Transnational ENhancement of ECOpOrT8 network
TEN ECOpOrT - Code SEE/D/0189/2.2/X

FEASIBILITY STUDY FOR THE PORT OF DUBROVNIK

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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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1 Summary

The idea of this study is to carry out the ecological risks analysis at the Port of Dubrovnik and to provide the guidelines for improving environmental footprint and working safety. The proposed plan for achieving some positive environmental impacts is based on the "Pareto principle". The aim of using this principle is to determine the optimal investments in the port’s employees (re)training in the domain of actual EMS (environmental management system) standards. The approximated investments due to “Pareto principle” should undoubtedly contribute towards achieving the environmental conservancy and better working conditions on considered passenger terminal at the Port of Dubrovnik, including its urban surrounding.

The study is organized into seven sub-sections (including Summary) which deal with the following topics:

- Description of the Port of Dubrovnik, including its past and present moment,
- Description of “Luka Dubrovnik” (LD) as a chosen external port operator (EPO),
- Chosen EPO risks assessment,
- Proposed action for risks reduction,
- Human resources at the analyzed EPO and costs of their (re)training in the EMS, and
- Worthiness of the proposed action in both short- and long-terms.

The study should familiarize the reader with the Port of Dubrovnik, some major environmental problems encountered and the possibilities of mitigating or eliminating them. The proposed model for reduction of environmental risks through investment in refreshment of employees’ knowledge and skills in EMS can be applied, as well, by the similar ports in the region. In this way, it can be made a transfer of good practices and experiences in the field of EMS between the Port of Dubrovnik and other passenger ports in the Adriatic-Aegean Sea region. Consequently, this might have positive implications for living and working conditions over a wider area, and improve the positions of the considered ports within above mentioned region at the Mediterranean maritime map of co-called “green” or ecologically “responsible” ports.
2 Description of the port

The port of Dubrovnik is categorized as a **passenger port** open for public transport. It is one of six ports of international economic importance to the Republic of Croatia. Management of the port is directly under jurisdiction of the Croatian Ministry of Sea, Transport and Infrastructure, Directorate of Maritime Transport, Maritime Domain and Ports.

Considering the prevalence of specific types of transport, Dubrovnik port distinguishes among other ports on Croatian part of the Adriatic (Split, Šibenik, and Zadar e.g., where liners traffic is more represented) by its orientation to cruise traffic (Figure 1).

Basic elements of port authority formal organizational structure are defined by the Institutions Act and the Law on Maritime Domain and Seaports. Port authority bodies are Board of Directors and General Manager. It is to be noted in this context that management mode for organization and structure of port authorities and hierarchical structure in which they are incorporated vary depending on classification of ports according to their importance in transport and port system of the Republic of Croatia, which is conditioned by size and type of port traffic, condition and size of port capacities and connections of the port with the hinterland.

Dubrovnik Port Authority is founded to govern, construct and use the Port Dubrovnik-Gruž, opened for international public transport, and proclaimed for its size and importance as the port of special international and economic interest for the Republic of Croatia. It is founded by the Croatian Government.

The Port Authority manages affairs defined by the Law include, but they are not limited to the following:

- Taking care for construction, maintenance, managing, protection and improvement of maritime domain represented by the area of the port,
- Constructing and maintaining port sub-construction, financed from the budget of the founder of the Port Authority,
- Performing skilled surveillance over the construction, maintenance, managing and protection of the port area (port constructions and sub-constructions),
- Ensuring permanent and smooth-running maritime traffic, technical and technological unity and safe navigation,
- Provides services of general interest or services for which there is no economic interest for other firms,
- Coordinating and supervising concessionaires’ activities inside the port area,
- Making decisions concerning the foundation and management of the free port zone in the port area according to the regulations which define free zones,
- Performs other affairs defined by the Law.

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Dubrovnik Port Authority gives concessions for port activities based on valid technical and technological conditions, after the public tendering.

Basic activities of the Port of Dubrovnik are as follows:
- Loading, unloading, transshipment, storage, sorting and refinement of goods,
- Mooring and mooring-off of the ships,
- Cleaning of the port area,
- Embarkation and debarkation of the passengers and vehicles,
- Other port services offered by means of giving a concession, such as providing water, energy and phone services, passenger and ship services, port machinery servicing, agency and shipping agency services, quality and quantity control and other services.

In the first phase of its development, the Port of Dubrovnik-Gruž was a combination of cargo (freight)-passenger port and as such remained until the end of the 20th century, when it became the passenger port, only (see historical section 2.1. for some more detail).

Figure 1 Port of Dubrovnik
The Port of Dubrovnik traffic is steadily increasing. As a special category of traffic, cruising is distinguished. During the past two decades, cruising in Dubrovnik had a very fast growing trend. Consequently, it has been developed into one of the leading Mediterranean and international cruising destinations. The certainty of continuing this trend imposes the need for an organized approach to the development management of this destination. Within this context, the Port of Dubrovnik has an inevitable role as the main reception infrastructure facility. The Port of Dubrovnik Authority has recognized the development of cruising as the backbone of the business plans and activities. Since the port ships’ and passengers’ reception capacities could not meet the growing demand, the preparatory phase of a comprehensive project of the Port of Dubrovnik modernization has been launched in 2003. The project is basically divided into the development of port infrastructure and the development of passenger facilities, with the ultimate goal to build a modern passenger port, with all modern basic and enhanced reception ship and passenger amenities. In other words, within next few years, Dubrovnik Port Authority expects to have a modern port with cruise passenger terminal, large multipurpose trade center, public garage, city congress hall and a huge range of different leisure and entertainment facilities. The phase of port infrastructure development has been partially realized. By the completion of the operational quay reconstruction, in the field of piers 10 to 16, the Port has received 1,000 meters of new operational quay suitable for receiving simultaneously three megacruisers. In 2011, the construction of new 220 meters of the operational quay in the area Batahovina is planned, and it is planned to build new 400 meters along the coast as part of Batahovina II project (Figure 2), as well.

Figure 2 Phases of the contemporary cruise Port of Dubrovnik development

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4 Source: Presentation of the Port of Dubrovnik, provided by the Port Authorities, July 2014, p. 1-12
The project of the port modernization as well as the development of the organization of the port system and the business process, in parallel with its implementation, are the basis of future development plans. With the goal to provide successful respond to the increasingly complex business requirements imposed by forthcoming development, the Port Authority has been conducting intensive business improvements that include implementing and maintaining integrated quality control system, comprehensive information integration of logistic and business processes, which will increase port’s efficiency and functionality. One of the port’s long-term objectives is providing continuous maintaining, improving and developing of previously mentioned systems.

2.1 Port of Dubrovnik in the past

The history of Dubrovnik port extends to the ancient times, when Greek sailors founded port along the east coast (Figure 3). Around 500 B.C. Budva is mentioned as a trading settlement of the Illyrian origin where lived together Illyrians and Greeks. The history of the Dubrovnik port, its origin and locations, has been written by many authors: Lucic, Beritić, Rubic, Ničetić, and others. In recent history, after the development of steamships, the port located in the historic town core, is replaced by the port of Gruž which is away about two kilometers from Dubrovnik old town center. Former “rustical” orientation of Gruž Bay is replaced by port features, along with the development of steamships in the mid-19th century, and the beginnings of the railroad transport and traffic in the early 20th century⁵.

![Figure 3 Port of Dubrovnik development through the history](image)

⁵ Source: Materials provided by the Port of Dubrovnik Authority, for the purpose of the study realisation, July 2014, p. 1-10
Over the centuries, Dubrovnik, with its long seafaring and merchant history, has been a relation between parts of the Mediterranean. Besides it had a very significant position at the eastern Adriatic seafaring route. With development of commerce and arrival of railroad to Dubrovnik, a need for a new sea port appeared, because the old port couldn’t fulfill the required standards of a cargo port neither by its position nor by its possibilities.

In the beginning the port was a cargo-passenger one and according to that there was one passenger quay, and the rest of the port was built as sea port for cargo ships with lifts for loading and unloading of ship goods. Also there was a terminal for load and unload of rail wagons with which they transported different goods throughout whole region. The port was specialized for reception and transportation of wooden materials, but with further development of the port they built a cold storage for reception and storage of easy damageable alimentary products. Also there was built one terminal for reception of passengers with restaurants and other facilities necessary for passenger transportation.

2.2 Port of Dubrovnik nowadays

The receptive capacities for ships at the Port of Dubrovnik correspond to the reception capacities of tourist attractions. The port has over 1,200 meters of coastline which depth is between 8 to 13 meters. The harbor is well protected, and access to the port, in nautical terms, is very favorable because it can be approached from the open sea. It is protected from all winds except the north-eastern which can limit the entry or stay of ships in the port. Large coastal area along the entire pier allows easy manipulation of passengers from cruise ships and their quick exit from the port. Joining the EU and the free movement of goods are simplified the procedures for entering and leaving the harbor. Travel agencies are providing tourist products that are purchased already on board.

The Port of Dubrovnik should be treated twofold: as a port of call (the geographical point where a cruise ship stops for a short time, especially on a journey), and as an embarkation (home, departure) port (the geographic point in a routing scheme from which passengers and/or personnel depart). The difference between these types of ports derives in fact from different needs they have to fulfill, and some of them are given in Table 1.

Analyzing Table 1 by comparing the criteria for embarking port and port of call reveals a significantly higher number of crucial criteria for embarking ports, while we find only three crucial criteria for ports of call. One is a tourist attraction, and the other two are port appropriateness, and sea depth and allowed heights. Important criterion in the group of destination attractiveness is presence of tour operators representatives, while among important port services are public safety and emergency medical services presence. All other elements are in the desirable category, anyway, or not necessary one. The alternative between mooring or anchoring is considered as important, while the existing of passenger terminal is not necessary. The important criterions in the group of port facilities are port service charges and taxes as basic presumptions for the port concurrency. Such a small number of crucial

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8 Source: Adapted from Materials provided by the Port of Dubrovnik Authority, for the purpose of the study realisation, July 2014, p. 1-10, Originally from: Dessler L., 1999
elements for ports of call, i.e. small number of important ones, abundance and diversity of tourist attractiveness along the coast, make undoubtedly significant contribution to the development of Croatian cruising ports/destinations, especially in terms of ports of call.

**Table 1 Embarking and ports of call needs**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Embarking (home) port</th>
<th>Port of call</th>
<th>Port of Dubrovnik as an embarking port</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tourist identity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tourist identity</td>
<td>desirable</td>
<td>desirable</td>
<td>x</td>
</tr>
<tr>
<td><strong>Tourist infrastructure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotels (capacity and category)</td>
<td>important</td>
<td>not necessary</td>
<td>Lack of hotels of 4 and 5 stars</td>
</tr>
<tr>
<td>Transfer possibilities</td>
<td>crucial</td>
<td>desirable</td>
<td>Limited capacities</td>
</tr>
<tr>
<td><strong>Attractiveness of the destination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaches</td>
<td>not necessary</td>
<td>desirable</td>
<td>Limited capacities</td>
</tr>
<tr>
<td>Shops</td>
<td>desirable</td>
<td>desirable</td>
<td>x</td>
</tr>
<tr>
<td>Tourist attractions</td>
<td>desirable</td>
<td>desirable</td>
<td>x</td>
</tr>
<tr>
<td>Historical monuments</td>
<td>desirable</td>
<td>desirable</td>
<td>x</td>
</tr>
<tr>
<td>Tour operators offices</td>
<td>desirable</td>
<td>crucial</td>
<td>x</td>
</tr>
<tr>
<td><strong>Port facilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port appropriateness</td>
<td>crucial</td>
<td>crucial</td>
<td>x</td>
</tr>
<tr>
<td>Mooring or anchoring</td>
<td>mooring</td>
<td>anyway</td>
<td>x</td>
</tr>
<tr>
<td>Passenger terminal</td>
<td>desirable</td>
<td>not necessary</td>
<td>Lack of passenger terminal</td>
</tr>
<tr>
<td>Sea depth and allowed height</td>
<td>crucial</td>
<td>crucial</td>
<td>x</td>
</tr>
<tr>
<td>Service charges and taxes</td>
<td>crucial</td>
<td>important</td>
<td>x</td>
</tr>
<tr>
<td><strong>Port services</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water, fuel, catering and waste disposal</td>
<td>planned for the entire voyage</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Public safety</td>
<td>important</td>
<td>important</td>
<td>x</td>
</tr>
<tr>
<td>Emergency medical service</td>
<td>important</td>
<td>important</td>
<td>x</td>
</tr>
<tr>
<td><strong>Public services</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customs</td>
<td>crucial</td>
<td>desirable</td>
<td>Reliefs due to joining EU</td>
</tr>
<tr>
<td>Passport control</td>
<td>crucial</td>
<td>desirable</td>
<td>Reliefs due to joining EU</td>
</tr>
</tbody>
</table>
2.3 Port of Dubrovnik as an embarking port: limitations and potentials

Looking at the Port of Dubrovnik in terms of the embarking port for cruisers, it is far from the major generating markets, and the wider region has no potential to generate passengers for cruisers. The emissive gravitational tourism market is primarily focused on air transport which is aimed at Dubrovnik airport, which can serve the aircrafts of all sizes and the flow up to a thousand of passengers per hour. During the summer, the airport is directly linked with about 50 destinations. The airport is about a half-hour drive from the Port of Dubrovnik. Described traffic connections indicate profiling the Port of Dubrovnik as an embarking port for small and medium size cruisers, where passengers arrive mostly by aircraft(s) in “package” arrangements that include transportation to the airport, stay on board ship, and/or possible stay at the destination, before or after the cruise.

The Port of Dubrovnik in terms of an embarking port reveals a lack of passenger terminal, although there is a tailored space that is used for this purpose. Good cooperation with the Dubrovnik airport enables the integration of certain functions of the airport with the port, which simplifies and speeds up passenger services. Another disadvantage of significant implementation of Dubrovnik Port for departures is still insufficient hotel accommodation capacity of hotels category with 4 and 5 stars in peak seasons, where travelers could stay before or after the trip. The ability to supply bunkers with significant quantities of goods in the Port of Dubrovnik does not exist, nor appropriate ship supply capacities. However, through Croatia joining the EU and the establishment of the institute of free flow of goods, the negative effects of mentioned lacks are significantly reduced.

2.4 Traffic density in the Port of Dubrovnik

During last several years, Dubrovnik Port Authority according to provisions of the study "Sustainable cruise tourism development in Croatia" prepared by the Institute of Tourism tries to limit the number of cruise passengers. New measures were introduced which, considering the huge demand for Dubrovnik as one of the most attractive destinations in the Mediterranean, in most cases limit the number of cruise passengers up to 8,000 per day. With the aim of limiting the number of passengers, Dubrovnik Port Authority and Dubrovnik County Port Authority have signed an agreement on joint booking according to 2+1 principle, which means booking two large cruise ships at the port and one large cruise ship in front of the Old Town. This booking system allows clear monitoring of most congested days in a year and the number of cruise passengers is limited or cruise call requests are refused accordingly9.

Below (Table 2) are given some statistical data on the traffic structure and density in the Port of Dubrovnik within the past few years.

Growing trend of cruising in comparison to the national and international ferry boat transport/traffic, which are mainly constants, is noticeable (Figure 4).

Some additional statistical data on the number of cruise ships arrivals, their dimensions and number of passengers in the period from 2009 to 2013 are given in Table 3.

9 Source: http://www.portdubrovnik.hr/index.php?act=1&lnk=139&lan=en#139 (Access 16th August 2014)
Table 2 Number of passengers in the Port of Dubrovnik over the past six years

<table>
<thead>
<tr>
<th>Year</th>
<th>National ferryboat traffic</th>
<th>International ferryboat traffic</th>
<th>Cruise</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>470 000</td>
<td>84 000</td>
<td>845 603</td>
<td>1 399 603</td>
</tr>
<tr>
<td>2010</td>
<td>465 000</td>
<td>90 000</td>
<td>916 089</td>
<td>1 471 089</td>
</tr>
<tr>
<td>2011</td>
<td>470 000</td>
<td>95 000</td>
<td>983 304</td>
<td>1 548 304</td>
</tr>
<tr>
<td>2012</td>
<td>473 000</td>
<td>99 000</td>
<td>1 076 468</td>
<td>1648 468</td>
</tr>
<tr>
<td>2013</td>
<td>475 000</td>
<td>103 000</td>
<td>1 180 000</td>
<td>1 758 000</td>
</tr>
<tr>
<td>2014</td>
<td>480 000</td>
<td>107 000</td>
<td>1 230 000</td>
<td>1 800 000</td>
</tr>
</tbody>
</table>

Figure 4 The structure and number of the passengers in the Port of Dubrovnik

Table 3 The statistical data on cruising ships arrivals in the Port of Dubrovnik

<table>
<thead>
<tr>
<th>Year</th>
<th>Cruise arrivals</th>
<th>GT</th>
<th>Avg. loa</th>
<th>Avg. pax/vsl</th>
<th>Pax</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>448</td>
<td>20 041 440</td>
<td>193</td>
<td>1 281</td>
<td>573 742</td>
</tr>
<tr>
<td>2010</td>
<td>526</td>
<td>22 268 293</td>
<td>190</td>
<td>1 212</td>
<td>637 269</td>
</tr>
<tr>
<td>2011</td>
<td>484</td>
<td>25 783 089</td>
<td>204</td>
<td>1 456</td>
<td>704 725</td>
</tr>
<tr>
<td>2012</td>
<td>486</td>
<td>27 162 953</td>
<td>209</td>
<td>1 529</td>
<td>743 087</td>
</tr>
<tr>
<td>2013</td>
<td>542</td>
<td>33 652 853</td>
<td>216</td>
<td>1 750</td>
<td>950 000</td>
</tr>
</tbody>
</table>

Legend:
GT – gross tons
Avg. loa – average length over all
Avg. pax/vsl – average number of passengers per vessel
Pax – average number of passengers per year
On the basis of the data presented in Table 3, it is clearly visible a growing trend in the average number of passengers on cruising travels who have visited the Port of Dubrovnik, as a distinguish tourist destination at Mediterranean, during the specified period\textsuperscript{10}.

\textsuperscript{10} Source: Materials provided by the Port of Dubrovnik Authority for the purpose of the study realisation, July 2014, p. 1-10
3 Chosen EPO (External Port Operator) description

The EPO (External Port Operator) chosen for this study is “Luka Dubrovnik d.d.” (LD, shortly\(^{11}\)) like the primary Dubrovnik Port Authority concessionaire, among 280 other concessionaires. The list of all concessionaires of the Port of Dubrovnik might be enclosed to the study as a separate document (on request). LD is responsible for EMS (Environmental Management System) measures developing and their implementation in the Port.

3.1 EPO activities in general

In this context considered EPO, “Luka Dubrovnik d.d.” (LD) performs the following activities within the port area:

- Mooring/mooring-off passenger ships, yachts and coasters,
- Supply vessels with electricity and water,
- Sewage and refuse disposal, sanitation and similar activities in the port,
- Cleaning of all types of objects,
- Provision of parking,
- Providing services of using technical means, forklifts, trucks, etc.,
- Workforce services,
- Baggage handling,
- Soon the provision of "black water" - feces disposal from yachts and coasters,
- Storage space renting,
- Cleaning Posat of various wastes coming by sea, etc.

3.2 Employees structure and number

LD EPO has a chairman, three executive managers for legal, accounting and commercial services, and four heads of the departments: parking office, operations, maintenance, and marina - mooring/mooring-off ships. There are also thirteen employees in administration and forty three employees directly on port operations. Part of these employees should be involved in the programs of (re)training in EMS due to the newest standards in order to upgrade EMS awareness, procedures and their improvements within the port area in the future.

3.3 Disposal of solid waste

From the standpoint of EMS, the most important port activities are solid waste disposal, then, soon, “black waters” or feces disposal, as well as the use of mechanization, because only in these sectors may be created a serious problem that relate to environmental protection.

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\(^{11}\) Note: the abbreviation LD will be used in the following text for “Luka Dubrovnik d.d.” as a chosen EPO of the Port of Dubrovnik
When we talk about the use of technical equipment like trucks, small and large, forklifts and press containers, it should be noted that LD leads strict control of these resources, control of their correctness, full-service, etc.

Within the LD operates a separate department, responsible for Maintenance, which among other things takes care of the safety of these technical means, and for the activities that this department can not realize when LD uses the services of other authorized entities in Croatia (e.g. company “Cion” for sanitary protection of the environment).

In this way LD prevents, i.e. it takes preventive steps to avoid certain failures that could harm the environment, for example: oil leaking into the ground, releasing large amounts of exhaust gases, etc.

The acquisition of solid waste from passenger ships, yachts and coasters have several stages. The first phase is the arrival of a truck with a special tank of 6 m$^3$ alongside the vessel and downloading of classified waste from the vessel being packed in black plastic bags. Then this waste is transported to Batahovina at strictly defined place for this job and then all transfers of waste from a truck into a press container are realized. The next stage is pressing waste, and when the press container is full, the cleanliness truck is coming, press container is loading, and then the truck goes to the landfill. In this area, there is a hangar made of solid construction material, which area is 200 m$^2$, and in it are stored containers and performed other necessary actions. The area is regularly cleaned and maintained$^{12}$.

Paper is separated apart and the wood packaging, pressed cans and glass. Employees, who collect, classify and transfer the waste, use protective clothing, gloves and masks if necessary.

It is worth noting that the port does not take the ships’ hazardous waste, medical, flammable, explosive, radioactive, and carcinogenic waste, paints, varnishes, batteries and all other waste that could cause harm to the environment, land, sea, air, and health of people.

Soon, the port shall offer the service of collecting “black waters” - feces from yachts and coasters in Gruž and in the aquatorium of the Old Town. For this purpose, port has bought a small boat and a vacuum pump with a tank of 1,000 liters or 1 m$^3$, which will suck the “black waters” – feces, from yachts and coasters, and then by automatic pump emptying the reservoir into the sewer system.

All yachts and smaller boats anchored in the aquatorium of the Old Town will have the opportunity to exploit port’s trash service at sea, as the port’s ship will come to the vessel, retrieve the waste, load it into the tanks and transport to the mainland. On the land side, the truck will wait to transport the waste to Batahovina and then the waste will be transported to the landfill by the cleanliness truck.

It is worth noting that the port regularly cleans the area Posat, too, especially when it is southerly, and when from the sea side comes a large amount of waste, mainly plastic packaging.

3.4 Occupational injuries

The LD EPO duly and regularly keeps records of occupational injuries, in a manner as follows:

$^{12}$ Source: Internal EMS documents (procedures) provided by LD, July 2014, p. 1-5
1) Supervisor of the injured worker writes a log in which there is the day, month, year and
time when the injury occurred. Then follows a description of how the injury occurred and
how the worker is accurately injured. It is also described how the first help to the worker
has been given until the arrival of emergency medical services, it is evidenced is he/she
detained in a hospital or released on home treatment.

2) After the report was drawn by the supervisor of the injured worker, the worker gives a
written statement of his/her injury, i.e. full name, date of birth, place of work and the
description of the injury, and how it was occurred.

3) Based on these data, the expert for the safety at work fills in the information on a special
form within 48 hours of the injury incurred and sends the report to the State Inspectorate,
i.e. to the Ministry of the pension system, Office in Dubrovnik. The form with the
announcement contains the workplace where the injury occurred, day, month, year and
time when it occurred. The notice also contains injury labeled by the special code.

4) Within eight days of the injury, the occupational safety expert in the port on a special form
fills in details of the injury, data on supervisor, data on eyewitnesses if any, and details of
the person who reported an injury at work.

5) Last page of the occupational injury report contains the selected (family) doctor medical
report. Finally, all documents are sent to the Croatian Institute for Health Insurance, which
issues a decision on the recognition or non-recognition of the injury.

6) At the end of the calendar year, the expert for the occupational safety submits an annual
report to the State Inspectorate, i.e. to the Ministry of the pension system if there were
injuries in the previous year; otherwise, the expert does not submit a report.

This procedure of monitoring occupational injuries in the port is taken from internal LD
documentation submitted for the purposes of this study accomplishing13.

13 Source: Internal EMS documents (procedures) provided by LD, July 2014, p. 1-5
4 EPO risks assessment

The biggest EMS risks in the Port of Dubrovnik are caused by cruisers. Compared to the environmental risks that may be caused by cruisers, risks caused by transportation devices in the harbor, intended primarily for solid waste managing and disposal - are negligible. So, here the emphasis in risk assessment is placed exclusively on the cruisers. Below are given some quotes that describe briefly the major environmental harmful effects caused just by cruisers.

Like any other oceangoing vessel, a cruise ship can affect both the water and the air with its waste products. First, there is the issue of bilge water, which collects in the lowest part of the ship and often contains oil from leaky engines as well as other contaminants. In general, a ship will treat bilge water before discharging it, but there have been cases of irresponsible ocean dumping in the past. Then there are the air pollutants that fly out from the ship's smokestacks—these include particulate matter, sulfur dioxide, and nitrogen oxides, etc. The latter two are the principal components of acid rain14.

So, some of common waste streams generated by cruise ships include bilge water (water that collects in the lowest part of the ship’s hull and may contain oil, grease, and other contaminants), sewage, graywater (waste water from showers, sinks, laundries and kitchens), ballast water (water taken onboard or discharged from a vessel to maintain its stability), and solid waste (food waste and garbage). There is significant concern about the potential environmental impacts of these waste stream discharges15.

In Table 4 is given a general LD EPO risk assessment based mostly on cruisers as main polluters with the greatest direct environmental impact on sea water and surrounding air.

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.

In Table 5 is given a scheme of EPO risks caused by the cruiser ships themselves and at the relations cruise ship-shore and vice versa, caused by the entities/objects involved into the port transportation chain.

The key relationship which might cause the greatest risks is: cruise ship to shore. The reasons are listed at the beginning of this section. Also passengers can produce negative environmental effects by generating packaging waste, or food waste.

Suppression of the harmful effects on the environment is the subject of the international IMO regulations, primarily MARPOL Convention with its Annexes arising mostly from regulations applicable to the construction and equipment of (cruise) ships. On the other hand some of the regional communities, like EU, further elaborate regulations for some regions such as the Baltic, or Mediterranean. The port authorities into their regulations incorporate the applicable rules, which are mainly related to MARPOL with Annexes, until the authorized institution (port state control) supervises their implementation at the port, on the basis of the available data during the voyage.

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14 Source: http://water.epa.gov/polwaste/vwd/cruise_ships_index.cfm (Access 17th August 2014)
### Table 4 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>

### Table 5 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>X</td>
<td>/</td>
<td>/</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Shore to ship</strong></td>
<td>X</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>X</td>
<td>X</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.).
4.1 Reducing risks by the implementation of law regulations

Like any economic activity, cruising tourism has negative effects which can be classified into two groups:

° effects on the environment, and
° effects on sociological/cultural heritage of the destination.

Further on the effects harmful to the environment can be classified as those caused by:

° ship (generating propulsion energy by releasing harmful gases and particles in the environment, that are produced by the combustion of fossil fuels; discharging ballast water; presence of the anti-fouling paints used for protecting ship hull, generating waste during regular propulsion and maintenance of the ship, etc.), and
° passengers and crew (generating packaging waste, food waste, “gray” water, sewage, etc).

In order to prevent and/or reduce these environmental impacts, in parallel with the implementation of the internal and national regulations in the domain of EMS, the Port of Dubrovnik applies the following international regulations:

° MARPOL Annexes:
  − Oily bilge water (Annex I)
  − Oily residues (sludge) (Annex I)
  − Oily tank washings (slops) (Annex I)
  − Dirty ballast water (Annex I)
  − Scale and sludge from tanker cleaning (Annex I)
  − Oily mixtures containing chemicals (Annex I)
  − Chemical / NLS (Annex II)
  − Sewage (Annex IV)
  − Ozone-depleting substances (Annex VI)
  − Exhaust gas-cleaning residues (Annex VI),
° IMO MEPC 1/Circ. 671, 20 July 2009, Guide to Good Practice for Port Reception Facility Providers and Users,
° IMO MEPC 44/20 Annex II Resolution MEPC.83(44), 13 March 2000, Guidelines for Ensuring the Adequacy of Port Waste Reception Facilities,
° EU Directives, etc.

In addition to respecting law regulations LD as an EPO at the Port of Dubrovnik pays great attention to the operational part of the EMS procedures, bearing in mind the safety of equipment and regularly cleaning port area and waste disposal. For EMS jobs where it does not have its own equipment, LD rents it throughout cooperation with authorized firms for these posts, like “Cion”, e.g. Accordingly, with this company, LD has signed a contract which subject is providing the pier for the boat – sea cleaning, and harbor space for two TEU containers\textsuperscript{16}.

\textsuperscript{16} Source: Original of the Contract between LD I “Cion” (Sanitary protection of the environment) being concluded on 31\textsuperscript{st} December 2012, p. 1-3
4.2 Managing ballast waters

Ships’ ballast water is a huge mechanism transporting exotic marine organisms around the globe today. It is to be emphasize that ballast water in the ports of the world have caused substantial harm to economic activities. For example, some mussels from ballast water can cause: clogging water systems for cities, factories and power plants, fouling boat hulls, accumulating in immense numbers on recreational beaches, etc. Ballast water discharges also pose significant risks for human health. In some parts of the world there have been increasing frequent outbreaks of toxic red tides caused by microscopic organisms called dinoflagellates. These dinoflagellates produce neurotoxins that accumulate in shellfish, causing illness and sometimes death in the people that eat them17.

There are several steps that could be taken to reduce the threat of ballast water invasions without reducing the flow of trade:

° Exchanging ballast water before the ship’s arrival to the port,
° Off-loading ballast water that would otherwise be discharged into the port and either store it for later use by departing ship in need of ballast, or treat it to kill the organisms it contains – as wastewater is routinely treated,
° Using on-board treatment technologies such as filtration, heating, treatment with chemicals or with ultraviolet or microwave radiation, or other means, etc.

Some basic suggestions for managing ballast water at loading and/or discharging are listed below.

4.2.1 At ballasting port

Some general recommendations for managing ballast water at ballasting port might be as follows:
° Arrive at ballasting port with the maximum allowable ballast. Load minimum allowable ballast at port consistent with ship safety. Load any additional ballast needed in water of sufficient depth to minimize the intake of sediment and bottom organisms.
° Do not ballast where water is likely to contain unwanted organisms, such as near sewage discharges or dredging operations; in areas with known incidence of transportable disease; in waters with algal blooms, especially toxic dinoflagellate blooms, or dense plankton populations; in water with high sediment loads; or in shallow water.
° Post warnings of toxic dinoflagellate blooms when they occur, so ships may avoid loading ballast.
° Do not ballast at night, when many benthic, epibenthic and planktonic organisms migrate toward the surface.
° In shallow water use ballast intakes located high on the ship's hull to avoid entraining bottom sediments or organisms living near the bottom.
° Use contrary ballasting: ballast in fresh water when expecting to deballast in salt water, and ballast in salt water when expecting to deballast in fresh water.

4.2.2 At deballasting port

Some general recommendations for managing ballast water are listed below:
° Arrive at deballasting port with the minimum allowable ballast.
° Do not discharge near mariculture areas or marine protected areas.
° Dispose of ballast tank sediments on land.  

4.2.3 Some general remarks/recommendations

The loading and discharging of ballast water is an essential component of the operation of ships. Ballast water is loaded and discharged for a variety of reasons, and carried in various configurations of tanks and holds. Scientific studies over the past twenty years have demonstrated that a wide variety of marine and freshwater organisms, may survive transoceanic and inter-oceanic transport in ballast tanks to be released in ballast discharges in viable condition. Sediments, sometimes in substantial volumes, may accumulate on the bottom of ballast tanks, and a variety of organisms may live within these sediments; under some conditions these may also be discharged with ballast water, or they may release larvae or eggs that may be discharged. Some organisms may form resting stages within ballast tanks and remain viable for extended periods. These may also eventually be discharged with ballast water, or may produce motile forms that are discharged. The concentrations of organisms in ballast water vary greatly. Several studies report dramatic declines in the number and diversity of organisms in ballast tanks during the course of voyages. Despite declines, organisms are sometimes abundant in ballast tanks at the conclusion of transoceanic voyages, such that a single ship may discharge many millions of individual organisms. Although researchers have sampled and studied the organisms arriving in ballast water at many ports around the world, information on the organisms discharged with the ballast water is needed to assess the urgency of implementing ballast water management, to characterize the nature and intensity of this stressor and to provide baseline data against which to measure the effectiveness of future control efforts. Undoubtedly, all being listed above is to be followed by the appropriate law regulations.

4.3 Managing waste and ballast water at the Port of Dubrovnik

Ballast water from ships at the Port of Dubrovnik is managed through the Croatian Integrated Maritime Information System (CIMIS). In accordance with the provisions of Directives 2002/59/EC, 2009/16/EC, 2009/17/EC, 2010/65/EC and Directive 98/41/EC, it came into force Regulation of certification, documents and data on maritime traffic, as well as of their delivery, collection and exchange, along with the manner and conditions for issuing licenses for free traffic to the coast (Official Gazette no. 70/2013).

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In accordance with the Regulation adapted on July 1st, 2013, the obligation of electronic business in official announcements and registration of ships arrivals and departures in international voyages, by CIMIS, has entered into force.

Every voyage is recorded at the national level by unique number, so called Voyage ID.

4.3.1 Logging ship waste

A representative of the ship (excluding fishing boats) duty is to announce fully and accurately to the Port Authority and to the body managing the port, all relevant data on the items of ship-generated waste and cargo residues as he/she received them from the ship on the NOAD Waste form, and to enter all the basic attributes, in accordance with Directive 2000/59/EC and MARPOL convention focusing on Annex V. If a ship at the port of arrival submit all (i.e. all ship-generated waste and cargo residues), then the items must be filled in only figure “amount of waste for submission (m³)” for each type of waste. If the ship in the port of arrival will not deliver anything in port reception devices, or it will deliver waste only partially, then it is mandatory to fill in all the information for each type of waste\(^{20}\).

4.3.2 Logging ballast water

Ships belonging to the Croatian state regardless of the category of sailing, and other ships regardless of their national affiliation, that sails into ports of Croatia, or that sails in the internal waters, territorial sea or protected ecological and fishing zones along the Croatian coast, and those coming from abroad have to submit to the harbor office fully and accurately report on the status of ballast water at least 48 hours prior to arrival to the port and, or immediately after departure from the last foreign port if the sailing time to the Croatian port is less than 48 hours. Commonly, a representative of the ship is obliged to enter all the basic data on ballast water, and for as many items tanks/storage as the ship announced in “The total number of tanks to be discharged”, by filling in all mandatory fields.

The ships are not in obligation to report the status of ballast water:

° If they navigate or stay in the inland waters, territorial sea, or within the protected ecological and fishing zones of the Croatia,

° If they belong to the Croatia, but navigate or stay in inland waters or territorial sea of another state, under the condition that it is exempted from the provisions of the Convention or national regulations on ballast water management,

° If they are not designed and constructed for ballast water carriage, or if they have permanent ballast water in sealed tanks of the hull, which are not subject to be discharged, or if the ships in matter are warships, auxiliary warships, and public vessels.

4.4 On some other aspects of the port diseconomies

In addition to ecological problems related directly to waste and ballast water disposal, there is also an indirect ecological impact, or another aspect of cruising diseconomies in the Port of

\(^{20}\) Source: Information provided by the LD representatives for the purpose of the study accomplishing, July 2014
Dubrovnik caused by the large number of tourists arriving each day in Dubrovnik. It is about the negative effects on the socio-cultural environment.

Negative impacts of cruise industry on visited ports are mainly: overcrowded ports and tourist attractions that have negative influences on land based tourism and the quality of life of the local inhabitants, along with the environmental impact on port regions. Concerning the expected growth of number of ships and passengers in Mediterranean, better organization of reception and transport/traffic of passengers is inevitable, as well as more balanced schedule of ship mooring over year, in a month and days of week, along with the offer of larger number of trips to Dubrovnik surroundings.

Another important socio-cultural moment in this context is the problem of designing tourism products, which due to the growing volume of passengers and the shortness of their stay does not aspire to the quality and originality of the landscape, but in accordance to the commercial requirements there is an intention to provide mostly quick sale.

Despite the environmental impacts and diseconomies factors, Peručić and Puh (2012) claim "Dubrovnik is the leading Croatian cruise destination with 80% of traffic in Croatian part of Adriatic. Taking the advantage of its extraordinary tourist potential with the cultural, historic and natural resources as well as geographical; being the most convenient station between Venice and Greek ports; Dubrovnik became a must see destination in the itineraries of cruise ships in Mediterranean. Dubrovnik, as a cruise destination, is mainly developed as a transit destination (port of call) and it is rarely the home port in itineraries. Dubrovnik is among top 10 ports with the highest traffic in Mediterranean (Table 6 / Figure 5)."

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21 Source: Adapted from "Attitudes of citizen of Dubrovnik towards the impact of cruise tourism in Dubrovnik" by Peručić D., Puh, B., published in Tourism and Hospitality Management, vol. 18, no. 2, 2012, p. 213-228

22 Source: Adapted from "Ports Dubrovnik and Bar-cooperation opportunities for development of sustainable cruise tourism", provided by LD representatives for the purpose of this study accomplishing, July, 2014
### Table 6 Leading Mediterranean cruise ports in 2010 (thousands of passengers)

<table>
<thead>
<tr>
<th>Port</th>
<th>Country</th>
<th>Port call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barcelona</td>
<td>Spain</td>
<td>1 085</td>
<td>2 348</td>
</tr>
<tr>
<td>Civitavecchia</td>
<td>Italy</td>
<td>1 200</td>
<td>1 920</td>
</tr>
<tr>
<td>Venice</td>
<td>Italy</td>
<td>305</td>
<td>1 617</td>
</tr>
<tr>
<td>Palma de Mallorca</td>
<td>Spain</td>
<td>778</td>
<td>1 347</td>
</tr>
<tr>
<td>Piraeus</td>
<td>Greece</td>
<td>700</td>
<td>1 210</td>
</tr>
<tr>
<td>Naples</td>
<td>Italy</td>
<td>1 068</td>
<td>1 118</td>
</tr>
<tr>
<td>Dubrovnik</td>
<td>Croatia</td>
<td>953</td>
<td>970</td>
</tr>
<tr>
<td>Tunis</td>
<td>Tunisia</td>
<td>850</td>
<td>850</td>
</tr>
<tr>
<td>Livorno</td>
<td>Italy</td>
<td>775</td>
<td>825</td>
</tr>
<tr>
<td>Santorini</td>
<td>Greece</td>
<td>758</td>
<td>758</td>
</tr>
</tbody>
</table>

*Adapted from: Contribution of cruise tourism to the economies of Europe 2011 Edition, prepared by G.P. Wild (International) Limited and Business Research & Economic Advisors, February 2011, p. 9*

### Figure 5

**Figure 5** Positions of leading Mediterranean cruise ports in 2010
(Dubrovnik is on the 7th place)
5 EPO risks reduction/elimination action

This section contains an overview of the major environmental impacts to the Port of Dubrovnik. It also gives an overview of the equipment and human capacities which LD has on disposal for reducing/eliminating possible environmental threats. Some guidelines for improving current EMS measures in the port are given, as well.

5.1 The greatest risk(s) of the considered EPO

The greatest environmental risks are linked to the cruise ships and to the passengers arriving in the port every day in considerable number. These main port activities urge managing disposal of solid waste, “black” and “gray” waters, bilge, oily, and/or ballast water from ships, including the exhaust gases from the ships propulsion machinery (in the fore front CO\textsubscript{2}, including consequently acid rains, greenhouse effect, etc.) and noise in lover extent, as well. Besides ships, passengers also might produce ecological impacts by generating waste and by disposing it in inappropriate manner, usually at forbidden places in the harbor. Some indirect environmental impacts, like social and cultural ones are discussed in the previous sections, and therefore they will not be the subject of the following analysis.

5.2 The actions for risks reduction/elimination

In order to reduce/eliminate these main environmental risks LD takes over all necessary and desirable activities in accordance with international and national regulations in this area, which are described in detail within the previous sections. The following sub-sections will address the equipment list and human capacities that LD has on disposal in order to reduce/eliminate environmental impacts at the Port of Dubrovnik. Also, the potential opportunities to improve the existing EMS situation in the port in the forthcoming period, is examined.

5.2.1 Available equipment

The operative department of LD specialized for port cleaning and waste dumping from ships has eight employees, and it has on disposal the following equipment:

- truck for the waste transport in tanks of 6 m\textsuperscript{3},
- Piaggio for transporting municipal waste with the capacity of 2 m\textsuperscript{3},
- press container with the capacity of 30 m\textsuperscript{3},
- tanks or containers for collecting waste (14 pieces),
- green plastic trash cans for collecting waste from yachts and small boats (20 pieces, of 200 liter capacity),
- street cleaner,
- mini wash for coast cleaning, and
- forklifts (seven of such devices)\textsuperscript{23}.

\textsuperscript{23} Source: Data provided by LD responsible employees for the purpose of the study accomplishing, July 2014
In addition to the equipment listed above, which is owned by LD, the equipment and services of the “Cion” company specialized for sanitary protection of the environment are employed in the port, as well. The LD also has a contract with the Fire brigade Dubrovnik whose equipment and services are used, when it is required.

The LD EPO uses the following equipment owned by the “Cion” company:

- air dam,
- absorbing barrier,
- skimmer,
- pumps,
- special eco-boat,
- dispersant, etc.

Besides the above listed equipment owned by “Cion”, LD uses when it is necessary offshore boom owned by Fire brigade Dubrovnik.

Currently, LD has no plans to acquire additional equipment for protecting the environment. However, there is a possibility for investing some funds in staff (re)training in the field of EMS. Within the next section will be elaborated how and why the port intends to realize this environmental action.

5.3 The EMS improvement

When it comes to improving EMS in the Port of Dubrovnik, i.e. within chosen LD EPO, well-structured and frequently used Pareto principle (or 80/20 principle) will be applied. More precisely, it will be used the assumption that by the 20% of investments in LD employees (re)training in EMS could be achieved 80% of the improvements in terms of risk reduction, prevention of incidents and consequently environmental conservation 24 (Figure 6). In this purpose, it is given a number and structure of employees, and it is calculated how much will cost (re)trainings for 20% of employees in administration and on-port activities for coping better with environmental issues in the future within the port, i.e. considered passenger terminal. Also, it is assumed that personnel (re)training will require traveling to another ports and learning on “the face of the place”, from experiences of others. This investment in employees (re)training in the domain of environmental safety and improving working and health conditions should result in multiple increasing of the positive impacts on environmental protection and ecosystem conservation. This should be achieved in 80/20 amount in accordance to here exploited Pareto principle. The certain time interval, along with the permanent monitoring and controlling will be necessary in order to prove the validity of the above proposed hypotheses 25.

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24 An example of Pareto principle: When it comes to expenditure on projects 20% of the cost brings 80% of earnings, and to achieve the remaining 20% of the results, it is necessary 80% of total expenditures.

25 Pareto model is adapted from previously realised the Port of Bar feasibility study for CTGC EPO as a good option when someone has to cope with both environmental economy and quantitative measures. In other words, in such cases it is necessary to do some approximations.
Within the next section are given some quantitative analyses in accordance to the previously proposed methodology. On the basis of realized calculus becomes clear which funds are necessary for achieving significant positive management effects in the attempt to conserve the environment in the appropriate manner.
6 Human resources and costs

If we, now, in pursuance of previously outlined want to specify the manpower needed to implement the ideas of (re)training at least 20% of LD employees in the domain of EMS, it should be noted that in the realization of this plan, first and foremost top managers and the Port Authority members must be involved. Besides, the employees at non-direct and direct on port activities must be included as well.

Thus, the people who will be involved in improving environmental conditions at LD EPO of the Port of Dubrovnik will be managers and employees at non-direct and direct on port vacations. Their number and duties are given in Table 7.

Table 7 Structure of employees and number of those who need EMS (re)training

<table>
<thead>
<tr>
<th>Employees</th>
<th>Description</th>
<th>Total No.</th>
<th>Int (20% of Total No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisors</td>
<td>Detail structure is given separately*</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Non-direct on port</td>
<td>Administration</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Direct on port</td>
<td>Port workers</td>
<td>43</td>
<td>9</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>63</td>
<td>14</td>
</tr>
</tbody>
</table>

*See Table 8 for more details.

Table 8 Structure of employees among supervisors

<table>
<thead>
<tr>
<th>Supervisors</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>1</td>
</tr>
<tr>
<td>Head of law department</td>
<td>1</td>
</tr>
<tr>
<td>Head of accounting services</td>
<td>1</td>
</tr>
<tr>
<td>Head of commercial sector</td>
<td>1</td>
</tr>
<tr>
<td>Director of parking service</td>
<td>1</td>
</tr>
<tr>
<td>Direktor of maintenance service</td>
<td>1</td>
</tr>
<tr>
<td>Director of marina (mooring/mooring-off operations)</td>
<td>1</td>
</tr>
<tr>
<td>Total:</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 7 contains the calculus of 20% of total number of employees at different operations and management levels, what is sufficient number for achieving considerable economic and environmental positive effects due to Pareto principle. Namely, 20% of the employees are to be (re)trained in EMS in order to give their contribution later on to considerable raising EMS quality and to provide environmental conservation and working safety.
6.1 Employees (re)training costs

The costs of (re)training of the employees in EMS are specified in Table 9. The calculus is made under the assumption that the average cost of EMS training is 700 euros and that the employees need to travel to another port (or other destination, where the training will be organized), and that they also need certain accommodation and per diem funds. The average traveling costs are taken as 600 euros per travel, while the accommodation and per diem costs are taken approximately as 100 euros per day. The related calculus is given in table below. In estimating these costs the information available at the referred web locations are used\(^{26,27}\).

<table>
<thead>
<tr>
<th>Structure of employees</th>
<th>Training</th>
<th>Traveling</th>
<th>Accommodation (5 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisors</td>
<td>2x700=1400</td>
<td>2x600=1200</td>
<td>2x5x100=1000</td>
</tr>
<tr>
<td>Non-direct on port</td>
<td>3x700=2100</td>
<td>3x600=1800</td>
<td>3x5x100=1500</td>
</tr>
<tr>
<td>Direct on port</td>
<td>9x700=6300</td>
<td>9x600=5400</td>
<td>9x5x100=4500</td>
</tr>
<tr>
<td>Sub-total (Euro):</td>
<td>9800</td>
<td>8400</td>
<td>7000</td>
</tr>
<tr>
<td>Total (Euro):</td>
<td>25 200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is assumed that the employees will have training once per year and due to the calculus present in Table 9 it is evident that the total amount of funds necessary for (re)training in EMS is 25,200 euros. However, if we take into consideration the fact that this investment will raise EMS quality of implementation for approximately 80% in comparison to present state, it is worth to be done. The previous stated is truth, especially if we consider that the investments in education and skills of employees have positive effects in the long run. Also, employees who attended the training will be later on in position to transfer their new-acquired knowledge and skills in the domain of EMS to their colleagues who did not have that opportunity.

6.2 The newest EMS standards and the employees’ responsibilities

Currently, the world’s leading environmental management system (EMS) standard is ISO 14001 (2004). It is now under review, with an update version due to be available in early 2015. Benefits of implementing this standard include reducing environmental impacts, reducing waste and energy use, and cutting the costs of running a business\(^{29}\). Employees in


\(^{27}\)Available from: http://www.cput.ac.za/academic/faculties/appliedsciences/prospectus/course?i=94&seo=TkQ6IEVOVkJST05NRU5UQU wg5EVBTFR (Access 10th June 2014)

\(^{28}\) The model is adapted from Feasibility study for the Port of Bar, June, 2014

the port can acquire the appropriate practical knowledge and skills in the domain of EMS by a number of accredited institutions. This should upraise their awareness and responsibilities in the field of the ecological footprint in the port activities.

It is of importance to note that attending EMS courses/training in accordance to the newest ISO 14001 standards is ideal for:

° Employees involved in planning and/or coordinating the implementation process for a system addressing environmental issues,
° Personnel who have been assigned the task of establishing an EMS within an organization,
° Decision-makers in the implementation process,
° Those wanting more information from organizations that are undertaking the implementation process of ISO 14001, etc.

Unavoidable part of the process of employees (re)training are their duties/responsibilities during the course/training and after its completing. So, the duties of the 20% of the employees at LD EPO during attending the courses in EMS are as follows:

° Conducting an environmental review for the Port/EPO (i.e. LD),
° Identifying and evaluating environmental risks,
° Developing appropriate environmental information, data analysis, reporting and recording processes,
° Determining key milestones including key resources required to implement and maintain an effective EMS,
° Documenting an EMS to meet ISO 14001 requirements,
° Documenting data control and record keeping procedures,
° Developing environmental policies, objectives, targets and management plans,
° Developing environmental awareness, communication and training strategies, and managing cultural change,
° Developing systems for monitoring and measuring an EMS and environmental performance,
° Reporting on the performance of an EMS,
° Operational controls and emergency planning,
° Developing and maintaining EMS documentation,
° Auditing and management review,
° Maintaining an EMS to achieve continual improvement\(^{30}\), etc.

And finally, upon successful completion of the EMS course/training, participants i.e. selected employees at the port EPO (here, as it is noted before, it is LD at the Port of Dubrovnik) should be at least able to:

° Analyze the workplace to identify needs,
° Design, plan, develop, support and evaluate the implementation of integrated approaches for environmental management,
° Identify requirements for environmental information and data,

Make recommendations for the design of the environmental information and data processes,

Develop the environmental information, data, reporting and recording processes,

Record and analyze information and data to monitor environmental performance and evaluate methods of prevention,

Monitor and evaluate the effectiveness of information and data collection, and analyze processes,

Define parameters of the environmental risk study,

Analyze and evaluate the environmental risk of a task or process, etc.

It is obvious that above listed EMS skills of trained employees are highly demanded. However, this is in line with the latest standards (ISO 14001), which in comparison to the previous set of standards (ISO 9001) raised EMS from a more operating level to a more strategic one. Thus, the obligations and responsibilities of personnel in managing environmental issues are far more complex and comprehensive. Since it is about a complex EMS spectrum of requirements and obligations to be met by each port and its employees, staff (re)training plan is undoubtedly a good and valuable investment.
7 Worthiness of the EPO proposed environmental action

7.1 Economic vs. environmental effects

The action towards (re)training staff in EMS at LD EPO of the Port of Dubrovnik is of significant importance to this recognized Mediterranean cruising port. Since it is difficult to determine exactly positive effect of this action to the environment and health of employees, passengers and Dubrovnik city inhabitants, it is opted here for the use of "Pareto principle". In general, according to this principle, 20% of investments will result in the increase of 80% in efficiency. This should work as well for the proposed investment in employees (re)training in the domain of EMS. So, by investing in 20% of number of employees (re)training in EMS, 80% better working conditions and effects when occupational safety and environment conservation are in matter should occur. This looks quite as a lump sum, but it is entirely consistent with the “Pareto principle” or “Pareto optimum” and can be applied in situations when it is difficult to handle with exact amounts of money, like in the case of evaluating environmental conservation actions’ effects.

7.2 Short term and long-term effects

The (re)trainings of workers are both directly and indirectly useful. Direct positive effects should be manifested throughout gaining workers’ new knowledge and skills which they can apply to their everyday posts. Long-term effects will be reflected in the possibility of transferring the acquired knowledge and skills to new colleagues (new hires) and those who were not in position to attend training. Thus, it is quite clear that investment in knowledge always has both the short and long term positive effects.

7.3 Possibilities of positive practices transfer

In this study applied model is based on the well-known and structured “Pareto principle” or “Pareto optimum”, which means that there are no obstacles in applying it to other EPOs or concessionaries in the Port of Dubrovnik, and to other similar ports in the region, as well. There is no doubt that the proposed investments in improving knowledge and skills of employees will result in multiple positive effects on business, environmental conservancy, and occupational safety in the port.

As it is noted before, in situations where it is not easy to calculate the direct material benefits of some investments, employing the "Pareto principle" has been proved as a suitable optimization method. Thus, the proposed solution for realizing this feasibility study for LD as an EPO at the Port of Dubrovnik 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 studies of such kind might encourage port authorities to take into consideration, more intensively, investment opportunities in the ports’ personnel, which would have positive economic effects, as well as positive effects on the preservation of the environment in the national context and beyond it, because the ports are usually of strategic importance for the overall economic growth and development of a country and a region to which they belong. More generally, implementing proposed environmental management system measures i.e. investing in employees EMS knowledge refreshment and renewing their skills can increase
chances of cutting energy bills, reducing waste and winning customers confidence in the way the port operates responsibly\textsuperscript{31}.

This is especially true for the Port of Dubrovnik, as one of ten leading cruising ports in the Mediterranean, with almost one million passengers annually. The proposed action within this feasibility study will enrich extraordinary tourist, cultural, historical and geographical potentials of the Port of Dubrovnik (Peručić & Puh, 2012) in terms of providing environmental conscious and responsible personnel with potential of providing continuous growth of the port on sustainable basis and warranting it with an optimal position at the cruising market and the tourists’ perception map.

Finally, it becomes critical for ports to work with their business partners/customers and other stakeholders to find sustainable solutions to increasingly complex challenges like climate change, energy, and land use, i.e., to meet today’s economic, environmental, and social needs without compromising the ability of future generations to meet theirs\textsuperscript{32}.

\textbf{“We must realize we are no longer unconnected. Our success —all of us in an integrated global supply and demand chain— depends on the success of the whole. The success of the entire world economy and the well-being of all of the world’s people depend on our ability to succeed as sustainable businesses at this critical juncture in our industry’s history.”}

Chang Kuo-Cheng, Chairman, Evergreen Marine Corporation

Source: “Evergreen Chairman Urges Cooperation,” Traffic World, March 6, 2006


\textsuperscript{32} Source: U.S. Environmental Management System – Primer for Ports: Advancing Port Sustainability, April 2007, pp. 1-50