

“GREEN PORTS” and the port of santos

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ABSTRACT: This article aims to analyze environmental aspects of the Port of Santos, the largest in Brazil, based on the concepts of the "Green Ports" police, the indexes defined in the "AQUA-Port" certification, developed by the Vanzolini Foundation in partnership with the Innovation Center for Logistics and Port Infrastructure (CILIP), from the University of São Paulo, USP; and the Environmental Development Index - IDA, created by the National Agency of Waterway Transportation - ANTAQ. For this it was made a literature review, which also included studies made by the Port Authority of Santos - CODESP; international benchmarking considering best practices in international ports in relation to environmental management. The research was supplemented by interviews with the managers of the environmental sector of the Port of Santos. From the study it was possible to identify current deficiencies in the environmental management of the Port of Santos, ongoing initiatives and alternatives to the adequacy of this port complex aiming sustainable development, following international tendencies. This research was made as a partial requirement for obtaining the title of Civil Engineering at the Faculty of Science and Technology from the University Santa Cecilia, Santos, São Paulo, Brazil.

Keywords *Green Port, Sustainability, Port of Santos.*

1. INTRODUCTION

Environmental issues have been discussed for a long time, and the environmental crisis, which was already evident in the 1960s, has worsened over the following decades, due to a series of disasters and environmental imbalances, going to be a major concern countries and the international scientific community, leading them to new research and studies in order to address the issue in world level. Thus, it is understood that environment is the mainstay of life.

This concept must be present in a variety of practices, including in port activities, classified as highly polluting and should be accompanied by activities that seek preventive initiatives to combat emissions of harmful gases generated and other potential environmental degradations. In Brazil, these aspects are provided for in the licensing process provided for in the Constitution and in the 6.938 Act of August 31, 1981.

In this context, the criteria established in the guidelines of the "Green Port" initiative will meet the world yearning, as regards the sustainable development of clean processes, not harmful to the ecosystem.

In practice, environmental management includes routines and administrative operations, as well as clearly defined programs aimed at environmental protection, health, safety of workers and users, and the community in general. According to Porto & Teixeira (2002) "[...] There is much to be done to incorporate environmental vision in day-to-day port.", Leading to understand that, even considering the importance and scope of the initiatives in question, and the realization of such concepts as a competitive differentiator in the various economic sectors, it is necessary to advance in the field of environmental management, in relation to the Brazilian port system.

2. RECENT LEGISLATION CONCERNING BRAZILIAN PORTS

Timeline:

- 1934 - Decree No. 24643 created the Brazilian "Water Code";
- 1961 - Decree-Law No. 50877 was about the disposal of toxic or oily waste in inland or coastal Brazilian waters. Through this decree remains strictly forbidden disposal of ship engines cleaning effluent, as well as the disposal of waste from naval activity in water bodies;
- 1967 - Law No. 5197 and Decree-Law No. 221 established the wildlife and fishing protection codes, respectively, that were considered landmarks of the Brazilian environmental legislation (Torres 2000);
- 1967 - Law No. 5357, known as the "Law of Oil", established stricter penalties for vessels or maritime terminals or ports that discharge contaminants agents such as oils or debris in Brazilian waters;
- 1993 - Law No. 8.630, known as the Brazilian Ports Law, assured to the entity concerned the right to build, renovate, expand, improve, lease and operate port installations, provided that in specific cases the celebration of contract and authorization were preceded by consultation with the customs authority and the municipal authority and approval of the Impact Report on the Environment (RIMA). Under the same law was instituted, in each organized port or within each award, a Port Authority Council, without prejudice to other duties incumbent ensure compliance with the standards of protection to the environment. Concerning the Port Administration, that law considered that such administration should be exercised directly by the Union or by the concessionaire of the public port authority, with its jurisdiction, within the

- port area limits, monitor port operations, ensuring that services take place regularly, efficiency, safety and respect for the environment;
- 2007 - Law No. 11.518 created the Department of Ports of the Presidency of Republic - SEP/PR whose powers and competence consists in the formulation of policies and guidelines for the development of the sector, in addition to implementing measures, programs and projects supporting the development of port;
 - 2008 - Decree No. 6620 established policies and guidelines that pointed to the development and promotion of the ports and port terminals sector, regulating the granting thereof, the lease and authorization of maritime port facilities upon prior guarantee sustainable means of these facilities; and
 - 2013 - Law No. 12815, known as the New Brazilian Ports Law, regulated by Decree No. 8033/13 provides that the exploitation of organized ports and port facilities may be made directly or indirectly by the Union, suppressing the deliberative character of the local Councils.

3. PORT ENVIRONMENTAL MANAGEMENT

According Kitzmann & Asmus (2002): "Environmental management is a set of operational programs and administrative practices aimed at environmental protection and health and safety of workers, users and communities".

The CONAMA Resolution No. 306/2002 defines Environmental Management as driving, managing and controlling the use of natural resources, environmental hazards and emissions to the environment, through the implementation of an Environmental Management System.

This integration can occur both in product development and in the supply of more environmentally responsible services, doing so with the management to be put as a way of administrative organization of this link in their behavior and environmental variables, attempting to forever the needs of stakeholders, negotiating conflict and, as Carrieri (2002): "aiming to reduce as far as possible its negative impacts."

In the case of port operations, the impacts can result from handling operations, transportation and cargo storage, as well as: infrastructure maintenance services; supply and repair of vessels, machinery, equipment and vehicles in general, which, when done improperly, can generate solid, liquid or gaseous waste that may cause pollution of air, water, soil and subsoil. Other relevant impacts are those resulting from heavy goods traffic in and change the landscape, among others.

Thus, port activities can have negative environmental impacts, increasing risks to health and local security, and endanger ecosystems. Hence the importance of the implementation of environmental management in this area, requiring not only compliance with existing standards, which must be constantly improved, as promoting the adoption of good and best environmental practices in port operation and management.

Thus, the Port Administration must have environmental awareness and proper conduct of the importance of these issues.

Within the context of covering the thought of environmental sustainability, we can say that the environmental manager model of organized ports and other port facilities should be based on institutional paradigm able to make the activities related to the sector in more timely and appropriate structures, observing the legal framework that regulates the environmental demands handled by international conventions to which Brazil is a signatory, to the national legislation, entering into provisional measures and public policies of federal and state levels (CIRM 1998).

Another great legal importance instrument in the evolution of environmental issues in the world is the Environmental Impact Assessment (EIA/RIMA), whose goal is to bring prevention and precaution of environmental damage, administrative transparency about the environmental effects of public and private enterprises, consultation stakeholders and management decisions. This instrument has to be used preventatively for approval of industrial zones and any potentially polluting activity and harmful to the environment.

In the port sector, it was from this idea of prevention and precaution to negative environmental impacts, on October 31, 1996, the Infrastructure Policy Board, chaired by the Civil House of the Presidency of the Republic approved the Government Action Plan Sub Port sector (PAG), prepared by the Executive Group for Modernization of Ports - GEMPO, basic document of the second phase of the Port Modernization Program (PIMOP). This action initiated the implementation of the Port Environmental Agenda, bringing "... an activity of the commitments of phase with the environmental management of seaports and is composed of a series of actions to modify and implement a profile of activity, adapting it guidelines for environmental preservation"(Geiport 2001).

In addition to these instruments currently in Brazil, the main obligations to be met by port managers are obtaining operating licenses; dredging licensing; environmental management facility; individual emergency plan; plan for solid waste management; environmental audit; risk management program; emergency management plan and environmental risk prevention program; and control and environmental monitoring.

3.1 Environmental Performance Index - IDA

ANTAQ, in fulfilling its legal duties in the environmental context, through its Environmental Management, created the Integrated Environmental Management – SIGA (ANTAQ 2), for the compliance with the law and the adoption of good practices in ports.

From the reviews of SIGA, the Resolution No. 2.650/2012 created the Environmental Performance Index – IDA (ANTAQ 3), adopted as a "tool for monitoring and control of environmental management at port facilities", that allows to quantify and simplify information to facilitate the understanding of the public and decision makers about the port environmental issues; and has the following structure, comprised of four categories:

The categories that make up the structure of IDA has 38 (thirty eight) indicators, of which 14 (fourteen) global, using the AHP - Analytic Hierarchy Process.

The Economic-operating category: "[...] deals with the actions of the organization, structuring and responsiveness, dedicated to environmental management, in accordance with its port operations. It has a set of 7 global indicators and 24 specific indicators.

The Socio-cultural category evaluates methods and social actions inserted in the environmental logic, "understood and treated as an integrated process, in which all aspects of environmental quality are considered," among them: health and sanitation issues, including environmental education the dissemination of good environmental practices and health contingencies, such as occupational health, collection and disposal of waste from vessels, containment of possible pandemics, etc.

The Physical-chemical category consists of indicators related to management actions of the possible types of pollution resulting from port activities.

Finally, the Bio-ecological category, which considers indicators that evaluate the issues more directly related to organisms in the port areas.

A report published by ANTAQ from data collected in the second half of 2015 shows, in the Figure 1, some results on management of Brazilian organized ports, based on IDA.

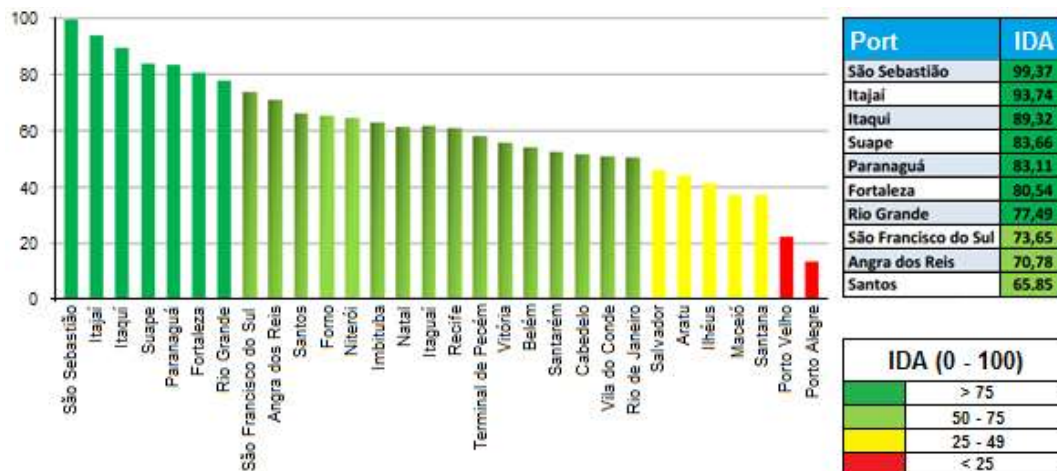


Figure 1 – IDA – Evaluation in the second half of 2015 (ANTAQ 4).

The Port of Santos appears in 10th place. However, this index does not consider some variables that can be influential, such as history of expansion, port-city relationship, importance in the national economic context, annual handling cargo, type of cargo, management structure, etc. For example: The Port of Santos, the largest public port of Brazil handles the sum of the ports that occupy the 2nd to 5th place. Among the 10 best-ranked, only the ports of Angra dos Reis, Fortaleza and Santos are administered directly by the Federal Government with centralized decisions in the Secretariat of the Ministry of Transport Ports. Angra and Fortaleza are small ports. The other ports are delegates to states and municipalities, with local management, more agile and flexible.

ANTAQ received feedback on the part of environmental managers of the 29 public ports evaluated in the IDA, by applying a questionnaire, which some relevant answers below:

Question 5: Is the composition of IDA indicators adequate? Answer: 36.4% had doubts and 9.1% disagreed.

Question 6: Is the distribution of weight assigned to each IDA indicator appropriate today? Answer: 41% disagree.

Question 7: In the case of the existence of indicators score below desired that port currently, what internal and external factors are preventing the improvement? Answer: Most frequent Topics:

- Lack of investments;
- Lack of proper / qualified personnel;
- Lack of coordination between actors;
- Lack of power of action; and
- Lack of environmental awareness.

The centralization of the national port system decisions in Brasilia, on the basis of Law No. 12815/2013 explains, in large part, this perception.

3.2 AQUA-Portos Certification

The AQUA-Portos Certification was developed by Vanzolini Foundation in partnership with the Center for Innovation in Logistics and Port Infrastructure (CILIP) of the São Paulo University (USP), as a certificate of sustainability. The AQUA Certification, launched in 2008, it is a version adapted for Brazil of the french certification HQE (Haute Qualité Environnementale), bringing a proposed change in the culture of civil construction under planning and management. Since then, several residential and commercial buildings, and

logistics and industrial parks among other projects received this certification. The AQUA-Portos Certification is a derivation of certification AQUA, with specific application to the port activity based on environmental licensing criteria, best practices and best practices.

This certificate aims to reduce the impacts of various activities of the branches of construction and port operation, following environmental parameters of development of local communities, health and safety of the operations are intended. The certification stages include pre-design, design, implementation and operation.

The reference of this AQUA-Portos Certification includes requirements of a Port Management System (SGP) criteria and indicators of environmental performance and quality of life for assessing these buildings.

Environmental Quality Performance indicators for Port Facilities (QAIP) consider 15 categories divided into three themes: social and economic life, quality of life and environment, assessing until 342 items according the specific project, evaluating the harbor and its surroundings, the property security, construction site, waste, natural environments and ecosystems.

In these 15 categories are required the demonstration and proof of these items from the early stages of planning and design, to see what were the environmental measures taken to ensure there is no impact on the fishing activity, the quality of air and water; and that environmental impacts are minimized, such as noise and vibration, among other.

As previously mentioned, the ANTAQ index IDA considers only aspects of environmental licensing. Already Certification AQUA-Portos goes beyond assessing the stage of the environmental initiatives of the ports qualifying them with good and best practices.

The AQUA-Portos criteria to be met by port project are:

- Base (B): - ENVIRONMENTAL LICENCE - Minimum performance acceptable to a High Environmental Quality company. This should correspond to rules that require enough performance of a company, or in the absence of that, the current practice.
- Good practice (GB): It means that the port will improve its environmental project obtained the environmental license.
- Best practice (BP): Level calibrated in line with the best practices that can be adopted in the High Environmental Quality projects. Considers the reality of Brazilian ports.

The Table 1 (Pereira 2015) shows an example of evaluation by de AQUA-Portos criteria (Port of Itaoca, a new port offshore in Espírito Santo State, the first certificated by AQUA-Portos in Brazil, in 2015).

Table 1. Port of Itaoca – AQUA-Portos evaluation.

Port of Itaoca - Construction Phase				Port of Itaoca - Operating Phase			
Category	Level of effort			Category	Level of effort		
	Low	Medium	High		Low	Medium	High
	GP > 35% BP > 60%	GP > 30% BP 50-60%	GP > 20-25% BP > 50-80%		GP > 35% BP > 60%	GP > 30% BP 50-60%	GP > 20-25% BP > 50-80%
The port and its surroundings	BP			The port and its surroundings	GP		
Economic and social approach	BP			Economic and social approach	BP		
Property security	BP			Property security	BP		
Care and maintenance	BP			Care and maintenance	GP		
Accessibility and mobility			GP	Accessibility and mobility			GP
Comfort	GP			Comfort	B		
Health	B			Health	B		
Energy		B		Energy		B	
Water			GP	Water			BP
Construction site and materials		BP		Construction site and materials		BP	
Waste	GP			Waste	GP		
Natural environments and ecosystems	GP			Natural environments and ecosystems	GP		
Air quality				Air quality			GP
Climate changes				Climate changes			GP
Soil Quality				Soil Quality			GP

This system allows evaluating the level of effort associated with each category. This shows that there are categories that are naturally more difficult to control, as well as being monitored by the port (Pereira 2015):

- Great effort for the port to consider aspects of the project: (Air quality, climate change, energy and health).
- Greater effort to consider the port operational aspects: (comfort, health and energy).

The Vanzolini Foundation now seeks to extend this sustainability certification for other ports and port facilities, thus contributing to the sustainable development of this important sector in Brazil.

4. THE PORT OF SANTOS

Located in the municipalities of Santos and Guarujá, with a quay length of 15,960 m and the total floor area of approximately 8.2 million square meters, the Port of Santos is considered the Brazilian main port complex and also in Latin America, responsible for about a quarter of movement of the Brazilian trade balance.

The Dock Company of São Paulo State - CODESP is the Port Authority responsible for the management and supervision of the Organized Port of Santos, offering services and infrastructure to the owners, tenants and port operators, as well as giving support to the government, trade and economic development with social/environmental responsibility.

The Port of Santos has several challenges when in that related matters Environmental Management. Among these factors are the complexity of its facilities due to the volume and variety of cargo, such as solid and liquid bulk; general cargo, including containers; project cargo (transformers, generators, wind blades, etc.); vehicles, etc., and their location: surrounded and limited largely by urban cities of Santos and Guarujá, and a estuary fed by tributaries to which converges all the untreated pollution existing in urban areas where their contribution areas.

Terminals and other port stakeholders of the port area, whose activities require the existence of environmental and/or sanitary licenses or permits, perform these requests on your behalf directly to the licensing agencies, and CODESP only verifies the existence, validity and compliance obligations.

The Port of Santos is in the process of obtaining the Operating License, whose responsible is the Brazilian Institute of Environment and Renewable Natural Resources - IBAMA.

CODESP considers a challenge to achieve good performance in environmental management at the Port of Santos. This perception stems from the intense and continuous movement of cargo in the largest port complex in Brazil, fundamental to the national economy; the environmental compliance requirements of operations, and the own origin and evolution of their occupation, which includes environmental liabilities which solution involves significant investments; problems of accessibility and port-city conflicts.

Another factor to consider is that the Port of Santos is federal, and after the enactment of Law No. 12815/2013, both leases with issues related to dredging, for example, are centralized in Brasilia, which limited local and regional autonomy in strategic decisions, including investments.

As previously mentioned, ANTAQ established the Environmental Development Index - IDA, which includes several performance indicators, assessing the various public port facilities in Brazil. But, according Pereira (2015), IDA is a good Brazilian initiative, but considers only aspects of the environmental license.

5. THE "GREEN PORTS" MOVEMENT

The growing concerns with sustainability in many ways include the rational use of natural resources and the future of the planet. In this context, the "green" initiatives are increasingly present in various activities of our daily lives. It's no different in the ports.

The growing concern and activism against pollution generated by port activity has raised the movement "Green Ports".

National and international laws have been created for new and existing ports, encompassing sustainability issues and creating increasingly stringent standards to create projects that minimize environmental impacts in port operations.

However, there is a conflict between the benefits generated by the ports and their terminals, as drivers of economic development of certain regions and/or cities, and the inevitable adverse effects on the environment caused by these activities.

Because of this conflict, and to adapt to increasing requirements imposed by the governments, emerged the concept of "Green Ports" which seeks to establish new quality and performance standards, and regular port activities to ensure the quality of life of the population in port cities and hinterlands, and become the port more competitive and visible on the market.

Some of the most important ports in the world have programs related to the "Green Ports" concept in different levels. There are some examples like: Long Beach (California - USA), Singapore and Rotterdam (NED).

6. RESULTS

CODESP argued that does not agree with some criteria and indicators adopted in IDA methodology.

One of the shortcomings with regard to the adoption of good and best practices in the Port of Santos activities stems from the lack of investment and government initiatives when it comes to infrastructure necessary for the implementation of sustainable processes and technologies. The centralization of strategic decisions of the Brazilian port system in Brasilia is one of the factors that hinder this process.

There are several programs and practices that could be implemented to minimize the negative impacts of activities. One is the land-based electric power supply for ships, eliminating the need for engine operation during the mooring period. This procedure would allow the reduction of emissions, vibration and noise that affect the health of both people working in port activities, as the residents of urban areas nearby. There are studies predicting the use of electricity using natural gas, however, nothing effective. The same goes for the use of alternative or renewable energy.

Another structural deficiency of the Port of Santos is the transport matrix in Brazil, which just uses railways and waterways for the transportation of their cargo. In 2015, for example, only 25% of cargo handling at the Port of Santos was taken by railways.

Perhaps the best example of initiative in the sustainability of the Port of Santos has been the implementation of the Brazil Port Terminal (BTP). The area leased to entrepreneurs was the old "dump" of CODESP, the largest environmental liabilities of the port, where over the years have been deposited thousands of tons of various types of chemical residues. The entrepreneur took the decontamination of soil, which resulted in the removal and treatment of approximately 730,000 tons of contaminated soil at depths of up to 15 m. The terminal, one of the most modern in the Port of Santos, was opened in 2013 and today is one of the country's leading container operators, considered world class.

So, initiatives are being taken, however, still lack a systemic character, awareness and increased local participation in defining strategies and decision making. Nor can it be forgotten that the port is a part of the logistics chain. Thus, some solutions rely on other entities of the process.

7. CONCLUSION

The Port of Santos has the potential to maintain its important role in the economy, and tends to maintain its status as the main port complex in the country. However, this requires planning, investment and continuous improvement of processes and systems that combine productivity, growth and competitiveness, taking into account the three pillars of sustainability: economic, social and environmental.

According Pereira (2015), the ANTAQ – IDA is a good initiative, but it is restricted to the formal environmental licensing limits without necessarily foster good and best practice in the port sector. According the same author, the development of criteria for analyzing the demands of the port environment is shown in Table 2.

Table 2. Criteria for analyzing the demands of the port.

	1996	2004	2009	2013	QAIP
1	Port development (water)	Waste	Noise	Air quality	Relationship with the local community
2	Water quality	Dredging operation	Air quality	Waste	Economic and social approach
3	Dredging disposal	Dredging disposal	Waste	Energy consumption	Care and maintenance
4	Dredging operation	Dust	Dredging operation	Noise	Construction site and equipment
5	Dust	Noise	Dredging disposal	Vessel waste	Soil Quality
6	Port development (soil)	Air quality	Relationship with the local community	Relationship with the local community	Property security
7	Contaminated soil	Hazardous cargo	Energy consumption	Dredging operation	Accessibility and mobility
8	Degradation / habitat loss	Supply of ships	Dust	Dust	Comfort
9	Traffic volume	Port development (solo)	Port development (water)	Port development (soil)	Water quality
10	Industrial effluent	Ship discharge (sanitary effluent)	Port development (soil)	Water quality	Waste
11	---	---	---	---	Natural environment and ecosystem
12	---	---	---	---	Air quality
13	---	---	---	---	Climate changes
14	---	---	---	---	Health
15	---	---	---	---	Energy

Considering that Brazilian port characteristics are very different compared to European ports, Pereira (2015) considers that it is possible to introduce new criteria to be assessed in certified ports in Brazil. Confirming this conclusion Table 3 shows the ten priorities of European Sea Ports Organization - ESPO (GreenPort 2016).

Table 3. European Sea Ports Organization – Ten priorities.

 1 Air quality	 2 Energy Consumption	 3 Noise	 4 Relationship with local community	 5 Garbage / Port waste
 6 Ship waste	 7 Port development (land related)	 8 Water quality	 9 Dust	 10 Dredging: operations

Energy consumption linked to the correlation between energy consumption, the carbon footprint and climate change; noise and relationships with the local community are all gaining importance in that list. The Port of Santos has shortcomings in addressing these issues in addition to its significant environmental liabilities. Dust, unpleasant odors and the presence of animal disease vectors remains a serious problem in solid bulk operations near urban areas.

However, it is still necessary to improve system management, both locally and nationally. After all, in a country of continental size like Brazil, it makes no sense to centralize the management of the Federal Government. The larger and more efficient ports worldwide show that regionalization is the most appropriate model. And management should be highly technical, based on results and committed to the economic, environmental and social sustainability.

In Brazil, especially in a state like São Paulo, the most developed in the country, with booming agriculture and industry, the participation of states, municipalities and the private sector is necessary in order to reconcile interests and goals. In this sense, the Law No. 12815/2013, which removed the deliberative character of the Port Authority Councils, was a step backwards in relation to the Law No. 8630/1993.

Finally, it is essential that all stakeholders understand that the three pillars of sustainability: economic, environmental and social have similar importance and cannot be treated independently or radically, or seen only as a cost, but an investment in the future.

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