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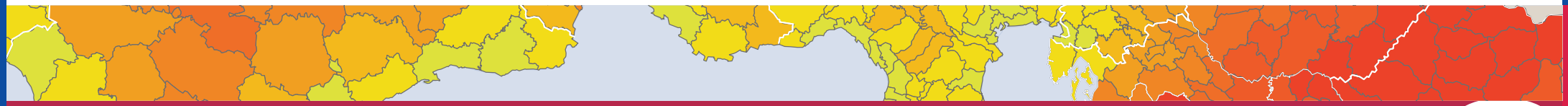

Territorial Observation No. 8
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8

Territorial Dynamics in Europe

Regions Integrating Land and Sea

EUROPEAN UNION
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INVESTING IN YOUR FUTURE

ESPON 2013 Programme

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Foreword: Land and sea - two sides of the same coin

The sea is closely connected with people's lifes in large parts of Europe. 35% of the European population live in coastal areas and 3% on islands. The sea is a valuable source of economic development, constituting a key pillar for trade, growth and employment. These valuable marine potentials are explained by the richness of the European seas in energetic, mineral and food resources as well as by their transport possibilities.

The maritime dimension as an integral part of growth strategies. The adoption of the Europe 2020 Strategy, which aims at smart, inclusive and sustainable growth, highlights the importance of exploring the added value of the marine environment. This new focus on the role of the maritime activities towards the achievement of the Europe 2020 goals dovetails with the Blue Growth Strategy formulated by the European Commission. Through this document, EU policy makers acknowledged the sea and the coasts as drivers of the economy and the development potential of the so-called blue economy, through the promotion of activities such as aquaculture, fisheries, offshore wind power generation and coastal tourism.

Growing synergies between maritime and regional policy. Traditionally, regional and territorial development policies have revolved around land-bound developments. This trend is changing due to the evidence that both land and marine development can help unfolding the growth potential of European regions and cities.

Europe's six seas. There are six seas in Europe, the Atlantic Ocean, the Arctic Sea, the Baltic Sea, the Black Sea, the Mediterranean and the North Sea. This identification is based on the application of several regional sea conventions such as OSPAR, HELCOM, and the Barcelona and Black Sea Conventions. However, the definition of seas and sea borders is not always straightforward.

Identifying European sea boundaries

The definition of marine borders is subject to complex arrangements, which vary depending on the topics at stake, as well as regimes and agreements of the countries involved.

The identification of marine boundaries is mainly based on maritime law and the international maritime conventions. According to maritime law, all nation states have declared territorial waters extending up to 12 nautical miles (approximately 22.2 km), while others have declared exploitation rights, based either on Exclusive Economic Zones which extend up to 200 nautical miles (approximately 370 km) from the shore, or based on the limits of the continental shelf, under the UN Convention on the Laws of the Sea.

In terms of European policy, there have been several approaches taken to identify the sea boundaries. The Marine Strategic Framework Directive (MSFD) divides Europe's seas into three broad marine regions and nine sub-regions based on an ecosystems services approach. This approach excludes the Arctic and the Black Sea. However, the EU's Integrated Maritime Policy Initiative or the agreement of the OSPAR Convention follow other approaches which are appropriate for their specific thematic interests, but which do not align with the MSFD boundaries.

The ESaTDOR project has adapted a pragmatic approach in delimiting the regional seas' boundaries (see Map 1). This ESPON Territorial Observation on maritime regions is based on results from ESPON projects that have researched different aspects of maritime issues. More specifically, these projects are ESaTDOR, TeDi, TRACC and GEOSPECS. The text builds on the objectives of the Europe 2020 Strategy and on recent European maritime initiatives such as the Blue Growth Strategy.

Map 1 Regional sea boundaries

The map is based on following conventions:

Convention	Entry into force	Contracting parties
Barcelona Convention	12 February 1978	All countries with a Mediterranean shoreline as well as the European Union
Black Sea Convention	Beginning of 1994	Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine
OSPAR (OSlo PARis)	25 March 1998	Benelux, Denmark, Finland, France, Germany, Iceland, Ireland, Norway, Portugal, Spain, Sweden, UK, Switzerland, the European Community
HELCOM (HELsinki COMmission)	17 January 2000	European Community, Germany, Latvia, Sweden, Estonia, Finland, Denmark, Lithuania, Poland and Russia

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Abbreviations

HELCOM: Helsinki Commission – Baltic Marine Environment Protection Commission

MSFD: Marine Strategic Framework Directive

OSPAR: Oslo and Paris Commissions – The Convention for the Protection of the Marine Environment of the North-East Atlantic

1 - Executive Summary: Potentials for land-sea contribution to EU 2020 targets

Europe's seas have great potentials for contributing to achieving the objectives of the Europe 2020 Strategy, as regards economic growth and renewable energy. In recent years, the role and importance of maritime potentials has received increasing policy attention, as the idea of Blue Growth has developed.

The main focus is on land-sea interactions, including the role of the maritime economy in a region (e.g. in the fields of shipbuilding, tourism, transport and fisheries), the land-sea flows (e.g. movement of people, goods, energy or information) and the environmental pressures (e.g. pollution). Like other territorial potentials, the potentials for maritime development are not equally distributed across all parts of Europe.

- **Strong land-sea interactions at the economic core of Europe and in regional hubs**. The maritime core of Europe, which covers the territory extending from the North Sea to the Atlantic, coincides with the highest concentration of economic activities based on land-sea interactions. In turn, regional hubs such as the ones located in the western Black Sea and in Portugal, present intense land-sea interactions nourished by transnational maritime clusters, smaller ports and tourism. Intense economic land-sea interaction, though, is also responsible for pressure on the maritime environment.

- **Weaker land-sea interactions in transition and maritime rural areas**. Transition areas, such as the ones found in the eastern Mediterranean and the Baltic Sea, show less intense land-sea interaction. However, they still gather significant economic benefits from their maritime activities thanks to their function as transport corridors. On the other side, maritime rural areas in the peripheries of Europe display low levels of human use and feeble land-sea interactions, only surpassed by the unexploited maritime potentials of the north Atlantic and the Arctic wilderness area.

- **Maritime jobs are vital in Mediterranean regions**. In Mediterranean regions the sea is a key source of jobs and growth, with 52% of the population working in maritime-related activities. This figure is unmatched in the rest of Europe. Investment is needed to sustain these jobs, with a focus on coastal tourism and cultural heritage, maritime transport, adaptation to climate change impacts and conservation of bio-diversity.

- **Growing maritime transport flows**. 80% of world trade is carried over the sea, and maritime traffic is expected to grow over the coming years. To capitalise on these opportunities, and to avoid the rise of transportation costs due to ports' and shipping lanes' congestion, there will need to be investment onshore and offshore to increase capacity and efficiency. Europe's shipbuilding and repair industry will need to be competitive in the world market. Moreover, there will need to be investment in maritime spatial planning and environmental management to guard against unintended and undesirable side-effects such as spillages or the spread of invasive species. Short-sea shipping is likely to offer good investment prospects within Europe.

- **Agglomeration benefits and challenges in the core**. 40% of the total port traffic in Europe is concentrated in the four largest ports, all of them in the North Sea, namely Rotterdam, Antwerp, Hamburg and Bremen. This concentration makes this part of Europe an important global gateway but also brings challenges in terms of congestion, hinterland connections and environmental pressures. The growth of economies in Africa, Asia and Brazil highlights the potential for development of global gateway ports in the Mediterranean. Already more than 200,000 vessels of over 100 tonnes cross this sea annually.

- **Geography matters for transport costs**. Central and eastern European regions and coastal areas with lower accessibility to major ports, face higher transport costs to and from major European ports. While absolute equality in accessibility can never be achieved, some selective investment in major transport infrastructure to enhance central and Eastern Europe's accessibility to major ports could support both competitiveness and cohesion.

- **Local ports can enhance development**. Local businesses tend to identify obstacles to economic development related to transport issues that are not necessarily concerned with accessibility to Europe as a whole. In selected places, local problems of poor infrastructure and restricted maritime connections could be overcome by investment that could be integrated into local growth strategies.

- **Telecommunication cables linking Europe with the world**. Undersea telecommunication cables are important infrastructures of the Information Society. Additional investments are likely to increase the pace of demand and to strengthen the connectivity of Europe with other parts of the world, e.g. through

cables beneath the Baltic Sea, the Atlantic Ocean, and the Mediterranean Sea.

- **Supergrid connections in the North Sea and to northern Africa**. The development of offshore electricity networks and their integration to terrestrial grid systems is important for strengthening the weight of maritime renewable energy and building the European supergrid.

- **Blue energy as future development potential**. Investment in blue energy such as offshore wind, wave and tidal power, could unlock potentials that are yet to be exploited. While offshore renewable energy technologies are still at an early stage of development, they have the potential to enhance Europe's energy security, employment and cohesion. In addition, they enable Europe to play a leading role in the development of clean energy technologies.

- **The northwest Atlantic shows the best offshore wind potential**. The North Sea leads in installed capacity for the exploitation of offshore wind. However, the northwest Atlantic might have greater potentials, as it is exposed to frequent weather fronts and has the strongest average wind speeds. Therefore, these two seas offer the best prospects for investment in energy generation from offshore wind.

- **Europe could become a global reference in tidal and wave power**. Because of strong tidal surges, the UK's and northern French seas hold the greatest potential for tidal power, followed by the Straits of Gibraltar and Messina. In turn, western coastal areas, which are fully exposed to the Atlantic, have the greatest capacity to develop wave power. In both cases, strategic investment in tidal and wave power respectively could give Europe a global competitive advantage. In parallel, this could lead to the strengthening of the local economies of these regions, which are all peripheral within their country.

- **Future oil and gas areas in the outskirts of Europe**. Additional exploitation of fossil resources are expected in the Arctic, off Cyprus and Greece in the Mediterranean Sea, as well as off Bulgaria and Romania in the Black Sea. Investment leading to successful exploitation of these reserves would contribute to energy security and also to growth in Europe's weaker economies, thus aiding cohesion. However, further fossil fuel availability could make renewables targets more difficult to achieve.

- **Prosperous urban regions generate more maritime flows**. Overall, urban regions with GDP per capita above national average, and higher concentration of tertiary activities show larger and more diversified traffic of ships.

- **International governance for exploiting blue potentials**. Exploiting maritime potentials to support regional and local development generally involves more than just one country. As the EU shares its seas with neighbouring countries, effective international governance arrangements are necessary, including investment in the management of maritime resources.

Overall there is large diversity amongst Europe's seas, but together they are a major economic and environmental asset, and an important part of Europe's cultural heritage. Unlocking the area-specific potentials for Blue Growth will support development in coastal areas and islands around Europe.

Analysis of territorial potentials and development conditions can show how and where investment in maritime sectors can be a key component of an integrated growth strategy.

Harvesting development options from land-sea interactions can make an important contribution to growth and job creation, and a smart, sustainable and inclusive Europe.

2 - Blue Growth and Territorial Development

For a long time territorial development and regional policy in the EU focused mainly on onshore areas. Although the European seas are an integral part of the European space, the maritime dimension of regional and economic development only began to get political attention in the last decade. Today, Integrated Maritime Policy, Blue Growth, Blue Economy and Maritime Spatial Planning are established policy areas.

Maritime Development Policies and Concepts

Integrated Maritime Policy aims at providing a more coherent approach to maritime issues, through fostering coordination between different maritime sectors. This includes issues that do not belong to a sector-based policy or those that require the coordination of different sectors and actors. Projects under the Integrated Maritime Policy include a European maritime transport space without barriers, a strategy for marine research, national integrated maritime policies, cleaner shipping etc.

Blue Growth is the overarching objective of an EU initiative published in 2012. The concept is connected to the Europe 2020 objectives of smart, sustainable and inclusive growth and aims at unlocking the untapped potential of Europe's seas and coastal areas. The Blue Growth strategy seeks to foster growth and job creation by capitalising upon the so-called blue economy. Its main focus is on short-sea shipping, fisheries, offshore oil and gas production, as well as marine and coastal tourism, renewable energy and biotechnology.

Maritime Spatial Planning concerns the process of analysis and allocation of human activities in marine areas with a focus on ecological, economic and social objectives. It can be used as a tool to implement the Integrated Maritime Policy.

Policy developments 2007-2012. The publication of the "Blue Book" in 2007 on the integrated maritime policy, and the Marine Strategy Framework Directive (2008) paved the way for a more careful look into maritime issues in Europe. The Territorial Agenda 2020, published four years later, underlined the importance of maritime activities for territorial cohesion in Europe. The priorities of the Cyprus Presidency of 2012 and the Limassol Declaration on the Common Fisheries Policy (2012) also highlighted the importance of common actions towards common challenges. Further examples are the Directive on a framework for maritime spatial planning and integrated coastal management (2013) and the Marine Knowledge document (2012).

Blue Growth = the maritime dimension of Europe 2020. The Blue Growth concept on opportunities for marine and maritime sustainable growth is a significant milestone in maritime policy. It was published by the European Commission in 2012. Blue Growth targets those characteristics of seas that work as drivers for the economy. It aims at harnessing the untapped potential of Europe's oceans, seas and coasts for jobs and growth. To do this, it draws upon technological developments, the environmental challenges of land and seawater resources, and the promotion of renewable energy resources. Blue Growth is strongly related to the Europe 2020 Strategy and represents the maritime dimension of it. The objective of Blue Growth is to identify and deal in an integrated way with economic, environmental and social aspects of Europe's seas. Blue Growth mainly focuses on five topics: blue energy; aquaculture; maritime, coastal and cruise tourism; maritime mineral resources and blue biotechnology.

Territorial diversity of maritime regions. ESPON evidence has proven the tight links between Blue Growth and territorial development, revealing the need for a stronger political focus on land-sea interactions in order to exploit the growth potential of maritime regions. Maritime regions are characterized by its high proximity and strong relation to the sea. These regions comprise both coastal zones (35% of the population), and islands (3%), which together host more than a third of the EU citizens.

Maritime regions across Europe do not perform at the same level. Each region has its own potential for development and growth, though it is usually subject to national structures and policies. Map 2 shows different types of maritime regions, taking into account different interrelations of coastal and maritime regions as well as the intensity of the land-sea interactions, based on economic activities; flows of people, goods and information and environmental impacts.

The core of Europe is also the core from a maritime perspective. The European core is characterised by a high concentration of economic activities based on land-sea interactions. The maritime core includes the main trade centers of Europe along the Channel and North Sea as well as the Atlantic Ocean. It includes European mega ports such as Rotterdam or Hamburg, i.e. gateways for communication and trade routes between Europe and the rest of the world. In other words, the maritime European core region coincides with the economic centre of Europe. However, the intense economic activities can also trigger undesired environmental impacts. Thus, the highest environmental pressures are localized also in maritime regions around the Atlantic and the North Sea.

Balanced pattern of maritime regional hubs. Regional hubs are characterised by strong land-sea interactions and maritime clusters of a transnational character, as well as smaller ports and tourist destinations. The pressure on the maritime environment deriving from

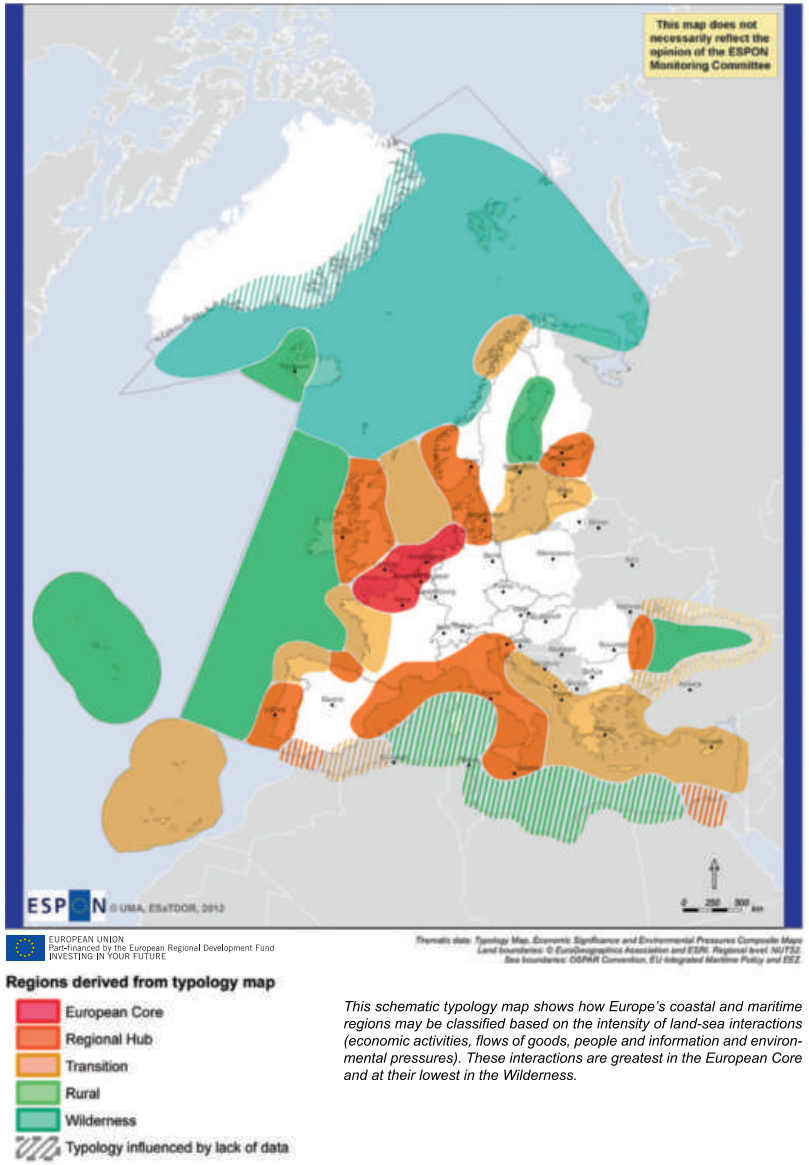
land-sea interactions is more moderate than in the maritime core area, but still significant. Maritime regional hubs can be found around the western parts of the Black Sea, the western Mediterranean Sea, most of the Portugese mainland, in northern Spain around Bilbao, large parts of the UK and eastern Ireland, southern Norway, most of Denmark and the southern Swedish coast, as well as the Gulf of Finland.

Transition areas benefit less from land-sea interactions. The transition areas have a more narrowly defiend maritime economy. In terms of intensity of interactions, they range between the core and regional hubs and the more rural and wilderness areas, where interactions are lower. The environmental consequences in the case of incidence of invasive species, organic input and nutrient are relatively lower. Transition areas can be found in the Atlantic Ocean, the eastern Mediterranean, and parts of the Baltic Sea, which have important functions as transport corridors.

Maritime rural areas are mainly in the outskirts of Europe. Maritime rural areas are characterised by low levels of human use and of economic land-sea interaction. They can be found in the eastern part of Iceland, the Gulf of Bothnia, the eastern part of the Black Sea, and large parts of the Atlantic Ocean including coastal areas of Ireland and the Azores.

Maritime wilderness is mainly in the far north in the Atlantic Ocean. Maritime wilderness characterises most of the northern parts of the Atlantic Ocean, stretching from Greenland to the eastern parts of Iceland, some parts of the Norwegian coast, Svalbard and northern Russia. Together with the maritime rural areas, the maritime wilderness areas show the lowest levels of environmental pressures caused by human activity.

Map 2 Typology of European maritime regions



This schematic typology map shows how Europe's coastal and maritime regions may be classified based on the intensity of land-sea interactions (economic activities, flows of goods, people and information and environmental pressures). These interactions are greatest in the European Core and at their lowest in the Wilderness.

3 - Hot- and coldspots of land-sea interactions

Land-sea interactions are a key component of the typology of maritime regions. A more detailed look at these interactions shows both hotspots and coldspots.

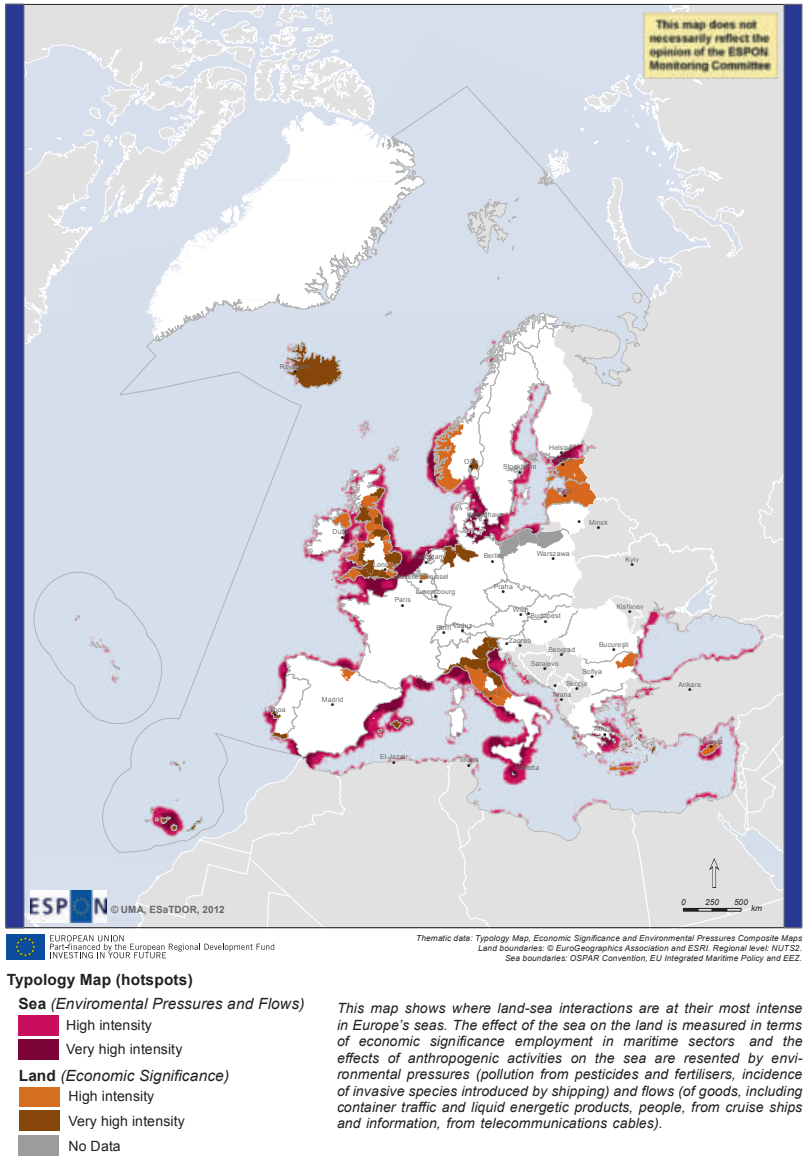
Hotspots and coldspots of land-sea interaction can be identified by analysing the significance of the maritime economy in a region (e.g. shipbuilding, tourism, transport, and fisheries), the land-sea flows (e.g. movement of people, goods or information) and the environmental pressure (e.g. change in sea surface temperature, pollution from pesticides and fertilisers, incidents of invasive species introduced through shipping, etc.).

3.1 Hotspots

The Channel and North Sea are the main hotspots. The main hotspots of land-sea interaction are linked to the major metropolitan regions and cities in the European core. This is mainly due to the importance of their ports, both in terms of employment and as gateways for global trade. This region is the most intensively used maritime region in Europe and shows high levels of activities based on maritime services, naval and coastguard activities, marine equipment and shipbuilding, while fishing and coastal tourism are also important activities. However, because these are highly urbanised regions, maritime industries are less significant in the overall make-up of employment.

The highest proportion of people engaged in maritime activities can be found in the Mediterranean regions. Although maritime hotspots for land-sea interaction are concentrated in northern Europe, the maritime dimension plays an important role along the Mediterranean Sea. In the Mediterranean Sea, the land-sea interactions are more of a local character.

Map 3 Typology map hotspots



With 52% of its population engaged in maritime activities, the Mediterranean Sea has the greatest share of population employed in maritime-related activities in Europe. One of the reasons explaining this is the fact that the Mediterranean hosts about 30% of the world's international tourism, normally attracted by the region's rich biodiversity and cultural heritage. Thus at local level in terms of jobs, the sea is an important source of livelihood for the communities around the Mediterranean.

Reviewing the hotspots according to the three dimensions integrated in map 3 shows:

- **Economic significance**: In Iceland, Norway, Estonia and Latvia, coastal areas of the UK, northern Spain, northern and central Italy, southern Portugal and most of the European islands, such as the Canaries, the maritime sector is of particular importance because of its high share of the total regional employment.

Offshore energy production and supply, for example, leads to significant socio-economic land-sea interactions. The offshore oil and gas industry has been a major source of direct and indirect employment, and has led to economic growth, especially in the North Sea region. As an example, the region around Aberdeen, the UK 'capital' of the oil industry, has a notably high GDP per capita. Furthermore, there are mega port regions e.g. in the Netherlands, that are economically important with regard to their crucial role in the global transport chains and in terms of employment.

In turn, fisheries and shipbuilding still play a role in some parts of Europe. Several regions have a relatively large number of employees within fisheries. Galicia (Spain) tops the list with more than 45,000 employees. In Denmark and Andalucía (Spain), fisheries count for around 34,000 employees. Other regions with many employees within fisheries are Catalonia and the Valencian Community in Spain, Bretagne and Provence-Alpes-Cote d'Azur in France. As for shipbuilding, Europe is more of a niche player. In fact, the four largest shipbuilding yards in Europe are concentrated in Germany and Italy.

- **Land-Sea Flows**: Maritime flows reflect the activities on the sea, including shipping lanes, oil and gas pipelines, electricity grids and telecommunication cables. The southern North Sea and Channel are the major focal point for marine transport and cables in Europe. Other hotspots are linked to major ports in the Mediterranean, in the Baltic around the Danish Straits and Gulf of Finland, and around the Canaries.

- **Environmental Pressure**: The coastlines along the Atlantic Ocean, the North Sea and the Baltic, have the highest environmental pressures. Other hotspots are evident along the northern shores of the Mediterranean and in the Black Sea. The regions within the European maritime core suffer from organic pollution, mainly coming from the Rhine, Elbe and Humber rivers. Moreover, invasive species are regarded as significant environmental threats particularly in the vicinity of the Channel and large ports. The same can be seen in the Black Sea, which suffers from eutrophication, nutrient inputs, heavy metal and oil pollution.

3.2 Coldspots

While the main hotspots of land-sea interaction are concentrated in the maritime core area of Europe, the coldspots are mainly to be found in maritime rural areas or in maritime wilderness and rural categories.

Coldest spot is in the far north. The regions of the Arctic Sea have relatively low levels of land-sea interaction. It is one of the world's most remarkable areas for fisheries and aquaculture, but only 12-14% of the employment in coastal areas of the Arctic is involved in tourism. Also, shipping traffic is relatively low, with the exception of the Norwegian and Russian coastlines and those between Iceland and mainland Europe.

Parts of the Atlantic Ocean, especially from western Ireland to the west coasts of Portugal, the north part of the Baltic Sea, and the central and eastern part of the Black Sea also show comparably low levels of land-sea interaction.

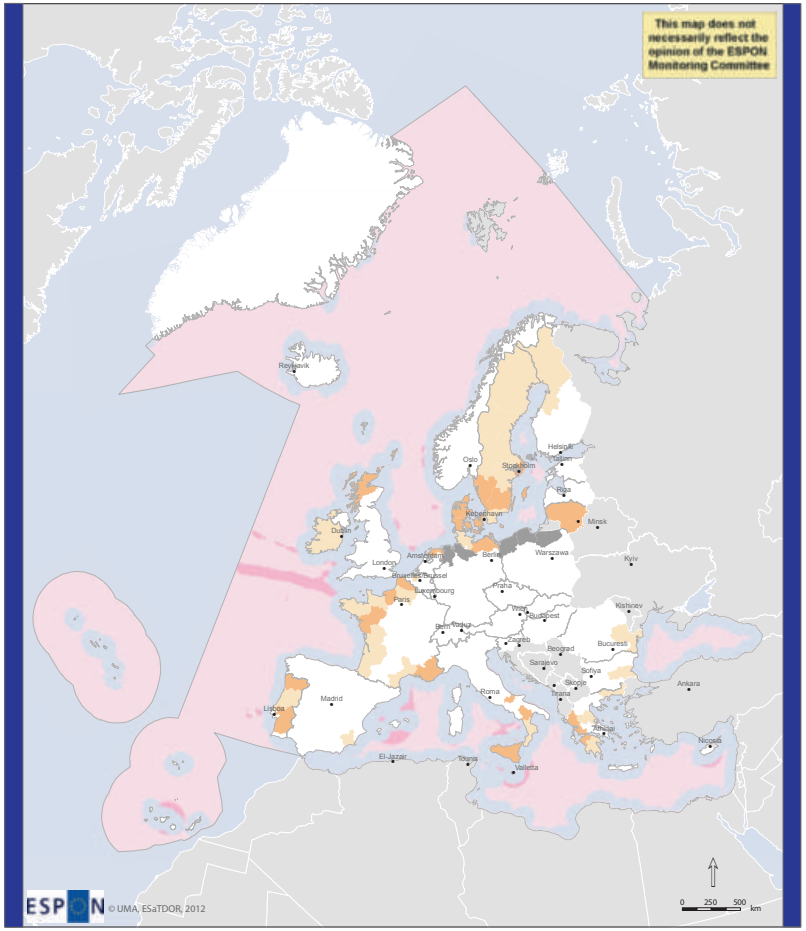
Depicting the coldspots according to the three dimensions integrated in map 4 shows:

- **Economic significance**: The maritime sector is of relatively low economic significance in the coastal areas of northern Finland, Sweden, Lithuania, Denmark, most parts of northern Germany, Ireland, the French coasts, as well as in the coastal areas of mainland Portugal (with the exception for the Lisbon and the Algarve), southern Italy, large parts of mainland Greece, and some coastal areas of Bulgaria and Romania.

- **Land-Sea Flows**: Low levels of land-sea flows can be found in most coastal zones where there are no major ports, as well as in the non-coastal maritime areas. Out in the sea, interaction levels are somewhat higher along the major shipping routes and along the lines of major communication cables.

- **Environmental Pressure**: Low pressure on the maritime environment is mainly to be found in areas relatively distant to the coasts. Along the coastlines of the Arctic Sea the environmental pressure tends to be lower than in many other coastal areas in Europe. At the same time, the Arctic is the most vulnerable maritime environment in Europe with enormous virgin natural resources. As for other areas, 7% of the Baltic Sea area is covered by Natura 2000 designations and, together with the Arctic and the Black Sea, they are recognized as fragile ecosystems due to their vulnerability to human pressures.

Map 4 Typology map coldspots



This map shows where land-sea interactions are at their least intense in Europe's seas. The effect of the sea on the land is measured in terms of economic significance employment in maritime sectors) and the effects of anthropogenic activities on the sea are resented by environmental pressures (pollution from pesticides and fertilisers, incidence of invasive species introduced by shipping) and flows (of goods, including container traffic and liquid energetic products, people, from cruise ships and information, from telecommunications cables).

4 - Maritime flows and networks

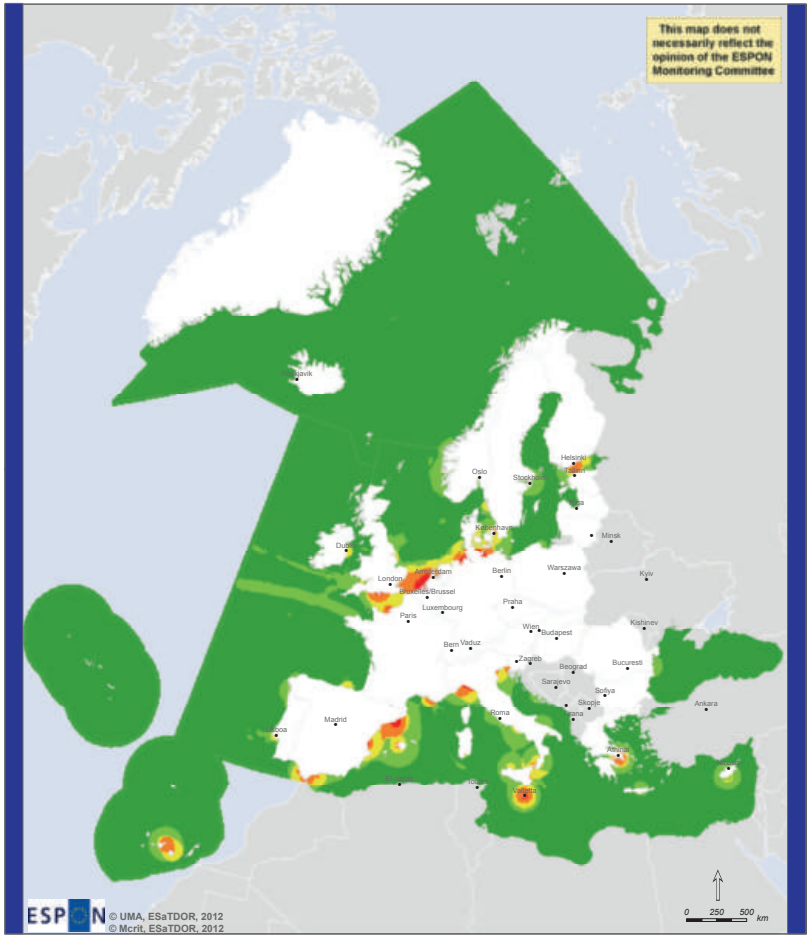
Flows are an important dimension of land-sea interaction linked to territorial development dynamics and the gateway functions of different areas. This includes the flows of people, goods, energy and information. Map 5 brings together a range of different maritime flows, including the economic influence of container ports and cruise ports, the volume of energy products, and the influence of undersea telecommunication cables.

Prosperous urban regions generate more flows. Generally, urban regions with GDP per capita above the national average, and a higher concentration of tertiary activities generate more valued, larger and diversified traffic. Examples for this are Hamburg, Lisbon, London, Stockholm, Oslo, Genoa, Rome (Civitavecchia), Bremen, Copenhagen and Athens (Piraeus). This stands in contrast to the more traditional and peripheral regions, where mostly the primary sector and bulk communities dominate both economy and flows.

Channel and North Sea are important hubs for maritime flows. Usually, areas with high intensities of flows are close to ports with high sea activity levels. As can be seen from map 5, areas with high levels of flows are concentrated along the Atlantic Coast, between Le Havre, in France, and Bremen, in Germany. The main freight transport ports are concentrated here: Rotterdam, Hamburg, Antwerp, Bremerhaven, Felixstowe and Southampton. Among them, the port of Rotterdam stands out for its influence upon several other northern European ports, serving both as a maritime hub and a continental gateway.

Cruises and container hubs in the Mediterranean. There are various areas with high levels of flows in the Mediterranean Sea, e.g. around Barcelona, Genoa or Malta. In the western Mediterranean, container transport

Map 5 Flows composite map



is an important dimension of the flows, though not at the same level as in the core of Europe. Important Mediterranean container ports are Marsaxlokk (Malta), Goia Tauro (Italy) and Valencia and Barcelona (Spain). Cruise activities are more important than container transport in the Mediterranean. In this respect, the main ports are Barcelona and Palma de Mallorca (Spain), Naples, Livorno and Civitavecchia (Italy), Piraeus (Greece) and Malta.

Other areas with important levels of flows are in the Baltic Sea, around the Danish Straits and Gulf of Finland, and around the Canaries.

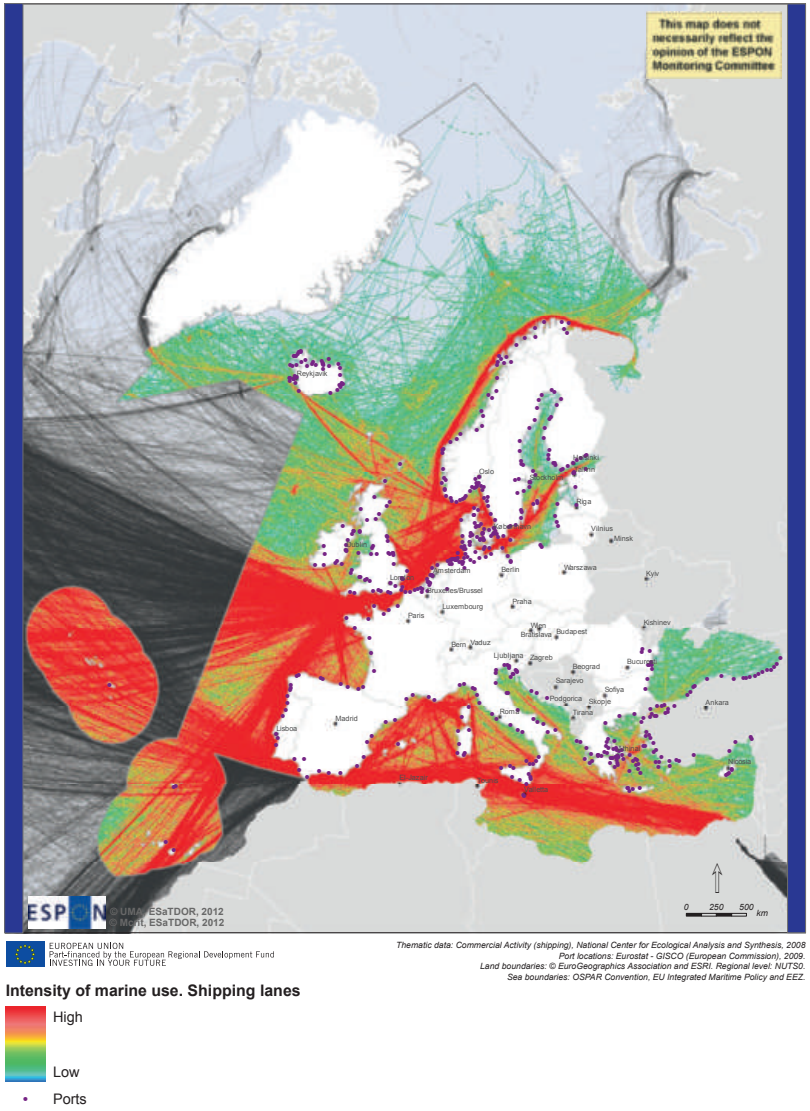
Probing more deeply into flows, the following two maps highlight two types of flows, namely the intensity of the shipping lanes (map 6), and the undersea telecommunication cables that carry information flows (map 7).

4.1 Key patterns of maritime transport

80% of the world trade is currently carried over the sea and more than 80,000 merchant ships moor at European ports every year. Around 90% of the EU's trade with third countries passes through Europe's ports. Moreover, maritime traffic is expected to increase over the coming years. The following figures illustrate the magnitude of red lines in map 6:

- **Mediterranean: 30% of total maritime traffic.** The traffic intensity in the Mediterranean accounts for 30% of total global maritime traffic with more than 200,000 vessels of over 100 tons crossing the sea annually. However, most of the traffic in the Mediterranean is just transit traffic.

Map 6 Intensity of marine use: Shipping lanes



- **Channel and North Sea: 40% of all port traffic in Europe.** 40% of the total port traffic in Europe is concentrated in the four largest ports, all belonging to the North-West: Rotterdam, Antwerp, Hamburg and Bremen. With more than 400 ships passing daily through the English Channel, the North Sea contains some of the busiest shipping routes in the world.

- **Baltic Sea: 15% of the world's cargo transportation.** The Baltic Sea is one of the most heavily trafficked seas in the world with up to 15% of the world's cargo transportation. Approximately one half of the ships in the Baltic Sea are cargo vessels, 18% are tankers and 11% passenger vessels.

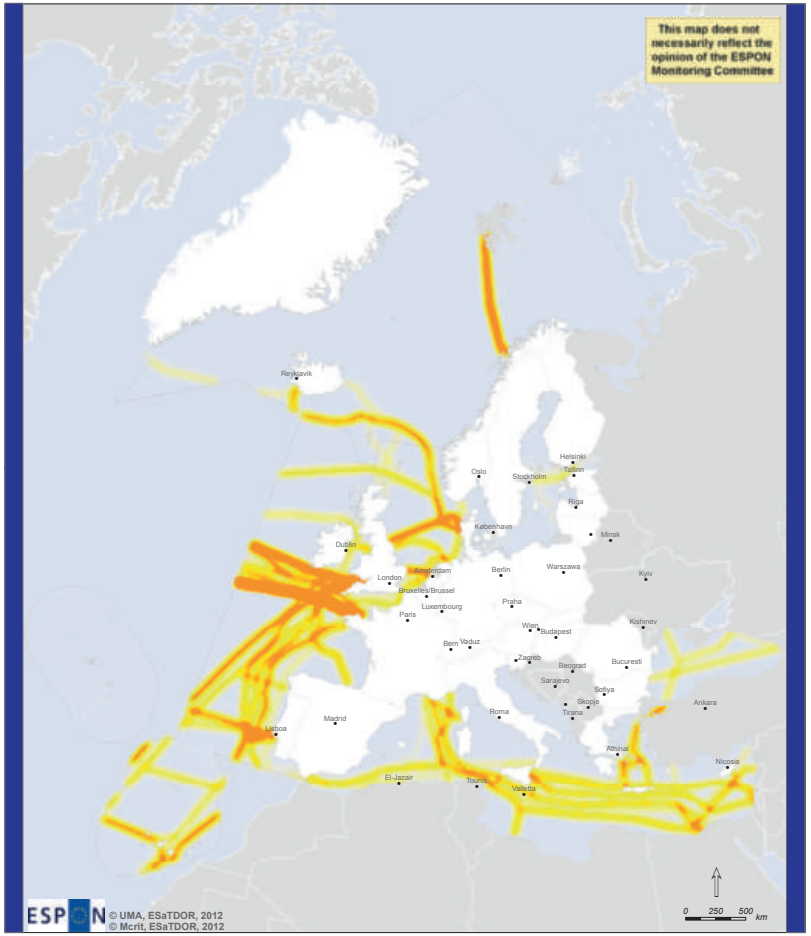
- **Black Sea: strategic links.** The Black Sea has important links with the Caspian and with the Mediterranean via the Bosporus, where crossings are naturally limited in terms of frequency of passage and size of ships.

More than 3 million related jobs. Given the above figures, it does not come as a surprise that Europe has the world's largest shipping fleet; with 41.6% of the world's vessels, directly employing some 300,000 seafarers on board merchant vessels and another three million in related jobs.

4.2 Marine networks

Three marine networks of importance for the European society. Overall, there are three marine network systems which interlink with terrestrial systems, namely electricity cables, oil and gas pipelines, and telecommunications cables. They all deliver their products onshore, or transfer them across sea

Map 7 Undersea telecommunication cables



areas, and are directly integrated to their respective terrestrial networks.

Expanding offshore electricity networks. Electricity cables form an important marine network system. Traditionally they were often seen as an underwater extension of predominately terrestrial grid systems. However, increasingly the attention is on cables connecting offshore sources of electricity supply, e.g. wind farms, to terrestrial grid systems.

Most offshore wind farms have a separate connection to land, but more integrated offshore networks are beginning to be developed, so that more than one farm may share a main landward connection. As offshore wind energy expands, the number of connections to land grows, linking wind farms to networks allowing for a more efficient use of cabling.

It is also likely that wind energy will be transferred directly across national borders, so that e.g. power generated in Swedish waters may find a more accessible market in Germany. In addition, connections to Europe's neighbouring regions are conceivable as a means of extending the energy market beyond Europe, especially through North Africa.

Current expansion of offshore electricity networks may therefore be a step in the direction of the intended European supergrid. This would enable not only the transfer of large-scale wind power from the north into the main centres of demand, but also the transfer of solar energy from the south.

Oil and gas pipelines linking offshore supply with terrestrial networks. By far the greatest concentration of pipelines carrying oil and gas is associated with the North Sea oil and gas fields. These pipelines transfer offshore supplies directly to producer countries, and form a network connecting supplies to surrounding North Sea countries. Gas pipelines in particular link up with terrestrial networks, supplying customers throughout northern Europe. A smaller number of pipelines can be found in the other European seas, for transferring hydrocarbons from isolated fields, such as in the southern Baltic, the western Black Sea, the Adriatic and the Bay of Biscay. However, these networks are expanding as new connecting pipelines are built, such as the Baltic Pipe project between Denmark and Poland.

Long-distance pipelines for increasing inflow of oil and gas to Europe. European seas are playing a key role in the development of strategic gas and oil supply routes into Europe. Some longer-distance undersea pipelines are coming on stream, crossing national borders. These are designed for the large-scale supply of gas from Russia to Europe. The North Stream pipeline through the Baltic is completed, while the South Stream pipeline project through the Black Sea remains a possibility. Land-based long-distance oil and gas pipelines, especially those reaching the Caspian Sea, are being integrated into existing European networks, partly crossing sea areas.

Information flows and communication across Europe. So far the concept of maritime flows has been used to represent land-sea interactions in terms of economic activities. However, flows of information through undersea telecommunication cables, carrying mostly telephone and internet traffic are of ever increasing importance

Europe plays a vital role as a communication corridor worldwide. These communications cables and networks require very little space and have low environmental impact.

Highest density of cables in the Celtic Sea. Undersea intercontinental communication cables are not new. Their roll-out started decades ago with the North Atlantic route. However, the development of optical fibres in the 1980's massively boosted telecommunication traffic. The most important route is still the one crossing the Atlantic to North America, with the highest concentration of undersea telecommunication cables located in the Celtic Sea. Once more, the European core, i.e. the regions in North-West Europe, displays the highest information flow intensity.

Various global gateways with varying directions. Portugal is another important hub for intercontinental cable connections. Other main intercontinental routes are those through the Mediterranean to the Middle East, southern Asia and the Far East and down the Atlantic around Africa to the Indian Ocean. All the aforementioned routes have networks of branches, for instance from France to the Mediterranean route, and more localised links between European countries, e.g. across the Baltic and around the Atlantic. Information flows also show high intensity along specific routes in the Arctic Sea.

5 - Ports and their hinterland

Given that 80% of the world's trade is carried over the sea and that maritime traffic is expected to increase, ports are important hubs and gateways. To fulfil their gateway function they need not only good international connections but also appropriate infrastructure linking them with their wider hinterland and the rest of mainland Europe. The accessibility of ports is crucial both as regards competitive travel time and transport costs.

5.1 Maritime accessibility in Europe

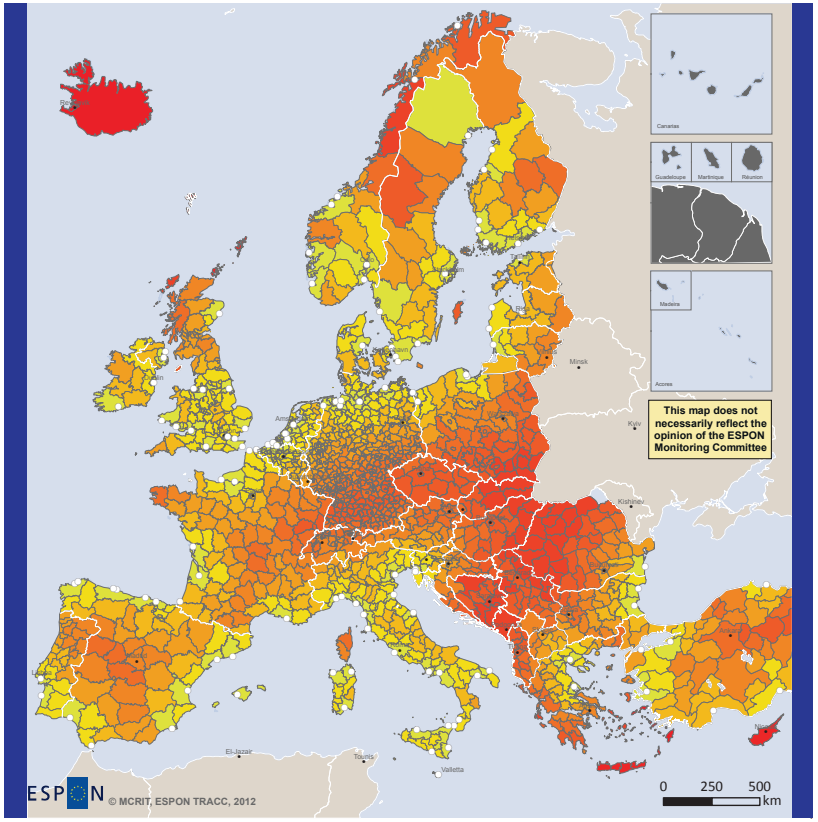
Map 8 shows how much it costs from any European region to transport goods to the nearest port handling traffic of more than 4 million tons. The costs vary from region to region across Europe, and reveal two dominant patterns:

Costal zones have lower transport costs. Distance to the nearest port matters and the more remote a region from the coast is, the higher is the cost to access a major port. In other words, coastal zones are in general more accessible – although there are some exceptions. In contrast, landlocked inland regions, and in particular those in central and eastern Europe, face higher transport costs.

Advantage for central-western European regions. However, a good geographical position is not sufficient, as even coastal regions may have poor accessibility if the infrastructures are not adequate. This is the case for example when the only ports nearby are small ones, or where connections are expensive. Some regions in central-western Europe have a clear advantage in terms of travel costs to the nearest core port.

These are mainly in Benelux, northwest Germany, the northern edge of France and the south of the UK.

Map 8 Travel cost to access the nearest maritime ports



Around this core area, other neighbouring regions may be very well positioned. For instance, Denmark has good accessibility levels by water and also by unitised rail, but it is well below the average for road accessibility.

High costs in areas relying on smaller ports. Remote regions have high costs to reach significant ports. Iceland and the north of Norway are examples. In spite of being a maritime country, Greece has many regions with high or relatively high port accessibility costs.

Understanding the indicator on travel costs to the nearest port

The indicators used for map 8 provide an overview on the access to the nearest maritime ports with a traffic volume larger than 4 million tons annually. Instead of looking at the time it takes to reach such a port, the focus is on the cost it implies.

For each NUTS-3 region the average generalised travel cost for different commodities to reach the nearest three maritime ports have been calculated. The modes of transportation considered for reaching the ports are (a) road, (b) road and rail, and (c) road and inland waterway.

5.2 Challenges for regional maritime accessibility

Territorial diversity often creates different accessibility challenges. European-wide maps provide a general picture of the territorial diversity of Europe. However, they hardly lead to an in-depth understanding of its pragmatic implications.

Most European maps focus on the integration of the continental territory and use measures of accessibility based on a pan-European model of accessibility which follows a gravitational model. According to this model, the longer the travel time from a region to large (in population or GDP) European regions, the least it is deemed accessible, even to locally-based companies.

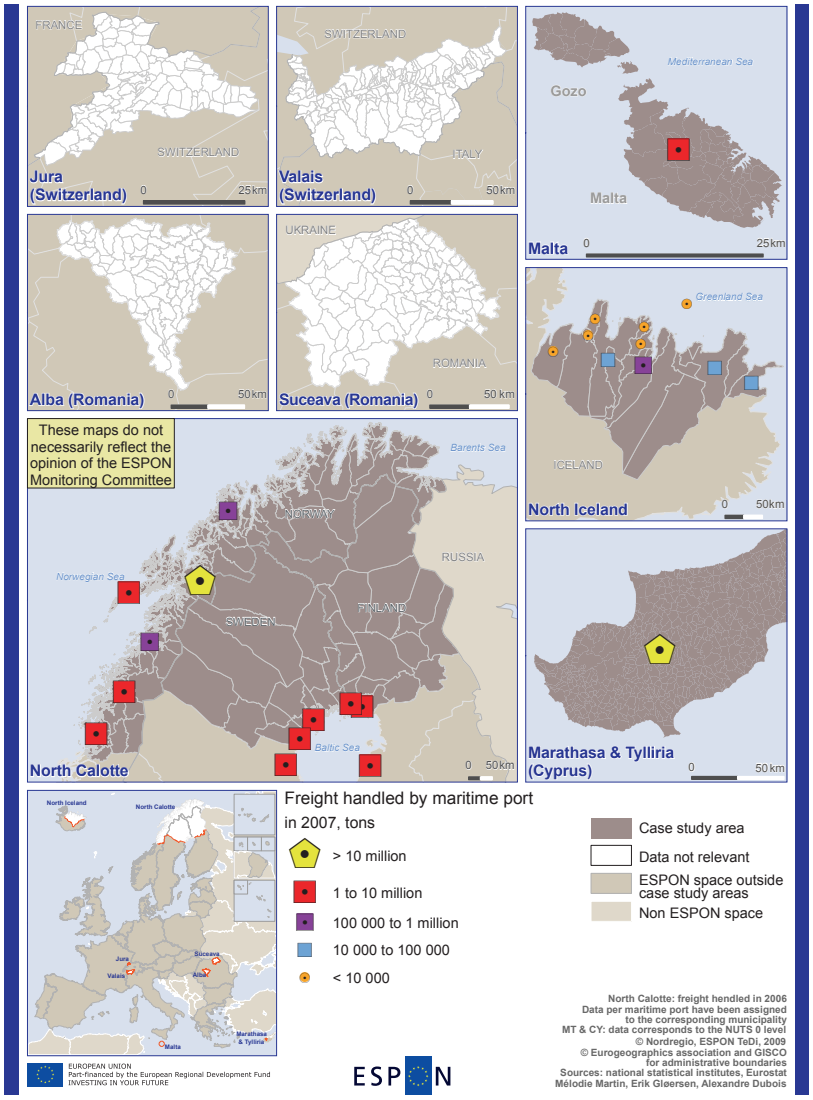
However, local actors tend to identify obstacles to economic development related to transport issues that are not necessary linked to Europe, and that do not always focus on improved connections in the direction of areas with the largest population or GDP figures. Instead, their concerns are the observed bottlenecks for exports or the local environmental issues related to transport.

Taking a closer look at specific European regions from different geographic areas and their particular characteristics, permits a better understanding of the differences between European regions (map 9). For instance, freight handling by maritime ports is important for regions like North Calotte in Sweden, North Iceland, Malta and Cyprus. Although in very different parts of Europe, they all face low accessibility, insufficient quality of transport and difficulties accessing important services. Their main accessibility challenges are connected to low levels of infrastructure endowment and restricted maritime connections.

Small-scale interface with North-West Russia and gateway to the Arctic. In the North Calotte region in the north of Sweden, ports play a central role for major regional exports such as the products of mining and forestry industries. Furthermore, North Calotte is increasingly functioning as a commercial interface to North West Russia, while together with North Iceland, it also tries to serve as a gateway to the Arctic.

Ports are vital infrastructures for insular territories. Ports play an essential role in insular territories such as Malta and Cyprus, as they are a crucial channel for the delivery of goods to and from the islands. Furthermore, the ports and geographical location of an island gives the potential to develop small-scale gateway functions. At a European scale, the location of Cyprus means that it could function as a gateway to the Middle East, while Malta could play a similar role to North Africa.

Map 9 Freight handled by maritime ports



6 - Blue energy potentials

Maritime regions can play an active role in regional development. Today this is more needed than ever, as all cities and regions need to exploit their comparative advantages in order to contribute to the overall objectives of Europe 2020 and of territorial cohesion.

One of the objectives of the Europe 2020 Strategy is to increase the share of renewable energy sources in the final energy consumption to 20%. European seas have major potential for renewable energy production. These blue energies are part of the Blue Growth Strategy and have the potential to contribute to increasing the share of renewable energy, and strengthening regional competitiveness and economic growth.

Blue energy focuses on offshore renewable energy technologies, such as offshore wind, tidal barrage, wave power and ocean thermal. Many of them are still at an early stage of development, but have the potential to enhance the efficiency of harvesting European energy resources, minimise land-use requirements of the power sector and reduce Europe's greenhouse gas emissions.

The geographical distribution of the potential for blue energy is not evenly spread throughout European waters. The same is applicable to related technological development, which is essential for exploiting the opportunities triggered by blue energy sources.

Offshore wind energy hotspot in the North Sea. Currently, offshore wind power is the most prominent blue energy. It accounted for 10% of installed capacity in 2011 and employed 35,000 people directly and indirectly across Europe. In geographical terms the installed offshore wind energy capacity is mainly concentrated in the North Sea with other focal points in the Irish Sea and the Baltic Sea. Elsewhere in Europe the installed offshore wind energy capacities are rather low.

The picture is somewhat different when looking at potentials for offshore wind power, as it is highly variable in its distribution. The north-western Atlantic areas exposed to frequent weather fronts have the strongest average wind speeds, followed by other western Atlantic areas, the North Sea and southern Baltic. Overall, the Mediterranean and the Black Sea have little potential for exploiting wind energy, though localised pockets of high potential can be found in the Gulf of Lion and the south of France.

Tidal power potentials are greatest around UK and northern France. Generally, tidal power is restricted to channels and estuaries where ocean conditions and other physical factors favour strong tidal surges. The UK's and northern French seas hold the greatest potential in this regard, followed by other areas with good opportunities, such as the Straits of Gibraltar and Messina.

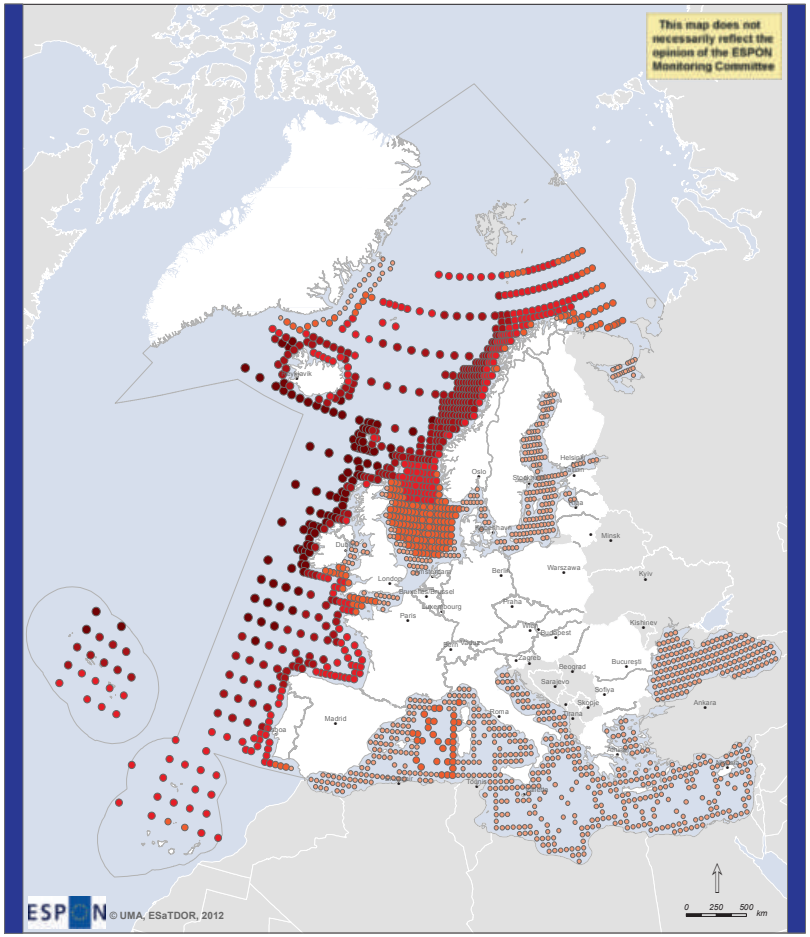
Wave power potential is greatest in western coastal areas. Map 10 shows the likely energy potential of wave power. Western coastal areas, which are fully exposed to the Atlantic, have the greatest capacity to develop wave power. This is followed by open areas in the North Sea and Mediterranean. Enclosed sea areas have relatively little potential in this regard.

The possibility to combine different marine renewable technologies may maximise the use of the space, infrastructure and services needed, which could encourage the growth of industrial clusters.

However, while the exploitation of marine renewables can make an important contribution to Europe's response to climate change, large scale renewable energy developments may lead to restrictions on other sea uses and may adversely affect marine environment. Among the risks associated with marine renewables are conflicts with major international shipping lanes and damages in environmentally sensitive areas.

Additional fossil resources in the Arctic, Mediterranean and Black Seas. Although not part of the blue energy potentials, Europe's seas hold also unexploited reserves of oil and gas. There are a number of potential developments around the periphery of Europe that could increase Europe's energy security while posing economic development perspectives for some EU Member States and neighbouring countries. This may complement oil and gas from the North Sea, which have long been of great economic importance. The unexploited hydro-carbon stockpiles are expected to be found in the Arctic, off Cyprus and Greece, as well as in the Black Sea macroregion, including Galata near the Bulgarian coast and the Ana and Doina fields off Romania.

Map 10 Wave power potential



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Thematic data: Fugro OCEANOR, Worldwaves, 2008.
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

Wave power potential (KW/m)

- 0.5 to 11.0
- 11.1 to 24.3
- 24.4 to 39.0
- 39.1 to 55.9
- 56.0 to 81.6

7 - Future maritime potentials for policy considerations

This Territorial Observation started with presenting different European seas. This was followed by exploring the diversity of maritime areas including the identification of the core area, different hubs, maritime rural areas etc. From there the text explored hot- and coldspots of land-sea interaction and picked on some particular dimensions of it, such as different types of flows and blue energy potentials.

Atlantic Ocean

Marine renewables are a great opportunity for the Atlantic Ocean, including both the expansion of conventional offshore wind farms and the development of new technologies, including the so-far untapped wave, current and tidal options. The development of more comprehensive offshore grid systems to connect renewable energy production to onshore points of demand will be an issue for the future. Some regions along the Atlantic Ocean have opportunities to develop into centres of technological development, manufacturing, construction and servicing of marine renewables. At the same time, the Atlantic Ocean is also an important shipping route and a major corridor for international telecommunication cables. In the future, it is expected that both the shipping and information flow through the Atlantic Ocean will increase. This poses the risks of emergent conflicts between different maritime activities, as well as for the environment. This shall spur the seek of synergies through further cross-sectoral agreements and territorial cooperation.

Arctic Sea

The Arctic Sea holds opportunities for increasing its supply of fossil fuels, and new pipeline connections may enable wider energy supplies to Europe. There are also associated risks, especially increased greenhouse gas emissions, running counter to 20-20-20 targets, and potential damage to sensitive ecosystems including the melting of the icecaps.

Baltic Sea

The Baltic Sea will remain an important corridor for gas transit, in particular with regard to the supply line from Russia to northern Europe. Furthermore, the Baltic Sea has good potentials for a continued expansion of marine wind energy, facilitated by shallow waters, and the further development of a transnational grid system. Additional telecommunication cables are also likely to be developed. The development of coastal centres for the construction and servicing of marine wind farms might be needed. At the same time transport volumes in the Baltic Sea are expected to increase, and there is a risk of multiple conflicts of interest between wind farming, shipping lanes and environmental vulnerabilities.

Black Sea

A major opportunity for the Black Sea lies in a transit function for the movement of fossil fuels primarily from Russia to surrounding countries into Europe. Its role in establishing good energy relations with Russia should be considered, through continued infrastructure development (pipelines and terminals) and governance arrangements. In addition, the scope for marine renewables, especially wind farms, could be explored.

Mediterranean Sea

The high amount of shipping passing through the Mediterranean Sea presents opportunities for the increasing land-sea interaction and subsequently, for the economic activities in the area. Both maritime tourism and the freight sector have the potential for growth. The Mediterranean Sea will keep its status as an important corridor for international telecommunication cables. Furthermore, there are good opportunities for the Mediterranean to increase its role as a gateway for the import of fossil fuels from North Africa, expanding the existing pipelines connecting southern Europe to the Maghreb. Future growth will depend on infrastructure development (pipelines and terminals) and governance arrangements. In turn, the Eastern Mediterranean offers development potential through the exploitation of fossil energy resources. In addition, the scope for marine renewables, especially wind farms in favourable locations, and their grid connections may hold growth opportunities.

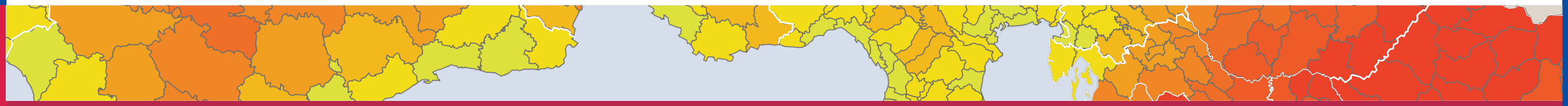
North Sea

The North Sea stands out as an important maritime powerhouse of Europe, both as regards transport and its important mega ports, and concerning maritime energy resources (including gas, oil and renewable maritime energies). Indeed, the North Sea has the potential to become a major contributor of sustainable energy supply through the large-scale development of marine wind farms, for which it has favourable conditions. Industrial clusters for technological development, manufacturing, construction and servicing of farms in strategic locations along North Sea coasts might develop further. The project of building a North Sea Grid that connects Scandinavia and the UK, would increase the attractiveness of developing renewable energy by enabling a better management of the peaks and troughs in supply of hydropower and wind. In addition, the North Sea holds great potentials for carbon storage by making use of depleted oil and gas fields. However, transport links between the major ports and gateways and their wider European hinterland present problems of congestion due to the increasing volume of maritime transport of goods.

International Governance Needs

International governance is needed for making better use of the potential of the seas and strengthening Blue Growth in order to contribute to the Europe 2020 objectives of smart, sustainable and inclusive growth. Dealing with the potentials and challenges of the sea involves not only numerous Member States, but also EU neighbouring countries. This requires international governance arrangements for the management of maritime resources.

It has to be acknowledged that these are evolving processes constantly influenced by changing technological, socio-economic and environmental conditions, as well as by the political climate. Therefore, in order to avoid competence overlaps and conflicts of interest, transnational cooperation stands as the most suitable way to ensure the effective management of the valuable resources offered by the European seas.



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