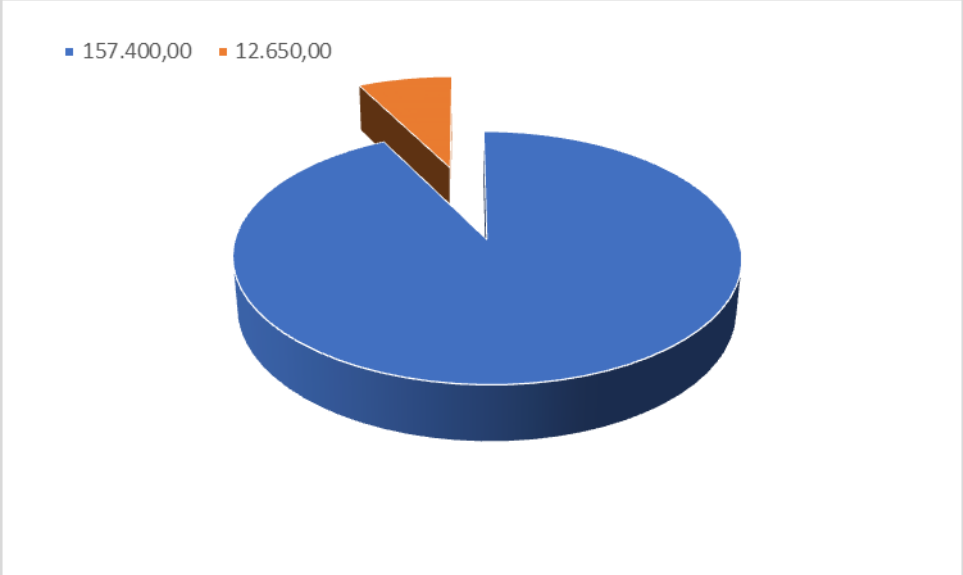


Figure 6 - Current use of available resources 7,4%

The part of the pilot project regarding purchase of the server has been finalized (contract was signed and server was installed) as it was explained in above article. The second part of the pilot project has also started but the contract will be signed in the next month.

4.b) Southern Adriatic Sea Ports Authority

The contract was awarded for the sum of EUR 119,520.00 including VAT. Any savings will be allocated to other activities

4.c) Ports of Durres

The two software modules selected for the first phase of PCIS implementation (PCIS-Core Module; ship module) are funded by the EFINTIS project while the hardware components will be funded by APD.

The tender has been published on 24.08.2022 and the winner has been selected on 19.09.2022. The contract is expected to be signed on 29-30.09.2022.

4.d) AAST Termoli

The pilot action was implemented by external supplier DBA PRO. SpA through public tender. The tender was published on 03/09/2021 e affidata per l'importo di Euro 86.460,00 including VAT. The contract between AAST and DBA PRO and was signed on 8/06/2022.

4.e) Albanian Institute of Transport

The tender for the study was published in April 2021 and the contract was signed in June 2021 for an amount of EUR 55,000. The contract was concluded in April 2022 after the delivery of the final report.

5 Current status

5.a) Port of Bar

The part of the pilot project regarding purchase of the server has been finalized (contract was signed and server was installed) as it was explained in above article. The second part of the pilot project has also started but the contract will be signed in the next month.

5.b) Southern Adriatic Sea Ports Authority/

The most important part of pilot action has been finalised.
The evolutionary part will be completed, according to schedule, by November 2022 and consists of:

- Extension of the application to the Port of Termoli.
- In the "DFSE Statistics" section, monthly statistics of the CO2 gas production trend filtered for each port and reference year, represented on a bar histogram or line graph.
- In the "DFSE CO2 Map" section, detail of gases produced by selecting a ship from the general map.
- Webservice Vessel Master which returns the ship master detail, querying for IMO the IHS Markit data catalogue.
- Webservice Voyage Master Data and related data visualisation section.

5.c) Ports of Durres

The status of implementation of the pilot action of the port of Durres, is in the pre-contractual stage and the implementation phase will start after the signing of the contract after 19/09/2022. The tender was launched on 24.08.2022 and ended with the last offer on 09/09/2022.

5.d) AAST Termoli

The pilot action is under development and will be completed on schedule in the AF by the end of 2022. As for the implementation phase, the implementation of the pilot action started after the contract was signed in June 2022.
By the end of October 2022, 50% of the implementation of the pilot action will be completed, while the other 50% will be completed in due time before the end of the project in December 2022.
Problems in the preparation and implementation of the pilot action are delays due to the involvement of stakeholders and their willingness to actively participate in the pilot actions.

5.e) Albanian Institute of Transport

The draft report of the development study has been finalized.

6 Expected results

6.a) Port of Bar

The description of the results will be elaborated in detail after the finalization of the tender procedure. At the moment the focus will be as noted in AF “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)”. The expected results (tasks) were described in point 2.

6.b) Southern Adriatic Sea ports Authority

The description of the results will be elaborated in detail with the full deployment of the application, but it will undoubtedly be one of the most important tools for measuring the emmissions produced by ships and a support for the drafting of the DEASP and in particular the Carbon Footprint.

6.c) Port of Durres

PCIS will be the main infrastructure system for the exchange of information and documentation, messages between users and other existing external information systems of various port community actors enabling integration with their systems. Should be a central hub for information exchange. It should provide a unified way of integrating with any system that supports standard information exchange protocols and data formats.
The PCS Integration Platform should receive, send and process B2B messages and act as an interface for recording data from messages to the central database. It should also contain administrative functions to control, manage and configure the application.
The new system will increase efficiency by introducing electronic document exchange for port procedures and establishing a predefined document flow and multi-level authorization / steps for specific community members. PCIS will interface with other National Shipping Formal Systems such as National Maritime Single Window, electronic identification equipment, transport systems and port operators (port terminals, transport lines, transport agencies, etc.)

6.d) AAST Termoli

The expected results of the pilot action is 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 environmental data (air, water, ground). Such system will allow to evaluate impact of port activities.

7 Outlook

7.a) Port of Bar

Considering the situation with COVID-19 pandemic, many of the planned activities have been postponed and some of the actions have encountered with the obstacles with implementation (no face-to-face meetings with stakeholders, work from home, delay in administrative procedures etc.).

With expected normalisation of the situation we expect the implentation of the actions to continue in planned cycle with consideration to the need for the possible extension of the project and therefore individual actions as well. However, in these challenging times, it is evident more than ever that digitalization of port's services should be a top priority for the management. Updating the PCS shall improve port's overall performance, paving the way to future progress of its services. Potential risks that may affect the successful implementation of the pilot might be the curent growing threat of cyber attacks, and these issues should be tackled along with current issues in the port business and development of the PCS.

The tender is published in August 2022 and signature of the contract is expected to be finished by the end of October 2022.

7.b) Southern Adriatic Sea Ports Authority

The next steps for the implementation of the pilot action will be the completion of the evolutionary part as described in the previous point. No particular problems were encountered during any phase of the implementation and it is a strong point to be able to conclude the activity before the natural end of the project.

7.c) Port of Durres

The TOR establishes a detailed timetable for the implementation of the PCIS project.

- Preparation for project start-up
- Implementation of the standard system in the virtual port infrastructure
- Installation testing and connection/interface with other basic port infrastructures
- System configuration and adaptation to the workflow of internal operations
- User training
- System documentation and start of operation
- Start-up of system maintenance

The problems encountered so far will not affect the outcome of the project, but have resulted in delays while risk mitigation will be achieved by reducing the implementation time through support and synchronisation of installation activities with the stakeholders included in the project and meeting the deadlines set in the AF.

7.d) AAST Termoli

The next steps in the implementation of the pilot action will be:

a) to complete the development phase of the pilot system by November 2022.
b) to test the pilot system with the support of the project stakeholders.
c) to support AAST during the dissemination phase.

The successful implementation of the pilot action will certainly not be affected by weak stakeholder support due to the knowledge and experience of the external provider in previous similar IT implementations.

While concerning the mitigation of potential risks that might occur from the weak stakeholder support will be mitigated through more meetings, discussions on future developments, involvement of stakeholders at an institutional level.

7.e) Albanian Institute of Transport

The document is going a final review by AIT, expected to end in October 2022, when the final deliverable will be shared among the partnership.

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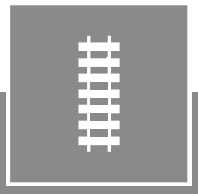

T2 PILOT PROJECTS **Version final**

DT2.1.1 Third report on realization of pilot projects and development study **03/2023**

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Interreg - IPA CBC Italy - Albania - Montenegro EFINTIS

Table of Contents

1 Purpose of this document

EFINTIS's WPT2 served as a main technical package for general production of the major EFINTIS project output which are 4 Pilot actions and 1 Development study. As these pilot projects are main outputs of the project, monitoring of the progress in realization was necessary in order to track the development of the pilot considering the background information, needs of each implementation site and what impact the pilots are expected to make. During the project implementation it was important to get the clear picture of these elements that are in nature very specific to each partner considering different situations and levels of development of ICT tools in each location.

In previous reports partners have collected the data on state of the art of the environment prior to the implementation of pilots and development study and as the pilots were moving forward along with other project activities so did the monitoring of those activities.

With this final report the aim is to share an image of a complete cycle of project and pilot implementation so partners will have an overview of the most important elements of the project implementation and what has improved since and in what manner has the implementation responded to the challenges and requirements set by the project itself.

Implementation of Pilots and Development study was meant to raise the technological competitiveness and to improve ICT tools according to EU standards. Each of the partner focused on its own level of development. Port of Bar focused on further development of the existing PCS system in relation to integration with other IT systems and needed improvements, ADSPMAM upgraded the existing PCS platform by solving some of the obstacles, Port of Durres started implementing the first phase of PCS, AAST designed and developed telematic platform for interconnection with other ports and AIT produced a Development study for development of intermodal logistic centres in Albania and explored the possibility of ICT connections among them.

2 Ex-ante situation – Background of the pilot action

2.1 Port of Bar

Bar is the central port of the Montenegrin port system and Port of Bar, being the only multimodal hub, which connects three transport modes – maritime, rail and road transport – holds a crucial place in Montenegrin transport system. The capacity of the port in Bar is nearly 5 million tonnes and at the moment cargo throughput is about 2,2 million of tonnes. The port, as practically the only cargo port in Montenegro, has capacities and development potentials (length of the operational coast, depth of the waters, connection with the railway and a large area for expansion), which gives it regional status

Integrated with the Belgrade - Bar railway and road traffic network, the Port represents a very important link in the chain of intermodal transport. In addition, the Port of Bar, as a modern port, offers great opportunities for further development of combined transport and interconnection of all regions, since the necessary road-railway infrastructure is located in its hinterland.

As the main port of the Montenegro, it is located in the southern part of the Adriatic Sea. As a multipurpose port (freight and passenger port), cargo handling is the main business of the port and further ICT development is necessary to be in line with relevant national/EU strategies.

Port Community System (PCS) in Bar was developed in 2014. Port of Bar was a partner in several EU co-funded projects through which the PCS system was developed, integrated and upgraded: ADB Multiplatform (IPA SEE Programme), EA SEA-WAY and CAPTAIN (IPA ADRIATIC Programme), ADRIPASS (ADRION Programme). PCS has improved port operations and increased competitiveness of the Port of Bar.

The PCS in Bar is still developing. Main stakeholders of the port using PCS are: public authorities (Customs Administration of Montenegro, Harbour Master's Office) forwarders, agents, harbour towing companies, etc. At the moment more than 80 companies and institutions are connected and there are more than 200 external users in port community. The effect of COVID-19 pandemic is raising many important questions regarding logistic and transport and developed PCS allow interchange data between all subjects in the logistic chain avoiding physical communication and paperwork and as a smart working tool.

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 in this first phase.

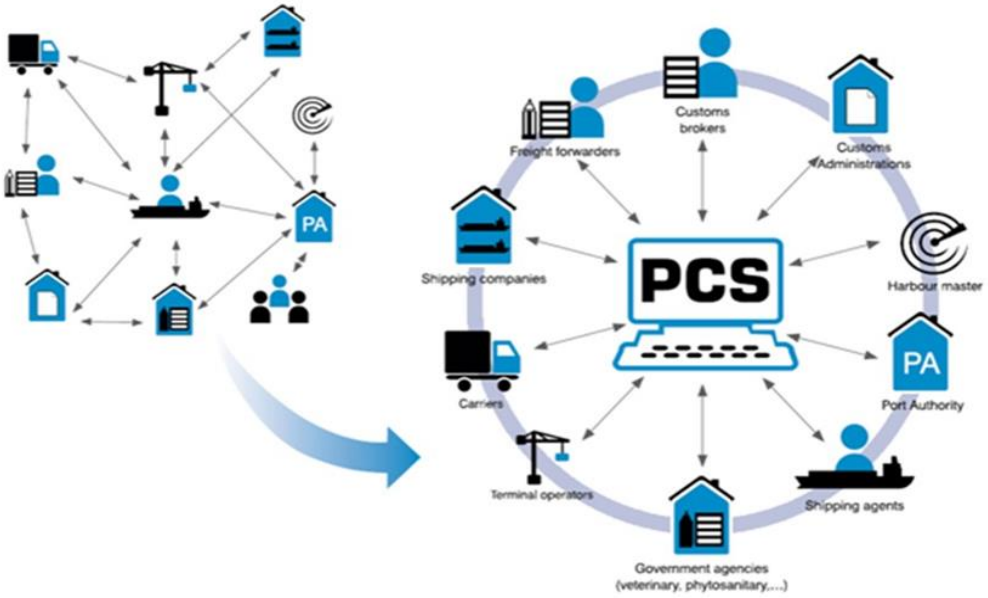

Figure 1: Flow of information before and after implementation of the Port Community System

Port of Bar working team has started analysing the current status and operations in the Port Community System, previous demands by stakeholders (forwarders, agents, customs etc.), the status of IT systems integration with LUBARIS (Port of Bar IT system) and with future National Maritime Single windows as well as with Customs IT system. In addition, analysis of possible upgrades in accordance with the above items and available budget has started.

In previous periods working team had meetings with the operational department of the Port of Bar and with the several stakeholders, in particular focus will be on the meeting with Customs Administration. All these meetings were necessary to improve and specify definitions of the upgrades and to meet stakeholders' demand.

The overall objectives of the implementation of the PCS in Port of Bar and its upgrades were:

- 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;
- etc.

2.2 Southern Adriatic Sea Port Authority

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 required 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. Furthermore, SASPA has developed the VEGA system within the activities foreseen by the strategic project "SUSPORT - SUStainable PORTs" financed by the Interreg Programme Italy-Croatia 2014-2020 Programme with the objective of improving the energy sustainability of maritime and multimodal transport through the development of joint action plans aimed at coordinating all the main actors involved in the maritime transport sector. This futuristic application aims to improve the energy sustainability of maritime and multimodal transport in the ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli of the Southern Adriatic Sea Port System Authority as well as to strengthen its action to protect the environment in its ports. Within the framework of the "SUSPORT" project, phase 2 of the project was concluded with the acquisition of new environmental monitoring devices to meet the needs of all ADSPMAM ports. The system, designed and developed to be fully configurable with respect to monitoring needs, provides advanced consultation dashboards, through which heterogeneous data can be interpolated, such as the impact factor of infrastructure works on the main environmental monitoring benchmarks.

In according with DEASP and for the purposes of calculating the emissions of maritime traffic in the AdSPMAM ports, reference was made to the available registers, divided by freight and passenger / ferry traffic, within which the following main data were available:

- Name of the ship
- Gross tonnage
- date and time of arrival at the port
- date and time of departure (data not always reported)
- Port of competence
- Passengers and embarked vehicles

Starting from these data, using databases available on the net (marinetraffic.com and others), all the information necessary to calculate the fuel consumption of the ships inside the port area in the maneuvering conditions (for an assumed time equal to 30 minutes for mooring and 30 minutes for restarting) and during the mooring period (during which the ship's auxiliary powers are considered active according to IMO (2014) - Procedure for calculation and verification of the Energy Efficiency Design Index). The data searched were:

- Engine power
- Engine fuel
- Motor operating speed
- Maximum speed of the ship in knots
- Year of construction
- type of ship
- size of the ship
- DWT of the ship
- Maximum draft

Regarding the speed of rotation of the engine, where not available, it has been assumed that it runs at medium speed. Cruise ships not equipped with slow diesel engines were all considered to be electrically powered.

In order to estimate the draft of the ships during the maneuvering phases, the TPC (tonnage per centimeter) was calculated starting from the width, length and Block coefficient of the ships in the list. For freight ships it was assumed that they traveled with an average load compared to the maximum transportable. For passenger ships, on the other hand, knowing the number of vehicles and passengers embarked, an estimate was made on their average weight, which was then used to estimate the draft.

The speed of the ships in port, indispensable for the calculation of the instantaneous power of the engines according to the Jalkanen formula reported in the calculation procedure in paragraph 7.1.5 of the Susport document D.3.2.1, was assumed to be equal to 5 knots.

In the few cases in which it was not possible to trace the date and time of departure of the freight ships from the registers, only the maneuver time was calculated for the purpose of calculating the CO2 emissions.

The calculation of the annual CO2 emissions of freight ships was carried out starting from the average daily emission for each port, calculated over a period of approximately 40 days, assuming that this type of traffic for the ports of the AdSP MAM does not have a high seasonality. The CO2 emission coefficient was derived from IMO MEPC 66/21 / Add.1 Annex 5, and equal to 3,206 tons of CO2 per ton of fuel (Marine Diesel) used.

This made it necessary to develop an application system to estimate the amount of greenhouse gases emitted by ships calling at the ports of Bari, Brindisi, Manfredonia, Barletta and Monopoli.

2.3 Port of Durres

In the port of Durres, several ICT systems have been implemented to increase security and facilitate administrative procedures, that have significantly increased the quality of service provided by the port today.

The Port Authority is monitored 24 hours a day with the camera system, making the port of Durres a high security area. 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. The following is a list of the main ICT systems in the Port of Durres

Durres Port Authority Main IT systems:

- **ISPS code related systems –> Physical Access Control, CCTV and Radio communication** communication network.
- 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.

I. Logs collection

Components:

- Central Monitoring Site (FSPD).
- Radio
- 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:

- 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 improvement 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 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.

2.4 AAST 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. Termoli is classified as a multifunctional port and its operations are mainly related to tourism (passenger & ferries, yachting), fishing, commercial activities and shipyards. 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. Since August 2022, the port of Termoli has become part of the port network authority of Bari, Brindisi, Manfredonia, Barletta, Monopoli.

The current situation 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:

- Deficiency of existing ICT technologies for the digitalization of processes and system operability
- Lack or deficiency of the of the existing telematic 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.

The deliverable D.T1.2.1 - Action plan for development of the ICT connection, described the solutions able to remove the 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.

2.5 Albanian Institute of Transport

Extensive and efficient transport infrastructure is essential for well-functioning economies and the development of regions and cities. When designed effectively, transport networks can be an engine for productivity and improved quality of life for citizens. “Effective modes of transport – including high-quality roads, railroads, ports, and air transport – enable entrepreneurs to get their goods and services to market in a secure and timely manner and facilitate the movement of workers to the most suitable jobs.

Transport infrastructure investment has always been a fundamental engine of economic development. The facilitating role of transport infrastructure with respect to trade for instance can be traced back in history.

According to the the implementation of Deliverable D.T2.2.5, the Albanian Transport Institute drew up a study with the aim of covering and finding state-of-the-art solutions for the development of intermodal logistics centres in Albania and possible ICT connections between them. In particular, it has the following objectives:

- ⇨ Development of intermodal logistic centers in Albania.
- ⇨ Proposal of advanced ICT tools, to improve logistic performance connections through the logistic centers.
- ⇨ Designing the Pilot Action of developing the ICT communication platform among the users and logistic centers in Albania

The main purpose of this study is Studying the possibility and propose the implementation of advanced ICT tools, to enable the growth and efficiency of intermodal transport activities followed by savings in energy, time and cost and a protection in a large environment and designing the Pilot Action, for the implementation of a collaboration platform is intended to alleviate some of the aforementioned obstacles to the logistics performance of the corridor.

3 Pilot action description

3.1 Port of Bar

As it is noted in the AF "Pilot project of the Port of Bar was focused 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)" and after the meeting with stakeholders (in particular Custom Administration) and analysis of all requests (internal and external) the final specification of the actions/upgrades were made. The draft version of the new functionalities were prepared:

New PCS functionality - Connection with Customs IS

By adding new functionalities to the existing Port Community System the following were enabled: 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 o UN/EDIFACT; Flat file messages (Fixed length, Variable length, CSV, etc.).

Customs PCS module comprises capturing data in PCS that is required by Customs and the integration with the Customs Administration IT system. The integration has been achieved by defining the XML structure of the messages to be exchanged between the two IT systems. The content is then inserted into the XML structure, giving the message its meaning.

Service Request screen has been amended with the tab ‘MRN’ and tab ‘Annexes’, where user can insert MRN number and attach customs declaration documents.

Business rules were introduced to determine whether a certain Service Request needs MRN number, depending on direction and customs status. MRN number can be entered per Service Request or per container or per vehicle. Multiple MRN numbers can be entered for the same Service Request (per its row), for the same container and/or for the same vehicle.

If MRN belongs to Service Request, it is entered within the MRN tab on the Service Request screen:

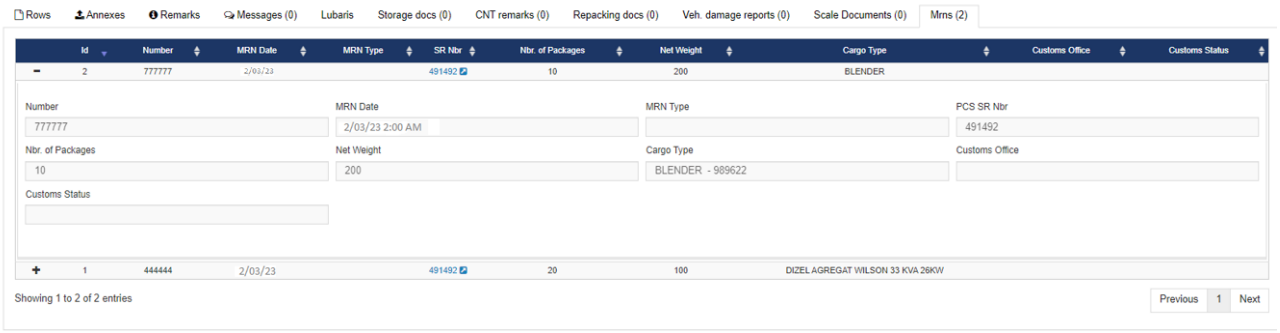

Figure 2: MRN number is also displayed within the Rows tab on Service Request

MRN number has been added as a searchable filed on the Service Request list screen, so a user can search through service requests containing particular MRN number:

Service Requests (SR), containing the requested cargo manipulation, have been extended with checking the status of the required MRN number within the Customs system before proceeding with the submission of the Service Request. Based on the received MRN status, certain actions on SR are allowed or not and SR processing can be stopped or continued. This feature is configurable, so it could be decided in the later stages whether to allow or ban further manipulations with the cargo.

The XML structure includes all necessary data fields in order to get the appropriate response from the Customs systems. These are declaration type, declaration date, customs procedure type etc., including the error segment with type and description of the error, in case of any errors encountered.

New PCS functionality – Dangerous Goods basic module

Dangerous goods basic module functionalities were developed as follows:

- Advanced pre - notification for all dangerous goods arriving by sea or land
- Alert management system for IMDG cargo
- UN code list for IMDG
- Reporting tool

- IMDG History tool

Dangerous goods basic module has been implemented, containing advanced pre-notifications for all DG cargo arriving by sea or land, alert management, UN code list, reporting and IMDG history tool. The DG cargo notifications have to be submitted with all standard required data for dangerous cargo. Luka Bar terminal is going to receive email notifications every time DG cargo has been announced. The service request contains and displays DG cargo specific information.

Dangerous cargo information is obtained from NMSW application, where agents need to submit FAL7 declaration, adding each DG item with all required fields (IMDG for container cargo, MARPOL for liquid DG cargo):

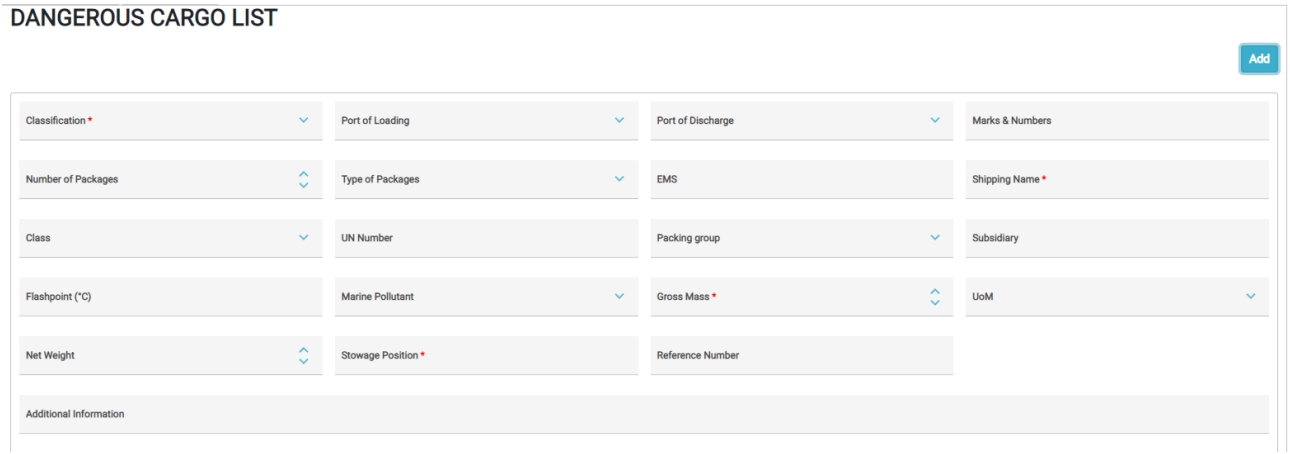

Figure 3: DG cargo list

A complete list of all DG cargo received from MSW is displayed below:

DANGEROUS CARGO LIST

Sequence number	Port of Loading	Port of Discharge	Stowage Position	Reference Number	Marks & Numbers	Number of Packages	Type of Packages	UoM	Shipping Name	EMS	DG Classification	Class	UN No.	Packing group
1	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1234	II
2	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1235	II
3	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1236	II
4	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1237	II
5	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1238	II
6	SIKOP-Koper	MTMLA-Valletta	asd	123	123	2	AE-Aerosol	M3-Cubic Meters	Aerosol	asd	IMDG	1.2	1239	II

Figure 4: DG cargo received from MSW

DG cargo list needs to be confirmed by the Terminal Operator before entering the specific port terminal.

Service Request has been amended with the DG information. Dangerous goods must be declared on the Service Request within all required IMDG fields (IMDG package, IMDG class, IMDG number), as shown on the GUI:

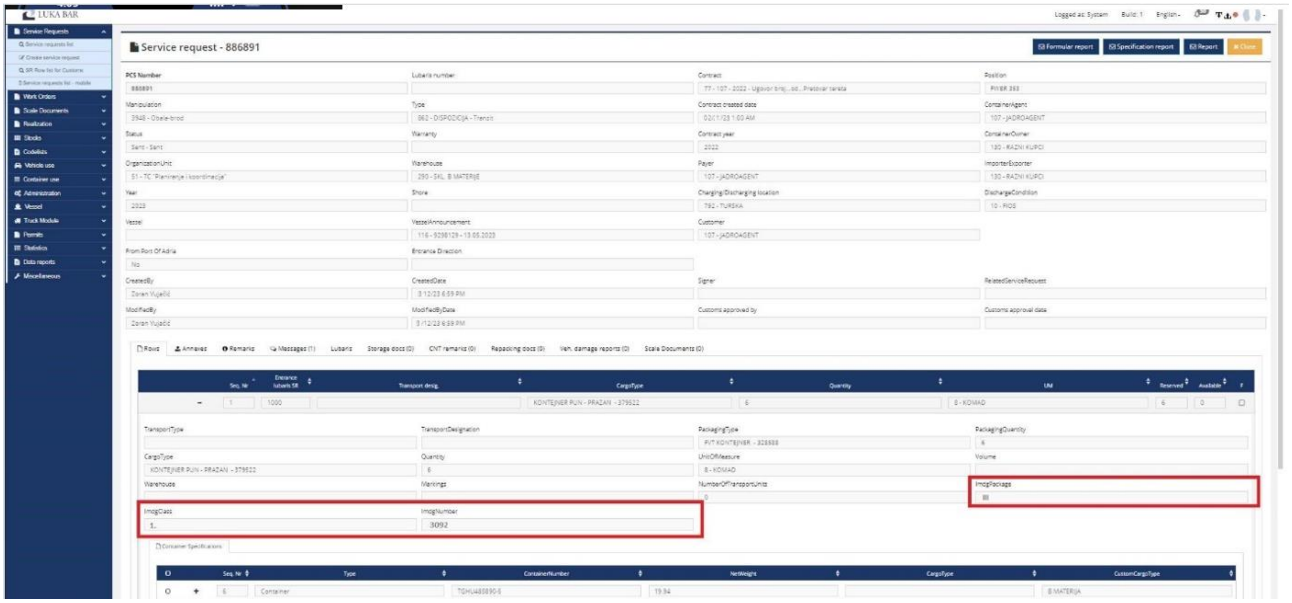

Figure 5: IMDG fields shown on the GUI:

Improved BI reporting

The existing data, as well as new data resulting of the PCS extensions, has been made available to the authorized users for searches within the PCS database and included in the various reports. The searchable data has been made available as filters, upon which resulting reports are created.

Here are some examples of the improved reports on offer:

- *Truck arrivals on the particular date*
- *Daily parking income report*
- *Vehicle diary report*
- *Statistics report - Manipulations per day*
- *Statistics report – Stock records per day*
- *Scale document report*

Implementation and integration of the Android application

All the existing and new functionalities were developed also for Android devices, taking care of the responsive design for better user experience. This includes MRN checks and truck pre-announcements.

The functionalities available on Android are:

- Vessel announcements
- Truck announcements
- Work orders
- Service Requests
- MRN Checks

Following are the main Android application GUIs, which were developed and integrated into the PCS.

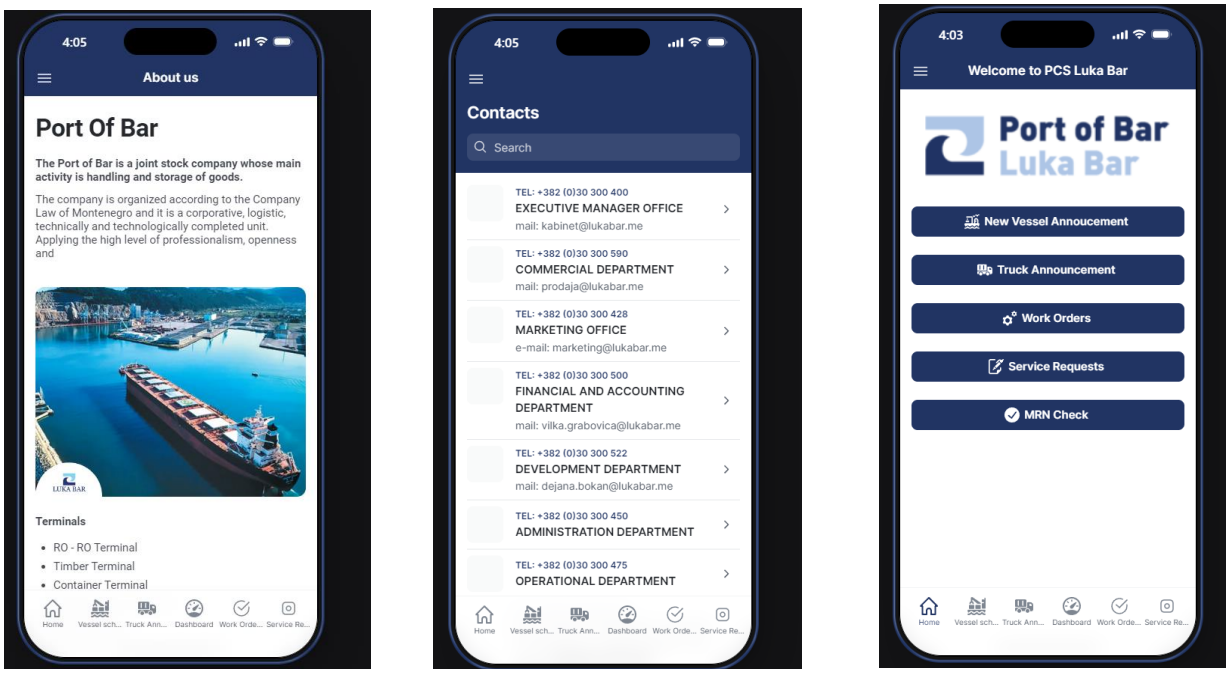

Figure 6: Android application GUIs,

Connection with NMSW

For the purpose of 'one time only' data entry, the existing manual entry of requested data into the existing PCS system (Vessel module) has been replaced by the integration with the new NMSW system, by means of the XML message exchange between the two systems.

Message structure for data exchange

Data is exchanged between systems in XML format based on a defined XSD schema. There are five types of messages defined:

- B2MSW – not used in this integration
- MSW2G
- RECEIPT
- RESPONSE
- REFERENCE

MSW2G

The message is intended to transmit MSW data to state authorities and relevant institutions, in this case the existing PCS system. It is allowed to send the message only in the direction of MSW to organizations. The message contains all the data types that the organization needs. The definition of receiving data types is defined at the organization level. An organization never receives a data type for which it is not authorized in the MSW system.

The message can contain data types:

- Metadata
- MAI
- NOA
- COA
- ETA
- ATA
- NOD
- ETD
- ATD
- SEC
- PAX
- HZA
- HZD
- VRQ

Metadata and MAI data types are always present and mandatory in every message. Integration with NMSW and Custom IT system will be operational in 2024 after starting the NMSW in Montenegro (plan is February 2024) and finalization of upgrade of new Custom IT system.

3.2 Southern Adriatic Sea Ports Authority

With the pilot action of EFINTIS we will acquire an application to be integrated into the GAIA PCS, for the real-time processing of the polluting emissions produced by ships up to the calculation of the Carbon Footprint.

The processing will take place using the AIS (Automatic Identification System) traces that allow to establish the exact position and movements of the ships and the IHS Markit (global information company) certified ship registry and formulas that the IMO makes available to the international community.

✓ The final data will be stored in the GAIA PCS database and will be made available to the *port community through historical and real-time reports*

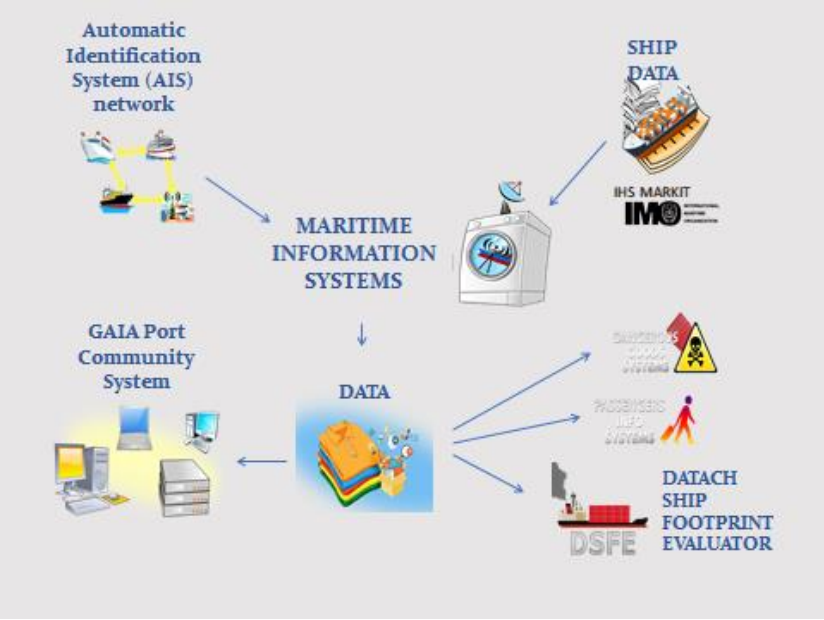

Figure 7: Data flow

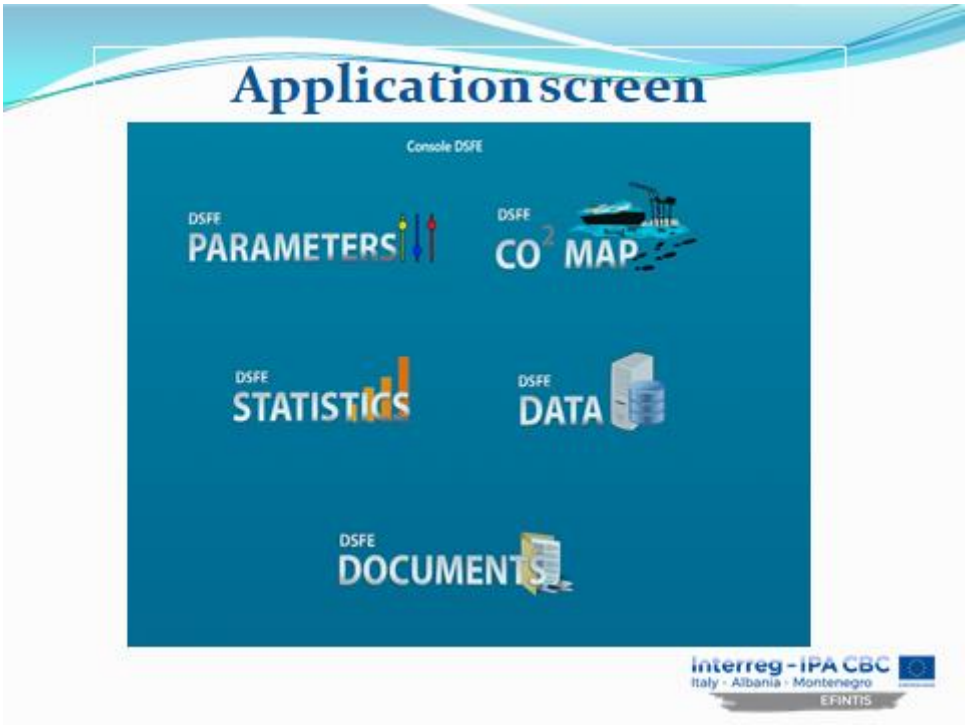

Figure 8: Application screen

Figure 9: List of ships intercepted by the DFSE system

Figure 10: List of ships intercepted by the DFSE system

Data emission calculated for each tipology of gas for each ship main motor emissions, secondary engine emissions, boiler emissions, maneuvering emissions, emissions during the mooring phase and finally, the total emissions calculation item**.**

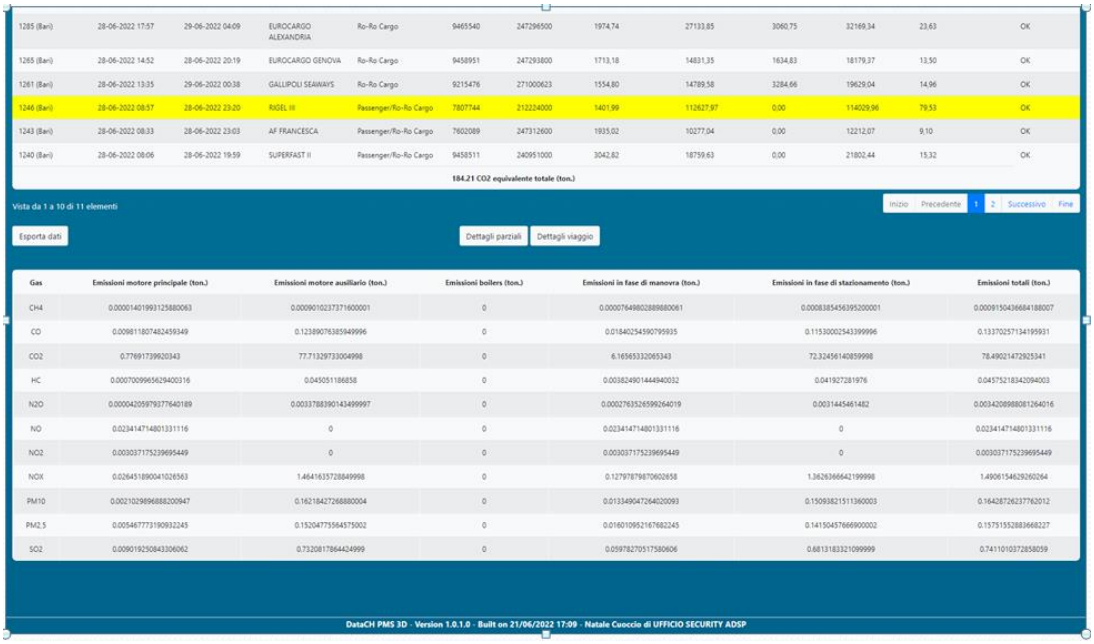

*Figure 11: **T**he energy consumption data per period and per ship*

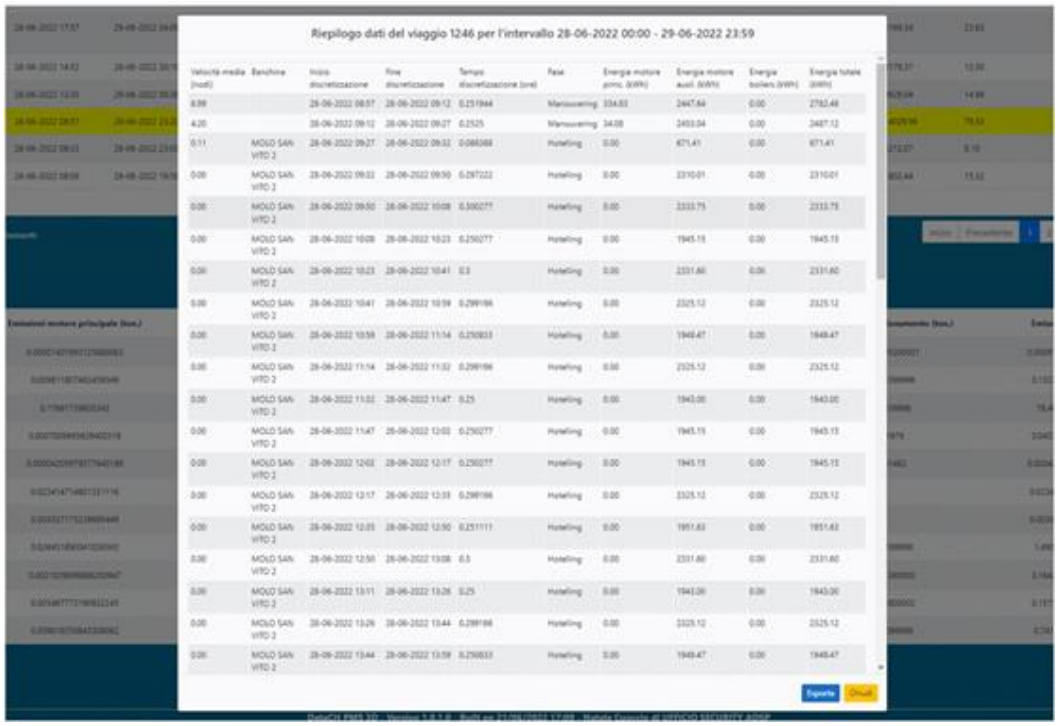

Figure 12: Map intercepting all ships in the area

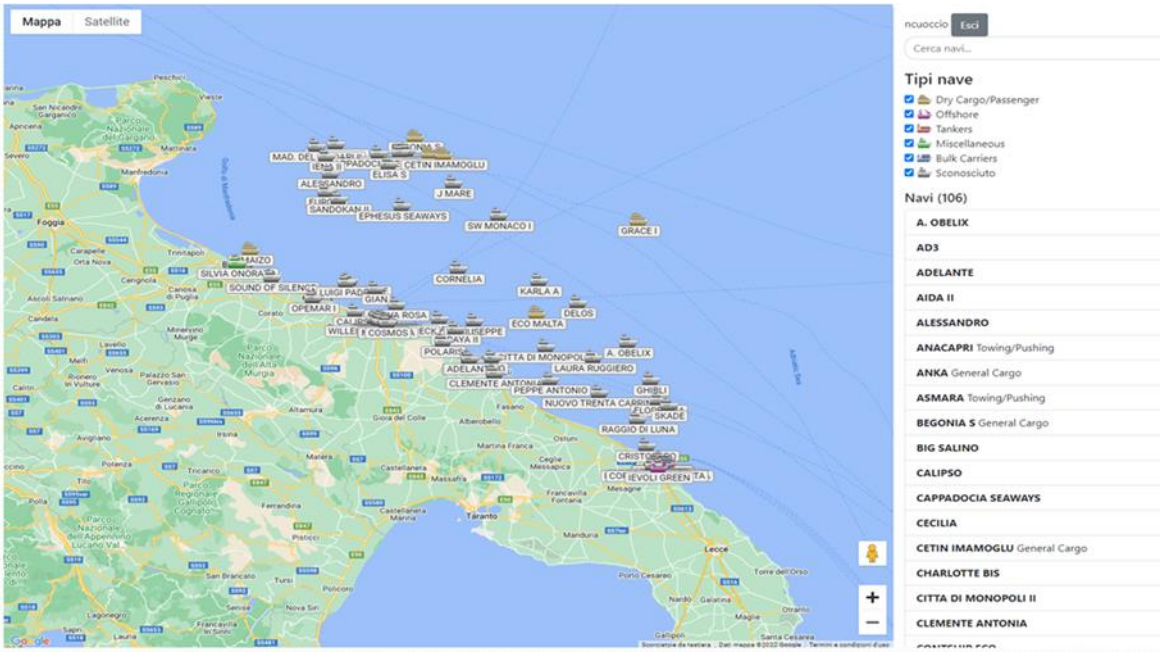

Figure 13: Detailed mapa and detailed data ship

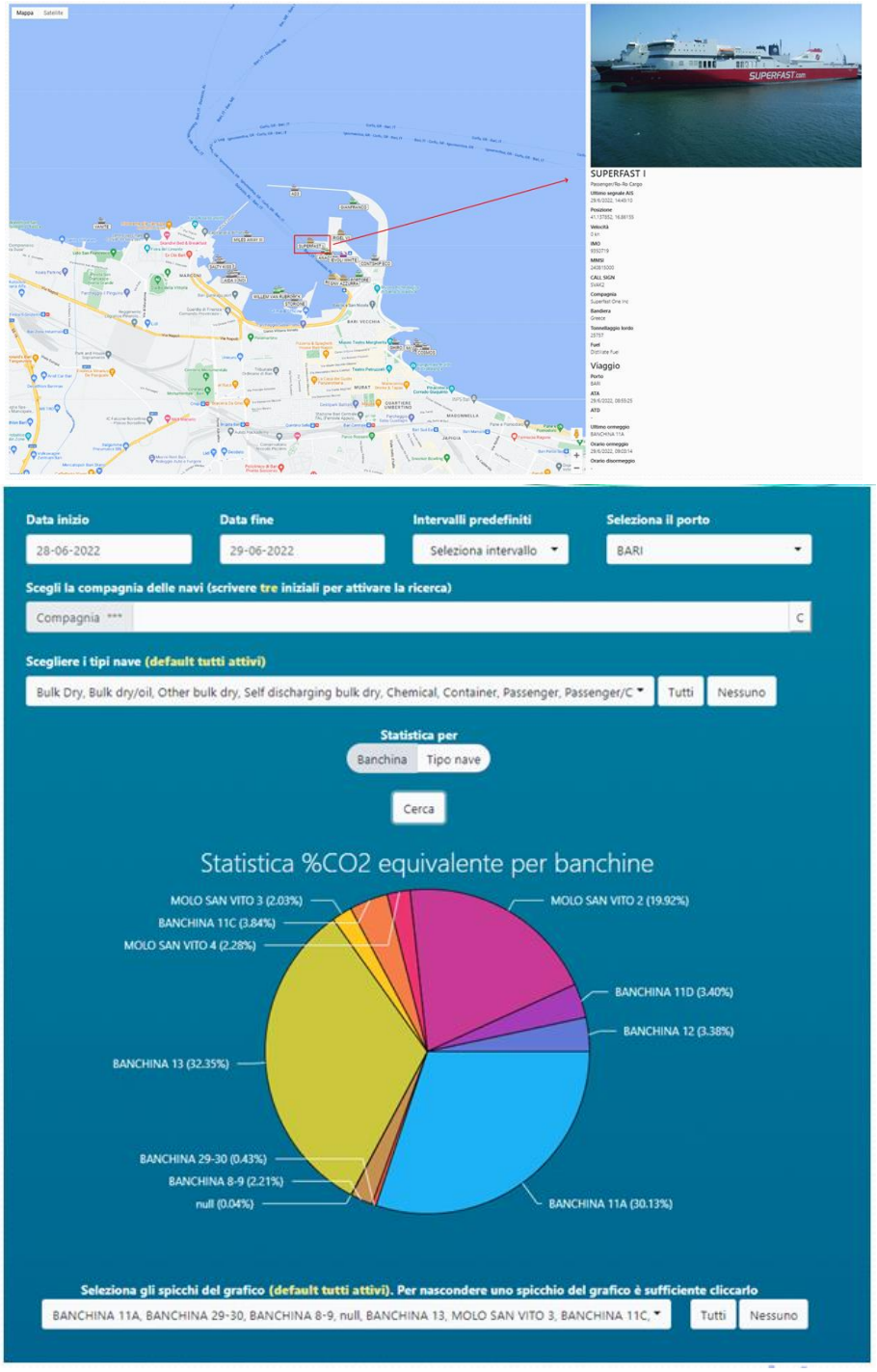

Figure 14: Statistic data regardind Co2 emitted at the quay during the mooring phase

3.3 Port of Durres

The main objective of the pilot action was the realization of a procurement procedure with all the necessary elements for the implementation of an Information System for the Port Community of the Port of Durres in order to increase the speed of communication, organizational interaction of the port community with the result of increasing quality., transparency in decision-making and strengthening institutional "memory".

Establishment of a Port Community System, as an information system for the management of port logistics operations with open possibilities for fully electronic connection with operations management systems in terminals (TOS) as well as national systems with single maritime windows (NMSW);

The procedure included the first phase of implementation and consisted 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.

The full implementation of PCIS carried out in several stages.

PCS modules covered by EFINTIS project were divided in two parts:

PCS CORE APPLICATION MODULE.

VESSEL & CARGO MODULE

The procurement procedure that APD included the two main modules of a PCIS system:

PC CORE APPLICATION MODULE was installed in test environment platform at the end of October and its parameterization continued throughout November 2022.

- The PCS Core application store all information passed through the Message Broker/Controller and entered through the PCIS Web tier into the system's database (RDBMS).
- Display information related to PCIS and implement all required business logic, supporting the processes covered by PCIS.
- The data source for the PCIS core application are the messages exchanged between members of the port community via the Message Controller (PCS Integration Platform), which are recorded in the database (RDBMS).
- The PCS Core application is designed as a 3-tier WEB application, dividing the Presentation, Business and Data layers into components that perform their dedicated functions.

I. PCS CORE APPLICATION MODULE IMPLEMENTATION

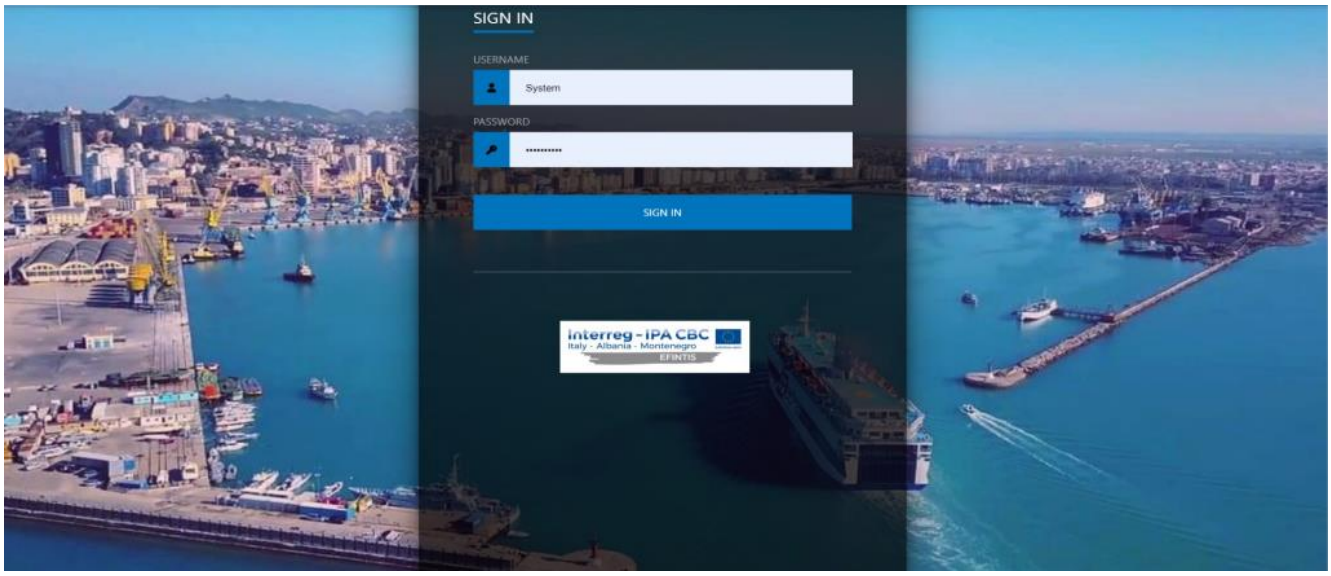

Figure 15: PCS core application module log in page

II. Vessel & Cargo module. Application module for ships and cargo in PCS

Ship Related Functionalities

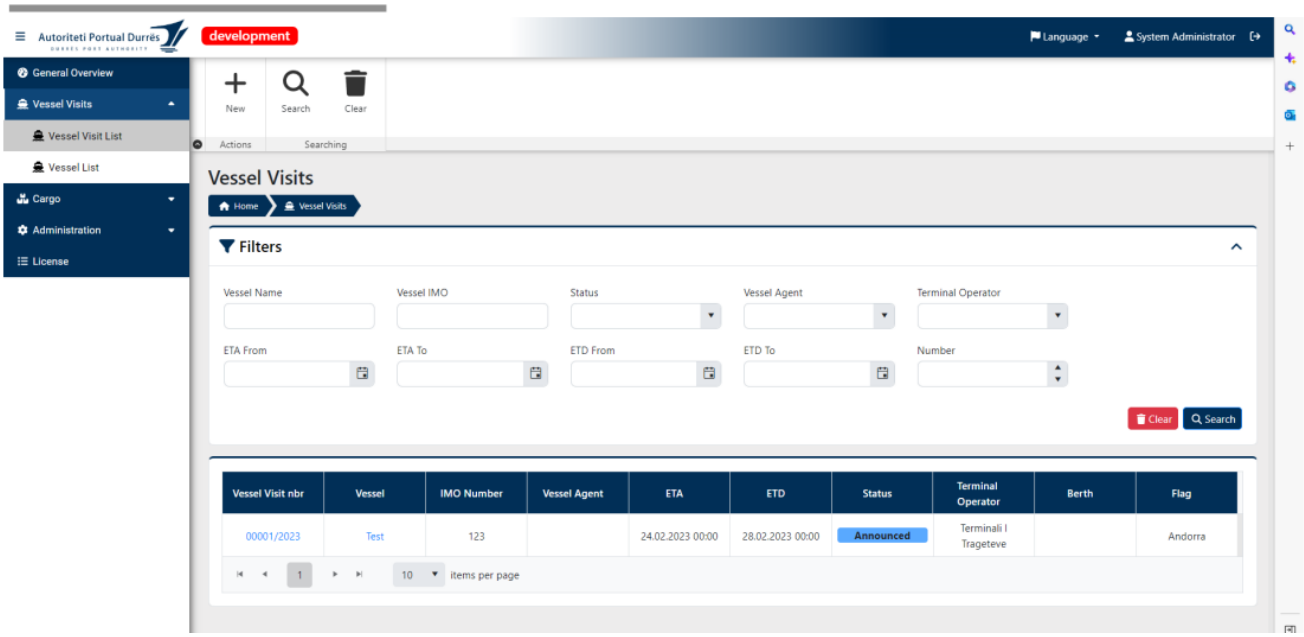

Figure 16: Vessel & Cargo module

1. Vessel Schedule.

The solution required by PCS software provide users with various vessel tracking options to view and examine pending vessels, vessels in port and vessels that have departed.

2. Management of ship data and information flow

Ship registration ang ship management procedures that serve for the guidance of the ship agent, port dispatcher, port operations or entities others related to the management of the process of the ship's stay in the port, through further steps to fulfill all the formalities and requirements for the ship's stay.

3. Vessel Visit Registration

The agent initiate the registration of the vessel's visit/arrival by submitting the notification letter electronically, including the following information regarding the arriving vessel:

- ⇨ The name of the ship
- ⇨ Date of arrival
- ⇨ Arrival time
- ⇨ The ship's flag
- ⇨ IMO Number ….Etc.

4. Statistical reports related to ships

The system provide standard reports, and specific asked reports to the port community.

5. Ship operations and ship procedures.

- ⇨ Custom clearance document (customs clearance)
- ⇨ Valid agreement (contract)
- ⇨ Cargo manifest (cargo manifest)
- ⇨ Cargo plan (Cargo plan)
- ⇨ Notice of readiness (Notice of readiness)
- ⇨ Proof of tons

6. Departure of the ship

The vessel operations module provide to the vessel agent the ability to electronically submit to PCIS a vessel release request along with all mandatory documents required by the Port Terminal Operator and other relevant organizations. Such documents are, for example, the captain's statement, the list of crew members at the departure of the ship, the list of passengers at the departure of the ship, the cargo - loading plan, etc.

II. Vessel & Cargo module. Application module for ships and cargo in PCS ship related functionalities.

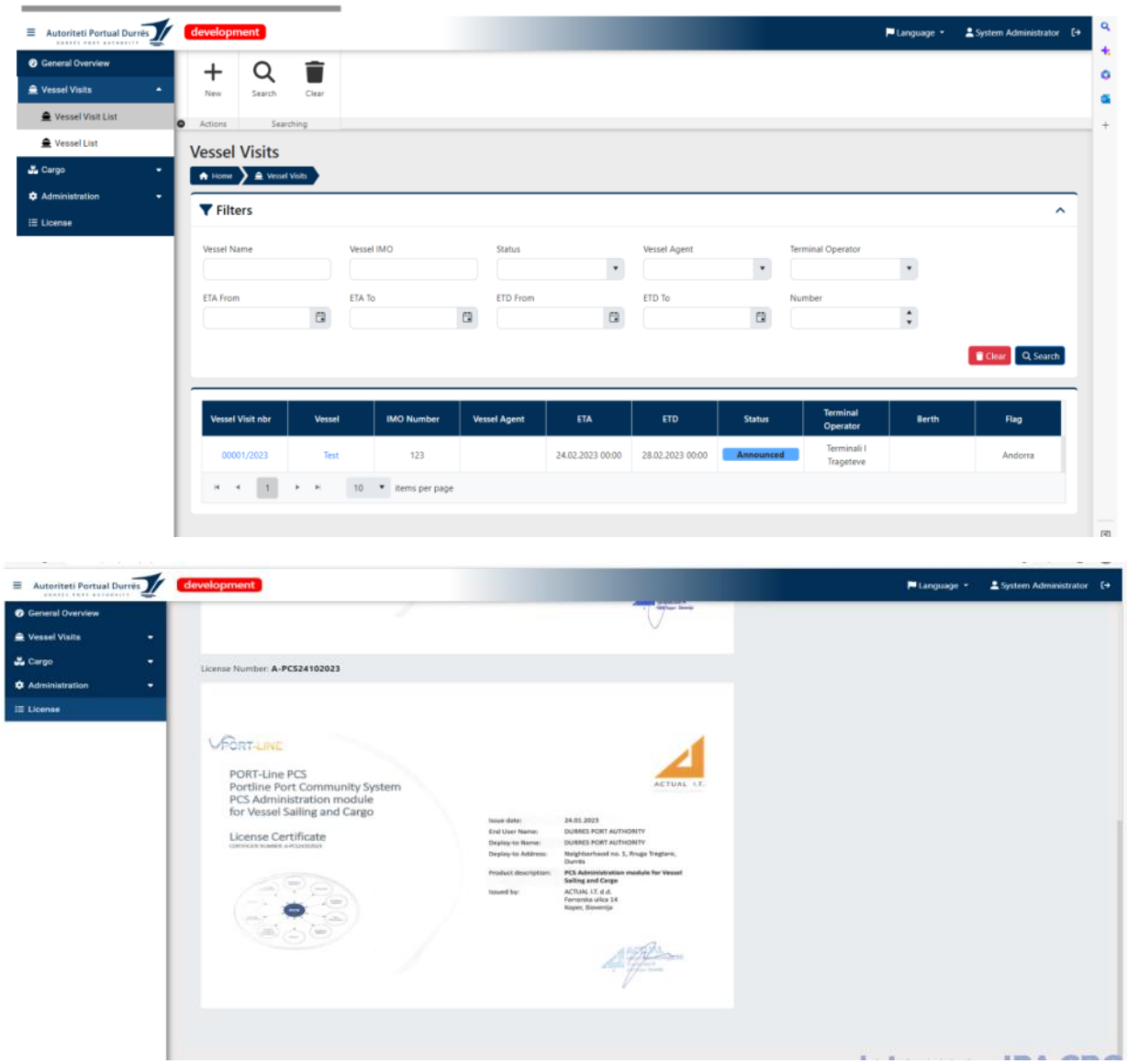

Figure 17: PCS ship related functionalities

FUNCTIONALITIES RELATED TO CARGO PROCESSING (CARGO)

In the framework of this project, the PCS system offer a minimum of the functionalities for reporting from the ship to Cargo loads and is focused on:

- ⇨ Service requests,
- ⇨ Warehouse documents
- ⇨ Stock records

The implemented PCS system offer the possibility in the future for integration with TOS systems for at least:

- ⇨ Work orders for Cargo loading/unloading;
- ⇨ Confirmation of operations;
- ⇨ Operations related to Cargo vehicles;
- ⇨ Blocking as well as blocking of cargo as a result of the need for inspection or similar by the Authorities;
- ⇨ Reporting on the level of operation

The Vessel & Cargo module is installed at the beginning of January 2023 is operational in the test environment. A preliminary workflow for Vessel & Cargo in Durres Port and has been defined and part of its operation is being verified in the field.

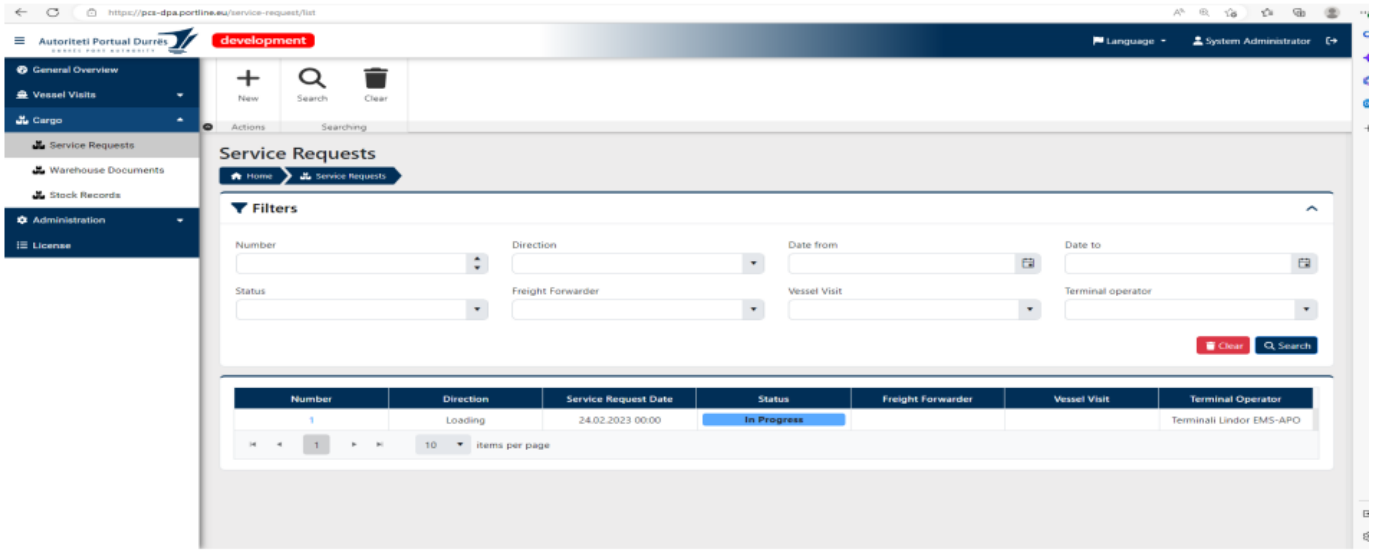

Figure 18: Service request in PCS

3.4 AAST Termoli

The main objective of the pilot action was to develop a standard ICT solution to enable and facilitate the exchange of information between ports and transport operators, in order to improve the management of freight and passenger traffic in the area of cooperation between Italy, Albania and Montenegro.

This pilot represents the design and development of an IT platform for environmental monitoring integrated in the port context. The environmental monitoring system design include several functions like estimates of GHG and pollutant emissions from ships and port installations.

The software is based on a microservices architecture, able to manage IOT protocols, support analyzes on big-data and create the digital twin of the port environment through the representation of the port in a 3D and 2D maps, highlighting the ships, their routes and the interested systems inside the port.

The platform collects all the vessel info in a database thanks to AIS (Automatic Identification System) data provided by Marine Traffic service in order to show the vessels positions, routes in a near real time modality and evaluate their CO2 emissions inside the port (the so called carbon footprint). This platform is a convergence for the data collection and analysis that may evolve over time thanks to the addition of new information sources, whatever sensors or databases.

The pilot system has been designed to collect and analyze, useful information for assessing the impact of port activities, to support sea cleaning activities and analyze carbon footprint emissions. It is also open to exchange data with other platforms presented in the ports when required.

Main Functionalities:

- Environmental Data acquisition ad elaboration
- Maritime Traffic and Carbon Footprint calculation
- Alert and KPI Service

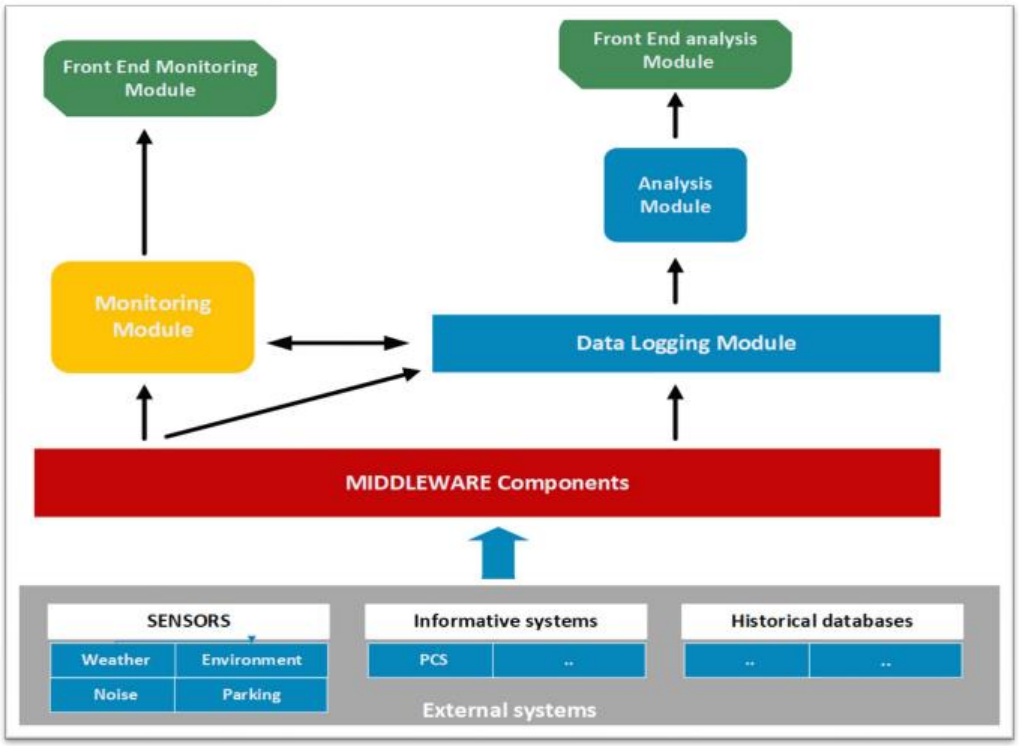

Figure 19: IT Platform for environmental monitoring in the port of Termoli

Here above is explained the system architecture realized. The architecture is based on open modules on the purpose to collect data and make analyzes, defining alerts, presents graphics reports on the main KPI selected by the users.

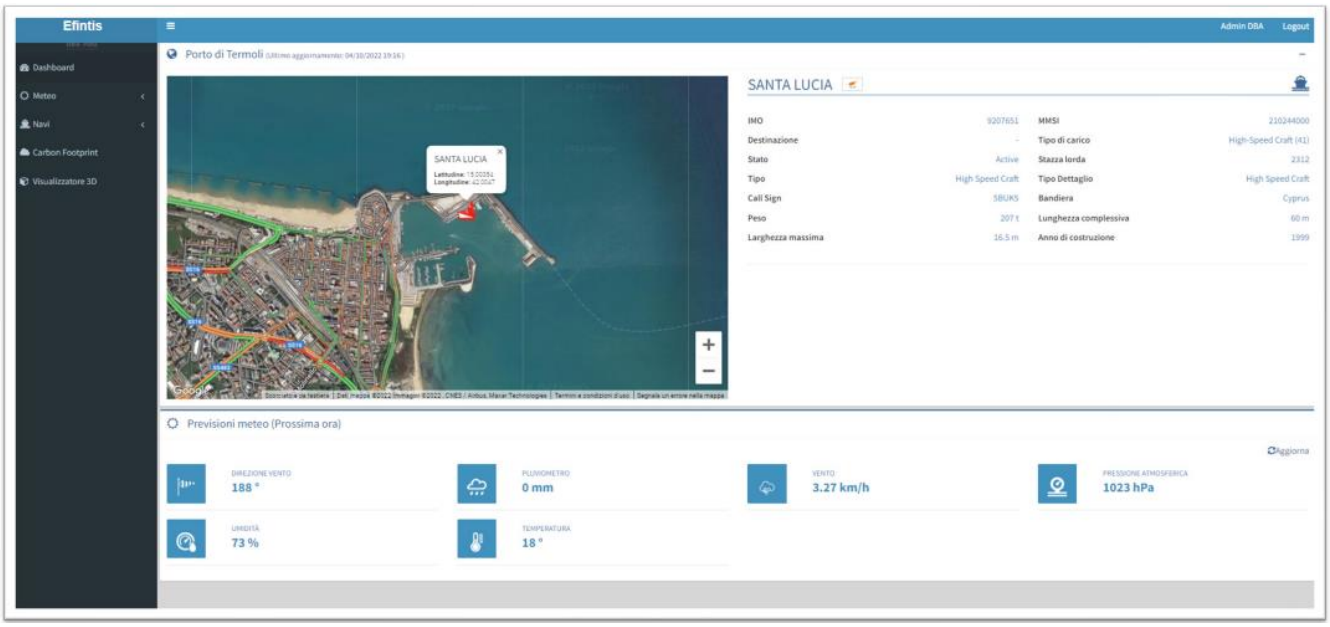

Figure 20: Weather Forecast

System shows the weather forecast of the day: hourly graphs with many information such as wind, rain, temperature, humidity, atmospheric pressure and solar radiation component.

Figure 21: Weather Data Analysis (ability to perform weather analysis on historical data)

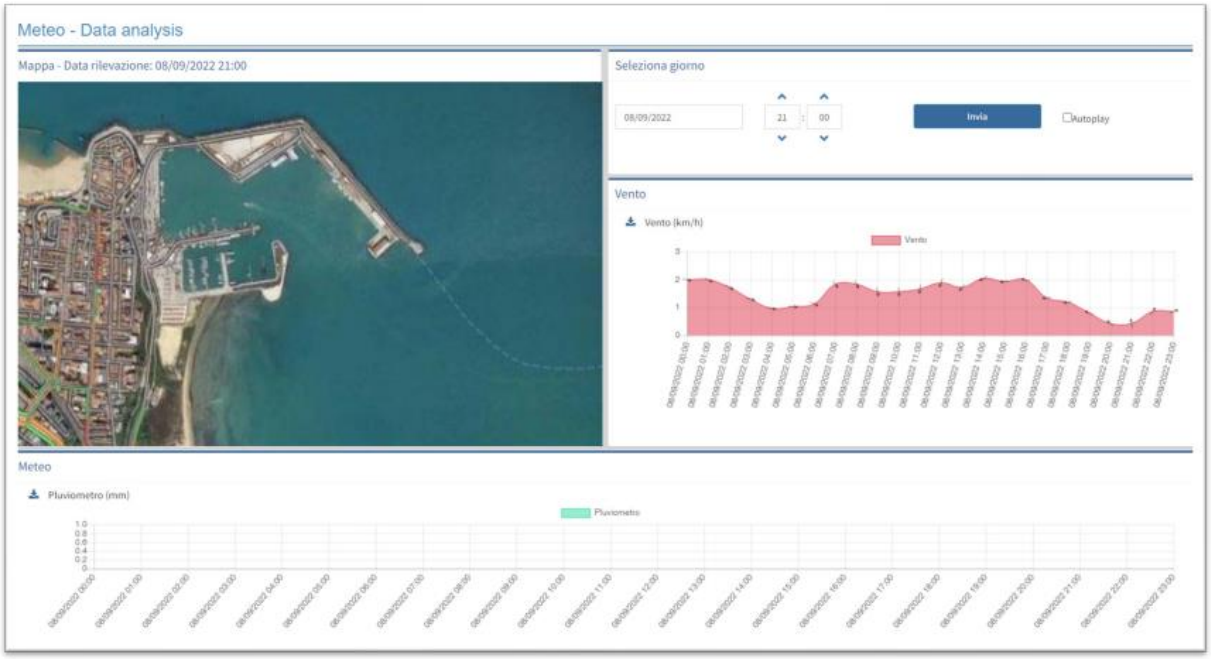

Figure 22: 2D Vessel traffic and position

Ship Traffic allows you to view ship traffic in the port of Termoli with detailed information about the ships highlighted inside the port.

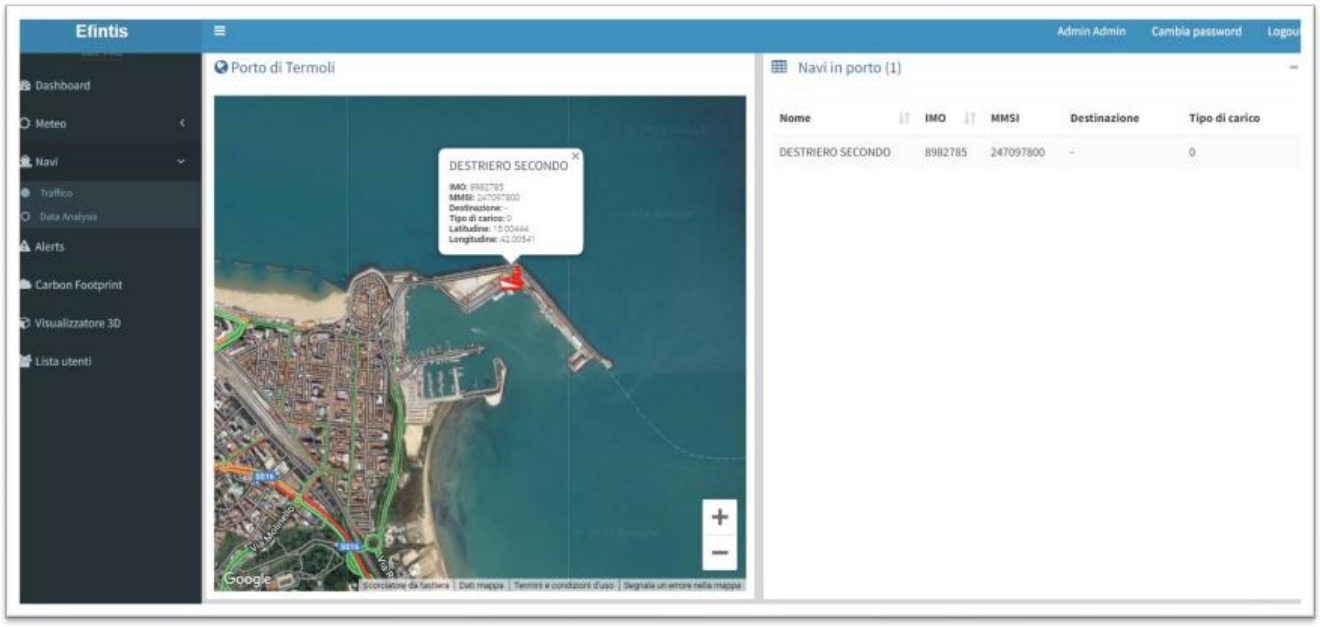

Figure 23: Ship Data Analysis

Ship Data Analysis – offers the possibility to search historical data related to the ship traffic and routes inside the port.

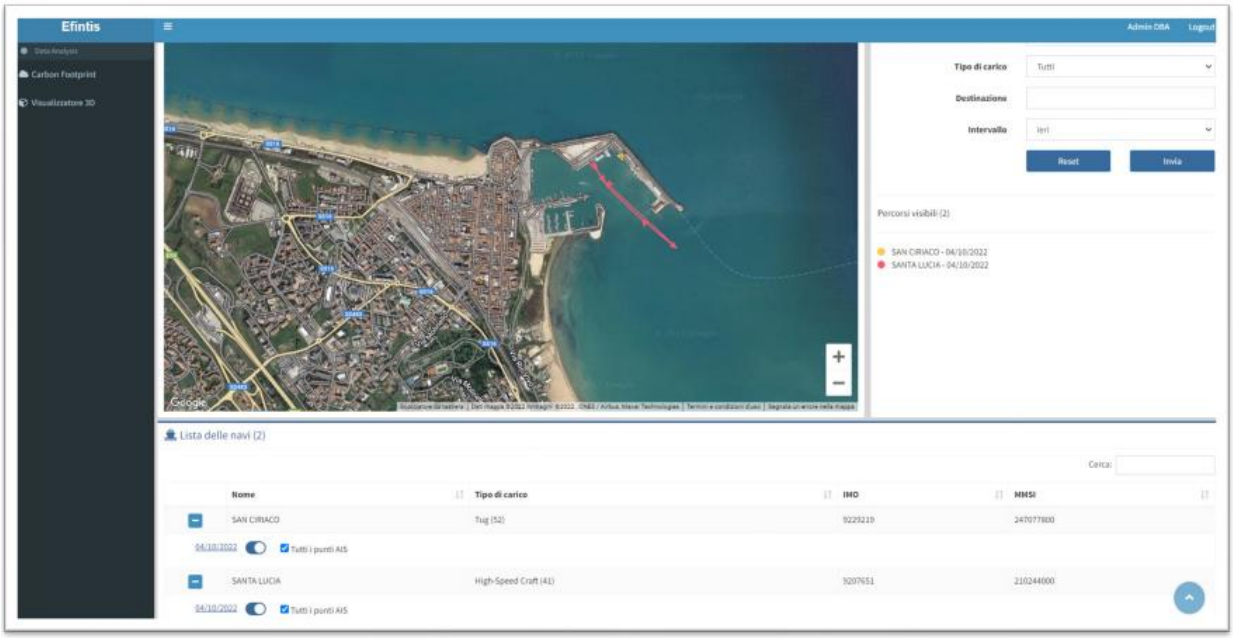

Figure 24: Carbon Footprint Data Analysis

Carbon Footprint data analysis – calculates the CO2 produced by the port activities (ISO 14064)

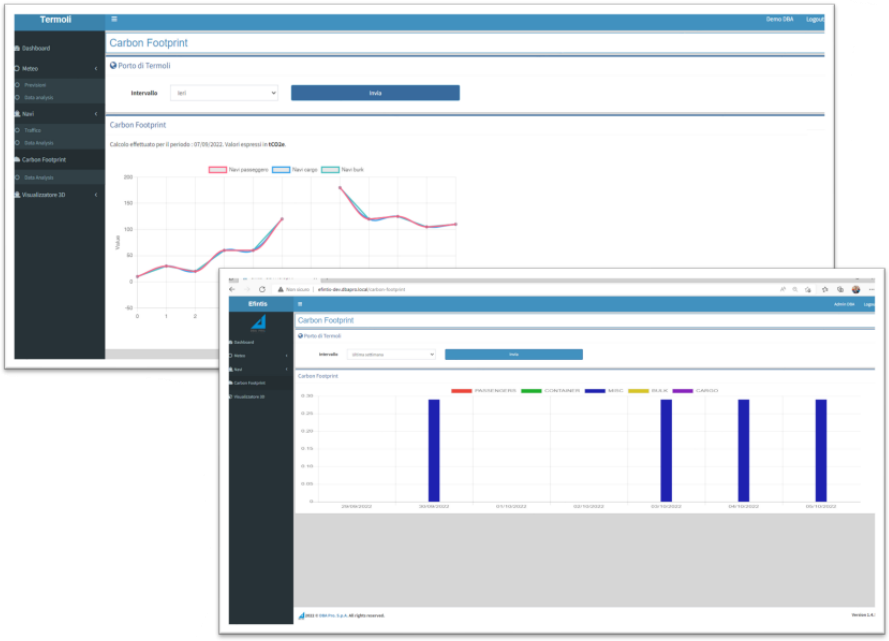

Figure 25: Termoli : 3D maritime traffic

Finally, 3D viewer rappresents the Termoli Port Area. It is interactive and navigable. It shows current ships traffic inside the port.

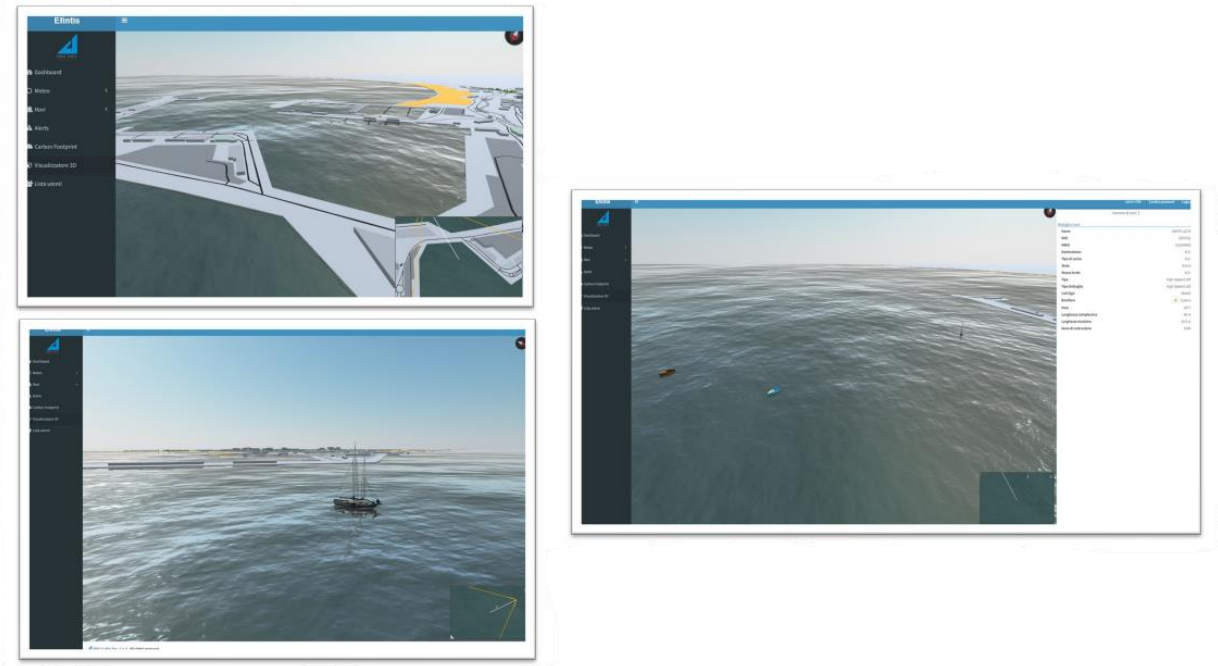

Figure 26: 3D viewer

3.5 Albanian Institute of Transport

The aim of the Development stud is to create the conditions for a sustainable growth and remove the lacks of the current development of intermodal transport on more levels (in this case we can talk about the Motorways of the Sea system) within the region.

The study had three major tasks:

Task 1: Development of intermodal logistic centers in Albania.

This task is focused on the enhancement of the actual assets of the transport network and selecting the most feasible projects to invest in, creating a priority ranking. In terms of freight transport, one of the priority actions to be undertaken is the establishment of a complete network of multimodal hubs where the freight flows can be organized, hence optimized.

Task 2: Proposal of advanced ICT tools, to improve logistic performance connections through the logistic centers.

This task is focused on the nine basic categories of IT tools supporting intermodal transport, each of them contains a detailed description. Within each category, detailed inventories of ICT tools available on the market have been carried out in accordance with the structured as:

- Load calculator;
- Intermodal Route Planner;
- Freight Exchange;
- Logistic Platform / Electronic Transaction Platform;
- Multi Depot Management System;
- Transport Management Systems;
- Terminal Operation System;
- Supply Chain Management;
- Port Community Systems.

There is a wide range of ICT solutions supporting the process of communication and management in the industry. These include a wide scope of management support - from location tracking, internal and external communication to handling management, mode selection and spare capacity.

Task 3: Designing the Pilot Action of developing the ICT communication platform among the users and logistic centers in Albania.

By assessment of the Albania Logistics Sector, the Pilot Action will be better to focus on the Tirana-Durres Corridor, as the main freight traffic flow. A collaboration platform can be a helpful tool to boost the competitiveness of the Albanian industry, creating an array of opportunities for all stakeholders.

I. Albanian Freight transport analysis, based on ANTP3-National Transport Plan

Freight flows, in the socioeconomic analysis includes a description of freight traffic in Albania, and a characterization of main commodities transported in the country, the information is crucial for follow phases of the Multimodal. Freight transport model use a "surplus and deficit" methodology analyzes present / future demand in the intermodal transport performance system.

The ANTP3 model attempt to identify the main commodities produced and consumed in Albania at the level of TAZ, to determine the main movements of freight traffic. The main commodities imported have increased their demand in the past years, being the machineries, equipment and spare parts the ones with greater increase. Nevertheless, minerals, fuels and electricity imports, although the exports have also been heavily reduced, which indicates an internal adjustment in the balance between supply and demand for Multimodality.

Table 1: TAZ and Population used for the modeling

TAZ	Name	Pop 2018
1	Tropoje	18,617
2	Mallakaster	25,999
3	Belsh	18,364
4	Berat	53,893
5	Devoll	25,482
6	Bulqize	27,551
7	Mat	24,364
8	Cerrik	25,842
9	Skrapar	10,330
10	Delvine	8,188
11	Divjake	32,909
12	Dropull	3,055
13	Durres	192,997
14	Elbasan	133,436
15	Kolonje	10,559
16	Fier	115,917
17	Finiq	11,347
18	Fushë Arrës	7,197
19	Gjirokaster	25,009
20	Gramsh	22,816
21	Himare	8,425
22	Kamez	122,909
23	Kavaje	47,297
24	Kelcyre	5,332
25	Klos	14,670
26	Konispol	8,885
27	Malesi e Madhe	29,957

TAZ	Name	Pop 2018
28	Korça	72,484
29	Kruje	65,924
30	Has	15,235
31	Kuçove	28,871
32	Kukes	43,542
33	Kurbin	42,394
34	Lezha	60,107
35	Libohove	3,198
36	Librazhd	29,267
37	Lushnjë	80,374
38	Maliq	39,828
39	Memaliaj	9,295
40	Patos	22,057
41	Peqin	24,609
42	Permet	9,258
43	Diber	54,394
44	Pogradec	58,688
45	Poliçan	9,833
46	Prrenjas	24,213
47	Puke	10,758
48	Pustec	3,138
50	Roskovec	20,888
51	Mirdite	20,242
52	Rrogozhina	26,127
53	Sarandë	21,798
54	Selenice	17,669
55	Shijak	30,707
56	Shkoder	131,804
57	Tepelena	7,805
58	Tirana	810,572
59	Ura Vajgurore	24,504
60	Vau i Dejes	29,335
61	Vlora	112,969
62	Vora	30,094

II. Traffic forecast – Future Scenarios- based on ANTP3

The following table summarizes the main results for the base year and for the projected year 2038.

Table 2: Total number of tons transported and general performances in the base year and in the year 2038

	Base year 2018 ANTP 3	Year 2038 ANTP 3
Tons transported yearly basis	17, 085,737	40,437,620
Total truck vehicles per day	9,249	20,615
Total trucks x km per day	1,109,071	2,665,675
Average trip length in km.	119.9	129.3

In this version of the Plan, the resulting growth of the number of tons transported is set in 4.4% annually in the period 2018-2038. At the same time the number of trucks x km are foreseen to have an annual growth of 4.5% in the same period due to a continuous increase of the trip distance in 0.04% per year.

One of the main factors for the development of intermodal transport of goods is the establishment and operation of logistics nodes or as it is otherwise known logistics terminals of goods. Terminals are points of exchange within the same modal system or between different modes of transport and ensure the continuity of flows of goods through their transfer.

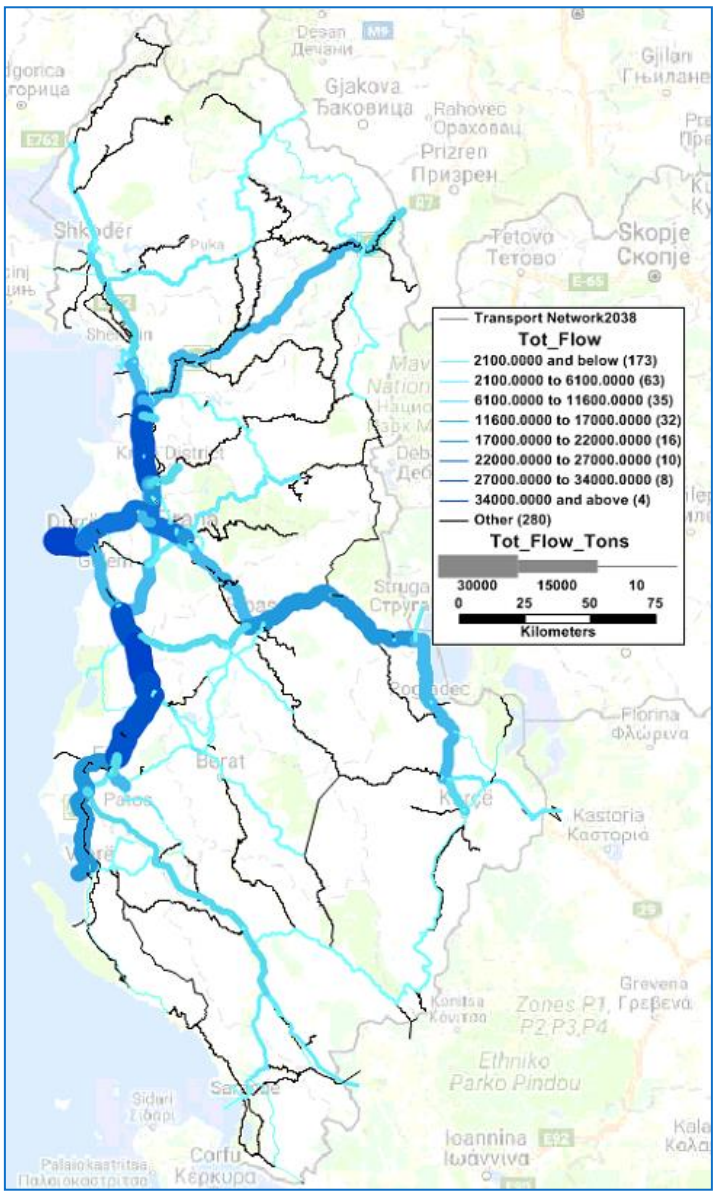

Figure 27: Total daily tons of freight flow in the Year 2038

III. Albanian National Transport Plan subsectors and interaction

ANTP-3, Sub-sector Plans have common topics and even proposals that involve two or more modes of transport. This is obvious for Intermodal Transport, which is indeed conceived by the combination of modes, particularly in freight transport but also for passengers. The coordination between modes is playing an increasingly role both in terms of infrastructure development and related services. Thereby, nowadays a maritime port extension cannot be conceived without efficient connections with road and/or rail; and also in the metropolitan transport the development of intermodal terminals facilitates passenger travels with relevant time savings and optimization of mobility.

Nevertheless, the positive impacts in terms of intermodality and combined transport for the national economy are particularly tangible in logistics. Thereby, the contribution of the transport infrastructures and measures to facilitate modal interchange are crucial to reduce logistics costs with the subsequent impact on the market and the regional economy. For this reason, the sectoral administrations should be involved in a committed and encompassed policy to improve intermodality. In this way, the ANTP3 make an effort to identify those related projects of different sub-sectors that shall be considered in the context of the Intermodal development. Thereby, particular proposals could be included both within sub-sectors and intermodal strategies. The objective is to reinforce the synergies when coordination among modes is carried out.

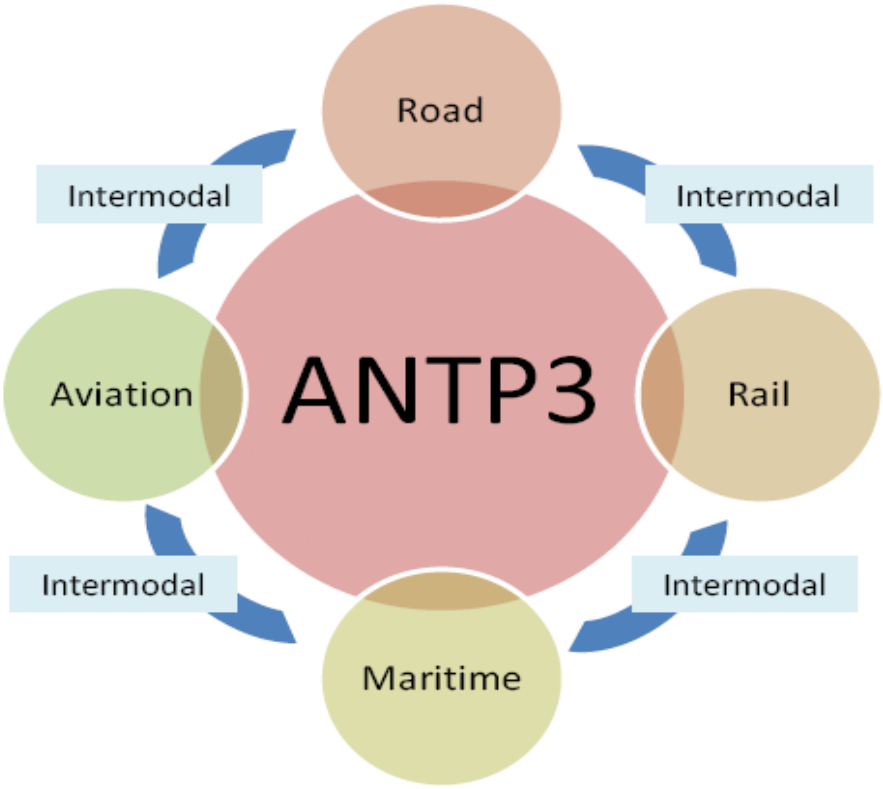

Figure 28: Albanian National Transport Plan subsectors and interactio

4 Stakeholders

The idea behind the EFINTIS project was that target groups and stakeholders will involve: local and national public authorities, forwarding agents, agents, enterprises as well as general public who will actively participate in exchanging of information related to ICT, traffic and freight flows through ports, removing bottlenecks caused by insufficient organization of documentation related to port operations/services, collection of necessary data for implementation of activities related to pilot projects. In addition, stakeholders will be provided with extensive network of information data on all bottlenecks existing in the port, and possible solutions to problems in logistics which may occur; maritime transport and ports logistics, especially when it comes to freight and people maritime traffic. In the following text the overview of main stakeholders reached by each partner is given.

4.1 Port of Bar

Port of Bar is the main cargo port in Montenegro. The port has started developing its Port Community System in 2014. Information systems of the main stakeholders (shipping agents, freight forwarding companies, institutions) were at a low level, and therefore, integration between the PCS and stakeholders' information system was not possible at the moment but this fact allows development of the PCS functionalities in accordance with stakeholders needs (mainly forwarders' and agents' needs). The EFINTIS upgrade of the PCS finally developed integration with two main institutional stakeholders, with Custom IT system and with National Maritime Single Window. At the moment we have more than 80 companies and institutions as a users of the PCS and also more than 200 employees (users) from these companies and institution use the PCS each day.

4.2 Southern Adriatic Sea Ports Authority

In the first draft of the Energy and Environmental Planning Document (DPEASP) of the Southern Adriatic Sea Ports Authority, there was an important involvement of the stakeholders and port operators in the phase of study and identification of the objectives, in such a way that the port communities shared the choices that will be adopted in the immediate future. In fact, the DPEASP identifies the energy-environmental sustainability objectives of the ports; the interventions and measures to be implemented to achieve the objectives; the program of interventions, even partial ones over a fixed period of time; the process of monitoring actions aimed at verifying the results achieved.

In updating the DPEASP underway, stakeholders and port operators will also be involved in the process of identifying the energy needs and related sources of emission of the entire port area, as defined by the Port Regulatory Plan in terms of both territorial perimeters and activities, also involving companies operating in port areas:

- companies authorized by the AdSP to carry out port operations;
- companies authorized by the AdSP to carry out port services;

- companies that have received from the AdSP the concession of state-owned areas and docks included in the port area.

Such involvement will be ensured through the administration of specific questionnaires aimed at both the definition of future scenarios relating to any activities planned for the reduction of energy consumption and CO2 emissions, and the definition of the Carbon Footprint aimed at the acquisition of further data relating to means of transport (land and sea) and to the facilities and equipment used by the organisations involved in the Port network.

		POWER OF INFLUENCE	
		LOW	**HIGH**
INTEREST	**LOW**	– Customs – Border Police – Guardia di Finanza	– Ministry of Transport and Infrastucture – Coast Guard – Apulia Region – Enviromental Department Arpa – Politechnic of Bari
	HIGH		– Agencies – Industries – Logistic enterprises

Figure 29: Stakeholders influence Southern Adriatic Sea Ports Authority

4.3 Port of Durres

The first phase of the PCS platform has been implemented thanks to the EFFINTIS project. It includes two initial modules: the PCS Core application and the vessel and cargo module. Various stakeholders, such as shipping agencies, freight forwarders, carriers, pilotage service, Durres Port Authority Dispatching Center, and General Cargo Terminal, are involved in this phase of the project.

The electronic platform created by the PCS system in the Port of Durrës connects port community members securely and intelligently. This platform enables stakeholders in Durres Port to exchange information, plan in real time, and manage port operations and business processes efficiently.

The system automates the exchange of information between actors in the port community, enhances logistics and port operations, and improves the efficiency of intermodal transport flows. It will also be the primary IT system for exchanging information and documentation, messages with users, and other external systems of stakeholders in the port community.

4.4 AAST Termoli

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)
- ARPA Molise, the environmental public institution

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)

4.5 Albanian Institute of Transport

Stakholder was involved during the study development through direct contacts and during informatin gathering. Since AIT is the authority who manages the Albanian National Transport Plan all dat gathered through interviews were used for the development of this study.

The main public Authorities:

- Ministry of Infrastructure and Energy,
- Durres Port Authority,
- Road Authority,
- Albanian Railways,
- Port of Shengjin,
- Port of Vlore,
- Port of Sarande.

The main participants of intermodal supply chains:

- Shippers,
- Road carriers,
- Rail carriers,
- Container terminals,
- Intermodal operator,
- Freight forwarders.

5 Resources

5.1 Port of Bar

The first part of the pilot project was related to the purchase of the server for the PCS and the contract was signed in May 2021. Contracting price for the server after realization of the single tender procedure was 12.650€. The installation of the server and all adjustments were finalized in 2021 and all current softwares were “transferred” to the new server.

The tender was published in August 2022. The contract was awarded for the sum of EUR 155,000.00 including VAT. Thee contract was signed in October 2022. In addition, 2.400 EUR were needed to integrate PCS with LUBARIS (IT system of the port).

5.2 Southern Adriatic Sea Ports Authority

The contract was awarded for the sum of EUR 119,520.00 including VAT. The pilot action was completed and tested in November 2022.

5.3 Ports of Durres

The two software modules selected for the first phase of PCIS implementation (PCIS-Core Module; ship module) are funded by the EFINTIS project while the hardware componentsare funded by APD. The tender has been published on 24.08.2022 and the winner has been selected on 19.09.2022. The contract was signed on 24 October 2022 with the company "ACTUAL I.T. D.D“.The Vessel & Cargo module began installation in early January 2023.

5.4 AAST Termoli

The pilot action was implemented by external supplier DBA PRO. SpA through public tender. The tender was published on 03/09/2021 e affidata per l'importo di Euro 86.460,00 including VAT. The contract between AAST and DBA PRO was signed on 8/06/2022.

5.5 Albanian Institute of Transport

The tender for the study was published in April 2021 and the contract was signed in June 2021 for an amount of EUR 55,000. The contract was concluded in April 2022 after the delivery of the final report.

Table 3: Data related to the implementation of the pilot projects

Deliverable	Title deliverables	Description	Tender published	Contract signature	Value of the contract
D.T2.2.1	Pilot project no. 1 - Port of Bar	Upgrade 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	Aug 2022	Oct 2022	157.400,00€
D.T2.2.2	Pilot project no. 2 - ADSPMAM	Improvement of current PCS GAIA in order to remove obstacles and introduce new technologies in port	Apr 2022	Aug 2022	109.800,00€
D.T2.2.3	Pilot project no. 3 - Port of Durres	Establishment of the 1st phase of the Port Community System in Port of Durres	Aug 2022	Oct 2022	151.000,00€
D.T2.2.4	Pilot project no. 4 - AAST	design and development of a telematic 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	Sep 2021	June 2022	86.460,00€
D.T2.2.5	Development study - Institute of Transport	Development study of Institute of Transport covers the development of intermodal logistic centres in Albania and possible ICT connections between them	Apr 2021	June 2021	55.000,00€

6 Conclusions

The effect of COVID-19 pandemic raised 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, these project activities and the main results of the pilots will allow transport businesses in the future to maintain a level of normalcy in those or similar conditions.

The project results in each port will, through intelligent system, deal with several weaknesses each port face in this area: poor maritime traffic control, safety and security, freight and passenger logistcs etc.

In addition, implemented ICT tools will allow interchange data between all subjects in the logistic chain avoiding physical communication and paperwork and as a smart working tool, it will rapidly be adapted to changes in surroundings systems and it has already proved necessary consedring the circumstances with COVID-19 pandemics.

The pilot actions under the EFINTIS project improve the overall performance of the ports and partners involved in the project, paving the way for future service development and new synergies.

7 List of figures