Transnational ENhancement of ECOPORT8 network
TEN ECOPORT - Code SEE/D/0189/2.2/X

COMMON MODEL
FOR ECOLOGICAL & SUSTAINABLE DEVELOPMENT & MANAGEMENT OF SEA-PORTS OF TEN-T NETWORK IN SOUTH EAST EUROPE

Edited by:
TEN ECOPORT Partnership

With the contribution of:
National Institute of Meteorology & Hydrology-Bulgarian Academy of Sciences

Jointly for our common future

WP 4 - Act 4.5
Common Model for sustainable development of the sea-network

Jointly on eco-routes

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With the contribution of:
TEN ECOPORT Partnership
South East Europe Transnational Cooperation Programme
PRIORITY AXIS 2: Protection and Improvement of the Environment
AREA OF INTERVENTION 2.2: Improve prevention of environmental risks
Project “Transnational ENhancement of ECOPORT8 network”
TEN ECOPORT project – Code SEE/D/0189/2.2/X
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Acknowledgment

The work "COMMON MODEL for ecological & sustainable development & management of sea-
ports of Trans-European Transport (TEN-T) network in South East Europe" was produced with
the financial support of the SOUTH EAST EUROPE Transnational Cooperation Programme,
Project Code SEE/D/0189/2.2/X, Project Title: “Transnational Enhancement of ECOPORT8
network”, Acronym: TEN ECOPORT.
Introduction

Nearly half of the global population resides in coastal areas. The dramatic increase of human pressures on the environment, being concentrated along the coasts, leads to degradation of coastal systems and destruction of habitats in the coastal zone. Although sea transport may be globally considered as one of the most environmentally harmless forms of transport, the port activities should be a subject to special precautions to ensure that they adhere to sustainable development conditions.

Several initiatives have been taken in the area of ports’ operations in relation with the improvement of the environmental protection (Peris-Mora et al., 2005).

For instance, the International Convention for the Prevention of Pollution from ships (MARPOL) is adopted on 2 November 1973 at the International Maritime Organization. As the 1973 MARPOL Convention had delayed to enter into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on 2 October 1983. The MARPOL Convention includes regulations aimed at preventing and minimizing pollution from ships —both accidental pollution and that from routine operations— and currently includes six technical annexes. Special areas with strict controls on operational discharges are included in most annexes.

In 1994, the European Sea Ports Organization (ESPO) created an Environmental Conduct Code for Industrial Ports (Goulielmos, 2000). Through 1997, the Amsterdam Port Authority started the project ECO INFORMATION (Euromagazine, 2003), and in the same year, Rotterdam port began the GREEN AWARD System with the same objective (Green Award, 2001). Besides, in 2003, the ESPO published the new Code of Practice (ESPO, 2004) recommending specific environmental practices to improve the environmental ports performance and ECOPORTS Foundation (www.ecoports.com/foundation/index.asp) started its activities (Darbra et al., 2004).

The European Union Regulation 1836/1893 has enacted in 1993. Industrial companies were invited to implement an Environment Management System (EMS) based on Environmental Management Auditing Scheme (EMAS) to be included in one European registry. Port installations were excluded from this invitation because they were not industrial companies in the strictest sense. However, ISO Standard 14001 (CEN, 2004) opened the door to the EMS implementation for all organizations which albeit without the institutional support that the European Regulation afforded. Indeed nowadays in Europe the ISO 14001 standard (see Figure 1) is considered to be a prerequisite in the certification process enabling voluntary participation by organizations in a Community eco-management and audit scheme (EU, 2001; EU, 2009).

In addition, the Water Framework Directive (2000/60/EC) and Marine Strategy Framework Directive (2008/56/EC) focus on the application of integrated policies for surface or coastal aquatic systems. The see ports are not an exception and their sustainable development depends on the application of well-defined environmental management instruments considering social, economic, legal, technical and environmental imperatives (Ondiviela et al., 2012).

Since 1997, the Valencia Port Authority in Spain has been developing several projects (ECOPORT Valencia, 2000) with a view to establish procedures to implement the Eco-Audit European regulation 1836/1893 in European harbors. The initiative was supported by the European Commission LIFE projects. Additionally, INDAPORT (IPEC, 2005) has been initiated
(2002–2004) to establish systems of indicators in order to implement a sustainable environmental ports management.

Therefore, to improve ports management and their ecological performance in order to guarantee the ports certification there is an urgent need to put into operation EMS to deal with the ports’ problems. In practice, an EMS is a continuous cycle of planning, implementation, review and improvement of processes and actions that an organization undertakes to meet its environmental obligations. Principally, the EMS is targeting on the achievement several environmental obligations (see Figure 2) as provided in Quynh et al. (2011):

- improving environmental performance;
- complying with environmental laws and regulations;
- reducing environmental liability;
- managing effectively resources;
- improving business/production performance.

For the majority of the organizations, many elements of an EMS may already be in place as they are common to management processes. However, the integration of environmental management with other key processes can improve financial, quality and environmental performance (Quynh et al, 2011).
Recently a number of methodologies objecting to analyze the environmental risks in sea ports
(Wooldridge, 2004; Wang et al., 2004; Jones et al., 2005; Peris-Mora et al., 2005; Ronza et
al., 2006; Eide et al., 2007; Grifoll et al., 2010; Petrosillo et al., 2010) or to assess the status
of ports’ environment (Darbra et al., 2004; Xu et al., 2004; Darbra et al., 2005; Borja and
Elliot, 2007; Marin et al., 2008) have been reported. This confirms an evolution towards
management practice in which both the economic and the environmental factors are
considered. In most cases these approaches provide answers for legal requirements, control
port management sustainability, identify significant environmental aspects or prevent and
assess water quality degradation. However, a complete sustainability can only be achieved by
tools integrating together all these aspects.

[Figure 2] Key elements of Environmental Management System (EMS) as a continuous cycle of planning,
implementation, review and improvement of processes and actions that an organization must undertake
to meet its environmental obligations (Quynh et al, 2011)

The combined approach for eco-port management has been adopted also in the ECOPORT8
project (http://www.ecoport8.eu), which in particular aimed to improve eco-management of
several sea ports of the Corridor 8 of the Trans-European Transport network (TEN-T) from
the South East Europe (SEE). However, as concluded in Marinski et al. (2012), even though
each of the considered ports has a system for environmental management (or at least
elements of such system) none of them meets the international and European standards for

One reason for this is that the ISO14001 is quite general and does not respond to the specific
needs for ecological management of sea ports. Moreover, Ghisellinia and Thurston (2005)
developed a hypothesis that the ISO 14001 implementation process can create several
cognitive biases which may hinder the overall environmental performance of certified
companies and described cases of decision traps into which companies may fall prey during the
ISO 14001 implementation. The latter can be summarized as follows: management nature of the standard, failure to identity a rigorous environmental baseline, misconception of pollution prevention, inordinate emphasis on short-term goals, focusing on regulatory compliance, and diversion of EMS resources to the documentation system. Furthermore, the comprehensive analysis of European industry (Measuring Environmental Performance of Industry) reported that the performance of companies with ISO 14001 certification was not significantly better than others (Berkhout et al., 2001), while Llomaki and Melanen (2001) found that certified EMS entities sometime do not necessarily result in improved material efficiency or waste minimization.

In order to overcome the abovementioned difficulties, TEN ECOPORT project (http://www.tenecoport.eu) has developed a Common Model (CM) (called equally procedure, approach or platform) that is able to yield and supports implementation of a long-term Management Action Plan (MAP) as a core element of the ecologically and sustainable development and management of sea ports of TEN-T networks within SEE area (Marinski et al., 2014). Since the sea ports constitute the main hubs of the SEE transport corridor 8, only a commonly shared and harmonized approach among them and a tool as the CM can bring a future positive impact in the entire TEN-T network.

This work aims to present the background, principles and description of the key elements of the Common Model for ecological and sustainable development and management of SEE sea ports. We believe that the proposed CM could resolve the decision traps related to ISO14001 as it always results in a realistic and constructive planning able to meet needs of decision makers and management authorities of the SEE sea ports for an improved environmental performance. The CM is built on the outcome of ECOPORT8 and TEN ECOPORT projects and in practice generalizes and summarizes the comprehensive results of both ECOPORT8 and TEN ECOPORT for SEE sea ports.

2 Background, principles and elements of Common Model

The section presents the basis for the development of the Common Model, as laid down initially in the outcome of ECOPORT8 project, and its further evolution and development undertaken during the implementation of TEN ECOPORT project.

At the beginning, in order to set up a platform for a better eco-management of SEE sea ports, ECOPORT8 project (http://www.ecoport8.eu) has proposed several methodological steps (linked in a spiral of continuous improvement) towards the EMS development and certification of sea ports (as shown in Figure 3). These include:

- Initial environmental review (legislative and environmental analysis);
- Common environmental policy elaboration;
- Improved programme for eco performance;
- Pilot monitoring systems establishment;
- Training, collaboration and effective relations;
- Creation of shared guidelines and methodologies for environmental port management.

Thereafter, based on the context analysis for the European Corridor 8 sea ports of the SEE TEN-T, the significant environmental objectives and principal measures have been identified
(see Table 1) as a part of a constructive planning for the improvement of the eco-performance of the SEE ports.

Then, TEN ECOPORT project (http://www.teneporte.co.eu), capitalizing on the results of ECOPORT8 project, has made further pragmatic steps towards an improvement the environmental quality of ports (Floqi et al., 2013).

The practical way to achieve this goal is the elaboration of a Common Model (procedure, framework, or platform) able to design a strategic MAP for ecological and sustainable development and management of the SEE sea ports and an operational EMS (Marinski et al., 2014). Apparently, the procedure has to be built on the above described general principles and should use nowadays innovative methodologies, methods and models for environmental protection in the area of SEE ports. Moreover, the proposed CM consists in a completed set of logical consecutive steps (guidelines) which are strictly related among them (so call chain or spiral approach) meaning that in the CM each step is propaedeutic for its next stages. All these translate in practical terms the foremost principles and objectives, including those of ISO14001, ensuring the better eco-performance and management of the SEE ports.

Principally, any model should be a conceptual scheme that describes and represents a given complex system. The system could comprise multiple views such as planning, analysis, design,
implementation, deployment, structure, behavior, input data, and output data. Thus, the model is required to describe and represent all multiple feathers of the considered system. Therefore, following the general concept for building of models the Common Model for the ecological and sustainable ports development and management is developed in a form of a procedure that is schematically presented in Figure 4.

Table 1 Significant environmental objectives and principal measures identified after context analysis of all pan-EU Corridor 8 ports of SEE TEN-T

<table>
<thead>
<tr>
<th>ENVIRONMENTAL OBJECTIVES</th>
<th>PRINCIPAL MEASURES</th>
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| To identify and ensure compliance with environmental legislation and regulations         | • Each of SEE area ports to create a Legal Register containing legal and other requirements; by means of Chapter 4 of the Final report “Identification and analysis of EU and national regulatory framework”;  
  • To assess regular compliance to environmental legislation;  
  • To influence the development of the environmental legislation related to ports and to assist its implementation.                                                                                                   |
| To elaborate an environmental management system for achieving SEE area ports environmental objectives and targets following UNITED ISO 14001/4/EMAS     | • Each of SEE area ports to update the existing management system and programmes (plans) taking advantage of ECOPORT project recommendations and guidelines;  
  • To determine more precisely environmental aspects and impacts associated with normal, abnormal and emergency conditions;  
  • To produce a procedure to assess the significance of aspects and establish a Significant Aspects Register;  
  • To establish measurable environmental performance indicators;  
  • To review environmental management system periodically;  
  • To stimulate continuous improvement in the port environment and its port environmental management by promoting the use of Environmental Management Information System tools (such as environmental audit, environmental review, environmental management system, decision support system, etc.). |
| To introduce monitoring, based on environmental performance indicators in order to measure progress in environmental port practices | • To setup a monitoring system with defined purposes, and implementation plan;  
  • To calibrate or verify measuring equipment prior to use at specified intervals according to common standards;  
  • To use qualified personnel to conduct and control the monitoring process.                                                                                                                                   |
| To strengthen the administrative capacity for environmental requirements implementation and enforcement | • To establish and improve working of the basic administrative structures at local and central level; appointment of additional personnel at the competent authorities, exercising of control over the environmental requirements implementation, providing the functioning of the competent authorities with the necessary technical equipment;  
  • To train the experts in EMS development and implementation in ports and to facilitate cooperation between SEE area port administrations in the environmental field;  
  • To increase awareness about environmental concerns of everyone involved in port activities and to set up an educational and information centre for port environmental issues. |
| To improve SEE ports communication policy and practice                                     | • To have better communication and coordination between port administrations, port users and state institutions responsible for environmental legal implementation;  
  • To encourage wide consultation, dialogue and cooperation between port administrations and stakeholders at local level (port users, public, NGOs);  
  • To inform the society about port initiatives taken to protect the environment and to conduct joint eco-campaigns;  
  • To use environmental reporting to the stakeholders, the state and the European Institutions as means of communicating environmentally good behaviour. |
| To efficiently install and utilize the financial and material resources to ensure sustainable port development and environmentally sound ports operation | • To share the costs of environmental solutions between SEE ports;  
  • To prevent wasteful duplication of research and development efforts by means of SEE ports cooperation;  
  • To benefit EU financial instruments for support of EU port operations management and environmental protection;  
  • To ensure effective utilization of raw materials, supplies and energy;                                                                                                                                           |

The scheme of the Common Model (see Figure 4) explains who are the main actors responsible for the improvement of port ecology —Port Decision Makers, Port Environmental Office and Port Operators and Stakeholders— and also what are important steps to be followed in the
process of construction and implementation of Managing Action Plan for ecological and sustainable SEE ports (see also Marinski et al., 2014).

Here it is important to stress that the elaboration and mostly the implementation of MAP cannot be efficient without the involvement of ports operators and stakeholders since without an active collaboration and agreement with them (or eventually forcing them through the application of legislations that the Decision Makers have to set in case), the Port Authorities alone will be not able to guarantee and perform an effective Environmental Management of SEE ports.

**Figure 4** Scheme of Common Model explaining main actors responsible for improvement of port ecology and the important steps in the process of construction and implementation of Managing Action Plan for ecological and sustainable SEE ports
In addition, the scheme of Common Model illustrates the supporting role of Research Institutes, Universities and Innovative Science in all CM’s steps and the important influence of National Government, NGOs, and all interesting parties, in particular when identifying and mapping the port critical environmental issues and environmental risk evaluation.

The CM procedure has to be initiated by the port decision makers with the creation of a relevant port Environmental Office. Then, the Environmental Office should prepare an initial assessment of port environmental status, to harmonize measures with the existing EU and national law, to create an environmental management strategy, to guarantee the application of advanced methods, models and tools for better port management, including utilization of a monitoring system to observe the port environment, to map the critical environmental issues on the port area through a WebGIS information system, to develop relevant feasibility studies and assessments and based on all these results to elaborate an MAP for an improve port ecology. Thereafter, the MAP has to be approved by the port government body before to be implemented, which is followed by an institutional monitoring, control and review of process performance during the implementation of MAP (see also Marinski et al., 2014).

Management cycle of the CM represents a process of continuous planning, implementation, review and improvement of actions that an organization undertakes to meet its environmental obligations. Integrating environmental management with other processes can improve financial, quality and environmental performance of the SEE ports. In most cases this provides answer to legal requirements, control port sustainability, identify significant environmental aspects or prevent and assess water quality degradation. The management cycle of the CM in TEN ECOPORT project is specified briefly into following phases:

- Initial phase - determination objectives that have to be in terms of economics and business, and must be quantifiable, measurable and shared
- Second phase - planning, where objectives become a basement and programs alongside with the resources allocated
- Organization and Communication phases – they are structured as the organization for resources allocated and information communication to all actors depending of the objectives to be achieved and according to the available funds organization for resources allocated and communication of founds to spend and the objectives to be achieved
- Action phase - it is needed to act as programmed in the previous phases
- Measurement phase - a very important step but appears to be restricted because the available instruments for the SEE ports (indicators, detection systems, etc.) are still very limited.
- Final phase - evaluation and control, also significant step of the CM, which completes by results reporting and closing the management circuit with eventual update and reformulation of the initial objectives and new planning.

Additional information about the management cycle of the CM could be found in other publications from TEN ECOPORT (http://www.tenecoport.eu). Thus, this work focuses mainly on the internal circuit of the procedure of the CM and specifies the consecutive steps of the MAP development. These steps are described thereafter in their logical sequence.
3 Description of Common Model steps

3.1 Environmental port diagnostic and initial assessment of port environmental status

Some facts and figures on ports pollution (UNESCO and EMSA):

- contribution of international shipping to global CO2 emissions from ships above 100 GT engaged in international trade was estimated to be 843 million tonnes in 2007 or 2.7% of the world's total anthropogenic CO2 emissions;
- land-based sources (such as agricultural run-off, discharge of nutrients and pesticides and untreated sewage including plastics) account for approximately 80% of marine pollution, globally;
- shipping accounts for about 20% of global discharges of wastes and residues at sea;
- over the last decades, the risk of accidents has increased. Contributing factors are the larger volume of maritime transport, including dangerous or polluting cargos, a higher exposure to third party interests and, finally, the increased recognition of the value of the natural environment;
- coastal tourism, port and harbour developments, damming of rivers, urban development and construction, mining, fisheries, aquaculture, and manufacturing, among others, are all sources of marine pollution threatening coastal and marine habitats;
- more than 10,000 marine species each day may be transported across the sea in the ballast water of cargo ships and introduced into a non-native environment;
- excessive nutrients from sewage outfalls and agricultural runoff have contributed to the number of low oxygen (hypoxic) areas known as dead zones, where most marine life cannot survive, resulting in the collapse of some ecosystems.

The management of relationship between a port and its environment requires the usage of practicable assessment techniques that merely define the port status quo but also provide appropriate data for checking compliance and auditing the impact of port activities on the environment (Wooldridge et al., 1999; Wooldridge et al., 2004).

A general survey of methodologies for identifying ports environmental aspects is performed by Darbra et al. (2005). A ranking of the major environmental issues in sea ports,—on statistical basis, has been established from the results obtained through the ESPO Environmental Questionnaire (Darbra et al., 2004). An example of such questionnaire or a matrix for assessment of significant environmental aspects is presented in Darbra et al. (2005). In this way have been identified the key environmental aspects in ports as follows:

- Emissions to air (including gases, solid particles and energy, dust)
- Discharges to water (e.g. waste waters, accidental releases during loading/unloading operations).
- Releases to soil due essentially to industrial activities.
- Releases to marine sediments and activities affecting the seabed (such as dredging).
- Noise, with its potential impact on population and fauna.
- Waste generation and dredging disposal.
- Loss/degradation of terrestrial habitats.
- Changes in marine ecosystems.
• Odours.
• Resource consumption.
• Port development (land and sea occupation).

In addition, Peris-Mora et al. (2005) proposed a system of indicators for port environmental evaluation and management. These indicators bring together a series of characteristics derived from different sources which are common to the majority of indicators (OECD, 1993; OECD, 2001; EEA, 2001). Further information on the application of common environmental indicators or their testing for marine and coastal environment concerning eutrophication and risk from hazardous substances can be find in the publications of the European Environmental Agency EEA (2001) and EEA (2002a,b). Potentially all activities carried out in the port area have to be a subject to an environmental assessment and to be considered in the building of the corresponding environmental. More details about practical steps to follow during the process of construction of indicators for port sustainable development are given in Peris-Mora et al. (2005).

Recently, Ondiviela et al. (2012) have introduced a methodological standard directed to unify and group the set of tools adopted by ports to satisfy the environmental requirements. This standard, included in the Spanish Standardization of Maritime Works (ROM Programme), and published under the denomination “ROM 5.1. Quality of coastal waters in port areas” (Revilla et al., 2007), was elaborated through a participatory process (i.e. port authorities, consultants, marine scientists, etc.) led by the Spanish Port Administration. Based on a DPSIR scheme (Driver, Pressure, State, Impact, and Respond), ROM 5.1 provides new technical tools for:

• classification of water bodies in port areas,
• environmental risk assessment,
• ecological potential assessment,
• recognition of sites where management efforts should be focused.

This methodological procedure has been tested in a selection of ports which are representative of the different social, economic, hydrodynamic, and environmental conditions, namely: the port of Tarragona (Mediterranean Sea), the port of Huelva (Atlantic Ocean) and the port of Gijon (Biscay Gulf), and is being implemented in three other Spanish ports in the Canary Islands, the Mediterranean and the Biscay Gulf.

Apart of the above general approaches there are also specific methods. For example, the water quality in port areas particularly could be specified by the Bacteriological quality index (IQB) or Trophic index (TRIX). IQB is based on the frequency of absence/abundance of fecal coliforms and streptococci, representative of the presence of urban-agricultural disturbance (Melley et al., 2004). IQB values should be calculated on available monitoring data. The Trophic index (TRIX) is a linear combination of the logarithms of four state variables (Chl-a, minN, Ptot and the absolute percentage deviation from oxygen saturation) and characterizes the trophic conditions of sea water, identifying four quality classes: highly productive, moderately productive, scarcely productive and open waters (Giovanardi and Vollenweider, 2004).

In accordance with the objectives of TEN ECOPORT project, as shown in Figure 5, during the first step of the CM procedure the port authorities have to reveal themselves which are the relevant and available instruments and techniques for its own port ecological diagnostic and assessment. For instance, the results of analysis and review of the policies in force and the existing instruments for the SEE port assessment and management, done in ECOPORT8 project (Branca et al., 2011), is presented in Figure 6, while the close-chain approach has adopted as a tool for ports assessment and management (see Figure 7).
Creation of environmental SEE port management

**TEN ECOPORT aimed to provide:**

- Tools and policies to plan for the efficiency of the Trans_European Network corridors
- Processes and Procedure verified which can reduce costs and risks
- Liabilities and sustainable development

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**Figure 5** Main objectives of TEN ECOPORT project for environmental SEE ports management

**Figure 6** Analysis and review of the policies in force and existing instruments for SEE ports assessment and management
3.2 Compliance with existing EU and national legislation and regulations

The main instrument to control, reverse and prevent degradation of the marine environment in port areas, as a result of pollution from port and ships activities, is the legislation that includes international conventions, EU directives, national laws and regulations (Floqi et al., 2011). Two examples of EU directives —for ship generated waste (2000/59/EC) and sulphur content of marine fuels (2012/33/EU)— are generally presented in Figure 8.

The Context Analysis, done in Ecoport8 project (http://www.ecoport8.eu), summarizes the results of a comprehensive review of currently existing legislation by:

- identification and analysis of international marine conventions and international treaties ratified by the governments of the project countries (MARPOL convention, London Convention, etc.)
- analysis of the EU and national regulations of the project countries as well as the instruments adopted for port planning;
- verification of environmental parameters of port interests, which are actually regulated by the legislation and analysis of the harmonization of national laws with EU legislation.
Ship-generated waste: all waste, including sewage, which are generated during the service of a ship and fall under scope of Annexes I, IV and V to MARPOL 73/78 and cargo associated wastes defined in the guidelines for implementation of Annex V to MARPOL 73/78 (Annexes III + VI are not in Directive’s scope)

Cargo residues: remnants of any cargo material on board in cargo holds or tanks which remain after unloading procedures and cleaning operations are completed, and shall include loading/unloading excesses and spillage.

Figure 8 EU directives for ship generated waste (2000/59/EC) and Sulphur content of marine fuels (2012/33/EU)

Consequently, the acknowledged major port environmental issues and the corresponding policy or legislation, including several not treated environmental issues, listed respectively by policy and SEE country (see Figure 9), can be found in the Context Analysis (http://www.ecoport8.eu) and as a summary in Floqi et al. (2011).
Table 1. List of IMO Conventions ratified by Italy, Bulgaria, Romania, Greece, Albania and Montenegro

<table>
<thead>
<tr>
<th>Title</th>
<th>IT</th>
<th>BG</th>
<th>RO</th>
<th>GR</th>
<th>AL</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Convention for the Prevention of Pollution from Ships, (MARPOL 1973/78)</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>International Convention for the Prevention of Pollution by Oil</td>
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<tr>
<td>Annex III: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk</td>
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</tr>
<tr>
<td>International Convention for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form</td>
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<tr>
<td>International Convention for the Prevention of Pollution from Ships, 1972 (MARPOL 1972/78)</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Annex IV: Prevention of Pollution by Seawater from Ships</td>
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<tr>
<td>International Convention for the Prevention of Pollution from Ships, 1972 (MARPOL 1972/78)</td>
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<td>Annex V: Prevention of Pollution by Garbage from Ships</td>
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<td>Annex VI: Prevention of Pollution from Ships (entry into force 19 May 2005)</td>
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<tr>
<td>International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969)</td>
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<tr>
<td>International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001 (Bunkers Convention)</td>
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<td>X</td>
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<tr>
<td>Protocol of 2000 on Preparedness, Response and Co-operation to Pollution Incidents by Harmful and Noxious Substances, 2000 (HNS-OPRC)</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>International Convention on the Control of Harmful Anti-Fouling Systems, 2001 (ANTI-FOULING) or (AFS 2001)</td>
<td>X</td>
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<td>X</td>
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<td>X</td>
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Legend: X - Ratified; - Not ratified; d - denunciation

**Figure 9** Acknowledged major port environmental issues and the corresponding policy or legislation listed by policy and SEE country respectively.
3.3 Creation of environmental Management Strategy for port

After carrying out the diagnostic of current port activities and initial assessment of port ecological status (step 1) as well as implementing an harmonization with the EU and national legislation in force (step 2) the procedure recommends the creation of a long-term environmental Management Strategy for a better port eco-performance and towards port certification.

The basic objectives of the port environmental management strategy should be (Damiani et al., 2013):

- Enhancing the cross-border and trans-European partnership between SEE port areas developing collaboration and effective relation among all stakeholder (port authorities, local institution, enterprises, external operators and citizens of the involved countries), in order to stimulate an integrated policy on environmental protection and growth of TEN corridors;
- Developing and implementing intelligent environmental port management and information systems using integrated technologies for environmental risk protection in order to reduce impacts on human health, biodiversity and other environmental issues.

The achievement of the general strategic goals is possible through the following specific objectives (Damiani et al., 2013):

- improving the capacity of port authorities for developing and implementing effective policies for environmental management of the port areas, by defining specific critical issues, implementing Specific Action Plan useful for a shared efficient and sustainable Operational Environmental Plan;
- promoting a peer discussion among all the people and Institution involved in port activities, aimed at providing, education, training, consulting and reviewing based on the best experiences and lessons gained by all the ports involved;
- creating regional/local platforms involving all the local stakeholder connected directly or indirectly with the port areas and the cities hosting them, in order to guarantees information about the peculiarities of each areas involved end to provide timely solution plans;
- providing innovative methodologies and instruments for mapping the critical issues for each port involved and highlighting the common key-elements, as basis of the Common Action Plan aimed to protect ports area and surrounding ecosystem;
- supporting EDI (electronic data interchange) system and other ICT instruments for updating the EMS systems starting by the assessing of the vulnerabilities and risks;
- creating an information base of research methodologies for environmental protection in SEE ports;
- promoting the transnational enhancement of a permanent TEN ECOPORT network for developing, strengthening and transferring of coordinated initiatives useful for a transnational strategy for port-eco-management in SEE sea basins;
- establishment of transnational subject as a multidisciplinary Task Force for gathering all the knowledge and experienced gained by the project and other future experience aimed to keep supporting and providing services to ports of SEE.
The Management Strategy for SEE ports aims to provide a transnational network that is enabling policy coordination among the partners and stakeholders, and can support the sea networks in the development and implements an intelligent environmental port management and information systems through integrated technologies for identification of the environmental risks.

3.4 Utilization of advanced tools, methods and models in port management

The instruments, methods and tools employed for improving the Corridor 8 ports environment protection are as a whole linked to the primary designated objectives of the Ecoport8 and TEN ECOPORT projects. These include:

- Electronic platform
- Environmental risk analysis (ERA) in ports
- Environmental land use plans (LUP) in ports
- Integrated coastal zone management (ICZM)
- Application of advanced models (hydrodynamic, geochemical, ecosystem, oil spills, etc.)
- Simulation of scenarios
- Seminars, workshops and training courses.

3.4.1 Electronic platform

The Electronic Platform for ports developed provides an environment where the stakeholders and port operators along with port authorities, universities, researchers, NGOs, and anyone interested about the trans-European eco-routes will be able to exchange ideas, good practices, publications and participate in open discussions. The users of Electronic Platform are able to search and share different kinds of information like legislations, publications, etc. about eco-topics, through a high-level of web technology applications. Further details about the features of the Electronic Platform are shown in Figure 10 and Figure 11.

3.4.2 Environmental risk analysis (RA) in ports

Risk analysis is essential for those ports where hazardous cargoes are handled. It is mainly undertaken to enable port authorities to determine the action that is needed to improve the safety of navigation and to deal with the foreseeable effects of an incident in the port area and in the aquatorium waters. The WP4 of ECOPORT8 project provides a short description of the methodology of environmental risk assessment and management and suggests a simple method for modeling environmental risk.

The key elements for the risk assessment are based on FMEA (Failure Mode Effects Analysis) methodology and the application developed for the management of risk and preventive measures RkFMEA. Risks are measured by four parameters: vulnerability (exposure) (R), probability (P), the effect of existing counter measure or control (action) (N), whereby these three parameters provide an overall risk factor RPN, according to the FMEA standard. Estimation of consequences, probability and effect of measures can be made on simple statistics, engineering expertise, expert’s opinion, mathematical models or other means and updated and upgraded with next iteration of the data set.
Electronic Port Platform
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INTRODUCTION
The Electronic Port Platform developed in the framework of the “TEN ECOPORT” project is providing an environment where the stakeholders along with port authorities, universities, researchers, students and anyone interested about the trans-European e-ports will be able to exchange ideas, good practices, scientific publications and participate in open discussions. The community of the platform is able to search and share many different kinds of information like legislations, scientific publications etc about eco-topics, through a high-level of web technology applications.

Platform development
The TEN ECOPORT Electronic Port Platform is a web-based platform. As a web application follows the client-server model. Client communicates with the server through a web browser, while the server responds to client requests with web pages.

Figure 1. Schematic representation of the information exchange among the different parts of the Electronic Port Platform

The structure of the Platform consists of 3 tiers:
> Presentation (Web Browser)
> Application Logic (Web Server)
> Storage (Database)

The greatest benefit of this structure is separating the application into different tiers, every tier is independent from the others. System failure can be managed much easier with future updates and changes.

Life-cycle of a client request

Figure 2. Schematic diagram of the Electronic Port Platform operational functionalities

Platform Functionalities
The Platform functionalities are divided into 3 main sections plus the privileges of a known (registered) user (5) which will be mentioned in the process.

Publications section contains scientific publications uploaded by registered users of the platform. The material of this section is available to all users (registered or guests) and several tools are provided for searching with specific terms or filters.

Policies section contains international, european, national and port policies uploaded by verified users of the platform. The material of this section is available to all users (registered or guests) and several tools are provided for searching with specific terms or filters.

Legislations section contains international, european and national legislations uploaded by verified users of the platform. The material of this section is available to all users (registered or guests) and several tools are provided for searching with specific terms or filters.

Training material section contains courses and presentations full of ecological techniques and strategies, available to all users (registered or guests). Several tools are provided for searching with specific terms or filters.

Discussion Area / Forum section provides to users the ability of asking questions and touching on critical eco-issues through open discussions. All registered users can start their own thread by asking a question or just mentioning the title of the topic.

Community member privileges are tools that the platform provides to registered users and designed to keep them up to date about topics they may interested.

Acknowledgements
This work is supported by the "Transnational Enhancement of ECOPORTS network (TEN ECOPORT) project with code SEE/D1/0193/2.2/X, co-financed by the European Union within the South East Europe Transnational Cooperation Programme.

The site of this application can be found in the link: http://www.teneecport.eu/platform/

Figure 10 Features and capabilities of the Electronic Platform
3.4.3 Environmental land use plans (LUP) in ports

The expansion of inner-city and industrial territories, including those related to the priority growth of tourist industry, has resulted in increasing the contact zone with ports’ territories. Looking for additional instruments to existing legislation, it is suggested for the revised and improved program on environmental protection of SEE ports to include modern territory planning related specifically to the environmental parameters of the port where its ecological infrastructure and operation is visualized and displayed on map materials. In this way, modern concepts on territory planning as an approach applied to ports will become an added operative instrument for environmental protection.

Based on comprehensive analysis (documental, SWOT, best practices in ports, modern environmental trends in architecture and urban studies) and taking into account the specific issues of ports it is possible to outline the major ideas in territory planning as a general strategy:

- Moving port equipment related to operations such as bulk, liquid transfer and other procedures generating environmental concern far from the broad city center areas;
- Reconstruction of part of the port’s facilities and equipment now restricting the access of the city to the sea into passenger terminals, sports and recreational areas and business zones;
- Graphic representation of port’s ecological infrastructure and its functioning;
- Identifying the connection of port areas with neighboring territories and aquatories on the ecological map in view of coordinating actions and measures addressing environmental protection issues;
• Identifying the port’s transport communications as a water transport logistic unit with the different types of land and internal transport in view of environmental improvement;

• Applying the principles of green architecture and bioclimatic planning to the SEE ports.

Applying the territory planning approach to ports has a strongly expressed preventive nature. This approach should be considered as an element of the general strategy for environmental protection in port areas and will be apprhapsed in the pilot port projects.

3.4.4 Integrated Coastal Zone Management (ICZM)

Ports of Corridor 8 are an important logistical link in the transport scheme of the countries in South Eastern Europe. They are part of the coastal areas where different economic sectors are developed: Tourism; Transport; Fisheries; Construction; Commercial; Agriculture; Energy Production; Coastal Defense. Ports activities strongly influence the environment, marine ecosystems and recreational resources. In coastal zones the balance between nature and needs of many conflicting uses needs careful management.

Integrated Coastal Zone Management is an approach to combine planning and management, in which all policies, sectors and interests could be properly taken into account in order to achieve sustainable coastal development. 'Integrated' in ICZM refers to the integration of objectives and also to the instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration.

3.4.5 Application of advanced models

Nowadays the Mathematical Modeling is established and reliable tool for integrated social-economic-environmental assessments, in risk quantification for human health and ecosystems, for fulfilling cost-effectively spatial and temporal gaps of monitoring or in making policy assessment analyses. TEN ECOPORT project considers application of variety of advanced tools, assessment technics and mathematical models including hydrodynamics, physics, geochemistry, ecosystems, and oil spills, as summarized in Figure 10. The additional more detailed information is provided in the proceedings of 2nd TEN ECOPORT International Conference held in Varna, Bulgaria (http://www.tenecoport.eu). Some of the models have been often used in scenario simulations that are helping decision makers testing different management options in order to achieve better ecological targets and effective good management practices.
IMPLEMENTATION OF ADVANCED METHODS AND MODELS

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INTRODUCTION
The presentation shows and summarizes the implementation of used advanced scientific methods and models, obtained results and analyses for assessment of the port’s environmental issues – water, air and accidents, developed in the frame of TEN ECOPORT project (http://www.tenecoport.eu/platform/).

RESULTS AND DISCUSSION

<table>
<thead>
<tr>
<th>Method/Model</th>
<th>Description</th>
<th>Outputs and Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-mapping</td>
<td>Eco-mapping is a powerful tool for collection of information and visualization of environmental critical issue at the port’s area based on monitoring of the relevant environmental parameters.</td>
<td>The all ports from TEN ECOPORT project</td>
</tr>
<tr>
<td>Electronic platform</td>
<td>Electronic Platform allows stakeholders, operators, universities and port authorities to exchanging and exchanging information technology, good practices, specific ideas, publications regarding the critical issues of the ports. Electronic Platform constitutes a fundamental element for the coordination in the long term investments for the future efficiency and sustainability of the sea-network.</td>
<td>The all ports from TEN ECOPORT project</td>
</tr>
<tr>
<td>WebGis portal</td>
<td>Contains extensive map coverage technical applications, including: loading information and resources for GIS. It is an effective tool that provides coverage for long-term variations of the marine parameters and sites of their changes in sub-areas in the whole eastern part of Mediterranean and Black Seas.</td>
<td>Port Burgas</td>
</tr>
<tr>
<td>Water quality assessment of port waters</td>
<td>Collection of data through observations and by automatic monitoring system. SilK and water sampling from the bottom and surface waters. Laboratory chemical analysis. X-ray Fluorescence analysis. X-ray Photoelectron spectroscopy and Multivariate hydrophobic index TRED.</td>
<td>Identification of the location of spill drifts in the Burgas Bay considering 23 points with high risk of oil pollution. The observed parameters include: temperature, salinity, turbidity, oil dissolved oxygen, oxygen saturation, petroleum, hydrocarbons, nutrients. Multivariate hydrophobic index TRED is calculated for water ecological assessment.</td>
</tr>
<tr>
<td>LOtEC bio-geochemical model</td>
<td>LOtEC is a multi-compartment biogeochemical budgeting model which is built as measurements for salinity, turbidity and concentrations of phosphorus, nitrogen and chlorophyll, collected by ECOFORT and TEN ECOPORT projects. Two distinct seasonal periods of low and high precipitation are considered in this study.</td>
<td>The model estimates water residence time, nutrient dynamics and variability of the ecosystem. The system varies between autotrophic and heterotrophic condition due to rainfall regimes, human activities, regimes and nutrient discharges with runoff or phosphorus release from sediments.</td>
</tr>
<tr>
<td>UE EPA AERMOD atmospheric dispersion modelling system</td>
<td>The model simulates dispersion of PM10 generated eventually from open source devices in port areas.</td>
<td>The model results indicated that the central part of Burgas might be polluted by port activities under southern winds. The more often appeared westerly and south-westerly winds bring the pollution from the port towards the town &quot;Burgas centre&quot; and the Burgas district &quot;Pobieda&quot;.</td>
</tr>
<tr>
<td>Hydrodynamic model 3D NEMO, Wave model SWAN and Storm-surge Model</td>
<td>NEMO 3D calculates the sea currents, temperature, salinity and other hydrophysical fields. SWAN: simulates waves near shore and evaluates the navigability conditions at the entrance and inside the port.</td>
<td>Ports of: Varna, Burgas, Constanta, Storm of 7-8 Feb. 2011</td>
</tr>
<tr>
<td>Oil spill drift model: MOTHY</td>
<td>MOTHY simulates the evolution of oil spills and other floating pollutant spills under different weather conditions. The model analyses possible environmental threats in case of oil leakage.</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION
The implementation of advanced methods and models for assessment of the port’s areas is an effective tool for gathering useful information on environmental issues, definition of environmental problems and for sustainable planning of the ports.

Acknowledgements
This research was made possible thanks to a research grant provided by South East Europe’s Transnational Cooperation Program within “Transnational enhancement of ECOFORT B network - TEN ECOPORT project (3BD.01.09/2.2/T)” and to all the partners, that take part in the model’s implementation.

Figure 12 Variety of advanced tools and models utilised in TEN ECOPORT project
3.4.6 Seminars, workshops and training courses

The seminars, workshops and training courses are invaluable tool and method for exchanging ideas, discussion problems, learning, and improving qualification and training staff of ports. For this reason they were widely used in TEN ECOPORT Community.

The informative summary of all organized events in the framework of TEN ECOPORT project (22 round tables among port authorities and stakeholders in SEE, 11 technical seminars with port operators, 3 informative workshops, 2 international conferences) is given in Figure 13.

In addition Figure 14 shows information about the training course "Oil Pollution Monitoring and Cleaning Techniques in ports area" organized by RNA in Constanta on 13-14 November 2013 under the motto "Peer education - Ports helps ports".

Figure 13 Summary of organized events (round tables, technical seminars, informative workshops, international conferences) in TEN ECOPORT
INTRODUCTION

Under the auspices of TEN ECOPORT, as part of their responsibilities within the project, Romanian Naval Authority in cooperation with UNIVERSUS organized in Constanta, at Hotel Oxford, from 13 to 14 November 2013, the Training course on “Oil Pollution Monitoring and Cleaning Techniques in ports area”.

The event was in line with the overall goal of the project, TEN ECOPORT being focused on creating platforms for dialogue to facilitate European cross-border cooperation between SEE ports (South East Europe) by promoting partnerships between stakeholders and addresses port authorities of the ports involved on one hand, and the local authorities and bodies, private companies and foreign operators within each port area, on the other hand.

The activity aimed the development and promotion of education and training support accessible to all project partner ports and operators acting in their related area by enhancing the awareness of the economic and environmental benefits resulting from sustainable management within all ports.

RESULTS AND DISCUSSIONS

Objectives of the Training
- to provide information, guidance and updates to the European legislation;
- and IMO international conventions;
- to utilize implementation and enforcement experience;
- to identify further needs;
- to protect the environment;
- to create income generated by governments from shipping and taxes and generation of job opportunities in ports;
- to find collaboration between all the involved authorities, companies and external port operators;
- to evaluate and assess real-time data on the local or regional level, in order to identify the strengths and weaknesses of each existing port policy, covering the vulnerabilities and risks of the capacities of the Port Authorities to implement prevention and response measures.

Topics of discussions

The main and marked training need covered by this training course is Protection of the marine environment within maritime ports area. The course was based on 7 different theoretical units and 2 practical units:

Unit 1 – EU legislation and official guidelines
- Oil pollution prevention measures
- Pollution prevention measures during bunkering operations
- Spill assessment
- Appropriate equipment for oil response and cleaning operations
- Oil spill response strategies
- Oil recovered – usage, disposal and neutralization
- Equipment for decommissioning

Unit 4 – Emergency communications plans
- Public Information and mass-media relations
- Evidences gathering

Unit 5 – Safety measures for the personnel involved in the response activities
- Liability, claims and compensation

Unit 7 – Training and exercises
- Training and exercises.

The course included also practical activity, visit to port of Constanta and presentation of response to pollution equipment, by Co-Sposium (Romanian Agency for Search and Rescue of human lives at sea).

CONCLUSIONS

The teaching methods used in the classroom were highly interactive. Teachers and experts involved in the educational process took care to effectively transfer the knowledge and skills to the students/learners not only through the traditional teaching methods, but also through the use of other tools, such as case studies, group discussions, and practical exercises. The students received a copy of all presentations made by each teacher, in electronic format, on a pen-drive. At the end of the training course, each participant received a certificate of attendance.

ACKNOWLEDGEMENTS

All values for teaching have a more than sufficient value (where 6 is the sufficiency).

The values of appreciation expressed through the analysis of the results of the questionnaire at the end of the course are highly positive. In particular, the total value of the average of values obtained at the end of the course (9.65) corresponds in equal measure to the evaluation of the teaching of the course (“General”) and of “Staff”.

The course witnessed highly attentive and consistent participation by all participants.

The high scientific value of interventions and the effective articulation of learning units were particularly appreciated.

Figure 14 Results of training course “Oil Pollution Monitoring and Cleaning Techniques in ports area” organized by RNA in Constanta on 13-14 November 2013
3.5 Design, development and application of port environmental monitoring system

The continuous monitoring is a key aspect for understanding of port environmental conditions. Monitoring is an essential part of the implementation of any Environmental Management System. The ISO 14001 and Eco-management and Audit Scheme (EMAS) standards require the identification and monitoring of ports’ environmental aspects. In addition, monitoring is necessary to ensure that port managers are better prepared to face any eventualities that may occur in a port, including emergency situations (Darbra et al., 2008).

The general principles and questions that operational environmental monitoring systems for ports should address are:

- Goals (objectives)
- Selection of monitoring parameters (what to measure)
- Procedures of monitoring
- Emission Limit Values (Environmental Quality Standards)
- Sampling frequency (when to measure)
- Points of monitoring (where to measure)
- Choice of instruments and tools (how to measure)
- Data collection protocol
- Data storage and processing

These components have to be applied to all environmental compartments (air, water, soil, sediments), waste and energy and resources consumption. Several examples of environmental monitoring systems developed in the framework of TEN ECOPORT project are reported in Figure 15 (a)-(e).
RESULTS

Automatic (GT-1) and manually monitoring systems.

- Water temperature, chlorophyll a and SGT
- Water turbulence, turbidity, pCO2 and pH
- Oxygen, DO, TSS, TDS, COD, BOD, COD, nitrate and other parameters

Results of monitoring of biotic and abiotic parameters in the water and sediments of the Port of Bari.

The results indicate that the levels of contaminants are within the acceptable limits set by the EU and national regulations. The levels of heavy metals and other pollutants are within the safe limits. The levels of dissolved oxygen and pH are also within the acceptable ranges.

The results also show that there is a significant amount of organic matter in the sediments, which can have negative impacts on the aquatic life and the overall health of the ecosystem.

The data collected from the automatic and manual monitoring systems are used to assess the environmental conditions of the Port of Bari.

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(c)
Figure 15 Examples of environmental monitoring systems developed in the framework of TEN ECOPORT project
The detailed and comprehensive information and recommendations about the design, development and utilization of monitoring in the SEE ports can be found in the final report of WP5 – Testing and Monitoring of ECOPORT8 project (http://www.ecoport8.eu) as well as in Marinski et al. (2014).

3.6 Mapping critical environmental issues and Evaluation of environmental risks

Eco mapping is an original and simple tool which helps in environmental management implementation. The purpose of eco-mapping is to collect relevant data which include details for stakeholders, operators, minutes from round tables/workshops etc.

The eco-mapping can be specified as:

- An inventory of practices and problems;
- A systematic method of conducting an on-site environmental review;
- A collection of information which shows the current situation using photos;
- A work and awareness-raising tool;
- A do-it-yourself tool;
- A tool which allows stakeholder involvement and participation.

Eco-mapping is the first step in environmental management. Eco-mapping is not only a practical method for conducting an environmental review, but also a tool that helps in learning about and collecting data. At the same time it is a support for training and a communication tool. The ready drawn eco-maps give a basis for the environmental documentation for a given site.

Everyone regardless of its specification and education can understand and use the eco-maps as a support for their work and training, can participate without having written procedures and instructions. Eco-mapping is a method which allows defining and prioritizing problems of the site, and eco-maps are a useful tool for communication work of a company and as they are understandable for all stakeholders.

Further details about the features, capabilities and application of the eco-mapping approach to the ports from SEE are provided in Figure 16.
IMPLEMENTATION OF ECO-MAPPING

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INTRODUCTION

This activity, coordinated by Iguemente Port Authority and involving all Port Authorities aims to provide the mapping of all the specific critical environmental issues within each port area and the surrounding cities involved. Through this activity has been presented an environmental tool - the Eco-mapping tool - for the creation of the permanent discussion platform among the Port Authorities and their port stakeholders, in order to increase environmental protection capacity of the port areas through “local networks”. The purpose of this method is to collect relevant data from all ten ports which include: stakeholders details, eight eco-maps results, minutes from held round tables/workshops etc. Eco-mapping is an original and simple tool which helps companies in environmental management implementation. Eco-mapping is the first step into environmental management and also a tool that helps in learning about and collecting data. At the same time it is a support for training and a communication tool.

RESULTS AND DISCUSSION

After receiving the Eco-mapping Forms from all Port Authorities, some interesting outcomes were revealed. First of all, it appears how difficult is the involvement, mostly in terms of responsibility, of the stakeholders. These new actors, involved in TEN ECOPORT to support Port Authorities in the Environmental Management, need to be leaded in an integrated sustainable management of their activities that can affect the environment not only of the Ports but also of the surrounding city.

Figure 1. Eco-mapping form

Furthermore, it is also evident in some cases, how the city activities could pollute ports’ aquatoriums, air or soils. Except for the Romanian Naval Authority, who was able to identify correctly corrective and preventive actions, the remaining 9 Port Authorities had just drafted their idea of actions to be implemented. Following the closed chained approach that leads these actions, it was demonstrated that only after identifying the factors of difficulties in achieving an environmental objective and after found solutions per each of them it is possible to find concrete and adequate action to be implemented.

The inventory of all critical issues within the port created through the Eco-maps was a screening for defining then the most significant ones and set the basin for the Definition of a Set of Common critical issues.

The majority of ports have the below common environmental issues:

- Air pollution due to Emissions of Gases and Dust and Particles Emissions
- Water pollution due to Effluent Contaminants by surface run off
- Energy consumption
- Accidental pollution

Table 1. Aggropata table of issues per Port

For these issues some common solutions were decided:

Air pollution
- Installation of appropriate monitoring system (air detectors)
- Persuade shipping companies to use better quality of purer fuels inside the port area.
- In case of critical situation applying the technical procedure of bio-fixing of fine dust.

Water pollution
- Purification of water that flows from storm water in heavy rains and inflow of untreated water from municipal service buildings discharged in aquatorium.
- Define a cleaning procedure of commercial docks.
- Use collectors for run-offs; use tarpaulins during windy days;
- Improving the technology of waste disposal in the port.

Energy consumption
- Evaluation of energy need and set up the Energy Plan of the Port.
- Promotion of green mobility inside the port.
- Replacing standard incandescent and fluorescent lamps.

Accidental pollution
- Define and apply the good practices to avoid any accidental spilling and leakage of waste.
- Feasibility study on the activation of a service that may intervene in case of pollution.
- Prevent accidental dispersal of fertilizers residuals or other chemical products into the water during the loading/unloading operations.

CONCLUSION

This punctual analysis made by Port Authorities using the Eco-mapping tool, aimed to provide the mapping of all the specific critical issues within each port area and surrounding cities involved in order to set the basin for the Definition of a Set of Common critical issues. Following the closed chained approach that leads these actions, it was demonstrated that only after identifying the factors of difficulties in achieving an environmental objective and after found solutions per each of them it is possible to find concrete and adequate action to be implemented.

REFERENCES

TEN ECOPORT is an International Project “Sustainable development of the sea ports in South East Europe”, funded by the European Commission. The Project is implemented through the framework of the TEN ECOPORT project. The Project is funded by the European Commission. The Project is implemented through the framework of the TEN ECOPORT project. The Project is implemented through the framework of the TEN ECOPORT project.

Figure 16 Features, capabilities and application of the eco-mapping approach to the ports from SEE
3.7 Creation of WebGIS information system

GIS technology nowadays became a widely used tool in activities such as monitoring of environmental processes and use of resources, and designing optimum decision-making apparatuses. GIS systems allow a comprehensive data management by interrogation, extraction, comparison, overlapping, graphic output and tabulation. For that reason one of major objectives of TEN ECOPORT project was the creation WebGIS for SEE ports.

Using the WebGIS users can: browse interactive maps by moving the mouse, zooming in and out on the maps, and selecting points of interest of a dedicated menu. Furthermore, users are able to: view information regarding ports and sensors used for the measurements of environmental parameters in the ports’ area. Moreover, the GIS application provides users with: reports regarding the parameters' measurements in the form of tables, charts and animations (see Figures 17 and 18).

Additionally, the WebGIS has the capability to allow access to more services to registered users. The registration is possible via the TEN ECOPORT Electronic Platform, it includes a one-step procedure and is free of charge. The registered users gain access to: tools for retrieving geographical information from maps such as distance and area calculation, location of a point on map based on given coordinates, map save and print options, and ability to save reports about measurements of port sensors in form of queries in order to access them any time they prefer.

Another important feature of the WebGIS is the automatic data storage. The measurements must be periodically collected from the local port servers, which are interconnected with various sensors located in each port area. The collection is automatically processed by the WebGIS application and it is invisible to the users. Data integration with WebGIS requires internet access to the server where the monitoring parameters values are stored initially and a clear structured text-based protocol for data exchange. The values can be exchanges in well-known standards as Comma Separate Value (CSV) or extensible Markup Language (XML) files through simple HTTP/HTTPS requests or REST web services.

Finally, the operational port environmental monitoring system and measurements, processed through the WebGIS information system, allow an effective mapping of critical environmental issues in the domain under port jurisdiction and surrounding areas by analysis of collected data, expert judgment and applying models or other advanced tools for port environmental assessments.
**Figure 17** Central interface and main features of WebGIS created by TEN ECOPORT project
INTRODUCTION

Nowadays, human activities, the commerce and the transportation means, affect significantly the quality of the marine and air environment. Ports and their surroundings can be considered as “hot spots” for the quality of the environment either at local or regional scales because are places with intense commercial activities. As a consequence, port activities impose contiguous and accurate methods for environmental monitoring.

The scope of the Web-GIS platform (http://www.tenecoport.eu/webgis) is to provide useful information regarding environmental situation in several port sea areas and their sea corridors in the greater Eastern Europe. Two general categories of data were used as initial information. Satellite monthly data sets as well as point measurements from stations are operating in many of the ports were included in this informational platform. The modern tools and methodologies were used as well as the valuable information it is provided can be used as a trustful and accurate application that provide spatial distribution of basic sea parameters and recent information about main ports of Southeastern Europe.

Initial information

Many different kinds of data were used in the Web-GIS platform and include:
- Satellite monthly data sets for a period of 10 to 12 years regarding Sea surface Temperature, chlorophyll-a and Colored Dissolved Organic matter
- Point measurements from stations are operating in many of the ports
- Points with environmental problems and regions of interest inside port territories
- Historical places/buildings inside port areas with short descriptions

Web-GIS features

The Web-GIS is a web based GIS application. As a web application follows the client-server model.

The structure of the WebGIS Platform consists of 3 tiers:
- Presentation (Web Browser)
- Application Logic (Web Server)
- Storage (Database)

The greatest benefit of this structure is that separates the application into different tiers, every tier is independent from the others. System failure can be managed much easier along with future updates and changes.

Figure 1. Schematic diagram of the Web-GIS application components and their interactions

Menus of the Web-GIS platform

In the central interface of the Web-GIS application there are two main choices: “Ports” and “Mapping parameters”.

The menu “Mapping parameters” provides mean short-term climatic spatial distribution of three parameters in the greater area of South-Eastern Europe using satellite products as initial information.

Figure 2. Example of a map that depicts the mean Sea Surface Temperature in July for the period 200-2013

The menu “Ports” includes important information about 12 ports that are participating in the “TEN ECOPORT” project.

The information is provided through five sub-menus:
1. Port regions (It can be seen five different areas inside port territories through different colored polygons)
2. Points of Interest (Historical places/buildings with relative information)
3. Eco-mapping (points with environmental interest inside port areas)
4. Monitoring (Graphs that provide the temporal evolution of measured parameters. These measurements came from stations that are inside port areas and operated for a given period)
5. Port mapping parameters (Maps that present the mean short-term climatic spatial distribution of selected parameters in areas around exclusively ports areas)

Figure 3. Example of port of Bari in the Web-GIS platform

Acknowledgements

This work is supported by the “Transnational ENhancement of ECOPORTs network (TEN ECOPORT) project with code SEE/D/0189/2.2/X, co-financed by the European Union within the South East Europe Transnational Cooperation Programme.

The site of this application can be found in the link: http://www.tenecoport.eu/webgis/

Figure 18 Description of WebGIS platform developed in TEN ECOPORT project
3.8 Feasibility studies and Elaboration of Managing Action Plan (MAP)

3.8.1 Feasibility studies

Increasing public environmental awareness is exerting greater pressure on Port Authorities and Operators to demonstrate that their operations are safe and environment-friendly. To ensure the growth of sustainability, many ports have oriented their environmental and related socio-economic policy through the development of Environmental Management Systems (EMSs). The standards already available for environmental management systems (EMS) even if are still voluntary standards have been demonstrated very useful for establishing a framework for developing an effective EMS and methods for measuring its success.

In order to determine if an EMS or portions of an EMS can improve the environmental performance of a given sea port, within the framework of the TEN ECOPORT Project was foreseen the realization of Feasibility Studies for Port operators and private organization that acting within the port area.

The purpose of Feasibility Studies is to find answers of questions: how an EMS in ports, which directly affects the activity of the port operators, is really effective or not, and how it can be improved by the port authorities. The Feasibility Studies are focused on the following a) Description of the port b) chosen EPO (External Port Operator) c) EPO risk assessment d) EPO (the greatest) risk reduction/elimination action, e) Human resources, equipment and costs and f) Worthiness of the EPO proposed environmental action

The Guidelines for Studies for Port Authorities were done by relative Research Institutions. The expertise and knowledge of the post graduates students that were trained on EMS within the project ECOPORT 8 was exploited and transferred into the Feasibility Studies for Port Operators.

The main results of risk analysis for seven port operators are reported in the present study and the new-generated knowledge throughout conducted study was proposed as monitoring strategy for other EPOs acting within port areas.

3.8.1.1 METHODOLOGICAL APPROACH

The Feasibility Studies (FS) were carried out by technical experts coming from research institutes and internal high professionalism experts within Port authorities.

The chosen EPOs for ports Bar, Dubrovnik, Durres, Patras, Igoumenitsa, Constanta, Brindisi and ports under Levante Port Authority are: "Container Terminal and General Cargo", "Luka Dubrovnik d.d.", "Marine Cleaning", "Patra’s Coast Guard", "Attica Group", "ARSVOM" and ARPA, respectively.

A meticulous study was done for each EPO chosen in order to:

- Assess the operative program of the Port Operators within the Port area including current compliance with local agreement with port authorities and regulatory norms.
- Identify those activities, products and services that impact the environment within port area;
- Identify, where possible, of the main risks and establishing, where possible the acceptable risks level;
- Estimate the optimal investments in both terminal equipment and employees (re)training in the domains of environmental and occupational safety.
Identify the measures and programs for improving environmental management and reducing environmental impacts

A framework of all environmental aspects was analyzed. The assessment of some potential risks, along with their environmental and working safety impacts for all the studies conducted were presented in general matrix (Table 2). Specific activities which can negatively affect air, soil and sea water in the port were used to create a detailed risk matrix which matches the activities carried out by the port operators and relative effects (Table 3).

**Table 2 Matrix of EPO risk**

<table>
<thead>
<tr>
<th>Risks</th>
<th>Ship I</th>
<th>Cargo II</th>
<th>Cargo handling equipment III</th>
<th>Passengers and crew IV</th>
<th>Transportation devices V</th>
<th>On port workers VI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ship to shore</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ship to shore/truck</td>
<td><strong>X</strong></td>
<td>/</td>
<td></td>
<td><strong>X</strong></td>
<td><strong>X</strong></td>
<td><strong>X</strong></td>
</tr>
<tr>
<td><strong>Shore to ship</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>X</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck/shore to Ship</td>
<td><strong>X</strong></td>
<td>/</td>
<td></td>
<td>/</td>
<td><strong>X</strong></td>
<td><strong>X</strong></td>
</tr>
</tbody>
</table>

**Legend:**

**I** Ship: **X** (possible/uncontrolled, or improperly managed) discharge of “black” (feces) and/or “gray” waters (waters from showers, sinks, laundries and kitchens), fuel and lubricants, discharge of solid waste, fire and explosion, exhaust gases, etc.);

**II** Cargo: / (in the case of cruise (passenger) ships, there is no such threat);

**III** Cargo handling equipment: / (in the case of cruise (passenger) ships, there is no such threat as well);

**IV** Passengers and crew: **X** (generating packaging waste, generating food waste, etc.);

**V** Transportation devices (here trucks mainly): **X** (possible low quality (or age) of transportation devices, improper handling and maintenance, disregard of equipment exploiting rules, etc.);

**VI** On port workers: **X** (possible risks caused by untrained workforce, fatigue at work, and/or lack of motivation, etc).
#### Table 3 General EPO risk assessment

<table>
<thead>
<tr>
<th>Environmental issues</th>
<th>Activities, products &amp; services</th>
<th>Aspects that effect the environment</th>
<th>Impacts on the environment</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>Cruisers’ (uncontrolled) discharge of “black” and “gray” waters, bilge and oily waters, ballast water, etc.</td>
<td>Water pollution caused by discharged “dirty” waters</td>
<td>Different toxic components, alien species, that cause disturbance of the ecological balance, etc.</td>
<td>Using modern technology for managing all types of waste waters onboard ships (here cruisers) / Using advanced wastewater-treatment systems, etc.</td>
</tr>
<tr>
<td><strong>Air</strong></td>
<td>The work of the propulsion machinery (mainly diesel engines) at cruisers</td>
<td>Air pollution caused by diesel engines exhausted gasses</td>
<td>Acid rains, greenhouse effects, caused by increased emission of toxic compounds like CO2, SO2, nitrogen oxides, etc.</td>
<td>Using modern (“clean”) ships’ propulsion technology, using new sources of alternative fuels, e.g. bio-diesel etc.</td>
</tr>
</tbody>
</table>

Of course, there are also many indirect negative environmental impacts on the surrounding soil and people lives. However, these following adverse environmental effects might be the subject of further more extensive research in this field in the future, and they are beyond the scope of this feasibility study.

### 3.8.1.2 RESULTS

The main environmental issues analyzed in the seven FS are:

- Waste Management (CTGC - ASVROM - Patra’s Coast Guard)
- Air Pollution (Luka Dubrovnik - Attica Group, ARPA Puglia in Brindisi)
- Water Pollution (Marine Cleaning - ARPA)

Environmental Risk Analysis (ERA) for specific activities of 7 EPOs were carried out using scientific methodologies. By the conducted studies risk reduction/elimination actions proposed can be classified in two main categories:

- actions related with modernization and adapting the equipment already in use by EPO and/or the purchasing of more reliable and “green” new equipment (cases: ASVROM, CTGC and ARPA in the case of Brindisi)
- actions related with retraining of employees in EMS in order to enrich level of their awareness and knowledge about the environmental issues and occupational safety (cases: Luka Dubrovnik; Marine Cleaning; Attica Group, ARPA)
Important results was also the use of scientific approach in the estimation of the optimal investments foreseen for both correction actions and human resources, thus the knowledge obtained by the FS conducted might be used like a general model for realizing similar studies in the ports being involved into this project and in some similar ports of the South Adriatic, the Aegean and the Black Sea regions in the future.

The "Pareto principle" here was used to determine the optimal investments in the port's employees (re)training in the domain of actual EMS. The EPO chosen by Dubrovnik Port Authority is "Luka Dubrovnik d.d." that performs the following activities within the port area: Mooring/mooring-off, Electricity, Water supply, Service disposal of solid and liquid waste, Refuse collection and disposal of waste oil and other waste, the use of technical means, Use of workforce and Manipulation of luggage. For Port of Dubrovnik Study the attention is given to the environmental risks that may be caused by cruisers with the negative impact on the quality of the Air and Water.

Structure of employees and number of those who need EMS (re)training:

<table>
<thead>
<tr>
<th>Supervisors</th>
<th>Administration</th>
<th>Port workers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>13</td>
<td>43</td>
<td>63</td>
</tr>
</tbody>
</table>

By using "Pareto principle" in port Bar is identified the level of risk at the terminal and the time intervals within the operating cycle of machinery in which the danger of risk is at the acceptable level. Also to estimate the optimal investments in both terminal equipment and employees (re)training in the domains of environmental and occupational safety are estimated. Common risks at container and general cargo terminal are connected with technology of logistics processes, which belongs to the group of so-called „clean technologies". The risks at the terminal are associated with cargo handling, cargo damage, its spillage and/or breakage with possible negative affect on the air, soil and sea water in the port.

Total investments in improving EMS

<table>
<thead>
<tr>
<th>New equipment costs (Euro)</th>
<th>2 276 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees (re)training costs (Euro)</td>
<td>160 200</td>
</tr>
<tr>
<td>Total (Euro):</td>
<td>2 436 200</td>
</tr>
</tbody>
</table>

This cost indicator can be used as a basis for improving operational processes at the CTGC EPO and thereby raise positive economic effects and reduce the risk of negative impacts on the environment.

The FS conducted have multiple goals: - is a useful tool in identifying the level of risk arises by the routine and extraordinary activities within the port areas; - is a useful method for the estimation of the optimal investments in both terminal equipment and employees (re)training in the domains of environmental and occupational safety; - If conducted with scientific approach it can surely contribute to the environmental conservancy and improving working conditions within the port areas and other port operators or private organization can be apply it, since the reliability was guaranteed.

This study demonstrate that the application of EMS or portions of an EMS would improve the environmental strategy of the organizations (private or public) and the confirm the benefits of instituting EMS within enterprise strategy.
Feasibility Studies for EMS in ports

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INTRODUCTION

Increasing public environmental awareness is exerting greater pressure on Port Authorities and Operators to demonstrate that their operations are safe and environment-friendly. To ensure the growth of sustainability, many ports have oriented their environmental and related socio-economic policy through the development of Environmental Management Systems (EMSs). The standards already available for environmental management systems (EMSs) even if are still voluntary standards have been demonstrated very useful for establishing a framework for developing an effective EMS and methods for measuring its success.

In order to determine if an EMS or portions of an EMS would improve the environmental performance of the Port Activity, within the framework of the TEN ECOPORT Project, it was foreseen the realization of Feasibility Studies for Port operators and private organization that acting within the port area. The main results of risk analysis for seven port operators are reported in the present study and the new-generated knowledge throughout conducted study was proposed as monitoring strategy for other EPOs acting within port areas.

RESULTS AND DISCUSSION

METHODOLOGICAL APPROACH

The Feasibility Studies (FS) were carried out by technical experts coming from research institutes and internal high professionalism experts within Port authorities.

The chosen EPOs for ports Bar, Dubrovnik, Durres, Patras, Igoumenitsa, Constanca, Brindisi and ports under Levante Port Authority are: "Container Terminal and General Cargo", "Luka Dubrovnik c.d.", "Marine Cleaning", "Patras' Coast Guard", "Attica Group", "ARMY" and ARPA, respectively.

A meticulous study was done for each EPO chosen in order to:

- Assess the operative program of the Port Operators within the Port area including current compliance with local agreement with port authorities and regulatory norms.
- Identify those activities, products and services that impact the environment within port area;
- Identify, where possible, of the main risks and establishing, where possible the acceptable risks level;
- Estimate the optimal investments in both terminal equipment and employees (re)training in the domains of environmental and occupational safety;
- Identify the measures and programs for improving environmental management and reducing environmental impacts.

<table>
<thead>
<tr>
<th>Table 1.</th>
<th>Environment, Nature, Human and Port</th>
<th>Criticality and Impact</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Pollution</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Water</td>
<td>Pollution</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Waste</td>
<td>Management</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Radiation</td>
<td>Exposure</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

| Table 2. | Interpretation of the level of risk on the potential impact on the environment, the community and the socio-economic activity, Source: EC, ALCOBA (EPO at Port of Constanca) (EC) |
| --- | --- | --- | --- |
| Low | 0-10 | No action needed |
| Medium | 11-50 | Action recommended |
| High | 51-100 | Immediate action needed |

A framework of all environmental aspects were analyzed. The assessment of some potential risks, along with their environmental and working safety impacts for all the studies conducted were presented in general matrix (Table 1).

Specific activities which can negatively affect air, soil and sea water in the port, were used to create a detailed risk matrix which matches the activities carried out by the port operators and relative effects (Table 2).

RESULTS

The main environmental issues analyzed in the seven FS are:

- Waster Management (CTGC - ASVROM - Patra's Coast Guard)
- Air Pollution (Luka Dubrovnik - Attica Group)
- Water Pollution (Marine Cleaning - ARPA)

Environmental Risk Analysis (ERA) for specific activities of 7 EPOs were carried out using scientific methodologies. By the conducted studies risk reduction/alimination actions proposed can be classified in two main categories:

- actions related with modernization and adapting the equipment already in use by EPO and/or the purchasing of more reliable and "green" new equipment (cases: ASVROM, CTGC)
- actions related with retraining of employees in EPO in order to enrich level of their awareness and knowledge about the environmental issues and occupational safety (cases: Luka Dubrovnik; Marine Cleaning; Attica Group)

Important results was also the use of scientific approach in the estimation of the optimal investments foreseen for both correction actions and human resources, thus the knowledge obtained by the FS conducted might be used like a general model for realizing similar studies in the ports being involved into this project and in some similar ports of the South Adriatic, the Aegean and the Black Sea regions in the future.

CONCLUSIONS

The FS conducted have multiple goals: - is a useful tool in identifying the level of risk arises by the routine and extraordinary activities within the port areas; - is a useful method for the estimation of the optimal investments in both terminal equipment and employees (re)training in the domains of environmental and occupational safety; - if conducted with scientific approach it can surely contribute to the environmental conservancy and improving working conditions within the port areas and other port operators or private organization can apply it, since the reliability was guaranteed.

This study demonstrate that the application of EMS or portions of an EMS would improve the environmental strategy of the organizations (private or public) and the confirm the benefits of instituting EMS within enterprise strategy.

![Figure 19 Feasibility Studies developed in TEN ECOPORT project](image-url)
3.8.2 Elaboration of Managing Action Plan

The building of a MAP for environmental friendly and sustainable SEE ports development, according to TEN ECOPORT, has to follow the instructions and recommendations given below (see also Marinski et al., 2014):

1. Cover Page of the MAP
   The cover page should include following information: title, who prepared the document, date, approval body, who is responsible for the MAP implementation, etc.

2. Structure chart of the MAP
   This is simply the table of content of the MAP.

3. Definitions of Terms used in the MAP
   Give a short description and specification of all terms (technical, financial, etc.) used in the MAP.

4. Write an Introduction
   The introduction must specify the general context of the MAP. It has to be short and concise. Consider that the MAP could be related at least to one (or may be several) critical environmental issues specific for the port.

5. Explain reasons for elaboration of the MAP
   The MAP generally:
   - helps port authorities to get awareness of the complex environmental context in which they operate and their impacting activities
   - provides an useful, practical and an easy way for guiding the future implementation actions taken for obtaining a sustainable economic, social and environmental development at national and trans-national level, and stimulating the competitiveness in the context of EMS certification.

6. Formulate Objectives of the MAP
   Highlight the legislative context which permits ports to promote an environmental management drawn to adoption of the best available practices for the solving environmental problems.

   Weigh the effectiveness of monitoring plans proposed for the assessment of the ports’ activities and environmental impacts. Draw the main steps/actions and best available practices in order to reduce the environmental impact and support its continuous improvement of environmental performance in port areas.

   Assess the framework for environmental management system implemented in your port.

   The objectives have to be not general but strictly and concretely related to the environmental problem(s) subject of the MAP. The principal aim is to define reference actions to prevent the pollution of water, air, ground, and preserve all natural resources in port areas and nearby coastal zones.

7. Legal framework (local, regional, EU, international) for MAP development and implementation
   When preparing the MAP clarify and comply with:
   - Existing Environmental Laws, Regulations, Policies and Guidelines
   - Existing Environmental Agreements/ New Environmental Laws, Regulations
8. **Give a short description of your port in relation to the MAP**
Describe port’s activities, operators, stakeholders, critical environmental issue, ecological needs, etc. related to the MAP.

Use any relevant and available information for your port arising from sources as:
- previous port environmental assessments,
- eco-mapping and other evaluation tools
- monitoring data and results from EMS, etc.

9. **Institutional organization chart for MAP implementation**
The framework should include the following information of Port Authority.

Internal staff and resources:
- a) Human resources to be involved
- b) Internal Financial Resources
- c) Internal services and facilities already available
- d) Training needs

External staff and resources:
- a) External and Internal Operators within Ports (Companies – Polluters – Institutions - public - private and national)
- b) External Financial Resources
- c) External services and facilities already available.

10. **Activities and Actions**
Activities and actions planned in the MAP should be specified also using the Round Table results by:
- a) Verification of the data and results achieved by round table
- b) Procedures established
- c) Procedure implemented
- d) Processing information and data storage
- e) Facilities chosen, etc...

Describe the actions and the activities planned for the problem related to this environmental issue after the definition of an environmental objective. Explain what practically has been or will be done inside port and the timing of implementations of actions. Give details about procedures, documentation, processing of information, data storage, prices, etc.

11. **Tasks and Responsibilities of key-actors**
Explain in the MAP who will do or is doing what, per each action proposed. Identify precisely all the responsible both in the internal staff and in the port’s Operators involved. Decide on the procedures established and implemented.

12. **Information and Communication System (info-management)**
Describe the main information to be disseminated for this action. Present the main target to be addressed by the communication system. Define your communication strategy.
3.8.3 Example of Managing Action Plans

Another important step implemented within the framework of TEN ECOPORT is the monitoring of the processes that regulate the port activities in order to improve their environmental quality. The principles of the Process Performance Monitoring are presented in Figure 20.

Figure 20 Principles of the Process Performance Monitoring

An example of the elaboration and implementation of MAP for the waste management in two pilot ports, i.e. Port of Bari and Port of Durres, developed in the framework of TEN ECOPORT, is shown in Figure 21 (a) and (b).
IMPLEMENTATION OF MAP IN THE PILOT PORTS
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1 Port of Bari
2 Port of Durres
E.armenio@apilevante.eu, rgjata@apuress.com.al

INTRODUCTION

The project TENCOPORT foreseen the implementation of a Managing Action Plan (MAP) between the Port of Bari and Durres. The drafting of the Common Action Plan is enclosed in the Activities 4.3 “Implementation of Managing Action Plan in two Pilot Sites” of the Work Package 4 “From Policies to Practice”.

The MAP regards the critical issues of waste generated from ships in the two ports.

The aim of the issue chosen is to find practical solutions to improve waste handling with focus on separate collection practices to find out, also, what can be achieved within existing legal framework.

In this context, the MAP is also a common shared plan aimed to help the port authorities involved to get awareness about waste in the port area. It provides an useful, practical and an easy way for guiding the future implementation actions taken for obtaining a sustainable economic, social and environmental development at national and trans-national level, and stimulating the competitiveness in the context of EMS certification.

The scope to pursue within the project TENCOPORT is that the proposed waste handling routines are spread and implemented by ships in the two pilot ports and thus contributing to a more effective waste handling and a better environmental protection.

SUMMARY OF THE INDEX MAP

1. LEGAL FRAMEWORK FOR IMPLEMENTING MAP: INTERNATIONAL RULES (MARPOL73/78), EUROPEAN DIRECTIVES (2000/59/CE) AND NATIONAL REGULATIONS
1.1 European and international principles adopted in Italian legislation
1.2 European and International principles adopted in Albanian legislation

2. THE TWO PILOT PORTS
2.1 The Port of Bari
2.2 The Port of Durres

3. ACTIVITIES AND ACTIONS
3.1 Processing information data and storage in the port of Bari: needs assessment of port waste reception facilities according to the requirements of ships and cargo residues
3.1.1 Types of ships and ordinary maritime traffic
3.1.2 Type and quantity of ship-generated waste and cargo residues
3.2 Processing information data and storage at port of Durres: needs assessment of port waste reception facilities according to the requirements of ships and cargo residues
3.2.1 Types of ships and ordinary maritime traffic
3.2.2 Type and quantity of ship-generated waste and cargo residues
3.3 Description of the port waste reception facilities for ship generated waste (type and location) in the Port of Bari
3.3.1 Description of the collection facilities for ship-generated waste
3.3.2 Location of the collection facilities for ship-generated waste
3.4 Description of the port waste reception facilities for ship generated waste (type and location) in the Port of Durres
3.4.1 Description of the collection facilities for ship-generated waste
3.4.2 Location of the collection facilities for ship-generated waste
3.5 Procedures established in the Port of Bari
3.5.1 Organization of collection and management services for ship generated waste - Port of Bari
3.5.2 Procedures for collecting of waste and cargo residues in the port of Bari (description of collecting, transport and disposal of waste)
3.5.3 Actions to be implemented in the Port of Bari
3.6 Procedures established in the Port of Durres
3.6.1 Organization of collection and management services for ship generated waste - Port of Durres
3.6.2 Procedures for collecting of waste and cargo residues in the port of Durres (description of collecting, transport and disposal of waste)
3.6.3 Actions to be implemented in the Port of Durres
3.7 Joint Actions - Coordination activities between the ports of Bari and Durres for the management of ship generated waste.
3.7.1 Joint actions and procedures between the ports of Bari and Durres

4. TASKS & RESPONSIBILITIES OF KEY-ACTORS
4.1 Responsibilities for the Port of Bari
4.2 Responsibilities for the Port of Durres

5. INFORMATION & COMMUNICATION SYSTEM
5.1 Ecological Waste Area in the port of Bari
5.2 Ecological Waste Area in the port of Durres
- Type of containers to be implemented
- Actions planned to increase environmental awareness towards waste management
- Recommendations
IMPLEMENTATION OF MAP IN THE PILOT PORTS

Elvira Armenio1, Rajmonda Gjata2
1 Port of Bari
2 Port of Durres
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REASONS FOR ELABORATION OF THE MAP

The overall objective of Plan is to enhance the effectiveness of the Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues and to ensure a harmonised implementation amongst two ports.

Considering the purposes above mentioned, the main objectives of the Managing Action Plan (MAP) between the ports of Bari and Durres are:

- To acquire a deeper understanding of the waste notification systems applied in pilot ports;
- To analyze the effectiveness of waste handling plans, in order to reduce illegal discharge of the waste at sea;
- To determine any problem encountered by ports users;
- To create a cooperation between the ports of Bari and Durres to reduce illegal discharges into the sea of all kind of waste and cargo residues from ships;
- To start coordination activities between the two ports to define protocols and procedures for the management of ship-generated waste;
- To improve the port waste management system by promoting practices of separate collection.

RESULTS AND DISCUSSION

Port of Bari: The area of waste reception facility will be localized near the 1st arm dock of the Port of Bari as indicated in the map (Figure 1). The area will have an extension of 200 m². The waste will be placed in watertight and covered containers. The containers will be equipped with appropriate signs and the area for waste collection will be covered.

Port of Durres: provides information on the availability of PRF, including the types of waste that can be delivered as well as the type of facility available. This port provide PRF for MARPOL Annex I (oil waste from machinery space), MARPOL Annex IV (sewage) and MARPOL Annex V (garbage, solid waste).

Figure 21 (a) & (b) Example of the elaboration and implementation of MAP for the waste management in two pilot ports—Port of Bari and Port of Durres—developed in the framework of TEN ECOPORT

Figure 1. Ecological Waste Areas in the Port of Bari

Common actions and procedures between the ports of Bari and Durres have been identified to solve the critical points mentioned:

1. Common procedure: apply the separate collection of waste on ship board ensuring compliance with MARPOL international convention and according to national regulations. This procedure will be applied to one ferry lines Bari-Durres.

2. Common procedure: The separate waste collection starts on board but it continues in the port. For this purpose the ship-generated waste must be collected and transported in the port reception facilities by continuing the separate collection of waste. The software (database) will also allow the Port Authority of the Levant to analyses systematically information for statistical purpose.

Figure 2. Ecological Waste Area in the Port of Durres

Acknowledgements

This MAP has been made possible by the assistance of several people and organizations. First of all, we would like to thank: the TEN Ecoport staff for the very useful guideline in drafting this Plan; technical representatives of two pilot ports; all operators involved in the waste management at the two pilot ports area, like: Harbor Master Office, Ship Agents, Waste Collection Companies.

[Common Model] [October 2014]
4 Conclusions

TEN ECOPORT project has developed a Common Model (CM) (called equally procedure) that is able to yield a long-term Management Action Plan (MAP), as a core element of the ecologically and sustainable development and management of ports of TEN-T networks within SEE area. Since the sea ports constitute the main hubs of the SEE transport corridors, only a common shared MAP among them can bring at long term positive impact in the entire TEN-T network.

The Common Model explains who are the main actors responsible for the improvement of port ecology —Port Decision Makers, Port Environmental Office and Port Operators/Stakeholders—, and what are the important steps to be followed in the process of construction of Managing Action Plan for ecological and sustainable SEE ports development and management.

The procedure of the Common Model has to be initiated by the port decision makers with the creation of a relevant port Environmental Office. Then, the Environmental Office of the port should make an initial assessment of port environmental status, to harmonize measures with the existing EU and national law, to create an environmental management strategy, to guarantee the application of advanced methods, models and tools for better port management, including utilization of a monitoring system to observe the port environment, to map the critical environmental issues on the port area through a WebGIS information system, and based on the results of the feasibility studies to elaborate an MAP for an improve port ecology. Thereafter, the MAP has to be approved by the port government body before to be implemented, which is followed by an institutional monitoring and control.

It is important to note that the elaboration and mostly the implementation of MAP cannot be efficient without the involvement of ports operators and stakeholders since without an active collaboration and agreement with them, the Port Authorities alone will be not able to guarantee and perform an effective Environmental Management of SEE ports.

In addition, the Common Model illustrates the supporting role of Research Institutes and Innovative Science in all steps of the Common Model and the important influence of National Government, NGOs, and other interesting parties, in particular when identifying and mapping the port critical environmental issues and environmental risk evaluation.

Finally, this document elucidates the Guidelines about the specific steps to be followed and gives the MAP's structure and a list of tangible instructions and recommendations that supporting and streaming the elaboration of MAP for sustainable development and improved management of sea ports of TEN-T in SEE.
References


