

ABSTRACT

Port Authorities have begun a process of reflection on environmental sustainability even under the pressure of international initiatives. The ordinary environmental management is increasingly organized on Environmental Management Systems (EMS), structured and aimed at a continuous improvement of the environmental performance of the Port Authority. In addition, environmental issues can be effectively addressed in the preparation of Port Master Plans, through the process of Environmental Assessment. The article highlights the contrast between the uniformity of practices that is found in ordinary environmental management of ports and legal and methodological fragmentation that instead characterize the environmental assessment of development port plans, also through the analysis of the case study of the Port of Livorno, highlighting some emerging issues (eg. sustainability in energy production and consumption) and some problems that hinder the effectiveness of the existing instruments.



The environmental performance of port areas from the ordinary management to the assessment of the effects of territorial transformations

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KEYWORDS

SEA; Environmental sustainability; Port planning;
Energy

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Introduction

In 1987, the World Commission on Environment and Development, known as the Brundtland Commission, within the report *Our Common Future* introduced the concept of “sustainable development” as an integrated approach to economic policy for decades to come, a development model to follow to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Many other definitions have been suggested in the following years, specifying the concept better and also giving different interpretations. However, it is not easy to find a definitive definition that allows to translate the principles into practice.

The wider vision of sustainable development includes within it the social, the economic and the ecological dimensions.

If we try to decline the general concept on the cases of those portions of the territory occupied by the ports or directly nearby to them, you can identify the concrete meanings of economic, social and environmental dimensions of sustainable development.

The economic dimension of sustainable development of a port area concerns the return on the capital invested in development projects, the efficiency of use of the area and the provision of services for businesses, the induced employment and economic development of the maritime cluster, as defined by CENSIS: the GDP (gross domestic product) produced by the national maritime cluster is around € 39.5 billion euros, equal to 2.6% of the national total at current prices; the maritime cluster employs about 477,000 people directly and indirectly.

The ability of the ports to stimulate production and employment is incredibly important: 1,000 euros spent within the maritime cluster (eg. investment or procurement) are able to activate 2,370 euros of total income in the economy and 1,000 new units of work generated in the maritime cluster activate 1,730 units labor in the economy.

The social dimension of sustainable development of port areas can therefore be defined through direct and indirect employment in the port companies and those connected and the degree of involvement and well-being of port workers, but also to the living conditions of the areas surrounding the port and interaction, virtuous or conflictual, between the port or the city. The ports are historically located in the vicinity of urban areas (usually before they were born) and have played a very important role in their development both in the economic sense that even cultural in the broadest sense, thanks to the circulation of people and ideas that gave vitality to the existing communities; today the change of port activities, however, has also generated problems to solve, such as the emission of greenhouse gases into the atmosphere from ships or traffic induced by maritime traffic, noise pollution caused by some manufactures, the placement of high-risk industrial activities closely with the town. These issues are crucial to be addressed but difficult to solve in the planning of port cities.

To define the environmental dimension of sustainable development in port areas we also referred to the issues mentioned above, with different specificities depending on each port area and all the surrounding territory.

The need to hold together the development of ports and environmental protection of the port itself and neighboring areas has been stated already in the United Nations Conference on the state of the Environment and Development (UNCED, 1992).

Today, the environmental sustainability of port activities is increasingly valued as an element of economic competitiveness also by the competent authorities and environmental awareness is slowly spreading among port operators.

The port sector is interested in preserving or restoring the nature and the image of "green" shipping to maintain its competitiveness by reducing the local impact and friction with the community, cooperating to maintain the livability of the area.

The environmental performance of the port areas have therefore been the focus of many regulatory initiatives at European and international scale in recent years. There have also been many "soft law" initiatives and voluntary membership.

The "International Convention for the Prevention of Pollution from Ships" (MARPOL, short for Marine Pollution), is an international agreement to prevent pollution of the sea by ships from operational or accidental causes, which transposes the two related international treaties in 1973 and 1978; it came into force in 1983, has been integrated with attachments and changed over the years. Today it regulates the behavior of ships flying the flag of the signatory countries, 98% of world tonnage, because each signatory nation is required to enact national laws to implement the Convention and is committed to complying effectively Convention, Annexes and related laws of other nations.

The Word Ports Climate Initiative (WPCI) is a statement of voluntary commitment to reduce the impact on the environment and climate of port operations and shipping in general, which has been adopted by 55 of the largest ports in a global scale.

The European Community affects the development and the environmental performance of the port areas at the regulatory level in an indirect manner through specific directives, such as those relating to sulfur content of fuels (Directive 2005/33/EC), pollution from ships (Directive 2295/35/EC), greenhouse gas emissions (Directive 2003/87/EC and Decision 405/2009/EC), port services (Directive 2000/59/EC), water quality (Directive 2000/60/EC), noise pollution (Directive 2002/49/EC), waste (Directive 2008/98/EC and Regulation n.1013/2006), protection of biodiversity (eg. Directive 92/43/EC Natura 2000).

The European Sea Port Organisation (ESPO) has long been committed to promoting initiatives of study and practical experience in the environmental management of port areas, developing and disseminating codes of practice to be adopted by involving the most relevant stakeholders operating in port areas, dialogue with institutions in the drafting of the relevant legislation. In particular ESPO has developed a common vision to the European Port Authority for environmental policies with the strategy of the so-called five "e" exemplify, enable, encourage, engage, enforce.

From ordinary management to planning the transformations

The ordinary environmental management of port activities is bound to comply with many specific regulations, which concern in particular the sectors of water, air, waste, fire prevention, dangerous substances, energy, noise, soil and subsoil, greenhouse gas emissions, safety at work and port security, maritime pollution.

Most of the Italian ports not only complies with the law requirements, but also offers services for the protection of the environment both in the field of intervention in case of environmental damage, both of prevention (eg. waste management) and developed, on a voluntary systems, environmental management tools that allow to achieve a continuous improvement of its performance.

We refer in particular to the ISO 14001 (international) and EMAS (European), which provide protocols for the voluntary certification of the managing institutions of the port areas and that have spread also in Italy between the Port Authorities.

It should be also mentioned the certification system PERS (Port Environmental Review System), a specific system of environmental management that has defined a basic standard of best practices in environmental management of ports and includes the use of a method of environmental self-assessment called SDM (Self Diagnosis Method).

The environmental compatibility of port activities is a key element also in the process of programming and planning of territorial transformations of port areas, so that the port master plans are subject to environmental assessment procedures prescribed by law.

The Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) have been introduced in the Italian legal system in separate and successive time steps, following the implementation of the relevant European legislation. EIA was introduced in 1985 by the Community (EEC 337/1985), adopted in Italy in 1986 (L349/1986) and redefined in 2006 with D.Lgs. 152/2004; SEA was introduced at Community level in 2001 (2001/42/EC) and implemented on a national scale in 2006 with the D.Lgs. 152/2004, substantially modified in 2008 and 2010 (D.Lgs. n.4/2008 e D.Lgs. 128/2010).

The Port Master Plan, in its current configuration, was introduced and regulated by Law 84/1994 "Reorganization of port legislation". In particular, the PRP, in the ports of category II must identify the extent and the overall structure of the port, the areas for industrial production, activity shipbuilding industry, the road and rail infrastructures, the features and the functional target of the areas concerned. In accordance with local regulations, the Port Master Plan by law 84/94 shall be submitted to the procedure for environmental impact assessment, the only one possible for the national legal system in that year, 1994.

The guidelines for the drafting of port master plans were issued in June 2004, after the adoption of the SEA Directive and before its national transposition and contain basic information.

The guidelines emphasize that the port master plans should not be considered as simple programs about maritime works and infrastructure, they must be understood as articulated and complex processes of planning and management, structural plans, and that they are at the same time:

- reference scenarios for the location and characterization of projects and actions;
- management decisions support tools.

The guidelines describe an assessment that essentially concerns environmental and social sustainability of the planning actions and their technical and economic feasibility.

Therefore the guidelines substantially describe a procedure with the requirements of the Strategic Environmental Assessment (SEA), but it is always traced back to the only existing procedure at the national level in 2004, the Environmental Impact Assessment (EIA).

The Legislative Decree 152/2006 made clear the scope of EIA and SEA; the first concerns the environmental assessment of projects, and the second one concerns the assessment of the environmental effects of plans and programs.

Considering the hybrid nature of the Port Master Plan, which is traditionally understood as a public works plan but normatively is defined as the strategic plan, to date there is still no a clearly defined situation with regard to its Environmental Assessments.

The D.Lgs. 152/2006, as updated in 2010 (Article 6, Section 3 ter) deals with environmental assessment of port plans but is open to several interpretations; the decree states that port plans are definitely subject to Strategic Environmental Assessment, but, if they present a prevalence of well defined projects of public works, it's possible to conduct at the same time also an Environmental Impact Assessment, using a unique procedure concluded by a unified decision.

Port plans are usually approved by the Regions, then the above regulations also overlap to the regional regulation, often significant about Environmental Assessment.

To date the national situation is quite varied and somewhat confused by the procedural point of view: some ports have a port plan that has never been subjected to Environmental Assessment because prior to 1994 and modified only with the technical and functional adjustments (eg. Salerno); some ports have submitted their plan to EIA after 1994 (eg. Piombino, Ancona); others have dealt with the process of SEA on the port plan (eg. Cagliari has concluded, Livorno is in progress) and finally some ports are facing the unified procedure of EIA and SEA (eg. Trieste).

In an environmental assessment, the effects of the plan/project actions on the environmental matrices are described with different approaches and with different levels of detail, depending on the available data and the subject matter.

For each environmental component, the effects identified are not homogeneous and should be described from various points of view:

- the territorial context in which the effect is expressed;
- the nature of effects: direct (are caused by the action and occur at the same time and in the same place), indirect (are caused by the action and occur later in time or farther in space, but are still reasonably foreseeable), cumulative or synergistic effects (in addition to other effects caused by past actions, present or reasonably available in the future).

The environmental assessment is usually developed using qualitative or quantitative methods, but from an examination of case studies we see a remarkable methodological heterogeneity.

In any case it is required the use of the most suitable indicators to describe the particular context, and to monitor over time the trend of the phenomena described in consequence of the application of the plan/project.

The most frequently used methods for assessing the overall sustainability of the project/plan in the literature are *matrices of environmental compatibility* (qualitative method) and *multi-criteria analysis* (MCA, quantitative method).

A key element in the success and credibility of the environmental assessment is the availability of data (and thus of indicators and indices derived from them) with an accuracy, a temporal coverage and an appropriate spatial reference. Those elements are not always available in case of port areas, but their presence is enhanced by the implementation of an Environmental Management System.

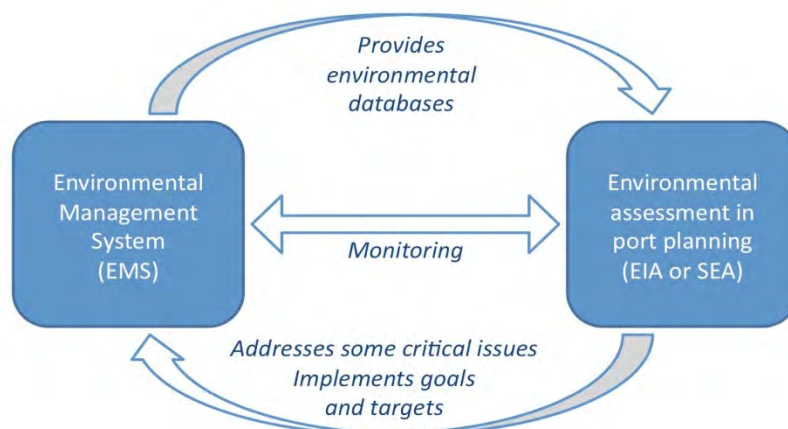


Figure 1. Virtuous relationship between ordinary environmental management and occasional environmental assessment of the territorial transformations.

A good permeability between the ordinary methods of environmental management like EMS and the environmental assessment of the effects of territorial transformations in port areas is really crucial (Figure 1).

As a matter of fact, the Environmental Management

System databases are fundamental to the construction of the state of the environment required as a baseline scenario in the SEA and EIA, because they provide indicators for monitoring, existing for several years; although often the data in the EMS are not so easy to integrate with other databases of different government and environmental agencies.

On the other hand, some environmental interference problems can be addressed in a much more effective in planning decisions, not just pointing mitigation and compensation but also through relocation and functional changes.

In addition, the objectives of spatial plans and the monitoring of their effects can effectively implement information and strategies of the Environmental Management Systems themselves.

Interferences between ports and cities

The impacts of ports on the neighboring urban areas can be classified according to a taxonomy general, but they differ considerably depending on the type of port activities (commercial, industrial and petroleum, passenger service, fishing, tourism and recreational).

The environmental impact of ports can be divided in three sub-categories in relation to determinants:

- problems caused by port activity itself;
- problems caused at sea by ships calling at the port;
- problems caused by logistics supply chain from inter-modal transport serving the port hinterland.

Table 1. Kind of impacts for determining factor.

Kind of impacts	Determining factor		
	Port activities	Ships at berth	Generated traffic
Spatial development of the port	x		
Development of the port at sea	x		
Dredging	x		
Disposal of dredged material and debris	x		
Solid waste	x	x	
Waste from the processing of fish on shore	x		
Soil contamination	x		
Water quality	x	x	
Bilge water		x	
Ballast water		x	
Water discharges from industrial process	x		
Water consumption	x		
Sewage from vessel		x	
Antifouling paints		x	
Spills from vessel		x	
Spills from storage tanks	x		
Pollution from rivers	x		
Generated traffic volumes	x		x
Energy consumption	x	x	x
Industrial emissions	x		
Emissions from motor vehicles			x
Atmospheric emissions from ships		x	
Dusts	x		x
Noise pollution	x	x	x
Olfactory pollution	x	x	x
Impacts of fishing	x		
Dangerous goods	x	x	x
Accidental loss		x	
Drainage of the coastline	x		
Damage to terrestrial habitats	x		x
Damage to marine habitats	x	x	
Cultural heritage and landscape	x		

It is thus possible to define the areas of impact that the EIA and SEA of port development plans have to deal with.

The hottest topics among those listed are certainly air quality and reduction of greenhouse gas emissions from the chimneys of ships. On this issue the European Community have focused through legislative initiatives, for example the proposal for a Directive of the European Parliament and of the Council 2013/012 on the development of alternative fuels infrastructure; even the big shipping companies and port authorities are dedicating great technological efforts to solve these

environmental problems. Both the proposal for the cited directive, both research and technological developments, point the focus on the use of natural gas as an alternative fuel ship (LNG) and on the possibility of supplying energy to ships at berth (OPS - Onshore Power Supply).

The issue of air emissions is therefore closely linked to the question of the power supply of the ships and the energy performance of the activities in the port area.

	1996	2004	2009	2013
1	Port Development (water)	Garbage / Port waste	Noise	Air quality
2	Water quality	Dredging: operations	Air quality	Garbage/ Port waste
3	Dredging disposal	Dredging disposal	Garbage / Port waste	Energy Consumption
4	Dredging: operations	Dust	Dredging: operations	Noise
5	Dust	Noise	Dredging: disposal	Ship waste
6	Port Development (land)	Air quality	Relationship with local community	Relationship with local community
7	Contaminated land	Hazardous cargo	Energy consumption	Dredging: operations
8	Habitat loss / degradation	Bunkering	Dust	Dust
9	Traffic volume	Port Development (land)	Port Development (water)	Port development (land)
10	Industrial effluent	Ship discharge (bilge)	Port Development (land)	Water quality

Figure 2. Evolution of the environmental priorities of ports in Europe 1996-2013. (Source: ESPO)

Figure 2 demonstrates the urgency of addressing these issues with an investigation into the environmental priorities of European ports 1996-2013.

The air quality was not present at 1996, was ranked sixth in 2004, had risen to the second place in 2009 and is currently in first place. The energy consumption was not present at 1996 and 2004, but is powerfully entered the charts in 2009 with a seventh place which has now turned into third place.

At the same time the problem of relations with the local community in the same year has entered the chart, showing that cohabitation between development activities of the port areas are not always easily reconciled with the demand for greater livability of the surrounding areas, also because of the increasing sensitivity of the community about environmental issues.

Port of Livorno, a case study

Ordinary environmental management

With regard to the environmental management routine, the Port Authority of Livorno was the first European to implement an Environmental Management System certified according to UNI EN 14001: 2004 and EMAS registered, in 2003-2004. To get these certifications it was necessary to define an environmental policy, an environmental program and an environmental management system shared among port operators.

It is the port authority to be certified, it is not the port of Livorno. Only some port activities are directly managed by the Port Authority, many activities are outsourced; furthermore in the port area there are also many private operators, not necessarily all certified and equipped with an EMS. Actually the environmental statement examines:

- the direct environmental effects: environmental aspects related to the activities that are carried out directly by the Port Authority of Livorno;

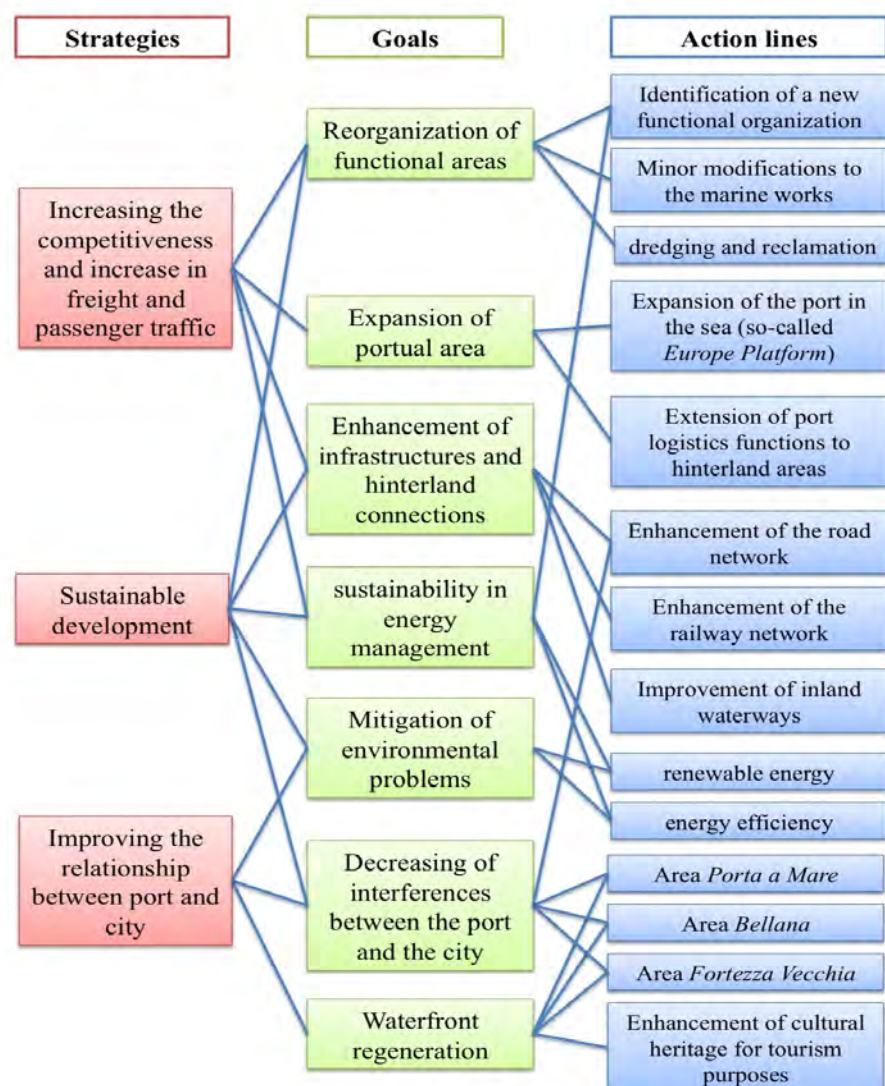
- the environmental effects mediated indirect: the environmental aspects related to the activities that are carried out by concessionary companies;
- the indirect territorial environmental effects: environmental aspects related to the activities that are carried out on the state property area.

The environmental statement therefore is already a point of annotated collection of environmental, economic and social data, and it works as a tool for decision support and for the Three Year Operating Plan and for the Port Porto, providing processes of monitoring and control of the territory since some years. It is a tool for checking the consistency between the evolution of the environment, the economy and social phenomena taking place in the port area and the principles of the Environmental Policy adopted by the Port Authority.

The Strategic Environmental Assessment on the new Port Master Plan

Figure 3. Schematic summary of strategies, objectives and action lines of the new PMP of Livorno.
(Source: Environmental Report, Livorno Port Authority; modified)

The Master Plan of the Port of Livorno in force dates back to 1953 and has been subjected to numerous variations over time; the current rules, however, do not respond to these new need for competitiveness required by the evolution of logistics systems and the current variation of the types of cargo and passenger traffic. Even the provincial and regional planning tools call for a new development for the Port of Livorno, a key element of the so-called *coastal logistics platform*. The Livorno Port Authority has initiated the procedures for the preparation and adoption of the new Port Master Plan in 2002; only recently a shared vision has been produced and the new master plan was adopted in December 2013.



The new PMP hinges on three main strategies:

- increasing the competitiveness and increase in freight and passenger traffic;
- improving the relationship between port and city;
- sustainable development.

Each strategy has been declined, according to some goals and each goal must be achieved through the implementation of specific actions (Figure 3).

In summary, the new Port Master Plan outlines an organization of port spaces more uniformly and efficiently than at present identifying areas depending on the types of merchandise and traffic, strengthening the multipurpose character of the port thanks to the reduction of interference in the activities. New functional distribution and adaptation of infrastructure to the new requirements imposed by the characteristics of the vessels and the evolution of logistics is also made possible by the construction of an expansion of the port to the sea (the Europe Platform), by the upgrading of existing docks and canals and by the deepening of the seabed.

The infrastructure outside the port are critical issues that must be overcome to achieve the necessary efficiency; the PMP considers the road network, the rail network and the waterways.

The Port Master Plan has also set the goal to redevelop the waterfront areas by redefining the overall structure of these spaces, enhancing the still present and compatible port functions and lightening urban areas from interference with port activities with the highest environmental impact.

Since the PMP of the port of Livorno has indeed above all the contents of a strategic plan and a framework for the successive design of the planned works, the Livorno Port Authority, in consultation with the Ministry of the Environment, Land and Sea and the Tuscany Region, in March 2012 decided to proceed with the activation of the single procedure of Strategic Environmental Assessment (SEA).

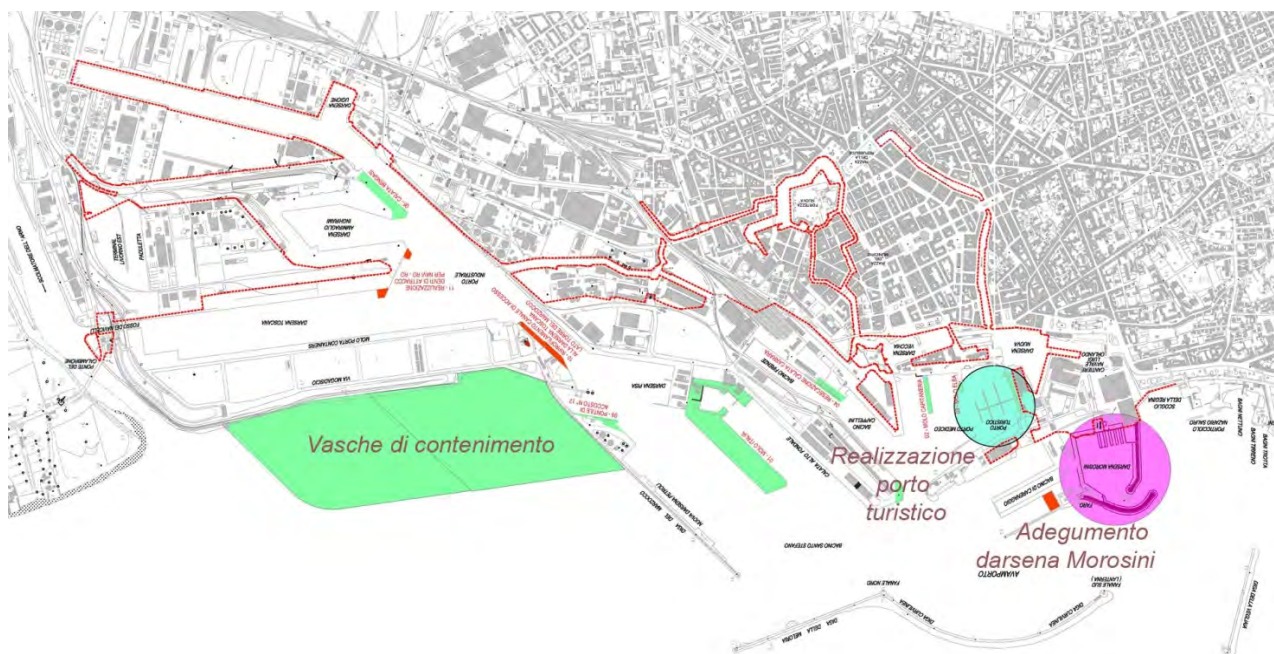


Figure 4. The current PMP. (Source: Livorno Port Authority, modified)

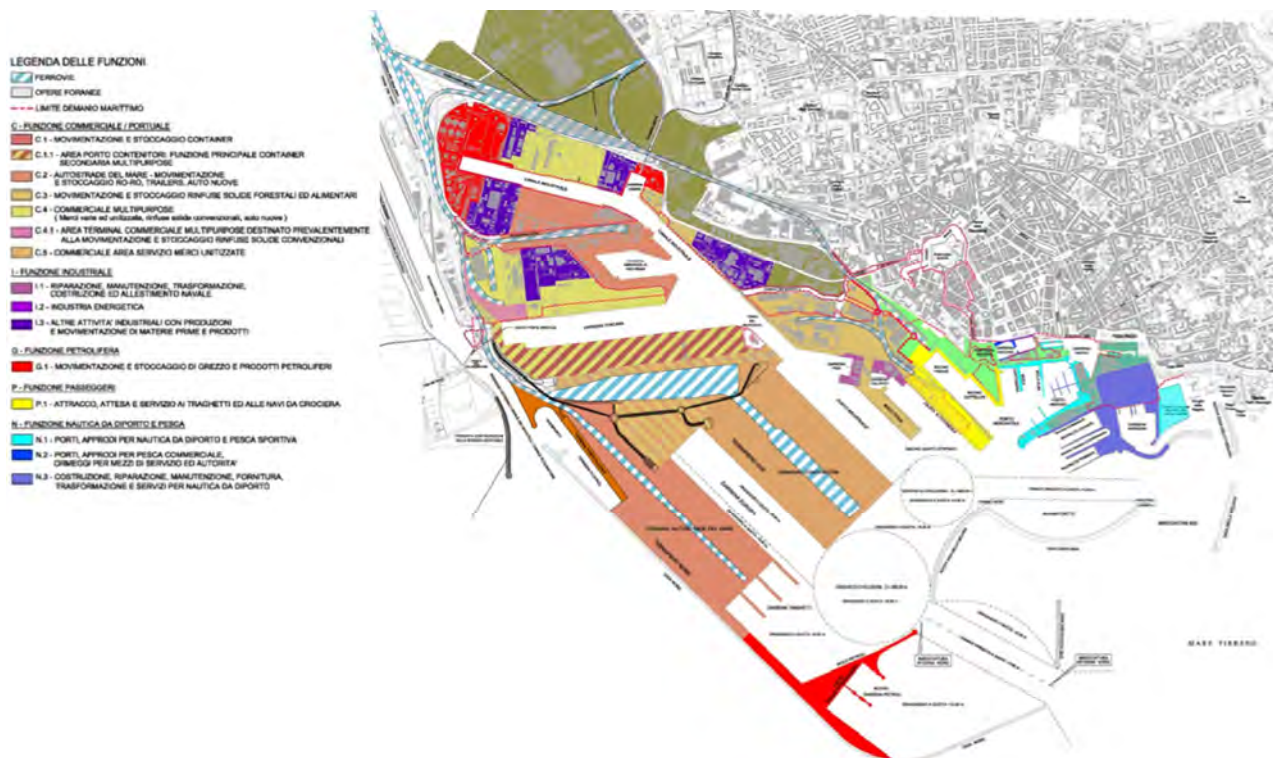


Figure 5. The new Port Master Plan - the functional distribution. (Source: Livorno Port Authority, modified)



Figure 6. The new Port Master Plan - the projects. (Source: Livorno Port Authority, modified)

The procedure required the preparation of an environmental report and also included the stakeholders' involvement.

In the environmental report the effects of PMP actions were analyzed on: landscape and cultural heritage, water quality and coastal marine environmental, air quality, climate and energy consumption, soil, subsoil and natural hazards, needs of construction materials, hydraulic-geological-geotechnical risk, waste and contamination sites, industrial risks, socio economic analysis.



Figure 7. Site visit with stakeholder during the SEA procedure.

As previously mentioned, the effects of the actions of the PMP on the environmental components have been described with different approaches and with different levels of detail also depending on the amount and quality of data available. All assessments were summarized in the *matrix of environmental compatibility*, obtained from the crossing of the environmental framework

and the strategic framework, to provide a qualitative overview of the environmental effects classified as positive, presumably positive, presumably negative or negative.

The most impacting action in PMP is the construction and starting up of the Europe Platform, on which most of port logistics will focus; the most stresses environmental components appear to be air quality, energy consumption and use of materials needed for the construction work.



Figure 8. Landscape and cultural heritage have been considered in the SEA procedure.

Energy consumption as an emerging theme

As shown by the studies carried out in the port area on the occasion of energy audits and european projects, the predominant component of energy consumption of the port of Livorno is formed by the movement and activities of ships at berth (over 92 % of total consumption, and ships at berth come to 77% of total consumption). The movement of goods, both internally and externally (HGVs) to the port area, contributes to the total consumption for a little over 5% of total energy used and energy consumption of the buildings are little more than 1% of total consumption.

The studies mentioned above have shown that the current energy needs for the port of Livorno are about 1500 TJoule.

The Environmental Report compiled for Strategic Environmental Assessment has developed a projection on the energy requirements for the configuration assumed in the new PMP, at 2040, which should arrive to 3399 TJoule, more than twice the current one.

The extension and rationalization of the port provided by the PRP make it necessary and possible to predict even its parallel energy development. According to the documents, a radical change of approach will become the port "from consumer to producer of energy".

This intention, however, risks to remain just a slogan if the competent authorities do not identify specific actions, which are still under investigation, both with regard to energy efficiency that production from renewable sources.

To date, the scenario is not so clear, so that the matrix of environmental compatibility in the VAS has failed to define the effects of actions relating to energy either as positive nor as negative; the SEA procedure has also required additional documents that have tried to investigate the situation of the energy infrastructure and strategies for improving environmental performance in the energy field.

The long-term goal for the Port Authority should be or to adopt a portual energy plan or to explore the theme of sustainable energy management within the already existing Environmental Management System.

			Strategic framework											
			In new functional organization	Minor modifications to the marine works	dredging and reclamation	Europe Platform	Extension of port logistics functions to hinterland areas	Enhancement of the road network	Enhancement of the rail network	Improvement of inland waterways	Renewable energy	Energy efficiency	Area Porta a Mare	Area Bellana
			Positive environmental effects											
			Presumably positive environmental effects											
			Any interaction											
			Presumably negative environmental effects											
			Negative environmental effects											
Environmental framework	Landscape and culturale heritage													
	Water quality and coastal marine environmental	Coastal hydrodynamics												
		Bathing												
	Biodiversity	Marine environmental												
		Terrestrial environmental												
	Air quality, climate and energy	Air quality												
		Energy needs												
		Acoustic climate												
	Soil, sub-soil and natural hazards	Use of the land												
		Needs of construction materials												
		Hydrogeology and water circulation												
		Hydraulic risk												
		Geological and geotechnical risk												
		Seismic												
	Waste and Contaminated Sites													
	Industrial risks													
	Socio-economic analysis													

Figure 9. Matrix of environmental compatibility. (Source: Livorno Port Authority, modified)

The Municipality of Livorno has joined the Covenant of Mayors in 2013; the drafting of the Sustainable Energy Action Plan (SEAP) occurred in the same months of the review of the PRP and, in parallel, of the municipal planning instruments; this conjunction makes it theoretically possible the integration of energy issues and local planning.

However, few obstacles and problems of various kinds persist and constitute weaknesses for an effective deployment of a new energy strategy for the Livorno port area; such problems can be generalized to a national scale.

The energy plan (and also the SEAP) is a complementary planning tool and concerns a sectoral issue of territorial planning, side by side with planning instruments themselves. The risk is to regard energy as an independent variable to be managed independently, with strategies and specific actions; the reality is that it depends on and affects both the structure and the urban functions (presence and distribution of assets located and their mutual interaction), even more in port areas.

The energy plan alone therefore isn't a tool that can heavily affect the reality of the territory on which it is addressed; its instances should be integrated into the main tools of spatial planning.

Figure 10. The port of Livorno and the production of energy from renewable sources.



A second critical element regards the rules governing soils in port areas: the Port Authorities can manage development policies on the public areas, but on the State owned land they can influence the behavior of private operators only through the instrument of grant; on private land they can not even apply this tool. Given that the Port Authority has no binding powers on

energy choices of private operators in the port area, it becomes essential to emphasize a bottom-up approach and to promote the self-organization of the port community to bring forward best practices in energy efficiency and production from renewable sources.

In addition, the regulatory framework in the field of energy defines the tasks but also the limits of Port Authority and private entities that operate in the port area, limiting their potential activity. In particular, given the predictions of the PMP, the Port Authority may estimate the expected evolution of the electric energy needs, and can give the information to the local or national network manager but can not make on its own the works needed to meet future demand. In addition, the Port Authority and any other port operator, can produce electricity becoming a producer of energy and can be used for self-consumption electricity produced, but can not sell it to a third party directly through its own distribution network.

Conclusions

The above analysis took into account both the environmental management routine, developed by now by many Port Authorities through the environmental management systems encoded by standards or international guidelines (ISO 14001, EMAS, PERS), both environmental assessment procedures that are extraordinary activated in the event of drafting new Port Master Plans, in

particular the Strategic Environmental Assessment, as in the case of Livorno, or integrated SEA-EIA procedure provided by national legislation.

The methodological homogeneity guaranteed by the use of recognized standards found in environmental management routine offers considerable strengths because it allows the standardization of feedback, the comparison of the performance of ports and the effectiveness of the dissemination of best management practices.

By contrast, the procedural and methodological heterogeneity that characterizes the environmental assessment of port master plans makes it very difficult to develop a comparison, identify environmental good practices in port planning and evaluate their effectiveness.

Permeability between ordinary and extraordinary assessment of the environmental effects of the transformations of the port areas is still really essential: on one hand the EMS Databases are fundamental for the construction of the state of the environment in SEA and EIA; on the other hand, the EMS are implemented by the objectives aimed in the acts of planning and by the monitoring of their environmental effects.

The reduction of energy consumption is the most current environmental challenge for port areas and is closely linked to the problem of air emissions and climate change; on this topic the effectiveness of the environmental management and of the environmental effect of territorial transformations of port areas will be measured in the next years.

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