



## Methodology for the Design of Residues Reception Facilities of Fishing Ports and Marinas

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### ABSTRACT

The fishing ports, marinas and mixed, have to develop their activity respecting and caring for the environment. Each port must respect their environment and this environment must be sustainable with either fishing port activity, sports or both. Concern about the consequences of environmental degradation and the problems it creates for people and goods, has an effect on society alarmist. At present, no activity can develop without respecting the environment. The ports need to reduce pollution forms if they want to limit their impact on the environment.

The increase in the standard of living and the increasing availability for free time the population increases in water sports activities sports. These activities enhance the expansion of tourism, quality tourism. The environmental quality becomes a key to the success of quality tourism and other activities developed in ports.

At the present time, we are witnessing empowerment, for sport, for certain ports or portion thereof and the creation of new ports. Environmental management is one of the success factors for a port facility. A marina successful or need to have an environment environmental quality. The marinas of a locality, region, if successful as a whole, will have a multiplier effect on the local and regional economy.

This Article sets methodological basis for the design of a waste reception facility for fishing ports and marinas or for those ports that are developed both. First, perform a conceptual approach of the basic concepts, followed by a methodology to define the layout of the facility. Third base is defined to control the environment and how to improve the environmental quality of the ports. The identification of the residues produced in port activities help us to estimate the type of containerization for residues. Finally, we establish design guidelines for the installation and we obtain some conclusions.

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### 1. Basic concepts

When accessing technical and scientific texts environmental, we detect that many concepts are defined differently. We discovered that many words apply to different situations. Various performances (consequences, phenomena) in the environmental field differently defined. An example is, the different identity that can be taken the same word "contamination" (Lovett and Ockwell, 2009).

For this reason, it is necessary to specify the sense that different expressions are used, while specifying the concepts.

Environmental change can be defined as any change in the environment, either by entirely natural causes or by human actions. Also be attributed to the combination of

other or both (Alonso and García, 2008). For example, the modifications caused by an earthquake, for the construction of a breakwater, or the landfill of any toxic substances, are all environmental changes, regardless of the origin, its magnitude or duration.

The environmental effect is defined as the changes caused by human actions, (whether intended or not). This effect may have been directly or might have been an unintended effect. For example, the changes resulting from the filling of a dock (whose effects can be positive or negative) environmental effects are considered. The disappearance of a species in one place, as a result of contamination by a deliberate disposal for uncontrolled release or sudden stroke, it would be an environmental effect. Neither the padding nor the environmental effect would disappear if they are due to natural causes.

The environmental effects are produced or not. Can be measured, litters of fuel spilled meters of coastline affected, number of dead fish. The identification, analysis and quantification of environmental effects can be done in an objective manner and the results achieved will be similar, regardless of who or who perform them.

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The environmental impact is defined as an environmental effect or a set of environmental effects of an action on which has issued a value judgment (George and Kirkpatrick, 2007). It comes to valued environmental effects, which are assigned a rating. This assessment is: "Very little significant, little significant, significant, very significant." These effects are always produced by human activity (Nogueira, 2009).

It is important to differentiate between effects and environmental impacts for demarcating responsibilities. The consequences of human actions cannot only be seen or assessed from different perspectives, but also can produce very different effects. These effects are estimation and valuation, are generally questionable on the environment (Lovett and Ockwell, 2009). One must understand the concept broadly, it not only highlights the effects that occur on the "natural" but also any other that may impact through the media and affect humans. For this reason we have to consider:

1<sup>st</sup>. Ecological impacts - environmental: Those that result from changes in the "natural" systems. Its incidence is important in the functioning of ecosystems.

2<sup>nd</sup>. Social impacts: They directly affect humans. Individually or collectively.

The concept of "environmental damage" was defined by Law of Environmental Responsibility 26/2007, (October 23<sup>th</sup>, 2007) and published in BOE 255 of October 24<sup>th</sup>, 2007. Identifies the damage caused by human activities on the environment. Defines the basis for establishing penalties and compensation, either by reason of fortuitous accidents, malpractice, negligence or malicious actions. The application requires a methodological basis considering to carry assess the damage and to provide a basis for determining claims and penalties. No difference if the property is public or private (Bretón et al., 2009).

Users expect that society and the environment of fishing ports and marinas (Couce, 2002), is not necessarily different from what society demands of the places where facilities are located recreational (Bau, Lanza, and Usai, 2008), value spaces for leisure and other venues (Borderías and Martín, 2006). This includes the beaches, parks and walking areas. Everything about the ports. Ports must provide conditions similar to those of a mall (Salvador, 2008). The environment of the ports must be of a quality equal to that of protected areas for their natural values (Madariaga, 2012). It is not enough to keep pollution and other forms of environmental degradation under control, it is necessary to correct them.

## 2. Methodology to determine the design

The fishing ports and marinas are based on having a quality environment. For this reason, their attractiveness and competitiveness depend on improving environmental quality. The port address must always make responsible environmental management. Each port has to be responsible for

environmental management and their environments (Borderías and Martín, 2006). These environments are:

Unique: Every environment is different from others. The geological substratum, its geomorphological features, vegetation and wildlife that live in this place, human occupation and surrounding land uses are different in each case.

Complex: These systems are composed of many elements, minerals, plants, animals, humans, etc. Interrelated and subject to multiple processes.

Open: Even where it seems that the boundaries are better defined (waterfront, an estuary) there is a continuous transport of materials and energy.

Dynamic: They are subject to change due to natural causes and also usually intense human pressure in port areas.

We must consider potentially impacting activities from operations in fishing ports and marinas, as well as all actions taken in their environments. These disturbing activities are:

Operational Pollution: The pollution produced in ports for the inlet and outlet of vessels, for the movement of vehicles on the docks, for the port machine operations, for the tasks of provisioning and freight. These operations, on the one hand, carbon oxides, sulphur oxides and solid particulates and aerosols, among these unburned hydrocarbons and otherwise generate noise, in the case of noise or agitation in water. From August 2013 comes into force legislation, which defines the noise level in the maritime sector.

Dumping of waste liquids and wastewater (Martínez, Esparza, 2010): This residues are the more or less watery liquid from the toilet of vessels, engine cleaning, washing tanks or tanks, ballast water and cooling water, etc. (Zambonino, 1998). Ports must have facilities for receiving waste from vessels (EEC Directive 2000/59/EC of 27 November on waste reception facilities in ports).

Maintenance and repair of boats: The activity itself cleaning the boats is done with water, detergents, degreasers, and solvents. The painted and varnished surfaces, installation, repair or replacement of gear, propulsion systems and navigation, etc. produces waste and generates visual impacts on the port.

Ship dismantling and recycling of materials: In many cases, boardwalks become the last of these boats beached creating local pollution and visual impacts for long. Failure to take appropriate action produces substantial environmental costs, (Martínez and Martínez, 2009).

Dredging: The dredging works are for the maintenance the good condition of the funds of the docks (Buruaem et al., 2012), the preservation of the depth and extent of the access channel. They work to promote navigation unavoidable in the dock.

Wastewater and urban runoff: Wastewater is one of the most common sources of pollution in ports. These waters not only from urban discharges, but also on the same craft. In some cases it may also be thermal pollution concentration in marine engines berthing areas of the ports. Consid-

erable and repetitive discharges lead to permanent effects of gravity, with permanent conditions to living beings, creating serious changes of natural systems (Hernández, 2001). This results in loss of habitat, species removal, obstruction of migration, etc. We must also consider the floating and suspended solids that are deposited on the edges of the docks.

An important data to consider are urban water runoff, made up mostly of rainwater from roads (Hernández, 2001). If discharged without mixing other, often have an acceptable quality, but may also carry substantial amounts of other pollutants.

**Industrial effluents:** For each port must determine the type of industries that are in the area surrounding the port. You have to study the processes of these industries and know if they make capturing and discharges to water.

**Farmers Spills:** Discharges from livestock farms have a biological oxygen demand much higher than those of urban wastewater, since they are much richer in organic matter than these. Wastewaters from livestock facilities are not free of pollutants other organic matter residues usually have medical or pharmacological, mineral oils and diesel. Must study these processes and determine if the farms make discharges into water.

**Contributions via atmospheric pollutants:** The loading and unloading activities in commercial ports such as handling of coal, metallic minerals and fertilizers, cement or other building materials, grain and flour, fertilizers or other junk and goods being shipping usually generates a significant amount of solid particles (Buruaem et al., 2012).

In marinas must be taken into mind that the loading and unloading commercial ports affect the cleanliness and maintenance of ships and those of their gear (sails).

**Other residues:** Solid residues are made by packaging a variety of forms (paper, metals, textiles, plastics, glass, wood), residues of cleaning products, ropes, tires, etc., As well as remains of fishing and food.

### 3. Environmental control and improvement

The management of fishing ports and marinas or mixed, cannot ignore the environmental (Zambonino, 1998; Madariaga, 2012). The environmental aspects are crucial to enhance the quality of ports and their environment. It is necessary to have an understanding of the environmental features of the environment, "natural" and "human" as well as the activities that take place in the port facilities and around (Alonso and García, 2008).

A useful procedure to have the environmental reality of a port is to establish an environmental monitoring system based on a system of indicators (TRAMA, 2006). A system of this type, well designed and correctly implemented is capable of effective monitoring of environmental quality in a number of ports and in each of them. These systems can rapidly detect any malfunctioning of greater importance and make it easier to port management, both to be stan-

dardized for all of them, as to reduce the number of controls, data collections and analyses necessary. It is a procedure that can make communication between specialists, managers and port address are good and fast. We propose to follow some guidelines, which are expressed below (Madariaga, 2012):

- 1<sup>st</sup>. Act in those fields in which they can have real competence. For example, put small means to prevent fuel spills.
- 2<sup>nd</sup>. Avoid or limit the ways most serious environmental degradation. For example, to solve the disposal of liquid waste from bilges.
- 3<sup>rd</sup>. Propose actions whose implementation entail a reasonable installation cost and require operating and maintenance costs in subsequent years assumable (Bau, Lanza, and Usai, 2008). Perform activities whose continuity is not assured is a way of wasting resources (Couce, 2002).
- 4<sup>th</sup>. Evaluate the actions that involve a reasonable investment (Bau, Lanza and Usai, 2008). The comparison between the cost of activities and the environmental benefits are to be tested by the managers of the ports (López, 2008).

### 4. Characterization of residues and environmental equipment need

The development, implementation and improvement of an environmental management system for fishing ports and marinas necessarily involve the study of the current situation, so that the data collected to detect needs and wants (Madariaga, 2012). For each port must detail the environmental control equipment available today, as well as the waste generated in the port activities. The general characteristics of a port can be summarized as shown in Table 1. We need to establish the characteristics of commercial fishing vessels and their crews quantified as shown in Table 2. You also need to know the characteristics of leisure sailing craft, their quantification and the number of users, we can evaluate as shown in Table 3. In both cases, commercial fishing and recreational boating vessels differ by their length. This differentiation is the same as provided for the design of berthing areas and rental costs.

**Table 1:** Summary of the characteristics of the port.

Port area:	Area.
Docks:	Area.
Operative length of docks:	Length.
Fish market surface and offices:	Area.
Ice Maker (storage):	Tons.
Cradles:	Number and tons.
Cranes:	Number and tons.
Cranes jib:	Number and tons.
Balances:	Number and tons.
Storage	Number and tons.

Source: Author

**Table 2:** Type of commercial fishing boats.

Length.	Commercial fishing boats (Total). Total crew.
> 30 meters.	Number of boats, crew number.
25-30 meters.	Number of boats, crew number.
20-25 meters.	Number of boats, crew number.
15-20 meters.	Number of boats, crew number.
10-15 meters.	Number of boats, crew number.
< 10 meters.	Number of boats, crew number.

Source: Author

**Table 3:** Boats of nautical sports.

Length.	Craft of nautical sports (Total). Total of users.
> 12 meters.	Number of craft, crew number.
10-12 meters.	Number of craft, crew number.
8-10 meters.	Number of craft, crew number.
6-8 meters.	Number of craft, crew number.
< 6 meters.	Number of craft, crew number.

Source: Author

The crew quantify helps us to define the quantity of residues generated. This generation is not the same on the weekends than during week, as it is the same generation that occurs in the summer than in the winter. For this reason, the location and capacity of the container will ensure the maximum capacity to collect waste that can be generated both by boats and by its users. This measure will prevent our ability to receive waste is insufficient. For the calculation of the waste generated by vessels and its users, we can build on the IMO document MEPC<sup>1</sup> 41/5/1 that commercial fishing vessels are summarized in Table 4 and Table 5. Similarly, as directed by the IMO document MEPC 41/5/1, we can summarize waste generation leisure sailing craft, which showed in Table 6.

**Table 4:** Generation of waste in commercial fishing boats.

Tonnage	20 - 70 Tons.
Crew:	2 - 15 Crew.
In port:	Variable.
Food residues:	1 - 2 Kg./ person/day
Sanitary and bilge water:	150-200 Liters/person/day
<b>Operational residues</b>	
Scrap metal:	Below 0.5 Tons./year.
Remains of fishing nets:	1-2 Fishing nets/year (max.)

Source: OMI, MEPC 41/5/1

**Table 5:** Percentage of residues generated by commercial fishing boats.

Food	Packaging	Plastics	Aluminum	Metal/Glass
38%	17%	16%	16%	13%

Source: OMI, MEPC 41/5/1

<sup>1</sup> Presented by "WWF" (World Wide Fund for Nature) to the International Maritime Organization (IMO).

**Table 6:** Residues generation from a craft nautical sports.

Size:	4-60 Ton.
Crew:	2-15 Crew.
In port:	70-85 % of the year
Food residues:	0,5-3 Kg./ person/day
Sanitary and bilge water:	50-120 Liters/person/day
<b>Operational residues</b>	
Residues of maintenance:	100 Kg./craft/year

Source: OMI, MEPC 41/5/1

In the identification of the residues generated in the fishing ports and marinas, we need to define the activities that are performed in the same regardless of its frequency. We will build on the activities we have considered shocking. The main activities developed in the fishing ports and marinas are shown in Table 7.

**Table 7:** Summary of port activities.

Port Activities
Download and selling fish.
Cleaning of facilities and methods used in sales transactions and unloading of fish.
Cleaning of decks and hulls.
Repair, maintenance and painting of craft.
Fuel supply.
Manufacture of ice.
Work of maintenance and repair of fishing gear and nets.
Logistics in passenger traffic (tourist movements).
Work maintenance and repair of craft, their engines and rigging (sails).
Activities of restaurants and services

Source: Authors

Once we have identified the activities, must be identified the waste generated in such activities. Each waste will relate to the applicable law either as hazardous or non-hazardous waste. Each residue will interact with international identification, while it will have to consider the law applicable to their proper management. This legislation is European, national, regional and sometimes local levels. Similarly, each residue was relate to the relevant international identification for transport as well as legislation to be enforced. In Table 8 we characterize the waste generated in port activities.

## 5. Design guidelines

For the design of a waste reception facility will be held the following:

- Types of waste generated in the port.
- Capacity and quantity of environmental equipment (containers) necessary depending on port users and the number of craft.

**Table 8:** Principal residues that are generated in port activities.

Residues that are generated in port activities	
Oil of marine engines.	Metallic packaging contaminated with oil.
Residues of marine engines.	Plastic packaging contaminated with oil.
Nautical flares.	Absorbents contaminated with oil.
Bulbs	Gloves contaminated with paint and/or varnishes.
Filters for marine engines.	Absorbents contaminated with paint and/or varnishes.
Cloths contaminated with oil.	Cloths contaminated with paint and / or varnishes.
Gloves contaminated with oil.	Cylindrical cells.
Fluorescent tubes.	Aerosols/sprays.
Batteries.	Solvents.
Button cells.	Paintings.
Metal Packaging contaminated with paint and/or varnishes.	
Plastic Packaging contaminated with paint and/or varnishes.	

Source: Authors

- Minimize the visual impacts of everything that pretend to be placed on the port.
- Comply with all applicable laws at the port to manage hazardous residues and non-hazardous.
- Define the ideal area to locate the main facility to receive residues.
- Define locate areas suitable for small groups of containerization.
- The reception of bilge water (hydrocarbon-polluted water) and sanitary water (WC) can be installed in areas of fuel supply (gas station port). This minimizes the visual impact.

The waste reception facility and reinforcement, signage and advertising will need in the port. To facilitate this action, users have to know the residues that are supported in the installation, quantities, schedules and deposit areas (López, 2008). Each container will have to carry identification of the residue that receives according to current regulations both for temporarily storing waste as for transport.

## 6. Conclusions

1<sup>st</sup>. The economic and tourism success of a port depends on the good management of the environmental quality of the port and their environment.

2<sup>nd</sup>. Each port is different, it is essential to know all the characteristics of the social and ecological environment. The experience gained in a port, can provide guidance for the design and environmental management in others, but cannot be extrapolated without further.

3<sup>rd</sup>. The construction of residues reception facilities in ports has significant economic multiplier effects on domestic production of a region and directly and indirectly affects many branches of economic activity.

4<sup>th</sup>. In the placement of the residues reception elements in ports will tend to minimize the environmental and visual impact.

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