ISCTE Business School
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The Logistics contribution to the Port of Lisbon competitiveness

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A special note to Helena Moura, which left this world too soon and was my best friend. To her, I want to dedicate this dissertation.

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"A wise man can learn from a foolish question than a fool can learn from a wise answer"

Bruce Lee

Abstract

Today, maritime freight transport is a keystone on foreign trade between countries as well as in the world economy. This is a main engine of economic activity and in this case, is what allows globalization to arrive in every corner of the planet. A major percentage of world trade is done by sea and the cargo is maneuvered in ports, all around the world which in turn increases the economic and strategic relevance of maritime transport.

Portugal is a country with an extraordinary maritime potential, for the development of activities related to sea shipping. Currently, maritime transport is developing faster in other regions of the world, namely in the Pacific (Southeast Asia), which are currently considered to be more competitive than other parts of the world.

This research builds a theoretical framework regarding Portuguese ports and focuses on the future of the port of Lisbon. The adopted methodology will consist on a study and analysis, focused on the investigation of the competitive environment, factors of port competitiveness, and an analysis of how on a future we can increase the competitiveness of this port infrastructure.

The present work will show that the interests of land and sea stakeholders are different because they have different expectations evidenced by their customers. The relationship between them is not always easy because when one side is affected, the other side will see the impacts, by causing serious imbalances in port activity and in order to prevent that, articulation and integration in terms of supply-chain and logistics is one of the objectives of this dissertation.

KEYWORDS: Logistics, Maritime, Competitiveness, Ports, Transports

JEL CLASSIFICATION: L91, L92.

Resumo

Na atualidade, o transporte marítimo de mercadorias é uma pedra basilar no comércio externo dos Estados, assim como na economia mundial, caracterizando-se como um dos principais motores da atividade económica e neste caso o que permite a globalização. Um valor significativo do comércio mundial de mercadorias é feito pelo mar e manobrado nos portos de todo o mundo o que por sua vez aumenta a relevância económica e estratégica do transporte marítimo.

Portugal é um país rico em potencial económico marítimo, para o desenvolvimento de quaisquer atividades que tenham no mar a sua base. Atualmente, o transporte marítimo está a deslocar-se para outras regiões do mundo, nomeadamente a bacia do pacífico, sendo estas consideradas atualmente como as mais competitivas.

A investigação incluirá um enquadramento teórico sobre a temática dos Portos, por forma a ampliar o conhecimento e um estudo aprofundado do ponto de vista da logística, sobre o Porto de Lisboa . A metodologia adotada consistirá no estudo e análise, focado na investigação do ambiente competitivo, fatores de competitividade portuária, e uma análise sobre de que forma futuramente podemos aumentar a competitividade do Porto.

O presente trabalho irá demonstrar que os interesses dos Stakeholders do mar e da terra são distintos, porque têm expectativas diferentes face aos resultados evidenciadas pelos seus clientes finais. O relacionamento entre eles nem sempre é fácil porque, quando um lado é afetado, o outro lado sente os impactos, causando sérios desequilíbrios na atividade portuária. A articulação e a integração em termos de logística e cadeia de abastecimento é um dos objetivos da presente dissertação, prevenindo a situação descrita anteriormente.

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Acronyms

AMT – Authority for Mobility and Transports

APL – Port of Lisbon Authority

APP – Portuguese Ports Association

CPLP – Community of Portuguese-speaking countries

D2D – Door to Door

EC – European Commission

EU – European Union

FDI – Foreign Direct Investment

HR – Human Resources

INE – National Statistics Institute

KPI – Key Performance Indicator

RO-RO – Roll on – Roll Off

SEZ – Special Economic Zone

SLW – Single Logistics Window

SPW – Single Port Window

SSS – Short Sea Shipping

SWOT – Strengths, Weakness, Opportunities & Threats

TEU – Twenty-foot Equivalent Unit

TWA – Temporary Work Agencies

1. Introduction

Today, we are living in a socio-economic environment where uncertainty and unexpected changes are preponderant. Economic growth has always been a challenge to modern world and developed economies. Mutations took place in order countries to thrive and produce wealth not only to invest but to improve their people's lives. However, with all the challenges, come great difficulties. The current reality of the societies produces new challenges and spurs renewal and reorganization with relevance to operations flexibility and decision-making processes. Thus, on this time, marked by the rationalization of financial means, an efficient response to use available resources is required.

Logistics is one of the areas which are affected by this new reality, especially ports and maritime logistics. Taking into account the large scale and strategic importance of the maritime transport system, it is necessary to carry out a restructuring of logistics in order to ensure a more efficient use of the available resources. The new environment is more difficult to be optimized, requiring multifaceted knowledge, not only in the logistics area, but also in other business areas as well as the various factors that influence the surrounding environment.

Currently, maritime freight is a keystone on the external trade of the states, as well as in the world economy, characterizing itself as one of the main engines of economic activity which allows economic globalization. A considerable percentage of the world trade in goods (about 80%) is made through sea and maneuvered in ports around the world. Certainly this increases the economic and strategic relevance of maritime transport and port logistics. It is mainly this fact that contributes to the competitiveness between states, causing them to seek to export more and more, reducing the costs associated with port and transport operations.

Portugal is a country with a high maritime economic potential, because its maritime geographical border is one the biggest in the world (Figures 1 and 2). It also has a unique geostrategic position, because it is located in the extreme west of Europe, next to the crossing of the great routes of navigation worldwide. Hence, this is a country that has enormous potential for the development of any activities directly or indirectly linked to the sea (Industrial and Logistic Cluster). Nevertheless, it is necessary to take into account, that only the potential is not enough to develop or apprehend the business opportunity linked to this area. Thus, innovation on the maritime sector is essential to its

international competitiveness, in all its aspects (logistics, economic), and this is one of the determining factors on increasing its importance in GDP by creating business and jobs opportunities.

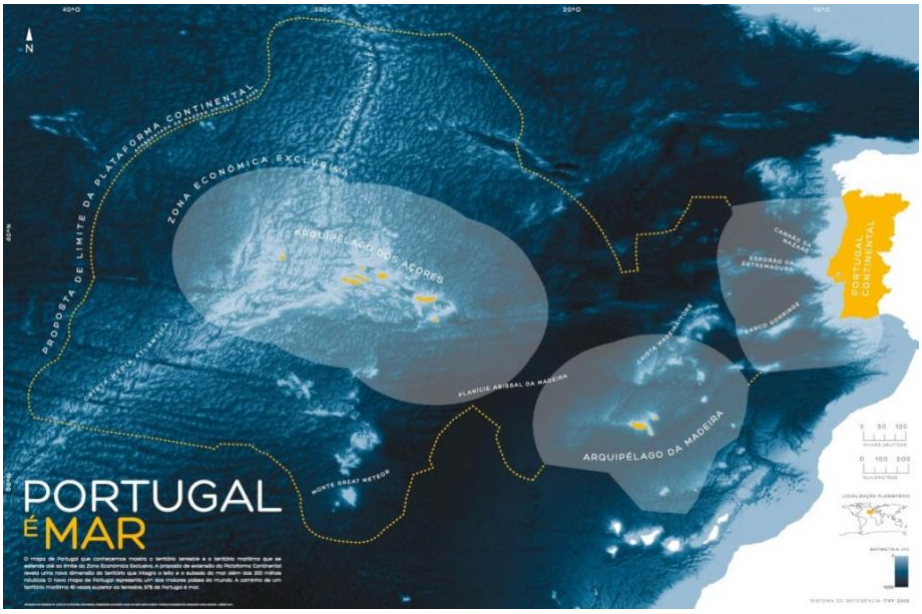


Figure 1 – Portugal SEZ

Source: Kit do Mar (Portuguese Mission to the UN)

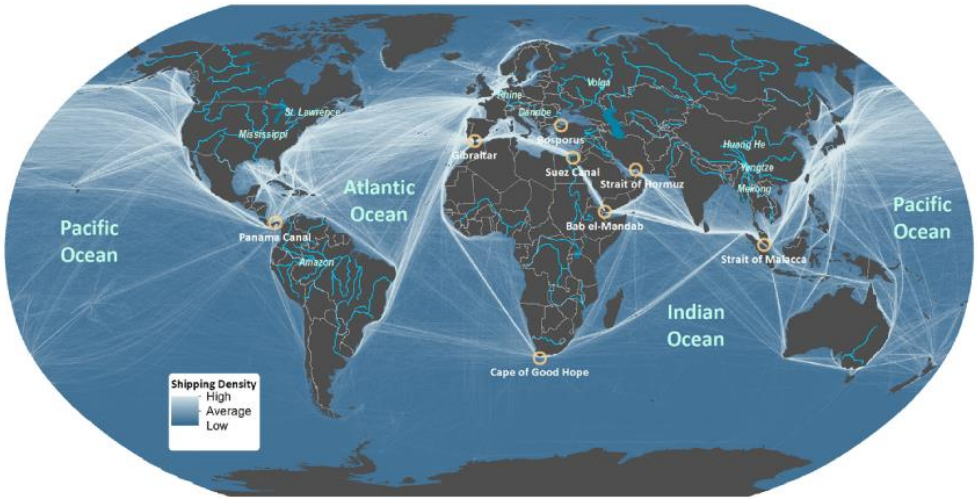


Figure 2 – Maritime Routes & Shipping density

Source: Shipping density data adapted from National Center for Ecological Analysis and Synthesis (A Global Map of Human Impacts to Marine Ecosystems)

Europe is losing its competitiveness in various domains to other regions of the world, especially Southeast Asia, which is currently considered one of the most competitive and fastest growing regions (SAER, 2009). The purpose of this dissertation is to find ways to reduce costs, to rationalize the current resources, so that, it is feasible in a sustainable way to achieve higher levels of efficiency and effectiveness on the

services and products made available by seaports to meet the needs of the economic actors.

Objectives and methodology

Based on these characteristics of the Portuguese and international maritime and logistics environment, the objectives of this research and the development of the dissertation is to analyze the Portuguese port network and especially the role of the port of Lisbon by identifying their strengths and weaknesses and the possibilities for improvement and growth in the short and medium term.

To achieve this objective, a thorough analysis of competitiveness factors in this sector was performed and the ways they can influence and determine the competitiveness of the ports and in the particular case of the port under study are analyzed. This includes in first place a more general look and after a direct look to the case in study.

The initial question for the dissertation is "*How maritime logistics and surrounding activities could be an asset to consider, for the future of Portugal and especially the port of Lisbon in its different forms*". The answer to the next question "How logistics can help to improve the competitiveness in port of Lisbon" is in fact what this dissertation is all about. A literature review and a SWOT analysis will be performed to answer to this question.

After all the study, it is intended to fill the "weak" points that exist in port of Lisbon and then elaborate an analysis regarding the projects that are being prepared or are already running in place and aim to put in place concrete improvements in the operation in order to attract new businesses.

Structure

In order to present the dissertation in a coherent way, the dissertation was divided into VII chapters. Initially (Chapter I), the contextualization and framing of the theme under analysis is presented indicating the problem that aggregates the development of the study and its objectives. In Chapter II, the literature is reviewed, with the development of concepts, as well as the analysis of articles that allowed the elaboration of this study. Chapter III is constituted by an analysis regarding the maritime cluster sector in Portugal and especially about ports sector. In Chapter IV, the Port of Lisbon will be characterized and its current situation will be the subject under study. Statistical data will be presented

in relation to the transportation, loading and unloading of cargo in their various typologies, as well as their explanation. Chapter V is about Port Competitiveness, with an introduction to the theme of competitiveness and further development of what is being done to improve the indicators under study and once again with statistical data and other credible sources of information. Chapter VI is a research and presentation of different logistic developments or possible improvements on Port of Lisbon. Here we talk about innovative projects and ideas, which can be implemented and are also an aspect in increasing the competitiveness. Also on this chapter, we discuss results and draw some conclusions, and, of course, we still leave open questions that can be explored in future investigations.

2. Literature Review

Regarding logistics, (Panayides & Song, 2013) says: *"(...)Logistics is the part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customers' requirements.(...)"*

The maritime logistics concept results from an integration of best practices in logistics on the sector of maritime transportation (Panayides & Song, 2013). This means that there has been an adaptation of the concepts and practices, which are used in supply chain and operations management. Of course, this forced this sector to adapt and to find professionals that are able to integrate on this new environment (Panayides, 2006). Economic globalization is one of the most important causes, that led this sector to a deep revolution, because much of the international trade is done by sea routes. It will also be important to define the concept of shipping and logistics. According to (Talley. 2013) maritime transportation is the use of transportation networks and maritime routes to transport cargo. What links these networks are the ports.

(Talley, 2013) advises a number of problems related to scientific research in this area. They mainly concern means of transport (vessels) and infrastructure (ports), and the relation to shippers is virtually omitted in this paper. Since a shipping network exists through the interlinked work of three main players (shippers, carriers, and ports), researchers should in the future increase the connections with shippers in their scientific research.

As mentioned earlier, one of the key issues in this scientific research is the development of networks or other interconnections between the various actors (Panayides & Song, 2013). A decision-making strategy is crucial, and this emerges from the necessity of the main actors in this sector to plan and to define its policy to a medium-long term (Panayides, 2006).

According to articles that were analyzed (Suárez-de Vivero & Mateos, 2014) & (Salvador et al, 2016), it was recognized that Portugal for several years has turned back

to the sea, despite all maritime tradition that the country had in the past. It is sufficient to state that the Portuguese pioneered the globalization (Ceuta was discovered in 1415, and it was the beginning of a long history of world discovery led by Portugal).

Nowadays, Portugal is recreating and developing a structured and sustained policy to the sea. The creation of the Minister of Sea on the twenty-first constitutional government and the conception of official documents with concrete proposals are signals of slowly change.

About 90% of trade transported by sea is non-petroleum products and are transported in containers (Kovačević, 2014). The cargo is in containers that have adequate dimensions also for land transport by truck (TEU dimension). This way it is possible to transport to any location without the need to perform unpacking and consecutive packing operations.

Shipping has low shipping rates compared to air transport, and shipping rates are substantially lower. In addition, the number of accidents and pollution level are lower compared to other means of transport. Increasing maritime transport naturally leads to increased complexity and form of transport management. Currently the objectives, focus on achieving greater transport cost gains and also on increased management efficiency, loading, unloading and repositioning of containers (Sciomachen et al, 2007)

Due to the increase of maritime transport, transshipment ports have also increased. This concept is described as a port where cargo is transferred from one ship directly to another, in some cases the cargo being temporarily transferred to the dry dock. The transfer takes place through movements made with cranes. The use of containers in the transshipment process makes the process more flexible and ensures lower operating costs.

Historically, ports have been an important location factor for cities, enabling international trade and investment and facilitating urbanization processes. However, the traditionally strong relationship between ports and port cities has gradually weakened due to the emerging negative externalities of ports. The results show that despite the positive relationship between port and urban networks, port cities currently exhibit no significant advantages over non-port cities in attracting Foreign Direct Investment (FDI), in addition, port-city competitiveness depends more on urban characteristics than on port factors. Based on these results, we propose various strategies for port- city developments.

Seaports impact on cities by attracting companies in a large variety of industries. The authors, (Yochum and Agarwal, 1988) categorized them into three types: port-specific industries that represent transportation and port facilities necessary for maritime trade; port-related industries that represent entities occupied in import and export trade; and port-induced industries that take advantage of the hub to expand and grow on their markets. Depending on their geographic and economic location advantage, port cities can rapidly grow.

One of the main characteristics of port development is the reduction of transportation costs, which satisfies efficiency-seeking foreign investment. However the previously strong relationship between ports and port cities is weakening. (Fujita and Mori, 2005) note that although growth has traditionally been initiated by the advantage of good water access in many large cities (e.g. Chicago and Paris), this does not play as important a role today as in the past.

2.1. Ports and Maritime Logistics

Ports and maritime transport are a crucial sector in sea exploration. They are, in fact, the backbone of any maritime cluster and act as a catalyst for many maritime sectors and companies on several sectors. The phenomenon of economic globalization, especially from the second half of the twentieth century onwards, has increased trade movements between distant continents to such an extent that, in meeting these needs, maritime transport has assumed a key role in world trade (Kovacevic, 2014).

The only way that guarantees the transport of heavy loads at once are the ships, a maritime transport vehicles, the ones that allow, at least in the long distances, transport optimized for various types of goods in quantity, cost and speed possible. Recognizing that maritime transport is fundamental to securing links between different parts of the globe is absolutely mandatory to understand the world we live in and the global economic growth that has enabled so many to get out of extreme poverty.

Within the framework of the European Union, the reasons for port growth derive from the world trade in goods and public support policies agreed in Brussels. Portugal, as a Member State of the European Union will have such support, it will also benefit from other factors that will change the current maritime transport and international dynamics

and sudden changes that we are witnessing, geopolitical issues and maritime security, allowing thus enhancing its maritime location, so to speak, its cluster of sea economy.

Maritime Transport and Logistics

In logistics, transport management plays a prominent role as it usually corresponds to an important cost component of logistics activities. The definition of transport networks, the selection of modes, engaging service and monitoring the implementation there are key components in the logistics of global products (Dias, 2005).

Seaport

The **Port** is a place that provides adequate conditions for anchoring and length of vessels, relatively safe, and these accommodate up winds and storms. Vessels and ships make berths for loading / unloading of passengers and loading / unloading of goods.

The concept of **Harbour** applies to the restricted area of the work required for their construction, protection and conservation, ie the infrastructure itself. A major function of the port is the transfer of passengers and goods from the marine mode for terrestrial modes, including road and rail transport.

Referring to the previous concept, it is important to allude to the objectives of a port and these naturally involve promoting exports and foreign trade by supporting the business sector in its productive logic, through the flow of production to the most diverse geographies. This whole organization is fundamentally focused on maximizing competitiveness and development.

Port is a place that needs to be endowed with great physical infrastructure but also to other levels and therefore asked to be sheltered from winds and waves, which have depths that allow arrivals ships and fast and secure matches, abundance of wharf, efficient, reliable port equipment and high productive performances, qualified HR, good and safe land and rail access, with points of convergence and connectivity that enable multimodal solutions, when the transfer occurs (Dias, 2005).

The 4 principal roles of a port can be summarized as follows:

a) Provision of shelter from elements. This arises when, due to heavy seas and storm conditions prevailing, ships can take shelter in the environs of port and thereby seek safe anchorage;
b) Cargo and passenger handling. A place where ships can load or discharge their cargo, and/or passengers. This is the prime function of a port;
c) Support services for ships. This embraces victualling, stores, bunkering, ship repair and so on;
d) Base for industrial development.

This leads to the ports having to move towards the optimization and rationalization and harmonization of the logistics chains where they are inserted, speaking here in a macro logistic logic.

Hinterland and Foreland

The port is a point of confluence of various modes of transport, acting as the interface between the connections to its Hinterland and to the Foreland. The maritime range as shown in the figure presented is a functional area jointly defined by its hinterland when inland markets are serviced and by its foreland when transshipment is taking place.

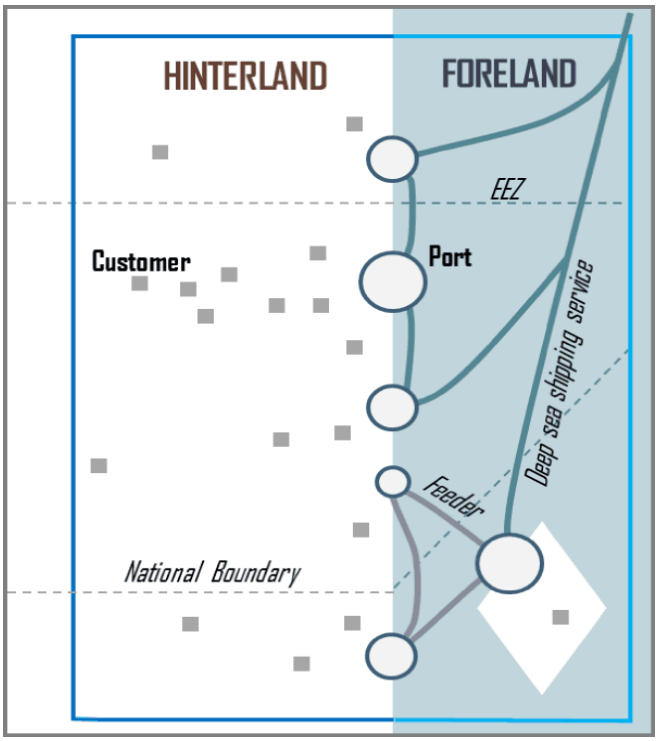


Figure 3 – Hinterland & Foreland border

Source: (Rodrigue, 2017)

The **Hinterland** of a port is the economic area, ie. the territory in which the economic operators using the services of that port for maritime transport operations are based. Hinterland also includes its port city, with its local traffic. Local traffic of the port cities had not in the past, very important, because the ports represented only cargo handling areas, which were essentially carried out trade activities, traffic and orders.

The port is a confluence point of various modes of transport, acting as the interface between the connections to its hinterland and to the foreland ports. In the largest ocean ports container shipping has become the most important cargo flow, a part of which is originating or destined for the hinterland of these ports (Der Horst e De Langen, 2008)

Thus, since ports have become important nodes in global supply chains, competition has shifted from being ports to being among supply chains. As a result of this change, ports have now considered access to their hinterland a key success factor, with the quality of transport services in their hinterlands as part of their business strategy (Notteboom & Rodrigue, 2005).

Slack (2001) indicates as one weaknesses of intermodality, the need for a high degree of coordination between the various actors and a high integration of responsibility in supply chain management. The integration and coordination of different networks often give rise to documentation, liability and legal problems associated with the various operators involved in the various stages of the intermodal solution.

Just as important as having a large cargo capacity on board ships is having the ability to have the container in the right place (Noteboom et al, 2000). In this game, ports play a very important role as nodes of the logistics chains, within which the loading, unloading and transfer of goods are taking place.

Cargo

Containers

Since the 1970s, container shipping has shown a high development (Sciomachen et al., 2007). Container transport has been the main flow of logistics today and the seaports where these containers are temporarily considered the nodes of international

transport (Janstrup et al, 2010). A container is a universal means of transport that can be moved by sea, land or rail.

The container has revolutionized transport and world trade by improving port service as a result of reduced ship lengths in ports and the reduced need for manpower. Containerized cargo enables direct Door to Door (D2D) service, thus eliminating the need to handle the cargo itself at the overflow terminals. It also offered minor risks of damage and cargo theft. The growth of maritime transport has stimulated the formation of economies of scale, which has led to the need for companies in the area to adapt, in particular to the purchase of large capacity vessels.

Container and "globalization" are synonyms. The increase in containerized sea freight transport in recent decades has undoubtedly been driven, in large part, by the phenomenon of globalization which has led to increased containerization of goods. In an integrated and interdependent economy, containerization offers the advantage of intermodal freight transport, reducing the cost per unit transported for large quantities of goods, so the trend is to increase containerization of fractional or bulk cargo.

In response to this trend, the world's maritime fleets have increased in size resulting in structural impacts on port infrastructure. One of the most important is that deep water ports have now played the role of transshipment and feeder ports in the other ports of the world system.

Operation and Intermodality

The concept of intermodal transport, as intended for transport between origin and destination, is to achieve the best and least costly performance possible. To meet this objective, a worldwide system of road, rail, maritime and air transport, that allows fast access with affordable costs to almost every corner of the world.

Intermodality has gained relevance within the port framework. Intermodality is a solution that combines, in an integrated way, more than one mode of transport, aiming to ensure the efficient movement of products, either promoting cost reduction or

complementing routes. In intermodality there is no handling or breaking of cargo and there is a single transport contract (Crespo de Carvalho et al, 2010).

Ports, as the main nodes of the global logistics chains, are considered to need to be constantly adapting to the served and potential markets in order to better compete with other ports sharing the same hinterlands and maritime services.

Administrative simplification, the upstream and downstream information integration of ports and the transfer of procedures to electronic support are considered to be the path in the evolution of ports and the best way to do this is to apply the Single Window philosophy across all stakeholders on port community. Transport and warehousing operations are integrated into logistics management, which in turn is usually part of the increasingly global production, distribution and marketing stages.
In this context, general cargo shipping represents over 70% of type of cargo handled by maritime transport, so all logistics activities becoming increasingly important. Ports provide the necessary land / sea interfaces and grow steadily in importance in logistics chains as they become increasingly global and complex.

The next figure shows us an integrated port logistics chain in which the various actors are involved in the process and how they relate to each other:

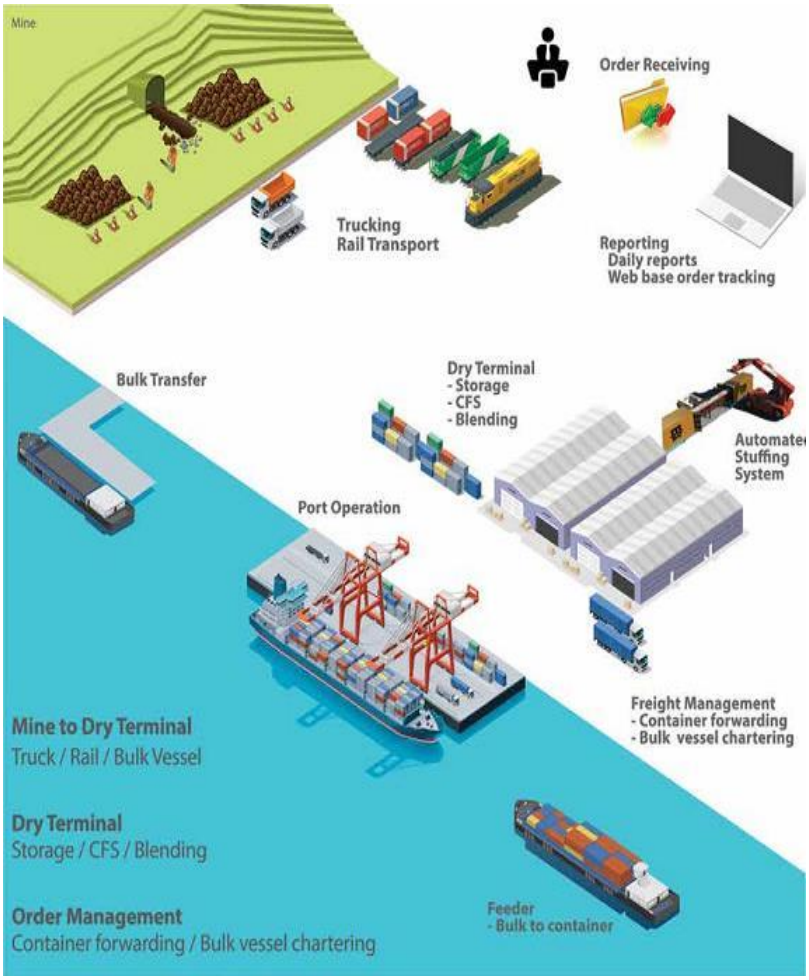


Figure 4 – Port logistics chain

Source: (Rodrigue, 2017)

2.2. From Maritime to Inland Logistics

According to (Estrada, 2007), the port activity of a port includes the traffic of the means of transport and the movement of goods, as well as a set of services that are developed in the maritime and land areas. In the maritime area are the main customers of the ports, the ships, which belong to one owner, the shipowner, being legally represented in the port by the contracted Shipping Agent. Ships are provided with a range of services such as navigational aids, piloting, towing, mooring, anchorage, repairs and calibrations, inspections, among others.

Ships carry goods that are unloaded at terminals and others are shipped and may be temporarily stored there. The goods are moved to hinterland by land or river transport and to their final destinations. Goods can be provided with a range of specific services such

as warehousing, inspections, customs clearance, weighing, consolidation / deconsolidation, among others. (Rodrigue & Notteboom, 2009)

In hinterland the goods can be moved to Logistics Zones and later transported to importers / exporters. At each stage of the flow of goods there is a set of defined procedures involving various actors with different responsibilities, resulting in a complex source of information and documentation to be dealt with individually in accordance with the provisions of current legislation. The traditional logic is to treat individually all procedures and information at each step of the commodity, in a closed way, with the entities involved in that step.

Previously, this sector only contemplated the maritime transport and ended in the ports where the goods were delivered. Today, reality has completely changed and there is enormous pressure from logistics on this industry in general and on ports in particular. They are now in a very competitive international landscape and in market-determined and integrated, also on complementary logistics chains. Among the many challenges facing ports and maritime transport, there is the paradox that in order to continue its role, it must become interoperable and interconnected with its competitors, rebalancing modes of transport and favouring intermodality (Van Miert, 2003). The current logic of competitiveness requires complementarity between different modes of transport.

Short Sea Shipping (SSS)

According to (Suárez-de Vivero et al, 2014), the short sea shipping in the EU (European Union) is largely confined, and the traffic that is in direct competition with road is very limited. The transport chain is disengaged with many unrelated participants: the maritime arm has few connections with the inland arms. This lack of integration is considered to be one of the weaknesses of SSS.

The containerized short sea shipping market is not yet well developed, so shippers do not yet have the service frequencies that are offered by deep sea shipping, mainly because the traffic volumes are insufficient (Paixao & Marlow, 2002).

As a result, short sea shipping has the image of a slow, unreliable and obsolete mode of transport. Explanations for the lower appeal of SSS are the lack of door-to-door

multimodality, administrative complexity, efficiency of ports, port services and port hinterland connections, public investment in roads.

There are few transport actors that have taken initiatives to better integrate short sea shipping in transport chains. Logistics service providers use short sea shipping services in some of the captive short sea shipping markets.

2.3. Port Competitiveness

According with several authors, the efficiency and competitiveness of ports is one the hot topics of choice for researchers in this area. This requires greater research about the service provide and its performance level. It is with this information that it is possible to make comparisons and take measures that can correct the mistakes encountered, improve the efficiency and the service provided, as on way of continuous improvement of the productivity and competitiveness values in relation to other ports infrastructures.

As we are talking about transport chains, the central objective is to move cargo at a lowest cost and as efficiently as possible. To achieve this, various assumptions are imposed, including economies of scale, efficient cargo handling, optimal integration of modes of transport and stock optimization on both the producer and consumer side. In transport operations, economies of scale are generally achieved by using transport units with higher cargo capacity (Estrada, 2007)

There were times, where the competition between ports were minimal, and the costs related to the port were considered insignificant compared to the high costs of shipping. Currently there is just the opposite, and there arise developments and / or incentives to improve the efficiency of the port, leading to an increasingly significant increase in competition and competition between ports internationally and even at a national level (Winkelmans, 2003).

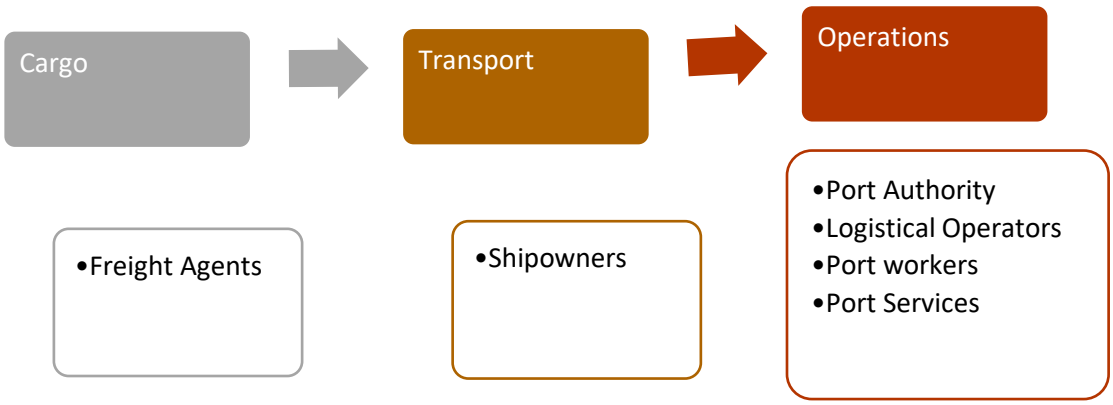
The search for efficiency and the need for capital for large-scale investment led to the reduce of bureaucratic control of public entities, leaving this sector for private sector involvement in a wide range of activities related to the ports.

3. Maritime Cluster

3.1. Port Value Chain

In logistics and port system, loading and unloading cargo is the glue of the entire value chain. The entire value chain, fully indicated above, rotates on the orbit of 'load'. As a result, all players in the value chain, from the shipping agents, port authorities, port operators and even shipowners, are worried about increasing the volumes/cargo in order to grow the revenues (Salvador et al, 2016)

The players which play a key role in the value chain are described above and also its brief description of what are the roles / functions on this integrated system.



Stakeholders

Freight Agents

Freight forwarders are the ones who sell the freight for the cargo owners. They are also responsible for bringing the cargo, from the origin to the destination, regardless of the type of transport used.

Nav Agents

Shipping agents, in addition to selling space on ships, they also play an operational role, since they deal with all logistics of the ship during the stop on port, including the dispatch of cargo, trying to integrate as much as possible, on the logistics chain (consolidation loading, transport, storage). These functions involve considerable complexity and require a strong relationship of trust between the shipping agent and the owner.

Maritime Shipowners

National shipowners are mainly engaged in shipping between the mainland and islands of the Azores and Madeira, although some are now starting to diversify their services to lines with Africa, or even intra-European short sea shipping

Ports

Public companies of port management, all of which are held by a single shareholder, State-owned, operate, as mentioned before, on a landlord model, which means, manage the areas belonging to the port and also be responsible for operating the logistics. This operation is done by third parties, namely big players on maritime logistics.

Harbour Operators

Port operators are public service dealers, who pay a fixed fee to port authority where they operate, added by a variable income depending on the volume of cargo managed. Operators' revenue results from a fee charged to ships owners for the loading and unloading service, which is limited to a maximum per contract with the port authority. Some terminals (particularly in smaller ports) are operated by the port authorities themselves.

Operators are responsible for purchasing and managing the equipment necessary for their operation, including cranes and gantries intended for the transshipment of cargo from the quay to ships and vice versa. This equipment requires a very high capital investment and also the price maintenance is really elevated.

Terminals for private purpose

Private use concessionaires are usually large industrial businesses that, given the volume of cargo - exported and imported - they generate, operate the terminal itself and the dispatched goods, for which there is a contract that allows the concession of this space. public between the Port Authority and the appropriate private concessionaire.

Other Players

Regarding this, we consider the TWA (Temporary Work Agencies), which are human resources companies, that consist of a pool of port workers. Operators, administrations and other port support services hire workers from these TWAs as needed. Other port services are pilotage services, trailers, docking / mooring, records, assistance, etc.

According with (Caldeirinha, 2011), regarding the stakeholders role in value chain there are other several characteristics, important to be mentioned because sea freight is a business of scale for all players, however with several different objectives:

- Shipowners want to carry maximum cargo per ship;
- Port Authority would like to have a higher number of vessels, because the business is essentially about ship fees and ship services;
- Port operators want to have as many cargo and vessels as far as possible, terminals (workers) to operate the equipment. For this reason, there has been a strong tendency towards concentration in recent years in this sector, with several terminals in various ports entering the orbit of the same economic groups.
- Another interesting point to note is that in the area of ports and maritime transport there is integration along the value chain in every way:
    - Many cargo owners have exclusive use terminals (for private purpose) - they operate their cargo themselves (private use terminals);
    - Freight forwarders are shipping agents and vice versa and both try to integrate the entire logistics chain;
    - Many shipowners are already in the business of agents and proactively looking for cargo for their ships;

3.2. Maritime sector in Portugal

Portugal location is on the western coastline of the Iberian Peninsula, separated from the center of Europe by Spain and its territory is discontinued, formed by the mainland and the Azores and Madeira.

The very existence of this country and its history has unequivocally contributed to the developing of its maritime sector by building a network of ports on its coast and acquire a marine fleet, composed by commercial and military (in mixed time), to protect their economic and military interests on mainland and also on its former colonies.

In the area of Portuguese maritime jurisdiction, particularly off the mainland, some of the world's most traffic-intensive maritime routes passes by (COTEC Portugal, 2012). In practice, Portugal is close to a confluence of routes resulting from the concentrating effect of the Gibraltar Strait.

The map shows the traffic intensity in the national maritime territory. Where the red is most intense we can see a large number of ships along the Portuguese coast, coming from the routes that run through the Gibraltar Strait and also from the Panama Canal and Africa as well.

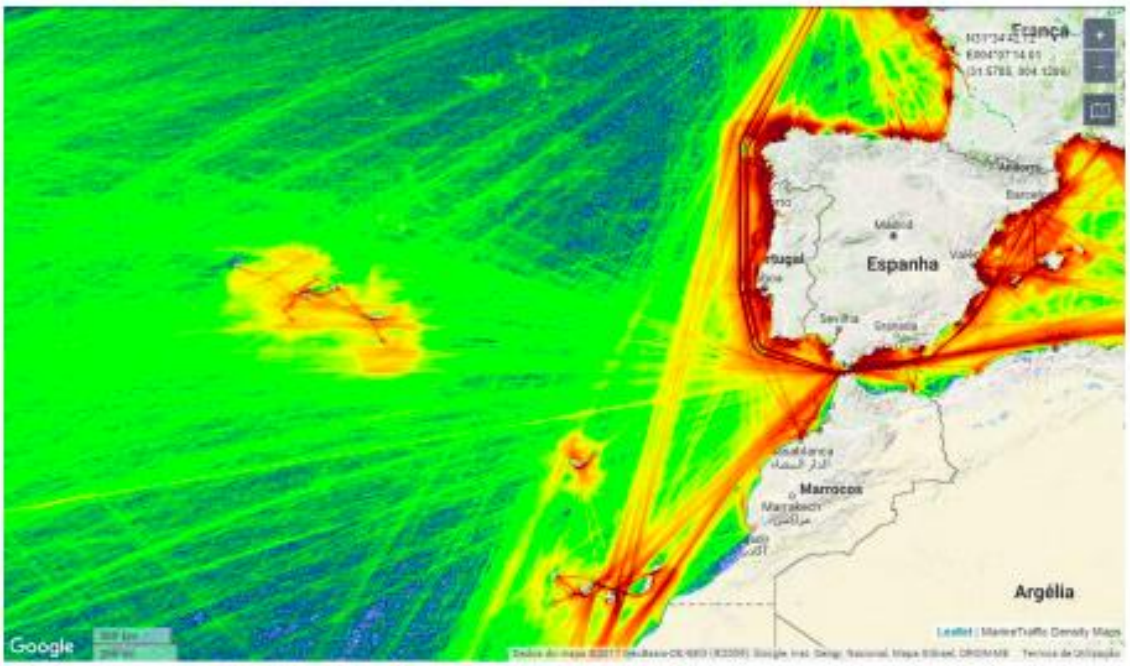


Figure 5 – Maritime Traffic in Portugal

Source: (Marine Traffic, 2015)

Seaports in Portugal

The activity of the seaports is the reality of the maritime cluster in Portugal. The geographical position of our country allows to establish itself as an important Atlantic gateway to the entry of goods/cargo into Europe. The port cluster is consistent as it has modernized port infrastructure and strategically located along the coast of the mainland and on the islands. The country has five major ports and they are located on the mainland, which handle **90%** of all cargo shipped by sea, according to the National Statistics Institute (INE).

In the figure below, the five major ports are represented as well as the secondary ports in Portugal mainland and islands (SAER, 2009). The five major Ports in Portugal mainland are: Sines, Leixões, Lisbon, Setubal and Aveiro. The others are secondary but also have an important role, especially on the Azores and Madeira.

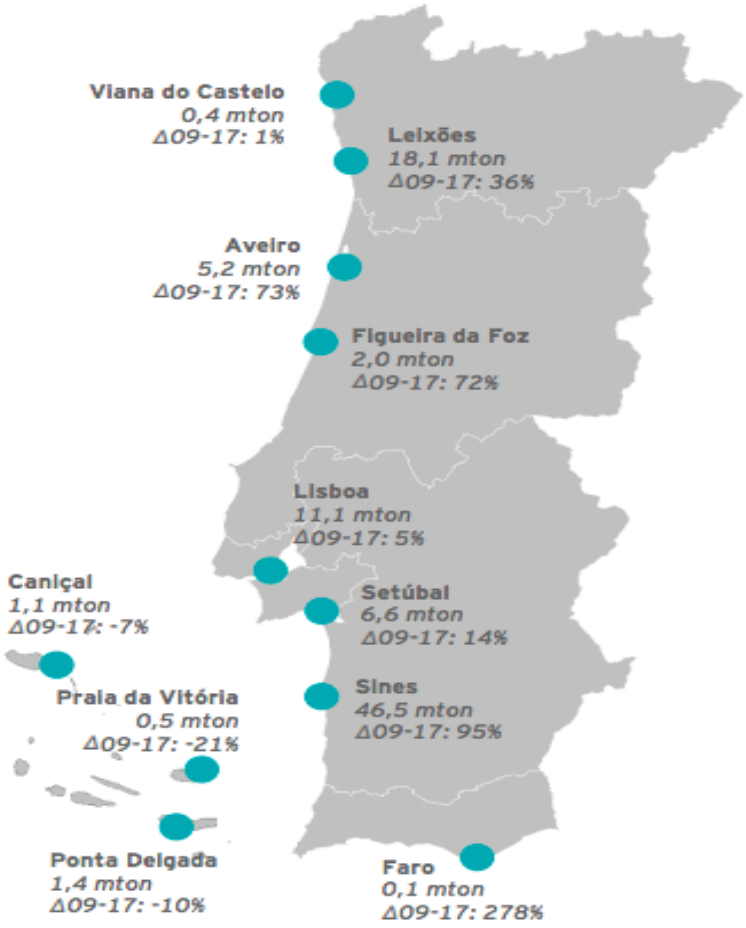


Figure 6 – Portuguese main & secondary Ports

Source: (APP - Portuguese Port Association, 2016)

According to the data provided by AMT (Authority for Mobility and Transportation) and APP (Portuguese Ports Association), the following graph shows the percentage of the market share of seaports in Portuguese mainland.

Clearly a dominance of the Port of Sines is observed in relation to all others with 52% of the market share. In second place is the Port of Leixões with a 20% share, which is also explained by its exporting role derived from its location in the North, where the industrial and exporting sector are located. The port of Lisbon is in third place with 13% with a key role but which is currently in a recovering position due to events such as the strike on port workers and the economic uncertainty of its management within the city.

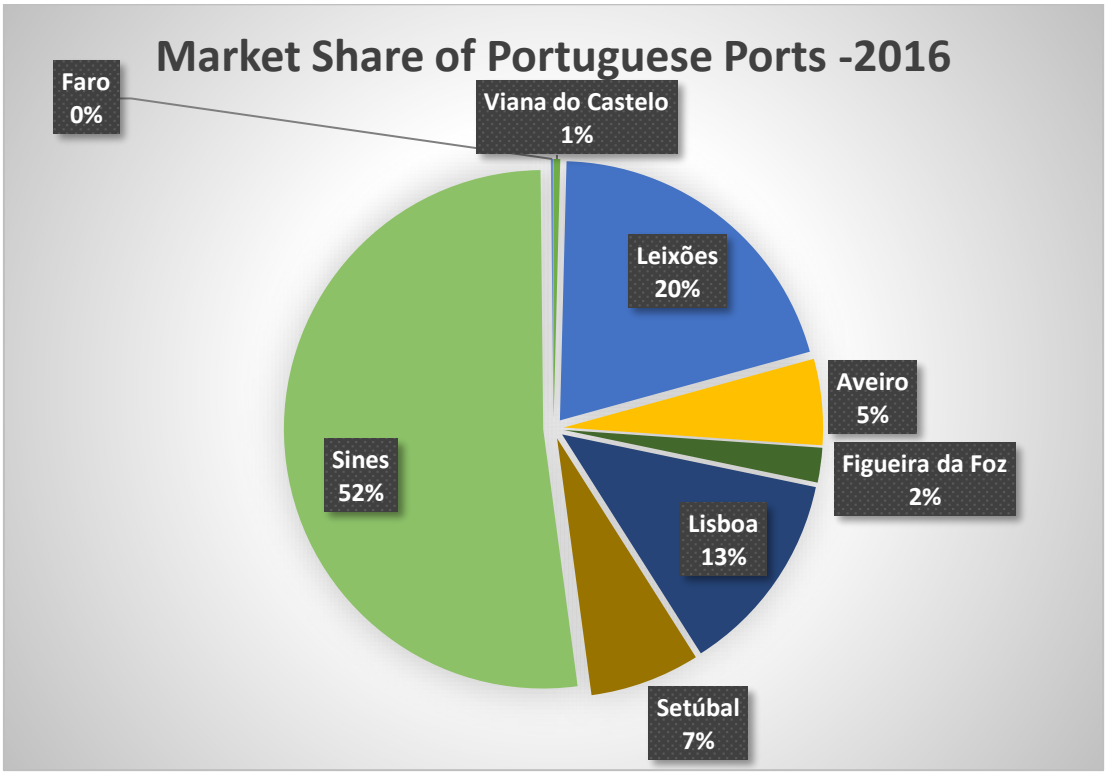


Figure 7 – Market Share of Portuguese Ports

Source: (APP - Portuguese Port Association, 2016)

Worldwide traffic intensity has increased at a faster rate than the economy has grown, as globalization produces production in places where labor is cheaper or where access to raw materials is easier

The coast of the Portuguese mainland is thus exposed to one of the main world routes and corresponding risks, mainly to the environment, nevertheless the Portuguese government

through the public and private entities (COTEC, 2012) continuously supports the test and the application of good safety practices and the responsibility to protect its coastal state, and consequently the national reputation in the maritime community.
Despite having a lot of potential, there are aspects that need to be improved. In addition, port tariffs create a barrier to ship entry and state funding is becoming increasingly difficult and private actors and especially international private actors with financial capital available for large-scale investment need to be involved.

Governance and Management

The Portuguese Ports have experienced profound changes, changing course regarding the attitude with customers. They moved mentalities and partially it was due to major changes in logistics chains, that, started to look in detail, to every step taken by commodity, time, costs, routes, alternatives with agility in changing solutions that allowed stop being captive ports and carriers (Bandeira, 2009).

Stakeholders influence the decisions of ports, companies and are increasingly viewed as strategic partners in a win-win relationship, increasing the frequency and range of relationships between entities, coordinating and linking operations and options. (Caldeirinha, 2011). Thus there is greater benefit, by sharing the information, in a transparent way at all levels and there is also a growing concern by the port authorities to know their customers, their logistics chains as well, presenting alternatives and innovative logistics solutions.

Today, Port Authorities take several initiatives to seek their clients, to visit, to disclose more information, in order to promote solutions and meetings of interest, between companies looking to innovate on this sector, but also to the hinterland and foreland solutions and promoting integrated solutions with shipping and land operators, with public and private entities.

In the business of port management, it remained in the public sphere, despite having evolved into the business model referred to as "landlord". The property and port management are public, but the port operation belong to private groups. The public actors have benefited from considerable investment by private entities on the expansion of port

terminals, by improving their accessibility, modernizing their equipment and also in information systems (Caldeirinha, 2011).

Opportunities to Growth

Regarding opportunities for Portuguese ports, three key characteristics for a sustainable growth can be identified:

- The most important world maritime traffic routes (Atlantic routes) pass in the vicinity of our maritime region, as you can analyze on the figure below.

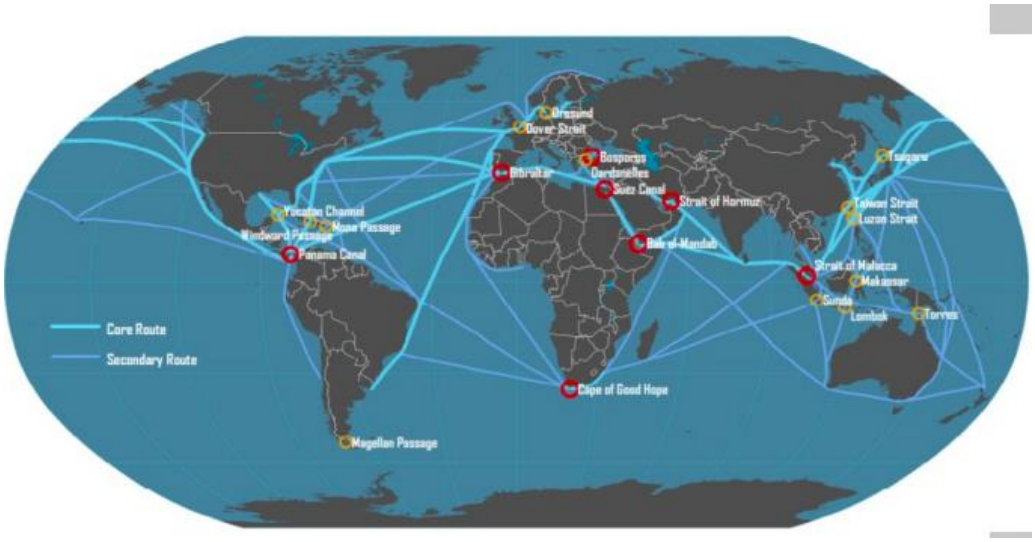


Figure 8 – Core and Secondary Maritime Routes

Source: Rodrigue (2017)

- National ports occupy an equidistant position from the extremes of the "European Central Corridor", which connects the Northwest of the continent with Italy;
- Portuguese ports have favorable natural conditions, in addition to their location, such as deep water, low tidal range, short access channels, and climate that allows them to operate 24 hours a day, every day of the year.

How to attract investment?

According to (Bandeira, 2009) and (SAER, 2009), these points mentioned above have the potential to enable the national port system to occupy a new strategic position. This strategic positioning will include:

- Integration of direct access functions to major intercontinental routes, acting as concentration / distribution hubs at European level;
- Be part of the development of the so-called European Short Sea Shipping;
- More efficient penetration of the peninsula and beyond the Pyrenees, for which you should have a long-distance terrestrial accessibility network and the development of the railway to make this a possible reality.

From these objectives mentioned above we must recognize that only the first has been making its way, mainly with the betting of Sines as a port hub and transshipment platform, as well as to some extent with the increasing internationalization of the Port of Leixões, where it processes a significant part of exports from the northern region and increasingly from some neighboring Spanish regions.

Earlier it was mentioned the role of Port of Leixões in the most commercial aggressiveness with the objective of raising cargo in the various Spanish regions but this should be extended to other ports such as Lisbon and Aveiro where its commercial hinterland reaches the Spanish provinces.

For an integrated and sustained evolution it is also necessary to continue to evolve in the factors that influence competitiveness such as the reduction of costs and fees and reducing administrative acts related to the dispatch of cargo, as well as the use of technological tools, such as information systems. for streamlining processes.

It should be noted, however, that the meeting of conditions necessary to revive maritime activity will require the attraction for Portugal international partners with financial resources and specialized know-how in the industry, to help internationalize the industry, the image of what whether to be achieved within the private port operation. This goal, however, will be possible only if adopted public policies necessary and sufficient to make Portugal a more attractive country for commercial frame, which will require immediately creating appropriate tax incentives, including the tonnage tax institution above mentioned and other advantages of equal extent.

4. Port of Lisbon

4.1. Context

The port of Lisbon is located in the city of Lisbon and is an Atlantic-oriented European port and a direct gateway to the Iberian market, located in the largest consumption centre (Lisbon and Tagus Valley), being a strategic infrastructure for the national economy.

Its strategic location gives it an extremely important status in the national and international trade logistics chains and also in the passenger cruise lines. Lisbon, the capital of Portugal, has a multifunctional port, composed of 18 port terminals dedicated to all types of cargo and cruise passengers, operating 24 hours a day, 365 days a year and offering the best sailing conditions for all types of ships. It is a shelter port with excellent natural conditions, located on the Tagus estuary - the largest estuary in Western Europe - which meets the Atlantic Ocean in a 32,000-hectare basin.

Historical Context

Long before D. Afonso Henriques's reconquest of Lisbon in 1147, there are reports of the presence in the area and the establishment of a commercial port on the north bank, in the Tagus estuary in the 18th century BC, by the Phoenicians.

This importance of Lisbon did not escape the knowledge of other nations with maritime tradition which led in 205 BC to the conquest of the city by the Romans and its baptism with the name of Olisipo.

D. Afonso Henriques, realizing the importance of the city of Lisbon in the international context, guided the reconquest movements to the south, with a view to establishing a zone of Portuguese influence along the Atlantic coast and securing the support of the crusades for the conquest. from the city of Lisbon, which is fundamental for the domain of the Tagus estuary. Thus, on June 28, 1147, a fleet of 164 ships carrying an army of 13,000 crusaders enters the Tagus.

Portuguese sailors challenged the belief in Europe at the time - that the land was flat - and managed to counteract it by making the voyages that united the continents for the first time.

In 1497 Vasco da Gama set sail from Lisbon and returned two years later, having discovered the sea route to India. This and other later trips helped make Lisbon a rich city and made Portugal prominent in the world.

The port of Lisbon is of fundamental importance as a port of call, with shipping heading to the Mediterranean and the Atlantic Ocean, and the landing in Lisbon of products from Brazil - wood, sugar and gold from Minas Gerais.

In the nineteenth century, the developments brought by the Industrial Revolution imposed new needs, including the modernization of the port of Lisbon; successive studies and projects culminated in the inauguration, on October 31, 1887, by D. Luís I, of the great works of the port of Lisbon.

4.2. Management and Governance

The APL S.A (Port of Lisbon Authority) has completed its transformation into a "landlord" port authority model, thanks to the development in recent years of a program of concessions to involve private operators in most port activities. Today, APL is dedicated to the domain management (landlord) and other functions of coordination, facilitation and promotion essential for the maintenance and improvement of the competitive levels of the port and the partners of the Port of Lisbon.

Landlord Port is a governance model where the private sector takes a leading role in providing operational services. The landlord who is a public body takes on a regulatory and control role over infrastructure. It negotiates and is responsible for granting terminal operation to private sector operators for a relatively long period of time. (Bandeira, 2009)

This model is also the most widely used in the management and administration of ports in Portugal with the exception of the Port of where the administration directly explores some of the port activities. (Bandeira, 2009). Thus one can say that the private sector is increasingly taking a leading role in the port sector and that there a cordial relationship between the various actors, and the state has a role in creating the enabling environment for this relationship and sustainable growth and integrated.

APL aims to become a logistics network facilitator - and has played an active role in promoting and disseminating the potential and services provided by the port in order to contribute to its development and competitiveness within the EU and worldwide (COTEC, 2012).

It is also relevant to note that the APL itself is only the Port Authority but there is a community who are the main players in the port business among which are included service companies such as piloting, trailers, dealers, shipping agents, brokers, ship owners , stevedoring companies, freight forwarders, warehousing / distribution, ship repair, other suppliers, road and rail carriers and even public entities.

4.3. Logistics Infrastructure and Transports

The port of Lisbon is a multifunctional port of reference in the Atlantic and therefore holds various infrastructures, where the logistics operation is done. The most economically and logistically important cargo typologies are agri-food bulk and containerized cargo.

Bulk Cargo (Dry)

The main terminals of the port of Lisbon dedicated to the reception, shipment and storage of food bulk solids, are as follows:

- Trafaria Food Bulk Terminal.
- Beato Food Bulk Terminal.
- Palença Food Bulk Terminal.

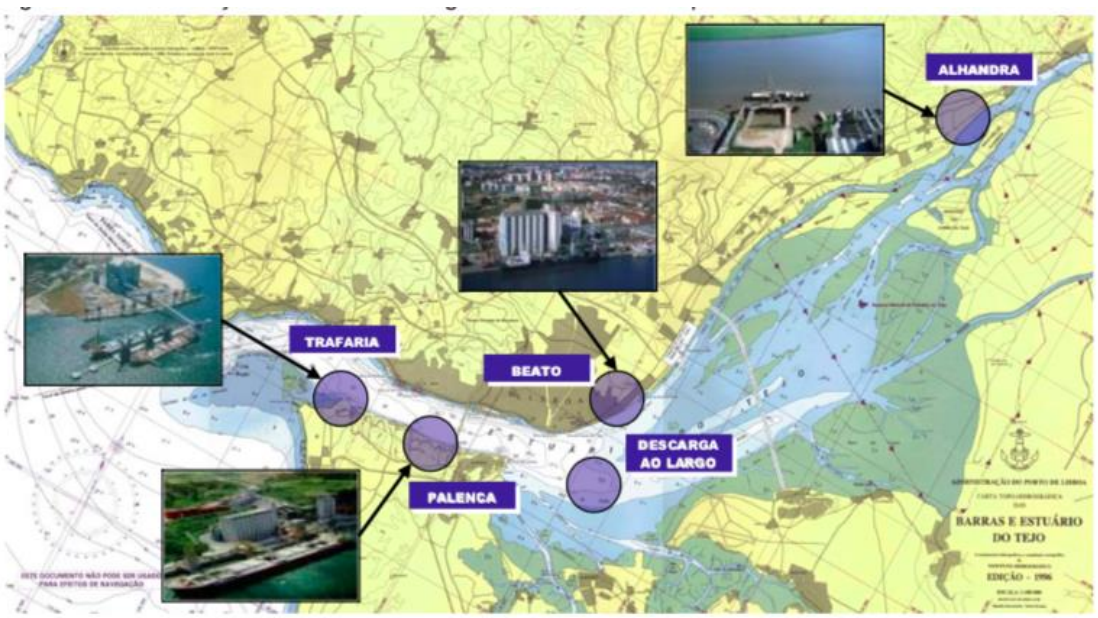


Figure 9 – Bulk Terminals in Lisbon

Source: (APL, 2019)

General Cargo (Containerized)

The specialized terminals of the port of Lisbon dedicated to container handling are follows:

- Alcantara Container Terminal:
    - This Terminal is a privileged platform for direct connections to North and South America, Africa and Europe. It also has a connection with rail transport mode which is therefore connected to the national rail network. The concessionaire of this terminal is LISCONT;
- Santa Apolónia Container Terminal:
    - It is a multimodal terminal offering direct services to Autonomous Regions as well as to the African continent, especially Angola. It has a dedicated railway branch and connected to national rail network. The logistics operation is conceded to SOTAGUS;
- Multipurpose Terminal of Lisbon:
    - This terminal essentially serves the Autonomous Regions of the Azores and Madeira and also the west coast of Africa (especially Cape Verde and Guinea-Bissau). It also has a dedicated rail network connection. The operation is managed by TSA.

Container terminals at the port of Lisbon have equipped port facilities and a management model that are convenient to the nature of its activity.

Concerning road traffic of truck vehicles which is generated by the terminal is drained by Av. Brasília and the Algés roundabout that connects with CRIL, with reasonable fluidity. The growth of this traffic, to which will be added the natural growth of light commuting traffic in and out of Lisbon, may generate some constraints to this route.

Regarding rail connections, the current situation is about three trains in each direction per day is acceptable, and may grow to around 16 daily trains (in each direction). Alcântara road-rail node and more space and means of movement, both in the container terminal itself, and in terms of guard lines near the Alcântara-terra train station.

4.4. Today Situation

Nowadays, the port of Lisbon, despite the enormous extent of its area of jurisdiction around the estuary, is currently a polycentric port and scattered along the north and south banks of the Tagus, without its natural connecting space, the estuary, actually functioning as an integrating space. In fact, the relations between the various port purposes either do not exist or are mainly made by land, diminishing the role that historically river had. However, solutions are ongoing to reduce the relevance of land transport in the connections between the various port infrastructures.

The great dependence of the port of Lisbon is its land accessibility, partially integrated in the urban environment, aggravated by the low importance of the rail mode in the internal articulation of the port areas and its relationship with the exterior, as well as the absence of a logistic chain organized. On recent decades it has created a chronic situation of "accessibility crisis" which undermined the efficiency and competitive capacity of the port. This created an environment of conflict between the port and the metropolitan territory, in particular with the nearby urban spaces (Ministry of Agriculture & Sea, 2014).

SWOT Analysis

In order to provide an accurate analysis, a SWOT analysis was elaborated, based on information collected from Port of Lisbon Authority, in order to know what are the strengths and weaknesses of this port infrastructure, against the backdrop of a current situation. In the present and in the short and medium term framework, understand what could be the growth opportunities and threats that will be a constraint. The purpose of this is to understand the overall situation and understand what possible solutions exist and how can them be applied to this infrastructure.

Strengths	Weakness
▪ Natural conditions that allow the reception of large ships. ▪ Privileged geographical position at the crossroads of major transoceanic routes north-south and east-west; ▪ Privileged conditions of entry and shelter on Tagus estuary; ▪ Located in the biggest center of the country's consumption which has a wide hinterland. ▪ Importance of the port for the competitiveness of the regional and national economy;	▪ Costs associated with port fees and services that prevent a higher growth; ▪ Lack of intermodal services for freight and links the port to the hinterland; ▪ Road and rail conditions that have some deficiencies hindering the flow of cargo. ▪ Hinterland extended but needs greater intermodality between transport; ▪ Local, road and rail accessibility constraints; ▪ Labour costs;
Opportunities	**Threats**
▪ Exponential growth in the number of vessels in the Atlantic routes, ▪ Globalization and internationalization of Portuguese companies and production of tradable goods ▪ Solutions at EU level for the excess traffic and opportunity of short sea shipping (small to medium distances)	▪ Competition with Spanish ports mainly those located in the Mediterranean, due to greater integration in the logistics chain. ▪ Concentration of maritime operators which leads to that already have ports and preferred routes territorial reorganization of production structures, particularly those linked to the industrial and logistics, in global terms, marked by industrial relocation and the growing importance in the freight system of logistics areas of major international brands, is located adjacent to major consumption centers and production;

Maritime activity

In order to better understand the maritime activity in the port of Lisbon, some data were collected. Regarding on the type of cargo handled, as well as its origin and destination. This provides an overview of the port's situation, and how its conditions and logistical infrastructure should be improved on a near future. It is also here that by increasing the installed capacity, we can increase the cargo volumes.

Cargo

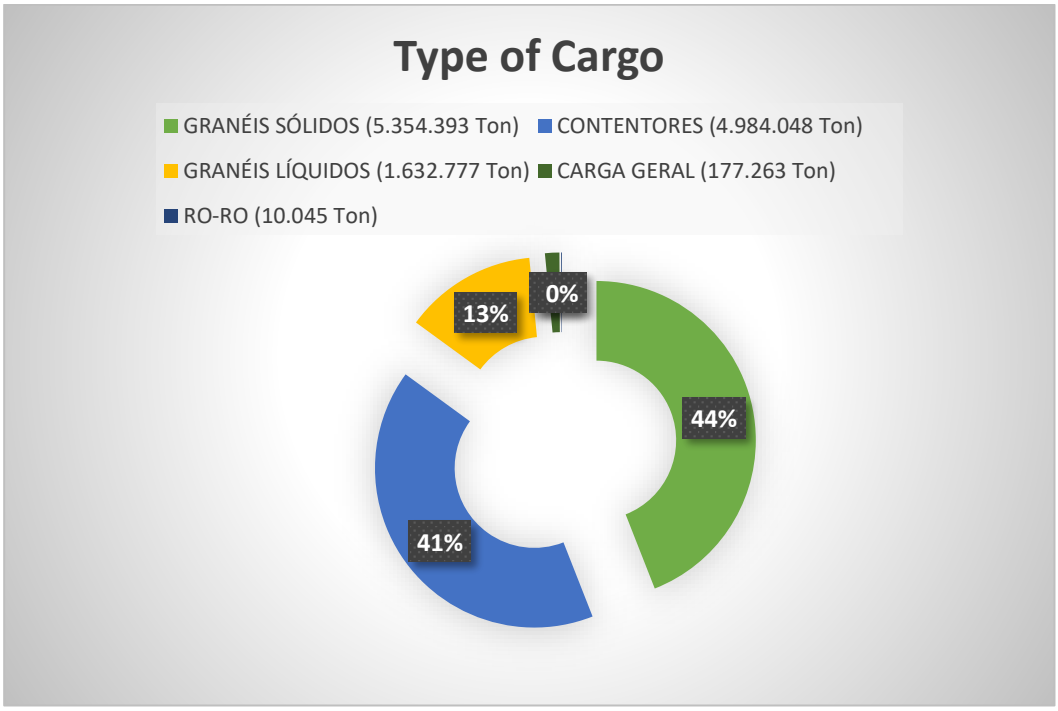


Figure 10 – Type of Cargo

Source: (APL, 2019)

According to the graph presented above, we can identify the containerized cargo and solid bulks with about 85% of all cargo handled by the Port of Lisbon. These are the two types of cargo where this port infrastructure and the operators are focused. We speak naturally of Solid Bulk (44%) more properly of food bulk with the existing terminals and the Containerized load of 41%. Here we talk about any type of cargo that can be packed in containers, and then the logistics that lead to its transfer to road and / or rail transport. The others mentioned in the chart as general cargo and Ro-Ro have a minor relevance in the context of the port, although liquid bulk has an interesting 13%, and we are talking about fuels.

The port of Lisbon plays a major role in terms of imports and exports at a national level. Lisbon metropolitan area is the largest center of national consumption and whose hinterland is quite wide. For this, charts were also elaborated containing what are the export destinations and the origin of the imports that depart or arrive from this port infrastructure.

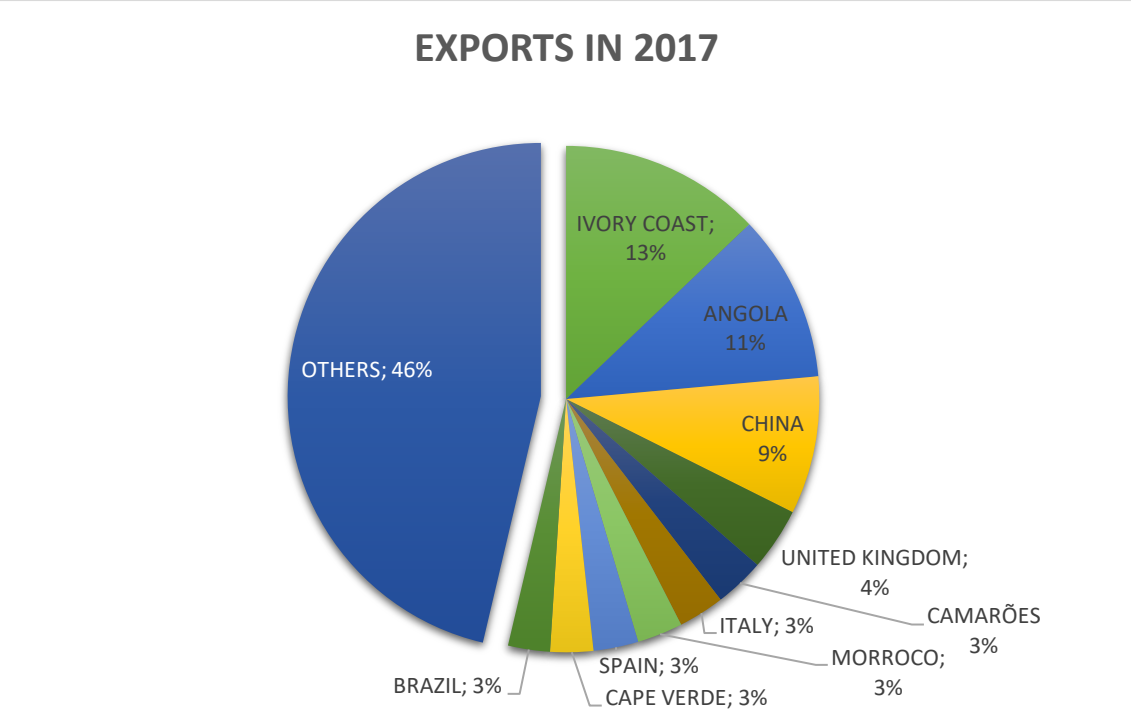


Figure 11 – Exports in 2017

Source: APL (2019)

In 2017, the main destinations for exports via the port of Lisbon were Côte d'Ivoire (13%), Angola (11%) and China (9%), the top 3. national territory where maritime transport clearly has competitive gains over other modes of transport. Another interesting curiosity is that EU countries have relatively lower percentages with the UK at 4%, Italy (3%) and Spain at 3%. The percentage relative to others (46%) is significant but speaks of a set of provinces that dissecting are very low percentages to refer to as the previous ones.

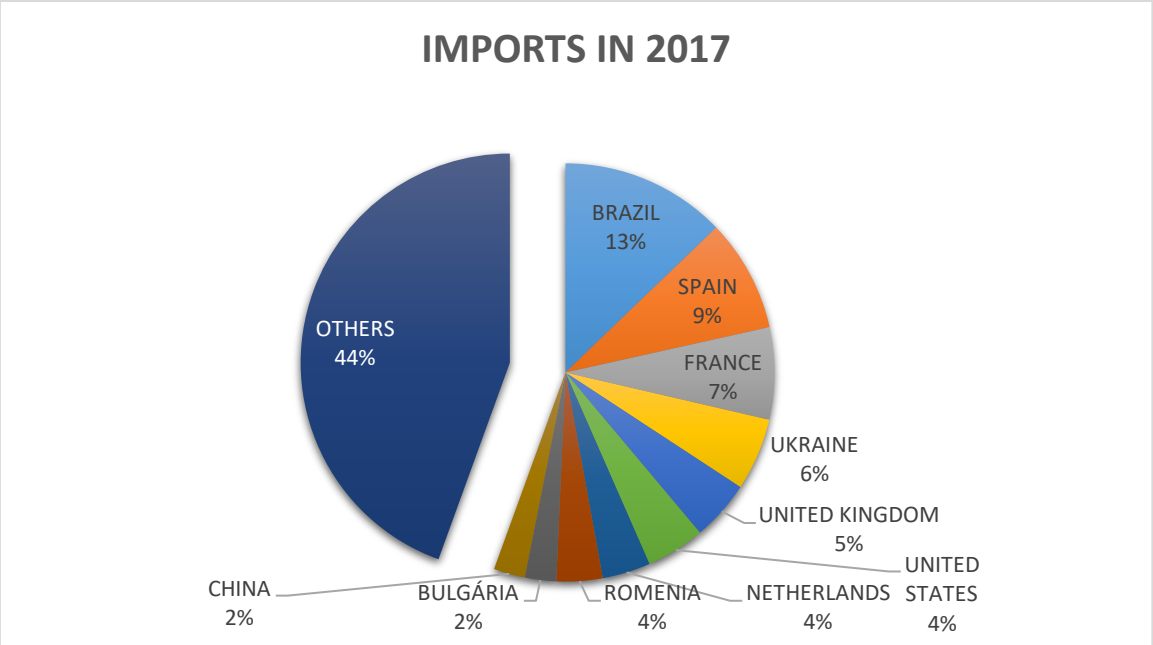


Figure 12 – Imports in 2017

Source: APL (2019)

Regarding imports in 2017, the top 3 were Brazil with 13%, Spain with 9% and France with 7%. Here we identify a country outside the EU which is Brazil and the other two which are two neighboring countries. It is interesting to note that even at short distances maritime transport continues to be advantageous, giving as an example Spain and France respectively, being two of the main points of origin of imports, whose destination is the port of Lisbon.

4.5. Ambitious Future?

The changes on Portugal's foreign trade relations, the evolution of the processes and technologies on port operations, the development of integrated supply chain logistics, along with the need for rationalization and modernization in areas necessary for port operations, and the growing of political/social intervention asking for the need of re-establish links in urban areas with the river, will naturally lead to the development of a new relationship between the port and the city.

A sustainable development of the metropolitan area (also developed on **Chapter VII**) it will need a greater change on the logistics profile of this port, and this is absolutely strategic for several actors. This adjustment goes through improving the development of containerized cargo component related to the concentration of population and economic activities in the region, particularly in the north and south of the Tagus and the continuance of the important component of food bulk, which is the first supplier in the country and that is strategic and critical to national security in a broader concept (Ministry of Agriculture & Sea, 2014)

As you can see below, this is the area of direct influence of the port of Lisbon on the largest consumption center in the country, and we can talk about a promising future given the trend towards greater concentration of population and economic resources.

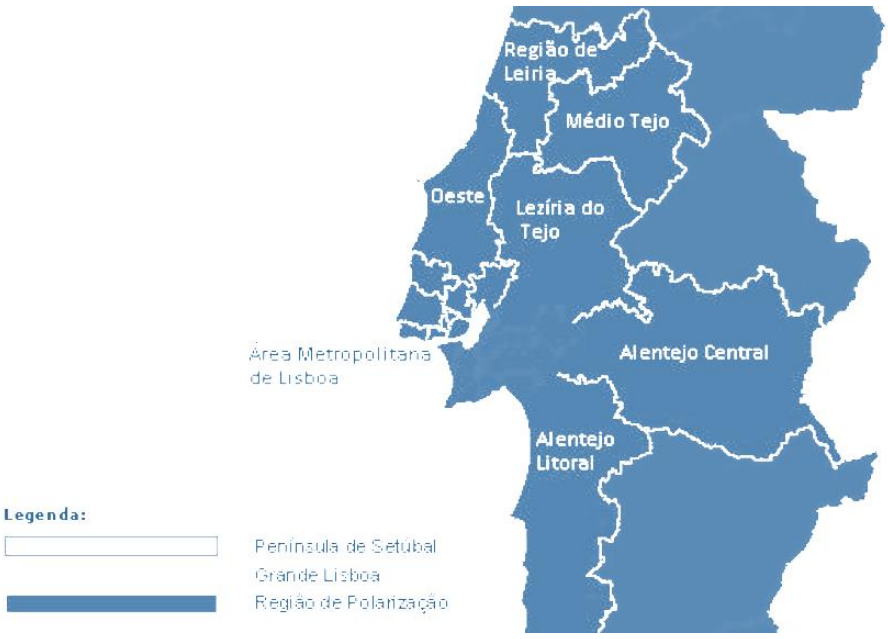


Figure 13 – Direct area of Port of Lisbon influence

Source: (APL, 2019)

However this idea of development explained before, should be done in a harmonious way with the city and its population. The coexistence of an efficient and competitive port and a territory under the points of urban and environmental view in its connection to the river, should be based on a new paradigm of port-city relationship.

Given that the previously mentioned, the future will be ambitious and bold. That will depend entirely on how it will be done and that the "how" is identified and involves:

- To improve the competitiveness of the port, organize and optimize its different business areas in terms of development at national and international markets;
- Promote cooperation between national ports and in particular the port of Setubal, by strengthening the functional complementarities and its geostrategic location. The objective is to valorize synergies associated with the new logistics platforms and transport infrastructures, in particular those integrated into the trans-European networks (road, rail and airport);
- Create a community of entrepreneurs on this area and that in order to consolidate and enlarge the market possibilities and its growth.

Projections for Cargo (2026)

In accordance with the statistical projections of the Lisbon Port Authority (APL) and considering that the strategy on a near future will focus on significantly improving the efficiency of the Port of Lisbon on the management of cargo (supply chain and logistics) and on the IT (single window) processes under development and implementation, that will promote the reduction of time and associated costs.

There are two scenarios that clearly show that the movement of goods depends not only on the capacity and efficiency of the port of Lisbon, but on the international economic environment in which all maritime freight transport is leveraged.

Scenario A:

- Pessimistic: A 35% increase in overall movement of cargo is expected and an annual growth rate of 2.9%, translated into an absolute value of 15.6 million tons of total movement in 2026;

Scenario B:

- Optimistic: Global freight movement is expected to grow by 72% and annual growth rate of 5.3%, resulting in an absolute value of 19.9 million tons of total movement;

5. Port Competitiveness

5.1. Competitiveness Factors

Portuguese ports have a strong geostrategic location, allowing direct access to maritime traffic passing in front of the Portuguese coast. This strength is not sufficient in itself as more factors that work in parallel are involved in this equation.

Governance:

Port policies have its own dynamics and influences directly the competitiveness, even though it is not as important as other factors in evidence, but the involvement of private actors has promoted a more competitive environment.

Industry:

Increasingly, logistics costs today represent an important element of the final cost of tradable goods. Shipping costs are relatively low, however rail and or road transport costs from port to final destination are high and have significant relevance to the total cost (Caldeirinha, 2011).

Hence, the ports have industries of some relevance within their hinterland in order to lower existing costs with the supply chain.

Ports being physically close to the destinations and origins of goods, on these days becomes a key aspect of competitiveness. With globalization and the relocation of production, which is now spread around the world, the costs related to logistics chain increase significantly and have a significant percentage in the final price of the product.

5.2. Competition and Port players

The following table allows you to evaluate the factors according to the view of the players involved, which data are various and what their interests are unrelated.

Decision Maker	Criteria
Shippers	Cost, quality of Operations locations, frequency of shipping services, speed/time, efficiency, facilities, information systems, hinterland connections, congestion
Forwarders	Efficiency, quality of Operations reputation, cost, frequency, location, speed/time, information systems, hinterland connections,
Shipping Companies	Cost, location, facilities, quality of operations, speed/time, efficiency, congestions, frequency of shipping services hinterland links, information systems
Terminal Operators	Facilities, Quality of Operations, cost, location, hinterland connections, information systems, congestion, efficiency

Figure 14 – Players and variables

Source: Adapted from (Merck, 2013)

It is relevant to mention the risk of monopoly in the port sector in Portugal. This happen because there are only small to medium sized ports. The Port Authority plays a regulatory role and has to promote competition between the players, otherwise the losses will be "global" as factors such as costs, investment in infrastructure, the quality of logistics operations will be more susceptible to failure.

According to several authors, especially (Merck, 2013) and (Yeo, 2010) there are several factors that influence port competitiveness.

Port Infrastructure

Infrastructure is a high investment with a rigid maturity and with increase maintenance costs and period which means that investors need to have great financial

stability and liquidity as well as operating period (high investments require a 20-30 years) that is in accordance with the possible return on investment (ROE).

Law Framework

A framework of laws applied to a sector with its own dynamics that allows for stability on the one hand without a high level of bureaucracy, and to promote competition between the various actors in the sector, which can stimulate greater financial return at the end of the day, increasing the economic viability of the investments.

Port Fees

Relationship between price and quality of service provided is on these days a mandatory balance for customers and neglecting this, could be a factor that changes everything, meaning this, decreasing its revenues.

Efficiency

A port which is efficient, compliant, with as few delays as possible in loading , handling and unloading the ships is a key to its success among the customers. An increasing number of dock movements per hour, will increase customer satisfaction and of course the opportunities to increase shipping will increase. Performance indicators (KPIs) are measured not only by the port authority but also by its players and customers regarding its business relationship.

Geography

The location is undoubtedly one of the most important factors taken into account nevertheless this is more complex than it seems. Is also important to analyse the proximity to sea lanes, protection against the sea currents, areas for the logistics platform.

Foreland

Sea connection is crucial for port competitiveness because it determines the frequency of services, meaning, the ports with the largest number of connections are more attractive, because they offer more services and routes, and the delivery of goods will be substantially faster.

In short, all of these factors interact with each other and their contribution to analysing competitiveness is substantially different, but their analysts cannot look on an independently way, otherwise we will not take the best possible approach to investigating port competitiveness.

The optimal solution would be one on all factors mentioned above are represented in a balanced way, but often we find factors with better representativeness than others in the overall analysis meaning, that every port has its strengths and weaknesses.

Also there is other factor which is really important to mention that is hinterland corridor influences directly the competitiveness. This is explained by today integration in a multimodal transport network and the point is to have fully integrated supply chain, which is characterized by its fluidity and with access to market. Regarding this, a port must have interfaces between economic/industrial activities and inland terminals that provide intermodal structures and connections between the foreland and hinterland (Notteboom and Rodrigue, 2005).

Strengthening capacity of transport modes may allow the expansion of trade. These unions are now present in the traffic of port cities. The quality and capacity of hinterland modalities, roads are critical to any expansion of trade.

5.3. Improving Efficiency

The Port Productivity Study and the factors that determine the understanding of the sector and how we can then increase the efficiency of the port terminals and to a more macro level of the entire logistics chain in which the port is integrated.

According to (Tonzon, 2002), the study of determinants of port performance and port choice leads to port efficiency being the most important factor in choosing a port, and this is a debate as we can see throughout the dissertation where we found several points of view under discussion.

The idea of lean management aims to reduce costs immediately but also to create more productive capacity with the same investment. That can be rented or used to produce

more, focusing on interdisciplinary collaboration, empowerment and follow-up the product quality indicators, deadlines and profitability (Caldeirinha, 2011).

After a careful analysis, in order to increase the on port sector it is necessary to put in practice the following:

- National seaports should be integrated in logistics platforms on international chains, maximizing the interface between motorways of sea, highway, rail and airports, making the shippers use Portugal as a hub (entry and exit point for the most diverse) for international hot trade spots, especially Europe and Americas;
- Improve the technical/material conditions of national ports: depth, conditions of operation, customer service and communication;
- Reduce taxation and bureaucracy associated with port transactions;
- Promote privileged relations between all the countries of the community of Portuguese-speaking countries (CPLP countries);
- Capitalize on all benefits that derive from the attraction of companies related to maritime transport generated by the international ship registration, in order to develop more activities related to the maritime transport industry in Portugal;
- Monitor international trends in ship registration, making Portugal on the forefront of ship registration services.

These are some of the solutions that are being promoted and that will be developed in the next chapter, both in general terms of the national port sector but especially about the object of this dissertation, the Port of Lisbon.

6. Projects and Innovation

6.1. European Union Agenda

On the present-day context, where profound changes are happening in world trade and the flow of goods circulating in the globalized market through global logistics chains, as well as the dispersion of decision-making centers on transport and distribution alternatives, ports ceased to be a stable link in the transport chain and have constant captive traffic to face ongoing challenges in maintaining and capturing new freight flows. In the European Union, transport and distribution policies have changed, impacting on port activity and providing opportunities that must be seized or threats to be avoided. The Portuguese ports and in particular the port of Lisbon, faces a new geo-strategic framework in which they have to contend with competition from a dynamic road transport, flexible and supported by the expansion of the motorways networks linking Portugal to Europe. The strategies of major shipping companies determine the geometry of the networks and nodes of the global shipping (Suárez et al, 2014).

One of the problems, that has been appointed, is the aggregate development between the various modes of transportation. This lack of synergy has obstructed intermodal integration and interoperability between different modes of transport.

On this figure , we can observe the five largest seaports and their connections to other transport modes and also to the logistics platforms. Every major seaport is connected by railroad or motorway, nevertheless there are several constraints, especially regarding railroad. For example, port of Sines does not have dedicated direct railroad to Spain.

Figure 15 – Ports & Intermodality

Source: (Minister of Agriculture & Sea, 2014)

Maritime Highways

These are the maritime equivalent of land motorways and are also key part of the trans-European transport network. It should operate as or replace land motorways to reduce road saturation as well as provide access to countries separated by sea from the rest of the EU. Motorways of sea are also valid for the transport of passengers and goods, in the latter case using RO-RO (Roll-on; Roll-off) vessels or containerized traffic.

The current roads congestion/heavy levels of traffic in road transport due to increased volume of goods and the demand for greater energy efficiency (environmental protection) and less pollution can boost the success of the motorways of sea.

The efficiency of a port is an essential element in order to attract businesses, as it has to work as a hub, operating expeditiously and without constraints, using new technologies to streamline processes (through digitization) and facilitate bureaucratic procedures.

These new challenges requires greater infrastructures to accommodate larger ships, large backlog logistics platforms to prevent congestion and articulated networks that allow for multi-mode solutions using less polluting modes (seas and rivers). In turn, the modernization and development of port infrastructures associated with the integration of mainland commercial ports into the Trans-European Transport Network (TEN-T) is an essential element for a sector in deep transformation and with huge growth potential.

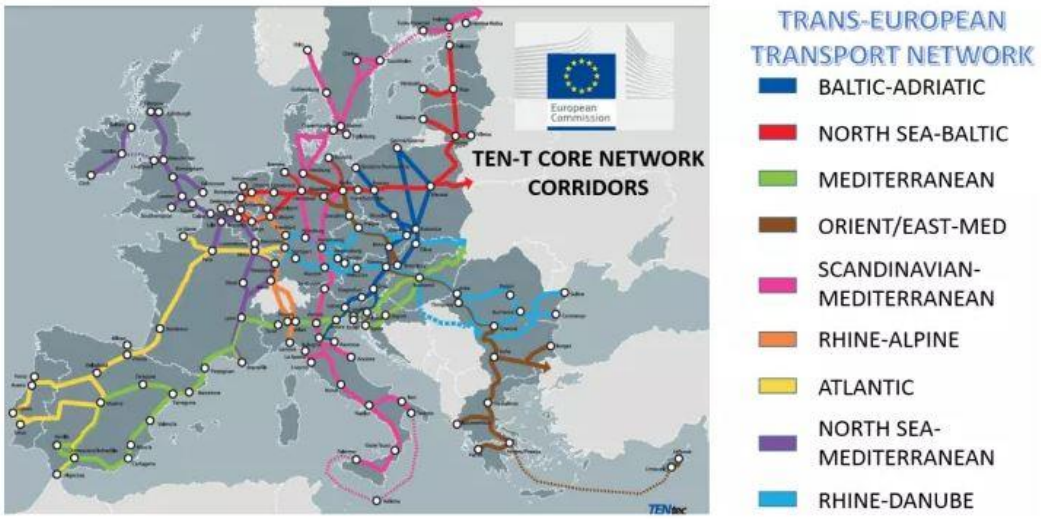


Figure 16 – Core Network Corridors in EU

Source: European Commission (EC)

Saturation of motorways and roads in all Europe and regardless of fuel that may be used there is no doubt that rail, air and sea short shipping will hold an important role in relieving the European roads. European inland waterways will be a solution in segments of cargo and passengers, to contribute for the improvement of environmental conditions of the population, and as the only possibility for a sustainable continued growth trade, production and consumption with the development standard of Europe.

6.2. Short Sea Shipping

Short Sea Shipping (SSS) is a recent concept and nowadays is a practical solution. It can be defined according to the European Commission (EC) as:

"(…)Short sea shipping includes domestic and international maritime transport, including feeder services, along the coast and to and from the islands, rivers and lakes. The concept of short sea shipping also extends to maritime transport between the Member States of the Union and Norway and Iceland and other States on the Baltic Sea, the Black Sea and the Mediterranean(…) "

It is a safe and sustainable alternative to road transportation, relieving pressure on European transport networks (especially motorways) as well as reduce its environmental impact. According to the European Commission there are reasons presented above for the development of SSS in Europe:

- Promote the overall sustainability of transport as the SSS presents itself as a safe and ecological alternative.;
- Facilitate links between countries and different regions;
- Increase overall transport efficiency.

It is essential that this kind of transport, know the needs of the user (market customers) in various spheres (speed, reliability, regularity, frequency, load security and cost levels.

The use of SSS in Portugal is able to solve the geographic location, its periphery in relation to EU center, facing the blockages or constraints in terrestrial infrastructures to neighboring countries. In terms of competitiveness it is not a direct competitor with road transport as it complements the D2D service (door to door).

6.3. Single Logistics Window

Single Port Window (III) & Single Logistics Window

Maritime IT systems play a a fundamental role in the world-wide transport of cargo and goods. In order to handle the rising global movement of volumes and meet the customers' demand for rapid and on-time delivery, the stakeholders (shipping liners and terminal operators along with Port authorities) work with IT and software companies to create a new management and technological solution to improve the whole process and answer to the global demands of this business. So, Global freight networks are emerging nowadays, and they combine maritime transport, inland, onshore road and rail transportation systems. Basically, an integrated and global system to include every stakeholders on the whole supply-chain process (Chew et al, 2015)

According to (APL, 2019), this project aims to implement the Single Logistics Window (LSW) which, is the evolution and extension of the Single Port Window (SPW). It will extend the management of information flows along the logistics chain, integrating maritime transport and mainland commercial ports with land transport modes and connection to dry ports and from there to the end clients.

LSW will support the procedures in electronic support and use a platform along the various nodes of the logistics chains that use the Portuguese ports (Ship / Port / Maritime Terminal / Rail Transport / Logistics Platforms - Dry Ports / Road Transport / Importers - Exporters), integrating the actors and the services.

This will improve the connectivity of freight traffic in hinterland by bringing ports closer to their final customers by creating and applying a new harmonized model of electronic intermodal transport procedures on all seaports.

The LSW have as its main objectives:

- Increase the efficiency of logistic supply chain and create economies of scale between ports and end customers;
- Help to maximize the use of national freight infrastructure;
- Enhance intermodality and the use of environmentally friendly transport.

6.4. Connecting the Port (Integrated Supply Chain)

The aim here is to enhance the use of the estuary and the river as a means of connecting the port operation areas with the logistics platforms, thereby reducing traffic on urban road infrastructure and the resulting environmental impacts. The daily impacts in Lisbon are from a high flow of road freight transport and also a result of the poor potentializing of rail freight and the existing constraints.

The figure presented above could be considered an "optimal solution" by using River barges in order to substitute the truck from the port to a factory or from the city port to a distribution center. The inland barges are a solution because the city of Lisbon offers that natural condition.

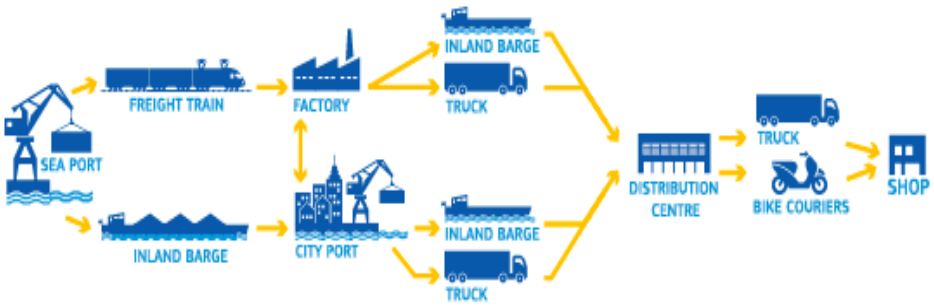


Figure 17 – Fully integrated Supply Chain

Source: Adapted from (Rodrigue, 2017)

Thus, the fundamental objective here is to create the conditions for the growth of current river traffic and for the introduction and dynamization of container traffic.

Container terminals will be seamlessly linked with a set of regional logistics platforms, preferably by rail and inland waterway.

River Transport to Castanheira do Ribatejo (drydock)

Figure 18 –Barge to river transport

Source: (ETE GROUP, 2016)

This project is based on the environmental sustainability and logistic efficiency of the Port of Lisbon, aiming at reducing greenhouse gas emissions and modal shift (road to river and vice versa), reinforcing the port's connection and articulation with logistics platforms:

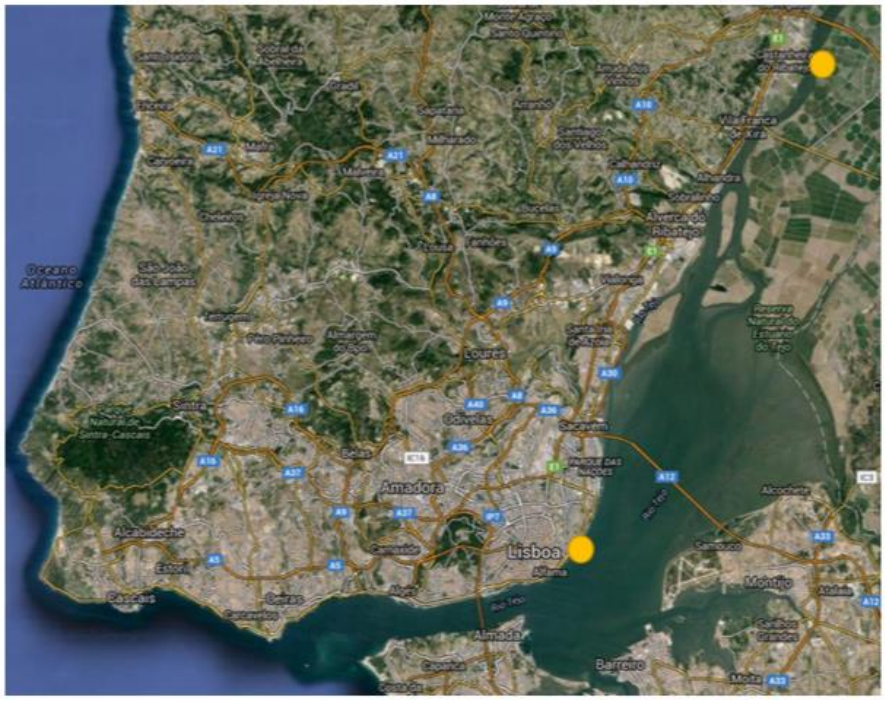


Figure 19 – Port Terminals to Castanheira drydock

Source: APL (2019)

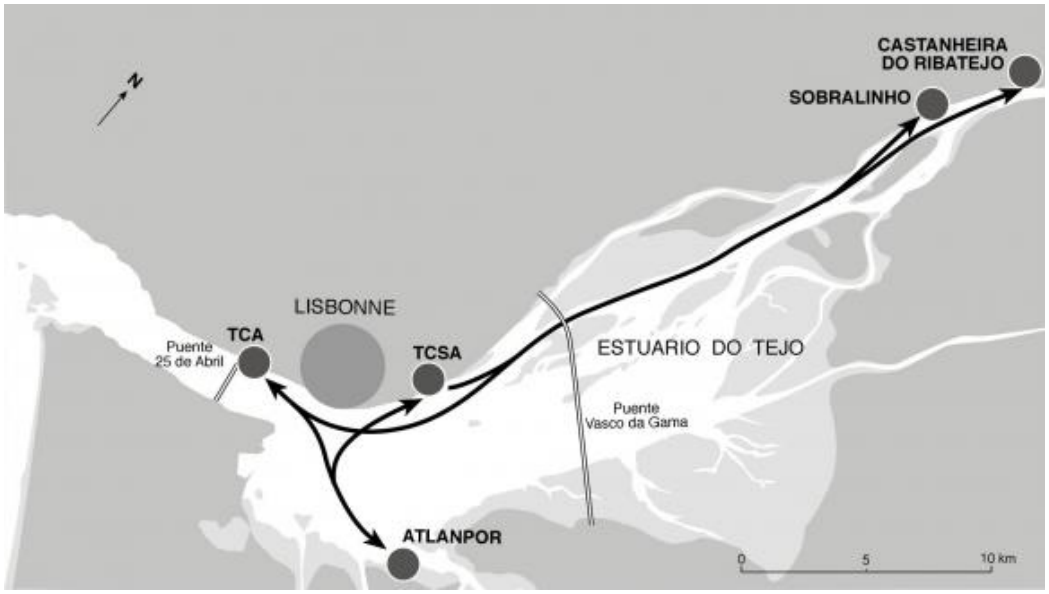


Figure 20 – Map of inland waterway on Tagus River

Source: Frasquilho(2008)

Regarding the figures presented above, the project is to promote the development of traffic in Tagus river, so that can constitute a true alternative to urban road transport resulting in less environmental and social impacts.

The port of Lisbon have excellent conditions to make the river a real alternative that is being put in place. This also supports that the port traffic movements does not need to correspond to an increase in road traffic fluxes entering and exiting the port, because this at the end of the day may reduce the number of trucks in urban areas (Frasquilho, 2008)

The navigation on Tagus will offer conditions to increase river transportation and the services associated to this activity and also the connection to Castanheira do Ribatejo will be characterized:

- The volumes moved will be containers, general cargo and bulk;
- Promote greater efficiency and activity between the two margins terminals and logistics platforms;
- Substantial reduction on road traffic and the consequent reduce on ecological footprint on urban areas.

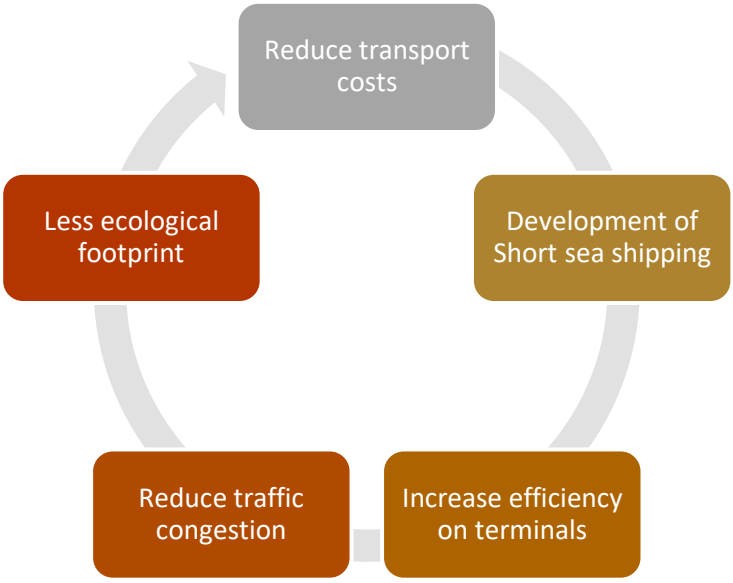


Figure 21 – The road to greater efficiency on Port of Lisbon

Source: (ETE GROUP, 2016)

Considering that river navigation is one of the critical projects for a sustainable development, the APL assumes a strategic bet to develop its multimodality, ensuring efficient integration and maritime, rail, road and river interoperability.
Also it will improve connections to its hinterland and the Atlantic corridor network as an asset to the trans-European transport network.

6.5. Strategic Area for Development

The Lisbon Metropolitan Area covers an area that extends through the Tagus valley to Abrantes and Castelo Branco; along the north coast, to Caldas da Rainha and Leiria; along the south coast, it is part of the tourist and leisure area of Tróia and Melides, as well as the Montemor-o-Novo / Évora axis. In other words, above is described the port of Lisbon hinterland.

The area therefore delimited comprises more than three million inhabitants and tendency is to concentrate, in the coming decades, more population, more companies and more tourism, consolidating Lisbon as one of the metropolitan regions of European metropolitan networks.

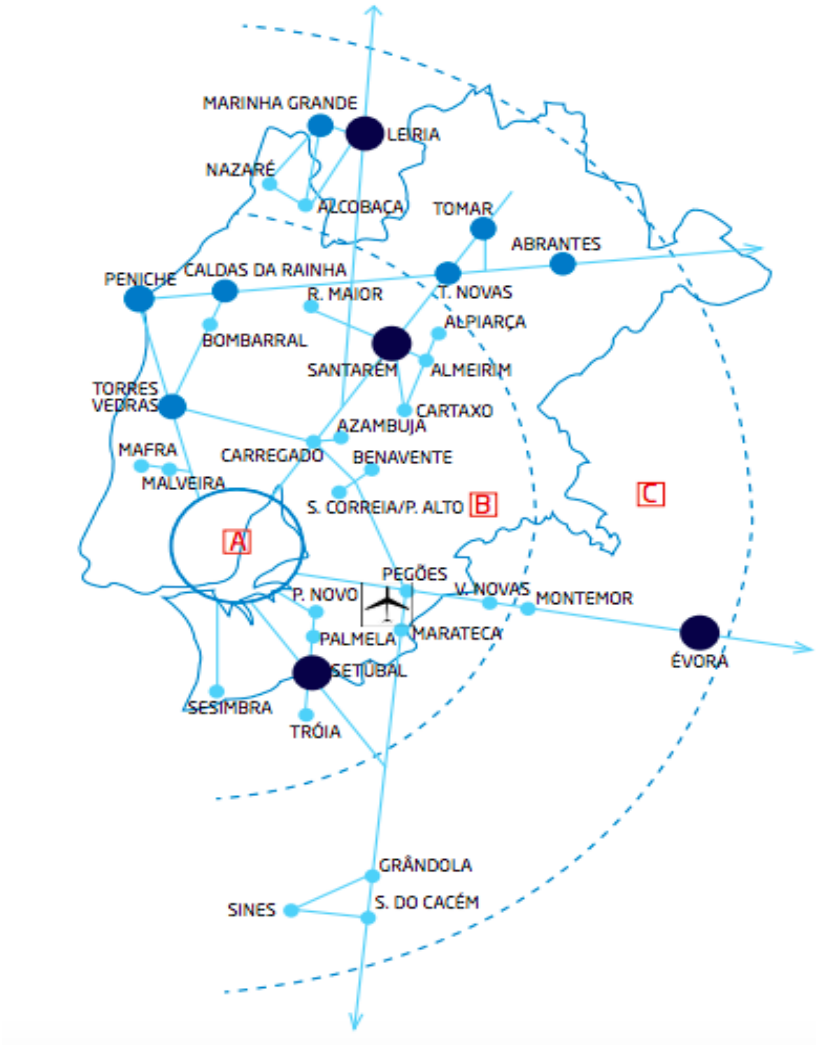


Figure 22 – Strategic Area for the Port of Lisbon Development

Source: (APL, 2019)

In the figure presented above, we can see what can be described as the strategic area for the development and growth of this Port infrastructure. Zone A is designated the urban area where its role is to conjugate and articulate with the city existing infrastructures and deal with urban pressure. Zone B already includes the entire metropolitan area of Lisbon, as well as neighbouring municipalities, and finally Zone C, that the objective is to have a broader influence of port operations on the construction of an emerging zone of economic dynamism, directly influencing the growth of opportunities and businesses in the district of Leiria and Évora.

In this context, the Port of Lisbon must respond to the needs and requirements of development of the emerging metropolitan region while reinforcing its competitive capacity in the national, Iberian and European port systems. This will require:

- The emergence of new logistics areas, which should be seen as an opportunity for the economic dynamism, in which this port must articulate itself to improve the efficiency of the regional and national freight transport and treatment system;
- Improvement of the environmental performance of the freight transport system and also the requalification of port areas that are not used anymore for supply chain operations.

6.6. Port Terminal

Alcântara Terminal

Several entities (APL & LISCONT) mention that Alcântara Terminal will be overloaded in a very short term which leads the APL and LISCONT (the company to which the Alcântara Terminal is leased) to consider alternatives that will help to respond efficiently. this problem.

The capacity problem presented by LISCONT Terminal is supply rather than demand. According to this entity there is too much demand, if there was more capacity there would be a greater likelihood of more ships entering. So the solution presented above is to increase its capacity in order to grow in a sustainable way.

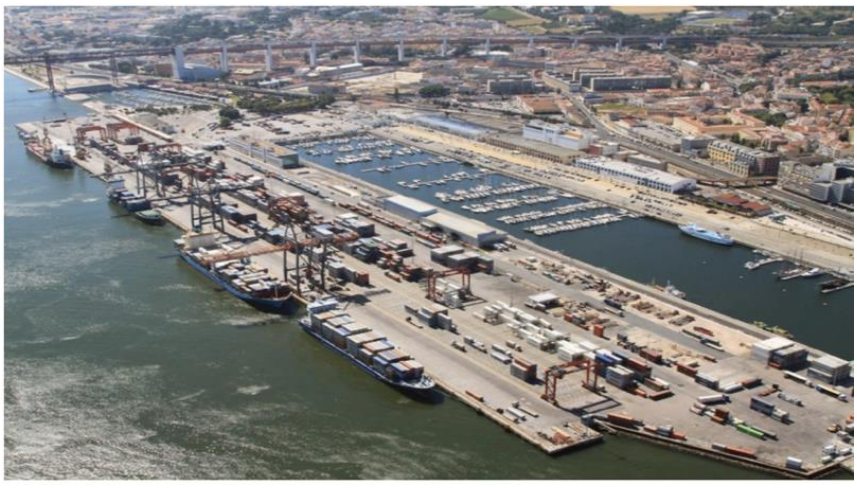
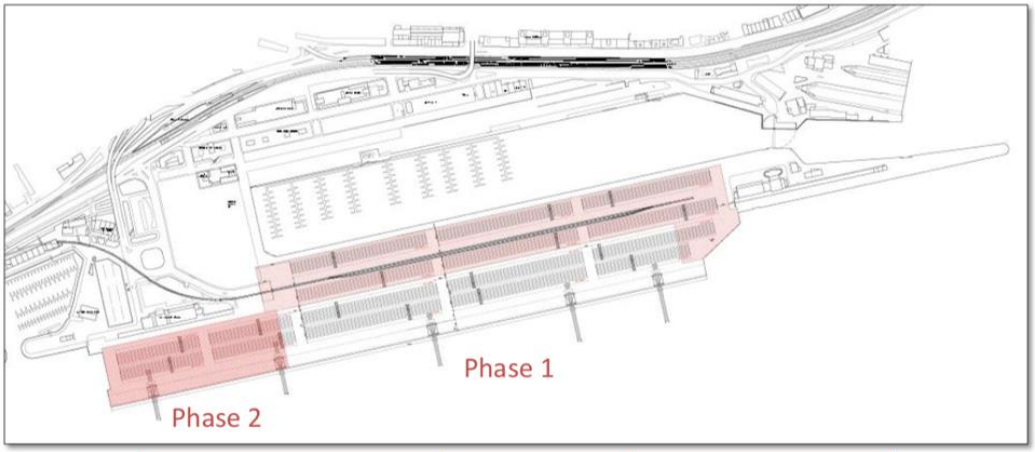


Figure 23 – Alcântara Terminal

Source: (LISCONT, 2017)

This project aims to increase the capacity of the Alcântara terminal by increasing its efficiency by installing modern equipment and increasing funds for larger ships. It focuses on harnessing the berth of 630 meters to 1090 meters in an area of 21 hectares with a capacity of up to 650 000 TEU. It is divided into two phases of development to minimize impacts on daily operation and because it is a large scale investment. One of the notes that is important to mention is that it will go from 3 berths to 5 and it is important to note that in the following plan this is shown.



	Present	Future
Length of quay (m)	630	1 090
Main terminal area (m²)	130 000	182 500
Container capacity (TEU / year)	350 000	650 000
Reefer plugs	200	400

Figure 24 – Project for Alcântara Terminal Expansion

Source: (LISCONT, 2017)

This project will the reinforce the dredge system, increase the docks and repaving of the embankment area. At the equipment level, the gantries make a maximum of 90000 movements for each berth, as the terminal has three berths giving a total of 270000 movements.

7. Conclusion

The elaboration of the present dissertation has allowed to reach the proposed objectives conditional to the lack of data to support the conclusions obtained. Nevertheless, we conclude that Portugal has an extreme need to emphasize itself in port competitiveness and may contribute to it by set industry in port areas.

According to several authors, there are factors that contribute to the competitiveness of a port, and there is no "perfect solution" nonetheless, an adaptation within the framework of national ports and to port of Lisbon. Thus, the research has consisted of a theoretical framework on the subject, a deeper study of the situation of port of Lisbon, as well as the analysis of the competitive environment and also about port competitiveness. Subsequently, innovative projects were identified in order to address "weaknesses" and improve the attractiveness of this port infrastructure.

Currently, Portuguese ports have connections to the rail network, motorways and logistics platforms which are not fully explored; insufficiency of port logistics zones (drydocks) that allow the concentration of cargo for shipping / receiving by rail, as well as the installation of industrial and logistics activities with added value to the logistics chain.

Portugal should benefit from its geostrategic location, which is on the intersection of major world shipping routes, in particular, with links between Europe and America, Africa and Asia. Also it has natural conditions for developing deep-sea maritime-port infrastructures. To be competitive, it is necessary to develop measures that increase the volume of traffic, add value to the goods transported and sustain the evolution of the port and develop the entire surrounding region, consequently the national economy.

Currently the 3 largest national ports, are the port of Sines, Leixões and Lisbon, which handle about 85% of all containerized cargo in our country. The port is an economic multiplier, due to the effects that it produces through the port activities, the proximity industries and the industries being an agglomerating centre of activities. It contributes to wealth creation and promotes regional development (sustainability of industries and job creation), which is fundamental for economy of small regions.

Regarding Alcântara Terminal, LISCONT, should continue its strategy in order to grow in terms of cargo and ships handled. The project which are in place is to increase its efficiency and cargo handling area. The increase in berths from 3 to 5, as well as the capacity to receive cargo from 350 thousand TEU / year to 650 thousand TEU / year will positively enhance the attractiveness and market opportunities of this terminal. If this situation changes from medium to long term, due to an even more substantial increase in the number of vessels, then LISCONT should consider a change of business model, by looking for other solutions such as a "dry port", outside the urban perimeter.

The logistics single window is a solution that are being put in place, which has a strong adherence to the concrete needs of business processes used on the ground by the stakeholders. It also presents an opportunity because its degree of adaptability in its architecture, allow its application on any national port, regardless of the reality of each and the types of systems, being used. As a result, ports, by managing electronic flows, will be able to better analyze and evaluate the behavior of the hinterland served, as they now hold data that they did not previously have capacity to handle and as such, may develop new business strategies to increase their performance. Also it will be more agile to treat information coming from the various stakeholders, which is undoubtedly one of its greatest assets in a world on permanent changing.

The present work has shown that the land and sea (stakeholders involved in the process) businesses are different because they want to meet different expectations evidenced by their customers but in some respects are similar since there needs to be a joint effort for the merchandise reach the customer according to all established parameters. The relationship, sea and earth, is not always easy because when one side is affected, the other side is also causing serious imbalances in port activity.

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