ECOWAVES

Transnational strategy focused on waste management for the protection of ports environment

PP3 - IGOUMENITSA PORT AUTHORITY S.A (GR)

Project acronym:	ECOWAVES
Project name:	Enhancing Cooperation in Waste management from VESsels in ADRION ports
Project code:	1129

Document Information

Document ID name:	ECOWAVES O.T1.1 - Transnational strategy focused on waste management for the protection of ports environment
Document title:	Transnational strategy focused on waste management for the protection of ports environment
Type:	Report
Date of Delivery:	19 05 2023
Work package:	WP T1
Work package leader:	PP3 – IGOUMENITSA PORT AUTHORITY S.A. (GR)
Dissemination level:	Public

Document History

Versions	Date	Changes	Type of change	Delivered by
Version 1.0	02/2023	Final version	-	Igoumenitsa Port Authority SA – Living Prospects Ltd

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1. Mission Statement

This Strategic Document is the main output of the Work Package T1 - *Port Environmental Framework* that was based on the key outputs of WP activities of the Interreg ADRION ECOWAVES project.

WP-T1 was focused on setting the knowledge framework for introducing the transnational strategy for environmental protection in port area, based on the sustainable transnational model for waste management. For this purpose, several activities/studies have been elaborated/implemented by the partners such as:

- A diverse analysis for collecting data regarding the ecological status of waterways and seafloors, vessels flow in ADRION ports and waste generation and characterization.
- A Good Practice Handbook showing good practices models in waste management in port and navigable areas.
- A SWOT analysis presenting current port regulation on waste management.
- A round table taking into consideration transnational policies for ports and aiming to transfer knowledge of waste planning in Adrion port areas and foster environmental status.

This strategic document presents **21 tailored guidelines** and **18 best practices** that have been drafted by the partners, aiming to enhance the actual environmental status (including waste management from shipping) of the Adriatic-Ionian ports, as well as their social profile.

Several key-target groups have been involved and engaged in project's activities for the durability of project's results:
• **Local authorities** in project's activities: This will support new sustainable waste management systems for port areas after sharing monitoring data and surveys showing lacks in current port waste disposal.
• **National institutions** will help setting a network among all partners institutions in order to apply new policies and strategies, enhancing the ADRION area environmental quality.
• **Tourists & ship operators'** awareness of the importance of their behaviour will be increased by capacity buildings and cruising lines commitment and tourist agencies cooperation in communication.
• **Vessels & cruising ships** will adopt new attitudes in sea waste disposal and avoid illegal discharges.

All these actors will lead to institutional and financial sustainability as ports will enhance their position as appreciated waste reception facilities and tourist marine sites and increase overall satisfaction of incoming guests.

This strategic document, consists of the following main sections:

- Identification of protocols/standards as best practices that can be applied in the Adriatic ports for enhancing their environmental status and their social responsibility (*State of Play*).
- Identification of Key actors involved – Possible synergies for the sustainability of the output.

- Tailored transnational Guidelines for enhancing actual environmental status of the ports and their social profile (Identification and definition of long-term goals that the strategy intends to achieve).
- Key Conclusions & follow-up activities

2. Identification of protocols/ standards as best practices that can be applied in the Adriatic ports for enhancing the environmental profile and their social responsibility (*State of Play*)

In order to improve the Adriatic ports' environmental profile and increase social responsibility, the partnership has selected specific **protocols/ standards** as best practices from their internal or outer environment, considered as applicable measures aimed at environmental sustainability and mitigation of the impacts deriving from port activities, applicable in the Adriatic, Ionian and river ports.

Those are presented below per Country, although some of them are related to each other but have different characteristics according to the Port where applied or provide additional information.

2.1 Italy - Port Network Authority of the Ionian Sea & Central Adriatic Ports Authority

Port Network Authority of the Ionian Sea

In order to improve its environmental profile and increase its social responsibility, the Port System Authority of the Ionian Sea has prepared and documented its Environmental Policy and has defined the modalities for the definition, verification, approval and dissemination of Environmental Policy, so that it becomes a reference for all staff and is made available to the public.

Environmental Policy is a guide to implement the Authority's Environmental Management System (SGA), in order to ensure compliance with all regulatory provisions in the field of the environment and to pursue a reasonable and continuous improvement of efficiency.

The High Management (AD), which is entrusted with the task of keeping the organization under control (the President in this case), has finalized its commitment:

- towards the environment, promoting the development of the Environmental Management System, compliant with UNI EN ISO 14001:2015;
- with the signing of the principles and guidelines of reference, through environmental policy.

The AD defines the Environmental Policy document according to the following operational phases:

- definition of commitments for the maintenance of regulatory compliance, for adherence to the philosophy of sustainable development, for the prevention of pollution and for continuous improvement aimed at reducing any potential environmental impact and significant and non-significant risk factors;
- definition of the general objectives, taking into account:
    - environmental aspects;
    - improvement of environmental management.

The Policy document is subject to review as a result of significant internal and/or external changes. The AD approves the Environmental Policy document, before its internal dissemination and/or external communication.

In application of the environmental policy principles adopted, the Ionian Sea Port System Authority has implemented several operational actions among which it is intended to indicate those described in the paragraphs to follow as "**good practices**" applicable in Adriatic, Ionian and river ports.

Good Practice 1: Adoption of the Environmental Energy Planning Document (DEASP)

In December 2019, the Ionian Sea Port System Authority adopted the Environmental Energy Planning Document (DEASP) drawn up in collaboration with DIPAR (Productive District of Environment and Reuse - Puglia Region).

The Document, in compliance with the Guidelines adopted by the Ministry of the Environment, The Protection of the Territory and the Sea, in agreement with the Italian Ministry of Transport, focuses in the first part on a photograph of the fact of the port of Taranto to 2018 (last year of which complete and certified data are available), at the energy, infrastructure and transport level and examines individually the different activities of the port and the components that characterize them.

The data collection took place by actively involving all the subjects operating in the port system both through collective and individual meetings coordinated with the preparation and administration of separate and articulated questionnaires:

- "Basic questionnaire", aimed at collecting energy and environmental data concerning buildings and concession areas in the port;
- "Questionnaire for the definition of future scenarios", concerning any planned activities aimed at reducing energy consumption and CO2 emissions;
- "Carbon Footprint Questionnaire", aimed at acquiring supplementary data on means of transport (land and sea) and on the facilities and equipment used by the bodies involved within the Port System.

The available data allowed the drafting of the Energy Balance sheet and the measurement of the Carbon Footprint of the Ionian Sea Port System.

The second part of the Document defines the objectives of energy-environmental sustainability to be achieved, the strategies and interventions to pursue them, proposing a series of technological solutions that allow, in the next three years, to launch actions and interventions aimed at reducing the use of energy from fossil sources for the same services offered, favoring technologies with less environmental impact.

These solutions identify:

- Interventions, which include works, plants, structures, works as a result of investments made with the aim of improving energy efficiency and producing energy from renewable sources;
- Organizational measures aimed at a more efficient and sustainable environmental energy management in the port environment extendable according to an APPEA model to the promotion of:
    - the unitary management of infrastructure and services throughout the port area;
    - monitoring of environmental performance;

- the preparation of a program of progressive environmental redevelopment of the Area.

The Document has established a reduction in greenhouse gas emissions of 15% in 10 years in relation to traffic volumes.

Good Practice 2: Integrated Monitoring Plan of the Taranto port area

The Ionian Sea Port System Authority, in collaboration with DICATECh (Department of Civil, Environmental, Territory, Construction and Chemistry Engineering), has drawn up the integrated Monitoring Plan of the Taranto port area (2 November 2015).

The aforementioned paper provides a description of the techniques, instruments and materials to be used for the construction of stations and separate monitoring actions for environmental matrices in order to control the impacts deriving from the execution of the works/interventions (in-ante-in-post operam) in progress/scheduled on the port areas, listed below:

- "Taranto Port Plate – Extension IV Protruding and West Dock";
- "Dredging of 2.3 Mm^3 of sediments in the Polysectoral Pier area and for the construction of a first lot for the functional filled case to the extension of the V Protruding of the Port of Taranto";
- "Taranto Port Plate – Logistics Platform";
- "Taranto port plate – Strada dei Moli";
- "Taranto Port Plate – Filled Tank";
- "Redevelopment of the Multisectoral Pier – Modernisation of the Mooring Quay";
- "Redevelopment of the Polysectoral Pier – New Foranea Dam for the protection of the Port outside the tarstead of Taranto – Stretch of Ponente";
- "Correction, enlargement and structural adjustment of the Levante quay of the San Cataldo pier and consolidation of the calata 1 of the Port of Taranto.

The Integrated Monitoring Plan acts as a guideline and indication, in order to indicate a minimum level of performance of quality, for the supply of fixed and mobile monitoring systems and the materials that will be used for the realization of the planned works.

The aforementioned Plan has identified an "area" monitoring network with the main objective of controlling, through measuring points "homogeneously" distributed over an area that includes all the areas relevant to the individual works and areas at the contour, the overall quality status of the land-sea system.

The long-term objective is to create a permanent monitoring system for the entire port area that, in the current phase, interferes as little as possible with the existing Area Monitoring Plans. The aim of the proposal is, therefore, to set up a well-programmed network of monitoring stations, concerning different matrices, through which to systematically detect a defined set of parameters: all in accordance with a methodological approach that can lead to a harmonious program both from the point of view of timing and operational methods to be adopted subsequently during the implementation and management of the monitoring project for the area under consideration.

The Plan identifies the monitoring actions with regard to the individual matrices to be investigated:

- Water matrix;
- Sediment matrix;
- Air matrix;
- Noise matrix,
- Soil matrix;
- Flora and fauna matrix;
- Filter organisms matrix;
- Benthos matrix.

In particular, the monitoring network for the **water matrix** is distinguished by seawater column and underground water column, with reference to a network of fixed and mobile stations; the following types of networks are available:

- a general network of fixed stations;
- a general network of mobile stations;
- a general network of piezometers on the ground.

The monitoring activities of the individual works are provided for in the context of the activity of the general networks in accordance with the individual protocols. If the Area Monitoring Plan of the individual work includes columns of water on fixed and mobile stations, the related measures must be included among those scheduled for the general networks: the higher frequency of the measurements, normally required by the individual Area Monitoring Plans, must harmonize with the quarterly frequency of the measures on the general network, without changing the dates and cadence, but only enriching the overall number from the beginning of the construction site of the individual work until the time of its end.

The purpose of the general network is to build a continuously updated basis of the general system. These "general networks" can provide an overview of the environment on which to base the comparison with the data subsequently or simultaneously produced within each Area Monitoring Plan.

The monitoring stations of the "seawater" matrix have been classified according to the works and the type of station, whether fixed or mobile.

With regard to fixed stations, a reduction of the same was carried out, choosing a total of 6, distributed throughout the entire area of interest, and respecting, for these selected stations, the locations reported in the individual Area Monitoring Plans.

For the network of mobile stations, a mesh has been defined, which is shown in the following figure, distributed homogeneously according to four rows of stations at different distances from the coast.

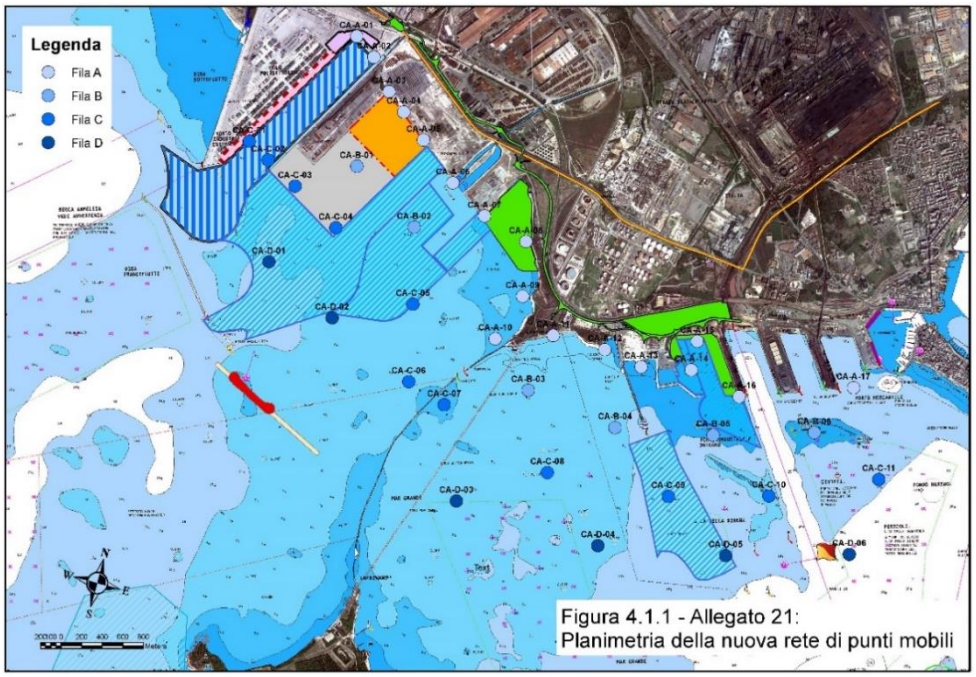


Figure 1 - Floor plan of the new mobile point network of the Integrated Monitoring Plan of the port area - DICATECh (2015)

The position of the measuring points is related to the location of ground piezometers whose original positioning was established before 2011; the entire piezometer network has already been sampled in two previous campaigns (July 2011 and April-May 2013).

The network of piezometers, space-continuous and sufficiently homogeneous, follows the projection of the coastline of the 1950s, occupying only public areas within the SIN1.

Such a location ensures comprehensive monitoring of the quality of water leaving the SIN and bound for the sea.

For the purposes of the general network for "area" monitoring, however, a reduction has been made in the number of piezometers belonging to the pre-existing network, taking into account only 22: these control points are homogeneously distributed along the coast and their position, as already mentioned, is related to the position of the control points at sea.

The abbreviations of the monitoring stations and their location are shown in the following figure.

[1]The sites of national interest (SIN) represent very large contaminated areas classified as dangerous by the Italian State and that need interventions to clean the soil, subsoil and /or surface and groundwater to avoid environmental and health damage.

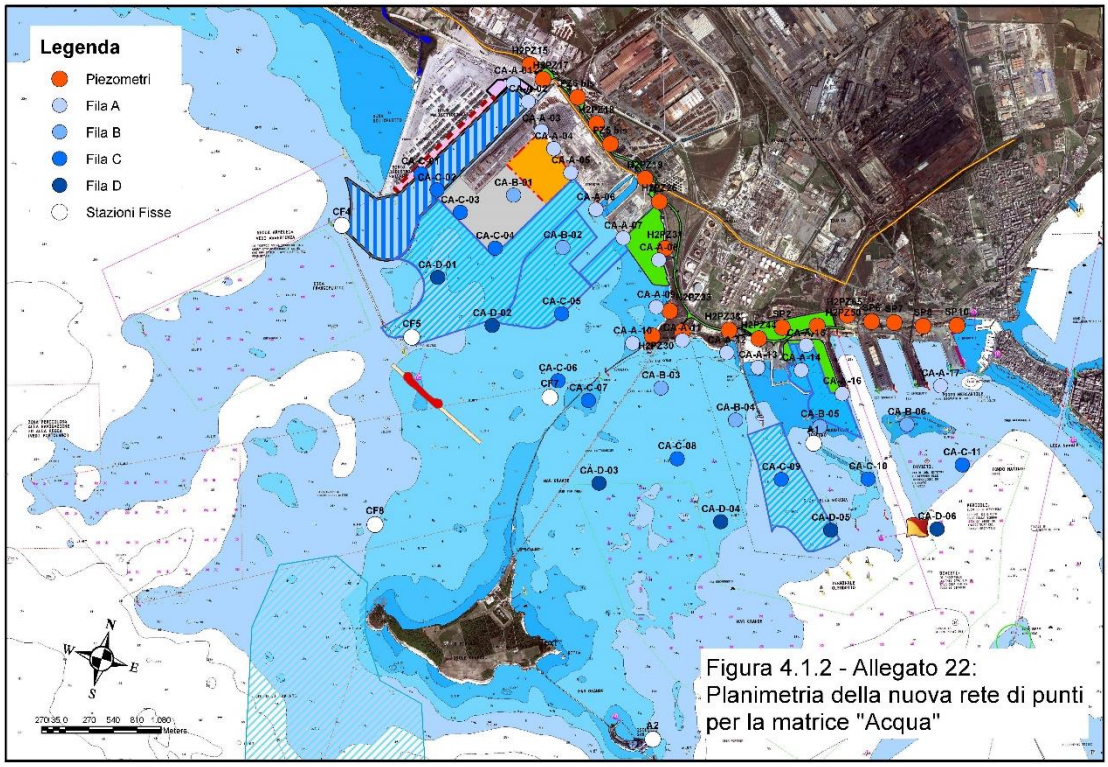


Figure 2 - Floor plan of the new network of points for the "water" matrix of the Integrated Monitoring Plan of the port area - DICATECh (2015)

At mobile stations there are multi-parametric profiles related to conductivity, temperature, pH, pressure, dissolved oxygen and turbidity along the seawater column. The objective of the water columns is to be able, with regard to some predefined quotas within the seawater body, to reconstruct information plans through interpolation of data. To do this it is necessary that the profiles are quoted with respect to the average sea level, taking into account the tidal phases, or, more easily than the bottom which, at least in theory, is stable. These water columns should of course also be envisaged at the fixed stations of the corresponding general network. In particular, on some of these fixed stations it is planned to use correntometers to determine the direction and intensity of currents along the water column. It is obvious that measurements on mobile and fixed measuring points (at sea) should be carried out as far as possible in accordance with the same time horizon, as it is not correct to interpolate and/or interpret non-cohesive data. This clearly poses some technical problems and the simultaneous nature of the measurements, a condition which is unrealistic if not with fully automatic systems, can only reasonably be approximated by an appropriate choice of measurement techniques.

In any case, the indication is to carry out the profiles along the water columns both in moving and fixed points at low tide, so that the aquifer is potentially spilly and there is a more representative picture of the land-based contributes to the marine environment. These profiles should also be conducted along the column of water intercepted by the monitoring wells always with regard to the same time horizon during which the profiles in the water column will be carried out on the sea waters.

As regards the collection of water samples at sea for subsequent laboratory chemical analyses, both for fixed stations and for furniture, in view of the low depth of the seabed under

intervention, two sampling depths, "surface" and "bottom", were defined, the latter dependent on the bathymetry of the seabed at the measuring point.

The connection of the mesh of mobile and fixed stations with the ground network, consisting of piezometers, allows to obtain different photographs of the qualitative condition of the waters to the land-sea interface (relations between seawater and groundwater) and to the sediment-water interface with reference to well-defined time horizons.

For the water matrix, for the three general networks, namely:

- the network of mobile stations which aims to monitor the parameters relating to the "water matrix" ("marine waters") throughout the area affected by the construction sites, where this in practice coincides with a large part of the area covered by the TOPT;
- the network of fixed stations;
- the network of piezometers;

the recommended frequency for water column measurements and sampling is quarterly.

This is obviously linked to climatic trends in the places of interest that affect groundwater fluctuations and sea conditions.

In addition, this activity is carried out on local networks of mobile and fixed stations falling within the relevance of each work, the locations of which coincide with those of some of the general mobile and fixed network stations.
On these local networks, the measurements on the water column and the sampling increase in frequency in compliance with the Area Monitoring Plans provided for each work, inserting the measurements in the intervals defined by the quarterly cadences of the general networks (e.g. in the case of the forecast of monthly measures there would be two additional measures among those on a quarterly basis).

The duration of monitoring for local networks is that provided within each Area Monitoring Plan.

The general network therefore continues to operate at all times with its frequencies: the overlapping of the monitoring activities of each work involves an increase in the number of data within the monitoring period of the work itself.

With regards to **marine sediments,** in order to characterize the level and type of pollution of the area of interest, a subdivision of the sediments of the seabed into four quality classes was carried out, a function of the concentration of pollutants present. This subdivision is based both on the Contamination Threshold Concentrations (CTC) defined by Legislative Decree 152/06, column B (industrial sites) of Table 1 of The All. 5. Title V of Part Four, and on the specific intervention limits defined by ICRAM for the port sediments of the Taranto site of national interest:

- "GREEN" - it contains sediments in which there is no exceeding of the intervention values defined by ICRAM;
- "YELLOW" - this class shall include sediments for which at least one of the parameters analyzed has concentrations higher than the intervention values defined by lCRAM,

but lower than the limit concentration values indicated in Table 1, Col. B of Legislative Decree 152/06 and subsequent amendments and additions;

- "RED" - the sediments belonging to this class are those in which at least one of the parameters analyzed has concentrations above the limit concentration values indicated in Table 1, Col. B of Legislative Decree 152/06 and subsequent amendments and additions, but below the limit values for the classification of "dangerous" listed in All. D, Part IV - Title I and II, Legislative Decree 152/2006 and subsequent amendments and additions;
- "VIOLET" - this class includes sediments with concentrations above the limit values for the classification of "dangerous".

Sediments in the marine environment become the final receptor body of numerous contaminants that, due to anthropogenic activities, but also natural processes, can accumulate in sediments that therefore become a "trap" of all contaminants poured and present in the column of water above.

In areas with a high level of anthropization such as port basins, often characterized by low hydro-dynamism, contaminants can reach very high concentrations in sediments, up to the establishment of a reverse process of transfer and leaching of "trapped" substances and the subsequent release of them into the water column. In this case, sediments potentially become an active secondary source of pollution: this situation can have a negative impact on the quality of the water column and sometimes lead to profound alterations in the dynamic balances underlying the functioning of the entire port ecosystem.

It should also be noted that the negative effects on the ecosystem may be more or less significant depending on the presence of some "pejorative" conditions related to the climate (winds, currents, tidal regime, thermal stratification of the body of water), the morphology of the area, the chemical-physical conditions of the system (redox, pH, etc.) as well as the very peculiarities of the matrices that make up the marine ecosystem (water, sediment, biota) and the "inland". Thus, the sedimentary compartment can be considered as a recorder and time supplement of what happens in the water column. In fact, a wide variety of polluting compounds, nutrient salts and organic matter, are found in higher concentrations in the sediment than in the water column, and the determination of the quality of the aquatic sector cannot be separated from monitoring through the sampling and periodic analysis of certain environmental parameters in the sediment matrix.

Monitoring stations constitute the area monitoring network for the "sediment" matrix and their planimetric distribution is shown in the following figure.

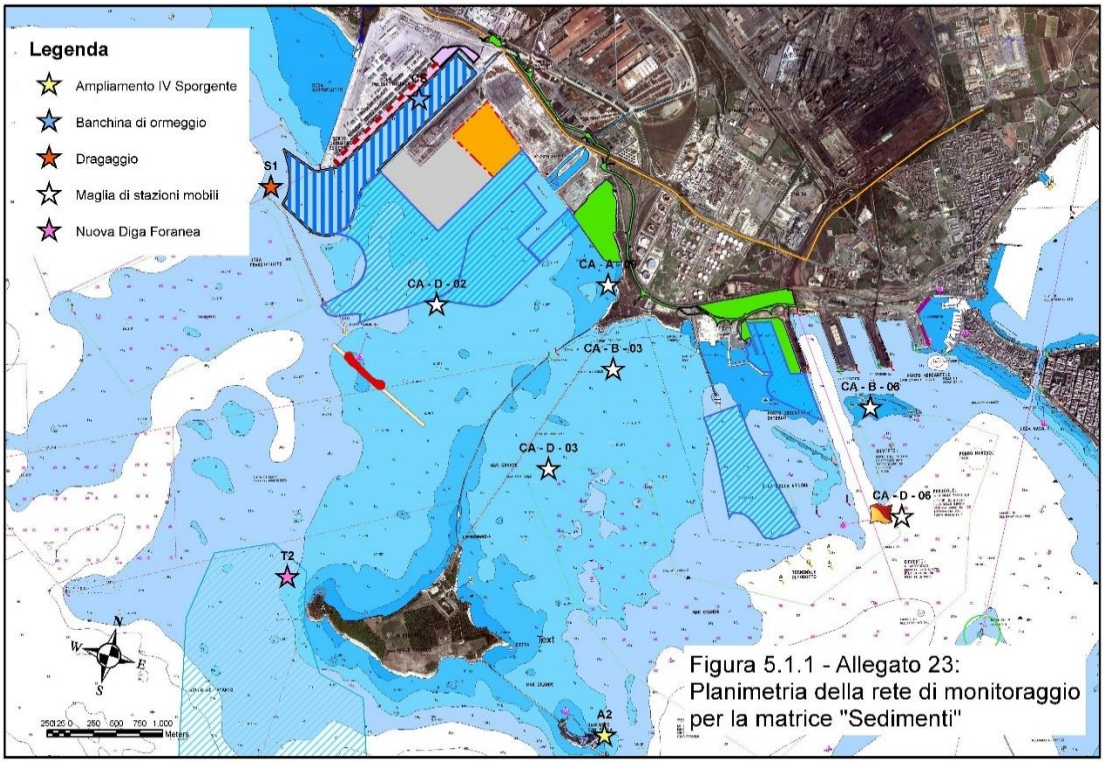


Figure 3 - Floor plan of the new network of points for the "sediment" matrix of the Integrated Monitoring Plan of the port area - DICATECh (2015)

At sediment monitoring stations, surface sediment (0 - 20 cm) is expected to be sampled for chemical-physical analysis, such as:

- particle size distribution;
- metals;
- hydrocarbons C<12 and C>12;
- IPA;
- PCB;
- pesticides;
- organostannic compounds;
- TOC;
- pH;
- potentials redox;
- nutrients (Ntot, Ptot).

For the sampling phase, reference can be made to what is reported in the "Manual for the Handling of Marine Sediments" (Ministry of the Environment and Land and Sea Protection, ICRAM 2007) which suggests for the sampling of submerged surface sediments (up to a thickness of 50 cm), the use of buckets, box corers or underwater operators equipped with liners, with characteristics suitable to take the entire aforementioned thickness or in any case a layer of material not less than the first 20 cm.

Good Practice 3: Waste collection and management plan of the Port of Taranto

The Port System Authority of the Ionian Sea, in compliance with the provisions of art. 5 of Legislative Decree 182/03 has drawn up the "**Waste Collection and Management Plan of the Port of Taranto**" approved by Resolution of the Regional Council n. 1407 of 12 June 2015 and in force since 28 November 2004 and subsequent updates. The most recent update of this Plan was approved with D.G.R. of the Puglia Region n. 1203 of July 31, 2020.

This Plan is updated and approved in accordance with the regional waste planning, in compliance with the aforementioned legislation, at least every three years or in any case in the presence of significant operational changes in the management of the port.

The Authority, with the Waste Collection and Management Plan of the Port of Taranto, is interested in regulating the management of all the different types of waste produced in the port area, not only with regard to waste produced by ships but also with those that are produced and managed throughout the territorial district of competence. Therefore, the plan deals, in its entirety, with the management and treatment of the different types of waste produced and collected in the port area.

Ship waste, which can be classified into special hazardous and non-hazardous waste, which can be delivered and disposed of by accommodation facilities, is distinguished into the following types:

1) produced by the ship;
2) load residues which consist of any material contained in the holds or tanks of the load and which has remained there at the end of the unloading and cleaning operations.

In turn, the waste produced by the ship is divided into:

a) special waste similar to urban waste (kitchen type, other than load residues);
b) waste water;
c) bilge water;
3) associated with the load.

Similarly, cargo waste is classified as:

a) slop (washing water);
b) ballast waters when they come into contact with cargo;
4) surpluses.

Responsibility for the management of waste collected in common use areas and therefore, to be considered "products" in those areas, lies with the Port System Authority of the Ionian Sea. This waste is divided into two types as it is distinguishable between those found by cleaning the common areas and those collected in the "ecological islands".

With regard to waste from the cleaning service of the common areas, it must be further specified that it comes from ground areas and water mirrors. In fact, in the Port of Taranto there is a service for the prevention and protection of pollution and rapid intervention for the reclamation of water mirrors and port areas by hydrocarbons granted by the local Captaincy of Porto to the Ecotaras S.p.A. Company.

The "Ecological Islands" project, on the other hand, was born from the need to provide users of boating, private and professional, fishing and/or recreational, functional structures for the collection of waste such as spent lead batteries and waste oils.

For both ship-generated waste and cargo residues and waste produced in common areas, the Plan reports the assessment of the type and quantity of waste produced, a detailed description of collection procedures and analysis of the presence of collection facilities in the port area.

The Waste Collection and Management Plan of the Port of Taranto also includes the collection procedures (means and equipment) and management of the different types of waste, identifying the various treatment plants, describing their type and capacity.

Other information that can be found in the Analysis Plan is:

- Cost analysis;
- Tariff system;
- Reports;
- Consultations;
- Regulations;
- Responsibility;
- Initiatives;
- Equipment and processes;
- Plants use;
- Disposal;
- The preliminary environmental report for subjection to the Strategic Environmental Assessment (VAS), in turn composed of the analysis in this regard:
    - bulk, miscellaneous goods, passengers and containers in the Port of Taranto;
    - the geographical classification and location of the port of Taranto;
    - the territorial classification of the port of Taranto;
    - the Site of National Interest (SIN);
    - Contents and objectives of the Plan with the assessment of the impacts on the various environmental matrices (air, landscape, water, soil and subsoil, noise, marine environment, vegetation, fauna and ecosystems).

It is also specified that, in **chapter** below, the description of solid waste disposal facilities (inside the port), liquids (near the port) and sediment treatment plants (under authorization) is given.

Central Adriatic Ports Authority

In application of the measures aimed at environmental sustainability and mitigation of the impacts deriving from port activities, the Central Adriatic Ports Authority has implemented or is planning to implement various operational actions, among which we intend to report those described in paragraphs a follow as "good practices" applicable in the Adriatic, Ionian and river ports.

Good Practice 1: Port area monitoring plans

The area of the port of Ancona is the subject of various monitoring campaigns of environmental matrices, including:

1. Coastal marine waters;
2. Bathing waters;
3. Sediments deriving from dredging activities.

In addition to these, in the port of Ancona are applied:

- the environmental monitoring plan of the sediment tank;
- the Atmospheric Pollution Project (P.I.A.).

Quality of coastal marine water bodies

With regard to the monitoring of coastal marine waters, the Regional Agency for Environmental Protection of the Marche Region (ARPAM) published in 2019, the "Report on coastal marine water bodies in the three-year period 2015-2017". The activities carried out led to the classification of water bodies and provided for the assessment of both the ecological status of water bodies, by analyzing the elements of biological, chemical and physico-chemical quality, and the assessment of the chemical status by researching and quantifying dangerous substances. priorities indicated at Community level.

The ecological status of coastal marine waters obtained following the monitoring conducted by ARPAM for the three-year period 2015-2017 is summarized in the following table. The water bodies closest to the area under examination are highlighted in red.

Table 1 - Ecological status of the water bodies of the Marche Region (three-year period 2015 - 2017).

WATER BODY CODE	NAME	CLOROFILLLA A CLASS	MACRO INVERTEBRATE CLASS	TRIX CLASS	STATE PARAMETERS CHEMICALS IN SUPPORT	ECOLOGICAL STATE
IT11.R_COSTA_UF01_01.A	Gabicce	Not monitored, merged with the Emilia-Romagna water body				
IT11.R_COSTA_UF02_02.A	San Bartolo	HIGH	NOT CLASSIFIED	GOOD	GOOD	GOOD
IT11.R_COSTA_UF03_12.A	Pesaro - Fano	HIGH	HIGH	GOOD	MODERATE	MODERATE
IT11.R_COSTA_UF03_12.B	Fano - Senigallia	HIGH	HIGH	GOOD	GOOD	GOOD
IT11.R_COSTA_UF03_12.C	Senigallia-Ancona	HIGH	HIGH	MODERATE	MODERATE	MODERATE
IT11.R_COSTA_UF13_13.A	Ancona - Numana	HIGH	HIGH	GOOD	GOOD	GOOD
IT11.R_COSTA_UF14_22.A	Numana - Porto Recanati	HIGH	HIGH	MODERATE	GOOD	MODERATE
IT11.R_COSTA_UF14_22.B	Porto Recanati - Civitanova	HIGH	HIGH	GOOD	GOOD	MODERATE
IT11.R_COSTA_UF14_22.C	Civitanova - Porto San Giorgio	HIGH	HIGH	GOOD	GOOD	MODERATE
IT11.R_COSTA_UF23_24.A	Porto San Giorgio - Grottammare	HIGH	HIGH	GOOD	GOOD	MODERATE
IT11.R_COSTA_UF25_27.A	Grottammare – San Benedetto(1*)	HIGH	HIGH	GOOD	GOOD	MODERATE
IT11.R_COSTA_UF25_27.B	Porto di San Benedetto del Tronto - Fiume Tronto	HIGH	HIGH	GOOD	GOOD	MODERATE
(1*) Not monitored directly but merged with the water body located to the south (Port of San Benedetto del Tronto - River Tronto)						

The table below shows the chemical status obtained on each water body and the indication of the parameter that has exceeded the standard; exceeding the standard in water does not lead to a downgrading of the chemical status.

Table 2 - Chemical status obtained on each water body. Elaborated by ARPAM

WATER BODY CODE	SWB NAME	CHEMICAL STATUS	Parameter exceeded
IT11.R_COSTA_UF01_01.A	Gabicce	Merged with Emilia-Romagna	
IT11.R_COSTA_UF02_02.A	San Bartolo	GOOD	Lead (SQA-MA water); Cadmium (SQA -CMA water); Mercury (SQA -CMA water)
IT11.R_COSTA_UF03_12.A	Pesaro - Fano	GOOD	Lead (SQA -MA water)
IT11.R_COSTA_UF03_12.B	Fano - Senigallia	GOOD	Lead (SQA -MA e CMA water); Mercury (SQA -CMA water)
IT11.R_COSTA_UF03_12.C	Senigallia - Ancona	GOOD	Lead (SQA -MA water); Cadmium (SQA -MA water);
IT11.R_COSTA_UF13_13.A	Ancona - Numana	GOOD	Lead (SQA -MA water); Cadmium (SQA -MA water);
IT11.R_COSTA_UF14_22.A	Numana - Porto Recanati	GOOD	Lead (SQA -MA water); Mercury (SQA -CMA water)
IT11.R_COSTA_UF14_22.B	Porto Recanati - Civitanova	GOOD	
IT11.R_COSTA_UF14_22.C	Civitanova - Porto San Giorgio	BAD	Mercury (SQA -MA sediments)
IT11.R_COSTA_UF23_24.A	Porto San Giorgio - Grottammare	BAD	Mercury (SQA -MA sediments)
IT11.R_COSTA_UF25_27.A	Grottammare - San Benedetto (1*)	BAD	
IT11.R_COSTA_UF25_27.B	Porto di San Benedetto del Tronto - Fiume Tronto	BAD	Mercury (SQA -CMA water/ SQA -MA sediments)

(1*) Not monitored directly but merged with the water body located to the south (Port of San Benedetto del Tronto - River Tronto)

Bathing water quality

During the 2020 bathing season, as in the previous four (2016-2019), the ARPAM carried out some monitoring activities of the waters intended for bathing in the Marche Region in order to protect and protect the health of bathers and at the same time to improve and protection of the water resource. Following the monitoring carried out during the 2020 bathing season, ARPAM published in October 2020 the "Report on the quality of bathing water", which shows that in 2020 there was a widespread improvement in the quality classes of bathing waters in the Marche region, in fact 31 of the 254 waters have improved their quality and only in one case has there been a deterioration.

The results obtained by the Agency for the last bathing season are summarized in the following graph:

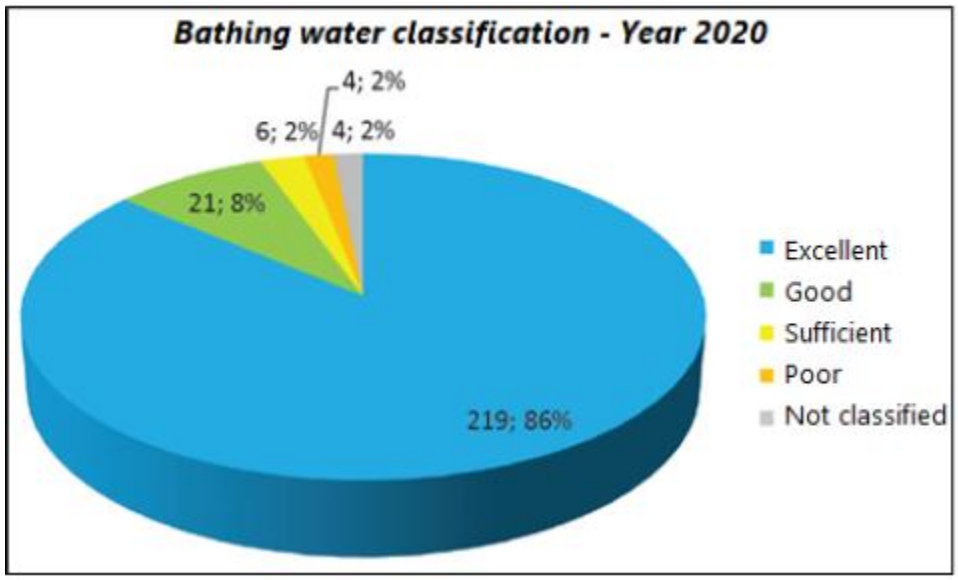


Figure 4 - Bathing water classification - year 2020 - Elaborated by ARPAM.

In the 2020 season, the Marche bathing waters were awarded the **Excellent class in 219 cases** (200 in 2019) and the **Good class in 21 cases** (31 in 2019), confirming the excellent performance of the coast in 94% of the points monitored. Only **6 waters** were found to be **sufficient** and only **4 scarce**.

Characterization of sediments deriving from dredging activities

In the port of Ancona various dredging operations were carried out by the Central Adriatic Port Authority (ADSP MAC) or by the concessionaires with the support of the ADSP from a technical and authorization point of view, various dredging operations, activities already in place in 2017 - 2020 and which continue to represent one of the main challenges of the ports of the Central Adriatic Sea.
In fact, the MAC ADSP for the Port of Ancona in the next three years provides for the start of some works, including:
- Dredging of the stretch of water in front of the quays from n. 19 to n. 25, in accordance with the "2008 Dredging Agreement";

- Dredging of the stretch of water in front of quay 26 of the port of Ancona and maintenance of the seabed of the port;

- Design of the dredging of the stretch of water in front of the new straight quay of the port of Ancona.

The discipline of the methods and technical standards for the authorization of diving into the sea of excavated seabed materials is regulated in Italy by the **Ministerial Decree of 15 July 2016, no. 173**, "Regulation laying down technical procedures and criteria for the authorization of the immersion in the sea of excavated seabed materials", which also indicates the modalities with which to carry out the nourishment and the transfer in conterminated areas in relation to the dredged sediments and/or conferred in areas not included in a Site of National Interest (SIN). The decree distinguishes different management methods: deliberate immersion in the sea, nourishment interventions, immersion in a confined environment.

Hierarchically, immersion in the sea is to be considered as the last option, after nourishment and immersion in a confined environment.

Therefore, with reference to the characterization of the sediments resulting from the dredging activities carried out in the Port of Ancona, the results obtained following the survey campaign carried out in 2020, from the application of the weighted integration criteria implemented by the Ministerial Decree n. 173/2016, the processing of the chemical hazard and the ecotoxicological hazard of sediments, integrated to process the "Quality Class" of the sediments analyzed following the various sampling campaigns performed.

In particular, for the characterization of the sediments deriving from the construction activities of quay 27 of the port of Ancona, an exemplary extract of the classification is reported. Specifically, the following elements were determined for each sediment sample:

- the percentage of pelite,

- the ecotoxicological hazard class,

- the percentage contribution provided to this danger by the elutriate,

- the chemical hazard class,

- the overall Quality Class of the material.

Table 3 - Sediment quality classification of Quay n. 27 - Port of Ancona - Example extract.

Monitoring station	Depht	Ecotoxicological hazard level	% Elutriato	Chemical hazard level	% Pelite	Material quality class	Notes
S01	0-50	MEDIUM	12.0	HQc(L2) <= Low	76.6	C	
	50-100	ABSENT	10.0	HQc(L2) <= Negligible	64.2	A	*1
	100-200	ABSENT	43.0	HQc(L2) <= Negligible	46.5	A	*2
	200-400	ABSENT	100.0	HQc(L2) <= Negligible	45.1	A	
	400-600	ABSENT	90.1	HQc(L2) <= Negligible	37.9	A	
	600-700	ABSENT	100.0	HQc(L2) <= Negligible	30.9	A	
S02	0-50	MEDIUM	68.6	HQc(L2) <= Low	71.7	C	
	50-100	HIGH	42.7	HQc(L2) <= Low	76.9	D	
	100-200	MEDIUM	72.7	HQc(L2) <= Low	39.1	C	
	200-400	ABSENT	62.3	HQc(L2) <= Negligible	33.8	A	*2
	400-600	ABSENT	67.0	HQc(L2) <= Negligible	40.9	A	
	600-800	ABSENT	100.0	HQc(L2) <= Negligible	39.1	A	
	800-1000	ABSENT	100.0	HQc(L2) <= Negligible	36.3	A	
	1000-1150	ABSENT	100.0	HQc(L2) <= Negligible	40.7	A	

*1: Values higher than those indicated for nourishment revealed (Technical Annex, Note 7 Tab. 2.5, Ministerial Decree 173/2016)
*2: Pelite higher than that indicated for nourishment revealed (Technical Annex of Ministerial Decree 173/2016, Figure 7)

Environmental monitoring plan of the sediment tank

Within the Port of Ancona, a sediment tank was built to receive the sediments from the excavation of the seabed of the port itself and other minor ports of the Marche. The tank has a final capacity of 145,000 m_3 (considering the achievement of the altitude equal to approximately +0.7 meters above sea level) and was built by choosing a technical solution that would allow it to accommodate sediments of quality classes B2 and C1, to pursuant to the then current Regional Council Determination 255/09, which represented the highest degree of pollution present in the sediments that can be conferred in a sealed sealed environment, according to the classification provided by the "Manual for the handling of marine sediments" drawn up by ICRAM - APAT ". As established by the successor Legislative Decree 173/2016 "Regulation laying down procedures and technical criteria for the authorization of immersion in the sea of excavated seabed materials", issued pursuant to art. 109 of Legislative Decree 152/2006, the sediment tank can now be used for sediments of quality classes C, D and possibly E, subject to specific risk assessment, as required by point 2.8 "Management options" of the Annex Technician of the aforementioned decree.

In accordance with the provisions of the Disciplinary of the Marche Region of 12/05/2016, the CNR-ISMAR of Ancona has been commissioned by the Ancona Port Authority to draw up and implement a monitoring program aimed at identifying and reducing any impacts caused by the operations of spillage of sediments inside the tank and, above all, from the opening of the gates, with which the tank is equipped, on the surrounding marine environment.

The proposed monitoring program includes an *ante operam* phase, an *in itinere* and a *post operam* phase, with some investigations to be carried out continuously starting from the *ante operam* phase, in order to collect data on hydrodynamics and characteristics physical and chemical of waters, sediments and benthic communities in the stretch of water adjacent to the backfill basin and a series of investigations to be carried out in conjunction with the opening of the gates.

The environmental monitoring plan of the sediment tank of the port of Ancona was drawn up by distinguishing the survey areas and the various environmental matrices examined. In particular, water samples were taken both inside and outside the tank and sediments in the area outside the sediment tank.

Atmospheric Pollution Project (PIA)

As part of the monitoring of pollution in the port area, the Central Adriatic Port Authority is the promoter, collaborator and implementer, in collaboration with the Municipality of Ancona and the Marche Region, for the realization of the Atmospheric Pollution Project (PIA) for the protection of the population from aerobiological pollution and fine dust, approved with Regional Council Resolution no. 621/2018.

The project analyzes and examines in detail the actual impact of emissions and fallout in the territory of the Municipality of Ancona.
The agreement between the Marche Region, the Municipality of Ancona and the Central Adriatic Ports Authority is aimed at improving knowledge on the exposure of the population to allergenic pollens and their potential interaction with atmospheric pollutants such as fine dust (PM10 - PM2,5).

Having acknowledged that the protection of air quality is a priority in any environmental protection policy, in compliance with Legislative Decree no. 155/2010, "Implementation of Directive 2008/50/EC on ambient air quality and cleaner air in Europe", the Marche Region has been assigned the institutional competence to avoid, prevent or reduce the harmful effects of atmospheric pollution phenomena on the human health and the environment as a whole.

At the basis of the Ancona Pollution Project (P.I.A.), a methodological document scheme was drawn up containing objectives, actions, expected results and a financial plan of the project.

The strategic objectives that the firm aims to achieve can be summarized as follows:

1. improve the management of pollen allergy in the population, urban and non-urban, through the use of Aerobiological Information systems and suspended particulates (PM_{10} - $PM_{2,5}$) with the aim of obtaining a better quality of life and direct and indirect reduction of the costs of the Regional Health Service;
2. evaluate the exposure of the population to pollen and their potential interaction with PM_{10} - $PM_{2,5}$ pollution;
3. increase the awareness of institutions, local communities, local health services, legislators, consumers, on the importance of integrated information for improving health among people suffering from pollen allergies and chronic cardio-pulmonary diseases;
4. raise awareness of possible life changes and preventive measures among those suffering from pollen allergies or cardio-pulmonary diseases through the use of aerobiological information systems and chemical-physical composition of the air and supporting educational initiatives aimed at reducing the risk for the most sensitive populations (children and the elderly).

The above objectives can be achieved through the following actions:

- establishment of an Integrated Information System (IIS) which includes communication of the weekly quantity of the various types of pollen, fungal spores and chemical air pollutants (PM_{10} - $PM_{2,5}$);
- assessment of the state of health of patients suffering from cardiorespiratory and neurological diseases, with particular attention to more sensitive groups (children, elderly);
- development of studies-initiatives concerning the use of potentially less allergenic plants;
- an effective mapping also of rural environments on the allergenic profile and that of chemical pollution by suspended particulate;
- communication and dissemination of the results of the PIA to the scientific community.

These actions will make it possible to achieve the following results:

- the creation of a centralized database with data from the PIA;
- the creation of educational/information campaigns for the promotion of better lifestyles and the prevention of related pollution pathologies;
- the creation of a map of rural and urban environments that facilitate the reduction of pollution and the greenhouse effect and are little or no allergenic; - the increase of knowledge about the effects of the interaction between pollen and suspended particulate in order to guide political decisions towards the best environmental and health choices.

Good Practice 2: Adoption of the Environmental Energy Planning Document (DEASP)

Liquefied Natural Gas (LNG)

Significant reductions in the emission limits for shipping are expected in the coming decades. This request will push towards the adoption of new technologies and fuels with a lower environmental impact. Liquefied Natural Gas is a very promising alternative to current fuels to contain CO_2, SOx, NOx emissions induced by Ro-Ro and passenger maritime traffic.
The study of the LNG Supply and Distribution System in the Port of Ancona, commissioned in 2017, is part of the GAINN4MOS initiative, an action promoted by the European Commission among a number of Member States aimed at developing the use of LNG (Liquefied Natural Gas) on means of transport with high installed power (shipping and heavy road transport), promoting the construction of coastal deposits distributed along the Atlantic and Mediterranean coasts.

The goal is to address the challenges posed by the sulfur directive (2012/33/EU) and the directive on the infrastructure necessary for the use of clean alternative fuels (2014/94/EU). In fact, the European Commission, with the European Directive 2014/94/EU on the development of an infrastructure for alternative fuels (DAFI), has established that the Member States adopt, by 2016, development plans for the various alternative sources for the transport sector. LNG is also placed in this context, for which the Directive provides that, through their respective national strategic frameworks, Member States ensure that, within predetermined terms, an adequate number of refueling points for LNG are created both in seaports. and in the roads belonging to the TEN-T core network (Trans-European Transport Network) and in the main inland waterway ports and are required to favor an adequate distribution system for the distribution of LNG in their respective territory, including loading facilities for LNG tank vehicles.

The aim is to reduce the environmental impact of diesel engines in sea and road transport, as well as to reduce operating costs for users of diesel engines and to develop the use of LNG, which, as an alternative to fuels current, allows the zeroing of SOx and particulate matter, a drastic reduction of NOx and CO and a moderate reduction of CO_2, and therefore contributes to the improvement of environmental qualities, together with the use of renewable energy sources.

In this context, the port of Ancona, characterized by an important activity of marine vehicles and a dynamic and infrastructured hinterland, has been identified as one of the possible “core” ports of the Italian network for the storage and distribution of LNG on the national territory. The goal of the work was to provide a technical-economic framework for a supply and distribution system for liquefied natural gas (LNG) in the port of Ancona. In particular, the study consisted of carrying out the following activities:

- Analysis of the potential and future demand for LNG, considering:
  - the refueling and / or possible conversion of land and sea vehicles;
  - an area of influence that includes the Marche, Umbria, Abruzzo, Molise and a part of Emilia-Romagna;

- different temporal and development scenarios, referable primarily to the provisions contained in the European directives 2014/94 / EU and 2012/33 / EU and in Annex VI of the MARPOL Convention.

- Rough sizing and choice of storage system technology (storage capacity, type and number of tanks).
- Analysis of possible solutions for the supply and distribution of LNG.
- Production of the block diagram of the terminal.
- Preliminary analysis on the security of the terminal.
- Definition of the layout and requirements required for the installation area (necessary surface, proximity to the docks for docking ships, connections to ordinary roads, etc.).
- Recognition of the regulatory and authorization specificities relating to the development hypotheses identified.
- Synthetic programmatic / temporal and economic framework of the solutions identified.

Cold ironing in the port of Ancona

In recent years, the port has seen a constant increase in traffic and therefore a consequent increase in the emission of pollutants in the area. The phenomenon is due both to the maneuvering movements of the ships and to the stationing of the same on the quay and to the vehicle loading and unloading. The Central Adriatic Port Authority thus began to take an interest in this aspect of the environmental issue as well.

Below is a brief representation of a plant solution for satisfying the energy demand of ships while stationed in port, annexed to the adopted Environmental Energy Planning Document of the Port System which, to overcome the problem of the high cost of electricity in Italy, proposes a trigenerative production system to produce the necessary energy on site. The power plant, powered by natural gas, in addition to energy for ships, produces a thermal residue that is used for the air conditioning of buildings located in the port area. This is made possible by the design of a highly efficient district heating network. In addition, a compressed air storage system is envisaged to still satisfy the maximum power request but with a lower power plant, exploiting the energy accumulated in the moments of lower demand. The technique allows to level the load, which is highly dynamic, as it depends on the presence of ships in port. This has been designed both to allow the system to always operate at its size power and consequently have a maximum yield and to reduce investment costs thanks to the installation of a smaller power plant, even if this second aspect is compensated by the cost of the storage system itself. The lower part of the electrical load is then satisfied by the power plant, the peaks by the energy storage system. If the latter is not sufficient, we resort to withdrawing electricity from the national grid. First, we moved on to identifying the docks to be electrified and the buildings to be air-conditioned with the district heating network.

The proposed electrification of the docks in the port of Ancona concerns the passenger sector, in particular that of ferries. They are characterized by a fairly regular frequency of arrivals and departures, although variable during the seasons of the year. Furthermore, they do not require particularly high powers, as is the case for example in the case of cruise ships. The latter may be the subject of a subsequent study, as works are planned in the port for the construction of a new quay specifically dedicated to this type of ship.

Ancona Blue Agreement

The Ancona Blue Agreement constitutes a voluntary agreement between the Central Adriatic Port Authority and the Harbour Office of Ancona on the one hand, and the shipowners/shipping companies of the participating ferries on the other, in collaboration with the local shipping agencies. The agreement, signed in November 2018, intervenes on the sulfur content of the fuels used, reduced to 0,1% for the main and auxiliary engines from the completion of the mooring maneuver in port and up to the departure and exit of the port, compared to the 1,5% required by law.

The agreement is part of the implementation of interventions aimed at reducing atmospheric emissions from ships, which constitutes a primary commitment for the Administrations and operators in the sector, in particular given the prospect of the Ancona port basin in the urban center of the city. In fact, the ferries that climb the port of Ancona, mooring adjacent to the city center, are found to operate in the vicinity of heavily man-made areas and therefore can contribute, in association with other factors, to affect the general state of the surrounding air quality.

In order to contribute to the containment of atmospheric pollution levels in urban areas, with particular reference to sulfur emissions into the atmosphere, it was also considered appropriate to intervene on the use of fuels for marine use, also given the obligation of current legislation in on the use of fuels by ships (Legislative Decree no.205 of 09 November 2007), or the use of "marine diesel oil with a sulfur content of less than 0,1%" for ships at mooring, starting from 1 January 2010, providing for the introduction of more stringent limits than those established by current Community and national legislation on the sulfur content of marine fuels, which can also be achieved through the adoption of voluntary agreements between the parties, without prejudice to the limits imposed by current legislation.

All this in compliance with the provisions of the International Maritime Organization and the European Union in the international regulatory framework aimed at prohibiting, starting from 1 January 2020, the use of fuels for maritime use with sulfur content higher than 0,5% in all Member States.

The need to mitigate the phenomenon of the emission into the atmosphere of the combustion gases produced by the ships that pass through the port of Ancona, located in the immediate vicinity of the urban agglomerations, has been shared by the shipowners/shipping companies, through the adoption of measures and voluntary technical measures.

Under the agreement, the signatory shipowners/shipping companies undertake to operate the main and auxiliary engines of the ships they operate with marine fuel with a sulfur content not exceeding 0,10% by mass from completion. of the mooring maneuver in the port, for the entire duration of the stop (regardless of the stop period communicated and made public, even if less than 2 hours), as well as during the unmooring and navigation phases from the quay assigned to the pilot station.

The agreement also provides for good management practices for ship machinery, aimed at further reducing, compared to the provisions of current legislation, the harmful emissions of the exhaust gases produced by them, in order therefore to adopt all technical measures and good practices. for the containment of exhaust gas emissions into the atmosphere, also paying

particular attention to engine maintenance with more frequent intervention intervals than the standard set by the plans of the individual companies.

On the other hand, the Harbour Office, responsible for preparing the docking plan, as part of the agreement, undertakes to optimize the order of entry and exit of the ships by communicating it in time to the ships concerned, while the Central Adriatic Port Authority undertakes, in relation to any changes mentioned above, to monitor and consequently to optimize the organization of the processes of embarkation and disembarkation of ships in collaboration with the maritime agencies and institutions responsible for entry and exit controls from the port.

Good Practice 3: Collection and management plan for ship-generated waste and cargo residues

The measures to carry out the activities related to waste management are proposed below as best practice, i.e. the **Plan for the collection and management of waste produced by ships and cargo residues**, which the AdSP MAC has prepared and approved with Resolution of the Regional Council of the Marche Region n. 1513 of 29 October 2012, recently being updated to Revision no. 2 of 24 March 2021, soon to be approved.

The Plan provides a detailed description of the management of some types of waste (the most common), however it is not to be considered exhaustive and does not exclude or preclude the management of other types of waste not mentioned but still manageable with the current plant structure. / management.

In particular, the management of:

- “Garbage” food waste (sterilized and non-sterilized);
- Liquid waste;
- Load residues;
- Filters, oils and exhausted batteries;
- Non-hazardous waste;
- Other hazardous waste;
- Waste produced by pleasure craft, fishing boats and smaller vessels;
- Waste from the cleaning of water bodies;
- Litter accidentally found at sea.

The Plan is updated every three years and, in any case, in the presence of significant changes in the management of the Port. It is structured according to an "open" system which, in the context of defined strategic choices, delegates the definition of technical-regulatory elements subject to rapid updates to other administrative tools, which are subject to rapid updates (e.g. call for tenders and service performance specifications, local regulations, tariff ordinances, etc.).

In addition to the methods of organizing the service, in the aforementioned Plan it is possible to find, among other information:

- The description of the port, with the relative historical data on traffic, the types of waste collected and the services provided;
- The facilities for the disposal and recovery of waste produced by ships, pleasure boats and fishing boats and cargo residues;
- The tariff regime, both for ships and pleasure craft, fishing boats, small vessels and other vessels;
- The estimate of the costs of the port facilities, also in terms of human resources for the performance of the service, the material resources and the framework of management costs and facilities;
- The Integrated Information System, with relative description, information activities for port users and the information process scheme;
- The guidelines for awarding the service (authorizations, concession reports);
- Identification of the person responsible for implementing the plan.

The details of the articulation of the plan can be found in **deliverable T1.2.1**.

2.2 Greece – Igoumenitsa Port Authority S.A.

IPA S.A has already adopted the most well-known protocols and standards relevant to Port activities. However, in this chapter, two more protocols/ standards were identified and are suggested as best practices.

Best practice 1 (ISO 16304: 2018) regards the arrangement and management of port waste reception facilities. Currently IPA S.A has transferred to external companies the reception, management, and final disposal of waste from ships visiting the port, as a contract work. In case IPA S.A decides to develop port reception facilities at its site, it is suggested to take into consideration and apply ISO 16304: 2018.

Best practice 2 (GRI Standards for Sustainability Reporting) regards structured guidelines supporting organisations, including ports, to draft their Sustainability Reports. IPA S.A currently develops Sustainability Reports, thus adoption of the GRI Standards could be a suggestion for IPA S.A in order to enhance its reporting procedures.

Good Practice 1: ISO 16304: 2018 "Ships and marine technology — Marine environment protection — Arrangement and management of port waste reception facilities"

ISO 16304: 2018 provides a method for addressing ship generated waste and cargo residues from when they are offloaded from the ship, to how they are managed ashore. The provision, operation and use of Port Reception Facilities (PRFs) are inherently linked, so ISO 16304 addresses the design of PRFs, and their operation and management. It is designed to be used by ports and terminals with existing PRFs which aim to refine their systems; it can also be used by new ports and terminals that are developing PRFs.

Parties to International Convention for the Prevention of Pollution from Ships (MARPOL) are obligated as Port States to ensure that PRFs adequate to meet the needs of the ships using them without causing undue delay are provided at their ports and terminals. MARPOL does not seek to regulate the management of ship generated waste and cargo residues at ports and terminals beyond the reception facility requirement. However, ports and terminals may

need to consider national, regional and local regulations. While these regulations can exceed the scope of MARPOL, the International Maritime Organisation (IMO) recognises the need to manage ship generated waste and cargo residues at ports and terminals as part of an environmentally sound management approach for avoiding, minimising, and eliminating pollution from ships.

In consideration of above, ISO 16304:2018 applies to the management of ship generated waste and cargo residues regulated by MARPOL that are discharged at ports and terminals. It also covers principles and issues that should be considered in the development of a Port Waste Management Plan (PWMP) its implementation and PRF operations. The operation of any PRF is governed by the principles and procedures included in PWMP. The procedures to operate the PRF and the development of a PWMP are closely linked and therefore are integrated into this Standard.

ISO 16304: 2018 addresses the principles and issues that should be considered in:

- The development of a port waste management strategy;
- The design and operation of PRF;
- PWMP development, implementation and compliance; and
- PRF management and accountability.

The Standard has been designed to be used by ports and terminals of any size. It does not give specifics on the size or location of a PRF in each port, but provides a list of principles to be considered and applied to any size of type of port or terminal (e.g. marina, fishing port, container terminal, oil terminal, roll on/roll off terminal, cruise terminal, ferry terminal, bulk or general cargo terminal, ship repair or recycling facility, and offshore terminal). Inland ports and marinas and those ports that have entered regional arrangements for the provision of a PRF can also use ISO 16304.

ISO 16304 is meant to complement ISO 14001 by adding a component that extends its principles to management of ships' waste in ports. It can be incorporated easily into other plans for achieving ISO 14001 accreditation, as an extension that focuses on PRF. Conversely, the processes put in place during the preparations for ISO 14001 accreditation will assist in meeting the development of a holistic Port Waste Management Plan under ISO 16304.

Good Practice 2: Global Reporting Initiative (GRI) Sustainability Reporting Standards

The Global Reporting Initiative (GRI) Sustainability Reporting Standards are the most widely used standards for sustainability reporting. The GRI Standards are used by different types of organisations throughout the world, including ports, as a global common language in order to communicate their economic, environmental, and social performance.

The GRI Standards help Organisations increase their transparency and communicate both their positive and negative impacts on sustainable development. The GRI Standards enable consistent and high-quality sustainability reporting, which helps organisations meet the needs of their stakeholders for comparable and reliable data. Any organisation, large or small, private, or public, regardless of sector, location, and reporting experience, can use the GRI Standards to report on its impacts in a standardized and comparable way.

Each Organisation reports on topics that reflect the organisation's significant economic, environmental, and social impacts and that are important to its stakeholders. With the GRI Standards, these are the "material topics" that the organisation reports on. The organisation's material topics are determined based on the organisation's activities and business relationships. Some of the aspects that ports deem important to report include promoting transparency in their management and sustainability actions, strengthening their performance, allowing communication with their stakeholders and meeting their expectations and responding to clients and competition, as well as developing a solid corporate image and a valuable reputation over time.

The use of the GRI Standards is self-declarative, meaning that each Organisation must indicate whether the report has been prepared in accordance with the GRI Standards following the criteria stipulated in GRI 101: Foundation. Reporting Organisations are required to comply with the Reporting Principles for defining report quality contained in GRI 101: Foundation on reporting reliable and quality information.

The GRI Standards are aligned with widely recognized international instruments for responsible business behavior. Organisations can also use the Standards to report on their impacts and progress on the SDGs. Since the adoption of the 2030 Agenda for Sustainable Development, GRI has developed guidance for companies to integrate these Goals into reporting practice, with the GRI Standards at the core.

2.3 Croatia – Zadar County Rural Development Agency

Good Practice 1: Respect the City – action plan

Although it is an initiative launched by the City of Dubrovnik, Croatia, and not the Port Authority, this example is an excellent example of cooperation between key actors in environmental management, waste management and promoting the sustainability of the destination.

Respect the City – Respect the City for a sustainable future of Dubrovnik Respect the City (RTC) is a with an action plan. It is comprised of a set of short-term, medium-term and long-term measures and activities focused on Dubrovnik as the leader in sustainable and responsible tourism in the Mediterranean.

Having recognized the need for both urgent and systematic action based on sustainable models of development of the city and of tourism as its primary economic activity, the City of Dubrovnik has launched the initiative Respect the City. Its aim is to reduce negative effects of overtourism through continued cooperation of stakeholders and a combination of measures and solutions.

The conservation of cultural heritage, the quality of citizens' daily lives and ensuring the best possible experience of Dubrovnik as a destination for its visitors – all those are motives for this shift in destination management. Already during the first year since the launch of the project, Respect the City attracted the attention of international media and the global tourist sector, whereas Dubrovnik is increasingly becoming perceived as a city which has started managing its tourism in a sustainable way.

Figure 5 – Respect the city of Dubrovnik

Good Practice 2: Waste management in the Port of Dover

Waste initiatives have been put in place at the Port of Dover, in order to recognise the value of the waste products generated and increase the sustainability of not only the operations of the harbour authority but those operating within the port estate.

Separate Waste Management Plans are in place for ships waste and port-generated waste. Annual targets are set to reduce waste to landfill and increase recycling for the general waste produced across the port estate. By working with our waste contractors to increase recycling and energy from waste we are on target to achieve a significant 90% landfill avoidance for this general waste stream. Information about changes to the waste service and performance against targets is provided to the main operators within the port community through quarterly meetings and newsletters.

Waste charges have been revised to reflect the value of recyclable waste products and encourage our customers to segregate and recycle and larger receptacles have been designed to reduce transport costs and emissions.

Particular success has also been achieved through the development of a paving framework agreement to cover the paving requirements for all landside infrastructure within the port. Instead of pricing and tendering each paving job separately, the framework takes a long term view of all the paving maintenance requirements within the port. This enables strategic decision making, which improves the efficiency and economies of scale associated with the works. Recycling capabilities and environmental performance were key criteria in selecting the principal contractor. In 2011, 82% of all wastes produced by the framework were recycled into clean aggregate, concrete and road sub base.

Links:
Performance against waste targets and further details of the measures implemented can be found in our annual environmental bulletin available on the Port of Dover website at the following link:

http://www.doverport.co.uk/?page=AnnualReports
The Ships waste Management Plan is also available at:
http://www.doverport.co.uk/_assets/client/images/collateral/Ships%20WMP%20ammended.pdf

Figure 6 – Waste management in the Port of Dover

Good Practice 3: Waste alternative Management System

The Port of Piraeus, Greece (PPA SA) has done a thorough audit within all port area in order to identify the possible sources of recyclable waste. After the identification of the waste streams, a Handbook on alternative waste management was elaborated and an appropriate management system was put in place. The Handbook includes all the procedures and steps that port employees should follow for appropriate waste management and it has been circulated to all the relevant personnel of PPA SA.

Overall, the following procedure has been implemented:

- PPA SA cooperates with the respective recycling companies which have been authorized by the Hellenic Ministry.
- In every field of activity the appropriate number and type of bins and containers for the waste collection have been assigned.
- In each activity sector (e.g. workshop, offices) there has been designated personnel in charge of supervising the waste collection and the implementation of the waste delivery process.
- The recyclable waste is collected and the relevant delivery documents are issued.

The implementation of this system was started in 2005 in a pilot framework, incorporating gradually all possible recyclable waste streams. The system has been further and fully developed in 2009. It is worth noting that certain practices, such as the management of waste toners and cartridges, are not regulated obligations but voluntary initiatives that support the PPA's environmental policy.

The implementation of this waste management system and the relevant record keeping on quantities and types of waste delivered, led to achievements such as the avoidance of bins overflowing and the maintenance of a cleaner port. After the entry into force of the system and its gradual development, the abovementioned waste are managed separately by the biodegradable and common domestic waste, reducing the waste disposed in landfills, saving energy and natural resources, while ensuring environmental protection and public health. This practice has also enhanced the active participation of port employees to PPA SA waste alternative management and thus their environmental awareness as well.

The system is based on the principle of waste transport routes optimization avoiding unnecessary internal routes for the transport of small quantities to a central collection point, as waste delivery is done at the production sites. Moreover, due to the reuse, recovery and recycling of the specific waste (reduced amounts of waste disposed in landfills), the contribution of port activities in air emissions associated with global warming have been decreased. Furthermore, the implementation of the system allows the assessment of the contribution of each activity in waste production and the identification of corrective actions, where appropriate.

Links:

http://www.olp.gr/en/nature-protection/nature-quality

Good Practice 4: Collection and temporary storage of waste generated by small boats

Port of Setubal and Sesimbra (APSS), Portugal, enables and provides means of collection and temporary storage of waste generated by small boats using the best techniques available. Containers for waste contaminated with hydrocarbons, equipped with sump, and wherein the cover container for used oil and has double wall flag strokes. The volume of containers also allows a high turnover and ease of use, allowing high safety standards. In addition, the users of recreational docks are encouraged to adopt good environmental practices, particularly regarding the management of waste generated by they own. The provision of suitable equipment for waste collection, creates conditions to make the source separation improves

the efficiency of waste management, increasing the amount that you can enter in recovery circuits.

Figure 7 – Collection and temporary storage of waste generated by small boats

2.4 Slovenia – Regional Development Agency of Northern Primorska Ltd. Nova Gorica

Good Practice 1: Sustainability Practices in Port Operations

Sustainability strategies achieving long-term viability in the face of economic uncertainty, low environmental and social impacts are critical for sustainable development of maritime operations. Accordingly, integrating the consideration of sustainability into all activities in and around a port is part of an aim to be a sustainable and efficient port. Annual sustainability reports published on port websites suggest guidelines and strategic advice towards port sustainability to address issues related to sustainable port operations and development with economic, social and environmental considerations. The suggested issues for “best practices” include: operational efficiency, safety and security in a port, cooperation and communication, monitoring and upgrading port facilities, and environmental management systems. Objectives of these practises embrace: resource, environmental, community and human resource management, continuous growth, and port operators and supply chain management.

During recent years, to address issues related to sustainable port development and operations, as well as to assist decision-making processes oriented towards sustainable development in port industry, a number of international organizations (OECD, IMO, and ESPO) and international ports have devised and proposed guideline and strategic advice towards port sustainability practises. For instance, international association of ports and harbour (IAPH) introduced best practice cases of European ports. The suggested practises in port operations includes reducing financial and environmental risks in ports; upgrading port facilities and equipment to cut operation costs; sustainable building construction in a port/hinterland; enhancing long-term viability of operations; safety and security in a port; resource efficiency; eco-friendly and socially responsible image; improving relationships with

key stakeholders; port infrastructure utilization; optimizing the routing of vehicles; vehicle utilization (modal shift); employee productivity improvement; recruitment and retention of employees; social and working environment; expansion of the coastal region facilities; and providing incentives for green practices. In addition, based on thematic analysis, prior study clustered the relevant practices into four sub-dimensions incorporating environmental technologies, continual monitoring and upgrading, internal process improvement, and cooperation and communication.

Table 4 – Sustainable practices

Services	**Description**	**Details**
Reducing financial and environmental risks in ports	Banks are concerned about their own legal liabilities, so they are taking a closer look at borrowing companies' eco-efficiency records - More investors are becoming interested in investing in environmentally responsible ports	CO2 emission assessment - Green gas emission assessment - Water quality assessment - Air pollution assessment - FDI (foreign direct investment)
Upgrading port facilities and equipment to cut operation costs	Facilities and equipment improvement - External cost down including pollution, climate change, and other biological damages driving from transport	AMP (Alternative maritime Power) - Tandem spreader - DPF (Diesel particulate filter trap) - e-RTGC (Electric rubber tired gantry crane) - Cold ironing (from inland) - LED street lamp - Solar power cranes
Sustainable building construction in a port/hinterland	- Reducing environmental impacts from construction method - Long-term viability of port facility	- Green building standard (LEED) - Use of noise reduction equipment
Enhancing long-term viability of operations	Using renewable and alternative energy sources for less environmental impacts	Solar energy, wind energy, and tidal energy - Use of CNG (compressed Natural Gas - Use of bio-Diesel, hydrogen fuel - LED (Light Emitting Diode) street lamp - Solar power cranes - Dredging for securing water depth
Safety and security in a port	Reduction of accidents (oil spillage) and noise/light pollution - External cost down including pollution, congestion and accidents	Reduction of accidents from using electronic transport - Public lighting - Auto Monitoring System (AMS)
Resource efficiency	Cutting waste and using natural resources more efficiently can save costs and boost profits	Resource recycling in a port - Sustainable purchasing
Eco-friendly and socially responsible image	Improving 'Green" image, and transparency of port operation	Sustainability report - Incentives to shipping companies and stevedores with eco-friendly equipment

Services	Description	Details
Improving relationships with key stakeholders	Collaboration for minimizing environmental impacts - Environmental groups and businesses are working together more to find solutions	CSR (Cooperate social responsibility) - EMS (Environmental Management System) - Co-operation between stakeholders
Port infrastructure utilization	Improving port infrastructure utilization to minimize congestion in a port - External cost down (congestion, accidents)	Optimum use of space - Efficient gate processing system - Extended gate operating hours
Optimizing the routing of vehicles	Energy/cost efficiency from optimizing the routing of vehicles - External cost down (congestion, accidents and other biological damages driving from transport)	Reduction in road transport - Idling time reduction of ship/truck - AGV (Automatic Vehicle System)
Vehicle utilization (Modal shift)	Employee training/education - The best and brightest young people are more willing to work for environmentally responsible ports	A combination of learning and working activities - Training/education
Recruitment and retention of employees	Job creation - Improving employee's satisfaction	Employee satisfaction - Public infrastructure and architecture for double use
The hinterland social and working environment	Creation of a pleasant life environment	Air quality and climate - Visual impact reduction - Open space and park development
Expansion of the coastal region facilities	Prevention of ocean pollution caused by land activities	Expansion and improve the sewage disposal plants, sewage landfills, waste water disposal plants
Providing incentives for green practices	- Encouraging eco-friendly practices in port activity area	Green ship certification System - Incentives on the new cleaning technology - Green flag incentive program

Some limitations of this present interesting directions for future research. As the theory can be strengthened by utilizing multiple examples, to improve the ability to generalize findings, further studies will be needed to extend the research area, covering the competing global mega container ports. The adoption and implementation of sustainability practice is relevant to attitudes towards responding to the external business environment, such as entrepreneurship and CSR (corporate social responsibility). Therefore, this study recommends that academic attention should be given to the theoretical relationships between attributes such as entrepreneurship and CSR that stimulate the adoption of sustainability practice also required to provide practical implications for port industries.

The »Sustainability Practices in a Port« costs vary according to the individual topic in the proposal, they cannot be estimated - this would require additional studies. The main topics to be estimated are:

- Environmental technologies (new equipment and technology introduction; renewable and alternative energy sources; optimizing the routing of vehicles and ships; vehicle ultičization (modal shift), sustainable building construction)
- Monitoring and upgrading (reducing financial and environemtal risks, improvement of safety and security in a port; upgrading port facilities and equipment, environmental index development)
- Process and quality improvment (joint planning and supply chain integration; port infrastructure utilization; service differentiation; service quality improvement)
- Active participation (training and edcuation; recruitment and retention of employees; waste reduction; providing incentives for green pracitces)
- Communication and cooperation (operational transparecy; exchange of information and knowledge; relationships with key stakeholders).

Good Practice 2: Smart Port

The »Smart Port« includes:

- A smart information system that esures the synchronzation and smooth operation of all traffic and operations at the maritime terminal, through the permanent exchange of data and information., The intelligent information system in an asset to improve the visibility, fluidity, realiability and safety of the marine terminal. It communicates directly with the other sysstems and softwares, namely the radar of the port authority, the cargo community system and also the system of Maritime Business, which allows adapting and improving the level of sevrices. Morever it is accessible from any screen whether it is a computer or tablet.
- A data center: computer data development is forcing the ports to have their own data center to store and analyize all the information of maritime traffic in real time which increases the speed and flexibility of the network and also improves the productivity of the port.
- Cybersecurity: aims to ensure the avaliability, traceability, integrity and confidentiality of information stored and transmitted. This information is threatened by cyberattacks, which can lead to disastrouis consequences such as information theft, remote control of computer systems, sabotage, etc. And sometimes the consequences are at the scale of the country. Then, the risks management of cyberattacks is unvoidable.
- Port automation: automation means the ombination of software,hardware and mechanics. Improving the degree of automation in the port helps to support interaction between different collaborative partners, reduce the number of unnecessary labor, reduce the inactivity rate, ensure speed, reliability, fluidity and traceability, minimize the waste resources and also increase the technical efficency of the port, which is one of the determining factors of productivity.

This suggestion puts the basic pillars of the smart port and it will be relevant to implement the concept in differnet ports to assess quantitatively and qualitatively their benefits. It is essencial to develop new smart port indicators, integrate them into a dynamic performance measurement system and connect the various logistics components in the port area to

monitor the evolution of the port. In terms of technological and IT solutions, most solutions are not yet mature to sever the realization of the full vision of the smart port, so further research in this direction would be needed to fill this gap.

The equipment that is needed in this kind of upgrade is as follows:

1. Smart information system (software)

2. Smart ships: equipped with a satelite system, a set of sensors and monitoring equipment, to imporve the system monitoring and control through increasing the quantity ans realiability of exchange data with the port, in real time. In fact the smart ship is connected with the port to collaborate automatically in the planning of the docks, in the preparation of cargo handling operations and work and materials handling and in the organization of truckers to the hour. This improves the management of fleets and minimizes the waiting time of vessels at the dock and also the time of inactivity. This collaboration between the ship and the port has a considerable marketing impact to make the port smart.

3. Smart container: the container is equiped with a set of sensors that allows collecting data on geolocation, humidity, temperature, vibration, pressure, shock, etc. It communicates remote and directly collected data to the information system, which allows to consult in real time the technical documentation, report damage o reven the plan of maintenacve operations. The smart container gives a constant feedback throughout his trip which gives a gobal vision on the fleed and facilitates the piloting.

4. Automated operations. This concernees the transport, storage and handling of containers inside the terminal. Transportation automation invloves replacing conventional trucks with electronically gudied transport platforms. Then, the storagew operations consist of the use of the rail cranes without operator, thus the operations of storage and extraction of containers are controlled by an automated control system. The dock cranes can be automatic to quickly load and unload ships. The automation of the port terminal internal operations reduces waiting times for ships and trucks and also reduces energy requirements.

Good Practice 3: Circular Economy Network of Ports

Circular economy network of ports, which would provide an innovation ecosystem around the port activity and stimulate circular economy initiatives in ports. All the ports that would join this network would be a part of online platform where there would be information of each port regarding the possibility of which waste is accepted by the port for reuse (metals, plastics, construction materials, biomass, mixed waste, energy, water, etc. and the price-list for the service.

For this reason, some activities would need to be carried out i each port in order for the network to be set up. The basic activities in each port that need to be carried out are as follows:

all ports that would join this network would be published on the online platform, where it would be clear which garbage is being purchased / taken over for new use.

- Mapping of stakeholders including Port Authorities, suppliers and other companies which carry out activities within the port (e.g. start-up incubators). Each partner will seek to bring the regional/national stakeholders from their territory into the network.
- Establishment of links with other related initiatives such as the European Circular Economy Stakeholder Platform. The aim would be to to share experiences and exchange opinions on circular economy solutions in the port sector.
- Definition of the structure, organisation, operating regime, scope and services that will be offered by the network.
- Organisation of internal roundtable discussions on circular economy in each port inviting all the relevant stakeholders. The roundtable discussion would aim at developing a medium and long-term work plan on circular economy within ports.

The consortium would collect needs (e.g. requests for improvements, difficulties) and stakeholder expectations to be considered and compiled in the framework of the various activities and topics foreseen during the project. This interaction with stakeholders would be possible through the organisation of the workshops, enabling:

- Discussion opportunities that arise in the port environment in relation to circular economy as well as the legal, economic, technical and other barriers that prevent or hinder the development of circular economies in the port sector.
- Identify ideas and agreed solutions applicable to specific port problems;
- Facilitate the development of synergies between the different actors in the value chains linked to the port activity.

This network of ports would facilitate the exchange of experiences and good practices, provide policy recommendations and foster the training as well as new business opportunities both in port clusters and other industries related to this environment.
Given that the activity would be common to all ports, a strategy for the implementation of this proposal should be drawn up with the participation and contributions of other ports that decide to accede to this proposal.

As ports play such a crucial role in circular economy, the network of ports will work as a facilitator to find synergies and promote/push all ports to upgrade their current sustainable status in their transitions to a circular economy. By facilitating the connection and communication between stakeholders, it will allow them to easily share their expertise obtained through personal experience in real-life use-cases, allowing the less experienced to familiarise themselves in terms of current best practices related to circular economy and serve as a tool to replicate the practices in their own context/use-cases if possible.

2.5 Serbia – Business association for sport, recreation, rehabilitation and business Eco zone Ada Huja

The Environmental, Health, and Safety (EHS) Guidelines[2] by World Bank Group prescribes the following:

[2] https://bit.ly/3fiQu9h

Good Practice 1: EHS Guidelines

Waste Management

The type and amount of solid and liquid wastes associated with port operations may vary significantly depending on the nature of port operations and the types of ships serviced. Wastes originating at the port may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle maintenance operations, such as paint, scrap metal, used lubricating oils and engine degreasing solvents. Wastes originating from ships may include oily sludge, inert materials such as food packaging, and food waste. Guidance applicable to port generated wastes, whether hazardous or non-hazardous, is discussed in the General EHS Guidelines. Specific pollution prevention, minimization, and control recommendations for ship-generated wastes received by port facilities are outlined below.

General Waste Reception

Port facilities should provide adequate means of receiving and managing effluents and wastes to meet the needs of the port and those of visiting ships that the port is designed to service.

The provision of waste reception facilities should be developed in coordination with the local governments according to their commitments to the MARPOL Conventionas port states. Port waste reception facilities should provideadequate capacity to receive port- and ship-generated wastes, including appropriately sized and located receptacles, and the capacity to deal with seasonal fluctuations.

Ship Wastes

- Information should be available for ship captains to identify solid waste reception facilities and acceptable handling procedures at ports;
- Discharge of solid waste from vessels should be prohibited while in port in accordance with MARPOL and national regulations;
- A collection and disposal system should be developed for ship-generated garbage for ships alongside and at anchor, consistent with the International Maritime Organization (IMO) Comprehensive Manual on Port Reception Facilities. Closable skips should be provided at the berths, and towed or self-propelled barges fitted with skips should be used to collect garbage from ships at anchor; and
- Food waste from ships delivered to the port should be managed according to applicable local regulations intended to protect human and animal health.44 Local requirements may include rendering, incineration, or landfilling of food waste and mixed waste containing food waste.

Hazardous Materials and Oil Management

Hazardous materials at ports typically include large volumes of hazardous cargo, as well as oil, fuels, solvents, lubricants and other hazardous substances used in port activities including vessel, vehicle, equipment and grounds maintenance. Spills may occur due to accidents (e.g., collisions, groundings, fires), equipment failure (e.g., pipelines, hoses, flanges), or improper operating procedures during cargo transfer or fueling, and involve crude oils, refined products or residual fuels, liquid substances, and substances in packaged form. General hazardous

materials management is addressed in the General EHS Guidelines. Additional recommended prevention, minimization, and control techniques specific to ports are listed below.

Spill Prevention

Oil and chemical-handling facilities in ports should be located with consideration of natural drainage systems and the presence of environmentally-sensitive areas/receptors (e.g., mangroves, corals, aquaculture projects, and beaches, etc.). Siting of these facilities should include provisions for physical separation/distance to avoid and minimize adverse impacts.

Hazardous materials storage and handling facilities should be constructed away from traffic zones and should include protective mechanisms (e.g., reinforced posts, concrete barriers, etc.) to protect storage areas from vehicle accidents. Covered and ventilated temporary storage areas should be designed to facilitate collection of potentially hazardous leaks and spills, including the use of sloped surfaces to direct spill flows, and the use of catch basins with valve systems to allow spills and releases to enter a dead-end sump from which spilled materials can be pumped/recovered. Where hydraulic equipment is used over or adjacent to water or other sensitive receptors, biodegradable hydraulic oils should be used.

Ports should include secondary containment for above ground liquid storage tanks and tanker truck loading and unloading areas.

Fueling areas should be equipped with containment basins in areas with a high risk of accidental releases of oil or hazardous materials (e.g., fueling or fuel transfer locations). Fuel dispensing equipment should be equipped with "breakaway" hose connections that provide emergency shutdown of flow should the fueling connection be broken by movement. Fueling equipment should be inspected prior to fueling activities to ensure all components are in satisfactory condition.

Spill Control Planning

Port operators should prepare a spill prevention, control, and countermeasure plan consistent with the IMO Manual on Oil Pollution Section II—Contingency Planning, which:

- Identifies areas within the port zone and nearby vicinity that are sensitive to spills and releases of hazardous materials and locations of any water intakes (e.g., cooling water for shore-based industries);
- Outlines responsibilities for managing spills, releases, and other pollution incidents, including reporting and alerting mechanisms to ensure any spillage is reported promptly to the Port Authorities;
- Includes provision of specialized oil spill response equipment (e.g., containment booms, recovery devices, and oil recovery or dispersant application vessels, etc.); and
- Includes regular training schedules and simulated spill incident and response exercises for response personnel in spill alert and reporting procedures, the deployment of spill control equipment, and the emergency care/treatment of people and animals impacted by the spill.

2.6 Albania - Port of Vlora

Good Practice 1: Ship-generated Waste Management Plan

PPA SA has elaborated and implements a *Ship-generated Waste Management Plan*, in line with the European Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues, as embodied in Greek Legislation, as well as according to the International Convention Marpol 73/78 for the Prevention of Pollution from Ships.

Through the implementation of this Plan, PPA SA aims at the reduction of discharges into the sea and especially the illegal discharges of ship-generated waste and cargo residues from ships calling at European ports, by improving the availability and use of port reception facilities, thereby enhancing the protection of the marine environment.

According to this Plan, PPA SA provides port reception facilities, adequate to meet the needs of all kind of ships that normally call at PPA SA port area, without causing them undue delay.

PPA SA, while designing its port reception facilities, takes into consideration the type of ships that normally call at its port area, their operating needs and estimates both the type and amount of waste and cargo residues they generate, in order to ensure the adequacy of the PPA SA port reception facilities.

In the PPA SA Ship-generated Waste Management Plan, waste and cargo residues are categorized according to the International Convention Marpol 73/78, as following:

- Annex I: Oily waste
- Annex II: Noxious liquid substances carried in bulk
- Annex III: Harmful substances carried in packaged form
- Annex IV: Sewage
- Annex V: Garbage
- Annex VI: Ozone-depleting substances

PPA SA provides port reception facilities for all the above-mentioned types of waste and cargo residues, according to the PPA SA Ship-generated Waste Management Plan. According to this Plan, the ship-generated waste management is divided in:

- Liquid waste management
- Solid waste management

An innovative technology on the sewage reception services is applied in the Cruise area. More specific, a permanent sewage network is operated in this area and the cruise ships calling at PPA SA Cruise Terminal may discharge their sewage by connecting to this permanent network, which connects to the urban sewage network with final recipient the Wastewater Treatment Plant of Athens in Psittallia. This permanent port sewage reception network was constructed to meet the increased needs of visiting cruise ships during the Olympic Games ''Athens 2004'' and since then many cruise ships have benefitted due to saving of discharge time. Saving of energy and fuel, reduction of air emissions and traffic congestion avoidance are also achieved, in comparison with delivering cruise ship-generated sewage on tanker trucks.

Good Practice 2: WASCOL system

Responding to the requirements of Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues, many EU ports have installed reception facilities, implemented waste management plans and developed fee systems. Although in general most of these different practices provide good results, some systems seem to be more effective

than others. For several years now the port of Antwerp applies a strong incentive-based fee system, leaving room for an open market for PRF (free choice for ship-owner/agent), combined with astate-of-the-art monitoring and information system. The volumes of ship-generated waste that are being delivered in Antwerp are not only significantly high but are increasing every year. The system is being monitored through a state-of-the-art information system on ship-generated waste (WASCOL), reducing bureaucracy for the users and increasing transparency. As EMSA considers the WASCOL - system as one of the best practices in EU ports, Antwerp has been invited to present the monitoring and information tool to other EU Member States (SafeSeaNet expert group). The fee system includes a strong incentive towards maximum delivery of ship-generated waste, without limits in terms of maximum volumes. Practices related to ship-generated waste were installed after extensive consultation with all the relevant parties (representatives of PRF, ship agents, Port State Control, environmental administration, etc.) and a forum has been established, were all issues relating to ship-generated waste are being discussed (every 3-4 months). As Port State Control has direct access to the information and monitoring system, the data on ship-generated waste are being used when targeting vessels for inspection.

Plastics have a place at the port, but that place is not in nature. Port of Antwerp is taking various actions aimed at preventing pollution and cleaning up waste and plastics in order to protect fauna, flora and ourselves. Port of Antwerp was the first European port to sign the Operation Clean Sweep charter at the end of 2017. The main objective is to avoid litter in seawater. To this end, they launched the 'Zero Pellet Loss' platform and brought together fifteen port companies from the entire chain of transport, industry and logistics. In 2019, the 'Zero Pellet Loss' platform launched an action plan with numerous measures for preventing the loss of plastic pellets, whether during production, transport, storage or processing. At the Doel Dock, 'Patje Plastic' is fishing out floating waste and plastics so that they do not spread further along the waterways. The design from the Dutch company Allseas is made from 75% recycled materials. The plastic catcher is completely mechanical and uses only wind, water and gravity to keep the dock water clean.

2.7 Montenegro – Ministry of Capital Investments

Best Practice 1: "No Special Fee" (NSF) System

The respective literature reveals that Best Practices can be discerned in more localized environments. One of the increasingly common practices is the "No Special Fee" (NSF)-System, or in some cases its next step the positive incentive approach. This specific approach has been adopted Baltic Marine Environment Protection Commission (HELCOM) in its legislative convention (Helsinki convention). It is noted that HELCOM involves 9 participating countries (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden) as well as the EU. According to HELCOM NSF- system this is ""a charging system where the cost of reception, handling and disposal of ship generated wastes, originating from the normal operation of the ship, as well as of marine litter caught in fishing nets, is included in the harbor fee or otherwise charged to the ship irrespective of whether wastes are delivered or not". Since waste, and in many cases litter, is a direct result of the ship's normal operation thus leading to its creation on boards, the NSF approach was the charging of payment for reception,

handling and disposal of oil residues, sewage and garbage at any calling port, regardless of the use of service or not.

This creates an incentive for the vessels to actively participate, while the fee involved covers waste collection, handling and processing, including infrastructure, and is usually counted on the basis of a ship's gross tonnage. In addition, the fee only covers investments in reception facilities, the operation of reception facilities, repair and maintenance costs of such facilities and the costs of handling, treatment and final disposal of received wastes, preventing its use as a competition tool between the regional ports.

The regional ports have their own waste management charges, calculated per gross tonnage. Any recyclable wastes (included in the chart under the overarching category of domestic waste) are collected / received without any extra cost and include paper/cardboard, glass and metal. The cruise and other ships calling at any of the four presented ports pay any other charges, in addition to this tariff, including vessel charges, mooring and unmooring, water supplies and quay charges. Within this unified scheme the practices of four ports (Copenhagen, Tallinn, Helsinki, Stockholm) are compared with regards to the criteria in the following table.

Table 5 - Baltic Area Waste Fee System

Type of Waste / Charge	Copenhagen	Tallinn	Helsinki	Stockholm
Oily washes	No special fee in general, except for oily tank washing water	No special fee	No special fee, with a cap of 20 m^3	No special fee
Wastewater	No fee for Black water with a cap of 130l per day. Charge for collection of Grey Water.	Free up to 7 m^3. Charge for exceeding amounts	No special fee	No special fee
Domestic waste	No special fee	No special fee	No special fee	No special fee
International food waste	No special fee	No special fee	No special fee, with a cap of 7 m^3 / 6 tons	No special fee
Hazardous waste	No special fee	No special fee	On the basis of occurred costs	No special fee
Electronics	No special fee	No special fee	On the basis of occurred costs	No special fee

Scrubber waste	On the basis of occurred costs	No special fee	On the basis of occurred costs	On the basis of occurred costs
Reductions in waste collection	After 7th port call	Delivery of sorted waste	None	Delivery of sorted waste On the basis of ship type and port calls
Restrictions	Waste fee includes only black water	Waste fee includes only 7 m^3 of wastewater	4h Loading / Collection time limit	None

As noted in the literature, many of the limitations placed are linked to infrastructure restrictions, while in most cases cruise ships are expected to communicate their waste type and quantity to ensure availability of transport means. In addition, all port declare that a major part of ship and cruise ship waste are recycled.

Best Practice 2: Holistic Approach of Port of Dover

Port of Dover, UK, is a port strongly represented in the port literature on good practices. As a multifunctional port including ferry, cargo, cruise and marina facilities and thus the respective multifaceted maritime traffic, it is a good example of approaches that need the contribution of multiple stakeholders.

This is especially true in the case of the environmental approach and its links to the Port's social responsibility. In the environmental sector, the port has adopted a holistic approach involving the traditional and contemporary environmental aspects such as:

- Environmental Monitoring using baseline and indicator parameters according to EU and national legislation;
- Measurement and reducing of Carbon Footprint (reducing it at 59% of base values in 2020) of port operation with regard to its own activities and processes;
- Active pollution prevention via pollution prevention training, to increase staff awareness and the reporting of environmental occurrences. A high level of preparation is maintained in order to cope with any incident in the Port liable to cause environmental harm;
- Establishment of an occurrence reporting system in order to do this, which allows trends to be examined and ensures that training and equipment are appropriate;
- Advanced Waste management on improving its waste management process with most of its waste streams being sent for recycling or reuse. Innovative ideas for future application include continuous improvements in the management of the general waste stream produced from port operations, increasing landfill avoidance through the expansion of recycling initiatives and achieving energy production from waste through incineration;
- Control of Water Quality and Marine Litter prevention;

- Control of Light and Air noise as part of reduction of impact of Port activities.

In addition, the adoption of pro-actively managing and delivering a sustainable port operation, via a certified Environmental Management System (EMS) and the adoption ISO recognized ISO14001 standard which requires demonstration of continual improvement in environmental performance, supports the commitment to the said approaches.

The port's CSR Plan is based on the constant update with the participation of all interested parties and stakeholders such as Port Board, management, employees, customers, suppliers and the community around shared values. The port's CSR Plan is based on the constant update with the participation of all interested parties and stakeholders such as Port Board, management, employees, customers, suppliers and the community around shared values. The overarching criteria for the Port of Dover's CSR activity are:

- Fit to the strategic intent and Port as a business
- Fit to the CSR policy
- Opportunity to create long-term and real value
- Potential for long-term and sustainable partnership (especially with the local community)

All the above-mentioned lead to a CRS plan focused on the local community, but with direct reference links to the Port's environmental policy. It is obvious that this creates the need for regular updates as well as for adaptable strategy, policy and implementation / regulatory texts, that can be adapted on the business level rather than the more inflexible central national authority level.

Best Practice 3: Linking of Port environmental policies to the United Nations Sustainable Development Goals

The best practice identified in the overall literature refers to the linking of Port environmental policies to the United Nations Sustainable Development Goals (SDGs). A set example is, according to UN reporting the Belgian Port of Antwerp, that aims to to work towards becoming a sustainable port reconciling economic, social and ecological interests, by incorporating the 17 SDGs in the port's mission and business plan with a roadmap for 2030.

The incorporation of the environmental aspect of the SDGs might be the general case, as climate change, water, biodiversity and marine environment have been in the target of contemporary approaches for the best part of the last two decades, however the innovative aspect of political, economic and social mixture in the SDGs creates new challenges and opportunities.

Provided that the appropriate tools are available, SDGs are a most suitable platform not only for promoting internal and national sustainable development goals but also for the promotion of regional and international cooperation.

In addition, the SDGs content is most suitable for complementary viewpoints to the established CSR content. In the case of Antwerp, SDGs also formed an assessment framework to encourage a more holistic viewpoint in the organization's decision making,

i.e. climate, well-being, decent work, safety, air quality, mobility, responsible consumption. Examples set, were the integration of SDGs into procurement and concession policies and the

port’s daily operations while the recorded success of certain projects with in the port, deliver, according to the ports officials “proof that the port can be a lever for a sustainable future for others, a test zone for new ideas or technologies” and lead

Furthermore, SDGs and their adoption provide the common ground for similarly thinking organizations for the development of cooperation and establishment of networks such as the Getting to Zero Coalition and the World Ports Climate Action Program (WPCAP), an initiative aimed at reducing CO2 emissions from shipping and ports and improving air quality.

3. Identification of Key actors involved - Possible synergies

3.1 Key actors – Stakeholders

3.1.1 Italy - Port Network Authority of the Ionian Sea & Central Adriatic Ports Authority

Port Network Authority of the Ionian Sea

The Port System Authority of the Ionian Sea, in compliance with the provisions of art. 5 of Legislative Decree 182/03 has drawn up the "**Waste Collection and Management Plan of the Port of Taranto**" approved by Resolution of the Regional Council n. 1407 of 12 June 2015 and in force since 28 November 2004 and subsequent updates. The most recent update of this Plan was approved with D.G.R. of the Puglia Region n. 1203 of July 31, 2020.

The following are specific information on **stakeholders** managing waste and port reception, treatment and disposal facilities:

- **Nigromare S.r.l. Company**: merchant ship-generated waste collection generated by vessels docked in the port of Taranto, offshore, beyond roadsteads/within roadsteads in Mar Grande.
- **RTI Morfini S.p.A./Hidrochemical S.p.A. Company**: collection and transport of bilge waters, slops, sludge having a flashpoint higher than 60°c and the merchant ship ballast water.
- **Ecologica Sud Company by Vito D'Angiulli**: used oils collection, unloaded by fishing and recreational vessels and ships, as well as used filters and exhausted lead batteries are collected in two reception facilities, located in the port domain and is managed by the **company Teorema S.p.A.**.

In addition, in the Port of Taranto there is a pollution prevention and protection service and emergency intervention for the remediation of hydrocarbon stretches of water and port areas given in concession by the local Harbor Master's Office to the **Company Ecotaras S.p.A.**. The number of daily interventions is on average equal to about 2/3, of which at least one near the areas under concession to the refinery in the Port of Taranto.

The Port System Authority of the Ionian Sea, in order to increase efficiency in waste management and improve the environmental status of the Port of Taranto, has issued the **Regulation for the regulation of the collection service of waste from board ships parked in the port and in the dock,** in accordance with the main legislation in force on the subject.

The Regulation regulates the services of collection, transport, treatment and disposal and/or recovery of:

- waste (special waste, waste similar to municipal solids, black water, waste consisting of food products and their residues landed from ships from non-EU countries, coming from the activity of embarkation and disembarkation of goods, etc.) from board merchant ships stopped in the port of Taranto;
- bilge water, washing water, flammability-point bilge waters of more than 60°c and ballast water and ship cargo residues.

In particular, the organization of the service provides that the masters of ships arriving in the port of Taranto fill in in all its part a form in accordance with Annex III referred to in Legislative Decree 182/03 and, also through the Maritime Agencies, forward it to similarities to the provisions of art. 1-2 of Order No 234/2016 of the Port Authority on the "Port Management Information System – PMIS". The Port Authority transmits the information to the service dealers.

In addition to the Maritime Agencies, port authority and concessionaires of the aforementioned waste management activities, a category of stakeholders of significant importance are certainly the users who use the services offered by the Ionian Sea Port System Authority and, more generally, the dealers managing industrial settlements. For these, several and numerous awareness-raising actions are carried out on the issues of waste management and environmental protection (also through the distribution of brochures and the affixing of appropriate signs).

Among the main stakeholders, the role of:

- ARPA Puglia that suggests the general guidelines of the Monitoring and Control Plan and the punctual methods for the analysis of environmental matrices;
- Companies and professionals included in the Register of Suppliers of the Ionian Sea Port System Authority;
- Shipping companies with which to interface for the development of green energy supplies (cold ironing and LNG);
- DIPAR as technical consultant through its Scientific Technical Committee in defining the operating methods of the Monitoring Plan, in the preparation of the technical elaborates of the DEASP, etc.

Central Adriatic Ports Authority

Below is a non-exhaustive list of the main stakeholders typically involved in the implementation of the rules and protocols on port waste management.

In the first place, it is certainly necessary to mention the users of the port, port operators and concessionaires, fishermen and boaters. Their contribution in the correct implementation of the protocols is fundamental for the effective and efficient management of waste.

As already reported in paragraph 5.3 of this document, within the Port of Ancona, the waste collection service from ships moored in the Port of Ancona and from ships anchored in the roadsteads and at the Falconara Marittima oil terminal has been entrusted to the Association Temporary Company (ATI) made up of the companies **Gruppo Garbage Service Srl** (parent company), **Fulmar Ecological Maritime Services S.r.l.** and **Carbonafta & Carbometalli S.r.l.**

The concessionary ATI therefore provides for the performance of the following services within the Port of Ancona, with guaranteed operation 365 days a year, with 24-hour service:

- Collected, transport, treatment, recovery and disposal of the denials of ships of each gender and type;
- Anti-pollution and de-pollution at sea from:
    - o oil tankers (drafting of breakdowns, patrols, etc.);
    - o spillage of hydrocarbons (with suitable boats);

o solid waste;

- Cleaning of waters and state-owned areas;
- Management of emergencies from spills into the sea;
- Environmental remediation.

The ATI uses nautical and land vehicles for the collection of waste produced in the port area.

Again, among the key players in port waste management we find:

- The Harbour Office: The Corps is the recipient of functions mainly related to the regulation of civil and productive uses of the sea, ports and coasts, as well as maritime transport in general. The attributions of a strictly military nature cover a substantially residual component linked to the concurrence activities in coastal defense and in supporting the action of the naval units of the Italian Navy. The staff of the Corps is vested with the qualification of officers and agents of the judicial police, for the violations provided for by the navigation code (article 1235) and other special laws (fishing, maritime state property, pleasure boating, environment, etc.).

Briefly, the activities carried out can be summarized as follows:

- search and rescue at sea (SAR);
- navigation safety;
- supervision of the operation of the port;
- marine environment protection;
- national control center for sea fishing;
- training of maritime personnel;
- registration of merchant, fishing and pleasure vessels;
- litigation for maritime administrative violations;
- maritime technical-administrative police including: the regulation of maritime activities (power of ordinance), control of maritime traffic, maneuvering of ships, inquiries into maritime accidents, management of ports not seat of a Port Authority;
- testing and inspections of coastal deposits;
- surveillance and maritime state police;
- recruitment of Navy military personnel;
- underwater archeology;
- contribution to the fight against illegal immigration by sea;
- civil protection services;
- traffic police services in port areas (article 12, paragraph 3 letter f of the highway code);
- anti-terrorism and security services, both in port areas and on board national and foreign ships, in compliance with current national and international legislation.

- Port chemist: is a professional figure provided for by the Navigation Code (Article 46 and following). The chemist of the port has an adequate knowledge of many professional topics, of the rules and regulations in force regarding naval and port safety, prevention of pollution at sea, degassing and remediation of tanks used for the transport of petroleum or chemical

products, both in liquid and gaseous state, refrigerants and under pressure, etc. The port chemical consultants, for example, have the task of ascertaining the dangerous conditions of ships as regards the presence of explosive, flammable, poisonous, corrosive or otherwise harmful and dangerous vapors or gases, carrying out the checks with all technical means jointly to possible chemical processes.

- Ministry of Health (maritime health offices): The Maritime, Air and Border Health Offices are present at the main international entry points (ports and airports) and carry out the tasks of international prophylaxis and cross-border health; these Offices guarantee the health defense of the national territory from the risk of importing infectious diseases through the international movement of people, means of transport and their cargo.

- Marche Region: which has the legislative power in matters of regional territorial planning and internal mobility, infrastructural endowment, planning and organization of health and social services, promotion of local economic development and organization of services within the region to businesses; on the subject of discipline, as far as regional interest is concerned, of cultural activities, of the enhancement of environmental, cultural and landscape assets, of regional enhancement and organization of tourism, of regulation, on the basis of specific agreements concluded at the regional level, of the financial relations between the territorial bodies of the Region for the respect of the regional and local programmatic objectives of public finance, as well as in any matter not expressly reserved to the exclusive competence of the State.

- Municipality of Ancona: local autonomous body that represents the community of the city itself and of the neighboring countries included in the municipality itself, taking care of the development and interests of the belonging fractions.

3.1.2 Greece – Igoumenitsa Port Authority S.A.

The port community in Igoumenitsa is mainly consisted of the Port Management Authority (Igoumenitsa Port Authority S.A), the ships, and the Igoumenitsa Coast Guard. The above actors/ stakeholders are responsible for the control/ implementation of the Waste Collection and Waste Management Plan for the Port of Igoumenitsa. Besides them, other actors are also involved in the implementation of the Waste Collection and Management Plan as well as in the implementation of protocols and standards, environmental measurements and assessments taking place in the Port of Igoumenitsa to ensure its environmental sustainability.

Specifically, aiming to ensure the successful implementation of the Waste Collection and Waste Management Plan, a dedicated office has been set up in the Port area. The office is run by IPA's contractors - who are responsible for the provision of waste reception facilities, and its operation is supervised by IPA S.A (Directorate of Port Services).

According to the Regulation of Internal Organisation and Operation of IPA S.A, the Directorate of Port Services is responsible for:

- The coordination and operation of the service delivery system for the ship-generated waste and cargo waste facilities.
- The supervision and control of the contracts of IPA S.A with the contractors.

- The monitoring and certification of the provisions of the contract's rights in favor of IPA S.A; as well as for sending the relevant statements to the Department of Finance for the invoicing and collection of related revenues.
- Monitoring compliance with environmental conditions regarding collection, treatment, and final disposal of waste and residues.

The ships arriving/ operating at the port are the waste producers. These are responsible for providing adequate information to the authorities and to the operators responsible for waste reception facilities about their waste and their storage capacity. In addition, the ships are obliged to implement the Plan and dispose their waste in organised port waste reception facilities.

Igoumenitsa Coast Guard is responsible for the conformity control of the ships approaching the port area as well as for the control of the waste management procedures followed by the ships. The Coast Guard is also obliged to manage the information it receives from ships and to utilize the data for a variety of purposes.

The following, sub-sections present some key-actors and stakeholders that the IPA is in collaboration or can create synergies and collaborations in the future enhancing the Environmental and social profile of the port and improving the existing waste management and monitoring system.

Table 6 presents in detail the key stakeholders and their contributions in enhancing the Port's environmental status.

Table 6 - Key stakeholders and their contributions in enhancing the Port's environmental status

Key Actors/ Stakeholders	Responsibilities/ Contributions
Ships	Waste Producer
	Responsible for providing adequate information to the authorities and operators of waste reception facilities about their waste and their storage capacity.
	Responsible to implement the waste management plan.
	Responsible for delivering their waste to organised port reception facilities.
Igoumenitsa Coast Guard	Responsible for the conformity control of the ships approaching the port area.
	Responsible for the control of the waste management procedures followed by the ships.
	Responsible to manage the information received from ships and to utilize the data for a variety of purposes.
External Technical Expert [HELLENIC ENVIRONMENTAL CENTER (HEC) S.A.]	Contractor responsible for the disposal of ship generated liquid waste.
External Technical Expert [ANTIPOLLUTION]	Contractor responsible for the collection and disposal of solid waste.
External Technical Expert [BIOLAB]	Contractor responsible for conducting seawater quality measurements.
Institutional Body	Responsible for IPA's Certification with ISO 14001

Key Actors/ Stakeholders	Responsibilities/ Contributions
[EUROCERT]	
Institutional Body [Lloyd's Register]	Responsible for IPA's Approval to be certified with PERS
Institutional Body [Ministry of the Environment and Energy]	Responsible for IPA's Approval to be registered in EMAS

3.1.3 Croatia – Zadar County Rural Development Agency

In Table 7, the stakeholders are listed according to their involvement in the project and pilot activity of the Port of Zadar Authority and based on their role, importance, contribution to the project, benefits and support they are providing to the project. Also actions to improve their support are indicated in order to increase their level of current support.

Table 7 - Stakeholders involvement strategy

Stakeholder	Role	Importance	Contribution to the project	Benefits	Conflicts	Current support	Strategies to improve support
Croatian Ministry of the Sea, Transport and Infrastructure	Observer, will be included in dissemination activities	HIGH	Croatian Ministry is informed about activities to be performed within the project and has expressed high interest in the results.	Ministry supports activities to be performed within the pilot action in the port of Gazenica.	None	Informal support	Inform the Ministry about implemented activities. Include them in dissemination activities.
ZIPO d.o.o.	Observer; Concessionaire for the provision of passenger services with the use and maintenance of port facilities (infrastructure and superstructure) in the area of the port Gaženica and is obliged to take measures and activities to protect and preserve the marine environment and prevent its pollution.	HIGH	ZIPO d.o.o. is not directly involved in implementation of project activities but as the main concessionaire has high interest in the project activities	ZIPO d.o.o. will benefit from project activities and is highly interested	None	Informal support	Improve contact, inform about implemented activities. Include them in dissemination activities.
Luka Zadar d.d.	Commercial cargo port concessionaire	HIGH	No contribution.	Although they are located in the cargo port which is not a subject to the project activities, know-how and best practice examples from the ECOWAVES project can be	None	No support	Will be informed about project activities and invited to participate to dissemination activities.

Stakeholder	Role	Importance	Contribution to the project	Benefits	Conflicts	Current support	Strategies to improve support
				used for the future environmental plans.			
City of Zadar	Observer, will be included in dissemination activities	MEDIUM/HIGH	No contribution.	Best practice examples from the ECOWAVES project can be used for the future environmental plans.	None	Informal Support	Contact and inform the City of Zadar about activities within the port. Include them in dissemination activities.
Zadar County	Observer, will be included in dissemination activities	MEDIUM/HIGH	No contribution.	Best practice examples from the ECOWAVES project can be used for the future environmental plans.	None	Informal Support	Contact and inform the Zadar County about activities within the port. Include them in dissemination activities.
Zadar County Development Agency (ZADRA NOVA)	Observer, will be included in dissemination activities	MEDIUM/HIGH	No contribution.	Best practice examples from the ECOWAVES project can be used for the future environmental plans.	None	Informal Support	Contact and inform ZADRA NOVA about activities within the port. Include them in dissemination activities.
University of Zadar	Interested in project activities, will be included in dissemination activities	MEDIUM/HIGH	No contribution, possible engagement for further analysis	University of Zadar, Maritime Department is highly interested in project activities and results with special emphasis on activities of the Zadar Port Authority.	None	Informal support	Contact and inform the University about activities within the port. Include them in dissemination activities and potential further analysis during or after the project duration.
Faculty of Maritime Studies in Rijeka	Observer, interested in project activities, will be included in dissemination activities	MEDIUM/HIGH	No contribution, possible engagement for further analysis	Highly interested in project activities and results for their future activities	None	Informal support	Contact and inform the Faculty about activities within the port. Include them in dissemination activities and potential further analysis during or after the project duration.
Ministry of economy and sustainable development	Observer, interested in the sustainable development activities, will be included in	MEDIUM/HIGH	No contribution	Know-how and best practice to be used in future projects and activities.	None	No support	Contact and inform them about project activities. Include them in

Stakeholder	Role	Importance	Contribution to the project	Benefits	Conflicts	Current support	Strategies to improve support
	dissemination activities						dissemination activities.
Zadar branch of the Croatian Chamber of Economy	Interested in project activities, will be included in dissemination activities	MEDIUM/HIGH	No contribution	Know-how and best practice to be used in future projects and activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Harbormaster`s office	Located in the port terminal building	MARGINAL/LOW	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Police (border and maritime)	Located in the port terminal building	MARGINAL/LOW	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	No support	Contact and inform them about project activities. Include them in dissemination activities.
Custom office	Located in the port terminal building	MARGINAL/LOW	No contribution	Since they are located in the port terminal building, they will have indirect benefits from the project activities.	None	No support	Contact and inform them about project activities. Include them in dissemination activities.
Jadrolinija G&V Line Miatours	Liner shipping companies, located in the port	MEDIUM/HIGH	No contribution	Since they are located in the port, they will have direct benefits from the project activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Cruise companies as – Scenic Cruises, Grand Circle, Aida Cruises,…	Cruise companies – using the Port of Zadar for transit and turnaround activities	MEDIUM/HIGH	No contribution	Since they using port facilities, they will have direct benefits from the project activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.
Čistoća d.o.o. Zadar Cian d.o.o. Split IND-EKO d.o.o. Rijeka Dezinsekcija d.o.o. Rijeka	Concessionaires – waste removal	MEDIUM/HIGH	No contribution	Since they collecting port waste - know-how and best practice to be used in future projects and activities.	None	Informal support	Contact and inform them about project activities. Include them in dissemination activities.

Stakeholder	Role	Importance	Contribution to the project	Benefits	Conflicts	Current support	Strategies to improve support
Ciklon d.o.o. Zadar Sordes d.o.o. Zadar Odlagališče sirovina d.o.o. Zadar							
General Public	Visitors, Tourists	MARGINAL/LOW	No contribution.	Rising awareness about sustainable solutions and their importance. Direct benefit – better devices for waste disposal	None	No support	Will be informed about the project activities and included in dissemination activities.
Local and National Media	Dissemination activities.	MARGINAL/LOW	Contribution in terms of communication and dissemination activities.	Rising awareness about sustainable solutions and their importance.	None	No support	Will be informed about the project and included in dissemination activities.

3.1.4 Slovenia – Regional Development Agency of Northern Primorska Ltd. Nova Gorica

Shareholders realize their management rights at the General Meeting of Shareholders. The powers of the General Meeting and other matters directly related to the General Meeting are set out in the Companies Act, the Company's Articles of Association and the Rules of Procedure of the General Meeting. For communication with shareholders, the joint stock company uses the following forms of communication: - regular general meetings of shareholders, - information system of the Ljubljana Stock Exchange SEOnet, - Luka Koper website with a special section 'for investors', - participation of company representatives in investment conferences at home and abroad, - monthly the newspaper Luški glasnik and its version, which is adapted for the external public, - the annual publication of the brochure Luški delničar for all shareholders, - press conferences on the company's operations, - meetings at the company's headquarters.

Stakeholder identification: Stakeholders of Port of Koper, which are defined and identified in the Management Policy of Luka Koper, d. d . are:

Shareholders: realize their management rights at the General Meeting of Shareholders. The powers of the General Meeting and other matters directly related to the General Meeting are set out in the Companies Act, the Company's Articles of Association and the Rules of Procedure of the General Meeting.

Customers dictate constant adjustment and introduction of changes and improvements in the company's operations. Customer satisfaction is the basic guideline of all employees. From the first contacts with customers, then the provision of services for them all the way to resolving possible complaints, it is necessary to be aware that customer satisfaction gives meaning to work and is the foundation of realizing the vision and mission of Port of Koper. Customer satisfaction is regularly monitored by Port of Koper. It provides customers with top quality services, quick response to their demand and effective information and all other necessary support. The existing port management model is the basis for equal treatment of all customers.

The port community is involved in changes in the functioning of the port system as a whole. The port community is an informal association of all stakeholders whose business activity is directly related to the provision of port services. These are clients of services - freight forwarders, agents and carriers, united in professional organizations - as well as representatives of control houses and inspection bodies and state institutions, who all together form expectations for the Port of Koper with the aim of coordinated operation at the entry or exit point. It is physically represented by the port area throughout the logistics chain. Port of Koper responds to these requests by coordinating them and communicating with interested stakeholders. The company's business success and the reputation of the Port of Koper are also related to the work of suppliers, so in achieving business goals, the efforts of all business partners who are involved in the operation of the port system as suppliers of necessary products or services are respected and highly valued.

Employees are encouraged to do a great job and the successful are rewarded. The culture of partnership with employees is built on the affiliation, cooperation, creativity, respect and responsibility of each individual. Much attention is paid to internal communication, as it is the foundation of a comprehensive communication web. Employees are acquainted with news, internal acts and other information through notifications via e-mail and notice boards, the monthly internal newsletter »Luški glasnik«(Port Newspaper) and the intranet. Employees who do not have access to a computer access the published information through information provided in the operative. Special emphasis is also placed on direct communication between employees in the form of working and operational meetings, quality teams, coordination, annual managerial interviews with colleagues, conferences and other forms of teamwork. Employees are encouraged to undergo continuous training. Through development plans, the career development and critical competencies of an individual employee are defined in accordance with the company's long-term development needs.

Commitment to sustainable development is one of the fundamental strategic directions. The focus is on establishing and maintaining partnerships with the **local community and the wider social environment.** This simultaneously ensures the successful development of employees and strong support for the social environment, and upgrades the care for the natural environment. Sponsorships and donations support education, sports, culture and humanitarian projects. Once a year, the 'port door opens wide' and the organization of the Port Day enables visitors from both the local and wider environment to see the port, piers, lifts, devices and transhipment and other activities.

State authorities: The state is aware that the Port of Koper, as the only Slovenian port, is extremely important for the entire economy. In 2008, the joint stock company was granted a concession for the performance of port activities, management, development and regular maintenance of port infrastructure in the area of the Port of Koper.

The essential elements of the concession contract are:

- the duration of the concession contract,
- determination of the method of calculating the concession fee,
- agreement between the contracting parties on how to invest in port infrastructure,
- rules for the management, administration and operation of the port,
- ensuring the openness of the port,
- rights and obligations of the parties upon termination or termination of the concession relationship.

The duration of the concession is 35 years, as stipulated by the Maritime Legislation Act. The agreed concession fee amounts to 3.5 percent of the company's operating revenues, less fees charged. By paying the concession fee, the joint-stock company, as the concessionaire, also pays the rent and the building right, and is exempted from paying the port use fee. The concession fee includes water rights, water fees and other fees related to the use of the sea. Investments in port infrastructure are made by the concessionaire in agreement with the Republic of Slovenia and on the basis of the valid five-year port development program. The management, operation and operation of the port were divided between the grantor and the concessionaire and agreed on the methods of coordinated action to achieve the objectives of the concession in the interest of both.

Ensuring the openness of the port is the obligation and goal of both parties. It is an obligation to provide services to anyone who is interested and fulfills the conditions in accordance with the principles of the acquis. The company's goal is to make the port of Koper the primary and best port for the countries of Eastern and Central Europe.

Media: The company is open to the general public. It answers media questions on an ongoing basis and keeps them informed about business operations and innovations in the company. It also publishes information on the company's website www.luka-kp.si and on the company's sustainable portal www.zivetispristaniscem.si. The company prepares press releases for the media, organizes press conferences and invites them to important business events and visits.

3.1.5 Serbia – Business association for sport, recreation, rehabilitation and business Eco zone Ada Huja

Based on the Law on Navigation and Ports on Inland Waters ("Official Gazette of RS", no. 73/2010, 121/2012, 18/2015, 96/2015 - other law, 92/2016, 104/2016 - other. law, 113/2017 - other law, 41/2018, 95/2018 - other law, 37/2019 - other law and 9/2020) **The Port Management Agency** is responsible for activities related to the acceptance of waste, garbage , sanitary waste and bilge water from vessels (Article 208, paragraph 2). This law also regulates the procedures for issuing permits for performing port activities in ports, ports, international passenger ports, ports for own needs and temporary transhipment points.

Pursuant to the Law on Navigation and Ports on Inland Waters, certain issues are regulated in more detail by the following regulations:

- Decree on conditions for navigation and rules of navigation on inland waters ("Official Gazette of RS", No. 96/2014) regulates, inter alia, the prohibition of discharge, spillage or discharge into the waterway of any objects or substances that may cause interference or danger for navigation or for other users of the waterway, including any form of oil waste or a mixture of such waste with water, as well as obligations in case of accidental discharge of objects or substances (Article 17);
- The Decree on the conditions that must be met by ports, ports and temporary transhipment points ("Official Gazette of RS", No. 33/2015 and 88/2016) determines, among other things, the obligation of ports of international importance to provide ship collection services, ie to be equipped with receiving stations for taking over the waste generated during the operation of the ship, as well as vessels for receiving waste oil, waste water, waste lubricant and municipal waste (Articles 3 and 13). This is in direct contradiction with the Law on Waste Management, since Article 71 prohibits the import of hazardous waste, and there is a problem of acceptance of hazardous waste (waste oils, etc.) from foreign ships, because the acceptance procedure is treated as import of hazardous waste. Given that adequate amounts of waste are necessary for the sustainable operation of the terminal, it will be necessary to consider possible solutions that will create a basis for receiving waste from foreign vessels, and on the other hand, will provide services to foreign vessels in accordance with relevant EU regulations.

After providing the necessary equipment for waste collection, the Port Agency is obliged to hire an operator who has a waste management permit, issued by the Ministry of Environmental Protection (hazardous waste), or local government units (non-hazardous waste). The list of operators is available on the website of the Serbian Environmental Protection Agency. Also, any movement of hazardous waste must be announced to the Environmental Protection Agency by filling in the Document on the movement of hazardous waste. The Port Management Agency is obliged to keep daily and annual records on waste generation and to report once a year, ie by March 31 of the current year, to the Environmental Protection Agency on the annual amount of generated, delivered and stored waste from the previous year.

3.1.6 Albania - Port of Vlora

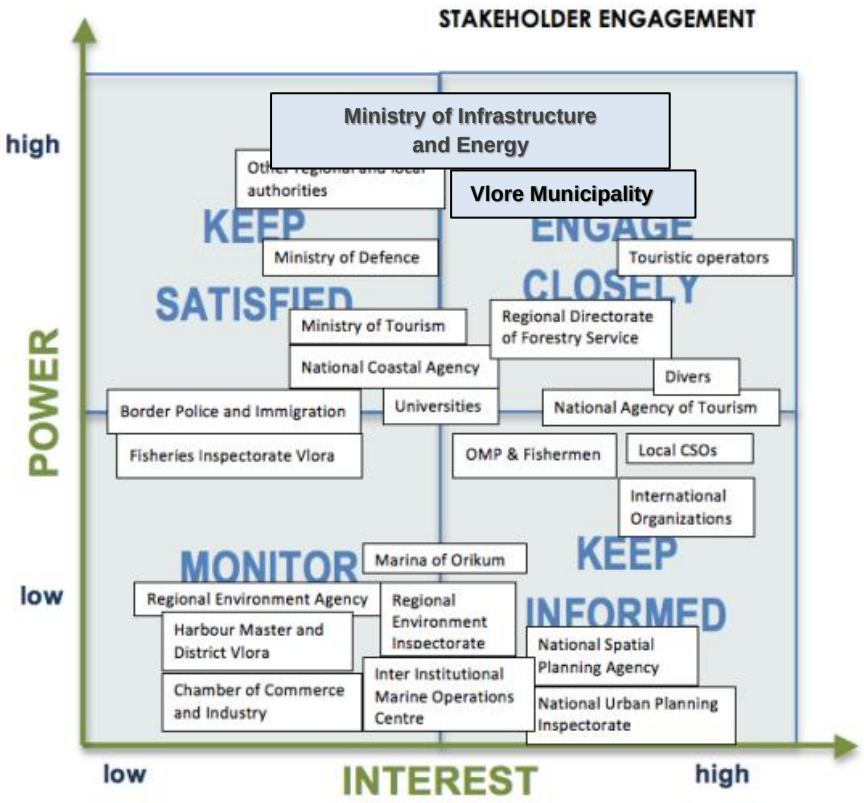


Figure 8 - Stakeholder engagement

A large number of institutions are responsible for waste management and the environmental situation in the port and in the Bay of Vlora, given that we have the presence of the Karaburun-Sazan Marine Protected Area and this makes us have a cooperation and integration of responsible institutions not only for the port and maritime traffic, but also the institutions responsible for protected areas.

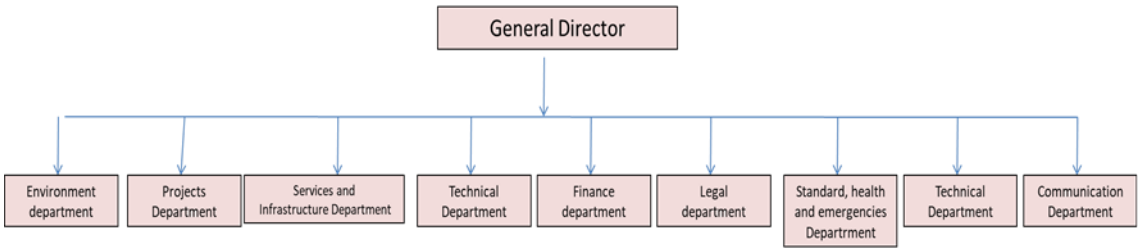


Figure 9 - Main departments of Vlora Port

Regarding the port authority personnel, the main department that is included in the implementation of waste management and environmental status is the environmental department and Standart, health and emergencies department in case of oil spills. The role of the environmental sector with only just one environmental specialist is to manage the waste inside the harbour of Vlora, in the land part.

To manage all the solid waste that are inside the port of Vlora is contracted only one private company which is responsible for waste management throughout the city of Vlora. The role of this company is the collection of solid waste collected in the respective bins found in the port of Vlora, 2 times a week.

Figure 10 - Vlora Port harbour

3.1.7 Montenegro – Ministry of Capital Investments

The Port of Bar is located on the western area of the city of Bar. Its ownership status is Landlord port (public ownership and contracted private operations regarding service providing). The Port is a multipurpose port featuring quay length of 1,440 m with dedicated terminals for container ships, general cargo ships, RO RO and cruise ships, and covers the total area of 518.790 m2 with nine berths and annual handling capacity of 750,000 TEU and 6.0 million tons of general cargoes.

The entire area of the port of Bar, with the exception of PIER V (Passenger Terminal), operates under a free zone regime. The free zone is mostly operated by Port of Adria (approx. 90% of the Zone).

The main operators of the Port are “Luka Bar" AD and “Port of Adria" AD.

“Luka Bar” AD, is a joint stock company whose main activity is handling and storage of goods, organized in accordance to the Law on Business Organization of Montenegro as a single corporative, logistic, technically and technologically completed unit. “Luka Bar” AD was restructured according to the restructuring program of the Government of Montenegro, and following the Shareholders' General Assembly decision of the 04.09.2009 meeting, new joint stock company the "Container terminal and general cargo" was created and incorporated. This company was privatized and under the new name “Port of Adria” AD was acquired in 2013 by Global Ports holding the operating rights. GPH owns 62.09% shares in Port of Adria.

As a result, the facilities of “Port of Adria" AD is located next to the „Luka Bar" AD. It has a container terminal with 330 m of operational shore and depth of 12 m, as well as a state-of-

art container lift (40t) and open storage area of the capacity of 2500 TEU and 180 refrigerated containers. It also has two quays for general cargo equipped with port lifts and closed storage area of 7.6 ha and open storage are of 5.86 ha.

Figure 11 - Port of Bar Satellite Picture

The third critical operator in the Port of Bar is the contracted waste operator for it (in accordance with the respective Waste Management Plan), Hemosan" Ltd. Bar. The company's activity cover not only Bar but also, the majority of the country's major port and marinas.

According to the company's public information and documentation, the applied ISO standards are the following:

- ISO 5001:2011
- ISO 9001:2015
- ISO 14001:2015
- OHSAS 18001:2007

The presentation of infrastructure and equipment regarding the waste management for the country's ports and marinas is based on the provided information by the contracted waste operator, Hemosan Ltd. Bar.

The company owns two Eco centers, one of which is in the Port of Bar and the other one in the Adriatic shipyard Bijela. The Eco center in the Port of Bar includes a recycling center for

the acceptance, disposal and treatment of oily and wastewater (slop, bilge water, sludge) collected from the vessels.

The most important equipment contains of one vacuum truck (10 m3) and cistern (32 m^3). The garbage from ships is collected on daily basis, and the average number of wastewater intakes on monthly basis is 5-10 times. All waste waters are subject of mechanical-chemical treatment in Hemosan's facility in Port of Bar.

3.2 Possible synergies

3.2.1 Italy - Port Network Authority of the Ionian Sea & Central Adriatic Ports Authority

Port Network Authority of the Ionian Sea

With a view to continuous improvement and attention to the environmental impact deriving from port activities, the following proposals for synergies with the main actors / stakeholders are considered to be improving:

1) Evaluation and sharing with interested operators of incentive measures in favor of those who reduce the quantities of waste produced and who adopt good operating practices;
2) Involvement of stakeholders in the implementation phase of the activities planned by the Port System Authority of the Ionian Sea aimed at an efficient and sustainable management of the port system in terms of environmental energy, as reported in the "Planning of interventions and coordination with the infrastructural planning of the Port System "of the Environmental Energy Planning Document (DEASP) of the Port of Taranto drawn up on behalf of the Port System Authority of the Ionian Sea, in collaboration with DIPAR (Production District for the Environment and Reuse - Puglia Region):
    a. Technical-economic feasibility study for the development of electricity production from renewable sources in the port area;
    b. Technical-economic feasibility study for the electrification of the quays;
    c. Technical-economic feasibility study for energy and environmental upgrading of the institution's facilities in the port area;
    d. Launch of the procedure for the expression of interest for the construction of LNG fueling systems;
    e. Publication of the tender for the identification of the Single Manager of APPEA services;
    f. Technical-economic feasibility study for the construction of a plant for the energy exploitation of wave motion;
    g. Technical-economic feasibility study for the diffusion of electric mobility in the port area.

    The interventions identified, concerning both the structures and the port infrastructures, will pursue various objectives, aimed at the economic and environmental improvement of energy consumption and supplies, allowing important results in the reduction of greenhouse gas emissions and promoting the eco-sustainability of the port system.

These strategies therefore concern not only the reduction of consumption, resulting from energy efficiency, but also the incentive for the use of new energy carriers.
On the other hand, the pursuit of a more general objective of rationalizing energy and environmental services is envisaged, coordinated in an integrated management logic of port services according to the APPEA model.

3) Evaluation in agreement with DIPAR and with the involvement of the most important suppliers of goods and services in the Register of suppliers, the possibility of including in the procedures for the award of environmental services indications referable to the "Minimum Environmental Criteria" referred to in the National Action Plan for Green Purchases adopted with the Interministerial Decree of 11 April 2008 - updated with DM April 10, 2013 and in particular to evaluate the possibility of using the tool of excellence in the field of Green Public Procurement (GPP): LCA (Life Cycle Assessment).

Central Adriatic Ports Authority

With a view to continuous improvement and attention to the environmental impact deriving from port activities, the following proposals for synergies with the main actors / stakeholders are considered to be improving:

1) Evaluation and sharing with interested operators of incentive measures in favor of those who reduce the quantities of waste produced and who adopt good operating practices;

2) Involvement of stakeholders in the implementation phase of the activities planned by the Central Adriatic Port Authority aimed at an efficient and sustainable management of the port system in terms of environmental energy, as reported in the Environmental Energy Planning Document (DEASP) of the Port of Ancona.

3.2.2 Greece – Igoumenitsa Port Authority S.A.

Aiming to enhance the port's environmental status, IPA S.A could create new synergies with some of the existing stakeholders as well as with key actors which are not currently actively involved in the port's environmental efforts.

Synergy 1: Develop collaboration with GRI

Specifically, in case IPA S.A decides to apply the GRI Standards in its sustainability reporting processes, it could possibly develop a collaboration with GRI and specifically with GRI's global Secretariat in Amsterdam.

GRI is a non-profit, independent, international Organisation, founded in the United States in 1997 by the Coalition for Environmentally Responsible Economies (CERES), the United Nations Environment Programme (UNEP) and the Tellus Institute. GRI supports different types of organisations (businesses and governments) throughout the world in promoting sustainability reporting, based on standards or a framework of principles and indicators that represent the best practices worldwide that Organisations can use to measure and communicate their economic, environmental, and social performance.

It is important to note that even though GRI does not verify or certify the content of a report; it does offer services to review a report's alignment with the GRI Standards and with frameworks such as the SDGs.

Synergy 2: Expand its collaboration with EUROCERT

Moreover, in case IPA S.A decides to develop Port Reception Facilities at its site, it could possibly expand its current collaboration with EUROCERT in order to be certified with the ISO 16034: 2018, which as presented above regards certification about arrangement and management of port waste reception facilities.

Synergy 3: Enhance its collaboration with EU projects which are under the umbrella of Adrion Programme and have similar scope with ECOWAVES

Lastly, IPA S.A could enhance its collaboration with other EU projects which are under the umbrella of Adrion Programme and have similar scope with ECOWAVES. Such an example is the project SEAVIEWS, with which IPA S.A could create additional links and develop closer co-operation.

SEAVIEWS, "SEctor Adaptive Virtual Early Warning System for Marine Pollution" is a project aiming at promoting and enhancing the capacity of transnational collaborations tackling environmental vulnerability, fragmentation and safeguarding ecosystem services in the wider Adriatic area. The SEAVIEWS project brings together stakeholders from 6 partner states: Greece, Albania, Croatia, Montenegro, Italy and Slovenia. Project partners (namely National Technical University of Athens – Greece, Chambers Group for the Development of Greek Isles – Greece, E-institute – Slovenia, Ministry of Transport and Maritime Affairs – Montenegro, National Interuniversity Consortium for Marine Sciences – Italy, University of Tirana – Albania, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture – Croatia), could be potential stakeholders with which IPA S.A could collaborate in order to exchange knowledge, disseminate results, best practices etc.

3.2.3 Croatia – Zadar County Rural Development Agency

N/A

3.2.4 Slovenia – Regional Development Agency of Northern Primorska Ltd. Nova Gorica

Environmental sustainability rising awareness - stakeholder numbers can easily help to raise awareness of the environmental situation, each in its own way and each in its own way. It includes all stakeholders, as each of them has its own target group. Given that stakeholders are listed in the pyramid scheme, awareness-raising campaigns would reach a larger number of target groups, which of course should take place constantly, not just as a campaign with a fixed duration. Although raising awareness does not seem to have major effects, in the long run this usually proves to be the best investment.

National funding for environmental sustainability: in collaboration with stakeholders in cooperation with various stakeholders, the intention to improve environmental sustainability would also be upgraded through the funds received to create better conditions for environmental sustainability in cooperation with stakeholders, it is necessary to prepare

concrete projects that would significantly improve the current status, and at the same time would be the start-up capital for subsequent own investments of the Port of Koper.

EU funding for environmental sustainability - In cooperation with the stakeholders of the Port of Koper, content suitable for upgrading the existing situation regarding environmental sustainability could be applied for in EU calls for proposals together with other ports in the EU (such as the ECOWAVES project). This is extremely important for environmental sustainability, as projects shared by several partners also have more impact and larger upgrades can be prepared than would otherwise be done by one partner (one port) alone.

3.2.5 Serbia – Business association for sport, recreation, rehabilitation and business Eco zone Ada Huja

All competencies and connections of different key authorities are prescribed by laws.

3.2.6 Albania - Port of Vlora

Institutions at the local level which have in their competencies the monitoring and management of waste as well as the monitoring of the environmental situation are: Port and Captaincy Vlora; Vlora Regional Administration of Protected Areas; National Environment Agency and National Coastal Agency.

The synergy can be realized between the Port of Vlora and the National Environment Agency which develops the monitoring of the environmental situation at the national level, including the respective stations in the area of Vlora. The State of the Environment Report, presents the assessment of the state of the environment based on relevant data for the main components of the environment such as forests, biodiversity, water resources, air, waste management, soil, noise, etc.

This report is a document that informs and recognizes the public on the state of environmental indicators, the impact on environmental health and their trend over the years. It also helps policymakers take action to protect and manage the environment. The main purpose of assessing the state of the environment is to understand the consequences or impacts on the environment coming from different sectors and to identify ways to minimize negative impacts.

The data that the National Environment Agency receives at the port of Vlora regarding the quality of water and species of natural importance every 6 months to 1 year, can be used to complete the database in the absence of the port of Vlora.

Another synergy of institutions can be established with the Regional Administration of Protected Areas which conducts a series of monitoring for the Karaburun-Sazan Marine Protected Area on the quality of water within the Bay of Vlora; waste management in Karaburun-Sazan BCP as well as the surrounding areas that bring impact to the protected area and the possibility of placing bins in the port of Vlora (through the project "Cognito" for the island of Szan and management of waste coming from tourist ships also supported by the Conservatoire du littoral, 5 baskets were placed in the port of Vlora). Through joint monitoring and the implementation of a waste management plan, the assessment of the environmental situation and the implementation of the waste management protocol at the local level can be improved.

Figure 12 - Placement of bins for different waste

3.2.7 Montenegro – Ministry of Transport and Maritime Affairs

The Port of Bar as an organization does not have specialized equipment for the management of waste, and especially in the case of vessel related waste and pollution and records a lack of specialized Personnel on Waste Management. In addition, the simultaneous operation of two port operators, can lead to a lack of coordination in environment protection activities.

The lack of both implemented training activities for Port of Bar Personnel and the concentration of all waste relating activities to a single external contractor can lead in high-risk condition, in the extraordinary situation that external assistance is not available.

The development of a common training theme under the auspices of the respective National authority should enforce both the internal and the local external capacity on the subject, and improve Overall improvement of Waste Management in Montenegro (increase of recycling rates, reduction of waste quantity headed in landfills).

4. Tailored transnational Guidelines for enhancing actual environmental status of the ports and their social profile (*Identification and definition of long-term goals that the strategy intends to achieve*)

Based on the reports and the studies undertaken by the partners in WPT1 - activities, they have formed specific Guidelines that can enhance the actual environmental status of the ports, as well as their social profile, including a proposed (short-term) time-plan for its implementation.

Those guidelines, that are considered applicable on EU ports, are hereby presented on project level.

Guideline 1: Unitary management of environmental and energy services according to the APEA model

Title	APEA- Landscaped and Ecologically Equipped Production Areas
Short description	The APEAs constitute an inclusive evolution of landscape themes, building quality and themes of energy production, of traditional APEA (Ecologically Equipped Production Areas, Art. 26 of Legislative Decree 112 of 1998 cd. 'Bassanini Decree'). The decree, in art. 26, indicates: "The regions and autonomous provinces of Trento and Bolzano regulate, with their own laws, industrial areas and ecologically equipped areas, equipped with the infrastructures and systems necessary to guarantee the protection of health, safety and environment. The same laws also govern the forms of unitary management of the infrastructures and services of the ecologically equipped areas by public or private entities (omissis) as well as the methods of acquiring land included in the industrial areas (omissis). The production plants located in the ecologically equipped areas are exempt from the acquisition of authorizations concerning the use of the services present therein. The regions and the autonomous provinces identify the areas (omitted) by choosing them as a priority among the already existing areas, zones or nuclei, even if totally or partially abandoned. The local authorities involved participate in the identification process ". Therefore, the national legislation refers to the individual Regions[3] the task of regulating the matter; however, putting some basic reference elements: 1) the ecologically equipped areas are equipped with the infrastructures and systems necessary to guarantee the protection of health, safety and the environment; 2) the ecologically equipped areas are characterized by forms of unitary management of infrastructures and services;

[3] For the Marche Region: L.R. n. 16/05 "Discipline of urban redevelopment interventions and guidelines for ecologically equipped production areas", and DGR n. 157 of 07/02/2005 "Guidelines for ecologically equipped production areas (APEA) of the Marche Region"

	3) the production plants located in the ecologically equipped areas are exempt from the acquisition of authorizations concerning the use of the services present therein. The Ecologically Equipped Production Areas (APEA) propose the so-called "cluster approach", since they are characterized by the application of principles related to industrial ecology or the adoption of environmental management systems for the area. The APEAs aim at "closing the cycles" of matter, water and energy, at the pooling of the main environmental services (water, energy, waste) and at optimizing the organization of activities that generate impacts on the environment. The cooperative approach basically takes the form of two basic aspects: • the adoption of collective facilities and infrastructures within the industrial area (e.g., consortium purifier, centralized area for waste storage, industrial aqueducts, energy production plants serving the area); • the identification of a unitary manager who deals with common services within the production area (e.g., collective management of waste, energy, safety). The Sole Manager is the entity responsible for the management and administration of the APEA and configures an innovative management model, which allows to obtain efficient collective services (innovative environmental and management services, waste management, water management, energy management, mobility management, logistics services, training, administrative support, technical support, research-innovation, brokerage, marketing, workplace security and management of infrastructure and environmental equipment , etc.). This unitary management also foreshadows objectives of coordinated improvement of the environmental quality of production sites, as well as the achievement of economies of scale, the promotion of Industrial Symbiosis processes, the implementation of a site-specific model of sustainable management. The optimization of production processes, through the focus on "core" processes and the outsourcing of "no core" processes in a landscaped and ecologically equipped Production Area therefore support the competitiveness of companies and promote production efficiency with environmental and energy sustainability objectives. On the basis of the reconnaissance carried out, relating to energy needs within the perimeter of the Ionian Sea Port System Authority, as well as the reconnaissance of the services requested in the same area in relation to: • Waste management; • Waste management and rainwater; • Transport and mobility;

- Authorization procedures;
- Safety ex D. Lgs. 81/08;
- Production and distribution of energy from renewable sources.

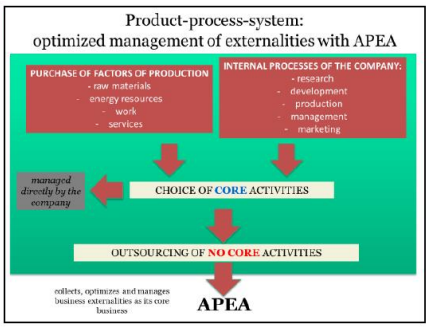
The Port System Authority of the Ionian Sea, within the DEASP (Environmental Energy Planning Document) has planned to evaluate, through a specific Feasibility Study, the implementation within the port area of a unitary management of these services according to the APPEA model, which sees the Port System Authority of the Ionian Sea, or its concessionaire, as the Sole Manager of the above services.

The actions can in fact be both structural and managerial.

Wanting to summarize some representative elements of the APEA common to all the Italian regions that have regulated the matter, we can mention:

- unitary management of collective services;
- area environmental program;
- economic development based on environmental sustainability.

Below is a brief explanatory presentation of the APEA model:



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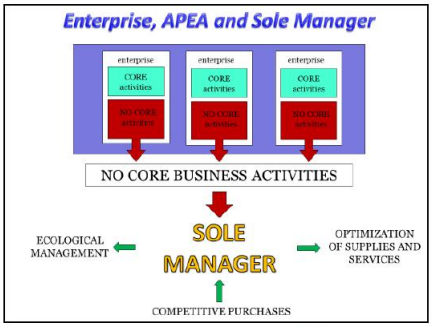
<tr><td></td><td> 

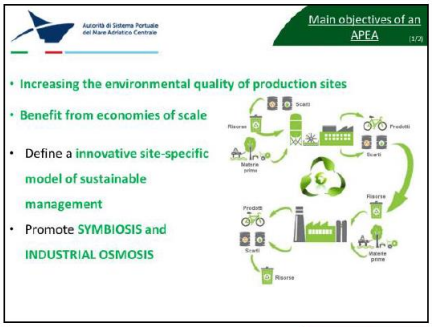


Figure 13 – APEA Model explanatory presentation</td></tr>
<tr><td>Problem addressed / Benefits</td><td>The implementation of this organizational model involves the design and redevelopment of the landscaped and ecologically equipped production areas that will have to be under different phases such as:
1. Environmental analysis: with the main purpose of framing the area being converted and/or designed at the environmental level;
2. Assessment of critical issues with consequent hierarchies of the same in order to establish later the priority actions to be developed;
3. Definition of the environmental programme through the identification of priorities and improvement objectives to be implemented;
4. Identification of the actions to be divided into specific projects that will be the real response to the critical issues that emerged during the environmental analysis phase;
5. Identification of the Single Manager through public evidence procedures.</td></tr>
<tr><td>Transferability issues</td><td>No problem of transferability of good practice. The Port System Authority of the Ionian Sea, within the DEASP (Environmental Energy Planning Document) has planned to evaluate, through a specific Feasibility Study, the implementation within the port area of a unitary management of these services according to the APPEA model, which sees the Port System Authority of the Ionian Sea, or its concessionaire, as the Sole Manager of the above services.</td></tr>
<tr><td>Cost</td><td>Unavailable</td></tr>
</table>

<table>
<tr><td>Equipment / infrastructures or personnel required</td><td>To be evaluated for each port. In general, by way of example, provision should be made for:
The installation of new or adaptation of existing infrastructure and services in the production area;
Increasing the quality and efficiency of common infrastructure;
The control of environmental performance and impact reduction;
Definition of a programme for the progressive redevelopment and conversion of existing parts towards a uniform and ecologically equipped management of the entire area.</td></tr>
<tr><td>Time-plan</td><td><table>
<tr><td></td><td>1st year</td><td>2nd year</td><td>3rd year</td></tr>
<tr><td>Technical and economic feasibility study for the transformation of the port area into APPEA</td><td></td><td></td><td></td></tr>
<tr><td>Publication of the call for proposals for the identification of the Single Manager of APPEA services</td><td></td><td></td><td></td></tr>
<tr><td>Implementing the APPEA Model</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Synergies & collaborations with key actors / stakeholders</td><td>The key players that, together with the relevant Port Authority, could foster possible collaborations and create possible synergies for the implementation of this guideline are:
Port concessionaires, dealers and port operators;
The Regional Environmental Protection Agency (ARPA);
DIPAR (Productive District of Environment and Reuse - Puglia Region) or other Production Districts for the Environment, where existing.</td></tr>
</table>

Guideline 2: Cold ironing

Title	**Cold ironing**
Short description	Cold ironing is the set of technological solutions designed to supply electricity to ships on the quayside, so that they can switch off their generation equipment, reducing fuel consumption and therefore emissions into the atmosphere. All ships are equipped with two types of engines, the main ones and the auxiliary ones. The former are necessary for navigation, while the latter for the generation of electricity. In order to obtain this energy, generators are usually used consisting of a generator coupled to either a diesel engine or a gas or steam turbine. The choice depends on economic considerations and the type of boat. The electricity produced is used on board for the so-called hoteling activities, such as lighting and air conditioning of the premises, refrigeration, the production of hot water for passengers and crew, and

in some types of ships also for loading and unloading goods (eg container ships).

These activities must be guaranteed continuously even while the ships are stationed in port, and this means that only the main engines can be switched off during this period, forcing the auxiliary ones to be left on. This leads to the problem of pollution in port areas.

The cold ironing technology intervenes in this sense, that is, allowing ships to turn off the auxiliary engines and supply them with electricity from the ground, taking it from the local network and distributing it through a system on the quay.

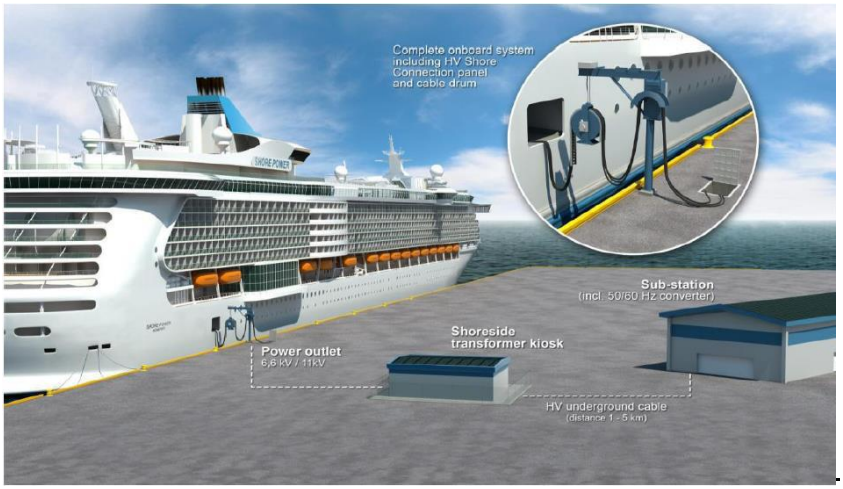


Figure 14 - Port-ship connection system

The term cold ironing was coined in Anglo-Saxon jargon from the comparison between a ship stationary in port and an iron, "iron", and since it is stationary with the engines off it is defined cold, "cold". Alternatively it can also be found under the name of "High Voltage Shore Connection" (HVSC) or "Alternative Maritime Power" (AMP) or "On Shore Power Supply" (OPS).

In 2012 the International Maritime Organization (IMO) defined the cold ironing technique as a "measure to improve air quality in ports and port cities, to reduce emissions of atmospheric pollutants and noise and, to a lesser extent, to reduce the carbon dioxide emitted by moored ships, generated by auxiliary diesel engines ".

Article 4 of the European Directive "on the construction of an infrastructure for alternative fuels" –DAFI 2014/94/EU– provides, in point 5, for the installation by 2025 of electricity supplies along the coasts, giving priority to ports in the TEN-T network.
A 2005 Entec UK Limited study estimated reductions in emissions from ships' use of ground-based power supply by comparing emission values for pollutants from ships stationed on the quayside (auxiliary engines

using fuels with a sulphur content of 0.1%), with emission values for pollutants from electricity generation.

The reference technical regulations for the construction of Cold Ironing plants is the IEC8005-1: "Design Standard for Shore to Ship Power". The following figure, taken from the European report "Service contract on ship emissions: assignment, abatement and market-based instruments – Task 2a: Shore-Side Electricity", shows schematically the architecture necessary for the feeding of ships. The elements that make up the system (with reference to the numbers in the figure below) are:

1. Connection cabin to the national grid in medium voltage or transformation substation connected to the high voltage network;
2. Medium voltage cable distribution within the port area;
3. Conversion cabin 50 Hz -> 60 Hz;
4. Distribution at ship connection points;
5. Ship connection system;
6. Connection and on-board interface panel;
7. MT/BT transformer on board[4];
8. Ship distribution network.

Key elements of the infrastructure are the ship dock connection system (5) and the 50 Hz -> 60 Hz conversion system (3).

A typical quay electrification system is presented as in the following diagram.

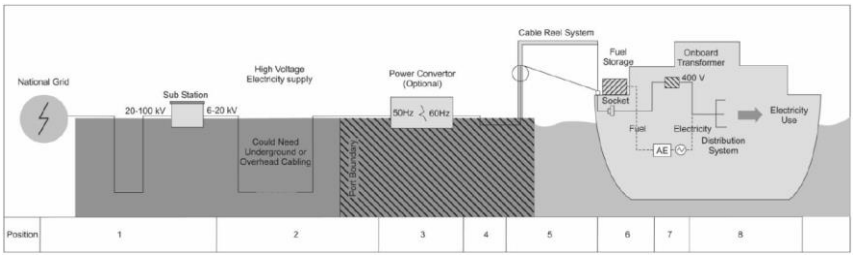


Figure 15 - Schematic architecture necessary for the feeding of ships

From an electrical point of view below is the IEC Scheme 80005 – 1:

[4] MT/BT: Medium voltage/low voltage

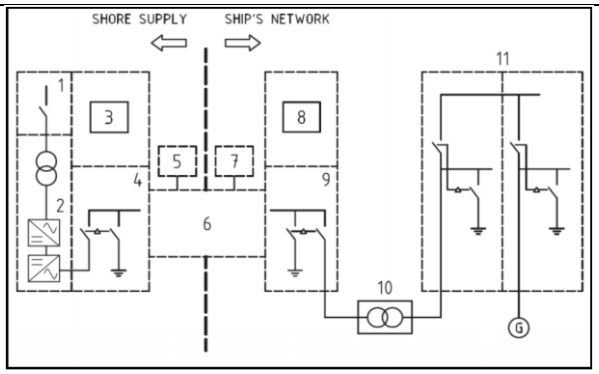


Figure 16 - Scheme IEC 80005 – 1

1. The general switch of the plant, at AT or MT level;
2. power conditioning devices (transformers and frequency converters);
3. protective equipment;
4. breakage and grounding devices;
5. ground-side control apparatus;
6. link component and interface;
7. control equipment on board the ship;
8. protective equipment;
9. transformer on board the ship (if any);
10. main electrical panel on board.

The elements constituting the interface between the ship's electrical system and the ground system are mainly composed of flexible, winding elements, which allow the interface panel to be connected on board the ship and are equipped with auxiliary power systems for winding the cable or handling parts.

Therefore, following the provisions of the technical regulations, the IEC8005-1 electrification of the quays provides for the following interventions on the ground:

a) the construction of a primary power transformation cabin from 150 kV to 20 kV;
b) the installation of static converters (properly flooded, possibly in the primary cabin) to adapt the national network frequency (50 Hz) to that of electrical systems on board certain ships (60 Hz);
c) the realization of the connection between the electricity transmission network and the primary cabin;
d) the installation of a cabin in which integrated protection and control systems and any transformer can be installed to adapt the distribution voltage to the supply voltage required by the ships;
e) the construction of underground cables for the transmission and distribution of electricity;

f) the creation of connection boxes to make the connection between the quay and the ship, complete, if necessary, with devices for the handling of connection cables.

The frequencies most commonly used on ships are 50 Hz or 60 Hz in relation to several aspects, among which the type of shipbuilding and the country of production stand out.

Ship-to-dock connections can be obtained by various modes depending on the vessels, the space available on the quay in relation to loading and unloading activities:

- Motor barge type power system
- Mobile power system
- Fixed power system

The motor barge type feeding system is made by adjusting a motor barge on which to house the connection system and in case the transformer system for adjustment between voltage levels.

Figure 17 - Motor barge type power system

The mobile power system consists of a trolley equipped with a drum wrapped with the power cord with a connector for the docked connection box at one terminal and a connector for the ship at the other.

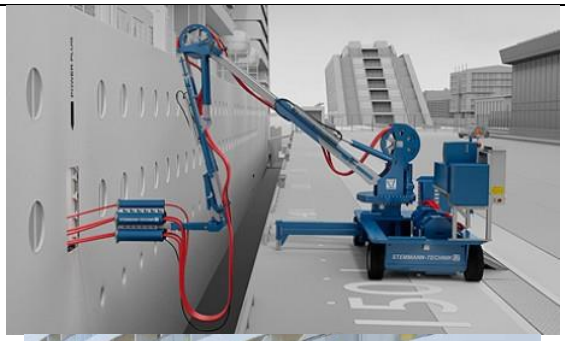


Figure 18 - Mobile power systems

The fixed power system consists of fixed cable carrier cranes made near the connection boxes.

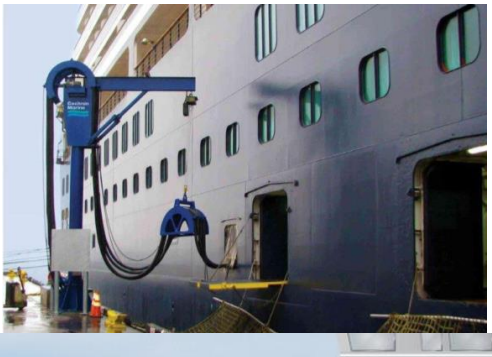


Figure 19 – Connection example

In the case of the port of Taranto, a "Feasibility Study related to the electrification of the commercial and industrial docks of the port of Taranto" drawn up in 2013 as part of the "Plan of first intervention measures for air recovery in the Tamburi district for pollutants B(a)P and PM10" and commissioned by the Port Authority of Taranto to DIPAR (Productive District of the Environment and Reuse) is available. , which

	has availed it of the advice of a group of professionals and professors of the Polytechnic of Bari and the "Aldo Moro" University of Bari.
Problem addressed / Benefits	One of the advantages of the implementation of cold ironing is certainly the reduction of fuel consumption and consequently emissions into the atmosphere thanks to the shutdown by ships on the quayside of their generation equipment. This also makes it possible to achieve the sustainability objectives set by the environmental policy of each port. For example, in Europe, the European Commission has set a target of reducing transport-related emissions by 90% by 2050 and as part of the Green Deal measures promotes the development of sustainable alternatives to fossil fuels. In this regard, EU Directive 2014/94 promotes the construction of infrastructures to increase the use of alternative fuels (DAFI Directive - Directive on Alternative Fuels Infrastructure); the provision identifies the contribution of cold ironing to environmental impact mitigation and calls for infrastructure to be built in EU ports by 2025. Cold ironing also mitigates another port problem: noise5. The port activities, which continue over the 24 hours, in fact generate a considerable disturbance to the residential neighborhoods surrounding the port, impacting on the lives of thousands of people on a daily basis. The acoustic impact of ports is the result of the overlapping noise generated by ships, cranes, loading and unloading operations, shipyards, trucks and trains that generate and combine noise throughout the day and night. The rumble generated by the engines of ships during the hospitalization phase at the docks is a large part of the problem. On-board generators are mostly made up of large internal combustion engines that drag synchronous generators. Even if housed in the heart of the ship, the noise and vibrations produced during operation propagate outside. This is mostly low-frequency noise (<100 Hz) that propagates over long distances and is little shielded by walls and windows. Reducing or shielding noisy emissions from ships by acting on noise sources would require structural intervention on the ship and would still have limited benefits.
Transferability issues	No transferability problems of the good practice. The Central Adriatic Ports Authority, as part of the DEASP (Environmental Energy Planning Document), has prepared a study on a plant solution for satisfying the energy demand of ships while stationed in port, proposing a system of trigenerative production to produce the necessary energy on site. The power plant, powered by natural gas, in addition to energy for ships,

[5] Source: Enel X, Legambiente, "*Green Ports: the route to sustainable development*", February 2021

<table>
<tr><td></td><td>produces a thermal residue that is used for the air conditioning of buildings located in the port area.</td></tr>
<tr><td>Cost</td><td>Not available. In general, the adoption of cold ironing is characterized by very high costs and it is therefore important that its programming is supported by an in-depth and complete cost-benefit analysis, related to the possible alternatives that can be adopted to reduce emissions associated with the power supply of ships in parking. The cost therefore varies according to the characteristics of the existing infrastructures and the extension of the quays.</td></tr>
<tr><td>Equipment / infrastructures or personnel required</td><td>To be evaluated for each port. In general, the elements that make up the system (with reference to the numbers in the figure below) are:
Connection cabin to the national grid in medium voltage or transformation substation connected to the high voltage network;
Medium voltage cable distribution within the port area;
Conversion booth 50 Hz -> 60 Hz;
Distribution at ship connection points;
Ship connection system;
Connection and on-board interface panel;
MT/BT transformer on board;6
Ship distribution network.</td></tr>
<tr><td>Time-plan</td><td><table>
<tr><th></th><th>1st year</th><th>2nd year</th><th>3rd year</th></tr>
<tr><td>Technical and economic feasibility study for the electrification of quays</td><td></td><td></td><td></td></tr>
<tr><td>Design of interventions and procedure with public evidence for the selection of the subject executing the works</td><td></td><td></td><td></td></tr>
<tr><td>Implementation of the system</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Synergies & collaborations with key actors / stakeholders</td><td>The key players that, together with the Port Authority, could foster possible collaborations and create possible synergies for the implementation of this guideline are:
Ministry of Infrastructure and Transport;
Captaincy of Port;
Port concessionaires, dealers and port operators;
Equipment suppliers.</td></tr>
</table>

Guideline 3: Environmental monitoring

[6] MT/BT: Medium voltage/low voltage

Title	Environmental monitoring
Short description	The Integrated Monitoring Plan acts as a guideline and indication, in order to indicate a minimum level of performance of quality, for the supply of fixed and mobile monitoring systems and the materials that will be used for the realization of the planned works. The aforementioned Plan has identified an "area" monitoring network with the main objective of controlling, through measuring points "homogeneously" distributed over an area that includes all the areas relevant to the individual works and areas at the contour, the overall quality status of the land-sea system. The long-term objective is to create a permanent monitoring system for the entire port area that, in the current phase, interferes as little as possible with the existing Area Monitoring Plans. The aim of the proposal is, therefore, to set up a well-programmed network of monitoring stations, concerning different matrices, through which to systematically detect a defined set of parameters: all in accordance with a methodological approach that can lead to a harmonious program both from the point of view of timing and operational methods to be adopted subsequently during the implementation and management of the monitoring project for the area under consideration. The Plan identifies the monitoring actions regarding the individual matrices to be investigated: - Water matrix; - Sediment matrix; - Air matrix; - Noise matrix, - Soil matrix; - Flora and fauna matrix; - Filter organisms matrix; - Benthos matrix. a general network of fixed stations; For example, the monitoring network for the **water matrix** is divided into sea water column and underground water column, with reference to a network of fixed and mobile stations; the provision of the following types of networks is envisaged: o a general network of mobile stations; o a general network of ground piezometers. o a general network of ground piezometers. The purpose of the general network is to build a continuously updated base of the general system. These "general networks" can provide a framework of the environment on which to base the comparison with the

	data subsequently or simultaneously produced as part of each Area Monitoring Plan. At the mobile stations, multi-parametric profiles are provided for conductivity, temperature, pH, pressure, dissolved oxygen and turbidity along the seawater column. The objective of the water columns is to be able to reconstruct information plans by interpolating the data in relation to some predefined altitudes within the body of sea water. To do this, the profiles must be quoted with respect to the average sea level, taking into account the tidal phases, or, more easily, with respect to the seabed which, at least in theory, is stable. These water columns will obviously also be envisaged in correspondence with the fixed stations of the corresponding general network. In particular, on some of these fixed stations the use of current meters is foreseen to determine the direction and intensity of the currents along the water column. For the water matrix, for the three general networks, that is: - the network of mobile stations which aims to monitor the parameters relating to the "water matrix" ("marine waters"); - the network of fixed stations; - the network of piezometers; the recommended frequency for water column measurements and sampling is quarterly. With regard to **marine sediments**, in order to characterize the level and type of pollution in the area of interest, a subdivision of the seabed sediments into four quality classes must be set, depending on the concentration of pollutants present. This subdivision can be based both on the Contamination Threshold Concentrations (CSC) defined by Legislative Decree 152/06, column B (industrial sites) of Tab. 1 of Annex 5 to Title V of Part Four, and, possibly, on the specific intervention limits defined by ICRAM for port sediments in sites of national interest: ➢ "**GREEN**" - in it fall the sediments in which the intervention values defined by ICRAM are not exceeded; ➢ "**YELLOW**" - this class includes sediments for which at least one of the analyzed parameters has concentrations higher than the intervention values defined by lCRAM, but lower than the limit concentration values indicated in Tab. 1, Col. B of Legislative Decree 152/06 and subsequent amendments; ➢ "**RED**" - the sediments belonging to this class are those in which at least one of the analyzed parameters has concentrations higher than the limit concentration values indicated in Tab. 1, Col. B of Legislative Decree 152/06 and subsequent amendments. ii., but lower than the limit values for the classification of "dangerous" reported in Annex

	D, Part IV - Title I and II, of Legislative Decree 152/2006 and subsequent amendments; ➢ "**PURPLE**" - this class includes sediments with concentrations above the limit values for the classification of "dangerous". Sediments in the marine environment become the final receptor body of numerous contaminants which, due to anthropic activities, but also natural processes, can accumulate in the sediments which therefore become a "trap" for all the contaminants spilled and present in the column. overlying water. In areas with a high level of anthropization such as port basins, often characterized by low hydro-dynamism, the contaminants can reach very high concentrations in the sediments, leading to the establishment of an inverse process of transfer and leaching of the "trapped" and the subsequent release of the same in the water column. In this case the sediments potentially become a secondary active source of pollution: this situation can have a negative impact on the quality of the water column and sometimes lead to profound alterations in the dynamic balances underlying the functioning of the entire port ecosystem. It should also be emphasized that the negative effects on the ecosystem can be more or less significant depending on the presence of some "pejorative" conditions related to the climate (winds, currents, tidal regime, thermal stratification of the water body), to the morphology of the the area, the chemical-physical conditions of the system (redox, pH, etc.) as well as the peculiarities of the matrices constituting the marine ecosystem (water, sediment, biota) and the "inland" ecosystem. Therefore, the sedimentary compartment can be considered as a recorder and temporal integrator of what happens in the water column. In fact, a great variety of polluting compounds, nutrient salts and organic matter, are found in higher concentrations in the sediment than in the water column and the determination of the quality of the aquatic compartment cannot be separated from monitoring through sampling and analysis. periodic of certain environmental parameters in the sediment matrix. In correspondence with the sediment monitoring stations it must provide for the sampling of superficial sediment (0 - 20 cm) for the execution of chemical-physical analyzes, such as: ✓ particle size distribution; ✓ metals; ✓ C <12 and C> 12 hydrocarbons; ✓ IPA; ✓ PCB; ✓ pesticides;

	✓ organotin compounds; ✓ TOC; ✓ pH; ✓ redox potential; ✓ nutrients (Ntot, Ptot). The monitoring of the air matrix allows the characterization of the air quality and meteorological conditions within the area of interest and in the adjacent areas in order to assess the potential impacts on the atmosphere component resulting from port activities and, for example, to realization of projects (diffusion and lifting of dust related to the handling of aggregates, transit of work vehicles, etc.). Therefore, the monitoring activities should be prepared mainly for the ante-operam phases, with the aim of providing an environmental reference framework that allows comparison with the data collected in the subsequent time phases and for the course of work in order to verify the increase, with respect to the ante-operam, in the level of concentration of dust and pollutants induced by the execution of the activities and / or works. For the aforementioned purposes, the monitoring for the "air" matrix should include at least one monitoring network consisting of mobile stations located in correspondence with points that are affected, independently of the works, by pollution in the atmospheric component. In particular, the stations should also be located in points where it is possible to evaluate the impact produced on the atmosphere by ship and road traffic: for this purpose a seasonal monitoring frequency is suggested, for a duration of 30 days. Given the purpose of area monitoring, it would be advisable to verify the opportunity of adopting in the network a fixed station for the control of the "air" matrix and of the meteo-climatic variables that works permanently (continuously, or with frequencies and on predetermined periods, also for the control of emergency conditions): this should have a central position with respect to the whole port area. At the mobile monitoring stations, at least the following parameters should be measured: - PTS[7], PM_{10} and $PM_{2,5}$; - CO, NOx, S02; - VOC (benzene, toluene); - IPA, metals; - meteoclimatic parameters.

[7] Total Suspended Particulate

	On the other hand, at least the following devices should be present for the evaluation of the meteoclimatic parameters at the meteorological station: ▪ anemometer for measuring and representing wind speed and direction; ▪ thermo hygrometer; ▪ rain gauge and radiometer; ▪ barometer; ▪ datalogger; ▪ anti-radiant screen. Air quality monitoring by means of mobile laboratories also requires the allocation of: - automatic analyzers for the evaluation of airborne pollutants (CO, NOx, S02); - automatic sampler with modular sampling head, which allows you to choose the fraction of the particulate material (PM_{10}, $PM_{2,5}$, PTS), metals and IPA. For the monitoring of VOCs (benzene, toluene), it is possible to resort to sampling with canister and subsequent analytical determination in the laboratory. The monitoring of the **noise matrix** makes it possible to verify the effects induced on the acoustic climate by port activities in order to certify compliance with regulatory limits and to arrange any mitigation measures. In the area of interest, interference on the acoustic climate is mainly linked to the movement of vehicles entering and leaving the port (both by sea and by land) and to the work carried out within the construction sites which sometimes have a significant impact on the acoustic climate. The monitoring technique generally consists in the continuous measurement of the noise through the positioning of a sound level meter which continuously records the acoustic pressure level. Given these premises, the monitoring of the "noise" matrix can be broken down into the three time phases: ➢ in the *ante operam* phase, it allows to define the background noise existing in the area of interest, constituting the initial framework with which to compare the data collected in the subsequent phases; ➢ during the construction phase, measures the emissions attributable to port activities, verifying compliance with the limits imposed by the legislation and the effectiveness of any mitigation measures;

	➢ in the *post operam* phase, as it is possible to provide for a check in order to compare the data collected in the *post operam* with the two previous phases. The choices of the monitoring stations must take into account the points that may impact the acoustic climate, regardless of the areas in which the activities take place or in those where new works are set up. The number of stations must be consistent with the extent of the area to be monitored and the function of the receptors to be investigated. The stations should be chosen in order to evaluate the impact produced by ship and road traffic and by routine operations within the port area: for this purpose, a seasonal monitoring frequency with a duration of 30 days is conceivable. It is also possible to foresee a thickening during the construction phase in relation to each activity / site, except for a check on any overlapping of the monitoring stations. For the other matrices (soil, flora and fauna, filter-feeding organisms and benthos), site-specific operational indications will have to be developed.
Problem addressed / Benefits	The Integrated Monitoring Plan acts as a guideline and indication, in order to indicate a minimum performance level of quality, for the supply of fixed and mobile monitoring systems and the materials that will be used for carrying out the planned works. The long-term goal is to create a permanent monitoring system for the entire port area which, in the current phase, interferes as little as possible with the existing Area Monitoring Plans. The purpose of the proposal is, therefore, to set up a well-programmed network of monitoring stations, concerning different matrices, through which to systematically detect a defined set of parameters: all in accordance with a methodological approach that can lead to a program harmonious both from the point of view of timing and of the operating procedures to be adopted later in the implementation and management phase of the monitoring project for the area in question.
Transferability issues	No transferability issues.
Cost	10 MILLION € (three-year monitoring), variable depending on the extension of the area to be monitored, the frequencies and the analytical sets defined.

Equipment / infrastructures or personnel required	To be evaluated for each port. By way of example and not limited to, the following are the elements that constitute a hypothetical monitoring network, in relation to the monitoring of:
	• Water quality:
	  • Network of homogeneously distributed fixed stations and piezometers;
	  • Network of mobile stations;

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CTD probe (Electrical conductivity (C), temperature (T) and water depth (D) and/or multiparametric probe;
Current meter;
Samplers and sterile containers for sampling;

- Acoustic environment:

Weather station for anemometric regimen determination;
Biennially calibrated phonometer;
Technician competent in acoustics entered on the ENTECA national list managed by ISPRA;

- Air quality:

Fixed and mobile monitoring station networks;
Any automatic analyzers for the evaluation of airborne pollutants;
Any automatic samplers;
Canister sampler for VOC monitoring;
Samplers and sterile containers for sampling;

- Sediment characterization:

Fixed and mobile sediment matrix monitoring station networks;
Samplers and sterile containers for sampling;
Bucket e/o box corer;
Technical divers equipped with liners;

- The soil matrix:

Samplers and sterile containers for sampling;
Any mechanical means;
Analysis of morphological profiles for landscape insertion.

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<tr><td>Time-plan</td><td>To be evaluated for each port and according to the monitoring plan considered. By way of non-exhaustive example, a hypothetical schedule of activities is reported:
<table>
<tr><td></td><td colspan="2">1st year</td><td>2nd year</td><td>3rd year</td><td>4th year</td></tr>
<tr><td>Drafting of the Monitoring Plan</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Public procedure for the assignment of the service</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>First monitoring period</td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>Synergies & collaborations with key actors / stakeholders</td><td>The key players that, together with the Port Authority, could foster possible collaborations and create possible synergies for the implementation of this guideline are:

Region;
The Regional Environmental Protection Agency (ARPA);

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	• University system and research bodies; • Analysis laboratories and firms specializing in monitoring systems.

Guideline 4: Adoption of GRI Standards in Sustainability Reporting

Title	Adoption of GRI Standards in Sustainability Reporting
Short description	The proposed measure regards the adoption of GRI Standards in Sustainability Reporting by IPA S.A. The GRI Standards, (also described in Section 4.2) are a structured methodology that is highly valued by the ports that have implemented them for sustainability reporting, setting forth a set of principles that guides the ports in how to present a report as well as provide a framework for its content. According to GRI Standards, the principles for defining report content are: • Stakeholder inclusiveness: The port shall identify its stakeholders and explain how it has responded to their reasonable expectations and interest. • Sustainability context: The report must present the reporting Organisation's performance in the broadest context of sustainability, meaning aspects and actions of the port that contribute, or aim to contribute in the future, to the improvement, or cause the deterioration, of the economic, environmental, and social conditions at the local, regional, or global level. • Materiality: Ports can face a wide range of topics or matters on which to report. Relevant subjects or topics to be included in the report, are those that can reasonably be considered important for reflecting the Organisation's economic, environmental, and social impacts, or influencing the decisions of stakeholders. • Completeness: The report shall include coverage of material topics and their boundaries, sufficient to reflect significant economic, environmental, and social impacts, and to enable stakeholders to assess the reporting Organisation's performance over the reporting period. According to GRI Standards, the principles for defining report quality are: • Accuracy: • The reported information shall be sufficiently accurate and detailed for stakeholders to assess the reporting Organisations performance. • Balance:

	The reported information shall reflect positive and negative aspects of the reporting Organisation's performance to enable a reasoned assessment of overall performance. • Clarity: The reporting Organisation shall make information available in a manner that is understandable and accessible to stakeholders using that information. • Comparability: The reporting Organisation shall select, compile, and report information consistently. The reported information shall be presented in a manner that enables stakeholders to analyze changes in the Organisation's performance over time, and that could support analysis relative to other Organisations. • Reliability: The reporting Organisation shall gather, record, compile, analyze, and report information and processes used in the preparation of the report in a way that they can be subject to examination, and that establishes the quality and materiality of the information. • Timeliness: The reporting Organisation shall report on a regular schedule so that information is available in time for stakeholders to make informed decisions.
Problem addressed/ Benefits	Reporting on sustainability information is increasingly becoming a legal requirement and less of a voluntary practice. Governments, stock exchanges, market regulators, investors, civil society and other stakeholders are demanding more and better information on organisations' sustainability impacts. Thus, measuring and reporting according to internationally recognized standards such as the GRI Sustainability Reporting Standards becomes imperative. IPA S.A already develops Sustainability Reports aiming to present its actual performance on major environmental aspects. Adoption of GRI Standards in Sustainability Reporting could support IPA S.A to take a step further and develop a common language enabling comparison of quality of information about its impacts. Additionally, GRI Standards could help the port to evaluate and recognize best practices for its business, align sustainability criteria, identify risks and opportunities, generate awareness among employees and upper management about issues linked to sustainable development, engage with all stakeholders and set goas for improvement.

	Specifically, the commercial, social, and environmental benefits and advantages that IPA S.A could gain by implementing the GRI Sustainability Standards include: • enhanced risk management, • operational continuity, • increased profitability, • improved reputation and social impact, • greater transparency, • asset appreciation.
Transferability issues	GRI Standards could be easily adopted by IPA S.A, without significant obstacles hindering its application. GRI Standards can be used in combination with other reporting frameworks. GRI continually works together with other reporting frameworks to avoid duplication of disclosure effort.
Cost	The GRI Standards are available as a free public good.
Equipment / infrastructures or personnel required	The use of external assurance for sustainability reports is advised in addition to any internal resources, but it is not required in order to make a claim that a report has been prepared in accordance with the GRI Standards. If the report has been externally assured, the assurance report must be included, stating the information that has been assured, as stipulated in GRI 102-56
Time-plan	n/a
Synergies & collaborations with key actors / stakeholders	Organisations report on their sustainability impacts in response to stakeholder information requirements. Thus, engagement with all relevant stakeholders would be strongly appreciated.

Guideline 5: Application of ISO 16304: 2018

Title	**Application of ISO 16304: 2018**
Short description	The proposed measure regards the application of ISO 16304: 2018, in the case that IPA S.A. decides to develop Port Reception Facilities at its site. As presented in Chapter 4, ISO 16304 provides guidance and sets best practice for the following areas of arrangement and management of port waste reception facilities. Specifically, the Standard applies to the management of ship-generated waste regulated by MARPOL that is discharged at ports and terminals. It also covers principles and issues that should be considered in the development of a port waste management plan, its implementation and port reception facilities operations. The procedures to operate the port reception facilities and

	the development of a port waste management plan are closely linked and therefore are integrated into ISO 16304. Specifically, the Standard addresses the principles and issues that should be considered in: ▪ The development of a port waste management strategy; ▪ The design and operation of PRF; ▪ PWMP development, implementation and compliance; and ▪ PRF management and accountability.
Problem addressed/ Benefits	The development of adequate port reception facilities (PRFs) for ship generated waste and cargo residues is a major factor in the management of each of the shipboard waste streams covered by the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes I to VI, as amended, excluding Annex III (packaged dangerous goods). MARPOL requires that Party States ensure the provision of adequate reception facilities in ports to receive these wastes. Parties to MARPOL should have developed implementing legislation to provide for PRFs. Regional and intergovernmental legislation has also been developed. However, due to operational, ownership, geographic, and legislative differences in ports, there is a large disparity in how operations are conducted. To overcome some of the major issues, the International Maritime Organization (IMO), through its implementation of IMO Instruments (III) Subcommittee (formerly the subcommittee on Flag State Implementation) developed an action programme to tackle the inadequacy of PRFs. To obtain the most efficient management of waste and to reduce the time and resource burden in segregating and handling waste in the ports, the concept of waste minimisation has been integrated into ISO 16304: 2018, by incorporating the following principles: - For waste generate aboard a ship: "Prevention before recycling before energy recovery before disposal" - Once the waste is offloaded ashore: "Avoidance before reduction, before reuse, before recycling, incineration with energy recovery, before disposal" Ship owners and operators, cargo owners, and port and terminal owners and operators, along with governments are aware of the importance of well-organised and managed waste collection, especially with respect to health and safety on board ships and at ports and terminals. It has been acknowledged at the IMO that standardized methodologies for waste management both on board ships and shore

	at PRFs would harmonize practices and ensure a smooth delivery of ship generated waste and cargo residues to shore-side facilities. The main driver for the Port of Igoumenitsa achieving accreditation in the standard would be to demonstrate to stakeholders the commitment to improving environmental standard of ship activities. This may help win an advantage over competitors, providing the Port with a lead in the market. Additionally, one of the benefits of the ISO standards is the requirement for monitoring, as well as internal and external auditing. This ensures credibility and is an alternative approach to ensuring compliance where enforcement mechanisms fall short.
Transferability issues	No issues identified. ISO 16304 is meant to complement ISO 14001 by adding a component that extends its principles to management of ships' waste in ports. It can be incorporated easily into other plans for achieving ISO 14001 accreditation, as an extension that focuses on port reception facilities.
Cost	n/a
Equipment / infrastructures or personnel required	-
Time-plan	
Synergies & collaborations with key actors / stakeholders	Collaboration with EUROCERT could be further enhanced in order to obtain 16304 accreditations.

Guideline 6: Adoption of an incentive-based fee system for waste delivery by ships and a state-of-the-art monitoring and information system

Title	**Adoption of an incentive-based fee system for waste delivery by ships and a state-of-the-art monitoring and information system**
Short description	The proposed measure regards a strong incentive-based fee system for waste delivery by ships, combined with a state-of-the-art monitoring and information system, known as "WASCOL" System. The measure has been applied for several years by the Port of Antwerp, which receives significantly high volumes of ship-generated waste - constantly increasing every year. EMSA considers the WASCOL system as one of the best practices in EU ports. *Fees for ship-generated waste* The proposed fee system includes a strong incentive towards maximum delivery of ship-generated waste, without limits in terms of maximum volumes. Specifically, according to the measure, all vessels

	calling at the port have to send an advance waste notification through EDIFACT – message directly into port information system (WASDIS), at least 24 hours prior to arrival. For each call a substantial waste fee must be paid to the Port Authority irrespective of the use of a port reception facility. As an incentive to deliver the ship's waste at port reception facilities, the disposal of the waste is partly covered through the collection of these fees. Thus, there is a financial compensation by the Port Authority per m^3 of delivered waste. *Waste information and monitoring system (WASCOL)* "WASCOL" is a web-based information and monitoring system of ship-generated waste and cargo residues applied by the Port Authority. The application manages all information related to the waste delivery of each individual ship in the port, by combining the information from the ship's notification with the data reported by the PRF. Specifically, WASCOL is used by PRF: • to register delivered amounts of waste (reporting requirement). It is used by the Port Authority: • to monitor and verify fees and reimbursements, • to monitor waste flows (comparison with ship's notification), • to register PRF's, • to register IOPP certificates (dedicated storage capacity). It is used by Coast Guard: • to target vessels for inspection.
Problem addressed/ Benefits	Discharges of waste and cargo residues into the sea are a serious threat to the marine environment. As presented in Section 3.2, Igoumenitsa Port Authority has documented an increased amount of ship-generated waste over the recent years, attributed to the growing number of passengers, ships and the technical projects implemented in the area. The proposed initiative could support IPA S.A to reduce and ultimately eliminate the intentional pollution of the marine environment by ships, providing ships with incentives to deliver their waste to organised reception facilities. According to Deliverable 1.3.1, the main reason preventing ships from delivering their waste to port reception facilities is high reception costs. Since the likelihood of a ship being 'caught' when discharging such cargoes at sea is low, ship operators prefer to avoid the cost of delivering their waste and take this action. If these costs were included

	in the berthing costs/fees, ships would not turn to the option of dumping at sea. The proposed measure aims to address this problem, and specifically, to: • reduce direct costs of waste delivery, • reduce bureaucracy for the users, • increase transparency, • facilitate control and inspection procedures Additionally, the system provides: • accurate and detailed data on delivery of ship generated waste, • the full picture of waste flows from ships to PRFs, • reliable statistics and thus better monitoring of the procedures.
Transferability issues	WASCOL is an internet application which could be used internationally to facilitate the monitoring of ship´s waste streams and exchange information. The measure could be easily adopted by Igoumenitsa Port, without significant obstacles hindering its application.
Cost	n/a
Equipment / infrastructures or personnel required	Web-based IT System Trained personnel for operating the System
Time-plan	n/a
Synergies & collaborations with key actors / stakeholders	Extensive consultation with all the relevant parties (representatives of PRF, ship agents, Port Authority, Coast Guard) could take place prior to the measure's implementation and a forum involving the aforementioned stakeholders could possibly be established discussing all issues relating to ship-generated waste (every 3-4 months). Additionally, since Coast Guard has direct access to the information and monitoring system, the data on ship-generated waste could be used when targeting vessels for inspection. Finally, collaborations with other ports applying the measure (i.e. Antwerp) could occur to exchange data and experiences.

Guideline 7: Usage of a Mobile Technological Handling Station (MTHS)

Title	**Usage of a Mobile Technological Handling Station (MTHS)**
Short description	The proposed measure regards the usage of a Mobile Technological Handling Station (MTHS) - an innovative technological solution for optimum handling of liquid/ pumped oil-containing waste from ships

	and/or polluted sea water, which recycles hazardous waste into a 100% recoverable REACH certified oil product. MTHS provides to the ports the operational ability to fight against sea pollution through the practical ability to pump large amounts of contaminated sea water from vessels into reservoirs. It is an extremely flexible, automatically operated handling system which is controlled from one location by one operator using a touch screen, laptop or remotely online, allowing waste in various proportions (oil/water/sediment) to be treated without the need for manual recalibration of the equipment and minimising the loss of usable output components. The integrated residual heat recovery system of the MTHS allows major savings on electricity and thermal energy through preheating the waste before treatment. The treatment process yields a 100% recoverable REACH certified oil component that is of stable quality, has a market and a product price that can be standardised. The waste generated in the process does not end up in landfills. Practically all waste generated in the process is recovered. The solids separated by centrifuge and decanting are used. The proposed technology consumes 1.58 kWh less energy to process 1 m^3 of oil waste than the old process and produces 7% less hazardous waste by mass. MTHS has been developed by the Port of Tallinn and its daughter company Green Marine and is in operation since 2011, aiming to implement the company's social responsibility policy more effectively.
Problem addressed/ Benefits	Discharges of liquid waste into the sea constitutes a serious threat to the marine environment. As presented in Section 3.2, Igoumenitsa Port Authority has documented an increased amount of liquid hazardous waste over the recent years, attributed to the growing number of passengers, ships and the technical projects implemented in the area. The proposed measure could support IPA S.A to implement its environmental policy more effectively, by improving its water management processes. The proposed solution brings benefits to many different parties like shipping companies, IPA S.A, the Coast Guard and also to local communities who wish to live by a clean sea. Specifically, the benefits arising from the adoption of the proposed solution are: • Less energy is spent on handling oil waste compared to similar available processes (the energy is recovered), • The amount of hazardous waste is significantly diminished in result of handling, and • The process is environmentally sustainable and economical.

	• The MTHS process ensures that the amount of airborne emissions is significantly less than with other existing technologies.
Transferability issues	No issues recorded.
Cost	n/a
Equipment / infrastructures or personnel required	The Mobile Technological Handling Station (MTHS) of liquid oil-containing waste is based on a technological set and energy saving solutions for optimum handling of oil-containing waste (incl. bilge, slops, sludge etc) and is built in 10 standard 20-feet sea containers installed in two levels. Technical specifications: ▪ Maximum capacity/output: 15.000l/t or 120.000 m^3/year; ▪ Feed input: 10–90% oil /water mixture, up to 15% v/v sediments; ▪ Viscosity of input waste: <25 cSt on separation temperature; ▪ Density: light fraction differs only by 5% from the heavy fraction; ▪ Water content in oil component output: <0.1% (actual production indicators, Tallinn); ▪ Sediments in oil component output: <0.1% w/w (actual production indicators, Tallinn); ▪ Heating source: hot water, steam or thermal oil (according to the parameters of the boiler system); ▪ Automation: fully automated; Material: for parts in contact with waste as well as for assemblies, high-quality materials are used, incl. chrome metals, stainless steel, Viton and Teflon. Trained personnel for operating the MTHS
Time-plan	n/a
Synergies & collaborations with key actors / stakeholders	Collaboration between public sector authorities and private parties will be needed for the implementation of the proposed measure.

Guideline 8: "Respect the City"

Title	**"Respect the City"**
Short description	Related to the lack of concrete destination cooperation and initiatives such as the initiative launched by the City of Dubrovnik "Respect the City" which through all stakeholders and through periodic action plans

	proposes measures that affect the further sustainability of the destination and awareness of both residents and visitors / tourists..
Problem addressed / Benefits	Although this is an initiative launched by the City of Dubrovnik and not the Port Authority, this example is an excellent example of cooperation between key actors in environmental management, waste management and promoting the sustainability of the destination.
Transferability issues	RELATED TO OBSTACLES - Given the many stakeholders involved, there is a possibility that the coordination of activities among the partners involved will be very demanding. For example, in the case of the proposed measure of educational eco trips for cruise passengers - one of the major challenges is how to address cruise passengers given the specifics of cruise companies and their business (these are large corporations with tens of thousands of employees)
Cost	n/a
Equipment / infrastructures or personnel required	Furthermore, a small manual can be made with recommendations and instructions on behavior in the port and proper handling of waste that would be placed in visible places in the port, on the websites of the City, County, Port Authority. Leaflet or brochure of recyclable materials can be distributed to all port users - from domestic population, foreign passengers, concessionaires, … It is necessary to create a manual in electronic form. Currently, it is difficult to estimate the costs given that it is necessary to decide exactly what activities and measures are planned to be taken within the initiative, however, this flexibility can allow each port to create measures according to its own budget and needs. The measure would be educational and could cover a whole range of target groups to which each port addresses.
Time-plan	Depending on the measures that will be launched within the initiative, the duration of the implementation of measures depends as well as due to the current pandemic of the COVID19 virus - from 3 to 9 months should be enough for any of the proposed measures.
Synergies & collaborations with key actors / stakeholders	Given that there are several target groups to which this initiative would address, it is possible to take more measures within the initiative in question. In this particular case (Zadar), an educational and ecological trip can be designed and offered for cruise passengers as a target group, and they can be offered the engagement of an expert guide who would take them on tours.

Guideline 9: Setting up an Eco Island in the Port

Title	**Setting up an Eco Island in the Port**

Short description	Setting up an Eco Island in the Port in terms of developing awareness of the importance of the circular economy. This measure is also very flexible and each port can, according to its needs and taking into account its own specifics, determine the optimal position and size of the tank. In light of this, it is very important to establish whether the problem lies in ship-generated waste or whether the waste was generated on the mainland part of the port area due to the impact of passengers / vehicles.
Problem addressed / Benefits	The assumption is that by setting up eco-islands in ports, waste would be generated in controlled positions and would be separated by species at the outset, which facilitates further handling.
Transferability issues	Regarding obstacles - it is important to organize the subsequent regular emptying of the subject equipment / waste containers so that the subject eco-islands would not communicate exactly the opposite story of the desired effect.
Cost	Costs are also difficult to estimate, but each port can, depending on its budget and needs, create its own Eco Island.
Equipment / infrastructures or personnel required	Apart from the supply of equipment and minor works, no greater involvement of staff is required, except for the organization of waste collection. Cooperation is needed with the concessionaires in charge of disposing of the types of waste in question, and it is also possible to educate all port users to use the islands in question as efficiently, correctly and often as possible.
Time-plan	It would take six months to create the terms of reference, equipment specification, organization and implementation of the tender for the procurement of equipment and possible conclusion of a contract / supplement to the contract for disposal with the company / concessionaire.
Synergies & collaborations with key actors / stakeholders	In the case of the passenger port in Gaženica - Zadar, which is the subject of this research, it has been shown that it is necessary to solve the problem of waste generated by passengers and vehicles using the port (paper containers, plastic, old batteries,…). the amount of waste is generated precisely in the waiting areas and other places where there is a large fluctuation of passengers / tourists.

Guideline 10: Development of a long-term Environmental Policy Plan

Title	**Development of a long-term Environmental Policy Plan**
Short description	Development of a long-term Environmental Policy Plan that contains a short-term, medium-term and long-term plan of activities related to the reception, manipulation and disposal of waste.

	In the specific case, it is about the just completed entire port infrastructure and superstructure in Gaženica, i.e., in the area where the new passenger port is expressed. Given that the port was fully launched less than two years ago, now is the right time to develop a detailed and long-term methodologically harmonized "Environmental Policy Plan" with the prescribed short, medium and long-term activities that need to be done to make the port more efficient in terms of receiving and disposing of ship and other waste.
Problem addressed / Benefits	It can be applied to all ports that do not yet have an adequate methodological approach in environmental issues.
Transferability issues	Obstacles in the development, and especially the subsequent implementation of these plans may have smaller ports with a modest number of skilled workers, given that a good methodological approach is required and subsequent regular monitoring of activities and implementation of measures prescribed by the plan.
Cost	It is still difficult to determine how much the development of the plan in question would cost, given that it depends on the scope and specifics of each port.
Equipment / infrastructures or personnel required	In addition, it would be desirable to involve professionals and universities in this process. For the broader picture - as part of this activity, it would be good for port authorities to join (if they have not already) existing environmental initiatives in ports, which can enable them to regularly monitor European Directives.
Time-plan	For the realization of this activity, taking into account the specification of the content and the duration of the procedure of procurement of services for the development of the plan in question, as well as the development of the plan itself, it is estimated that it takes between six and nine months.
Synergies & collaborations with key actors / stakeholders	All companies / concessionaires dealing with the reception and disposal of waste in the port should be included in the development of the plan. A warm recommendation is to designate a person within the port to deal with the implementation of the plan in the port area.

Guideline 11: Circular Economy Center

Title	**Circular Economy Center**
Short description	Circular Economy Center: this would be part of the Port of Koper - a subsidiary where waste suitable for reuse would be accepted. It is necessary to determine what types of waste could be taken. In addition, it would be necessary to set up an online platform, which

	would show which waste is accepted in this center and daily update information on how much can be accepted that day/week. All logistics would be based on cooperation with a number of stakeholders, including recycling centers, to which certain waste would be taken for recycling. First of all, it is necessary to prepare a plan, obtain all the necessary ship data on waste (how waste is separated on a particular ship, how it is stored, what is the capacity in relation to the waterway, etc.). Based on this, it would be necessary to develop a detailed waste management circular economy plan, and prepare all the necessary logistical arrangements.
Problem addressed / Benefits	Such a service, which would take care of renewable waste, would greatly relieve the existing waste management service, which would consequently mean that the waste currently collected in the port would be processed faster and thus less of a burden on the environment.
Transferability issues	Given that ships from different parts of the world come to port, the problem with this kind of waste would be that not all ships have the same waste separation protocol (there are certain nuances), which would consequently mean that waste that is suitable for further use, found as general waste.
Cost	n/a
Equipment / infrastructures or personnel required	For this type of activity, it would be necessary to set up a new company, with new employees and equipment.
Time-plan	This kind of project can be realized withing 1-2 years.
Synergies & collaborations with key actors / stakeholders	Local authority, state authority and other stakeholders would certainly be interested in this type of activity, as on the one hand it is also the aspiration of the state and local authorities, and on the other hand it is also an opportunity to generate new profits in economic terms.

Guideline 12: Smart waste management system

Title	**Smart waste management system**
Short description	It is an online system or application that every ship that lands should fill in along with all the other documents it submits on landing. This would be an online application where each ship would have to predict the amount and type of garbage it will deliver in port. The application would also have a price list that would vary according to the type of waste (separate waste, general waste, hazardous waste, ..), but the notification of this waste would be mandatory before landing. Thus, the waste management center

	could also organize logistics in a timely manner for a certain type of waste expected on the coast. This would reduce subsequent logistics in the center itself or help speed up the flow of stored waste.
Problem addressed / Benefits	Such an upgrade of waste management would, at low cost, help to improve the operation of the center, reduce the accumulation and storage of waste and, consequently, contribute to environmental sustainability.
Transferability issues	Such a mandatory waste disposal forecasting system would most likely need some legal basis for the port to require this from incoming ships. Otherwise, this could be given as an option in any case and in this case the cost to the ships would be lower.
Cost	n/a
Equipment / infrastructures or personnel required	online application system monitoring staff
Time-plan	1-2 years
Synergies & collaborations with key actors / stakeholders	Several stakeholders would support this guidelines, as we achieve high benefits with low costs.

Guideline 13: Electrification of means of transport within the port

Title	**Electrification of means of transport within the port**
Short description	All vehicles and machinery used inside the port should be electrically powered, including company vehicles used outside the port. This would mean that all working machines and all other vehicles and means of transport powered by conventional fuels are replaced over time. This is also one of the more important aspects of environmental sustainability in the port, as all possible mechanization should be replaced by more modern versions that contribute to a clean environment.
Problem addressed / Benefits	It is certainly one of the important steps and aspects of environmental sustainability and should be one of the main goals in the next few years. If we want to keep up with the times in terms of environmental sustainability, then this step is inevitable in the future.
Transferability issues	This type of intervention entails an exceptionally high cost. The replacement of all vehicles, means of transport and other machinery should be done gradually.
Cost	n/a

Equipment / infrastructures or personnel required	n/a
Time-plan	Till year 2030
Synergies & collaborations with key actors / stakeholders	Most stakeholders would support such a project - each to the best of their ability. In any case, certain grants from the state or the EU would be welcome here.

Guideline 14: Facility at the terminal on the coast

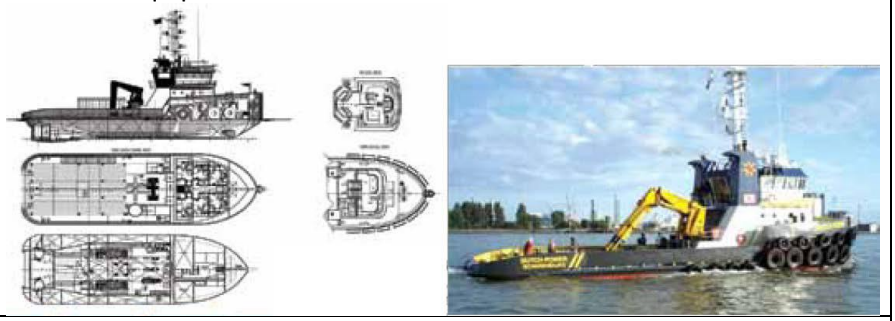
Title	**Facility at the terminal on the coast**
Short description	The following guideline can be used in the ports with poor waste management system which lack of proper equipment. Those projects need to be implemented in Serbian ports in order to achieve sustainable environmental protection and fulfilling obligation arising from legislation. Waste materials generated on tourist or cargo vessels, both in the process of operation of the vessel, in the process of its maintenance, and in the process of providing catering services, are divided into hazardous and non-hazardous waste, which can be solid and liquid, and wastewater (gray and black) and oily bilge water. The generation, collection and temporary storage of waste materials on ships and cruisers can be very differently organized, so the floating dock platform and the onshore terminal must be ready and able to accept: – wastewater (gray and black) – oily bilge water – packaging, non-hazardous waste, which can already be separated by type, and can also be mixed; – mixed municipal waste, which has no use value (a higher percentage is biodegradable waste); – waste motor oils; oiled cloths, filters, etc .; – worn-out fluorescent tubes; waste batteries; – waste edible oils; – other types of waste in smaller quantities. The technical-technological solution includes: – Terminal on the coast, – Floating dock for own needs with wastewater treatment plants (gray and black and oily / bilge), – Service ship with its own ship crane ("interceptor" - self-propelled motor vessel).

	Collection of waste from cargo ships is done with the help of a specialized ship, "interceptor" for receiving waste materials, about 30 m long, specially equipped for that purpose, with its own ship crane. This ship docks with a vessel at berth or anchorage and picks up waste materials from it: wastewater (gray and black), oily / bilge water, waste oil, solid waste (separated and mixed) and oiled and other hazardous waste. Waste materials that are in the liquid phase can be taken directly from the tank by means of pipe connections and pumps or a special own ship crane (crane), located on the deck of the ship, "interceptors" for receiving waste materials, if they are in tanks / containers. Solid waste, which is in containers, is also transferred by crane. The service ship with its own ship crane ("interceptor" - self-propelled motor vessel) has the task to safely pick up all waste (solid or liquid) from a passenger or cargo ship and take it to a floating pier located along the coast. Waste transportation is technically, but also ecologically, the most sensitive part of the system, and therefore the crane operator and service ship driver must be fully skilled in this type of work, and must undergo education and training in countries that already have experience in such jobs. When the ship "interceptor" for reception reaches the platform, hazardous (solid and liquid) and non-hazardous waste, which can be in containers, barrels, tanks, buckets, etc., is transferred from it to the floating pier, from the pier over the approach bridge by forklift to the shore, and from there on to the terminal located on the shore. At the entrance to the Terminal, there is a porter's lodge, from where the employee opens the sliding gate, identifies the type of waste, picks up and fills in the necessary documents that accompany the waste and directs the forklift to a digital platform floor scale where the amount of waste is identified. Depending on the type of waste, the forklift, identified and measured waste, is transported to a plateau for non-hazardous or hazardous waste, for storage, or treatment (selection and baling), until it is picked up by an authorized operator. After the surrender, ie. storage of waste, the forklift goes for a new amount of waste from the platform, or, if the job is done, parked under the canopy on the plateau for non-hazardous waste. The authorized operator, when he comes to pick up the waste, enters the terminal through the gate (which is remotely opened by the clerk in the porter's lodge), picks up a certain, measured, type of waste, fills

	in the necessary, accompanying documentation and leaves the terminal through. Wastewater is pumped and treated in a gray, black and oily / bilge wastewater treatment plant. The terminal is designed to be ready and able to receive all these types of waste in an adequate and environmentally friendly way. In addition, the Terminal must be functional and have the necessary facilities, equipment, installations and roads, all in the function of providing the necessary and quality services and environmental protection. For these reasons, the available space is divided into three parts: 1. Administrative-manipulative-service plateau; 2. Plateau for non-hazardous waste; 3. Plateau for hazardous waste; ***1. Administrative-manipulative-service plateau consists of:*** – Fences 2m high around the whole complex – Sliding entrance / exit gates 1 and 2 – Administrative buildings – Parking for passenger cars and forklifts – Porters – Platform - floor scales – Internal roads with two entrances / exits. ***2. The plateau for non-hazardous waste consists of:*** – Canopies – Conveyor belts for waste separation with hopper – Three wire containers for receiving separated raw materials – Two-chamber balers – Warehouses of secondary raw materials – Three containers for already developed secondary raw materials - PET, metal and glass – Press container for mixed municipal waste. ***3. The plateau for hazardous waste consists of:*** - Tank with tank for waste machine oils - Containers for oily hazardous waste - Containers for fluorescent tubes - Container for waste batteries - Container for waste edible oils. On the Administrative-manipulative-service plateau there is a porter's lodge, a floor scale, an administrative building, parking lots and a grease and oil separator.
Problem addressed / Benefits	Part of waste management system in ports, providing the necessary and quality services and environmental protection.

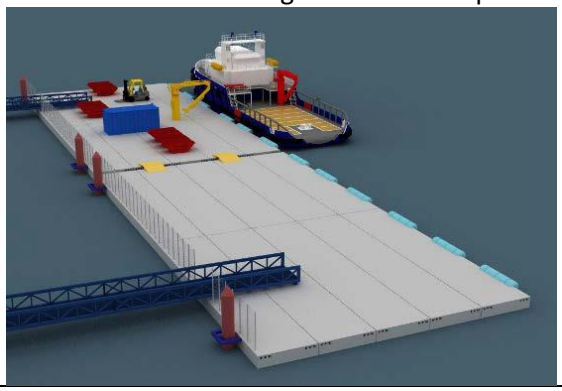
<table>
<tr><td>Transferability issues</td><td colspan="2">This could be implemented in many ports.</td></tr>
<tr><td>Cost</td><td colspan="2">Not available</td></tr>
<tr><td>Equipment / infrastructures or personnel required</td><td colspan="2"><table>
<tr><td>1</td><td>Administrative building:
- office,
- wardrobes for employees,
- toilets.</td></tr>
<tr><td>2</td><td>Landscaping, and facilities on site:
- - fence around the plant to the main gate,
- - portiernica,
- - internal roads,
- - trails around buildings, etc.</td></tr>
<tr><td>3</td><td>Office equipment of the administrative building and porters - furniture, sanitary equipment, thermotechnical equipment</td></tr>
<tr><td>4</td><td>Substation</td></tr>
<tr><td>5</td><td>Computer system with SCADA monitoring station</td></tr>
<tr><td>6</td><td>Video surveillance equipment</td></tr>
<tr><td>7</td><td>PP equipment</td></tr>
<tr><td>8</td><td>Outdoor lighting</td></tr>
<tr><td>9</td><td>Digital platform scale
-Max. measuring weight = 10 t
-Min. measuring weight = 5 kg</td></tr>
<tr><td>10</td><td>Forklift, electric
- load capacity = 2 t</td></tr>
<tr><td></td><td>Plateau for non-hazardous waste</td></tr>
<tr><td>1</td><td>Belt feeder with hopper Belt width: 1000 mm</td></tr>
<tr><td>2</td><td>Belt sorting conveyor Belt width: 1000 mm Conveyor length: 5000 mm</td></tr>
<tr><td>3</td><td>Two-chamber vertical baling press 150 kN
Bale weight: up to 200 kg</td></tr>
<tr><td>4</td><td>Containers, closed, for separated waste (PET, Metal, Glass)</td></tr>
<tr><td>5</td><td>Screw press container, for mixed municipal waste, 10 m^3</td></tr>
<tr><td>6</td><td>Container for separated materials</td></tr>
<tr><td>7</td><td>Storage of spare parts and chemicals, under the canopy</td></tr>
<tr><td></td><td>Plateau for hazardous waste</td></tr>
<tr><td>1</td><td>Container for oily hazardous waste (cloths, filters, etc.), 1000 l</td></tr>
<tr><td>2</td><td>Containers for waste batteries of 1000 l</td></tr>
<tr><td>3</td><td>Container for fluorescent tubes with a maximum length of 1600 mm</td></tr>
<tr><td>4</td><td>Container for waste edible oils of 500 l</td></tr>
<tr><td>5</td><td>Tank with tank for waste motor oils of 5 m^3Tank for receiving up to 1/3 of liquid</td></tr>
</table></td></tr>
<tr><td>Time-plan</td><td colspan="2">Not available</td></tr>
<tr><td>Synergies & collaborations with key actors / stakeholders</td><td colspan="2">Synergies between port management, operators and responsible authorities</td></tr>
</table>

Guideline 15: Specialized ship for receiving waste materials from vessels

Title	**Specialized ship for receiving waste materials from vessels**
Short description	Specialized ship for receiving waste materials from cargo and passenger ships, with its own ship crane (ALB-OWTV-1). Shipbuilding as well as installation of equipment must be appropriate and reliable. The ship is made of mild steel, NS steel - class A. At the stern is the engine room and space for the steering gear. All cargo handling operations are performed from the pump station and from the main deck. Cargo pumps are controlled from the CCS cargo control station on the main deck. A 15 t deck crane will be placed at the stern of the ship on the left side of the cargo area. The ship is equipped with all necessary rescue equipment, fire protection and medical equipment. During inactivity (outside working hours and when there is no call from the vessel to pick up waste materials), the service ship for receiving waste materials will be moored at the floating pier. Basic characteristics: - Load capacity approx. 650 t - Length 40 m - Width 8 m - • Deck height 3.5 m.
Problem addressed / Benefits	Part of waste management system in ports, providing the necessary and quality services and environmental protection.
Transferability issues	This could be implemented in many ports.
Cost	Not available
Equipment / infrastructures or personnel required	Boat with equipment 
Time-plan	Not available
Synergies & collaborations with key actors / stakeholders	Synergies between port management, operators and responsible authorities.

Guideline 16: Floating dock

Title	**Floating dock**

Short description	A floating dock for its own needs is a reception platform without its own drive. The floating dock for its own needs should provide unobstructed access and stay at the dock of the projected number of people and equipment, as well as a safe berth of a specialized ship for receiving waste materials. as well as equipment for waste treatment, with the associated steel structure in the form of equipment foundations, access paths and enclosures. The facility is built of concrete pontoons interconnected completely in the required dimensions, which ensures that the upgraded platform, equipment and pier do not suffer loads from the movement of the pontoons themselves. The facility is designed so that there are physically separate platforms for solid waste handling and a platform for storing wastewater treatment plants. Equipment located on a floating pier includes: - Gray and black water treatment plant - Oily / bilge water treatment plant - Receiving tank for oily / bilge water - Receiving tank for gray and black water - Waste oil tank - Containers for sludge after treatment, one for sludge created by treatment of gray and black waters and for sludge created by treatment of oily / bilge water Deck crane for receiving waste from a specialized ship at the pier. 

	
Problem addressed / Benefits	Part of waste management system in ports, providing the necessary and quality services and environmental protection.
Transferability issues	This could be implemented in many ports.
Cost	Not available
Equipment / infrastructures or personnel required	- Floating dock for own needs - Deck crane on the pier - Bridge for access to the pier - Receiving tank for gray and black water - Receiving tank for oily / bilge water - Container device for purification of gray and black waters - Container device for purification of oily / bilge water - Sludge container after wastewater treatment - Waste oil tank - Pumping pump - Internal pipe network - Skimmer pump in case of an accident
Time-plan	Not available
Synergies & collaborations with key actors / stakeholders	Synergies between port management, operators and responsible authorities

Guideline 17: Operational Guidelines on the Provision of Reception Facilities in Ports and the Delivery of Ship-Generated Wastes in the Mediterranean

Title	**Operational Guidelines on the Provision of Reception Facilities in Ports and the Delivery of Ship-Generated Wastes in the Mediterranean**
Short description	An alternative for the mobile collection of ship-generated waste is to have one or more centrally located fixed shore-based waste reception facilities, or fixed collection points with containers or skips. For smaller ports this might be a suitable option, especially when the collection is organized on a strategic place in the port (e.g. a lock providing the main access to the port). A specific advantage of a fixed PRF is that its

	operations can be extended and combined with waste (pre-) treatment. For large ports the main disadvantage of a fixed reception facility is that in order to deliver wastes and residues, a ship might have to shift berths if the reception of the ship generated waste is located at a fixed place somewhere else in the port. Shifting berths is a very time consuming and expensive operation, which may lead to undue delay or ships not being keen to use the If PRF are located in a less suitable place, delays, congestion and an increased risk of accidents and collisions will result. Appropriate sites for fixed garbage receptacles therefore include wharves adjacent to moorages, access points to docks, fuel stations and boat launching ramps.
Problem addressed / Benefits	The primary ocean-based sources of marine litter are merchant shipping, ferries and cruise liners, fishing vessels, particularly with respect to lost or abandoned fishing gear, military fleets and research vessels, pleasure craft, offshore oil and gas platforms, and aquaculture farms. 14. It is frequently cited that globally 80% of marine debris originates from land-based sources, and 20% from ocean-based sources, however the origins of this ratio are unclear (NOAA, 2009). Besides, the importance of these sources in terms of their contribution to the marine litter problem varies significantly regionally and locally depending on the scale of these activities in the area, as well as the policies regulating them. This means that there is significant variation in the amounts and types of debris arising from these sources regionally and locally. The assessment of the trends in marine litter levels and its sources is crucial for identifying and adopting targeted measures for the different sources. In this respect, the monitoring actions in regional sea conventions, such as the OSPAR Convention, the Helsinki Convention and the Barcelona Convention, are very valuable. Monitoring is applied on uniform marine litter indicators and methods (like beach monitoring and fulmar and/or turtle stomach monitoring), which provide information on the trends in marine litter accumulation and effectiveness of measures. Furthermore, proper source identification is a key element in the monitoring programmes.
Transferability issues	- *increased traffic* - *Expansion of the port: new terminals in operation*
Cost	-
Equipment / infrastructures or personnel required	- Provision of adequate port reception facilities, in order to meet the port users' needs and facilitate a smooth delivery from the ship without causing undue delay; - Introduce modern technology to be implemented by the waste management industry in order to minimize the impact of waste management towards the environment, avoiding emissions to land, water and air;
Time-plan	

Synergies & collaborations with key actors / stakeholders	- *RAPA Vlorw* - *Municipality of Vlore* - *Increased cooperation between Vlora Port and Durres Port might also be a valuable and economically viable option*

Guideline 18: Toward excellence in port environmental management and sustainability- Green guide

Title	**Toward excellence in port environmental management and sustainability- Green guide**
Short description	The main aim of the Green Guide is to trigger port authorities to be proactive and to commit to sustainable development and the continuous improvement of their environmental performance. With this focus, the Guide demonstrates options and approaches, without losing sight of the fact that port authorities find themselves with different challenges to face, have different financial and regulatory powers or capacities to act upon those challenges and finally, have a different track record and history of environmental management and performance. In other words, the Guide recognises that each port is unique. While respecting the differences between ports, the Guide: - defines a common vision of the port sector on environmental sustainability, - promotes the efforts of European port authorities in the field of environmental management, - demonstrates evidence of the progress achieved by the sector over time, - provides guidance to ports in establishing and developing further their environmental management programmes, - highlights the main environmental challenges that ports face and demonstrates response options, - develops a common approach towards responsible action, while respecting the diversity of ports, their competences and their abilities
Problem addressed / Benefits	Air quality Energy conservation and climate change Noise management Waste management
Transferability issues	- Port vision - Spatial planning and infrastructure management - Port dues
Cost	-
Equipment / infrastructures or personnel required	-
Synergies & collaborations	RAPA Vlore National Coastal Agency Vlora Municipality

with key actors / stakeholders	

Guideline 19: Improvement of Infrastructure and reception procedures of black and grey water

Title	**Improvement of Infrastructure and reception procedures of black and grey water**
Short description	The development/upgrade of infrastructure to be able to acceptblack and grey wastewater (sewage, shower and galley wastewater) at some of all of the quays. Vessels can offload sewage free-of-charge and also have the possibility to offload their black and grey wastewater to tanker trucks, pontoons or boats. This type of infrastructure allows the Application of the "No Special Fee" (NSF)-System, simplifying the procedures linked to the delivery of waste and creative motives for the improvement of environmental conduct in the port's area. The practice conforms with IMO regulation and EU legislation and the approach of the Baltic Marine Environment Protection Commission (HELCOM) in its legislative convention (Helsinki convention). According to HELCOM NSF-system this is ""a charging system where the cost of reception, handling and disposal of ship generated wastes, originating from the normal operation of the ship, as well as of marine litter caught in fishingnets, is included in the harbor fee or otherwise charged to the ship irrespective of whether wastes are delivered or not". Since waste, and in many cases litter, is a direct result of the ship's normal operation thus leading to its creation on boards, the NSF approach was the charging of payment for reception, handling and disposal of oil residues, sewage and garbage at any calling port, regardless of the use of service or not.

Guideline 20: Contract Charging System

Title	**Contract Charging System**

Short description	The contract system is applicable which is the more beneficial in the ports where there are regular visits of the ships as is the case in the P.I. Under this system, a contract is negotiated between the owner of the ship which have registered the P.I as home port use and the operators of reception facilities in the port where the ships regularly visits. There are various contractual terms including volume and type of waste, frequency of use of facilities and fee payment. Enables the vessels owners to budget disposal costs over a fixed period, while port is guaranteed a certain yearly income over the same period The practice conforms with IMO regulation and EU legislation. It can be expected that the increased preparedness level, as the port authorities know in advance the needs of the contracted vessels, improves the normal time required for the waste disposal activities, thus improving the "attractiveness" of the port.
Problems addressed/ Benefits	As ships have contractual agree to dispose of waste in the specific port, and agreed costs in advance, administration is minimized, as is the need for monitoring of that particular ship. Illegal dumping is minimized as payment for delivery of waste is fixed, whether facilities are used or not, removing the so there is no financial incentive to dump waste.
Transferability issues	Simple Knowhow and Capacity Exchange
Cost	No additional costs beyond the regular maintenance activities.
Equipment / infrastructures or personnel required	Requires standard facilities and equipment.
Time-plan	Short – Mid Term procedure Adjustment
Synergies & collaborationswi th keyactors /stakeholders	Luka Bar AD Port of Adria AD Waste Management Contractor: Hemosan Ltd

Guideline 21: Ship-Generated Waste Recycling Theme

Title	**Ship-Generated Waste Recycling Theme**

Short description	The scope of the approach is the increase of ship-generated waste recycling rates, with the purpose of reducing the overall amount of waste landfilled. The Port of Tallinn has been actively pursuing the strategy of recycling very high percentages of ship-generated waste received from cruise ships, with efforts being placed in ensuring that recyclable waste is recycled or reused and diverted away from landfill to be reused, recovered or recycled. The practice conforms with IMO regulation and EU legislation. The increase of recycling rates is considered a major indicator for sustainability and "greening" of waste relating procedures, improving the respective performance of waste collection and the "attractiveness" of the port.
Problems addressed/ Benefits	Minimizing Landfill Waste and Increasing Recycled Material
Transferability issues	Depending on overall infrastructure in the country / region
Cost	Depending on overall infrastructure in the country / region
Equipment / infrastructures or personnel required	Separate Collection Points for Recyclable Material
Time-plan	Depending on overall infrastructure in the country / region
Synergies & collaborationswi th keyactors /stakeholders	Luka Bar AD Port of Adria AD Waste Management Contractor: Hemosan Ltd National Authorities

5. Key Conclusions

The O.T1.1 is a transnational strategy focused on supporting waste management/recycling for the protection of ports environment, which was shared and adopted by the network established during the project's implementation.

One of the project main results was an evident enhancement of common understanding among partners and stakeholders on the base of shared transnational policies regarding port waste management. Considering that vessels voyaging to and from ADRION countries are major sea polluters, establishing the network of the port authorities and its stakeholders for adoption of the transnational port waste management model, which is the base of the transnational strategy elaborated, and agreement deed with ship operators and cruising lines was one of the most important results of the project. This included severe rules for waste management and commitment to inform cruisers of the arrival port waste management system thanks to a video clip showing good practices for environmental protection of port areas.

ECOWAVES partners, through cross-border collaboration, put systems in place to ensure common targets are achieved: enhance the capacity in transnationally tackling environmental vulnerability, fragmentation and the safeguarding of ecosystem services in the Adriatic Ionian area. As a result, port areas were provided with eco-islands, lighting sign system, monitoring equipment with state-of art methodologies and technologies. All Partners cooperated to the fulfilment of the chosen targets.
In particular, the innovativeness of the project laid in 2 main aspects, on the one hand the use of the most modern technologies, on the other the creation and validation of a model that can be strengthened and expanded even after the end of European funding and beyond the area of cooperation.
In this strategic document, **21 tailored guidelines** and **18 best practices** have been drafted by the partners, aiming to enhance the actual environmental status (including waste management from shipping) of the Adriatic-Ionian ports, as well as their social profile.

Several key-target groups have been involved and engaged in project's activities for the durability of project's results:

• **Local authorities** in project's activities: This will support new sustainable waste management systems for port areas after sharing monitoring data and surveys showing lacks in current port waste disposal.
• **National institutions** will help setting a network among all partners institutions in order to apply new policies and strategies, enhancing the ADRION area environmental quality.
• **Tourists & ship operators'** awareness of the importance of their behaviour will be increased by capacity buildings and cruising lines commitment and tourist agencies cooperation in communication.
• **Vessels & cruising ships** will adopt new attitudes in sea waste disposal and avoid illegal discharges.

All these actors will lead to institutional and financial sustainability because ports will enhance their position as appreciated waste reception facilities and tourist marine sites and increase overall satisfaction of incoming guests.

In general, this strategic document is intended to be replicable in other contexts of sea or river port authorities in Adriatic-Ionian basin. The model that forms the basis of the strategy, is centred on types of waste to dispose, optimization of waste management approaches and represents the first step for the creation of environmental conditions as improved waste management of ports and plays an important role in overcoming environmental vulnerability. Thus, the model will be further transferred to public port authorities of the other sea or fluvial port towns as well as to private ports and marinas of Programme area with high visible and wide-ranging dissemination activities carried out on multimedia platforms, public events and press releases.

This project output was the result of a solid cooperation among Partners, based on the actual monitoring of the situation in port waste management, studied and analysed through specific monitoring tools, including technical aspects with the aim to preserve ecosystems and water resources.

All Partners will keep spreading/disseminating the main output among their stakeholders, creating a broad network of awareness and knowledge, ensuring long lasting results in environmental preservation of seas and port areas.

The model of sustainable waste management in port area will be available on the project website and easily transferable to the other ports and harbours of the ADRION shores.