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The ‘Portuguese Range’ as the Westernmost Maritime Region of Europe

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Ports located in the Portuguese west coast have been collectively defined as the ‘Portuguese Range’, constituting a multi-port gateway system integrated within the broader context of an already well-established traditional maritime region. The aim of this paper is to identify how the Portuguese ports have been developing and how they can establish themselves as a gateway to the Iberian Peninsula and Western Europe. In fact, Portuguese range ports, located at the extreme of rail freight corridor n°4, could greatly benefit from ‘port regionalization’ into bordering regions of Spain, the Madrid Community and Northern Europe, forming in this way a competitive gateway to foreland regions along the Atlantic Ocean, such as Latin America, North America, West Africa and Southern Africa.

The paper first describes the current situation of Portuguese ports regarding infrastructure, superstructure and throughput, aiming at establishing its capabilities, level of activity and potential problems. Regional transport infrastructures current status, such as rail lines, inland terminals and dry ports are also reviewed, including projects currently foreseen by authorities. Main problems and bottlenecks in regional connections are identified. Main shipping lines calling in Portuguese ports, terminal operators, railway operators and 3P logistics service providers operating in Portugal are also identified. The strategies for promoting ‘port regionalization’ adopted by these different players in the supply chain are reviewed and analyzed, with focus on shipping lines, terminal operators, freight forwarders, port administrations and Governments. Conclusions are drawn and policy suggestions are made for further improvements in the regionalization of Portuguese ports, taken as an enhancer of economic growth.

Keywords: Ports, Regionalization, Intermodalism, Logistics, Transport networks, Competition.

1. INTRODUCTION

Maritime clusters have been discussed extensively throughout Europe for many years now, with a significant number of maritime regions claiming to have a maritime cluster located within its borders. In general, the concept of cluster implies the existence of a set of companies and organizations focused on a specific economic activity and engaged in interactions (cooperation or competition) between themselves. The concept implies a density of activity leading to the creation of critical mass in the concerned activity, synergies between the different companies and specialization of functions.

It is a controversial subject whether Portuguese maritime activities represent a fully developed and active maritime cluster (Salvador *et al.* 2015, Simões *et al.* 2015). Notwithstanding this, it is beyond doubt that Portugal remains the westernmost maritime region of Europe and that Portuguese ports are one the most active components of a possible maritime cluster in Portugal (Liberato *et al.* 2008). Furthermore, the long west coast of Portugal provides a number of good ports, which constitute a valuable asset for the Portuguese economy and have been collectively named as the 'Portuguese Range' by such authors as Notteboom (2010, 2013). Their location within the same country and the geographical proximity between them, while at the same time serving largely overlapping hinterlands, means that they constitute a multi-port gateway system.

The integration in the European Union has now come to a stage where the building of a common market requires Portuguese ports to take a new role within the EU as a competitive gateway to foreland regions along the Atlantic Ocean, such as Latin America, North America and West Africa. The first and foremost regions which could benefit from this new gateway role could be the cross-border regions of Spain and the Madrid community. The development of rail freight corridor n°4, integrated in the new transport infrastructure policy (TEN-T), could then make it possible to use the Portuguese range as a gateway to northern Europe. This rail corridor, in particular, runs from the Portuguese ports of Leixões, Lisbon and Sines towards Madrid, France and Germany.

The fundamental theoretical concept behind a successful strategy for developing these ports into a viable gateway to Spain and beyond is 'port regionalization'. This concept was originally developed by Notteboom and Rodrigue (2005) and has been applied to the Portuguese range by Santos and Guedes Soares (2015a). It involves aspects from the

development of infrastructures (ports, railway, intermodal terminals) to business and marketing strategies.

This paper presents an empirical study on the changed role that Portuguese ports could take as the gateway to Spain and Northern Europe for cargos coming from the Atlantic Ocean, establishing this activity as the leading sector within a renovated Portuguese maritime cluster. The overall aim is to assess the current status of port regionalization in the Portuguese range, complementing the study of Santos and Guedes Soares (2015b) by including relevant data on connectivity of Portuguese ports and stakeholder's policies. The study is focused on containerized cargo and related infrastructure and stakeholders, as this is the main type of cargo for which regionalization is important.

The paper is organized as follows. Section 2 provides a review of literature on port regionalization. Section 3 describes the situation regarding infrastructures in container terminals, railway lines and inland terminals and dry ports. Section 4 characterizes the level of utilization of the mentioned infrastructures. Section 5 reviews the strategies towards regionalization adopted by the different stakeholders. Section 6 indicates the current status of regionalization in Portuguese ports. Finally, conclusions are drawn in section 7.

2. PORT REGIONALIZATION

Different conceptual perspectives have been proposed throughout the years to describe how ports evolve in time and space. Especially noteworthy is the concept of 'port regionalization', introduced by Notteboom and Rodrigue (2005), in which the hinterland of the port is expanded through different strategies and policies in order to link it more closely with inland freight distribution centers and terminals, organized in a regional network of load centers interconnected by transport corridors. This phase attempts to answer issues such as congestion of infrastructure, environmental constraints, limited handling capacity and the fragmented production and consumption of goods in modern societies. Regionalization results also from logistics decisions and subsequent actions of shippers and third party logistics providers, that is, it is to some extent market-driven. A major motivation of the market is to materialize cost reductions in the inland distribution.

This phase of port development promotes the formation of discontinuous hinterlands, characterized by 'islands' in distant regions connected with the port by transport corridors. The mentioned islands are formed around particular inland terminals with which the port establishes strong functional links. The size of the islands depends on the inland terminal

function as a gateway, efficiency and price of truck haul for completing the door-to-door transport. These inland terminals allow ports to intrude in the natural hinterland of competing ports.

Efficient transport corridors, typically consisting of rail lines, are a necessary condition for a successful regionalization strategy. Rodrigue *et al.* (2013) provide an analysis of the characteristics of different inland terminals in Europe and Northern America. Preferably, inland terminals should also be dry ports, with customs clearance given in these inland terminals. Roso *et al.* (2006) review the status of dry port terminals in Sweden. Notteboom and Rodrigue (2012) compare the characteristics of rail network, distribution and dry ports in Europe and North America.

The regionalization process has also been studied for different regions, for example around the port of Antwerp, by Notteboom (2006), or from the perspective of inland waterway transport, see Notteboom (2007). Another approach to the study of regionalization is the work undertaken by Garcia-Alonso and Sanchez-Soriano (2010) and Martínez-Pardo and Garcia-Alonso (2014) on the analysis of port hinterlands in Spain.

It is also important to recognize that ports have become elements embedded in supply chains, as pointed out by Robinson (2002) and that these supply chains compete among themselves. In fact, some large carriers have extended the scope of their activities towards the land based freight distribution side of supply chains, in parallel with similar trend for large container terminal operators. The value propositions of both are thoroughly discussed in Van den Berg and de Langen (2014).

This paper reviews the infrastructure status and the policies of stakeholders necessary for the promotion of regionalization of Portuguese ports to the Spanish hinterland.

3. SUPPLY CHAIN INFRASTRUCTURE

3.1 Container Terminal Characteristics

The commercial ports that constitute the ‘Portuguese range’ are divided in two groups: the northern group with Leixões and Aveiro; the southern group with Lisbon, Setúbal and Sines. Figure 1 shows the location of the Portuguese range in the west coast of the Iberian Peninsula, centered on the three core European network ports: Leixões, Lisbon and Sines.

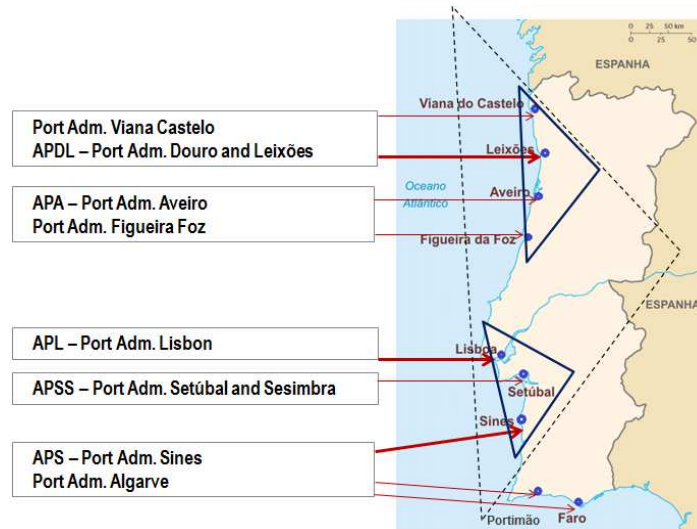


Figure 1 – The Portuguese range and its governance structure

Table 1 shows the characteristics of the existing container terminals in the Portuguese range. Leixões possesses the main container terminal in the north (TCL), which serves mainly the north and center of Portugal and is engaged primarily in short sea shipping. Lisbon possesses three container terminals (Liscont, Sotagus, TML), which, together with Sadoport container terminal in Setúbal serve the Lisbon metropolitan area and the southern part of the country. Liscont container terminal is called by a few deep sea services, although not integrated in the major East-West trades, while Sotagus terminal is engaged in short sea shipping and TML is dedicated to the domestic trade. Terminal XXI, in Sines, engages mainly in transshipment, integrated in the major East-West trades, but also called by north-south deep sea services and a few feeder services. The terminal in Setúbal (Sadoport) operates short sea ships. Terminal XXI is the terminal with the largest handling capacity, followed by TCL and by two terminals in Lisbon (Liscont and Sotagus). Sadoport is a comparatively newer terminal, somewhat under equipped for the area and quay length available and TML is very small, operating only with geared feeder vessels in the Portuguese Atlantic islands trade.

Table 1 - Characteristics of container terminals in the Portuguese range

	TCL	Liscont	Sotagus	TML	Terminal XXI	Sadoport	Total
Handling capacity (TEU)	650.000	350.000	450.000	~85.000	1.320.000	~250.000	3.105.000
Quay length (m)	900	630	750	480	940	725	4425
Quay water depth (m)	12	14	10	6	17.5	12	
Area (ha)	22	12	16.5	4.8	36	20	111
Yard capacity (TEU)	13150	8592	10300	2300	-	-	
Maximum size of ships (TEU)	4000	6000	2000	~700	18000	5000	
Quay gantries	5	3	5	-	9	2	24


3.2 Railway Connections

Railway lines are fundamental in the establishment of high capacity corridors to inland terminals in distant regions. Their cost structure points to economic gains when used for cargo flows which penetrate deep in the hinterland (Notteboom 2010). ADIF (2013) and REFER (2014) provide a comprehensive and updated description of the Spanish and Portuguese networks, which are interconnected in one location in the north and two locations in the east. The two interconnections in the eastern border are integrated in rail freight corridor n°4, see Atlantic Corridor (2014).

As far as port regionalization is concerned, the most important issue is the number and quality of the interconnections between the Portuguese and Spanish networks. In this respect, different parameters are of importance: speed, rail gauge, single or double track, electrified or not, voltage and type of current, type of catenary, maximum slopes, minimum radius of curves, maximum length of train, maximum load per axle, maximum speed, signaling and control system.

Table 2 shows some of these parameters for the three existing border crossings. Railway characteristics immediately next to the border are shown, but in different segments along the line the characteristics may vary. All lines have the Iberian rail gauge and the only electrified line is in the Portuguese side, connecting to Vilar Formoso. Speeds are lower on the Portuguese side but maximum train length is restricted on the Spanish side, being much lower than the European standard of 750m. Figure 2 shows that, apart from the interconnection issues shown in Table 2, further issues exist at the French border because the rail gauge and voltage are different. These technical issues greatly hinder the use of rail freight corridor n° 4 as a means to extend the hinterland of Portuguese ports.

Table 2 - Characteristics of railway lines in interconnections between Portuguese and Spanish networks

Connection	Type	Gauge	Electrified	Max. Speed	Length of train	
Valença – Spanish side	Conventional Single track	Iberian 1668 mm	No	160	220	
Vilar Formoso – Spanish side	Conventional Single track	Iberian 1668 mm	No	140	550	
Caia – Spanish side	Conventional Single track	Iberian 1668 mm	No	200	400	
Valença – Portuguese side	Conventional Single track	Iberian 1668 mm	No	85	-	
Vilar Formoso – Portuguese side	Conventional Single track	Iberian 1668 mm	25 kV/50Hz	90	750	
Caia – Portuguese side	Conventional Single track	Iberian 1668 mm	No	120	-	

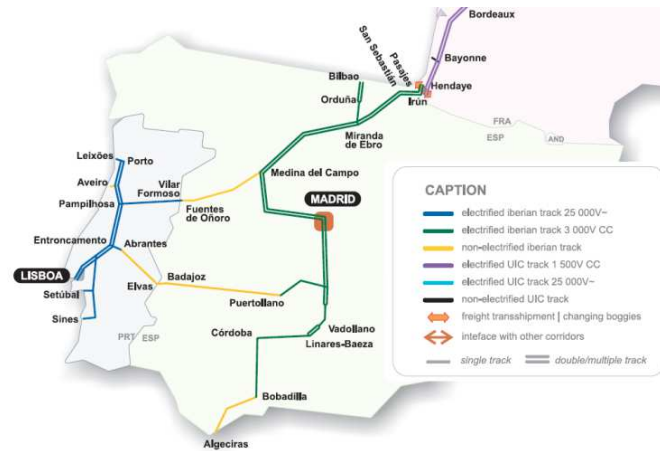


Figure 2 - European rail freight corridor 4, adapted from Atlantic Corridor (2014)

Another important issue relating to railway infrastructure is whether the lines are actually running to the port terminals. According with REFER (2014) there are railway terminals in all five main ports and in every case the rail tracks run into the container terminals, but generally the lines are not electrified in the last mile.

In order to solve the existing shortcomings of the Portuguese railway network and its connections to Spain, the Portuguese government has approved an integrated transport plan, presented in ME (2014). It has been announced that by 2020 the railway line between Caia and the three southern ports will be fully upgraded.

3.3 Inland terminals and dry ports

As per the definition given by Roso *et al.* (2008), a dry port requires an intermodal terminal, fitted with gate and customs so that customers can leave the containers as if directly in the seaport, coupled with a high capacity transport means to the seaport (typically railway).

One type of dry port is the distant dry port, which is typically close to a major urban area away from the seaport and is the most common type of dry port. Several examples of these dry ports and inland terminals exist in Spain around Madrid and Zaragoza, with some characteristics given in Table 3 and its geographical location shown in Figure 3. Most of them have Spanish custom's facilities and are fitted with good rail connections, qualifying as dry ports. The operators of these terminals are container terminals operators (Noatum Valencia) or port administrations (Barcelona). These terminals are oriented to Spanish ports in the Mediterranean.

Table 3 – Inland terminals and dry ports in Spain

Region	Major promoter	Year	Handling capacity	Storage capacity	Rail tracks
Noatum rail terminal, Zaragoza	Noatum Valencia	2013	165.000TEU	3300TEU	6 rail tracks of 690m-850m
Conterail, Madrid	Noatum Valencia	2000	107.000TEU	4700TEU	7 rail tracks of 420m-475m
Terminal Marítimo de Zaragoza	Port of Barcelona	2001	~60.000TEU	-	10 tracks of up to 750m
Centro Logístico San Lázaro, Mérida	DLEX	2014	40.000TEU	-	tracks up to 400m
PLSWE, Badajoz	Junta Extremadura	2016?	237.000TEU	1700TEU	9 tracks of 750m (5 tracks in the first phase)
Expacio Mérida, Mérida	Junta Extremadura	2016?	230.000TEU	1200TEU	6 tracks of 560-740m
Expacio Navalmodal, Cáceres	Junta Extremadura	2016?	332.000TEU	1400TEU	8 tracks of 750m
Zaldesa, Salamanca	CyLog	?	-	-	Yes, but to be improved

Table 3 includes also another five inland terminals of interest to Portugal, located in Extremadura and Leon, existing or planned, which can be categorized as mid-range inland terminals (to be developed to full dry ports). There has also been for some years now the project to develop the Puerta del Atlantico inland terminal, in Mostoles, west of Madrid, which is not included, however, in EU-DGMOVE (2014a) study. In Badajoz, works are already underway in the Plataforma Logística del Suroeste Europeo (PLSWE), immediately next to the Portuguese border, and the works will be concluded in 2016. This platform will include a dry port working in cooperation with the Portuguese ports.

Concerning the north sector of the Portuguese range, namely the connection between Aveiro and Spain and associated inland terminals, the ports of Leixões and Aveiro have been in contact mainly with the Salamanca logistics platform, Zaldeza. Since 2013, Zaldeza and the port of Leixões cross-operate warehouses. The development of an inland terminal and dry port in Zaldesa is included in the EU-DGMOVE (2014a) study but no starting date is public.

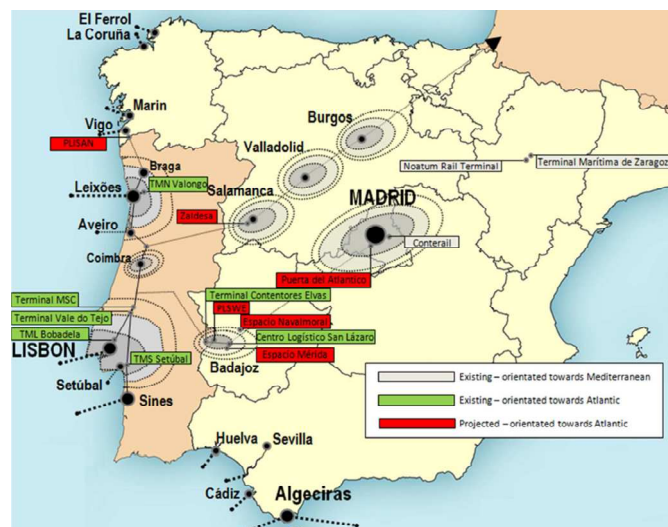


Figure 3 – Location of inland terminals in Spain and Portugal

4. UTILIZATION OF INFRASTRUCTURE

4.1 Container Terminal Utilization

Port throughput in the Portuguese range has known in recent years some growth, in what concerns containerized cargo, although some ports have had significant operational set-backs due to labor unrest. Santos and Guedes Soares (2008) evaluated the cargo handled in Portuguese ports between 2001 and 2007. Significant conclusions were that container throughput was increasing significantly in Leixões and Sines and container terminals in Lisbon and Setúbal were underused.

Since then, Sines has grown to become a significant transshipment hub in East-West trade lanes, constituting an example of the “deconcentration within a port system” phenomenon described by Notteboom (2010). Although being mainly a transshipment hub, Sines cannot be seen as decoupled from the Portuguese range as it is contending with the port of Lisbon for different hinterlands.

Figure 4 shows the evolution of the container throughput (in TEU) in the five concerned ports (with seven terminals) between 2002 and 2014. The most significant terminals are TCL in Leixões and Terminal XXI in Sines. At the same time, these are the terminals where throughput is growing. Sadoport in Setúbal has also grown considerably in the last year, approximately 47%, although throughput remains low. Sines handles a substantial number of TEUs. In 2014, around 78% of its throughput consisted of transshipped containers.

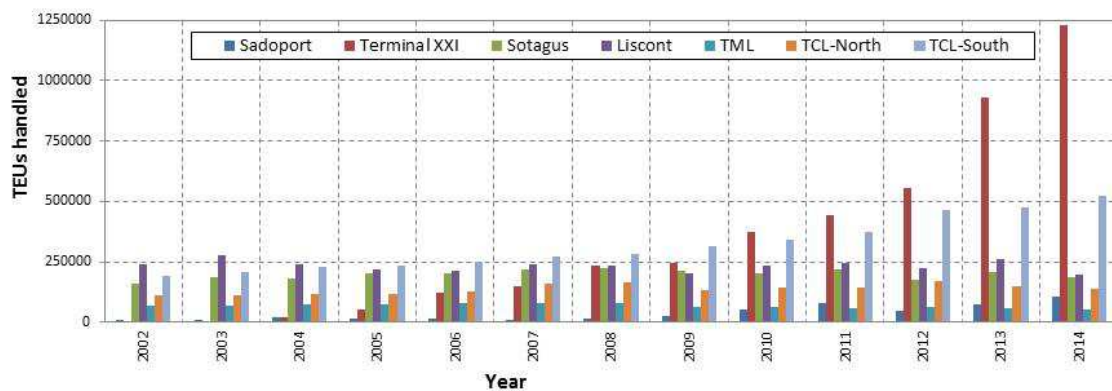


Figure 4 – Container terminals throughput in Portuguese ports

Figure 5 shows the capacity utilization levels in the different terminals between 2002 and 2014. Note that design capacities used to calculate utilization are the ones existing in 2015, implying an underestimation for earlier years. TCL terminals are now operating very close to

design capacity. Terminal XXI in Sines is also nearing full utilization, but works are underway to upgrade its capacity.

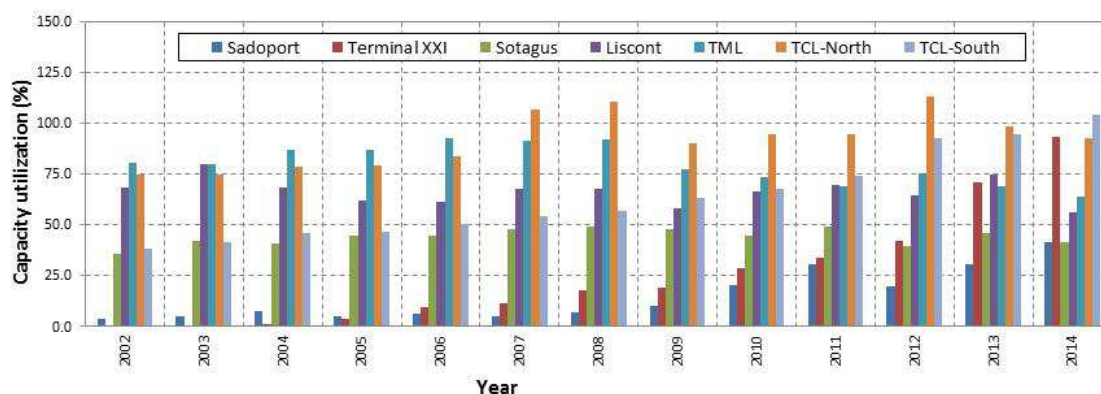


Figure 5 – Utilization of container terminals in Portuguese ports

The utilization of the container terminals is directly related with the number and characteristics of the liner services calling in Portuguese ports, shown in Table 4. It is possible to conclude that Lisbon and Leixões clearly have more services than other ports. Sines has a much larger gross capacity of ships calling each week, due to the fact that ships coming to Terminal XXI are larger than the ones calling in other ports. The maximum size of ships calling in Sines is currently 13.000TEU, while it is only 1.200TEU for Setúbal. Lisbon receives ships more than twice as large as Leixões.

Table 4 – Number and type of services calling in Portuguese ports

	Number of services	Gross capacity of ships per week (TEU)	Maximum size of ships (TEU)	Maximum length of ship (m)	Maximum draft of ship (m)	Maximum length for port (m)	Maximum Draft for port (m)
Sines	16	77.100	13.000	350-360	15-15.5	400	17.5
Setúbal	6	4.660	.1200	140-160	8-10	WL	9.5-12
Lisbon	32	36.865	5.700	260-280	13-14	240-WL	11-14
Leixões	27	23.414	2.400	190-210	11-12	220	10-12

Table 5 shows the geographical reach of the liner services calling in Portuguese ports. The world regions directly connected to each port are shown as shaded. Sines has the widest reach, connecting the country with every continent and is fully integrated in the major east-west trade lanes. Setúbal is restricted to short sea shipping (Europe and North Africa). Lisbon and Leixões are also engaged primarily in short sea shipping and domestic services, but Leixões features some deep sea lines to West Africa and Southern Africa, while Lisbon is additionally connected to the Americas (North and South), implying some integration in the major East-West trade lanes. In general, Portuguese ports provide comprehensive direct connections with most of the world.

Table 5 – Geographical reach of Portuguese ports

Region\Port	Leixões	Lisbon	Setúbal	Sines	Region\Port	Leixões	Lisbon	Setúbal	Sines
West Coast US		x		x	Azores-Madeira	x	x	x	
West Coast South America					Canary Islands	x	x	x	x
East Coast Canada		x		x	Cape Verde	x	x		
East Coast US				x	Maghrebe	x	x	x	x
Gulf of Mexico		x		x	West AFR	x	x		x
East Coast South America		x		x	South AFR	x	x		x
Northern Europe-UK	x	x	x	x	East Coast AFR				
Northern Europe-Continent	x	x	x	x	Middle East				x
NE-Baltic	x			x	India				x
West MED	x	x	x	x	Australia				x
East MED				x	South East Asia				x
BlackSea					China				x
Spain-Galicia	x	x	x	x	Japan/Korea				
Spain-Asturias		x		x	-				
Spain-Basque Country		x		x	-				
Spain-MED	x		x	x	-				
-					Total	12/29	16/29	8/29	23/29

4.2 Railway Utilization

Besides the infrastructure issues which have been described above, it is also important to examine the operational structure of railways and the current levels of capacity utilization. Rail freight operation is carried out mainly by private companies: 16 in Spain, according with Fomento (2013), and 3 in Portugal. The following discussion relates to freight railway traffic between both countries but not necessarily bounded for Portuguese ports, mainly because it has been identified that a deficit exists in terms of statistical information relating to cargo carried by rail to Portuguese ports. Table 6 shows the results of a survey of public information released throughout 2014 and 2015, indicating the freight railway services between Portugal and Spain currently in operation.

Table 6 – Rail freight services Portugal-Spain

Promoter	Origin/destination	Weekly trains	Main cargos
CP Carga	Portuguese ports - Madrid, Saragoça, Valência, Tarragona e Barcelona,	3 (48 TEU)	Various
Takargo	Portugal-Barcelona	5	Various
ALB	Lisbon (ALB terminal) - Mérida (DLEX)	4 (46TEU and 1000t)	Fresh agriculture products
KLog	Alfarelos - Barcelona	2	Dangerous goods, paper, furniture, cosmetics and pharmaceutical products
Alfil Logistics	Riachos (TVT terminal) - Barcelona	1 (1000t), 3 in 2015	-
ALB	Lisbon (ALB terminal) – Badajoz multimodal platform	2	Tomato, olives, olive oil, wine

Figure 6 shows the number of daily freight services in the different lines in Spain, considering only trains bound for ports, being worth noting the high traffic density between Madrid and Valencia and Zaragoza and Barcelona. The traffic towards the Portuguese border is of little significance, but taking in consideration geography and natural conditions, it should be much more significant.

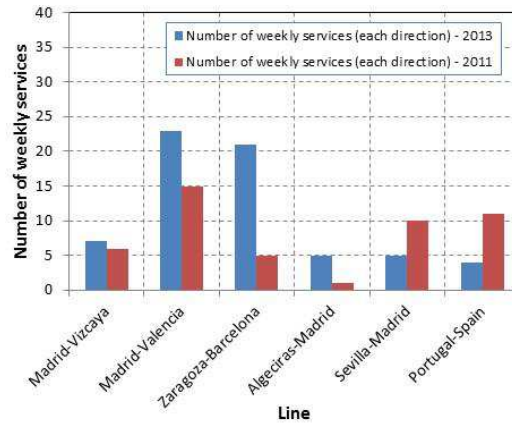


Figure 6 – Average number of freight trains per day in the Spanish railway network, ADIF (2014)

Figure 7 shows the net number of tons of cargo carried in containers by rail between different regions in Spain and between Spain and Portugal. The numbers include some internal cargo exchanges. Containerized cargo exchanged by rail between Spain and Portugal (entire country) is of the same order of magnitude than that exchanged across one of the major rail routes in Spain, namely Madrid-Valencia or Madrid-Vizcaya (Bilbao). The flow from Zaragoza to Barcelona is even larger. This indicates that rail traffic of containers between both countries is underdeveloped and points to a low regionalization.

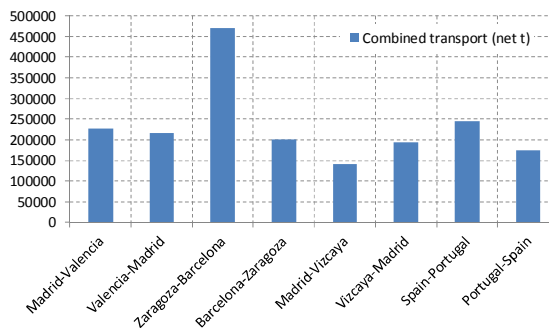


Figure 7 – Cargo (net tons) carried in containers by rail between different regions in 2011 (INE (2012), Observatorio del Ferrocarril (2012))

5. STAKEHOLDER'S STRATEGIES

Regionalization is not only about developing the necessary infrastructure, but also involving the stakeholders in its utilization. The most relevant stakeholders are port administrations, governments, terminal operators, shipping lines, railway operators, freight forwarders and 3P logistic service providers. Port administrations and governments (central or regional), that is the public sector, are mainly involved in the development, management and promotion of infrastructure, their main goals being the promotion of economic development (national

level), regional development and sustainability of transport solutions. The other stakeholders engaged in supply chains which use the infrastructure, mainly coming from the private sector, are concerned primarily with maximization of profit and development of their commercial activities at regional level. This section will start with the analysis of public sector policies, followed by an analysis of other stakeholder's policies.

5.1. The role of port administrations

The governance model currently followed in Portuguese ports presents the major features of the landlord port model, striking a balance between public (port authority) and private (port industry) interests. Under this model, the most common form of organization for large ports, the public port authority acts as a promoter of economic growth, aiming at expanding the port's hinterland to lower transport costs and foster development.

5.1.1. Concession agreements

A fundamental tool for enhancing the regionalization process is that of the concession contract, agreed between the port authority and the terminal operator. Through a carefully designed contract, the terminal operator's commercial attitude of profit maximization can be made to coincide with that of the public authority, which lies in increased throughput levels, economic growth and further extension of the port's reach to help decrease transport costs in an enlarged hinterland.

Concession agreements are likely the most important tool available to landlord port authorities in dealing with the terminal-operator industry (Pallis *et al.* 2010). Concession agreements commonly take the form of performance-based contracts to create incentives for the terminal operator to act in the public authority's interest.

Particular care should be taken to properly define expected throughput levels and related penalties and compensations should address failure to match the projected throughput. Only by means of a carefully designed concession contract can the seemingly opposing nature of the public and private interests be surpassed, allowing ports to become economically efficient assets and be able to attract private capital.

Taking into account that the public interest lies in high efficiency and increased throughput levels, while the terminal operator seeks a proper return on investment, the possibility of the payment of penalties in case of nonperformance (i.e., low efficiency and low throughput

levels) on the part of the operator are generally accounted for in a concession agreement. This motivates the operator to seek high throughput levels and not only a given return on investment (World Bank (2007)).

Despite this, in Portugal nonperformance penalties have frequently been absent from concession agreements, with some adverse consequences. For instance, according to the contract outlining the extension of the concession agreement for the Alcântara container terminal in the port of Lisbon, the operating risk is taken entirely by the port authority (Court of Auditors Portugal, 2009). Concerning another major container terminal in Portugal, the Terminal XXI in the port of Sines, criticisms to the concession agreement in place have also been vented on the following grounds: the lack of specification of minimum cargo movements; the absence of provisions regarding the quality of services; the inefficiency of the clauses related to the compliance with the investment goals; and the difficulty in applying the penalty system (Court of Auditors Portugal, 2010). Nonetheless, and concerning public interest, the concession contract in place for Terminal XXI has some positive aspects when compared to that of Alcântara Container Terminal, namely, the lack of guarantees of minimum revenue for the concessionaire to be borne by the awarding authority, or the flexibility to adapt the investments to the market conditions. Additionally, for Terminal XXI, the operational risk is taken entirely by the terminal operator.

Another crucial aspect of the concession contracts in place in Portugal is that port authorities have commonly sought concession agreements aiming at revenue maximization instead of promoting an increase in throughput levels. Moreover, operational and economic performance targets and associated nonperformance penalties have typically been laid down in an unclear manner or entirely excluded from concession agreements in place. Realizing the need to change some aspects of some of the concession contracts in place in the Portuguese seaport industry, and which hinder port efficiency, the Portuguese government has put forward a series of renegotiation processes of current concession agreements in order to increase the efficiency in port operations.

Table 7 – Concession contracts subject to renegotiation processes

Port	Terminal	Concessionaire	Start of the concession agreement [year]	Duration of concession [years]	Investment (concessionaire) 2001-2012 [million euros]
Douro and Leixões	Leixões container terminal ^(a)	Terminal de Contentores de Leixões, S.A.	2000	25	31
Lisbon	Alcântara container terminal ^(a)	Liscont – Operadores de Contentores, S.A.	1985	(b)	33
	Santa Apolónia Container Terminal ^(a)	Sotagus – Terminal de Contentores de Santa Apolónia, S.A.	2001	20	21
	Lisbon Multipurpose Terminal	Transinsular, Transportes Marítimos, S.A.	1995	15 ^(c)	-
Setúbal	Multipurpose Terminal Zona 1 ^(a)	Tersado – Terminais Portuários do Sado, S.A.	2004	20	9
	Multipurpose Terminal Zone 2 ^(a)	Sadoport – Terminal Marítimo do Sado, S.A.	2004	20	12
Sines	Container Terminal Sines XXI ^(d)	PSA Sines – Terminal de Contentores, S.A.	1999	30	123

(a) The concession contracts pertaining to these container terminals were the subject of the negotiation process as determined by the order 403/2014 of 14 March, of the Finance Ministry.

(b) The duration of this concession, originally fixed at 20 years, was extended until 2042 through the Decree-law 188/2008, of 23 September. This diploma was repealed by the Law 14/2010 of 23 July. However, in 3rd March 2014, the Portuguese Constitutional Court delivered the decision 202/2014, according to which the Law 14/2010 is deemed unconstitutional.

(c) This contract has been extended until a new bidding process is prepared.

(d) Terminal XXI concession agreement is also shown, although not subject to renegotiation.

In the Portuguese case, as outlined in ME (2014), a series of reforms in the port sector is envisaged, with the aim of increasing the sector's efficiency on one hand, and on the other hand, decreasing costs associated with the port industry, namely, by decreasing the port dues as a means of increasing the competitiveness of Portuguese exports.

In the aftermath of the referred strategic plan, the Portuguese government has launched the procedure for the re-negotiation of the concession contracts for the provision of services to cargo at port terminals. This negotiation process comes also in the context of the Troika Memorandum of Understanding. In total 9 concession contracts are subject to revision under the referred plan: two pertaining to the port of Douro and Leixões; one in the port of Aveiro; four for the port of Lisbon; and two for the port of Setúbal. Given their greater significance, only the concession contracts concerning container terminals are shown in Table 7.

5.1.2. Port price

One of the main issues for a properly designed concession agreement is the fixing of a maximum price that the concessionaire can charge to port users. This, together with performance objectives is one of the main tools for the public port authority to ensure the alignment between the private and public interests.

However, in Portugal, some questions have been raised concerning the adequacy of the imposed maximum port price levels. In particular, port price is frequently considered to be excessively high, with no adhesion to the real costs associated with the service provision. For instance, in 2010, in a sample of 29 terminal operators, 60% showed a return on equity of over 10%, with container terminal operators showing an average return on equity of 20% (for one container terminal operator, the *ROE* actually reached 40%) (Silva *et al.* 2013), which are considerably high values. This fact suggests an abuse of monopolistic power, possibly inadvertently allowed by public port authorities due to improperly designed concession agreements, the consequence of this being an increase in costs associated with port utilization and an inefficient use of publicly owned resources. Additionally, this suggests the possibility of a decrease in the maximum allowed port price to increase efficiency and decrease costs, without compromising the financial viability of the terminal operator.

5.2. The role of the Governments

Port regionalization would also benefit from the integrated development of the logistics infrastructure. The Portuguese government presented in 2006 a plan named *Logistic Portugal*, see MOPTC (2006). As shown in Figure 8, the plan included 4 port logistics platforms, serving Leixões, Aveiro, Lisbon (in Bobadela/Sobralinho) and Sines. In addition, 4 logistics platforms next to the north and eastern borders were planned (Valença, Chaves, Guarda, Elvas/Caia), with the stated purpose of expanding the hinterland of the Portuguese ports and attracting Spanish investment. Finally, 2 urban logistic platforms were also planned, each one next to one of the major Portuguese metropolitan areas (Lisbon and Porto).

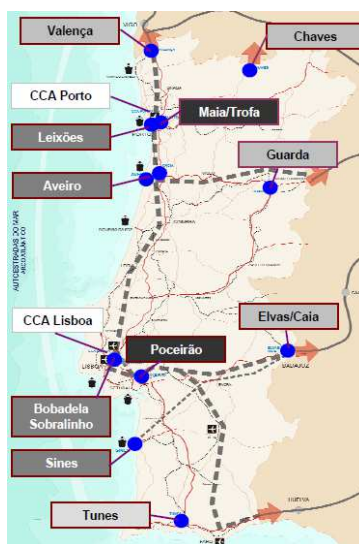


Figure 8 - Portuguese network of logistics platforms, MOPTC (2006)

Table 8 – Status of logistics platforms

Platform	Type	Status	Rail connection	Initial cost (millions euros)
Leixões	Port logistic platform	Infrastructures+superstructures built	Connection to be built (?)	118
Aveiro	Port logistic platform	Basic infrastructures built	Connection built (750m tracks)	80
Lisbon	Port logistic platform	Basic infrastructures built	Connection planned but not built	19
Sines	Port logistic platform	Infrastructures+superstructures built (some companies installed)	Connection planned but not built	65
Valença	Cross border platform	Infrastructures+superstructures built (some companies installed)	Connection planned but not built	71
Chaves	Cross border platform	Infrastructures+superstructures built (some companies installed)	No connection planned	97
Guarda	Cross border platform	Infrastructures+superstructures built (some companies installed)	Connection planned but not built	34
Caia	Cross border platform	Not built	Connection planned but not built	59
Maia/Trofa	Urban platform	Not built	Connection planned but not built	232
Poçeirão	Urban platform	Basic infrastructures built	Connection planned but not built	307
Tunes	Regional platform	Not built	Connection planned but not built	46

In early 2015, the situation was as shown in Table 8. The logistic platform of Leixões is under construction, spreading over two different areas, counting already with commitment of Zaldesa (logistic platform of Salamanca) and logistic operator Luís Simões. The other ports have also built their logistic platforms but not more than the infrastructure exists at this stage.

Regarding the logistic platforms near the border, the ones of Valença, Guarda and Chaves were indeed built or are under construction, often reduced in size with respect to initial plans, but have failed to develop into significant nodes in the supply chains connecting Portugal and Spain. Valença platform has a significant overlap with the PLISAN (Platforma Logistica e Industrial de Salvaterra-as-Neves) located in Spain only 20 km away, aiming at becoming the dry port of Vigo. This later platform is currently in the initial stages of construction and significant drops in real estate prices have been announced in order to attract more demand.

The Caia logistic platform has never been built, but a small freight rail terminal exists close to the border, in Elvas. The local town council and a Spanish freight forwarder (Transitex), actually part of a larger Portuguese company, have been cooperating in the development of this rail terminal. As mentioned before, Extremadura is now building a large logistic platform just across the Portuguese border, Plataforma Logistica del Suroeste Europeo (PLSWE), which will take the place of Caia platform.

Overall, the conclusion is that a substantial amount of money has been invested by public authorities, although most projects have not been built or have been downsized, and the utilization rate of most platforms remains very low. Progress in the south sector of the Portuguese range is lower than in the north sector. The role of the Guarda and Caia platforms will probably be taken by Zaldesa and PLSWE, both in Spain, located closer to population centres, respectively Salamanca and Badajoz. Valença faces significant competition from PLISAN. Oppositely, logistic platforms associated with ports have been largely completed.

5.3. The role of the terminal operators

In addition to the logistic platform network, mostly developed by central governments, local authorities and port administrations, other important drivers for port regionalization are terminal operators and 3PL services providers. The container terminal operators in Portugal are largely absent from engaging in operating intermodal terminals in Spain. The exception is Tertir, the holding company for Liscont container terminal, which also owns the Spanish freight forwarding company Transitex, which is operating the freight railway intermodal terminal in Elvas. This terminal also receives significant amounts of cargo from Spain and plans to increase the area of the intermodal terminal, allowing longer trains, and to build a container freight station allowing for consolidation and deconsolidation of cargo in containers.

On the side of the 3PL companies, it is possible to mention that Conteparque logistic operator, which in turn owns the ALB Área Logística da Bobadela SA, an intermodal terminal operator operating facilities located close to the four major Portuguese ports, is also receiving several trains per week from Extremadura, initially from Centro Logístico San Lázaro (Mérida) and now from the multimodal platform of Badajoz.

5.4 The role of the shipping companies

Shipping companies have not shown significant interest in obtaining cargos from Spain, probably because they also call in Spanish ports. The exception has been MSC, which promotes the most significant port-related railway freight traffic in Portugal. This is related to the container terminal in Sines (Terminal XXI), with trains leaving from the region of Lisbon and Setúbal and from Leixões. In 2012 MSC was sending to Sines 11 trains in each direction per week, while in March 2014 a record total of 96 trains in one week was recorded. From these, 86 inbound and outbound trains came from the intermodal terminals in Lisbon-

Bobadela and Riachos, where MSC has an intermodal terminal. Additionally, 10 trains to Leixões were also sent and received. In late 2014, reports indicated that an average of 10 freight trains per day was being sent/received in Terminal XXI. Sines is also receiving 2/3 trains per week from an intermodal terminal near Setúbal. The trains are generally operated by CP Carga. These developments indicate a regionalization process happening within the Portuguese range itself, rather than directed towards the exterior, aiming at setting up a discontinuous hinterland for the port of Sines. MSC is currently a candidate to the privatization of CP Carga, the Portuguese public railway operator.

7. CONCLUSIONS

Ports in the 'Portuguese range' have now the opportunity to expand their hinterland to Spain and possibly to Northern Europe, in what concerns containerized cargo, through the use of rail freight corridor nº4. However, this paper allows the conclusion that even regionalization into Spain remains weak.

It has been shown that railway connections between Portugal and Spain need to be significantly improved and that even with the current limitations a renewed interest from railway operators, logistic service providers and intermodal terminals has already been shown. However, handling of cargo by rail remains low, especially when compared with Spanish lines connecting to major Spanish ports.

A number of inland terminals and dry ports are under construction in Extremadura, most notably PLSWE in Badajoz, and these are expected to enhance the regionalization of Portuguese ports, whose administrations are actively promoting these infrastructures. In this respect, completion of related railway infrastructure investments has been announced for 2020 and is of the utmost importance.

Regarding port infrastructure, existing container terminals in Portugal have a handling capacity of 3.100.000 TEU per year. The Portuguese government has presented a number of projects to largely expand this capacity and meet future demand. The Portuguese range is well served by container liner services which connect directly the country with most regions in the world. However, the port of Sines is handling the vast majority of the liner services connecting to regions outside of the Atlantic and Mediterranean basins. Lisbon is the only other port directly connected to the American continent.

The most active stakeholders in promoting regionalization in Portugal have been the port authorities, mainly through establishing agreements with Spanish authorities, inland terminals and logistic platforms on cargo exchange, cross-operation of infrastructures and joint marketing actions. Terminal operators and shipping companies have shown little interest in this process, with the notable exception of MSC.

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REFERENCES

- ADIF (2013), Description of the Network 2013 (in Spanish), Madrid, Spain.
- APL (2002), Development of the strategic plan for the port of Lisbon – phase 4 (in Portuguese), Lisbon, Portugal.
- Atlantic Corridor (2014), Rail Freight Corridor N°4 - Corridor Information Document.
- Court of Auditors (2009), Alcântara Container Terminal Concession - Port of Lisbons, Audit Report nr 26/2009 - 2S. Lisbon, Portugal.
- Court of Auditors (2010), Terminal XXI Awarding Audit - Port of Sines, Audit Report nr 26/2010 - 2S. Lisbon, Portugal.
- EU-DGMOVE (2014a), Atlantic Core Network Corridor Study-Final report, Brussels, Belgium.
- EU-DGMOVE (2014b), Core Network Corridors – Progress Report of the European Coordinators, Brussels, Belgium.
- García-Alonso, L., Sánchez-Soriano, J. (2010), Analysis of the Evolution of the Inland Traffic Distribution and Provincial Hinterland Share of the Spanish Port System, *Transport Reviews*, 30(3), pp. 275-297.
- Fomento (2013), “Plan of Infrastructures, Transport and Housing PITVI (2012-2024)” (in Spanish), Madrid.
- INE (2012), Transport Statistics (in Portuguese), Lisbon, Portugal.
- INE (2014a), Regional accounts for the 2000 to 2013 period (in Portuguese), Lisbon, Portugal.
- INE (2014b), Regional accounts for Spain (in Spanish), Madrid, España.
- Liberato, J., Salvador, R., Guedes Soares, C., Correia Ferreira, A. (2008), The Portuguese Maritime Cluster in a European and World context. (in Portuguese), Guedes Soares, C. & Costa Monteiro C., (Eds.). *O Sector Marítimo Portugues*. Lisboa: Edições Salamandra, Lda.; pp. 41-58.
- Macário, R. (2009), Paradigms and Development Strategies: Portugal Logístico, Proceedings of 15° APDR congress, Cidade da Praia, Cabo Verde.
- Martínez-Prado, A., García-Alonso, L. (2014), Analysis of the inland port regionalization process in Spain, *Procedia – Social and Behavioral Sciences*, 162, pp. 228-236.
- ME (2014), Strategic Plan for Transports and Infrastructures – 2014-2020 Horizon, (in Portuguese), Lisbon, Portugal.
- Notteboom, T. (2006), Port regionalization in Antwerp, in *Ports are more than piers*, pp. 307-328, Liber Amicorum Willy Winkelmanns, Antwerp: De Lloyd.
- Notteboom, T. (2007), Inland Waterway Transport of Containerised Cargo: from Infancy to a Fully-fledged Transport Mode, *Journal of Maritime Research*, Vol. IV, No.2, pp. 63-80.
- Notteboom, T. (2010), Concentration and the formation of multi-port gateway regions in the European container port system: an update, *Journal of Transport Geography*, 18, pp. 567–583.
- Notteboom, T. (2013), Recent traffic dynamics in the European container port system, *Port Technology International*, Issue 58.
- Notteboom, T., J-P Rodrigue (2005), Port Regionalization: Towards a New Phase in Port Development, *Maritime Policy and Management*, Vol. 32, No. 3, pp. 297-313.
- Notteboom, T., Rodrigue, J-P (2012), Dry Ports in European and North American Intermodal Rail Systems: Two of a Kind?, *Research in Transportation Business & Management*, Volume 5, December 2012, pp. 4–15.
- Observatorio del Ferrocarril (2012), Report 2011 (in Spanish), Madrid, Spain.
- Pallis, A.A., Notteboom, T. and De Langen, P.W. (2010), Concession agreements and market entry in the container terminal industry, *Maritime Economics and Logistics*, vol. 10, no. 3, pp. 209-228.
- REFER (2014), Network description (in Portuguese), Lisbon, Portugal.

- Robinson, R. (2002), Ports as Elements in Value-driven Chain Systems: the new Paradigm, *Maritime Policy and Management*, vol. 29, nº3, pp. 241-255.
- Rodrigue, J-P., Notteboom, T. (2013), Containerized Freight Distribution in North America and Europe, in *Handbook of Global Logistics - Transportation in International Supply Chains*, Bookbinder, J.H., Springer, New York.
- Roso, V., Woxenius, J., Lumsden, K. (2008), The Dry Port Concept: connecting Container Seaports with the Hinterland, *Journal of Transport Geography*, Volume 17, Issue 5, September, pp. 338–345.
- Roso, V., Woxenius, J., Olandersson, G. (2006), Organization of Swedish Dry Port Terminals, EU INTERREG NORTH SEA PROGRAMME - SUSTACCESS.
- Salvador, R., Simões, A., Guedes Soares, C. (2015) Participative approaches in the Portuguese maritime cluster . Guedes Soares, C. and Santos T.A. (Eds.), *Maritime Technology and Engineering*, London, UK: Taylor & Francis Group; pp. 149-154.
- Santos, A. M. P. and Guedes Soares, C. (2015a), Competition dynamics between the Hamburg-Le Havre and the Mediterranean port ranges. Guedes Soares, C. & Santos T.A. (Eds.). *Maritime Technology and Engineering*. London, UK: Taylor & Francis Group; pp. 87-98.
- Santos, T.A., Guedes Soares, C (2015b), Port regionalization in the Portuguese range, *Proceedings of ECONSHIP 2015 – European Conference on Shipping, Intermodalism & Ports*, 24-27 June, Chios, Greece.
- Santos, T.A., and Guedes Soares, C. (2008), Analysis of the Trends in Cargo Handling in Portuguese Ports (in Portuguese), in *O Sector Marítimo Português*, Guedes Soares, C. and Costa Monteiro, C. (Eds.), Edições Salamandra Lda., Lisboa.
- Silva, J. A., Cardadeiro E., Alte T. S.. (2013), Revision of the contractual model and regulation mechanisms in the port sector, (in Portuguese) Final report. Autónoma University, Lisbon.
- Simões, A., Guedes Soares, C., Salvador, R. (2015), Multipliers, linkages and influence fields among the sectors of the Portuguese maritime cluster. Guedes Soares, C. and Santos T.A. (Eds.). *Maritime Technology and Engineering*. London, UK: Taylor & Francis Group; pp. 155-164.
- Van den Berg, R., de Langen, P. (2014), Towards an 'Inland Terminal Centered' Value Proposition, *Maritime Policy & Management*.
- World Bank. (2007) Port Reform Toolkit, Public-Private infrastructure advisory facility. Washington DC, The world bank.