



Review

Challenges for the future of ports. What can be learnt from the Spanish Mediterranean ports?



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ABSTRACT

The tourist development along the Mediterranean coast, especially on the coast of Spain, France and Italy, has caused a huge urban expansion and consolidation of a highly densified harbour front. The environmental consequences should bring about the future growth of the existing system of ports through its re-qualification development. The article provides a list of 6 strategies for the future improvement of ports that correspond to the areas of research in the international port literature. These ideas had been deeply developed in previous works from different disciplines, but they are now put together in order to offer a general vision of the debate: (1) marine strategy and integrated coastal management, (2) sustainable port infrastructures, (3) port networking initiatives, (4) regionalization of ports, (5) urban and landscape connectivity, and (6) social integration of ports. The text collects some literature on each of the views and suggests throughout the topics some ideas to be considered for existing ports in general and specifically for the Spanish Mediterranean ports.

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1. Introduction

The Spanish Mediterranean coast has been highly transformed in the last 50 years because of a mass tourist activity. The natural

and original landscape has been occupied by new urban settlements, as “an elongated city” (Mass and MVRDV, 2000), and a densified system of small ports all along the coast (Nebot et al., 2010). This provides mainly technical-nautical services and relies heavily on tourism. This development has been enhanced especially over the last 25 years since the beginning of port devolution process in 1992 (Castillo-Manzano et al., 2013). From the early 1990's each Spanish region can develop its own policies in terms of

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port issues (since the adoption of the law 27/1992, 24th November, State Ports and Marine). These differences of management and a lack of coordination between regional interests have caused imbalances in the general port infrastructure as well as territorial decompensations (Pie et al., 2012). There are areas with a high development of port services and some others with very few installations as it is shown in Fig. 1.

This pressure over certain coastal areas has caused environmental damage as the result of not only the construction process of ports but maintenance and exploitation (Alemany, 2004). The loss of wildlife, alteration of natural dynamic processes, and loss of natural beaches are some of the consequences of this development. However, it shouldn't be forgotten the economical benefits that these touristic extensions have brought for the local economies and communities (Kuznetsov et al., 2015). The debate is now focused on the balance between environmental concerns and economic importance.

The last tendencies in port development suggest the extension and re-qualification of existing infrastructure instead of constructing new ones (Alemany, 2005. 22–27), prioritising nature conservation. There is much literature available about sustainable and quality development of existing ports. Moreover, there are some projects in process focused on this idea of renovation vs. new ports, introduced below.

In this context of discussion, 6 strategies are proposed as new opportunities for the future of port development: (1) marine strategy and integrated coastal management, (2) sustainable port infrastructures, (3) port networking initiatives, (4) regionalization of ports, (5) urban and landscape connectivity, and (6) social integration of ports. These topics correspond to areas of research that have been previously studied by experts. The aim of this article is to

offer a general point of view and explore how these fields offer new possibilities for existing ports. These 6 concepts will structure the essay. Each of them will be introduced from some literature available and discussed focusing on the future of ports in general, and specifically in the case of Spain.

2. Marine strategy and integrated coastal management (ICM)

The current increase of demand of maritime space for different activities and the impact they have on coastal resources require the adoption of an integrated planning and management approach (Directive 2014/89/EU of the European Parliament the Council of 23 July 2014). An Integrated Coastal Management suggests taking into account all areas involved in the exploitation of maritime resources, from the port activity, marine biodiversity, aquaculture, fishing, energy, nautical tourism, landscape, transport, and infrastructure. The main objective of ICM is adopting adequate decisions for the global group of activities, promoting a sustainable and balanced development of the Coast (Peña, 2004). Integrated management promotes a global project for the coast, where different institutions from several maritime activities and policy-levels, work together or at least agree with the same policies and criteria.

In the case of the European countries, the European Commission has been recommending the application of an integrated planning and management in coastal areas for the last 15 years (Commission of the European countries, 2000). However this recommendation had not been implemented until 2013, when a legislative proposal to support the implementation of Marine Spatial Planning and Integrated Coastal Management was adopted for the European members (Commission of the European Communities, 2013). This text includes the complementary nature of the maritime spatial

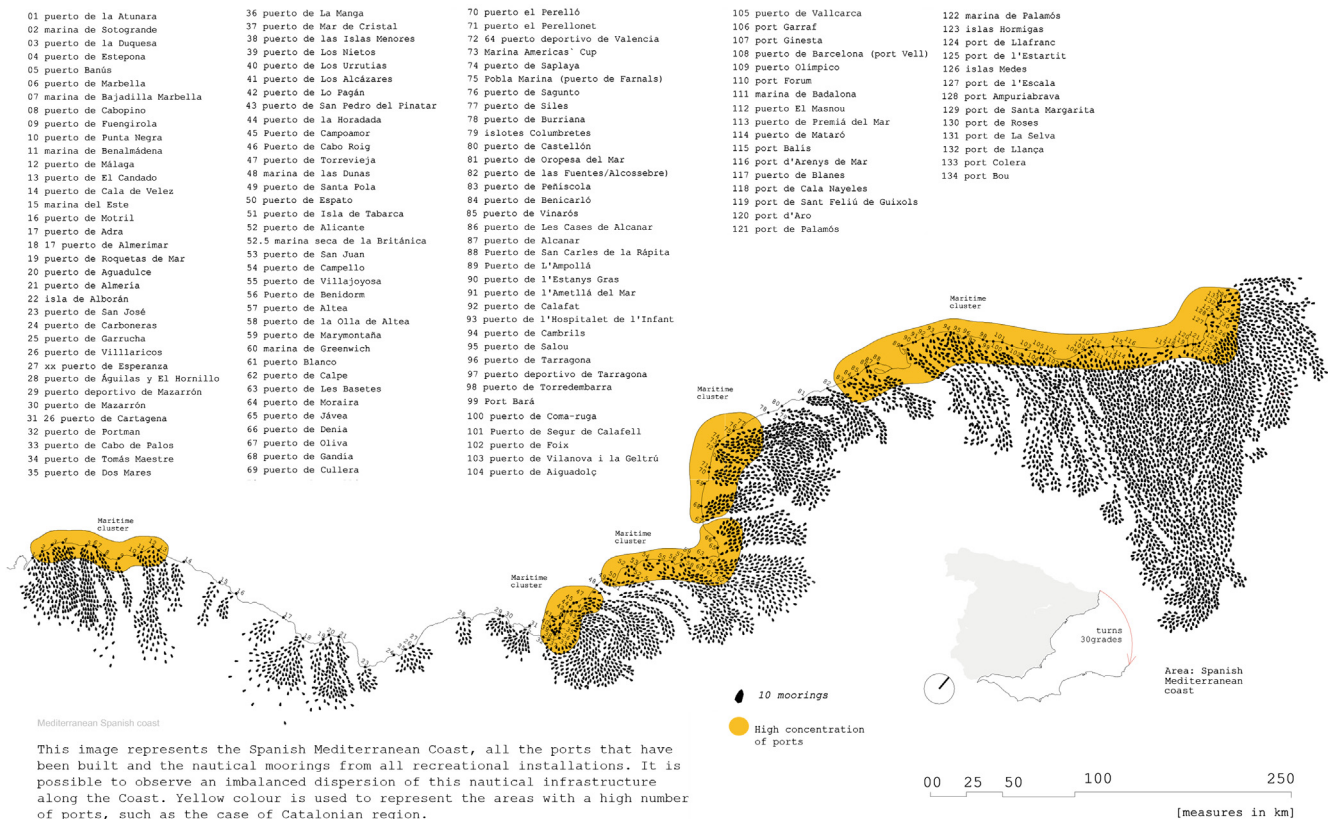


Fig. 1. Imbalances in port infrastructure/maritime clusters. This image represents the Spanish Mediterranean coast, all the ports that have been built and the nautical moorings from all recreational installations. It is possible to observe an imbalanced dispersion of this nautical infrastructure along the Coast. Source: own elaboration.

planning and the integrated management of coasts, both as tools for improving planning and management of land-sea interface (Zamora-Rosello, 2014). The new proposal established a specific working space for all maritime activities mentioned above. This proposal requires a coordinated relationship between institutions especially in relation with ports and infrastructure development over the coast.

With regard to integrated coastal management, some Mediterranean countries¹ have acquired a formal commitment through the ICZM Protocol 2012–2019 in the Mediterranean (PAP/RAC 2013). The core purposes and objectives of this Action Plan are to implement this protocol based on country-based planning and regional co-ordination. In order to achieve these purposes, the countries will develop national strategies, specific coastal plans, and programs within the same criteria and objectives. (Rochette et al., 2012).

The debate about the ports should be integrated in the ICM project and Marine Spatial Planning; a global proposal for the coast should condition this port development in all regions. In the past, the construction of ports was allowed in many areas as a way of promoting tourism, as in the case of the Mediterranean coast. This should not be allowed in the future anymore. The new construction of ports endangers the existence of natural beaches, ecological environments, and tourist activity in other coastal areas. As Capucci et al. (2011) indicate “Sediment management is becoming a critical issue around the world, particularly where the development of harbour facilities, the conservation of coastal environments and needs of tourism compete for sustainable use of sediment resources”.

The role of ports is essential in planning and integrated coastal management, and therefore attention should be paid to the relationship between coastal and port policies. An interesting relationship between government coastal policies (between 2004 and 2008) and the role of the ports is pointed out in the analysis of Barragán Muñoz (2010) on a new integrated coastal management in the Spanish model. As it can be read in this text, “in the first version of the coastal policy, harbours had an important role (commercial ports were separated from the marina ones), while that a year later, in the second version of the coastal policy, harbors disappeared as an issue to discuss”. The author attributes these changes to the initial predominance of technical criteria over politics when making this coastal policy. The conclusion of this points out the need to emphasize the role of ports within coastal policies beyond political interests.

It is necessary to think of ports development from a global perspective, considering the entire coast and not only the regional areas in separate parts. No sectors, including port development, should aspire to maximising their benefits; instead, they should promote a balanced development for all of them (Peña, 2005). Alemany (2005, 22–27) pointed out the need to avoid construction of new ports without taking into consideration the surrounding infrastructure already built. So far this has not been achieved in the case of the Mediterranean Spanish Coast (Pie et al., 2012). This global vision would allow re-balancing some aspects such as the pressure over certain coastal areas or the low level of development in others (Nebot, 2012). At this point it seems there is a widespread agreement on the need of integrated policies and initiatives between the different maritime activities in the regions. But ICM also requires understanding and management of coastal systems at national, regional and local government policy-levels (Celliers et al., 2015; Barragán Muñoz, 2003).

This question of common policies was discussed in details in the

meeting of experts on port development “Future of Maritime Towards 2030” in the University of Antwerp (Belgium, 2011). This discussion consisted of two points of view. On one hand, the need of having a general vision was confirmed, but on the other, the idea of maintaining the identity of each region was also considered. However, according to McLaughlin and Fearon (2013) the conclusion of the meeting underlined the importance of having this general perspective in order to balance the different national and international interests. Regarding ports, the commitment to an integrated coastal management and the new framework for the management of maritime space (Directive 2014/89/EU of the European Parliament and the Council of 23 July 2014) between European countries must be seen by regional and State Governments as an opportunity to review their port policies.

In the case of Spain, the diagnosis made by Barragán (2003) on an integrated coastal management, points out important deficiencies, caused by the economic pressure on coastal space and resources, as well as a lack of interaction between different administrative levels. The new European context of Integrated Coastal Management has led to the design and planning of a national strategy such as the Sustainability Coastal Plan, the opening of an Observatory of the Spanish Coast and agreements between the central government and coastal regions (Report Gestión Integrada de las Zonas Costeras en España, 2012). However, the success of this strategic coastal management instrument is not clear yet. The lack of coordination between regional and national strategies or the high improvisation of some coastal management policies call into question the future of the Spanish ICM (Barragán Muñoz, 2010). At this point Peña² suggests the design of a new single project of ports for the whole Spanish coast so that all regional interests can be considered and balanced out (Mendez, 2008).

3. Sustainable port infrastructures

In recent years it has increased concerns about the environmental impact due to the development of ports. There are numerous research papers studying ecological issues in ports and port management policies in relation to green port development (Peris-Mora et al., 2005; Gupta et al., 2005; Darbra et al., 2009; Capucci et al., 2011; Ausili et al., 2012; Lam and Notteboom, 2012). Many of these research works focus on experimental analysis or case studies of European experiences. Lam and Notteboom (2012) make an interesting comparative study between European ports (Antwerp and Rotterdam) and Asian ports (Singapore and Shanghai) with regards to green port development, and findings show that ports are particularly mature in applying environmental standard regulations.

A definition of a sustainable or green port is one in which the port authority and port users pro-actively and responsibly develop and operate, based on an economic green growth strategy (PIANC, 2014). All initiatives of PIANC, The World Association for Waterborne Transport Infrastructure (www.pianc.org) are of great interest and focus on different types of sustainable strategies. The report “Sustainable Ports—A Guide for Port Authorities” (PIANC, 2014) develops the “green port philosophy” concept and it includes proactive environmental measures and strategies for sustainable development of ports. Some of the key issues pointed out are: environmental quality (soil, water, air and noise), habitat and integrity of ecosystems, energy efficiency and energy transition (from fossil towards renewable), materials and waste management,

¹ So far the members involved are Albania, Croatia, European Union, France, Montenegro, Morocco, Slovenia, Spain, Syria and Israel as the last country that has ratified the implementation of Protocol in 2014.

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and climate change mitigation and adaptation. This report allows a better understanding of ecological issues in port development and port management.

Lam and Notteboom (2012) indicate 3 types as the main impacts caused by ports. Firstly, air pollution, affecting the health of residents of the local community with respiratory diseases. Secondly, water pollution, due to the discharge of fuel oil residue, waste disposal from ships and cargo, and its effects on the marine ecosystem. Thirdly, the maintenance and upgrading of port infrastructure, causing a high impact on marine ecosystems due to dredging and civil works (Peris-Mora et al., 2005). The EU, in 2011, published an alert on Effective ICZM strategy identified for harbour dredging (European Commission, 2011). As it can be read in this document, “removing sediment from harbor beds to allow ships to enter can significantly accelerate coastal erosion and the gradual wearing away of land by the sea”.

A large number of studies highlight damages and identify strategies to mitigate coastal erosion as an example of effective Integrated Coastal Zone Management, as in the case of the Italian harbors Marina di Carrara (Capucci et al., 2011) or Augusta harbour (Ausili et al., 2012). Flushing efficiency of Augusta Harbor (Lisi et al., 2009) is another example of how contamination can influence stakeholders and population of surrounding areas on the transformation of ports in hubs, as well as delay the process of regionalization or enlargement of ports. In addition, some of the documents produced by PIANC can also be consulted as references of good practices (PIANC, 1997; PIANC, 2013; PIANC, 2016).

Regarding the incidence of ports and maritime works on the coast, Peña (2004) clearly explained some of these impacts pointing to its high impact on the nearby beaches, which in some cases may disappear. Alemany (2004) focuses on the impact caused by the construction of the sailing facilities. He points out the following impacts: the physical change in the configuration of the marine and terrestrial environment, the occupation of the coast, the difficulty of access to the sea for citizens, the growth of developments in port environments and the access to new natural areas with environmental value.

One of the main problems in the western Mediterranean coast, specifically, on the Spanish coast, has been the scattered location of facilities dedicated primarily to recreational boating. In many cases, these facilities have been used as instruments for coastal development. In addition we should take into account the lack of rigorous studies of environmental and landscape impacts, and the damage caused due to a lack of understanding and interaction between port infrastructure and marine and terrestrial environment (Alemany, 2004). Port of the Future report (2015) includes the need to assess the impact of a port infrastructure: “An assessment of the state of the current coastal ecosystem, ecological feedback and environmental requirements of physical, chemical and biotic aspects for ecosystem functioning is required, using indicators that cover economic, social and environmental issues to determine whether port development would have impact on the coastal ecosystem”.

The emergence of environmental impact studies is an alert to the unthinking dynamic construction of these offshore installations. In Spain, since the late 1990s, environmental impact studies for the development of port projects are required. For example, the Law 5/1998, of April 17, Catalonia Port Act includes the obligation to incorporate an environmental impact and study of coastal dynamics in the port projects. Although these regulations, the problem of impacts appears from considering these studies as just paperwork without any quality result on the impact on the natural environment.

As an answer to all these impacts, “port authorities around the world are pursuing a greening of port management in view of safeguarding their ‘license to operate’ and increasing their economic and

environmental competitiveness” (Lam and Notteboom, 2012). Local, regional and state governments all around the world are also implementing new initiatives and policies for the sustainable growth of port systems. In the context of the Mediterranean area, some countries with a long tradition of navigation such as France, Italy or Spain, have proposed a sustainable port development, extending and improving existing ports instead of building new ones (Alemany, 2005. 22–27).

In the case of Italian ports, the program *Italia Navigando*, explained by Marconi and Bonetti (2005), was created to develop a system of 50 functional ports. The program mainly consisted of transformation of ports (90% of the project) and only considered new constructions in very poor areas. However, the promising project of national network of tourist ports in Italy has not achieved the success expected despite the huge investment program, and it has generated large debts as a result of questionable management (“il Fatto Quotidiano”, 2016; Senato della Repubblica, 2016).

In the case of the Spanish coast, it should be considered that in recent years some public administrations and institutions have designed strategic policies for the development and growth of the existing network of marinas, towards a more sustainable practice with the coastal environment. For example, the Plan of Ports in Catalonia 2007–2015 sets as priorities the expansion of existing ports facing the construction of new infrastructure, as well as the development of low impact installations as dry marinas, anchorage areas in natural harbors and removable facilities. Another example is found in the *Strategic Bases 2004 – 2015* document of the Public Ports Agency of Andalusia that agrees with the need to expand existing marinas against the new construction. In conclusion, there is an urgent need to assess the capacity of the coast to support more facilities in a global way.

These low impact performances on the coast imply a deep knowledge of the environment and its specificities. Proper location of infrastructure and a locally adapted design can minimize this impact. The *Port of the future report (2015)* concludes on the importance of the infrastructure morphology for a non-impact port development: “...the use of natural depths reduces the extent in which depth needs to be designed and maintained by dredging and hence habitats are less disturbed”. PIANC has emphasised with strength the need to develop a Working with Nature philosophy of designing and operating (PIANC, 2014). The concept of “working with nature” is today an area of research that will shape the design of port infrastructures in the future.

4. Port net-working: cooperation between ports

We now turn to the idea of a port networking system – an efficient and well connected group of ports – as a strategy for a quality development of existing ports. As it has been mentioned earlier we are considering the idea of a growth in terms of requalification and revision of the ports already built. The port networking theory points towards new relationships between ports for their future development. At the international debate of “Future of Maritime Towards 2030” mentioned in the section above, experts also concluded the need of cooperation strategies between ports. McLaughlin and Fearon (2013) added that “old rivalries and bitter politics will serve little economic purpose heading towards 2030, especially for competing ports within the same region”.

As Robinson (2002) pointed out more than 10 years ago, the concept of a network offers a new perspective where the value of each unit comes from the global system and from the capacity of cooperation between them: “Ports must now be seen as elements in value-driven chain systems or in value chain constellations”. Notteboom and Winkelmanns (2001) suggested that port networking would be the most important role of port Authorities in

the 21st century.

Since then, numerous research papers have been published on port networking; some of them show real experiences of collaboration between ports, as in the case of container ports in Hong-Kong and China (Song, 2003), Italian ports (Marconi and Bonetti, 2005), The Netherlands ports (Wolteboer-Van Donselaar and Kolkman, 2010), the ports in the South West of England (Chang, 2011) and some other international port areas (Notteboom et al., 2007). However, there are still very few countries with port networking experience; Australia, Holland, Germany, USA, Nordic countries as well as some Chinese and European ports are pioneers. And there are still many maritime areas that need a revision of their port system policies towards more efficient models.

The Netherlands Institute for Transport Policy research analyzes cooperation between port authorities (Wolteboer-Van Donselaar and Kolkman, 2010). The paper focuses on the study of different types of collaboration between the ports in Holland and it discusses the role of a Central Government as a promoter of port cooperation according to public interests. The report can be a useful reference for other governments that want to promote a more efficient use of their current port infrastructure. However, it is advised to point out that it suggests the application of centralised policies rather than promoting local and regional policies.

Moreover, this kind of collaboration can be established between ports from different countries and not only between regions from the same country. There are examples of cooperation between international ports, like the initiative Eco-ports (<http://www.ecoport.com/map>). It consists of a network of more than 150 European ports that share good practices on environmental concerns. They have already started some projects in relation with sustainability and coast in order to offer ecological services and facilities for the Eco-ports members.

Otherwise, the type of cooperation also depends on the level of commitment between ports, as McLaughlin and Fearon (2013) point out in their research. They identify different types of collaboration like the ones that establish a small commitment and do not require formalizing any relationship between port authorities. One of such examples are the ports of Rotterdam and Amsterdam that share information services. Another type of collaboration requires a high level of commitment, like the collaboration between the ports of Malmo in Sweden and Copenhagen in Denmark. The two port authorities joined in order to find a solution to the possible disadvantages that the bridge built between the two countries could cause.

Viola (2005) distinguishes between two types of ports in terms of activity and connectivity: the so-called “hub ports” that are well connected with a wide range of transportation, and the “satellite ports” between them. He suggests a collaboration between the main hub ports as well as between the smaller satellite ports. Services such as boat rental, maritime excursions, enterprise relations, tourist services, specialisation of ports are some of the possible strategies of networking (Chaparría, 2000).

In the case of the Spanish ports, it would be convenient to differentiate between the commercial harbours (General Interest Harbours) from the marina and fishing harbours as they have different functions, size and different environmental impact on the Spanish coast. But, above all these reasons, the two of them have different policies and management; the commercial harbours are the State's responsibility and the marina and fishing harbours are managed by the autonomic regions.

Nebot (2012) takes this idea of connectivity and tests it in the Mediterranean Spanish arc. The graphic made for this purpose distinguishes between two kind of networks as shown in Fig. 2. On one hand, “base-ports networks” which join those ports that are close to the main hubs of transportation, have a high boat capacity

and offer adequate services. And on the other hand, “secondary - ports networks”, which relate the ports located between the above mentioned, even though they do not offer as many services as the “base-ports”; however, they can enhance the cultural and the landscape values of the region where they are located. Most of these correspond to marinas and fishing ports with very different regional policies to each other. In this context of looking for new ways of collaboration between them, generic solutions cannot be applied for the whole of the coast. It is necessary to develop specific strategies according to local conditions within a common port planning context that assures the balance between regions.

The port infrastructure of the Spanish coast is different in each region in terms of size and number of ports and this diversity suggests specific strategies for a sustainable development. For example, in the region of Catalonia there is a high number of nautical ports along the coast –we can find ports every 4.5 km- and most of them have a capacity of over 600 moorings, as it is shown in Fig. 2. In this region port policies should limit the construction of new ports and instead, they should attend overcapacity problems by promoting collaborative initiatives as an alternative development. Another example is the region of Alicante, where there are also a high number of nautical installations, but unlike in the case of Catalonia they are generally small capacity ports of 200–300 moorings. Policies in Alicante should consider the extension of existing ports instead of constructing new ones. And at the same time, they should consider collaborations between the smaller ports in order to prevent external threats in a more efficient way. On the study of the Spanish coast Nebot (2012) offers some strategies for different regions and suggests some hypotheses to be considered by the current Spanish port Authorities.

Nebot also notes how cooperation between ports can promote a more efficient model and development of the current infrastructure in the Mediterranean area. The nautical maps (Nebot, 2012) clearly show a particular concentration of ports in certain areas of the coast as maritime clusters, shown in Fig. 1. This concentration of ports can help to develop strong relationships and interdependencies (Benito et al., 2003). Economic benefits, higher level of efficiency and innovation from ports in clusters, in comparison of the ones in isolation, are some of the reasons for activating these groups and their internal relationships (Chang, 2011). At this point port policies should consider programmes and initiatives for integrating local authorities, firms and organizations into the same network.

In conclusion from all cases that have been analysed in previous works we can already foresee a large number of possibilities in connection with the research of port networking. Cooperation between ports is now a challenge for the future of ports and without doubt, a field to be explored in the following years.

5. Port's regionalisation: ports as part of territorial transport systems

The idea of connecting the port infrastructure to the general system of transportation (airports, train and motorways) has been recently studied by experts. They agree with the idea that intermodal connectivity can optimise the freight distribution as well as bring more people from different areas (Castillo-Manzano et al., 2013). Notteboom and Rodrigue (2005) introduce this concept of regionalisation as a development of ports outside the proper extension of ports and based on the connection between them and the intermodal transport. On the territorial scale they find the opportunity to develop a net of corridors between ports and territorial centres instead of having isolated and badly connected systems of ports.

According to Notteboom and Rodrigue (2005) the improvement of connectivity means taking actions outside the ports. The concept

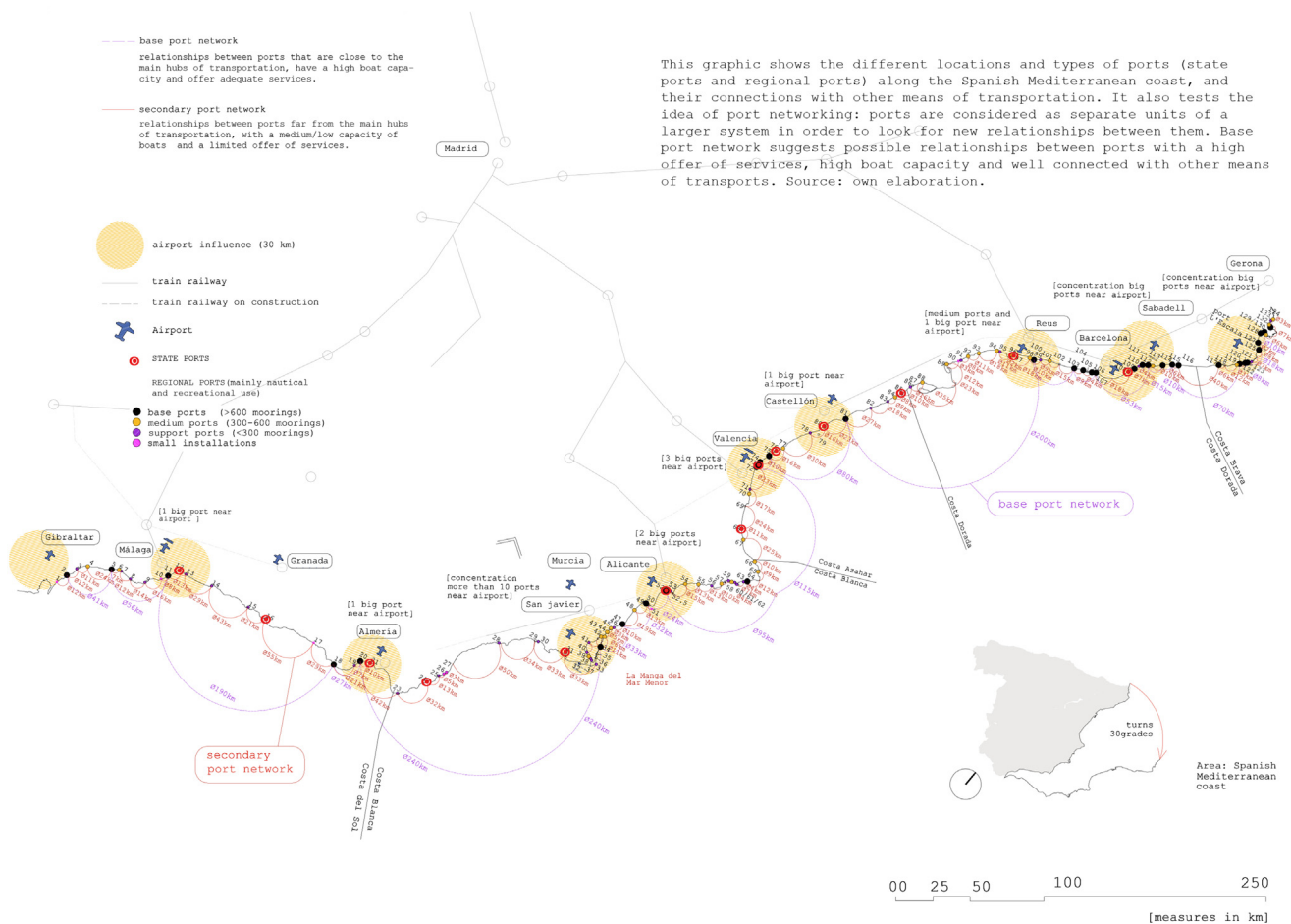


Fig. 2. Networking between ports. This graphic shows the different locations and types of ports (in terms of boat capacity), and their connections with other means of transportation along the Spanish Mediterranean coast. It also tests the idea of port networking. Ports are considered as separate units of a larger system in order to look for new relationships between units. Source: own elaboration.

of regionalization brings the perspective of port development to a higher geographical scale beyond the port perimeter. According to them different institutions and authorities must work together on the same policies, but not only port authorities on their own. Moreover, in the case of the main ports, and because of the high impact over the general system of ports and transportation, there should be a common Strategic Plan for the balance of all the interests involved. At this point some experts (Notteboom and Winkelmanns, 2001; Heaver et al., 2000) conclude that this process of regionalisation must be considered from the point of view of integrated policies.

In the case of Spain, a net of intermodal transportation had been developed in order to connect major production centres and promote tourism activity along the Mediterranean area. However, nowadays, there is still no good connection by train between the Spanish Mediterranean regions. The Spanish “radial” design of transport infrastructure has prioritised connections with the city of Madrid, located in the centre of the Iberian Peninsula, as it can be seen in Fig. 2. In 2013, the European Parliament approved the Mediterranean Railway Corridor for freight and passengers. This infrastructural project would connect Spain’s main harbours on the Mediterranean Sea and Gibraltar, such Barcelona, Tarragona, Valencia, Cartagena, Almería, Málaga and Algeciras, with Northern Europe (European Investment Bank website: <http://www.eib.org/projects/pipeline/2013/20130068.htm>).

Once again, Fig. 2 tests the application of this idea of

This graphic shows the different locations and types of ports (state ports and regional ports) along the Spanish Mediterranean coast, and their connections with other means of transportation. It also tests the idea of port networking: ports are considered as separate units of a larger system in order to look for new relationships between them. Base port network suggests possible relationships between ports with a high offer of services, high boat capacity and well connected with other means of transports. Source: own elaboration.

regionalisation on the Mediterranean Spanish coast. In this document all ports and territorial systems of transportation are represented in order to understand some current conditions and future opportunities, and some working hypotheses for the Mediterranean area come from these mapping trials. The first hypothesis is based on the idea that areas with high tourist development should have at least one “base-port”, with adequate technical services for boats and tourists, high capacity and good connections with other means of transportation (Figueira de Sousa, 2005). This hypothesis considers trying to improve existing transport infrastructures within an area of influence around the port. These improvements, however, should be carried out according to the urban complexity in which they are immersed in order to avoid territorial overload. The second hypothesis supports the idea of improving access from ports to local landscapes in the areas of the “secondary ports”, the ports located between the above mentioned (see Fig. 2). Nebot (2012) proposes different strategies for this purpose like improving the roads and pedestrian paths, offering a better service of public transportation, or bicycle and electric car rental services in the area.

6. Connectivity between ports and cities: ports as part of the urban systems

In the previous sections we looked at the development of ports from the point of view of improving the relationships firstly

between the ports themselves then secondly the relationships between ports and other means of transportation. The following part highlights the importance of relationships between ports and their local urban environments. There is much literature available on cities and ports. RETE, the Association for the Collaboration between Ports and Cities has made a big effort on the study of real cases. Specifically, the publication of journal *Portus* 22 focuses on the New Generation of Sustainable Urban Port Waterfronts (Alemany and Bruttomesso, 2011; Pavía, 2011). All these waterfronts recent experiences can be consulted in the journal *Portus* and the digital paper called *Portusplus*: <http://www.portusonline.org/>. Besides all these research initiatives, there are also recent port policies, as in the case of Spanish regional port policies, that include strategies for opening their ports to cities and transform their front ports accordingly. Busquets Garu (2004) points out that the cities are trying to recover their relationship with the sea.

Alemany (2005, 34–39) points out the influence that new sailing requirements have on the process of port transformation. The new commercial activities require conditions that the old ports could not provide so they had been abandoned for new ones. These old ports are not widely used and are now a good opportunity to include new activities according to the demands of the citizens (Bruttomesso, 2007). These port transformations started already in the 1960's with some well known examples such as the renovation of the St. Katherine Docks in London. Since then there have been many ports undergoing similar transformation and this have changed the relationship between ports and cities. (García Vázquez, 2008; Alemany, 2015).

Another successful port transformation is the transformation of the old port of Marseille, in France. This was converted some years ago from a commercial port into tourist and nautical port for small boats. As well as other Napoleonic ports embedded in the town, Marseille port did not have enough depth to meet the current industrial needs. Its transformation has led citizens from Marseille recover their relationship with the sea through a new public “water square” (Alemany, 2013). Other more recent examples such as the new Ocean Village at the Southampton Port in England, or the new Docks in Malaga, Spain, provide new insights into the international debate on port and city relationship. Andrade studies in depth this relationship through the analysis of ten cases of port cities; a research document to be considered for future urban and port policies (Marín Cots et al., 2014; Andrade Marqués, 2012).

The new nautical use for old ports is becoming a common practice in this context of port transformation (Alemany, 2005, 34–39). This new use lets the old ports to be re-used again as it offers new moorings according to nautical tourist demands without building any new infrastructure (Peña, 2004).

Beside the transformation of these old ports we should also consider the relationships between all the ports and their environment. Spanish Port Authorities have made an attempt to carry out such integration projects within their latest policies; an example of which is the new Plan of Ports in Catalonia. (http://www.ietcat.org/websites/ctp/MAPA_CTP/ES/catalunya_pu5.html). This plan provides some urban projects for the area outside the ports. This new interest of integrating the port areas and the cities has led to different initiatives from local governments. One such example is the architectural competition, organised by The Port Agency in Andalusia, for the integration between the port of Barbate in Cadiz and its local environment. The result was excellent and some of the proposals can be seen on the following website: http://www.barbate.es/opencms/opencms/aytobarbate/actualidad/noticias/2011/noticia_0308.html.

According to Pavía (2006a,b) there should always be continuity between the port infrastructure and the environment. In the case of urban ports the challenge is to connect the port with the city. In the

case of ports in natural environments, however, as in many ports in the Mediterranean Spanish Coast, the challenge is to integrate the port with nature. Such ports provide access to the local landscapes. Chapapriá (2008) also highlights the importance of adapting the shape of port infrastructure to the natural landscape. We can find some good examples on port-nature integration in the last projects of the landscape architect Bet Figueras.³ The extensions of Port Ginesta (Nebot et al., 2012) and San Carles de la Rapita (Reventos i Rovira et al., 2010) both in Catalonia, were carried out with the highest respect towards their surrounding landscape. These two projects are considered to be pioneers in integrating ports with their natural surroundings proving that a sustainable development of ports is still possible. Both projects can be useful references for future interventions in the Mediterranean Coast. Nebot PhD (2012) explores the integration between ports and their natural landscape and suggests some strategies to be considered for the development of the ports.

The proposals for extending existing ports instead of building new ones, as mentioned before, are an opportunity to revise and improve the relationships between the ports and their surroundings. The previously mentioned commitments acquired by many European countries on an integrated management of coasts, are pointing out the need to revise the port policies in relation with territorial and urban policies. All this suggests the importance of integrating ports and cities, or ports and nature for a sustainable development of ports in the following years.

7. Social integration of ports

Ports are often hermetic places and are difficult for local people to access. They can also be an obstacle to access the sea (Martorell et al., 1988). The following section points out the need to assure the access of local communities within the ports. Below we will attempt to justify an integration that would include a physical improvement of access as well as a social and economic development of the port activities, as per local demands (Ravesteijn et al., 2014). If the ports offer new activities and services for local people, it will increase their use and promote maritime culture among the citizens.

According to Ravesteijn et al. (2014), port and other infrastructure projects directly relate to citizen interests and values in terms of employment and welfare, but also, because of the expropriation of agricultural and otherwise used land. Alemany (2005, 22–27) openly criticises the privatization of coastal and port areas when he refers to a large number of marines that had saturated some areas of the coast. The construction and maintenance of marines (Alemany, 2004) has caused strong environmental impacts and they have also occupied some ecologically valuable coastal areas. He claims these marines should serve as public places and not exclusive areas for a minority of people: “*These exclusive facilities cannot justify anymore the occupation of such privileged coastal areas and their high cost and impact*”.

Consequently, these port projects cannot be developed without the consideration of citizens and all stakeholders in general. New approaches are being developed to meet citizens requirements as Ravesteijn et al. (2014) explain. Some port authorities are aware of the need to open these port areas for local people demands. The Andalusia Ports Agency within the Community of Andalusia, for example, has launched several initiatives to encourage citizen participation in the management of ports as available on the official

³ Her landscape projects are characterized by the way of approaching to the different situations: from a complex analyze and a specific answer for each of the places (Interview Bet Figueras, 2006).

website: <http://www.eppa.es/>.

Alemany (2005, 22–27) suggests the incorporation of new maritime uses for the local population within the ports. An adequate supply of activities in response to some local demands can ensure the constant use of the ports by the citizens. Some examples of these new activities could be the introduction of sailing in ports, fishing workshops, local markets of sea products, or some other maritime related activities. These different uses can promote social diversity within the ports, attracting not only boaters and tourists but local citizens too.

We can find some examples of such combination of activities within the ports that have led to successful and socially diverse ports (Nebot, 2012). For example, the Olympic port in Barcelona combines different kind of uses for the local population; there is a municipal sailing school, places for sport fishing and a lively commercial and recreational area by the docks. All these activities are very well connected to the city as there is a good urban project in place integrating the docks and the urban surroundings (Mackay, 2000). Fernandez et al. (2013) offer a very interesting point of view in terms of port activity diversity. Their “Coastal Farm” concept refers to a port that combines seaweed farming, fish farming, markets, coastal forests, coastal vegetation and research. According to them all these would ensure food, jobs, safety, economical benefits, transportation, environmental awareness and education for the local population.

In the different cases the strategy for a social integration of ports is based on the mixture of uses within the port; an adequate selection of services according to local and tourist demands.

8. Conclusions

The international debate for a sustainable development of ports is focused on the balance between environmental concerns and economical benefits. This is in line with the EU's approach to sustainable long-term maritime and maritime sector growth (European Commission, 2012). The 6 strategies proposed for the future of ports point out new possibilities for a sustainable development of the port system:

- (1) Regarding the marine strategy and ICM policies, the diagnosis made by experts reveals a practice with important weaknesses, as in the case of the Spanish coast. These have been aggravated by the economic pressure on the coastal space and resources, as well as a lack of relationship between the different administrative scales. The role of ports is central for an integrated coastal planning and management, and therefore relationship between coastal and port policies should be taken into account. The commitments made by different countries to develop an ICM and Marine Strategy must be seen as an opportunity to review the existing port policies. In the case of the Spanish Mediterranean coast the lack of coordination between regional and national strategies, or the degree of improvisation of some coastal management policies, have led to the imbalanced development of the ports system that should be considered in a future ICM project for the whole coast.
- (2) In regards to the sustainable port infrastructure experts agree on the importance of the infrastructure morphology for a non-impact port development, and focus on the concept of “harbour dredging”, natural depths and “working with nature philosophy”. A large number of studies on harbour dredging show the need to progress in this field of research that will probably condition the design of port infrastructures in the future. Experts also agree on the need of assessment about the state of the current coastal ecosystem,

ecological feedback and environments using indicators that cover economic, social and environmental issues to determine whether port development would have an impact on the coastal ecosystem. Last tendencies in port development projects and port policies suggest the extension and improvement of existing infrastructures instead of constructing new ones in order to minimize the impact caused by dredging and civil works on the marine ecosystem.

- (3) The port networking strategy points towards new cooperating relationships between ports for their quality development especially in case of competing ports within the same region. Ports in networking groups can obtain higher economical benefits, level of efficiency and innovation than ports in isolation. According to this idea, the different concentrations of ports along the Spanish Coast can help to develop strong relationships within the same geographical areas. The theory of clusters is of a great interest for the future of Spanish ports. However, although there are numerous research papers on port networking, there are still very few countries with such port networking experience. The study of some of these pioneer projects predicts numerous networking possibilities to be explored in the following years.
- (4) The port regionalisation strategy supports the idea of a development outside the extension of ports and based on the connection between them and the intermodal transport. Experts agree on the opportunity to develop a net of corridors between ports and territorial centres instead of having isolated and badly connected systems of ports. This strategy becomes an opportunity, not only for main ports, but also for smaller ones which, through these connections, can find a way to increase their different activities inside the port. These improvements outside the ports become an interesting field of research as in the case of the Spanish coast where two systems of nets are proposed. One is for main ports (base-port network) and the second one is for smaller ports (secondary port network). Both of them are based on the improvement of the connection between ports and intermodal transport.
- (5) The strategy of connecting ports and cities highlights the importance of relationships between ports and their local urban environments. Even though there is much literature available on real experiences, integration between ports and cities is still a challenge for the future as there are still many ports that are closed to their surroundings and to the local communities. The integration between ports and the natural environment is of a huge importance in Spain because of the high number of ports outside of urban areas. Spanish Local Port Authorities have already developed some policies for a better integration between not only ports and cities but also between ports and the natural environment. However, most of such projects of integration in Spain concern mainly urban ports and only a small amount of ports in natural environment. The first successful examples of the latter are in the region of Catalonia: Port Ginesta and Port San Carles de la Rapita. The integration of these ports with their natural environment demonstrates how landscape architecture becomes an essential discipline in the projects of ports.
- (6) Finally, the strategy for a social integration of ports points out the need to assure the access of local communities and promote a social diversity within the ports. Experts agree that an adequate supply of activities in response to some local demands can ensure the constant use of the ports by the citizens. Citizen participation becomes a useful tool that some port authorities already use in Spain for meeting

people's demands. Some recent researches promote different uses within the ports. This is achieved by innovative proposals such as the “Coastal Farm Project”. This project demonstrates how ports can be places of innovation and opportunity by including new activities for local communities.

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