1. Introduction

The port-city relationship is an interesting theme to study in order to better understand the dynamics of capital and land use in port cities, which are considered global cities due to certain characteristics, Sassen (2001). Researches on these relationships show a paradox observed in port areas: a large potential for development associated with a spiral of obsolescence.

This work encompassed many stages which allowed for a better understanding of what global cities are and of how port cities attain that status. The development of interoceanic navigation was determinant for these cities to become centers of a cosmopolitan and globalized culture.

This study aimed to discuss these questions defining how the port-city relationship takes place in Brazil and worldwide, as well as identifying the socioeconomic, socio-environmental and historical forces that guide the creation, growth and maintenance of modern port cities.

2. Methodology

According to Vergara (2014), it is interesting to adopt the definition of bibliographical review as a method of exploratory analysis to assemble and understand the characteristics that define port-city relationships, and then apply this analysis to the relationships in Brazil. The author defines bibliographical research as a methodical study of published materials such as journals, periodicals and electronic networks in which a set of analytical instruments is created for other types of research, such as the applied research which was adopted in the final part of this study.

Still according to Vergara, applied research is defined as a research fundamentally motivated by the need to solve concrete problems.
The bibliographical research process worked with two lines of search for theoretical references: the first searched for specific authors defined by a previous bibliographical research in periodicals of wide circulation, such as technical journals and/or personal communications within the academic space, and the second was a random search based on keywords in widely popular and accepted electronic search engines, scientific-based or not. The main search engines used were the general search engine Google and the following scientific search engines in order of priority of use: Periódicos Capes, the official database managed by CAPES, the Brazilian government body in charge of promoting scientific research, and Google Scholar, a search aggregator of scientific works created and managed by the general search engine Google.

This research was based on the search for relevant keywords considering the name of the featured authors and the port-city theme, and they were researched in both Portuguese and English. The selected articles were those that contained at least one of the keywords and that were published after 2000. The keyword list was non-exhaustive, thus new words could be added and/or removed and/or associated again at each new search.

The second part of the study was based on an applied research, since the goal of this study was to present an overview of Brazil’s port-city relationships and to propose work prospects and improvements for these relationships, based on the theoretical references and on the presentation of international cases obtained through the bibliographical review.

The overview of Brazil’s port-city relationships was based on a practical study of the country’s port scenario carried out by the International Virtual Institute of Global Change of the Federal University of Rio de Janeiro (IVIG/COPPE-UFRJ) under contract by the Secretariat of Ports (SEP), a strategic government body directly linked to the Presidency of the Republic, entitled “Implementation of the Conformity Program for Managing Solid Waste and Liquid Effluents in Brazilian Maritime Ports”.
3. Theoretical references

The bibliographical research showed that, prior to analyzing and defining the port-city relationship, it is necessary to study more comprehensive concepts of work from many fields of knowledge, such as sociology, geography and even the environment, and that, in order to define the port-city relationship, it is necessary to conceptualize the city, globalization, the dynamics of port operations and even how the city is inserted into sociopolitical and socio-environmental concepts. In general terms, these concepts are defined and related as follows:

- City and globalization: based on a world dominated by large international networks of traffic, merchandise exchange and information, the concept is related to the important need to define the city not as a point of agglomeration of people and markets, but as a point of intersection – of meeting – of people, merchandise, services and information. Its dynamics could be confused with the same concepts that guide port operations and that define the concept of Global Cities defended by Sassen (2001).

- Landscape (natural/urban): a concept taken from ecology (METZGER, 2001) that may be defined considering the urban landscape as a set of variables or factors which determine and characterize a location as an urban environment when they interact in any scale, without considering the social variable. However, when the social variable is taken into account within this concept, the new concept of Historic Urban Landscape is created, as denominated by Girard (2013).

- Urban resilience: another concept from ecology (BEGON, TOWNSEND and HARPER, 2006), which may be defined as presented by Herzog (2013): urban resilience is the capacity a system – a city – has of absorbing impacts and maintaining its functions and purposes, i.e., surviving and persisting in an environment with variations and uncertainties.

In addition to these concepts, it was also necessary to understand what is the right to the city and to a balanced environment, even within the chaotic scenario of a city and its urban environment. Both concepts are adopted by Brazilian legislation and by the growing theoretical movement of green infrastructure.
4. The port phases

To understand how the port-city relationship has been taking place, it was important to study how it evolved since the medieval times, especially how port activity occurred from then until the 21st century. Taking this context into account, Schubert (2011) carries out a study that describes the port phases identified by him, which can be summarized into six phases, as Figure 1 shows.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Period</th>
<th>Symbol</th>
<th>Spatial characteristics</th>
<th>Economic characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st phase</td>
<td>Medieval times – 19th century</td>
<td><img src="image" alt="Symbol" /></td>
<td>Primitive port/city</td>
<td>Pre-industrial stage</td>
</tr>
<tr>
<td>2nd phase</td>
<td>19th century – early 20th century</td>
<td><img src="image" alt="Symbol" /></td>
<td>Expanding port/city</td>
<td>Fast industrial and commercial growth</td>
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<tr>
<td>3rd phase</td>
<td>Mid-20th century</td>
<td><img src="image" alt="Symbol" /></td>
<td>Modern industrial port/city</td>
<td>Economic scale/Fordism</td>
</tr>
<tr>
<td>4th phase</td>
<td>1960s-1980s</td>
<td><img src="image" alt="Symbol" /></td>
<td>Retreat from the waterfront</td>
<td>Post-Fordism</td>
</tr>
<tr>
<td>5th phase</td>
<td>1970s-1990s</td>
<td><img src="image" alt="Symbol" /></td>
<td>Redeveloping of waterfront</td>
<td>Flexible accumulation</td>
</tr>
<tr>
<td>6th phase</td>
<td>1990s-today</td>
<td><img src="image" alt="Symbol" /></td>
<td>Renewal of port/city links</td>
<td>Globalization</td>
</tr>
</tbody>
</table>

**Figure 1.** Summary of port phases  (Source: adapted and translated from Schubert, 2011)

In a more comprehensive analysis of the description of these relationships, Schubert states that the historical abandonment of port areas represents a modern challenge for the urban planning of cities. Moreover, in order to understand the processes of abandoning and redeveloping these regions, it is necessary to consider the contexts in which they are inserted, such as the economic restructuring of the world, changes in port work and the urban structures of cities and ports.

Still according to Schubert, the redevelopment of port areas is caused by aspects of social and urban improvement, as well by the fact that these regions play the special role of an urban area that functions both as transportation center and as social/economic center. With this convergence, new forms of development can occur, whether they are socioeconomic, sociopolitical and/or socio-environmental.
5. Port regions – the world

The identified context of port-city relationships shows that ports, even those born already in accordance with the fourth phase, significantly influenced the development and urban planning of their peripheral regions, whether through the current arrangement of the urban layout of historical ports, such as New York or Hamburg, or through the development of cities according to the needs of modern ports, installed after the 1960s and established as strictly industrial areas, such as the port of Jebel Ali in Dubai and the early port model of Hong Kong.

As such, by taking a closer look at the issue of the port abandoning its historical port region, it was possible to observe that this link is not lost, for most revitalization processes of port areas do not abandon the historical legacy of urban organization that ports impose on their surroundings. As a result, the concept of Urban Historical Landscape (GIRARD, 2013) can be used once again as a tool for the revitalization process of port regions worldwide.

These characteristics were confirmed, for instance, by Hein (2011), when describing the construction of Hamburg’s urban landscape: “Despite the overall detachment of port and city, the port remained symbolically connected to the identity of the city, through its economic power and financial importance, through harbor festivals and order events (...)”, and by Krinsky (2011), who analyzes the relationship between the port of Manhattan and the spatial layout of the region: “The history of trade and industry created a legacy embodied in the city’s physical form as well as in its buildings and their location.”. Krinsky also defends that:

The port shaped the street pattern, influenced the distribution of buildings and the dynamics of land use, inflected zoning and new patterns of land use, and even affected the shape of waterfront rehabilitation long after containerization and other forces pushed port facilities elsewhere. Forces at play included urban policy, technological innovation, and globalization.

These observations refer solely to the port-city relationships of historical ports. When taking modern ports into account, the pattern is noted once again, which was proven for instance when Yiu (2011) studied the building of Hong Kong’s global image:

Hong Kong’s function as an innovative production and trade centre, as well as a port city, is reflected in the way in which the exhibitions excel.
Furthermore, as the exhibitions attracted more trade, the TDC\textsuperscript{1} shaped Hong Kong’s urban form.

Or on the work of Ramos (2011) about the port of Jebel Ali:

(...) it was the Jebel Ali Port and Industrial Zone, with its superlative scale, that truly broke with Harris’s ring-radial structure. It established a new growth corridor perpendicular to the Gulf coast along the Abu Dhabi-Dubai Road(...)

Hence, with respect to this issue, in spite of the significant contribution the identification of the phases of port development provides to the understanding of the historical advancement of the port activity, it became evident that these phases cannot be considered static nor isolated from the influence the port has over its historical or peripheral regions. Therefore, taking into account ports and port regions worldwide, and considering that the phases are continuous, as well as the idea of a permanent influence of ports, it was possible to assess the international scenario of the port-city relationship.

Within the international context of reestablishing port-city relationships, the scenario and the real cases studied (such as New York, Valencia, Amsterdam and London, among others) show that, in spite of a great variety of projects and types of revitalization, historical waterfronts areas are always reintegrated to their port cities, except for most Asian cases, which completely lose their features each time the activity is reformulated.

The projects, especially those European, were concerned with both a socioeconomic and socio-environmental restructuration of the port area, due to demands from the surveyed population or to national and international norms.

Either way, for any international project, the highlight of the sixth port phase lies on what Wiegmans & Louw (2011) summarized on their work about Amsterdam: the process of port revitalization is motivated by an intricate relationship between port function, port form and port regulation – laws, policies, etc., which is shown in the diagram in Figure 2.

\textsuperscript{1} Trade Development Council: council of business development, a mixed government body of the city of Hong Kong, initially in charge of managing the port and its international prospects. Later, the council took on functions related to administrative planning and urban development.
The port scenario in Brazil is analyzed based on this context, in order to find out how these processes are taking place in the country.

6. Port regions - Brazil

The study Implementation of the Conformity Program for Managing Solid Waste and Liquid Effluents in Brazilian Maritime Ports” (IVIG/COPPE-UFRJ) showed that Brazil has both historical and modern ports, in which the stages of development proposed by Schubert (2011) are identified. Moreover, the studied ports are detached from city life. This detachment, in spite of following Schubert’s principles, is different between historical ports and modern ports.

The differences of modern ports will be described first. Owing to a simplification of the processes, they were characterized as ports from their conception and installation, following the model proposed by the fifth port phase, in which they are installed or moved to new peripheral areas or areas independent from cities, in a search for large coastal stretches and large depths that enable the establishment of the industrial port model and the absorption of future expansion processes. The ports of Suape (PE) and Itaguaí (RJ) are part of this category – their development and operation are completely detached from the cities originated by their installations. Both function as typical industrial centers which handle their cargo without any great influence, being independent from the cities and municipalities in their surroundings.

For historical ports, however, the phases proposed by Schubert created very specific local and regional arrangements for the relationship between a port and its...
cities. These relationships are either typical, with the port moving from its historical area, such as the port of Rio Grande (RS), or highly conflicting, such as the port of Santos (SP), the most important port in Latin America, with a great part of its operation still taking place in its historical area. In addition, it is possible to identify port revitalization projects of moderate significance, such as in Recife (PE), Belém (PA) and Manaus (AM), or of large national and international significance, such as the redevelopment of the historical port area of the city of Rio de Janeiro (RJ). With such a wide variety of cases in the Brazilian port scenario, conducting an overview was a complex task. Thus, in order to better discuss the prospects of port relationship in Brazil, the cases of modern ports were not considered and historical ports were analyzed as a group, with the definition of three groups based on whether a revitalization processes existed or not and on the renewal of port-city links following a similar model to that proposed by Schubert for the sixth phase. As a result, the groups were categorized as follows:

- Ports without any revitalization processes: larger group, encompassing more than half of the studied ports and without any type of project similar to the sixth phase;
- Ports with partial revitalization processes: group with a few members, with the cities of Recife (PE) and Belém (PA) standing out with their two types of partial and successful projects – the technological innovation center Porto Digital and the touristic/commercial complex Estação Docas, respectively;
- Ports with drastic revitalization processes: group currently composed only of the city of Rio de Janeiro (RJ), with an ongoing project aimed at total land use alteration and social changes in its port region, which has been proven to be successful in the stages completed up to the moment.

Despite the study identifying different groups for the port scenario and port-city relationship in Brazil, the existence of a pattern based on the fifth phase model proposed by Schubert was observed. For most cases, although the geographical abandonment of the historical port area does not exist, the port activity per se has been increasingly detaching itself from port cities.
In this context, the pursuit of more harmonious relationships has been noted in a top-down approach initiated only by governments, not depending on the population and on the port authority.

These types of projects are much closer to the American model of revitalization of the port areas of Boston, Baltimore and San Francisco, but there are recent processes incorporated to their scopes that remember the European model – the adoption of design competitions and a drastic and mixed alteration of land use in areas influenced by the execution of the project. However, they are still based on handing most projects to private companies, with the government taking the role of strategic manager in charge of executing the modernization of urban facilities (ex: basic infrastructure) and establishing the strategic documents for urban planning, such as the definition and update of the city’s comprehensive plan.

As a result, the scenario showed some interesting aspects which define that the port revitalization process in Brazil does not fit into the current international model, creating a necessary gap that initiates the discussion about the quality and/or effectiveness of the processes.

7. Prospects for the (re-)establishment of port-city links in Brazil

As revitalization projects for historical port areas are still latent and undefined, with the exception of the project of the city of Rio de Janeiro, the moment is favorable for Brazil to create revitalization processes capable of bringing about significant positive changes for its port areas. In addition to their historical significance, port areas are also strategically important for two reasons: they occupy extensive parts of the urban territory with a large potential for (re)development if basic infrastructure is modernized, and they naturally attract people and capital given its strategically central location.

In order to properly reach this goal, it is necessary to review the existing projects and conduct a more strategic planning of future projects, taking into consideration the concepts of Historic Urban Landscape and Urban Resilience. These processes should take over some stages which would contribute for a higher effectiveness of the revitalization of historical waterfronts.
The first proposed step is to review the planning and execution processes of the projects, bringing the top-down approach closer to a bottom-up approach. In other words, during the first stages, the government in charge should make more efforts to develop the project in a way that enhances coordination with port authorities and the population, in a general commitment aimed at meeting the real needs of the port region or of the city. At the same time, this perspective contributes for resuming port operations in a less industrial and more natural way, in addition to promoting the renewal of the links between function, form and regulation proposed by Wiegmans & Louw (2011), which is the international trend defended by Schubert’s sixth phase.

Next, an exhaustive environmental analysis and assessment of the region’s environmental liabilities is suggested, for in this work they are considered to be one of the most important changes in the process. It should include the interface of the port’s interaction with the natural environment, with water, land, air and sound pollution standing out. The goal of this step is to create an environmental inventory and database capable of developing primary projects aimed at environmental improvement, in order that the port area becomes a more pleasant urban area with many possible urban uses and without any abandoned industrial regions.

Then, the last step suggested is to delimit the scope of the (re)development projects of urban waterfronts based on principles of green infrastructure and focusing mostly on the concept of Historic Urban Landscape, on sustainable urban planning and on the increase of the region’s urban resilience. To complete this step, it is necessary to define multidisciplinary and interdisciplinary planning staffs and to have great availability of capital. Hence, this step should be executed based on the well-established design contests and on a higher integration of public-private partnerships to the project. Their expansion became harder since the enactment of Federal Law 11,079 from 2004, due to a lack of knowledge of the advantages of this type of partnership that usually leads to win-win socioeconomic situations with moderate public investment.

If the projects are supported by these three large pillars, Brazil could create an individualized form of port revitalization and international acknowledgement, different from what is seen in the established American, European and Asian processes.
8. Final considerations

After a bibliographical review and the presentation of practical cases, it was noted that Brazilian ports still follow the models of port operations from the 1960s to the 1980s, Schubert (2011). Without any direct intervention, the port function per se will keep distancing itself from its urban function in historical waterfronts.

The work proposes resuming more sustainable port-city relationships based on: the review and establishment of participative projects with a bottom-up approach; a more comprehensive environmental analysis and assessment, including port/environment interfaces; and the definition of their scopes based on the concepts of Historic Urban Landscape, Sustainable Urban Planning and Urban Resilience.

Keywords

Port city; urban regeneration; sustainable urban planning; urban resilience; historic urban landscape; global cities; port development; port operation; green infrastructure