



# **ESaTDOR**

## **European Seas and Territorial Development, Opportunities and Risks**

### ANNEX 5 to the Final Report: **Black Sea Regional Profile**

ESPON Applied Research 2013/1/5

Version 16/1/2013

# Regional Sea Profile: the Black Sea

## 1 Introduction

In the last few years there has been growing acknowledgement that the seas which surround Europe offer significant opportunities for - and potential risks to - territorial development. The sea provides resources on and in its waters and on and under the sea bed that can be harnessed as the basis for territorial development; it enables the flow of goods, services and people, connecting different parts of Europe to each other and the wider global community; and it provides an important environmental asset that needs careful management not least because the health of the sea is critical to efforts to combat climate change. However, different stakeholders have different priorities in terms of what uses and priorities should be privileged in different parts of the maritime environment and few have an overview of the range of issues that require consideration in making such judgements in an informed way.

Whilst there has been a growing recognition of the need for improved planning of maritime space, as exemplified by the growth of integrated coastal zone management and marine spatial planning, more broadly little has yet been done to explore the potentials and challenges of planning for these areas, particularly in relation to their transnational and cross border dimensions. As a step forward, this ESPON project aims to explore the territorial development opportunities and risks facing the seas of Europe by distilling key land/sea and transnational interconnections. Each European regional sea has its own specific characteristics in terms of territorial development opportunities and risks, and uses different governance structures to manage competing claims. This report focuses on one of the six regional seas which are covered by the project and provides a profile of the Black Sea.

Each Regional Sea Profile report is subdivided into two parts. The first part seeks to provide a detailed characterisation of the regional sea as it exists today. The second part starts to look to the future and describes the potential opportunities and risks pertaining to each sea, and sets out policy recommendations that can help guide territorial development within the region.

Part 1 begins with a brief section which provides contextual information including a description of how the boundaries of the regional sea have been defined for the purposes of this project. In some instances this has been relatively straightforward. In others we have had to make pragmatic decisions as varying boundary definitions are in use and in some areas are still very much contested. The second section then describes in more detail key thematic characteristics of each regional sea focusing on the maritime economy, transport, energy and undersea infrastructure and the environment. This characterisation reflects the existing situation and is based around a standardised series of maps which draw upon the limited number of data sets we have uncovered that relate to these themes where there is good European wide coverage. The maps have, in some cases, been supplemented by local information which is seen as being an exemplar of good practice and which might have relevance to other European regional seas in terms of improving data coverage and mapping to inform policy development.

One of the critical characteristics of all of the regional seas is that the effective management of both the opportunities and risks will require cross boundary and transnational cooperation between the

members states of the EU, members of the European Economic Area and potential accession countries and other countries who share a common interest in a particular sea. The configuration of interested nation states varies from regional sea to regional sea, although how transnational and cross boundary issues are being managed at the present time is reflected on in the governance section. Here a limited number of case studies are used to explore the effectiveness (or otherwise) of various maritime governance regimes designed to address specific cross border and transnational issues.

The final section of the first part provides an overall characterisation of the regional seas based on composite maps of flows, economic significance and environmental pressures. The purpose of these composite maps is to characterise the maritime regions covering both land and sea in terms of intensity of use and land sea interactions. Drawing upon these composite maps a baseline typology of maritime regions is presented which classifies these areas as European Core, Regional Hub, Transition, Rural and Wilderness based on their current attributes.

In the second part of the report the focus shifts to the future and it comprises two elements. First we summarise key opportunities and risks for future territorial development for the regional sea based on the understanding of current and potential land sea interactions. Second this assessment leads to a set of policy recommendations targeted at different stakeholder groups related to future planning and development in the region.

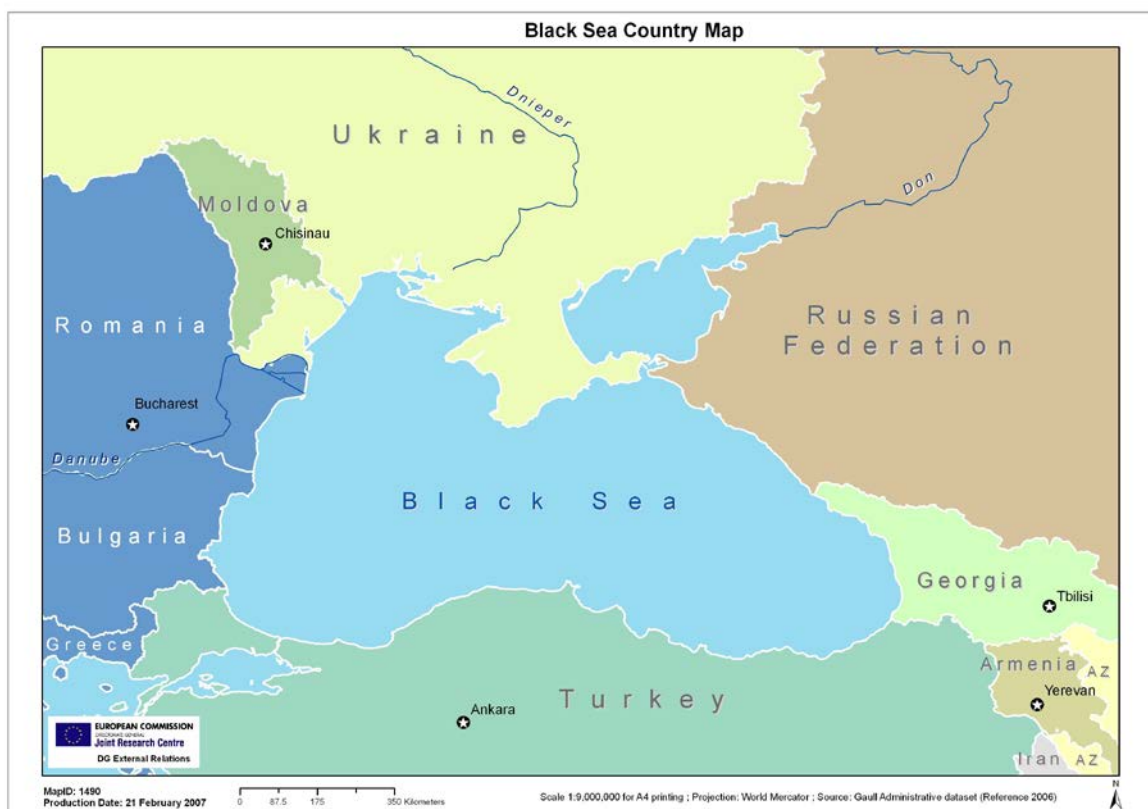
## 2. Context

The roughly oval-shaped Black Sea occupies a large basin strategically situated at the southeastern extremity of Europe. The Black Sea is the largest, low tide, brackish-water intercontinental sea, bounded by Europe, Anatolia and the Caucasus, the most isolated from the World Ocean - connected to the Oceans via the Mediterranean Sea. The Bosphorus strait (which emerges from the sea's southwestern corner) connects it to the Sea of Marmara, and the strait of the Dardanelles connects Marmara Sea to Mediterranean Sea. The renowned Crimean Peninsula thrusts into the Black Sea from the north, and just to its east the narrow Kerch Strait links the sea to the smaller Sea of Azov.

The Sea of Azov is bounded in the north by mainland Ukraine, in the east by Russia, and in the west by the Ukraine's Crimean Peninsula (see Map BL1). The Sea of Azov is the shallowest sea in the world with the depth varying between 0.9 metres (2 ft 11 in) and 14 metres (46 ft). There is a constant outflow of water from the Sea of Azov to the Black Sea. As the Sea of Azov is not part of the EU, the subject has not been approached.

The Black Sea is very vulnerable to pressure from land based human activity and its health is equally dependent from the coastal and non-coastal states of its basin.

The large European rivers Danube, Dnieper and Don (via the Sea of Azov), flow into this sea together with other important rivers such as Rioni, Kodori and Inguri Chorokh, Kyzyl-Irmak, Eshil-Irmak, Sakarya, Southern Bug and Dnister.



**Map BL1.** The Black Sea area. Source: <http://global-atlas.jrc.ec.europa.eu>

## **Background**

### **The Black Sea in Figures:**

Geographical Coordinates: 46°33' - 40°56N and 27°27' - 41°42' E

Drainage area: 2 000 000 km<sup>2</sup>

Total shoreline: 4 340 Km  
(without Sea of Azov shoreline)

Bulgaria 300 Km

Georgia 310 Km

Romania 225 Km

The Russian Federation 475 Km

Turkey 1 400 Km

Ukraine 1 628 Km

Area of Water Surface: 432 000 Km<sup>2</sup>

River inflow: 340,6 Km<sup>3</sup>

Water volume: 547 000 Km<sup>3</sup>

Maximal depth: 2 212 m

Salinity : 18 - 22 pro mil

Average fresh water balance: 3.7 - 441 Km<sup>3</sup>

### Black Sea biological species:

Fungi, algae, higher plants 1 619

Invertebrates 1 983

Fishes 168

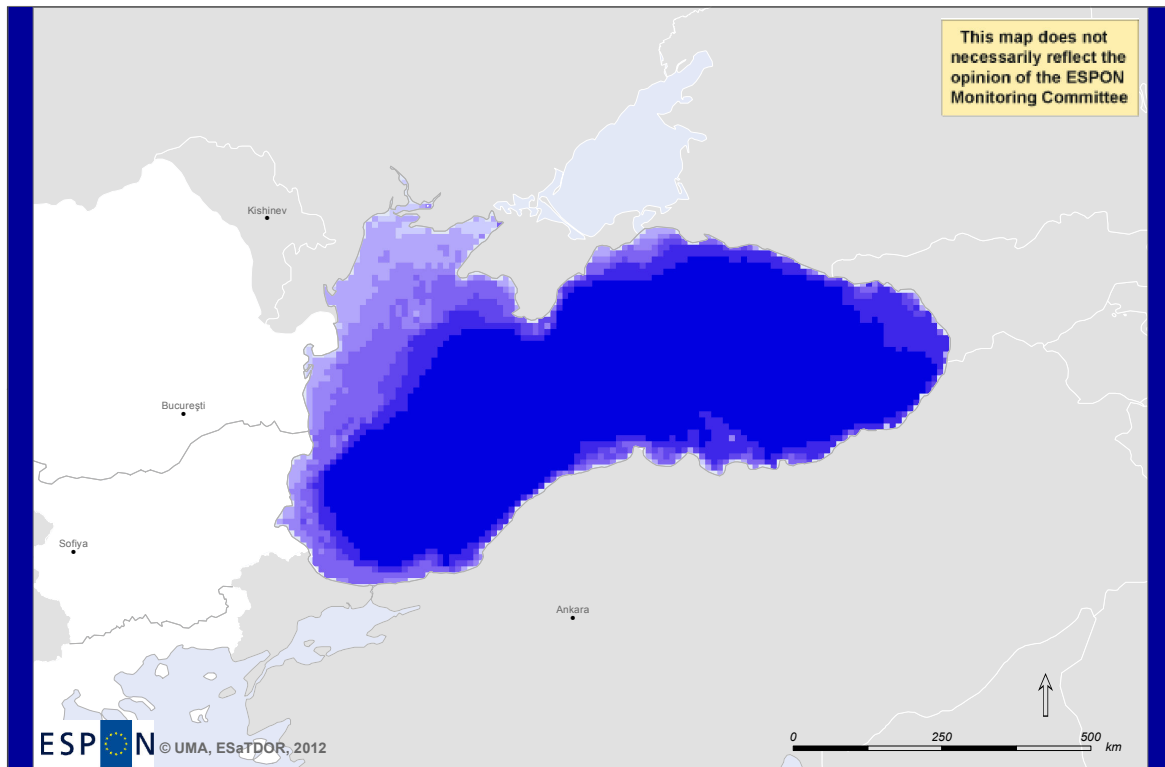
Marine mammals 4

Source: [http://www.blacksea-commission.org/\\_geography.asp](http://www.blacksea-commission.org/_geography.asp)

For the purposes of the ESaTDOR project the Black Sea does not include the Sea of Azov. This is because the Sea of Azov is bounded by Russia and Ukraine, neither of which are part of ESPON space.

The seabed of the Black Sea is divided into the shelf, the continental slope and the deep-sea depression. The shelf occupies a large area in the north-western part of the Black Sea, where is over 200 km wide and has a depth ranging from 0 to 160 meters (see Map BL2). In other parts of the sea it has a depth of less than 100 m and a width of 2.2 to 15 km. Near the Caucasian and Anatolian coasts the shelf is only a narrow intermittent strip.








## Sea Depth (Bathymetry)



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Thematic data: Sea Depth, GEBCO.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

### Sea depth (m)

 Above -10	 -101 to -200
 -11 to -30	 -201 to -1,000
 -31 to -50	 Under -1,000
 -51 to -100	

**Map BL2.** Sea depth (bathymetry) of the Black sea

The Black Sea forms in an east-west trending elliptical depression which lies between Bulgaria, Romania, Ukraine, Russia, Georgia and Turkey. Only 2 neighbouring countries belong to the EU, namely Romania and Bulgaria.

The coastline of the Black Sea is only mildly indented, except for the northwestern and northern shores, which are low and furrowed by numerous ravines, valleys, and rivers, the mouths of which are often impeded by sandy spits. The mountains of the southern Crimea form the only precipitous cliff areas. In the east and south, the coasts are steep and mountainous. Spurs of the Greater and Lesser Caucasus ranges, separated by the Kolkhida lowland, confine the Black Sea in the east, while the Pontic Mountains run along the southern coast. Near the Bosphorus outlet, the shoreline relief is moderate though still steep. Farther north, in the Burgaski Bay area, low mountains emerge where the Balkan Mountains of Bulgaria extend eastward. Continuing northward along the western shore, a flatter plateau region gives way to the great Danube River delta, which thrusts its mass out into the sea.

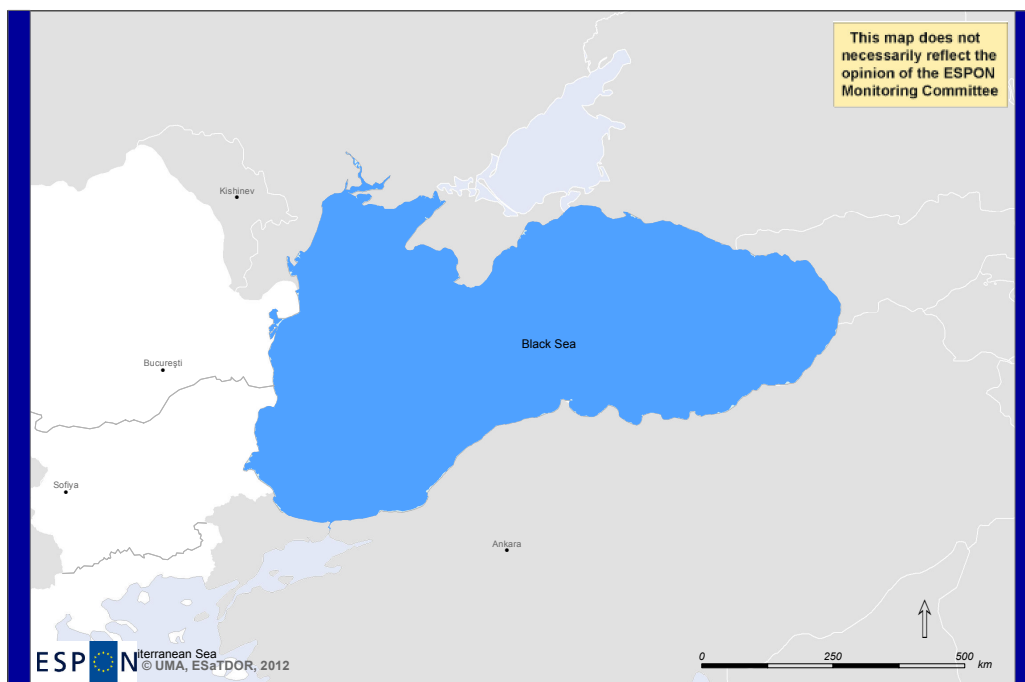
Black Sea contains only a few small islands, the largest being Zmiyinyy (Fidonisi) of Ukraine, east of the Danube delta, and Berezan at the mouth of the Dniester River estuary. The submarine relief may be visualized as a series of concentric and occasionally asymmetrical rings. Beyond the shoreline a shallow shelf zone occupies about one-fourth of the entire area. It is broadest in the west and at the head of Kerch Strait but elsewhere forms a rim about 6 to 7 miles (10 to 11 km) wide, and the depth of the edge is usually less than 360 feet (110 metres). The shelf gives way at its edge to a slope, which is broken by submarine valleys and is steep in its upper parts. Between the port cities of Sinop and Samsun (Turkey), the coastline is paralleled by a rugged range of underwater mountains extending for nearly 100 miles (160 km). The hollow forming the basin's core covers about a third of the total area and is a completely featureless flat plain, with depths increasing evenly toward the centre to a little more than 7,200 feet (2,200 metres), with the axis of maximum depth displaced toward the Turkish coast.

The maximum east-west extent of the sea is about 730 miles (1,175 km), and the shortest distance between the tip of the Crimea and the Cape Kerempe to the south is about 160 miles (260 km).

The Black Sea has a positive water balance; that is, a net outflow of water 300 km<sup>3</sup> per year through the Bosphorus and the Dardanelles into the Aegean Sea. Mediterranean water flows into the Black Sea as part of a 2-way hydrological exchange. The Black Sea outflow is cooler and less saline, and therefore floats over the warm, more saline Mediterranean inflow. The Black Sea is the world's largest meromictic basin where the deep waters do not mix with the upper layers of water that receive oxygen from the atmosphere. As a result, over 90% of the deeper Black Sea volume is anoxic water. The current hydrochemical configuration is primarily controlled by basin topography and fluvial inputs, which result in a strongly stratified vertical structure and a positive water balance. The upper layers are generally cooler, less dense and less salty than the deeper waters, as they are fed by large fluvial systems, whereas the deep waters originate from the warm, salty waters of the Mediterranean. This influx of dense water from Mediterranean is balanced by an outflow of fresher Black Sea surface-water into the Marmara Sea, maintaining the stratification and salinity levels.

The Black Sea forms one large marine ecosystem (see Map BL3). Biological species include 1,619 fungi, algae and higher plants, 1,983 invertebrates, 168 fishes and 4 marine mammals.













## Black Sea Marine Ecosystems



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Thematic data: UNEP, WCMC.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

### Large Marine Ecosystems

	Baltic Sea		Faroe Plateau
	Barents Sea		Iberian Coastal
	Black Sea		Iceland Shelf
	Canary Current		Mediterranean Sea
	Celtic-Biscay Shelf		North Sea
	East Greenland Shelf		Norwegian Sea

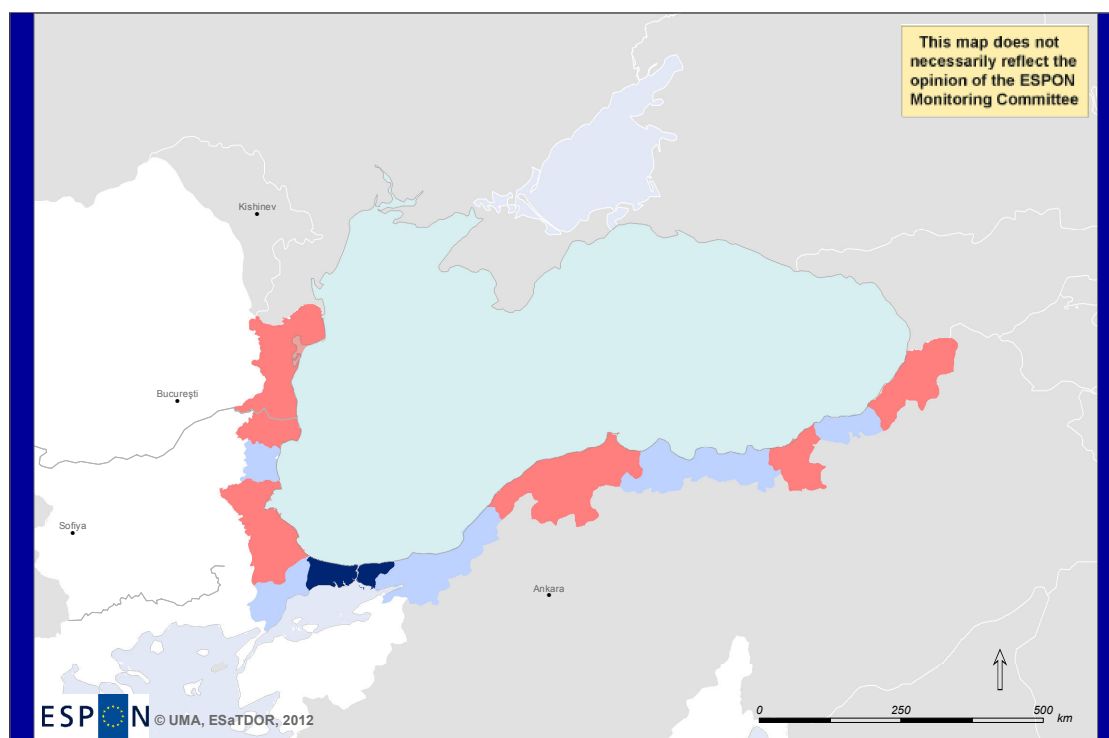
**Map BL3.** Large marine ecosystems (LMEs) in the Black Sea region



The Black Sea countries coastal zones are estimated to contain about 20 million people. However, the situation with regard to Istanbul is confusing, since the coastal administrative unit which includes Istanbul has a short Black Sea coastline. Thus, if the population of this area is also included, the value increases to over 39 million people. Map BL4 below shows that the metropolitan area surrounding Istanbul is the most densely populated part of the Black Sea, with an average population much higher than the national average for Turkey as a whole. Of the two ESPON territories on the Black Sea, Romania and Bulgaria, coastal population density is relatively low, except for in the Severoiztochen region of Bulgaria, which contains the major Black Sea port of Varna.

The proportion of national populations living within Black Sea coastal administrative areas varies widely: 0.6% in Russia, 4.5% in Romania, 10.5% in Turkey (excluding Istanbul), 14.4% in Ukraine, 26.5% in Bulgaria, 37.1% in Turkey (including Istanbul) and 38.6% in Georgia.

## Coastal Population Density (Compared to National Averages)

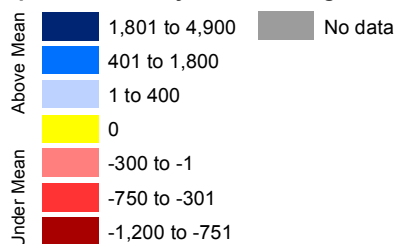


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Thematic data: Population density, EUROSTAT, 2008  
Land boundaries: © EuroGeographics Association and ESRI, Regional level: NUTS3.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

**Population density in coastal regions 2008 (number of persons compared to national averages)**



**Map BL4.** Population density in Black Sea coastal regions, 2008 (persons/km<sup>2</sup> compared to national averages).

### 3. Thematic Sections

#### Maritime Economy

The economic activities connected to the Black Sea can be divided into 3 areas: traditional maritime sectors (shipping, shipbuilding, marine equipment, maritime services, recreational boating, seaports, offshore supply, navy, inland navigation, maritime works and marine aggregates), tourism and fisheries. Of the maritime activities with onshore employees (shipping, shipbuilding, marine equipment, maritime services, recreational boating, seaports, offshore supply, navy, maritime works and marine aggregates) Black Sea countries remain some of the most important providers of labour for the seagoing work force (East European countries provide 20.3% of officers and 14.6% of ratings from the world total, where Romania, Bulgaria and Ukraine constitute a large part).

In August 2007 a maritime cluster was established in Varna (Bulgaria) and soon another will be developed in Constanta (Romania).

According to Policy Research (based on Houthoff Buruma and Policy Research (2007) – IPR Shipbuilding study, European Foundation for the improvement of living and working conditions (2008) – Article concerning port workers in Romania, BIMCO/ISF (2005) – Manpower 2005 update, Eurostat – Industry, Trade and Services (Annual enterprise statistics) 2005, Eurostat – Tourism indicators 2005, and United Nations (2004) – Fishery country profile) Romania employed about 80400 persons in traditional maritime sectors, 45600 persons in tourism and 10600 persons in fisheries. In the same time Bulgaria employed about 29700 persons in traditional maritime sectors, 72700 persons in tourism and 900 persons in fisheries. All employment in Romania is situated in the region Sud-Est (greatest proximity to the sea).

**Table 1** Employment in Romania and Bulgaria

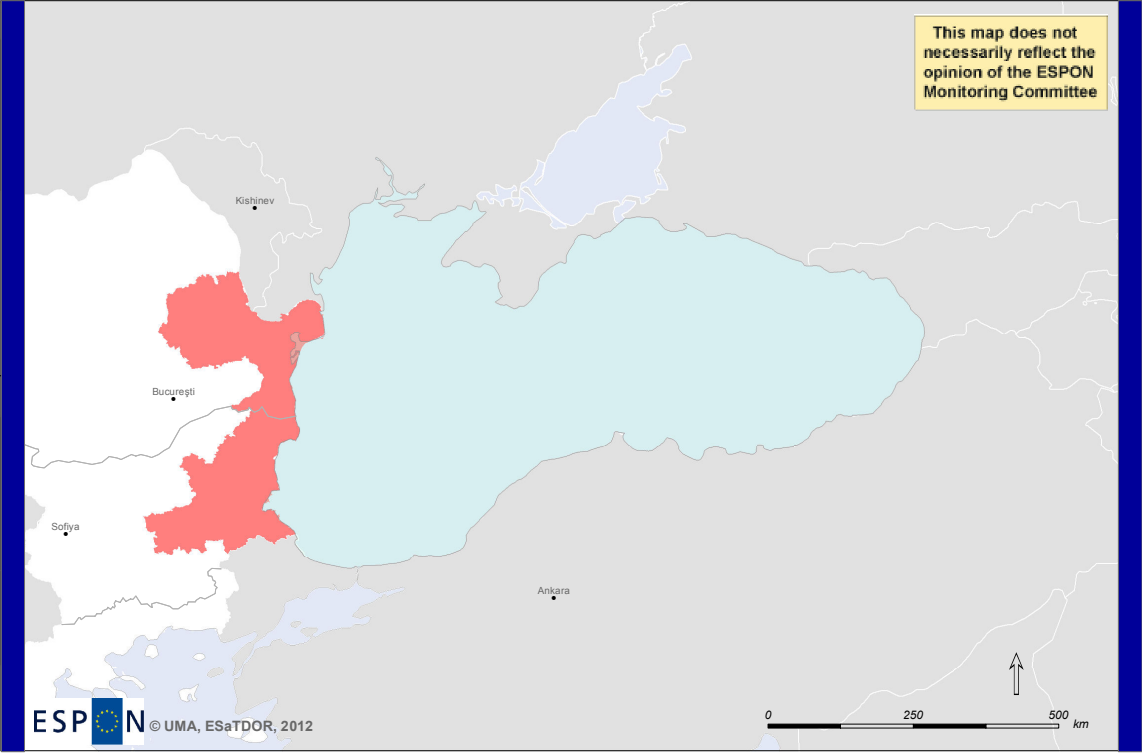
	<b>Romania</b>	<b>Bulgaria</b>
Navy	6 800	10 000
Marine equipment	17 709	8 172
Shipping	13 327	5 405
Seaports	18 000	-
Shipbuilding	19 855	6 147
Recreational boating	-	-
Offshore supply	-	-
Maritime services	-	-
Inland navigation	3 097	-
Maritime works	1 575	-
Marine aggregates	-	-
Coastal tourism	45 610	72 653
Cruise tourism	-	-
Fisheries	10 600	895

Source: Policy Research Corporation

The analysis of the employment data in the maritime sectors and Areas in the EU featured in Table 1 was made by assessing existing employment data, in particular figures from Ecotec’s study "Employment trends in all sectors related to the sea or using sea resources" (2006), the underlying work of Policy Research Corporation and a broad selection of national maritime cluster studies.

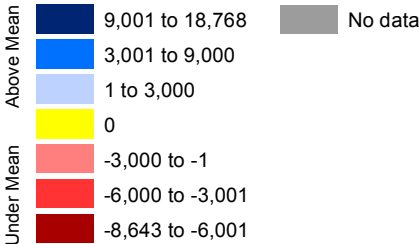
From 2000 to the third quarter of 2008, was a period of high and sustained growth with real GDP increases for the Black Sea region as a whole averaging 6% per annum. As a result living standards started to rise and trade and investment to increase. Since the third quarter of 2008, has been marked by a sharp halt in growth coupled with a low inflow of foreign capital due to the global financial crisis. Map BL5a shows that despite the economic improvement from 2000 to 2008, average GDP in Black Sea coastal regions is still relatively low compared to national averages, and in Map BL5b extremely low compared to the average across ESPON coastal regions as a whole.

# GDP Compared to National Average



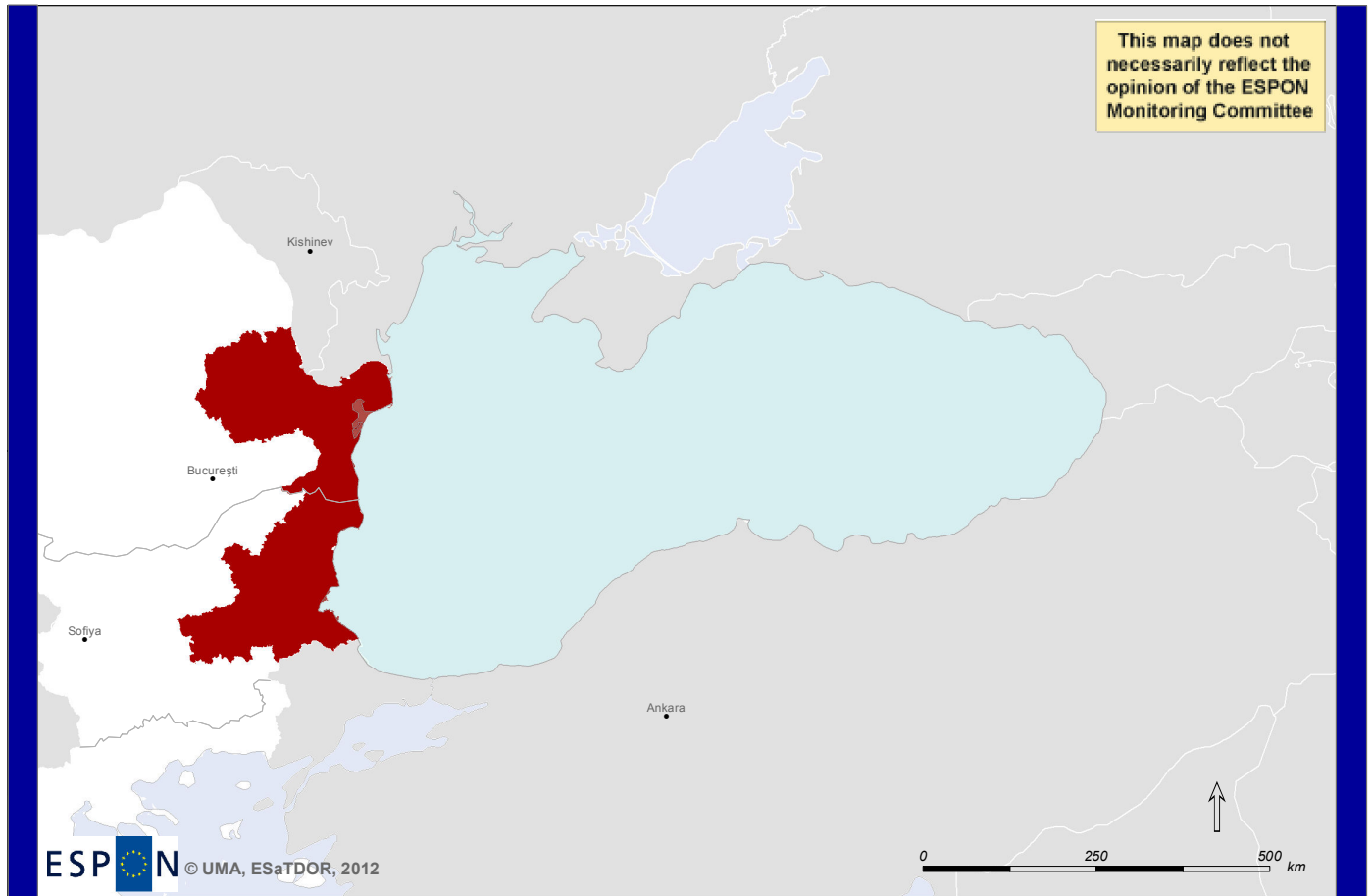
EUROPEAN UNION Part-financed by the European Regional Development Fund INVESTING IN YOUR FUTURE  
 Thematic data: GDP, EUROSTAT, 2009; STATISTICS NORWAY, 2009.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

**GDP in coastal regions (euros/inhabitant compared to national averages)**



**Map BL5a.** GDP in Black Sea coastal regions 2008 (Euros/inhabitant compared to national averages.)

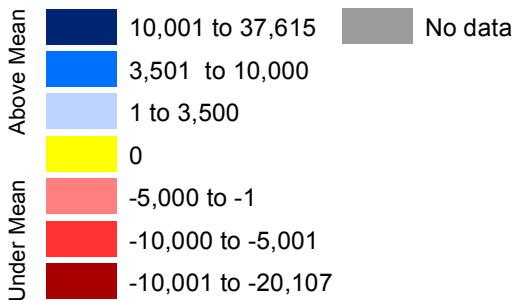
# GDP Compared to Coastal Average




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Thematic data: GDP, EUROSTAT, 2009; STATISTICS NORWAY, 2009.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## GDP in coastal regions (euros/inhabitant compared to ESPON Seas coastal regions average)



**Map BL5b.** GDP in Black Sea coastal regions 2008 (Euros/inhabitant compared to average across ESPON coastal regions).

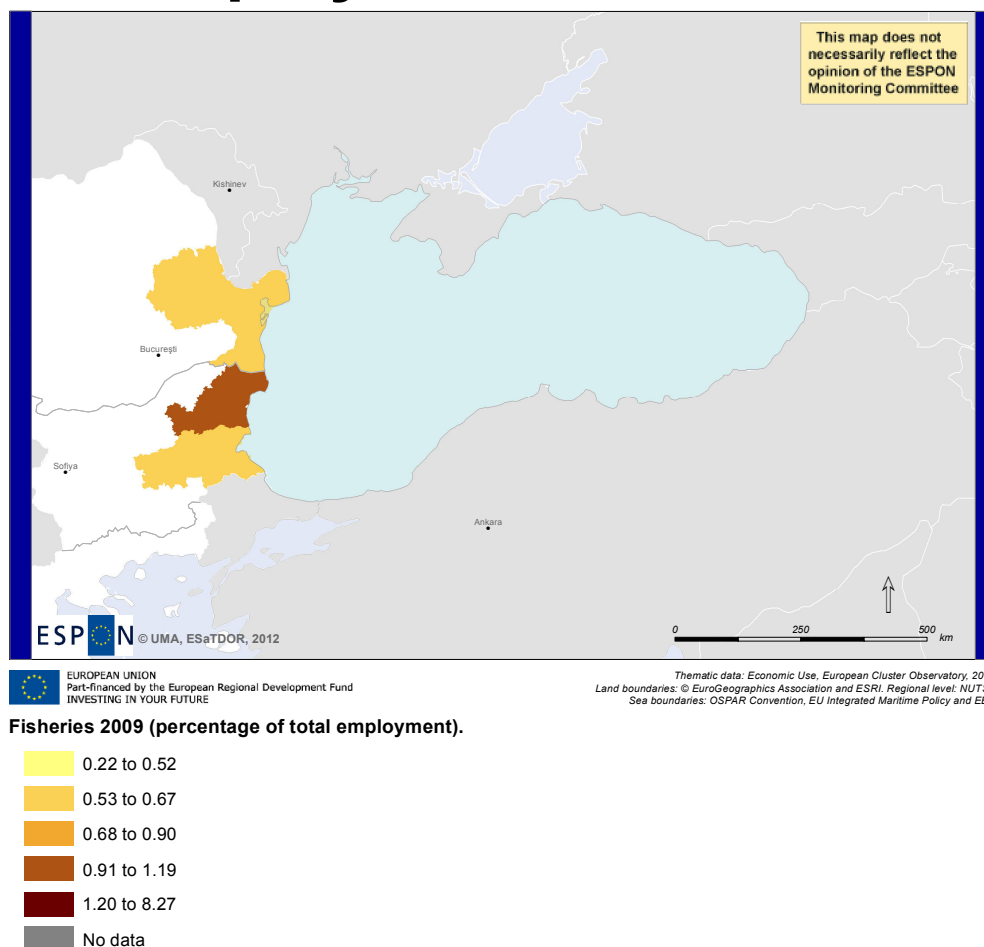
There is no doubt that the Black Sea's fisheries have deteriorated dramatically in the past three decades. The diversity of commercial fish caught has decreased over this period from about 26 species to some six. The volume of fish caught has actually increased, despite a near collapse in 1990, but this is almost entirely due to the large anchovy fishery of Turkey. Main factors behind this decline are: changes to the ecosystem as a result of eutrophication, arrival of alien species and overfishing.

There are two kinds of passive fishing: commercial fishing, carried out by private companies and angling carried out by persons.

In 2002, 21 private companies were authorized to carry out commercial fishery. A number of more than 4 500 fishermen operated in this type of fishery and used 880 boats, 40 pound nets, 1260 turbot gillnets/trammel nets, 11 beach seines and 9030 rodlines. The Black Sea fishery is a seasonal activity, and it is carried out from the middle of March up to the end of October.

There are an estimated 10 600 persons working in the Romanian fisheries sector, of which 46% are subsistence fishers, 18% are involved in fish farming, 27% are active in inland fisheries and 9% in marine fisheries. This estimate does not include those working in the fish processing industry.

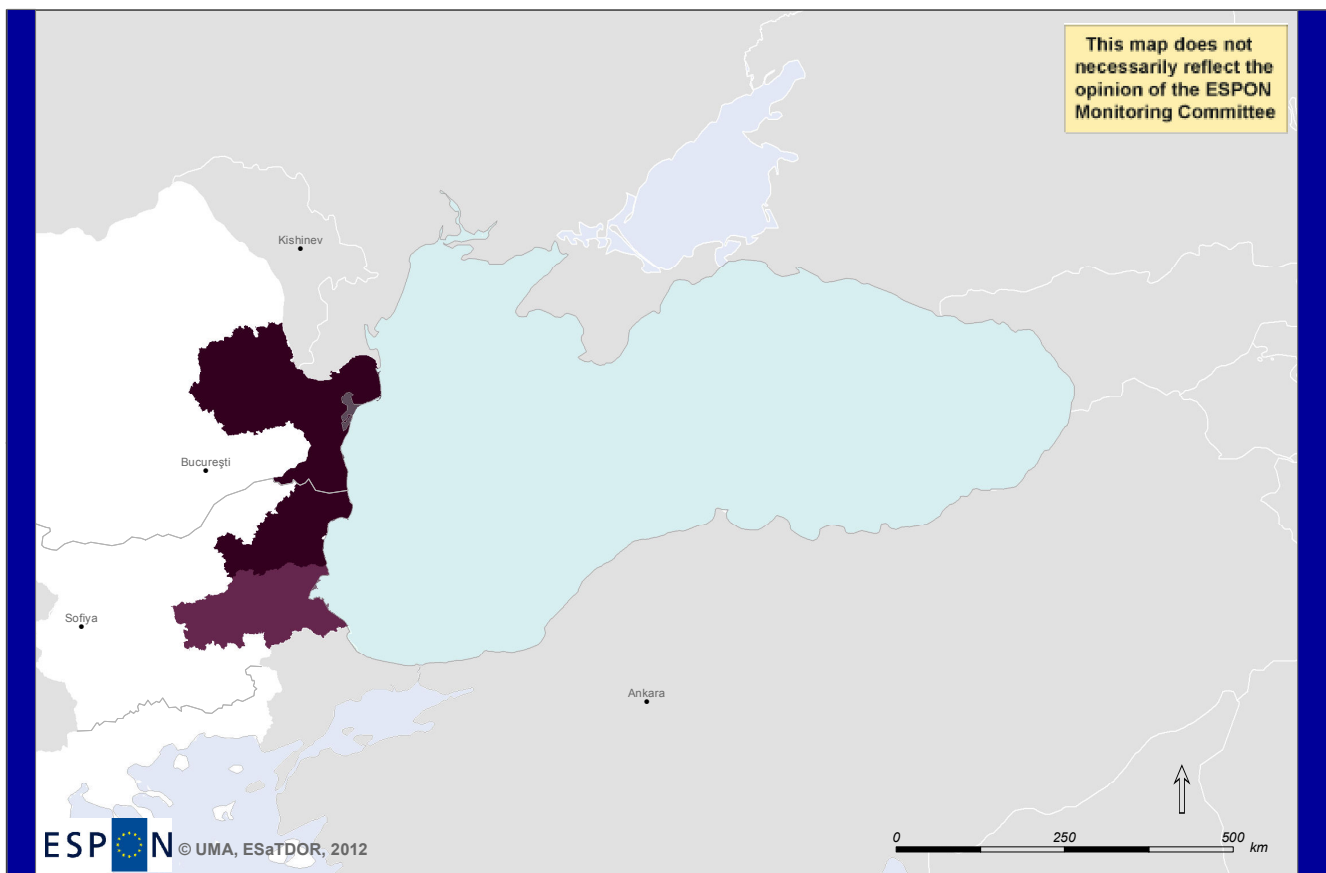
## Employment in Fisheries



**Map BL6.** Employment in Fisheries (as a percentage of total employment), 2009.

Shipbuilding and marine equipment are the most important activities when it comes to employment in the traditional maritime sectors with more than 50000 employees. However, shipping, seaports and maritime services, navy and coastguard together also employ over 50000 people. Despite these figures, Maps BL7, BL8 and BL9 show that employment in shipbuilding, other traditional maritime industries and other sectors associated with the maritime cluster is still relatively low as a proportion of total employment in Black Sea coastal regions.

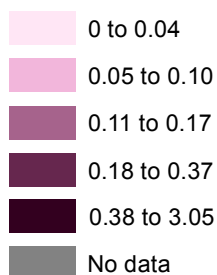
## Employment in Shipbuilding



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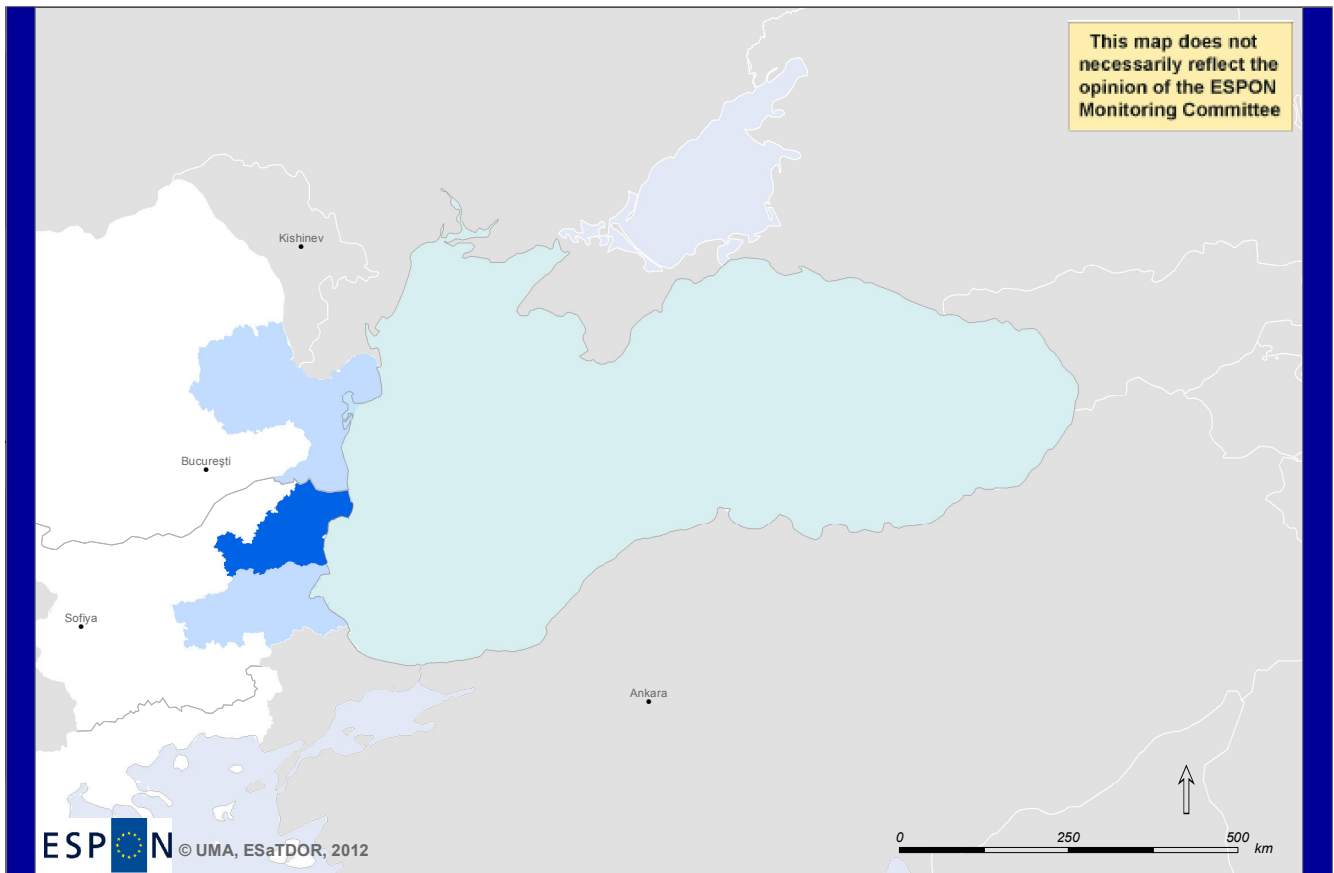
Thematic data: Economic Use, European Cluster Observatory, 2011.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

### Shipbuilding 2009 (percentage of total employment).



**Map BL7.** Employment in Shipbuilding (as a percentage of total employment), 2009

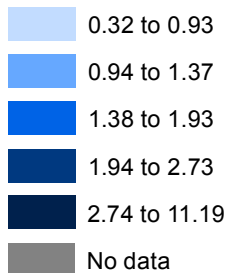
# Employment in Other Traditional Maritime Sectors



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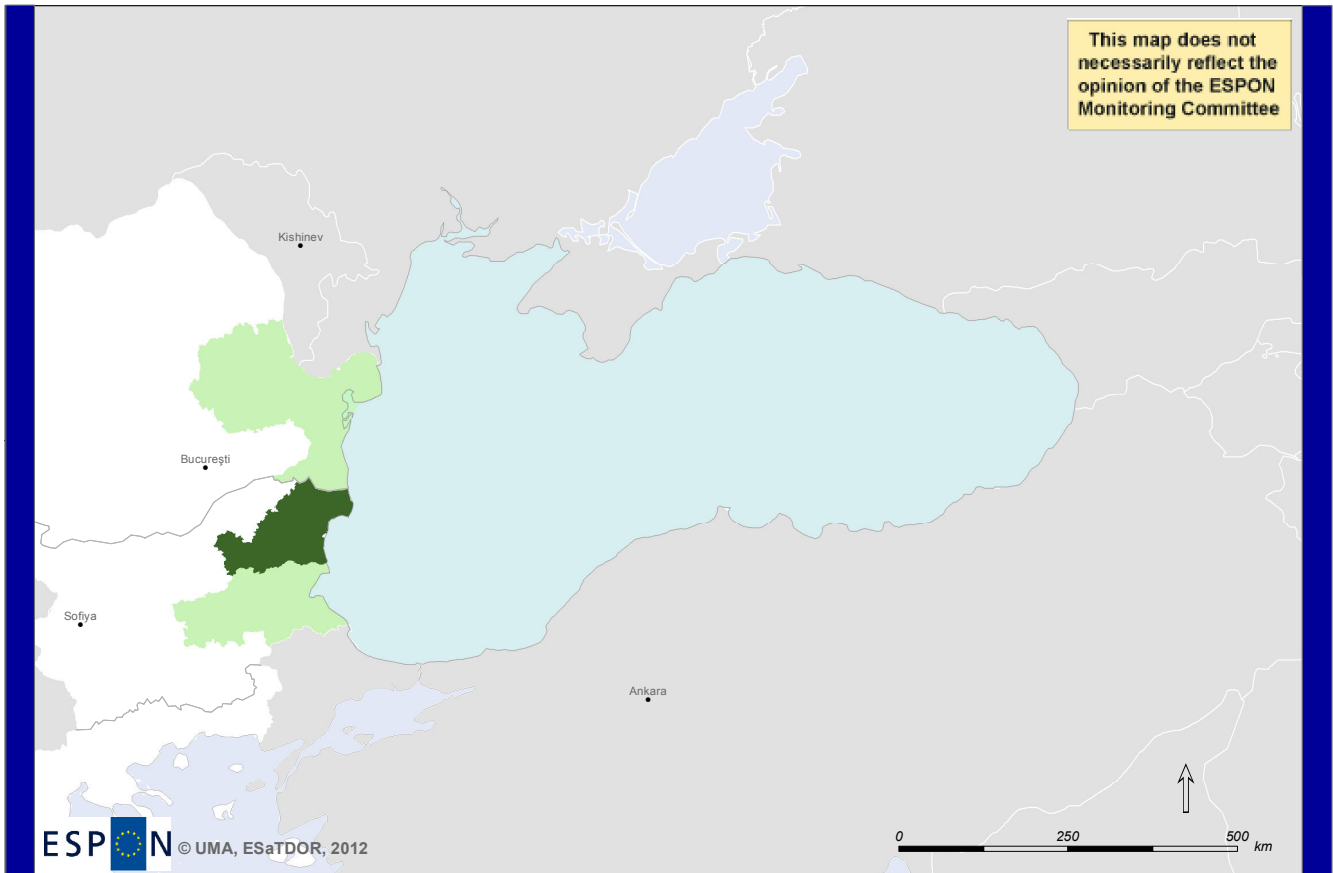
Thematic data: Economic Use, European Cluster Observatory, 2011.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Other traditional maritime sectors 2009 (percentage of total employment).



**Map BL8.** Employment in other traditional maritime sectors (as a percentage of total employment), 2009

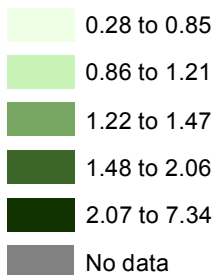
# Employment in Other Sectors Associated with the Maritime Cluster



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Thematic data: Economic Use, European Cluster Observatory, 2011.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

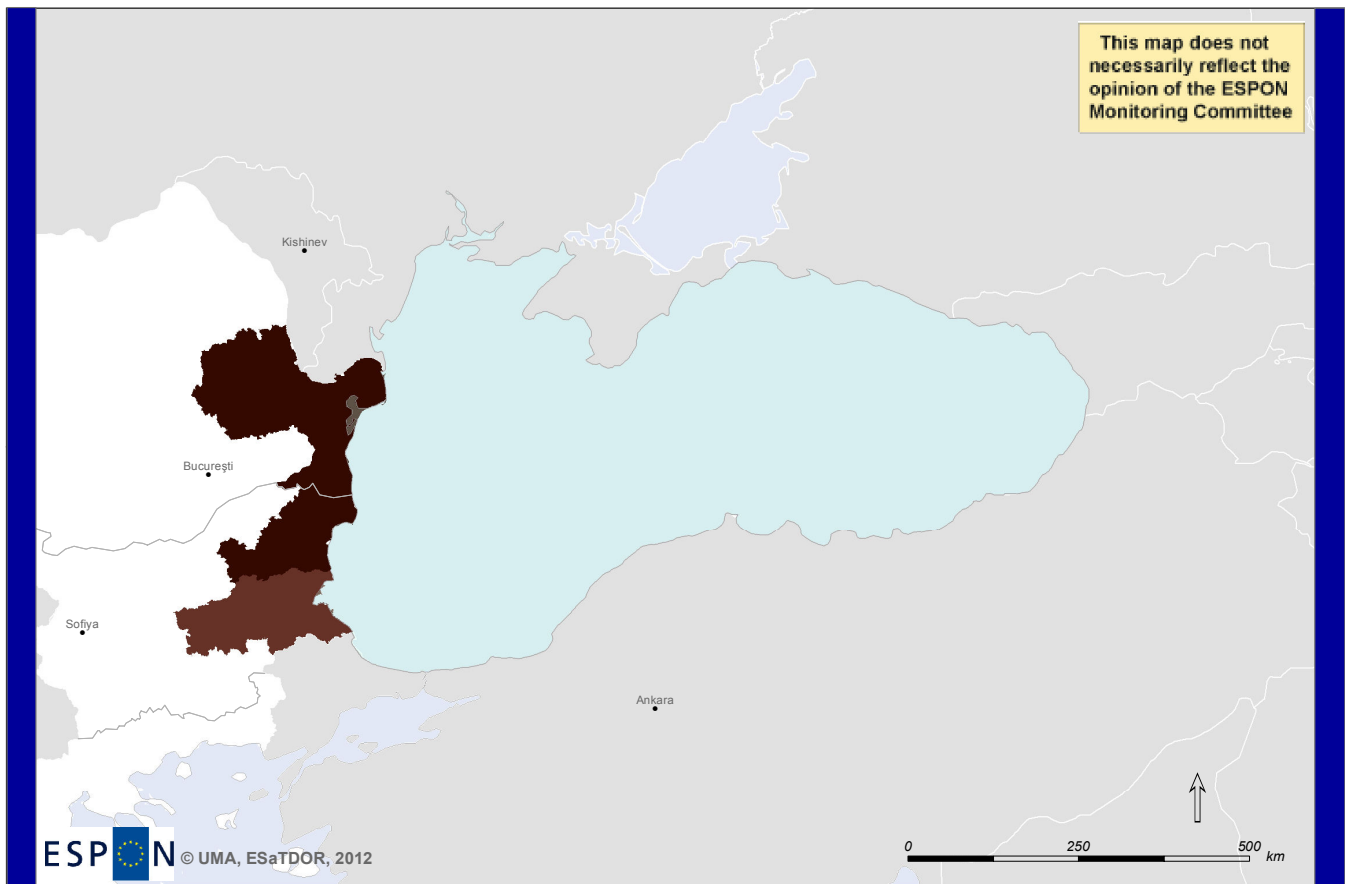
## Other sectors associated with the maritime cluster 2009 (percentage of total employment).



**Map BL9.** Employment in other sectors associated with the maritime cluster (as a percentage of total employment), 2009



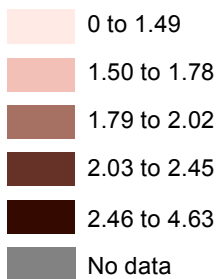
# Employment in Transport




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*Thematic data: Economic Use, European Cluster Observatory, 2011.*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

## Transport 2009 (percentage of total employment).



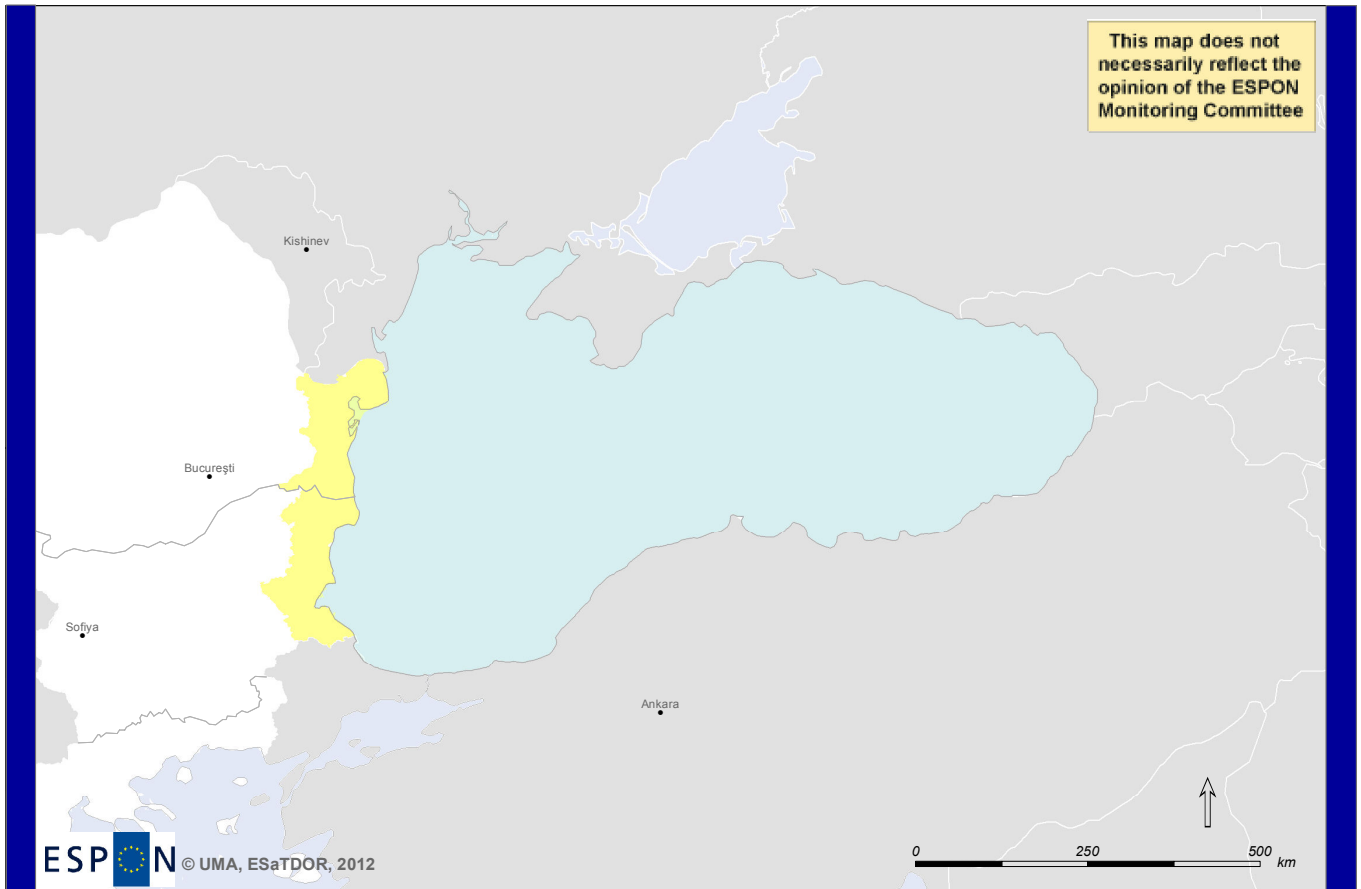
**Map BL10.** Employment in the transport sector (as a percentage of total employment), 2009.

The Black Sea is still the most popular tourist destination for people in nearby countries. But more significant is the large volume of traffic passing through the area – both people and goods, including gas and oil on its way from the Caspian Sea. These are mostly transported on tankers, but major construction work is currently underway on pipelines.

Mass tourism development in the Black Sea coastal regions has relatively recent origins, and as compared to other EU destinations, the figures already show good results. Focusing on their natural and cultural heritage, they have developed the typical Mediterranean urban tourism model, and offer a combination of sandy beaches, ancient monuments and modern resorts aimed at addressing the demands of international tourism.

In 2009, European regions with a Black Sea coastline had around 2100 tourist accommodation facilities, 77.0 % of which were hotels (or similar establishments). From 2008 to 2009 the number of tourist accommodation facilities throughout the Black Sea basin increased by 1.1 %. However, this trend varied according to accommodation type: the number of hotels increased by 3.7 % during this period and the other types of accommodation declined by almost 7.0 %. Over this period, the density of tourist capacity increased in Romania's coastal regions, particularly the Tulcea region. On the Bulgarian coast, the density increased only in the Burgas region; however, it declined in the other two coastal regions. Tourism intensity (measured in terms of tourist establishments and bed places, see Map BL11) remains relatively low across the Black Sea coasts of Romania and Bulgaria. Employment in tourism is highest in the Severoiztochen province of Bulgaria, which contains the port of Varna and several beach resorts such as the Golden Sands resort and national park, Kavarna, Balchik and Kamchia (see Map BL12).

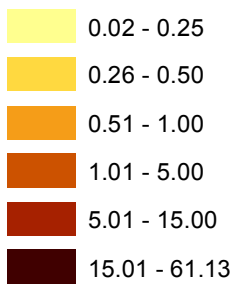
# Tourism Intensity




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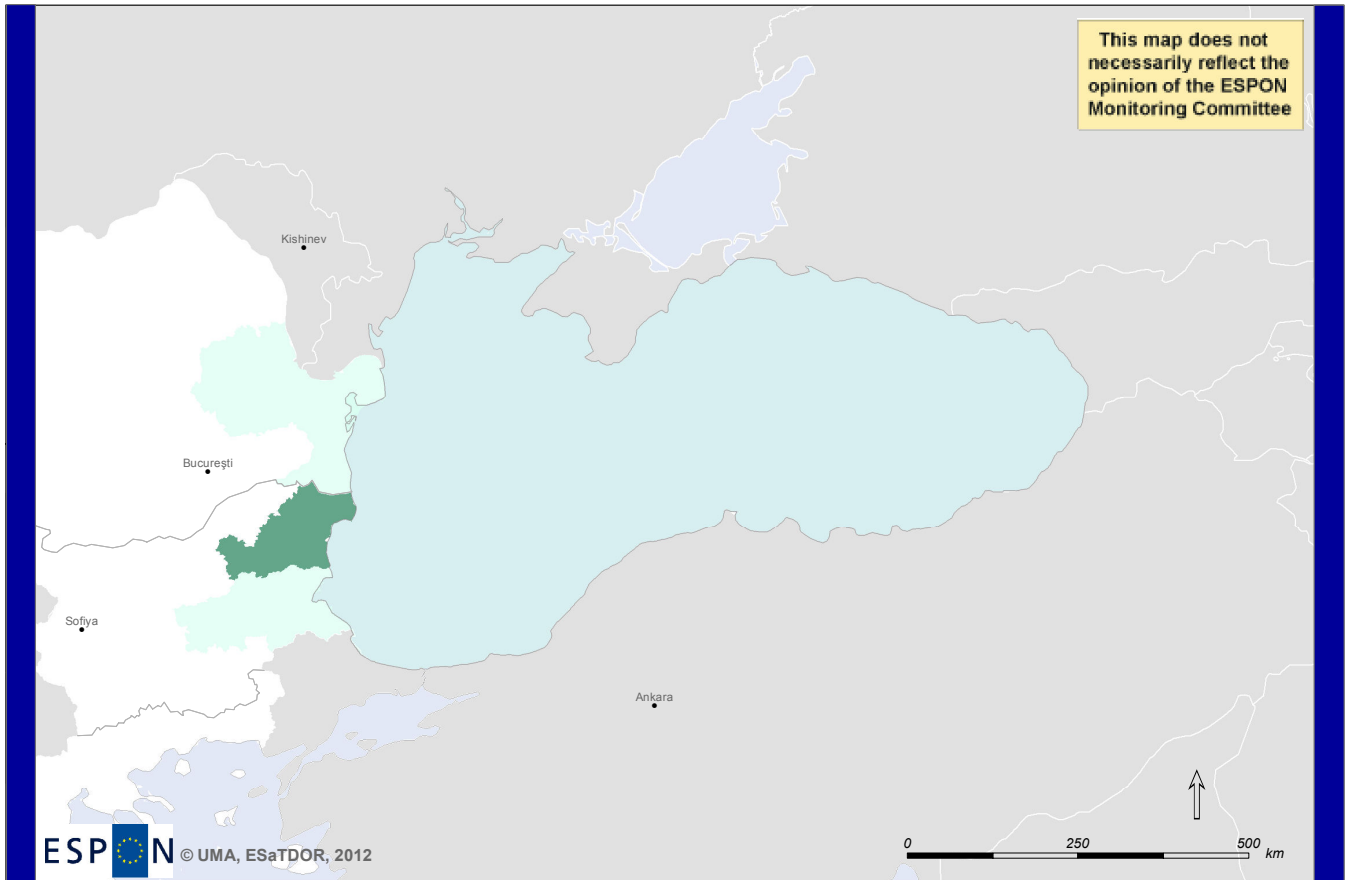
*Thematic data: Tourism Intensity, EUROSTAT, 2009*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS3.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

## Tourism Intensity (establishments, bedrooms and bedplaces/km<sup>2</sup>)



**Map BL11.** Tourism intensity, measured as number of establishments, bedrooms and bedplaces per km<sup>2</sup>, Black Sea.

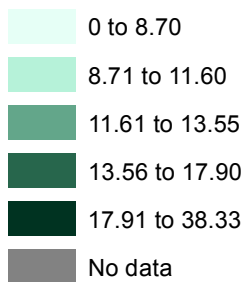
# Employment in Tourism




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Thematic data: Economic Use, European Cluster Observatory, 2011.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Tourism 2009 (percentage of total employment).



**Map BL12.** Employment in tourism (as a percentage of total employment), 2009.

## Transport

The importance of Black Sea ports in international maritime trade is continuously increasing and this tendency will continue for the near future due the improved harvest of grain. Map BL13a shows that Constanta is by far the largest port in the Black Sea in terms of goods handled, although this is still relatively small compared to other European ports.

Map BL13b reflects Romania and Bulgaria's importance to the Black Sea region as major exporters of agricultural products, with a high proportion of outward goods shipping at Varna and Constanta.

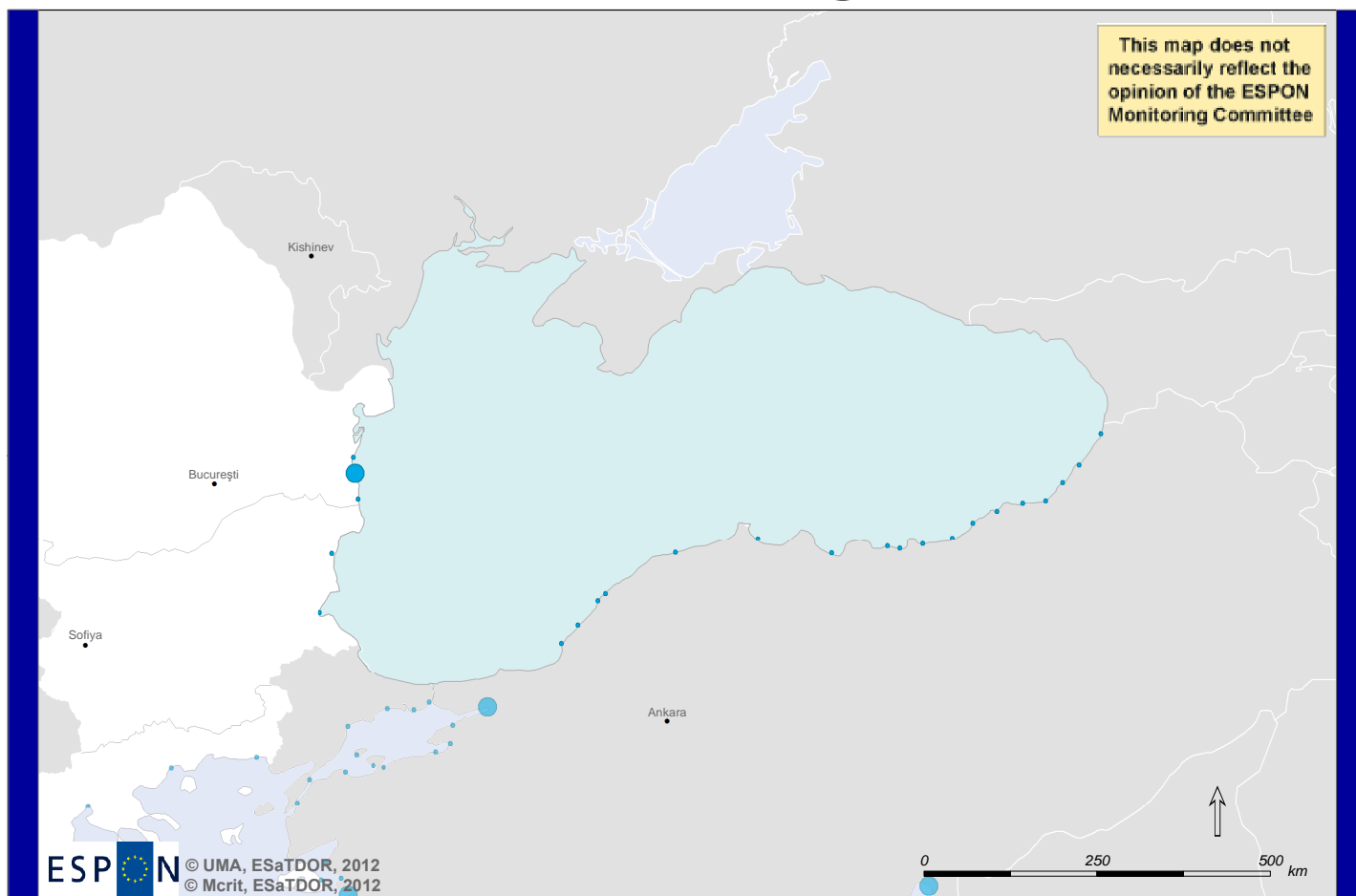
Maps BL13c and BL14 show contrasting pictures of shipping trends for the Black Sea region. Whilst total goods shipping overall has decreased in most ports around the region (see Map BL13c), there has been an increase in the volume of container goods handled (Map BL14). Number of ships, size of ships and cargo have decreased in 2009 and started to recover during 2010 and 2011.

A significantly greater number of vessels were reported to have had accidents in the EU sector of the Black Sea in 2010 than in the previous three years, and the loss of life and damage caused was also greater.

However, it should be noted that the overall number reported is always relatively small in comparison to the other EU regions. The 18 vessel accidents reported in 2010 was over 150% up on 2009 and 64% up on 2008, with collisions being the predominant accident category (around 45% of the vessels were involved in this type of accident). 7 people were reported to have lost their lives on board ships in the region in 2010, which is an increase on the figures for 2009, but this was largely the result of the Karim I sinking off Cape Emine, Bulgaria, with the loss of 5 lives.

There were no significant spills reported by ships in this region in 2010.

# Goods Shipping, 2008

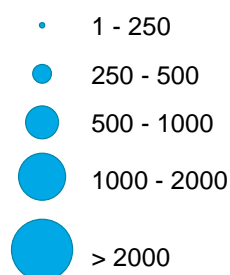



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Thematic data: Gross weight of goods handled in all ports, EUROSTAT, 2008.  
 Iceland data: EUROSTAT, 2006.

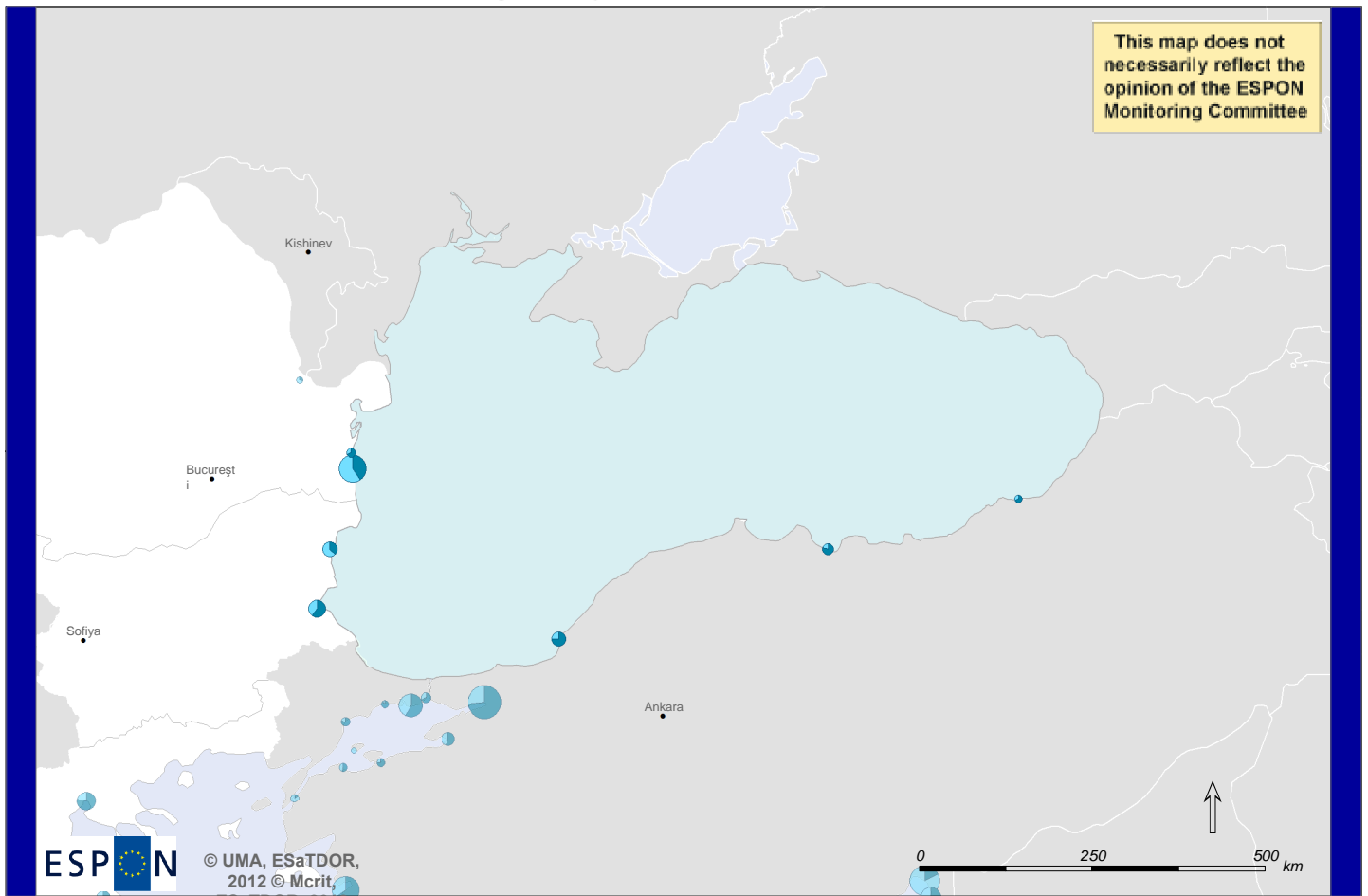
Port locations: Eurostat - GISCO (European Commission), 2009.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Total shipping at Black Sea ports, 2008 (million tonnes). All ports.



## Map BL13a. Total goods shipping (million tonnes) at Black Sea ports, 2008



# Shipping by Direction, 2008




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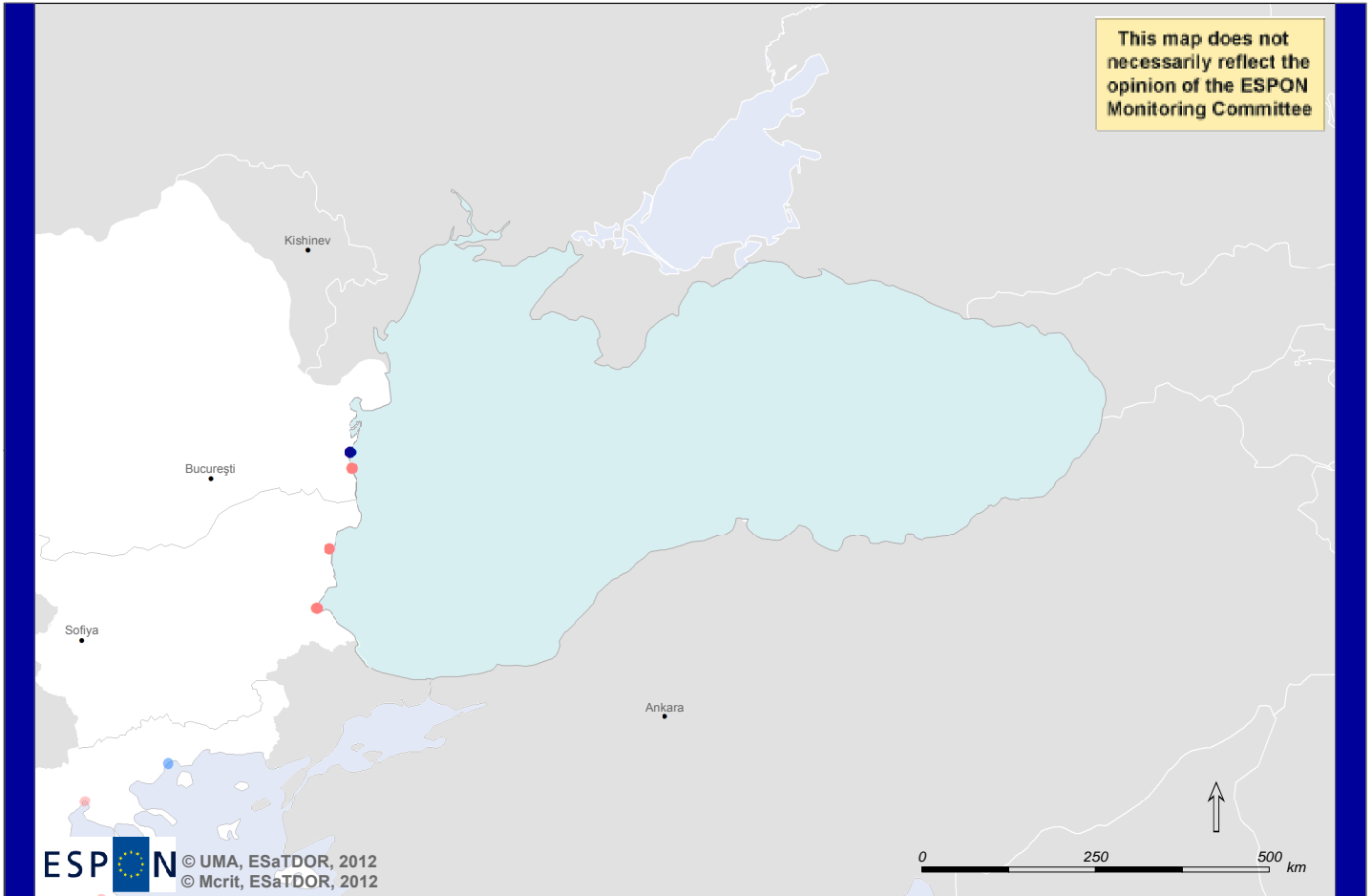
*Thematic data: Gross weight of goods handled in all ports by direction, EUROSTAT, 2008. Port locations: Eurostat - GISCO (European Commission), 2009. Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0. Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

## Total shipping at Black Sea ports by direction,

-  Inward direction
-  Outward direction

**Map BL13b.** Shipping at Black Sea ports by inward/outward direction, 2008

# Shipping Trends




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Thematic data: Gross weight of goods handled in all ports by direction, EUROSTAT, 2004 - 2008.  
 Port locations: Eurostat - GISCO (European Commission), 2009.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

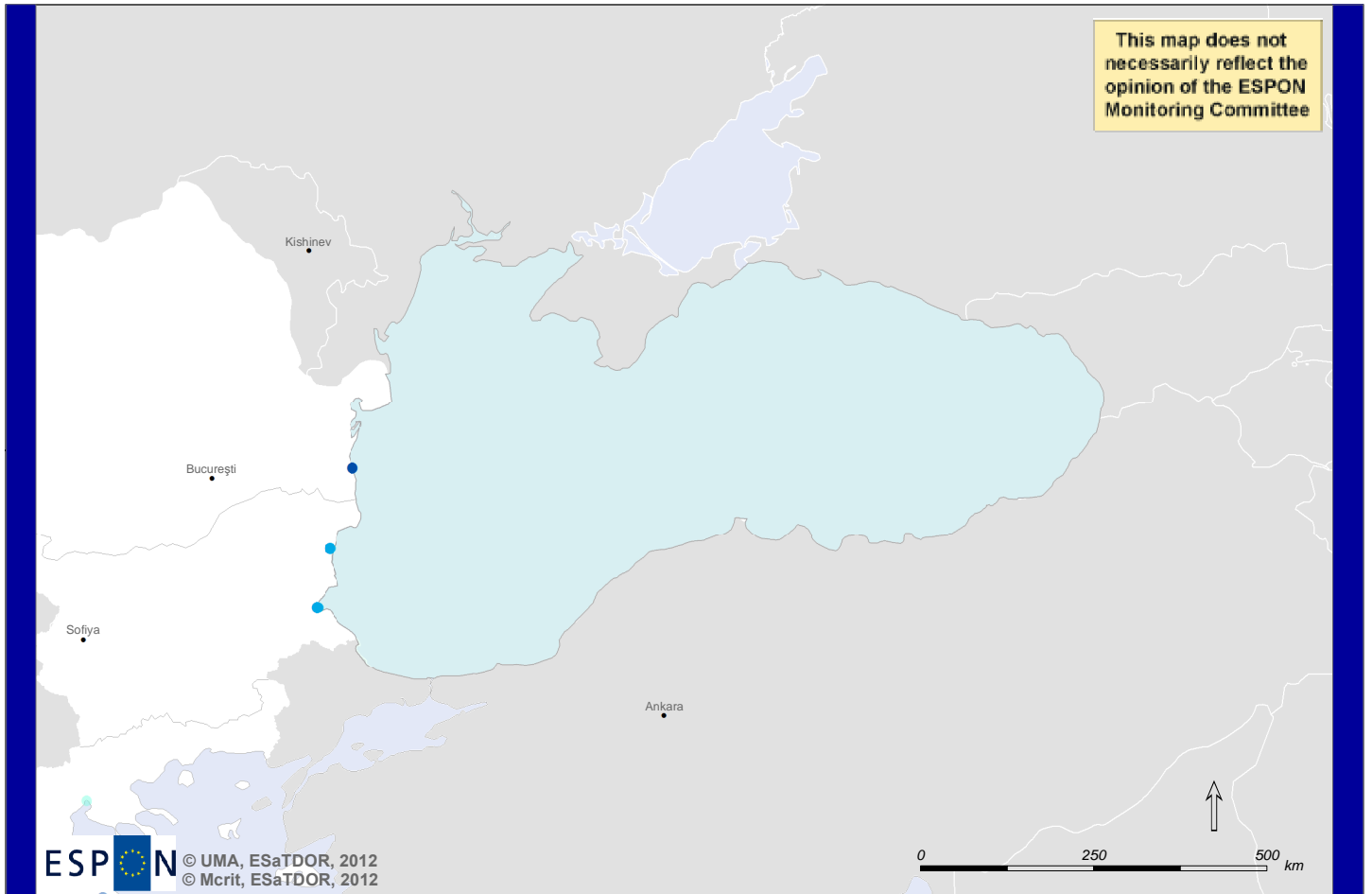
## Total shipping at ports. Average annual traffic increase, 2004 - 2008 (%).

- < -20%
- -20% to -10%
- -10% to 0%
- 0% to 10%
- > 10%

**Map BL13c.** Average annual traffic increase in shipping at Black Sea ports, 2004-2008



# Container Shipping Trends




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*Thematic data: : Containers handled in all ports by direction, EUROSTAT, 2008.*  
*\*Marsaxlokk data: Freeport Malta, 2008.*  
*Port locations: Eurostat - GISCO (European Commission), 2009.*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTSO.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

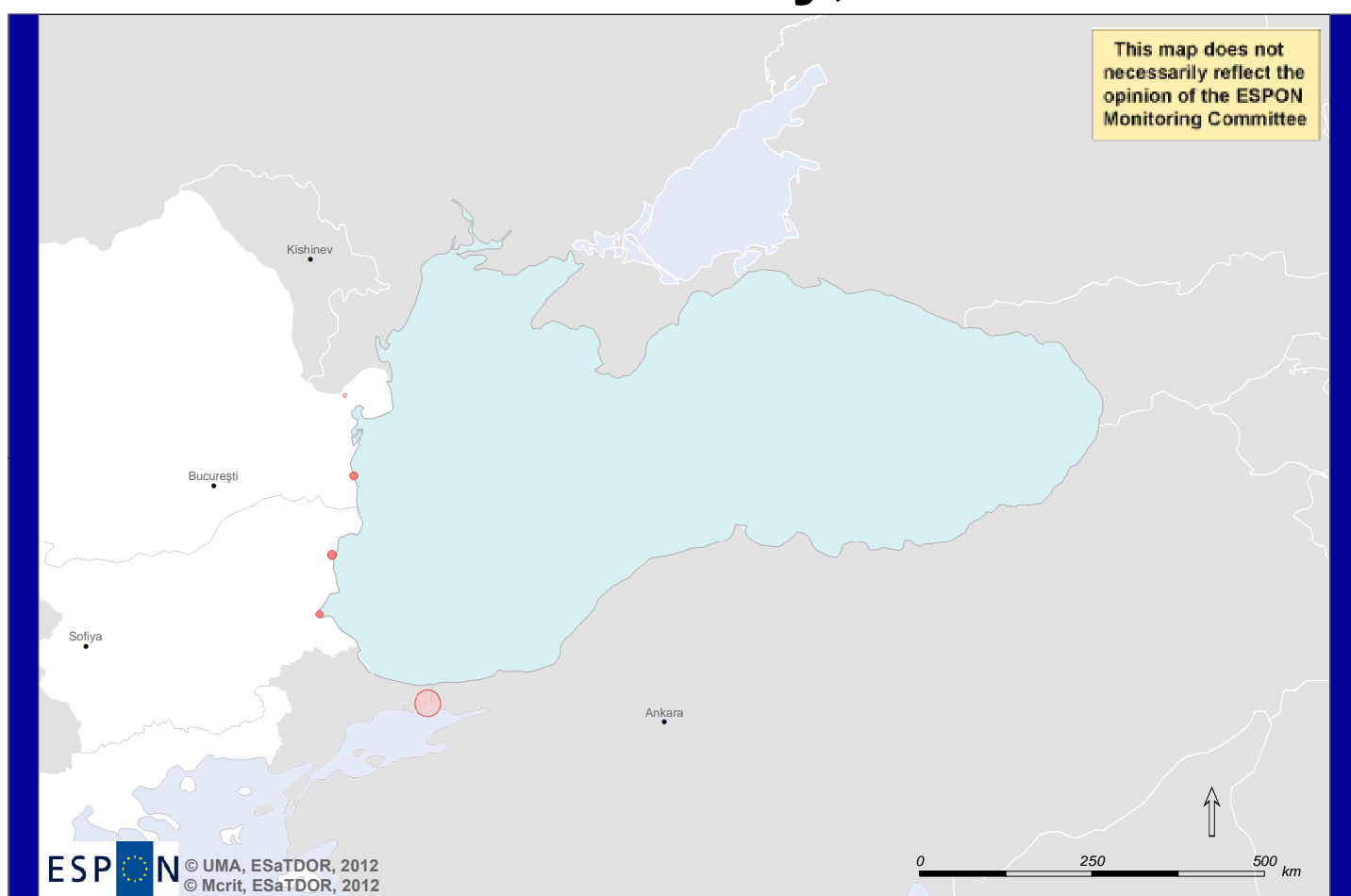
## Container shipping at Black Sea ports. Average annual traffic increase 2004 - 2008 (%).

- 0% - 10%
- 10% - 20%
- 20% - 30%
- 30% - 50%
- > 50%

**Map BL14.** Average annual increase in container traffic at Black Sea ports, 2004-2008.

Cruise shipping is of major importance for various ports around the Black Sea area, but unfortunately number of cruises is quite limited and the same goes for their size. Map BL15 shows that currently most cruise passengers embark and disembark in Istanbul, whilst other Black Sea ports are destinations for day trips only. Increasing port facilities in Black Sea destinations could help to attract cruise companies to set up more permanent bases in the region, helping to increase the overall level of tourism and bringing significant economic benefits to tourist destinations.



## Cruise Activity, 2008




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*Thematic data: Passengers maritime transport by direction and type of traffic, EUROSTAT, 2008.*  
*Port locations: Eurostat - GISCO (European Commission), 2009.*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

### Cruise activity at ports by passenger type, 2008.

-  Starting or ending a cruise
-  On excursion

**Map BL15.** Cruise activity at Black Sea ports by passenger type, 2008.

## Energy and Undersea Infrastructure

The Black Sea region lies at the crossroads of major oil and gas export flows to the world energy markets. Wider Black Sea area is increasingly becoming very important in terms of energy production, transportation and distribution.

In November 2006 the 2nd Energy Ministerial Conference was held under the Baku Initiative sponsored by the European Commission, and a new Energy Road Map was agreed by the European Commission and Governments of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkey, Ukraine, Uzbekistan and the Russian Federation (as an observer) setting out a plan of action to bridge the gap between the current situation in the energy sector of these countries and the long-term vision for a common energy strategy. The priority areas identified in the Road Map include supporting to sustainable energy development - including energy efficiency, renewable energy sources and demand side management - and attracting investment into energy projects of common interest.

The Energy Community Treaty, having as main goal to set up a legal and economic framework in relation to Network Energy, entered into force on 1<sup>st</sup> July 2006, accepted Georgia as observer in December 2007 and was enlarged with Moldova (full member from 1<sup>st</sup> May 2010) and Ukraine (full member from 1<sup>st</sup> February 2011) . The Contracting Parties established to adopt and implement the *acquis communautaire* on energy, environment, competition and renewables. Turkey has confirmed the intention to engage in formal negotiations to join the Energy Community Treaty.

In the Black Sea Region each country is distinct in terms of its energy use and potential for renewable energy, but several trends are clear. First is that renewables are clearly underexploited. Second is that of the renewables sources, hydropower is the best known, but at large scale (and hence questionably 'renewable'); the massive growth in wind power seen globally is beginning to make itself known in the region.

The abundance of oil and gas in the Caspian region has left countries there using that resource for domestic use, as in Azerbaijan, while many other countries continue to rely heavily on fossil fuels that have historically been available at cheaper than market prices, complicating the economic argument for alternatives.

The State Agency of Ukraine for Energy Efficiency and Energy Conservation (SAUEEEEC) launched in 2010 a project of which includes the largest European solar power plant (80 MW) in Okhotnykovo, Crimea. The project aims to produce electric energy from "clean" sources – the sun and the wind – to the amount of 2,000 MW. SAUEEEEC expects the production share of alternative energy to make up 30 percent of Ukrainian energy market by 2015.

Ukraine funds its energy saving projects by the profits the government receives from selling CO<sub>2</sub> quota under the Kyoto protocol. In 2009; having traded its CO<sub>2</sub> emission quota to Japan, Ukraine has received almost USD 400 m.

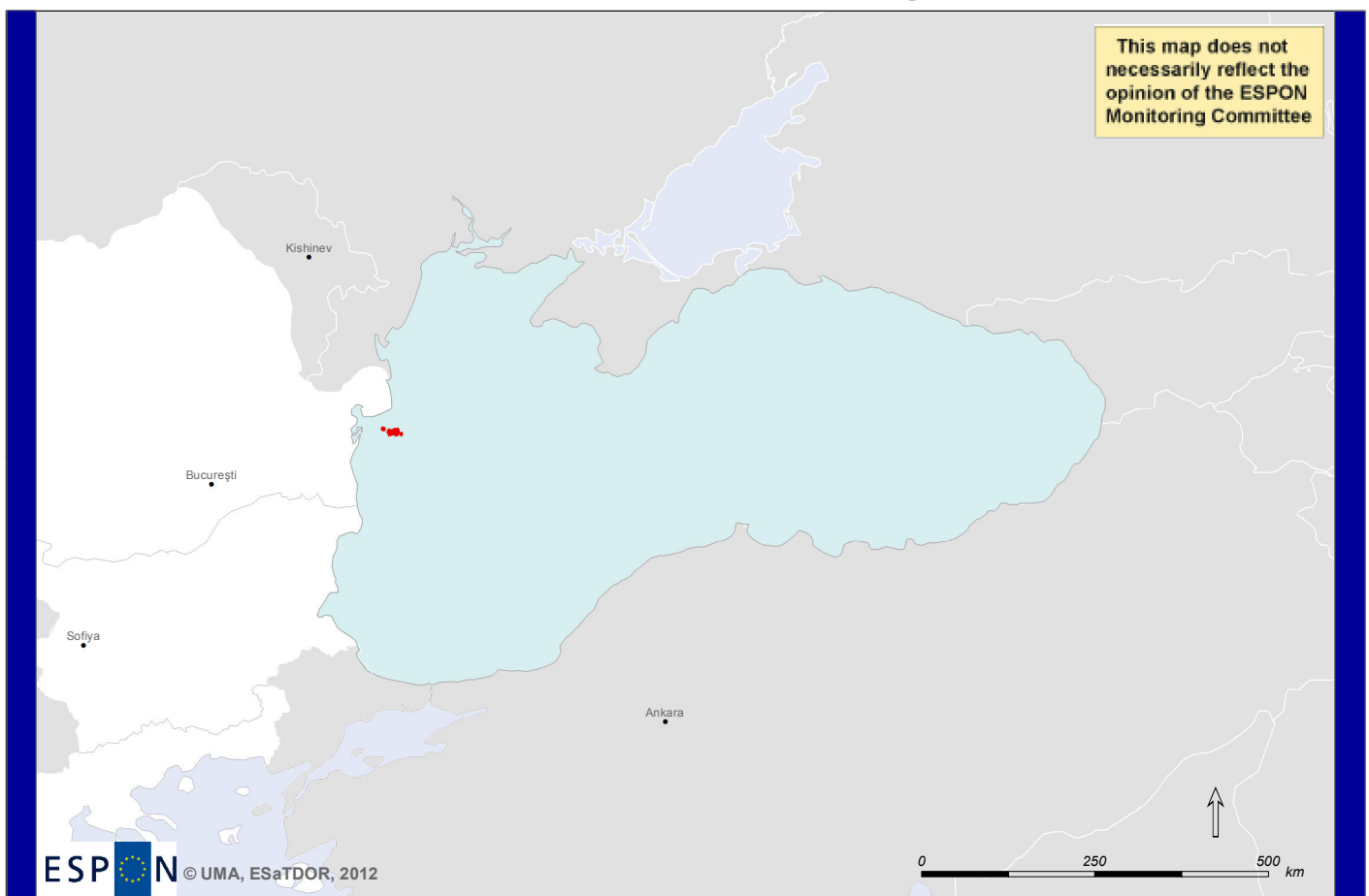
The amount of solar radiation in Ukraine varies between 800 and 1450 W/m<sup>2</sup> per year and provides an extensive potential market of solar energy projects. As of 2009, Ukraine is the twelfth largest energy market in the world with an installed capacity of 54 GW. Ukraine exports its excess electricity to Hungary, Moldova, Poland, Romania, Russia, and Slovakia.

A dynamic development of onshore wind power capacity installation may be observed in the latest period in Romania and Bulgaria.

A small number of oil platforms are operated by Romania and Ukraine (the location of these is shown in Map BL16). In the latest period Turkey started exploration using modern platforms to discover oil and natural gas reserves, based on recent seismic research. The importance of the oil and gas sector for employment in the region is shown in Map BL17, whereby there is a high proportion of people employed in oil and gas in the coastal regions of Romania.

With regards to renewable energy, besides the development of onshore wind there has been some testing of wave power devices in the Black Sea. Due to the enclosed nature of the Sea and its low tidal range, energy generation from wave power is low (see Map BL18). However, the significant inflow of fresh water into the Black Sea from large rivers such as the Danube and Don and the channelling of water through the Bosphorus could offer key locations for renewable energy generation.

## Oil and Gas Rigs



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*Thematic data: National Center for Ecological Analysis and Synthesis based on data from NOAA's National Geophysical Data Center, 2008; HELCOM and LOTOS Petrobaltic S.A., 2011.  
Land boundaries: © EuroGeographics Association and ESRI, Regional level: NUTS0.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

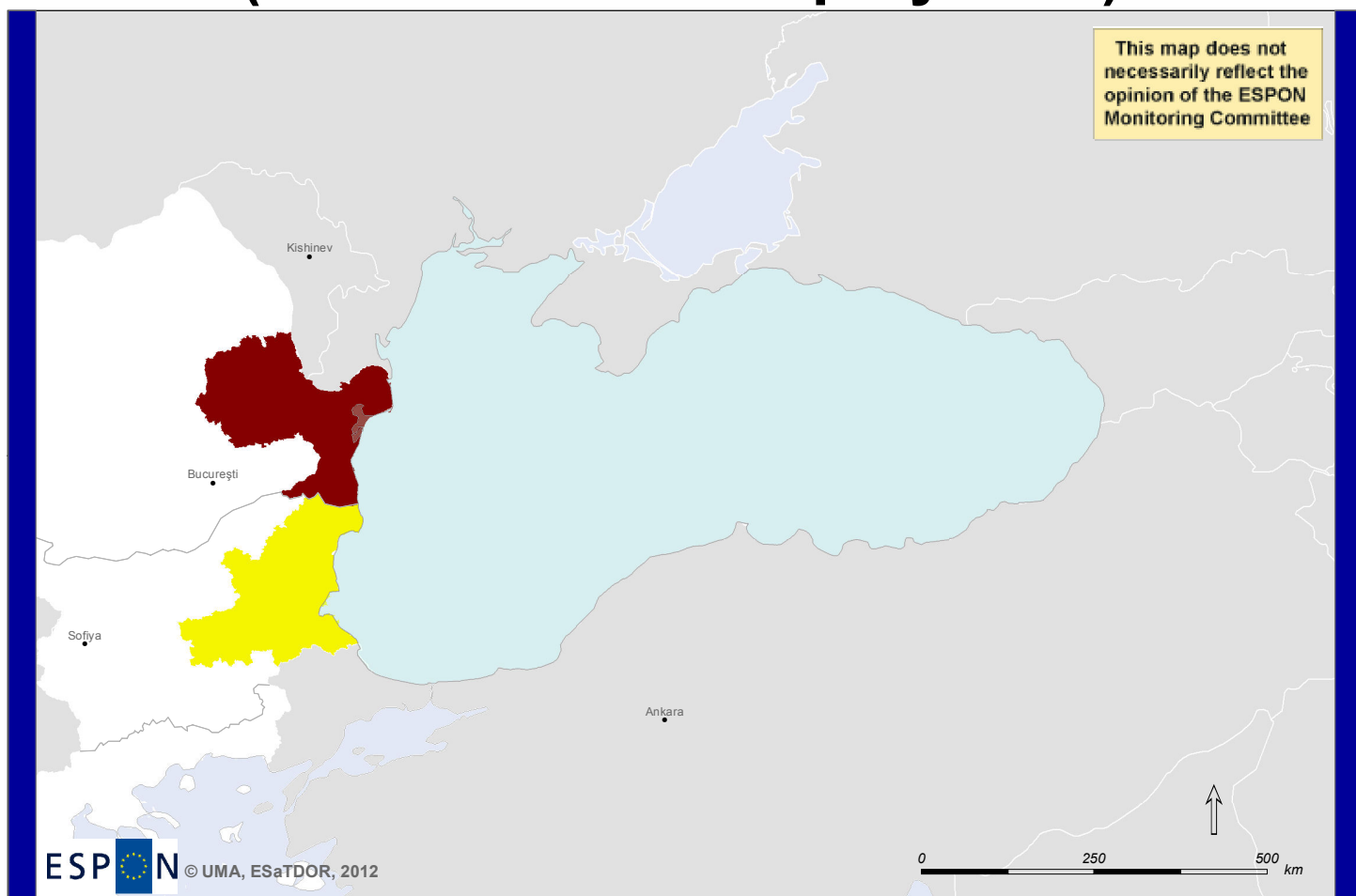
### Oil and gas rigs

■ Oil and gas rigs

This map is produced using data on the location of stable lights at night (the Stable Lights of the World dataset) of a NOAA program with ephemeral sources of lights (e.g. fires, mobile structures) removed. data represents presence/absence of light in a resolution of 30 arc-second for 2003. This has been integrated into a 10x10km grid based on the presence or absence of light in every cell, which does not mean that the whole cell is occupied by oil or gas rigs.

**Map BL16.** Location of oil and gas rigs in the Black Sea

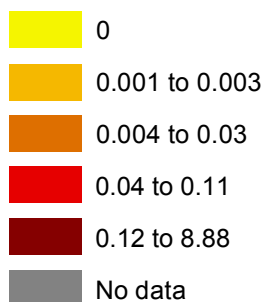
# Employment in Oil and Gas (as a % of total employment)



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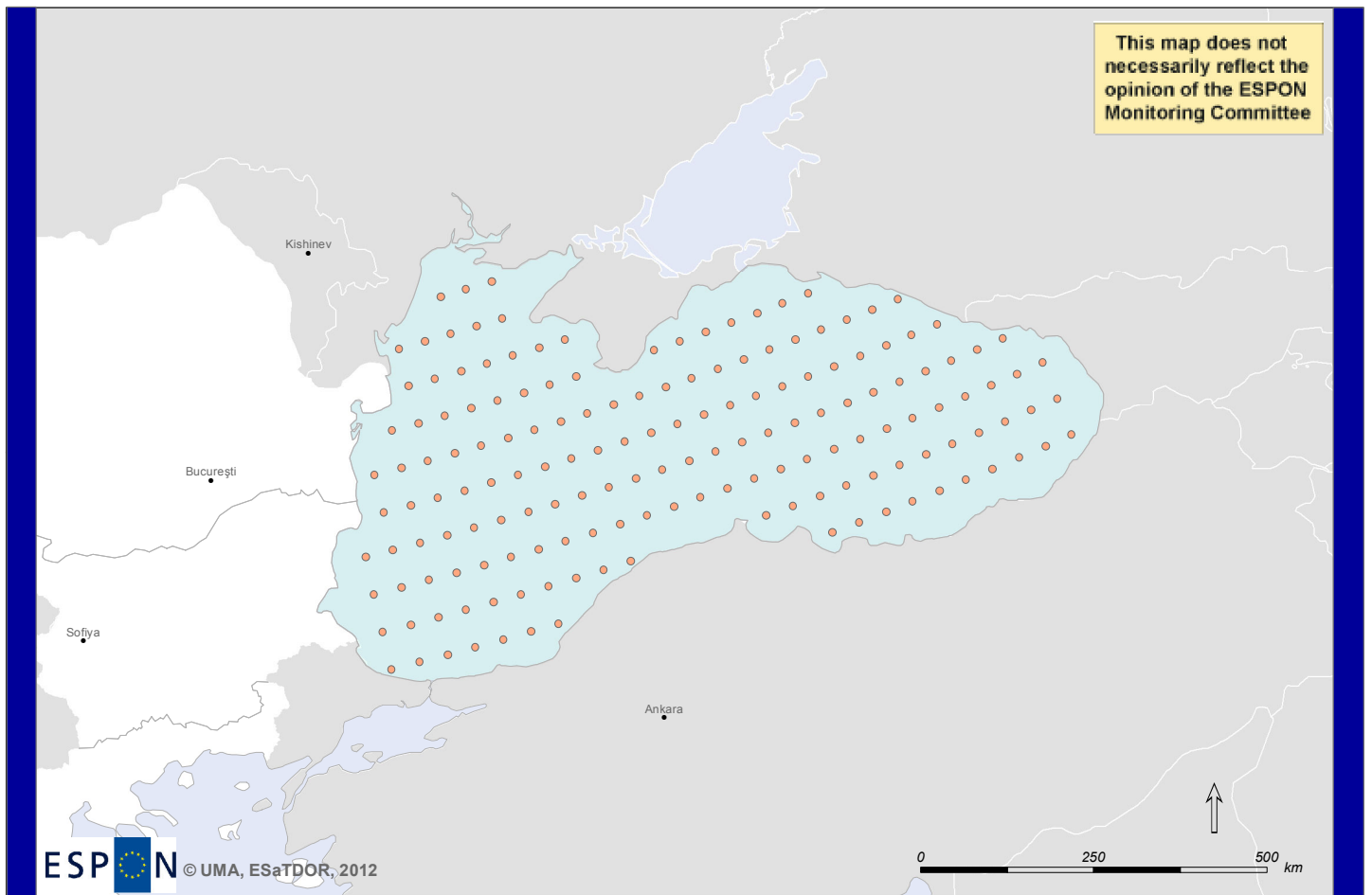
Thematic data: Economic Use, European Cluster Observatory, 2011.  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Oil and gas 2009 (percentage of total employment).



**Map BL17.** Employment in the oil and gas sector (as a percentage of total employment), 2009.

# 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

Map BL18. Wave power potential in the Black Sea

### *Pipelines in the region*

The **Druzhba pipeline** is the world's longest oil pipeline with 4000 km length reaching Ukraine, Hungary, Poland and Germany. Pipeline was built in 1964 and currently has a capacity of 60–62 million tons per year. There are two project proposals with regard to the further extension of the Druzhba pipeline: extension of the northern branch of pipeline to the German North Sea port of Wilhelmshaven and extension of the pipeline to pass through Hungary and Croatia for reaching Adriatic Sea.

The **Baku–Tbilisi–Ceyhan pipeline** is a 1,768 km long crude oil pipeline from the Azeri-Chirag-Guneshli oil field in the Caspian Sea to the Mediterranean Sea. It connects Baku, the capital of Azerbaijan; Tbilisi, the capital of Georgia; and Ceyhan, a port on the south-eastern Mediterranean coast of Turkey, hence its name. It is operational from 10 May 2006 and is projected to transport 1 million barrels per day.

The **Odessa–Brody pipeline** (also known as **Sarmatia pipeline**) is a crude oil pipeline between the Ukrainian cities Odessa at the Black Sea, and Brody near the Ukrainian-Polish border (674 km). There are plans to expand the pipeline to Płock, and furthermore to Gdańsk in Poland.

**Blue Stream** is a major trans-Black Sea gas pipeline that carries natural gas from Russia into Turkey. Operating at full capacity delivers 16 bcm per year. The pipeline was built with the intent of diversifying Russian gas delivery routes to Turkey and avoiding third countries. It is planned to build the second leg of pipeline to allow expanding Russian gas export to the south (via Samsun-Ceyhan gas pipeline further to Israel and Lebanon).

**South Caucasus Gas Pipeline** (Baku-Tbilisi-Erzurum route) is to transport natural gas from the Shah Deniz gas field in the Azerbaijan sector of the Caspian Sea to Turkey. First deliveries of gas started in December 2006. The pipeline is being constructed in the same corridor as the Baku-Tbilisi-Ceyhan oil pipeline in order to minimize the environmental and social impact. The pipeline is 692-km-long and the annual capacity will be up to 16 bcm, with the potential of being connected to Turkmen and Kazakh producers through the planned Trans-Caspian Pipeline. The first aim of pipeline is to supply Georgia and Turkey. In longer perspective South Caucasus pipeline will supply Europe with Caspian natural gas, including Iran and Turkmenistan, through the planned NABUCCO project, Turkey-Greece and Greece-Italy pipelines.

**NABUCCO** is a gas pipeline project connecting the Caspian region, Middle East and Egypt via Turkey, Bulgaria, Romania, and Hungary with Austria and further on with the Central and Western European gas markets. The pipeline planned length is 3.900 km and the transport capacity of pipeline will be 31 bcm per year.

Another proposed route aiming at the transportation of natural gas from Kazakhstan and Turkmenistan to Central Europe is expansion of **Central Asian-Centre** gas pipeline, which runs from Turkmenistan via Uzbekistan and Kazakhstan to Russia.

**Burgas-Alexandroupoulos** oil pipeline (279 km) is a project for transportation of Russian and Caspian oil from the Bulgarian Black Sea port of Burgas to the Greek Aegean port of Alexandroupoli. It would be an alternative route for Russian oil for bypassing the Bosphorus and the Dardanelles. However, in June 2010 it was announced that Bulgaria will not participate in the project to due strong opposition of local population of Burgas and an environmental impact assessment is needed before making a final decision about the project.

The **Pan-European Oil Pipeline** is a proposed oil pipeline from Constanța in Romania via Serbia and Croatia to Rijeka and from there through Slovenia to Trieste in Italy (1,856 km). The aim of the pipeline is to bypass Turkish straits in the transportation of Russian and Caspian oil to Central Europe. In Trieste the pipeline will be connected with the Transalpine Pipeline, running to Austria and Germany [10].

**Trans-Caspian Pipeline project** is a proposed submarine pipeline between city of Turkmenbashi in Turkmenistan and Baku in Azerbaijan and considered as a part of the South Caucasus pipeline and NABUCCO project.

Along with South Caucasus and Trans-Caucasus pipelines the **Iran-Turkey gas pipeline** with extension of 2.577 km is the third essential branch of the NABUCCO project. The construction of pipeline was completed in 2001. In Erzurum the Iran-Turkey pipeline is linked to the South Caucasus pipeline.

**Iran-Armenia gas pipeline** is a 140 km pipeline between two countries running from Tabriz to Iran-Armenia border. The initial capacity of the pipeline is 1.1 bcm annually, which will be increased up to 2.3 bcm by 2019. The Armenian side plans to lay some more 197 km of the pipe in order to reach the planned amount. The pipeline operation started on December 2006 and was officially inaugurated on 19 March 2007.

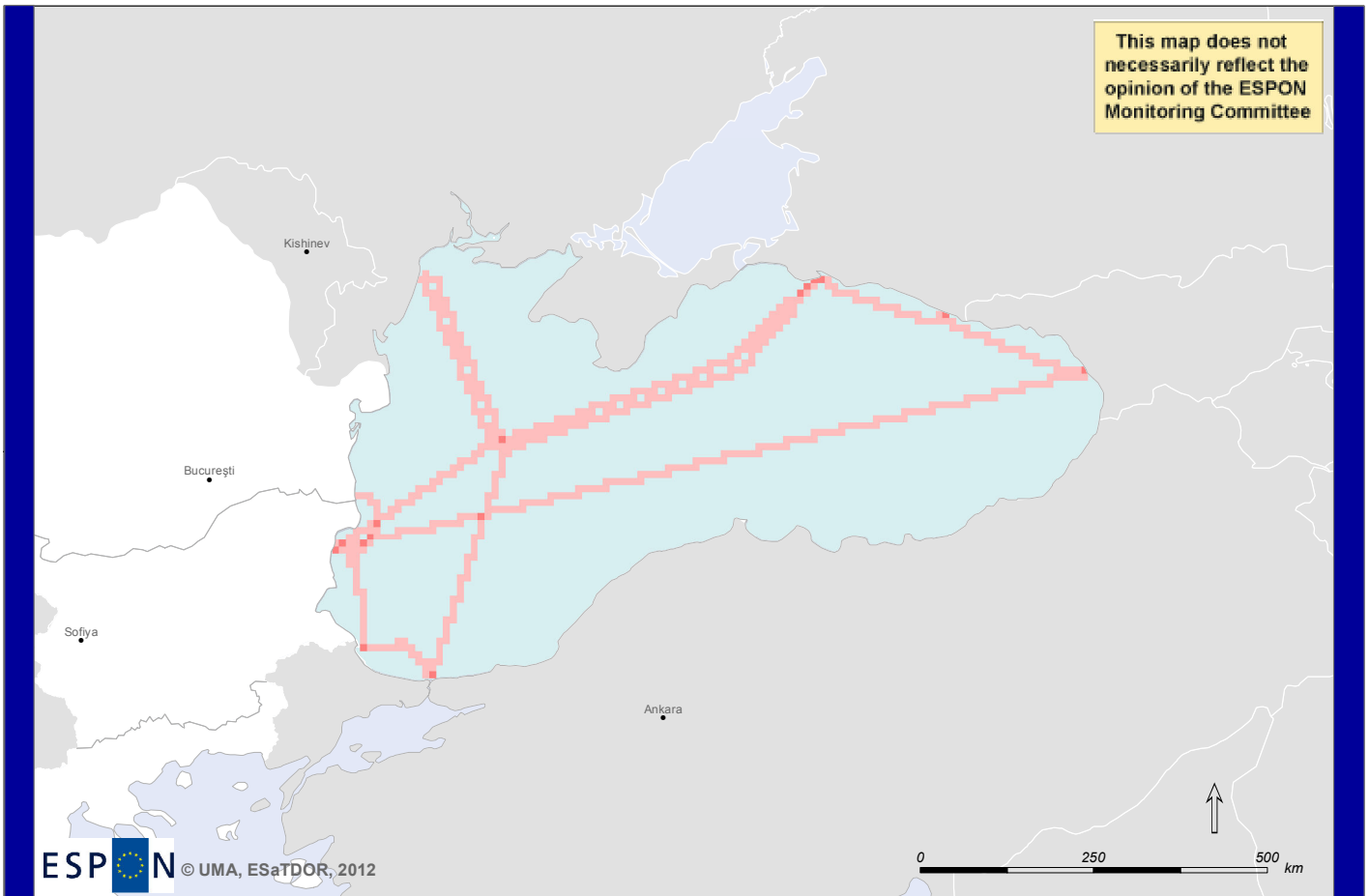
**AMBO (Trans-Balkan pipeline) project** is planned oil pipeline from Bulgarian Black Sea port Burgas via Former Yugoslav Republic of Macedonia (FYROM) to Albanian Adriatic port Vlore. The 894-km pipeline is expected to transport 750 000 barrels of oil per day. Trilateral convention on the AMBO project was signed on 31 January 2007.

#### *Undersea Cables*

In addition to the pipelines which cross the Black Sea a number of telecommunications cables run along the sea bed. These are shown in Map BL19.



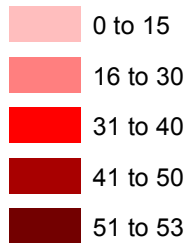
# Undersea Cables




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Thematic data: Greg Mahlknecht, [www.cablemap.info](http://www.cablemap.info), updated 22-02-12  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Cable length (Kilometers per 10km grid square)



**Map BL19.** Undersea telecommunications cables

## Environment

In the latest period the Black Sea has been exposed to natural and environmental fluctuations and to strong anthropogenic stresses. The state of the Black Sea environment continues to be a matter of concern due to the ongoing degradation of its ecosystem and the unsustainable use of its natural resources. Map BL20 shows the location of designated *Natura 2000* sites, with the Danube delta and the Burgas Lakes complex being particularly significant areas due to their extended wetlands.

The most important polluting factors in the Black Sea are land-based sources which account for more than 70%. These sources are tributary rivers and point sources (domestic and industrial discharges). The dumping of different materials, including dredge spoils, is also a contributory factor. River transport is by far the most important source.

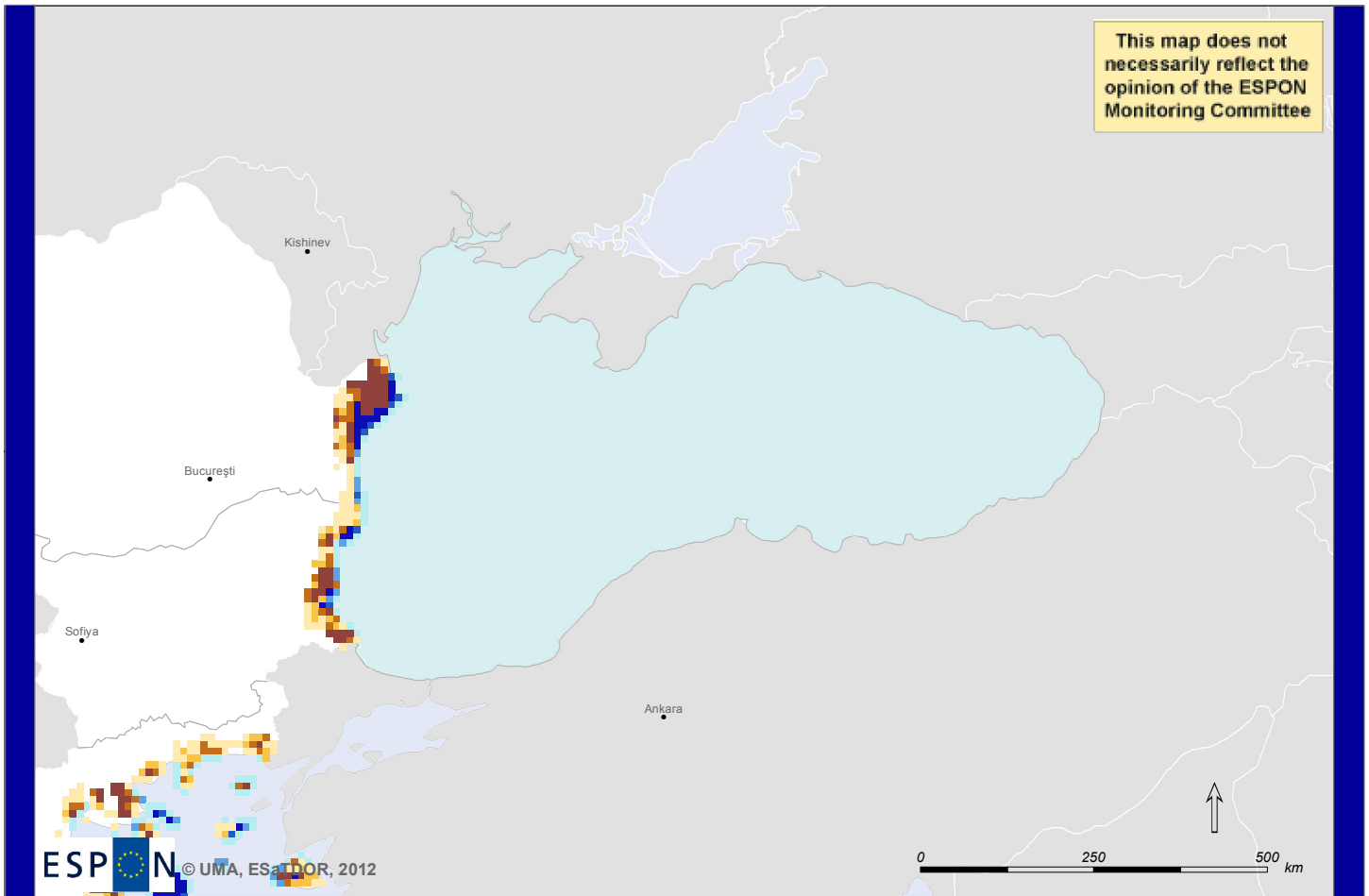
The Black Sea ecosystem continues to be threatened by inputs of certain pollutants, notably nutrients. Nutrients enter the Black Sea from land based sources, and in particular through rivers. The Danube river accounts for well over half of the nutrient input to the Black Sea. Map BL21 shows where organic pollution (from pesticides) is highest in the Black Sea, with clear areas around the Danube and the Dniester rivers being especially problematic.

Eutrophication is a phenomenon which occurs over wide areas of the Black Sea and should be of concern to the countries of the Black Sea basin.

A large amount of data has been gathered on the heavy metals content of the Black Sea. The trace metal contamination is generally limited to areas where high concentrations occur, well defined source-related hot-spots, and is not a basin-wide phenomenon. Those hot-spots are in front of deltas or estuaries, commercial ports or industrial water discharges. Unfortunately these are the coastal waters where the most important biological processes take place.

It was estimated that 111,000 tons of oil enter the Black Sea each year. Of this quantity, the Danube accounts for 48%. Most of the remainder comes from land-based sources (wastewater without proper treatment and accidents in handling oil or oil products). A considerable amount of oil reaches the Black Sea from ballast water discharged by ships but an accurate figure is unknown.

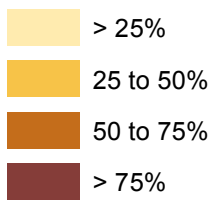
# Protected Areas



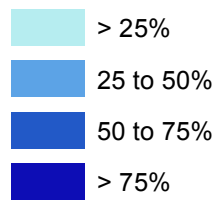

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Thematic data: Natura 2000 Network, European Commission - European Environment Agency, 2010.  
 CAFF Arctic Protected Areas, CAFF and PAME Arctic Council, 2011.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Percentage of grid size (Land)

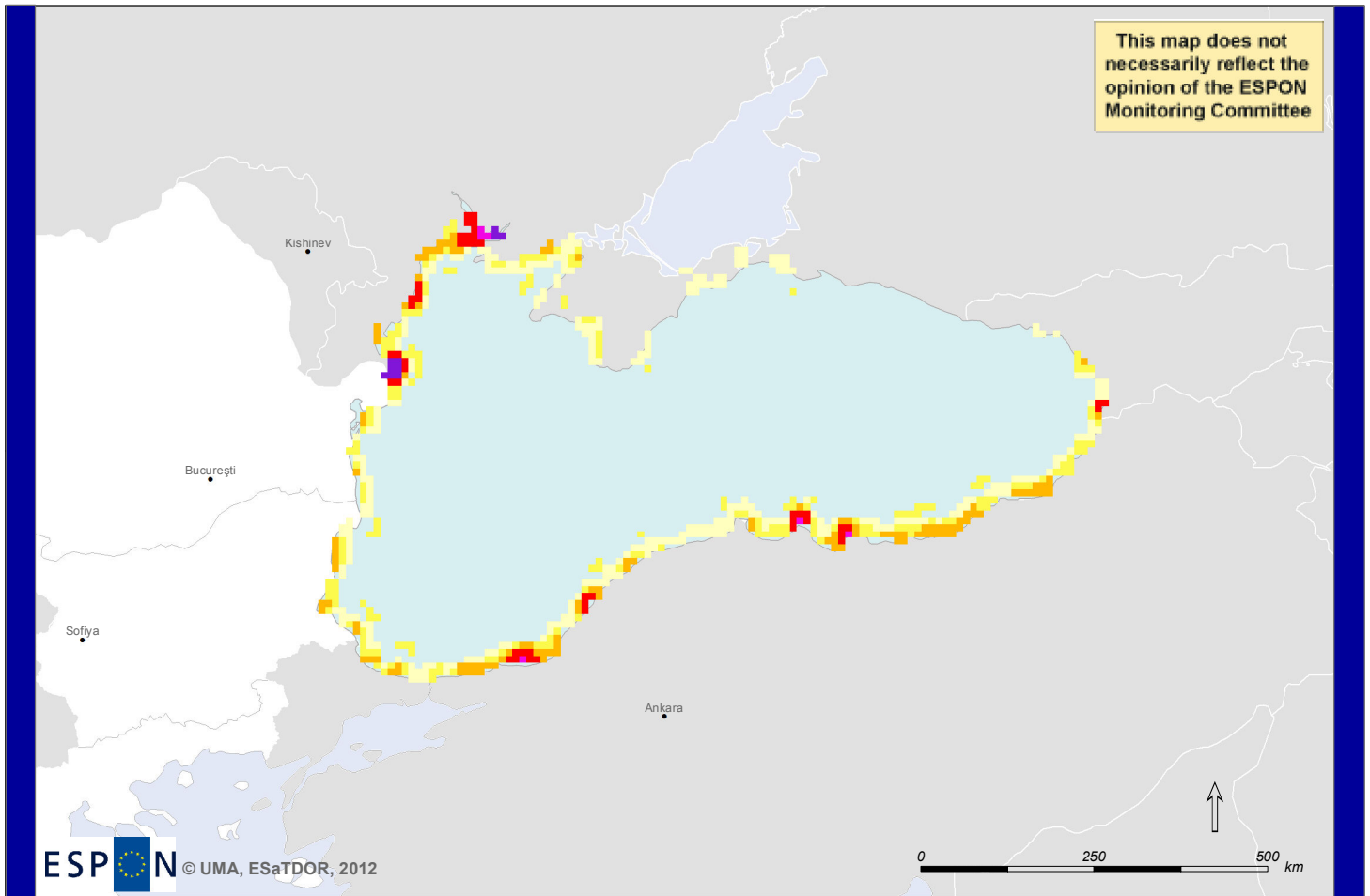


## Percentage of grid size (Sea)



**Map BL20.** Designated Natura 2000 sites (percentage of coverage per 10km grid square)

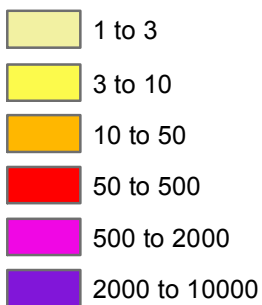
# Organic Inputs




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*Thematic data: National Center for Ecological Analysis and Synthesis, Organic Pollution, 2008.*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

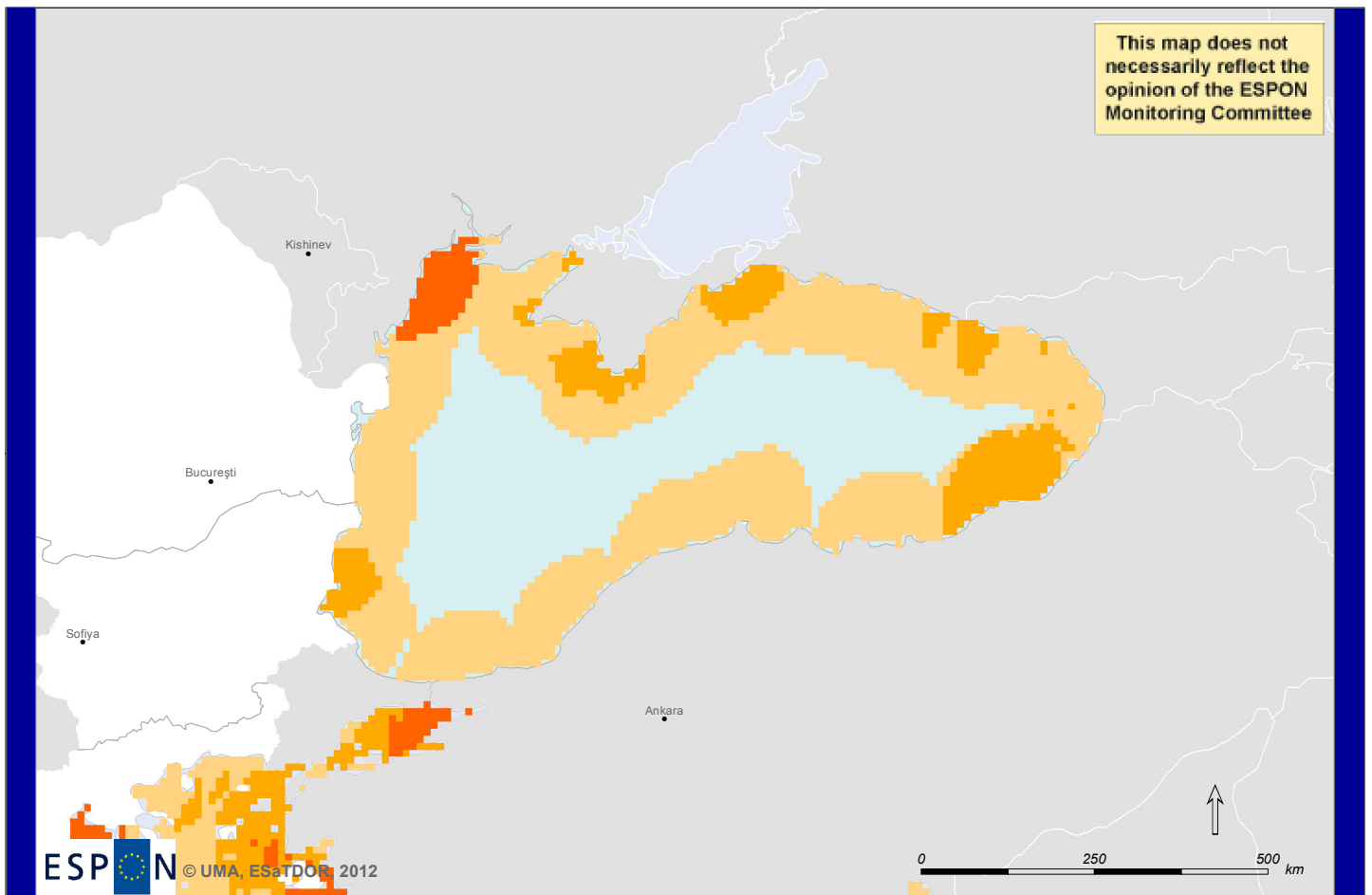
## Organic pollution (total kg of pesticides per year)



**Map BL21.** Organic pollution in the Black Sea (total kg of pesticides per year)

The past introduction of exotic species, through the de-ballasting of vessels, has seriously damaged the Black Sea ecosystem and constitutes a threat to the adjacent Mediterranean Sea. Map BL22 shows where the incidence of invasive species is highest, notably in the north western corner of the Black Sea, around the port of Odessa.

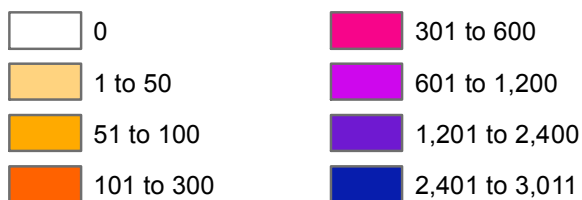
## Incidence of Invasive Species




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*Thematic data: Invasive Species, National Center for Ecological Analysis and Synthesis, 2008*  
*Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.*  
*Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.*

### Total number of invasive species per grid (October 2004 - October 2005)

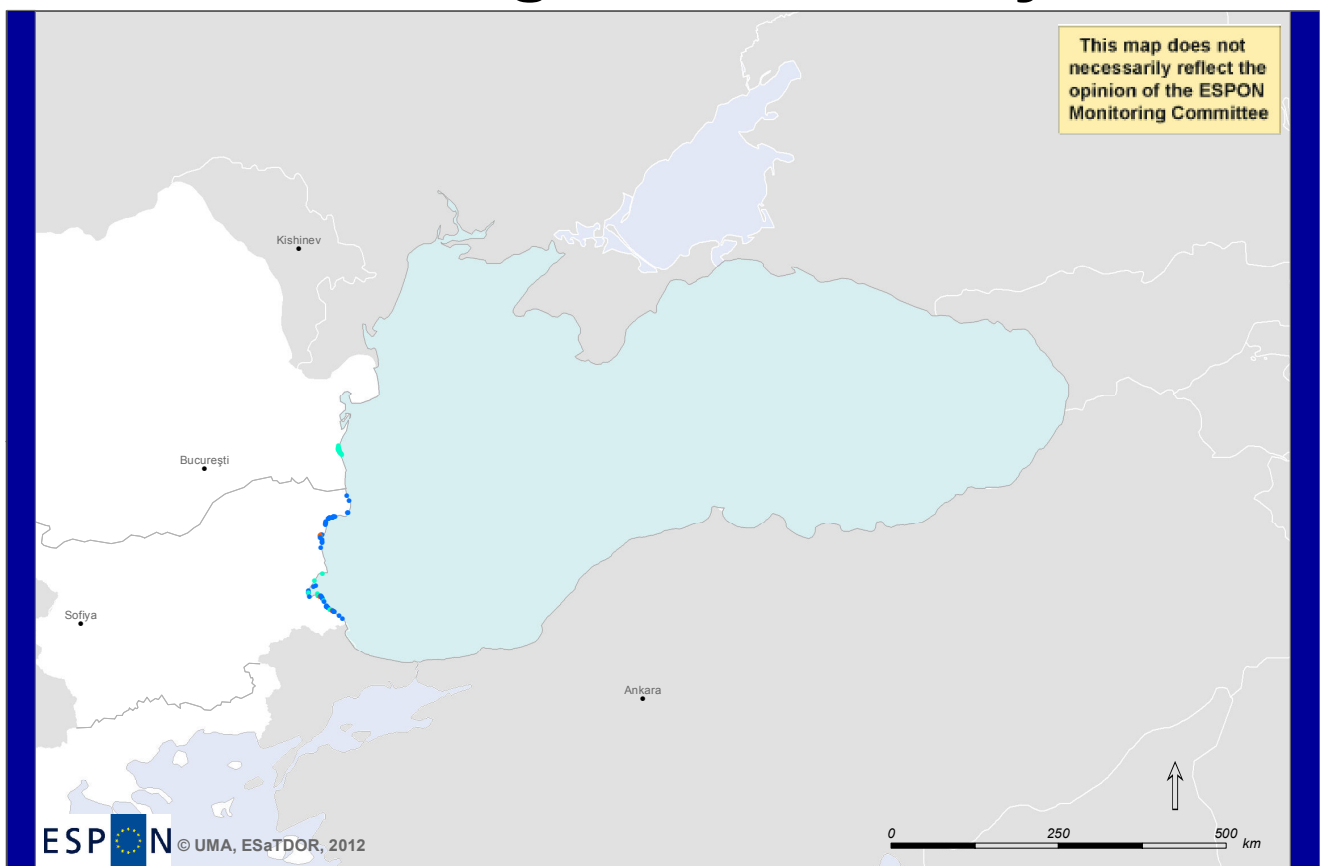


**Map BL22.** Incidence of invasive species in the Black Sea

The thin upper layer of marine water (up to 150 m) supports the unique biological life in the Black Sea ecosystem. The deeper and more dense water layers are saturated with hydrogen sulfide, that over thousands of years, accumulated from decaying organic matter in the Black Sea. Due to the unique geomorphological structure and specific hydrochemical conditions, specific organisms, basically on the level of protozoa, bacteria, and some multi-cellular invertebrates inhabit the deep-sea waters. Knowledge about biological forms of life in the deep waters of the Black Sea is very limited. The disturbance of the natural balance between the two layers could trigger irreversible damage to the people and ecosystem of the Black Sea.

Despite problems of pollution in the Black Sea, the quality of bathing waters in its coastal regions is good. Map BL23 shows how a number of sites have been assessed for the Bathing Water Directive, meeting the mandatory values of the Directive or better. This is positive in terms of attracting coastal tourists, however additional pressures on coastal resorts need to be managed to ensure that this situation is not reversed.

## Bathing Water Quality



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Thematic data: European Commission, Bathing Water Directive 76/160/EEC Report, 2010  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

### Status of bathing water for year 2008

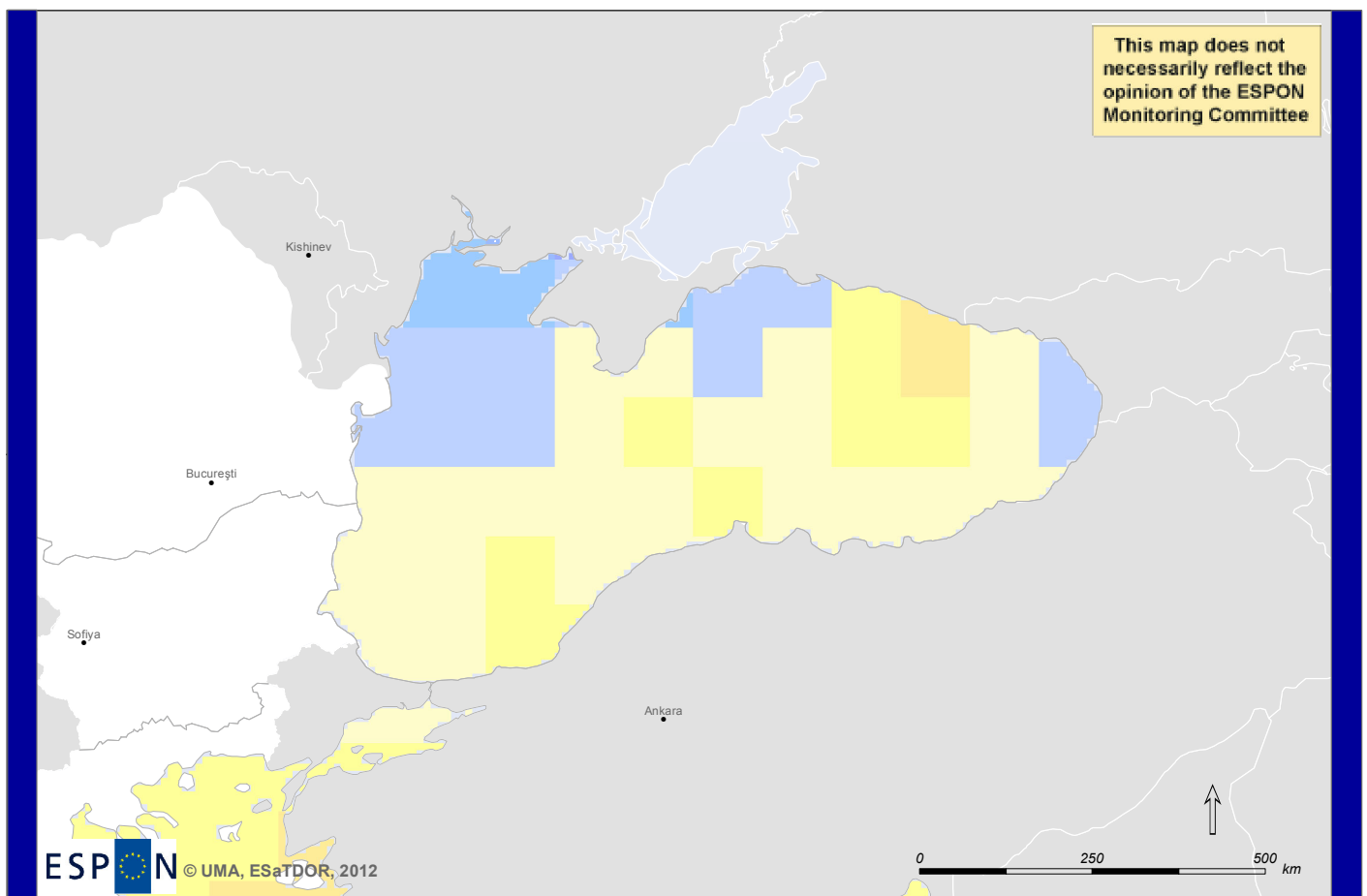
(Please note: symbols of upper categories are placed on top)

- Banned or closed (temporarily or throughout the season)
- Not compliant with the mandatory values of the Directive
- Compliant with the mandatory values of the Directive
- Compliant with the mandatory and the guide values of the Directive

**Map BL23.** Quality of bathing water relative to Bathing Water Directive standards, 2008

The surface water of the Black Sea has an average salinity of 18 to 18.5 parts per thousand (compared to 30 to 40 for the oceans) and contains oxygen and other nutrients required to sustain biotic activity. These waters circulate in a basin-wide cyclonic shelf break gyre known as the Rim Current which transports water round the perimeter of the Black Sea. The intra-annual strength of these features is controlled by seasonal atmospheric and fluvial variations. The temperature of the surface waters varies seasonally from  $-1\text{ }^{\circ}\text{C}$  ( $30\text{ }^{\circ}\text{F}$ ) to  $28\text{ }^{\circ}\text{C}$  ( $82\text{ }^{\circ}\text{F}$ ). Map BL24 shows how sea surface temperature in the Black Sea has changed over the last 20 years, showing significant decreases in the north west and increases in the southern parts of the Sea. At present it is unclear if this is due to climate change or much longer term natural fluctuations, however the pace of change could have serious implications for biodiversity in the region.

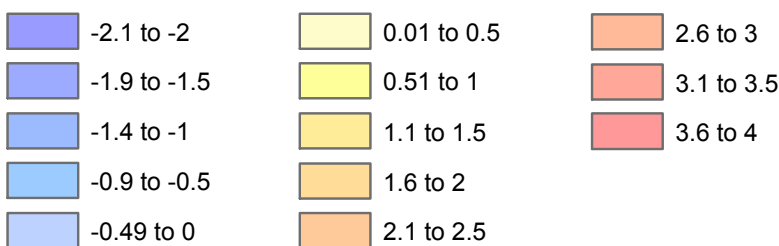
# Increase in Sea Surface Temperature



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Thematic data: National Oceanic & Atmospheric Administration (NOAA), Optimum Interpolation (OI) Sea Surface Temperature (SST) V2, 2012  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS0.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Increase in sea surface temperature between 1981-2011 (degrees Celsius)



Map BL24. Increase in sea surface temperature (degrees Celsius), 1981-2011

## 4. Governance Case Studies

### Global Ocean Observing System in the Black Sea Area

The **Global Ocean Observing System (GOOS)** is a permanent global system for observations, modeling and analysis of marine and ocean variables to support operational ocean services worldwide. GOOS provides accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible, and the basis for forecasts of climate change. GOOS is designed to: Monitor, understand and predict weather and climate; Describe and forecast the state of the ocean, including living resources; Improve management of marine and coastal ecosystems and resources; Mitigate damage from natural hazards and pollution; Protect life and property on coasts and at sea; Enable scientific research.

The GOOS is comprised of several UNESCO/IOC/WMO/ICSU/UNEP sanctioned bodies which coordinate together to advance the GOOS objectives of a comprehensive, sustained, operational and international ocean observing system.

- I-GOOS (Intergovernmental Committee for GOOS) is the intergovernmental body responsible for strategic direction and encouraging its member states to commit to sustainable support.
- PICO (Panel for Integrated Coastal Observations), GSSC (GOOS Scientific Steering Committee) and OOPC (Ocean Observations Panel for Climate) are advisory bodies which supply the I-GOOS with scientific studies and expertise underpinning the strategic goals of GOOS.
- GRAs (GOOS Regional Alliances), GPO (GOOS Programme Office), and JCOMM (Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology).

The main aims and objectives of the Black sea GOOS are as below:

- To contribute to international planning and implementation of the GOOS and to promote it globally.
- To identify regional priorities for the use of operational oceanography.
- To co-operate with the Black Sea Environmental Programme (BSEP), the Permanent Secretariat of the Black Sea Commission (Secretariat for the Bucharest Convention) and other relevant bodies, to harmonise oceanographic activities in the region.
- To develop capacity of the regional countries and promote the level to sustain GOOS activities.
- To promote the development of technology and computer systems for operational oceanography.
- To facilitate a network for real and/or near time data exchange by the members.
- To provide high quality data and time series for a better understanding of and improving of the Black Sea ecosystem.
- To find means to ensure the most effective use of existing technologies related to operational oceanography and marine meteorology.
- To assess the economic and social benefits from operational oceanography.

To assess the economic and social benefits from operational oceanography, Black Sea GOOS activities have been designed to foster operational oceanography in the Black Sea basin, to collaborate with, and maximize the benefits from, EuroGOOS and MedGOOS, and to promote the integration of these activities into the framework of GOOS.



Black Sea GOOS aims to promote studies and evaluation of the economic and social benefits produced by operational oceanography. Black Sea GOOS is a joint effort of all bordering countries, which will set the basis for the monitoring, modelling and forecasting.

The collaboration of the other Black Sea countries will have an impact on marine-related industries and services, such as coastal recreation, transportation and fisheries. Among the riparian countries, Bulgaria, Romania, Ukraine and Georgia can have access to the world's oceans only through the Black Sea. Thus the Black Sea is one of the important socioeconomic

links for these countries. Black Sea GOOS will play an important role in the sustainable use of this sea and improve the quality of its environment. Russia has a coast on several seas, but the Black Sea is the only sea that is warm enough to allow recreational activities. Improving the water quality of Black Sea through Black Sea GOOS will increase the quality of life in this country. Turkey has a coast on the Mediterranean Sea, the Aegean Sea, the Sea of Marmara and the Black Sea, but over 80% of the fish catch of Turkey is from the Black Sea. Typically, the marine industries and services contribute between 3% and 5% of GNP for a developing coastal state (EuroGOOS, 1996). Black Sea GOOS can add significantly to the efficiency, safety and productivity of these activities. Additional benefits arise from the use of marine forecasts and data to improve and extend seasonal and interannual forecasts of weather and climate over the adjacent landmasses. Accurate estimates of the GNPs of most of the Black Sea coastal states are not available simply because, for some, they have not been estimated at all. As a result, a cost-benefit analysis involving all the six Black Sea states is improbable at the outset. For Turkey alone, the contribution of the Black Sea is estimated to be 0.6–1.0 billion USD. If the benefits gained by a predictive system are taken to be 0.1% of this amount, it would imply benefits of 0.6–1.0 million USD. This can be extrapolated to the other Black Sea countries, yielding 2–3 billion USD for the region.

The Black Sea GOOS data exchange is done via the Global Telecommunication System (GTS) using the code forms SYNOP, TEMP, PILOT, SHIP, BATHY, TESAC, BUOY, etc. In 2005, a Pilot experiment on operational functioning of the Black Sea nowcasting/forecasting system within the ARENA project was carried out. The pilot project demonstrated the exchange of data in real-time for target areas in the Black Sea. Only model data was exchanged in this pilot.

### **Marine Strategy Directive and GOOS**

The aim of the European Union's ambitious Marine Strategy Framework Directive (adopted in June 2008) is to protect more effectively the marine environment across Europe. It aims to achieve good environmental status of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The Marine Strategy Framework Directive constitutes the vital environmental component of the Union's future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment.

The Marine Strategy Framework Directive establishes European Marine Regions on the basis of geographical and environmental criteria. Each Member State - cooperating with other Member States and non-EU countries within a marine region - are required to develop strategies for their marine waters.

The marine strategies to be developed by each Member State must contain a detailed assessment of the state of the environment, a definition of "good environmental status" at regional level and the establishment of clear environmental targets and monitoring programmes.

Each Member State must draw up a programme of cost-effective measures. Prior to any new measure an impact assessment which contains a detailed cost-benefit analysis of the proposed measures is required.

Where Member States cannot reach the environmental targets specific measures tailored to the particular context of the area and situation will be drawn up.

The goal of the Marine Strategy Framework Directive is in line with the objectives of the 2000 Water Framework Directive 2000 which requires surface freshwater and ground water bodies - such as lakes, streams, rivers, estuaries, and coastal waters - to be ecologically sound by 2015 and that the first review of the River Basin Management Plans should take place in 2020.

In respect of each marine region or subregion, Member States shall make an initial assessment of their marine waters, taking account of existing data where available and comprising the following:

- (a) an analysis of the essential features and characteristics, and current environmental status of those waters, based on the indicative lists of elements set out in Table 1 of Annex III, and covering the physical and chemical features, the habitat types, the biological features and the hydro-morphology;
- (b) an analysis of the predominant pressures and impacts, including human activity, on the environmental status of those waters which:
  - (i) is based on the indicative lists of elements set out in Table 2 of Annex III, and covers the qualitative and quantitative mix of the various pressures, as well as discernible trends;
  - (ii) covers the main cumulative and synergetic effects; and
  - (iii) takes account of the relevant assessments which have been made pursuant to existing Community legislation;
- (c) an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment.

### **The Black Sea Regional Energy Centre**

The **Black Sea Regional Energy Centre (BSREC)** was inaugurated in 1995 following the Chalkidiki Ministerial Meeting, held in 1994 in Greece.

The establishment of the Centre was a joint initiative of the European Commission, under its SYNERGY Programme, and the countries of the Black Sea region: Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey, Ukraine, since 1999, the Former Yugoslav Republic of Macedonia, since 2001, Serbia have become members of the BSREC as well.

BSREC was registered in Sofia, Bulgaria, according to the legislation of its host country.

The Black Sea Regional Energy Centre (BSREC) acts as a focal point for energy related activities, aimed at developing co-operation between the Black Sea region countries and the EU in the energy field.

The Center's core activity is targeted to promote the development and implementation of market oriented energy policy, encourage restructuring of the monopoly structures, encouraging the energy efficiency and renewable energy projects, assist investment and funding, and allow the collection and dissemination of energy sector related information at a regional level.

Apart from its international activities, the BSREC is actively involved in the Bulgarian energy issues, acting as a Bulgarian energy society.

Areas of expertise of BSREC include:

- Harmonization of countries' energy legislation with the EU one;
- Energy market reform;
- Security of energy supply and promotion of utilization of renewable energy sources (RES);
- Energy efficiency and rational use of energy (RUE);
- Networking, exchange of experience and dissemination of information.

The Black Sea Regional Energy Centre audience target is given by: international organizations, ministries, regional authorities, public and private enterprises and individuals.

The program consisted of the thirteen involved countries and a number of institutes and organizations.

**The main objectives** are as follows:

- promotion of energy policy application and market reform, with reference to EU Directives on electricity and gas, the European Energy Charter and the world-wide accepted restructuring process;
- encouragement of investment and funding opportunities in the energy sector of the Black Sea Region;
- easy access to foreign and international institutions and companies to the Black Sea region energy sector;
- facilitation of Black Sea Region initiatives for social partners who wish to link with international counterparts;
- information exchange on energy policy issues, including creation of a common information data bank;
- provision of co-ordination services for international and bilaterally funded projects addressed to the region.

The Black Sea Synergy offers a dialogue opportunity concerning the emerging maritime policy within the Union, with the aim of maximizing the abiding growth and the aim of creating work places within the branches connected to the sea and within the coastal regions. This means to create not only a network of inter-sectorial maritime cooperation between services, enterprises and science institutions, but also to improve the cooperation and the integration concerning maritime surveillance in order to make sure of the safety and the security of the maritime transport and of environment protection.

To conclude with, in order for the original geophysical platform to achieve security, stability and prosperity, the harmonization and the enlargement of the Europeans, the Asians and the Africans efforts to create a new and lasting relation at the Black Sea and at the Mediterranean Sea, is necessary. Black Sea Synergy considers that it is time to prepare a new future in which synergizing spaces of contact, of confluence and of connection at a Euro-Afro-Asian level has its place.

## **The Commission of the Protection of Black Sea against Pollution**

The Commission on the Protection of the Black Sea Against Pollution (also known as the Black Sea Commission, is sometimes also referred to as the Istanbul Commission) via its Permanent Secretariat is the intergovernmental body established in implementation of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), on April 1992. (as defined in Article XVII).

The main objectives are: combating pollution from land-based sources and maritime transport; achieving sustainable management of marine living resources; pursuing sustainable human development.

The main policy measures are: pollution reduction from rivers, priority pollution sources, vessels; regulatory and legal tools; conservation of biological diversity, expansion of protected territories, promotion of responsible fisheries; introduction of ICZM, promotion of EIA environmental audit, ecologically sound technologies and public involvement in environmental decision making, green tourism and sustainable livelihood.

In The Black Sea Commission each of the contracting parties (Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine) to the Convention on the Protection of the Black Sea against Pollution has a representative. It is chaired on a rotation principle and during his term the chairman cannot act in the capacity of Representative of his country. The Black Sea Commission meets at least once a year and at request of any one of the contracting parties at any time. (See [Article 17](#)) Since December 2000, Turkey has been hosting the Secretariat of the Black Sea Commission in Istanbul.

The main functions of the Commission according to [Article 18](#) of the Convention are:

- 1. Promote the implementation of this Convention and inform the Contracting Parties of its work.*
- 2. Make recommendations on measures necessary for achieving the aims of this Convention.*
- 3. Consider questions relating to the implementation of this Convention and recommend such amendments to the Convention and to the Protocols as may be required, including amendments to Annexes of this Convention and the Protocols.*
- 4. Elaborate criteria pertaining to the prevention, reduction and control of pollution of the marine environment of the Black Sea and to the elimination of the effects of pollution, as well as recommendations on measures to this effect.*
- 5. Promote the adoption by the Contracting Parties of additional measures needed to protect the marine environment of the Black Sea, and to that end receive, process and disseminate to the Contracting Parties relevant scientific, technical and statistical information and promote scientific and technical research.*
- 6. Cooperate with competent international organizations, especially with a view to developing appropriate programmes or obtaining assistance in order to achieve the purposes of this Convention.*
- 7. Consider any questions raised by the Contracting Parties.*

*8. Perform other functions as foreseen in other provisions of this Convention or assigned unanimously to the Commission by the Contracting Parties.*

The concrete activities of The Commission are based on the Convention on the Protection of the Black Sea Against Pollution, The Black Sea Strategic Action Plan, coordinated with national and regional projects/activities, International Financing Agencies, and national and regional policy measures and overall efforts of the countries to restore and preserve the environment of the Black Sea, and a detailed work-programme, reflecting these is drawn up on an annual basis.

The Protocols of the Bucharest Convention to which Turkey is Party, are listed below:

- Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land Based Sources,
- Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances,
- Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping,
- *The Black Sea Biodiversity and Landscape Conservation Protocol.*

The Commission on the Protection of the Black Sea Against Pollution (the Black Sea Commission) implements the provisions of the Convention and the Black Sea Strategic Action Plan.

The common interest in the conservation, exploitation and development of the bioproductive potential of the Black Sea and taking into account that the Black Sea coast is a major international resort area where Black Sea Countries have made large investments in public health and tourism, led to a deal between the countries bordering the Black Sea.

It is important to balance the different economic, social and ecological interests in the area. The important topics on environmental improvement and cross border issues related to marine spatial planning are: international cooperation and agreements for sustainable development and protection of the Black Sea ecosystem and assessment of establishment of a cross border Network of marine protected areas to represent the Black Sea Basin, as well as actions to manage and plan human use and activities.

Table 4.1. Case studies summary table

	<b>GOOS in Black Sea area</b>	<b>The Black Sea Regional Energy Centre</b>	<b>The Commission of the Protection of Black Sea against Pollution</b>
<b>Drivers</b>	weather and climate, marine and coastal ecosystems and resources, natural hazards and pollution	Energy field	Pollution, fisheries, green tourism
<b>Challenges</b>	full economic potential of oceans and seas; monitor, understand and predict weather and climate; protect life on coast and at sea	Energy demand, EU Synergy policy, energy applications, global change in the energy field	Combating pollution, management of marine living resources, sustainable human development
<b>Legal Status</b>			Legally binding
<b>Effectiveness</b>	Medium	Medium	High
<b>Stakeholder involvement</b>	Medium	Medium	Medium (BSC cooperation with other intergovernmental organizations)

## 5. Characterisation of the Sea (current position)

Over the past 20 years the Black Sea region has faced numerous socio-economics changes.

Based on The Blue Growth report the most important economic functions in the Black Sea are shortsea shipping, offshore oil and gas exploration and coastal tourism. Other additional sectors are: fishing, land based industry, military uses and infrastructure. Aquaculture is developing in all Black Sea countries, but it has grown rapidly into an important activity in Turkey and Bulgaria (BSC, 2007, Deniz, 2001).

According to Eurostat 2010, 6.4% of shortsea shipping occurred in the Black Sea, based on the gross weight of goods transported.

Offshore oil and (mainly) gas production in the Black Sea is located in production fields such as Ayazli off the Turkish coast, Galata near the Bulgarian coast, and the Ana and Doina fields off Romania.

Tourism on the Black Sea is increasing. International tourism makes up only a small percentage of total tourism on the Black Sea (about 14 % in 2006 for Bulgaria, Russia, Turkey and the Ukraine combined); most tourists come from within the region. It is estimated that about 4 million visitors come to the Black Sea coastline each summer (BSC, 2008). The Black Sea region tries to copy the approach of the Mediterranean region, hoping to attract international tourists. It focuses on the natural and cultural heritage of the regions, offering sandy beaches, ancient monuments and modern resorts. In Bulgaria, the number of tourism establishments increased by 14 % on average per year between 2000 and 2005. Bulgaria offers seaside resorts, large hotels, motels and other tourist properties focused in the cities of Varna and Bourgas. Romania, with 14 hours of sunshine per day in the summer and warm water and air temperatures, is also experiencing growth in the tourism sector. It offers modern facilities, historical sites and monuments, spas, traditional villages, and vineyards (European Parliament, 2008).

The integration of this thematic information into composite maps gives a general overview on the economic, transport and environmental situation of Europe's seas. A sum of percentages was calculated of every economic sector related to maritime activities in each NUTS 2 region<sup>1</sup> (percentage of the total employment representing the maritime cluster). These sums have been classified by quintiles as follows in Table 5.1 and the results shown in Map BL25:

Table 5.1: Composite classification of maritime economic use

Total Percentage	Total Employees	Category name
5.42 - 15.52	8,005 - 51,861	Very Low
15.52 - 17.60	51,861 - 109,775	Low
17.60 - 21.06	109,775 - 162,63	Medium
21.06 - 24.69	162,923 - 263,461	High
24.69 - 36.35	263,461 - 674,442	Very High

A similar approach generated composite maps for maritime transport patterns (flows, Map BL26) and environmental pressures (Map BL27). The environmental pressures composite map was obtained by calculating the average (equal weight basis) of layers with information about invasive species as well as organic and inorganic inputs. Their values were reclassified into five groups (based on quintiles) as follows:

<sup>1</sup> Data for Denmark, Ireland and Slovenia are on national level because as no data was available on NUTS-2-level

Table 5.2: Composite classification of environmental impacts

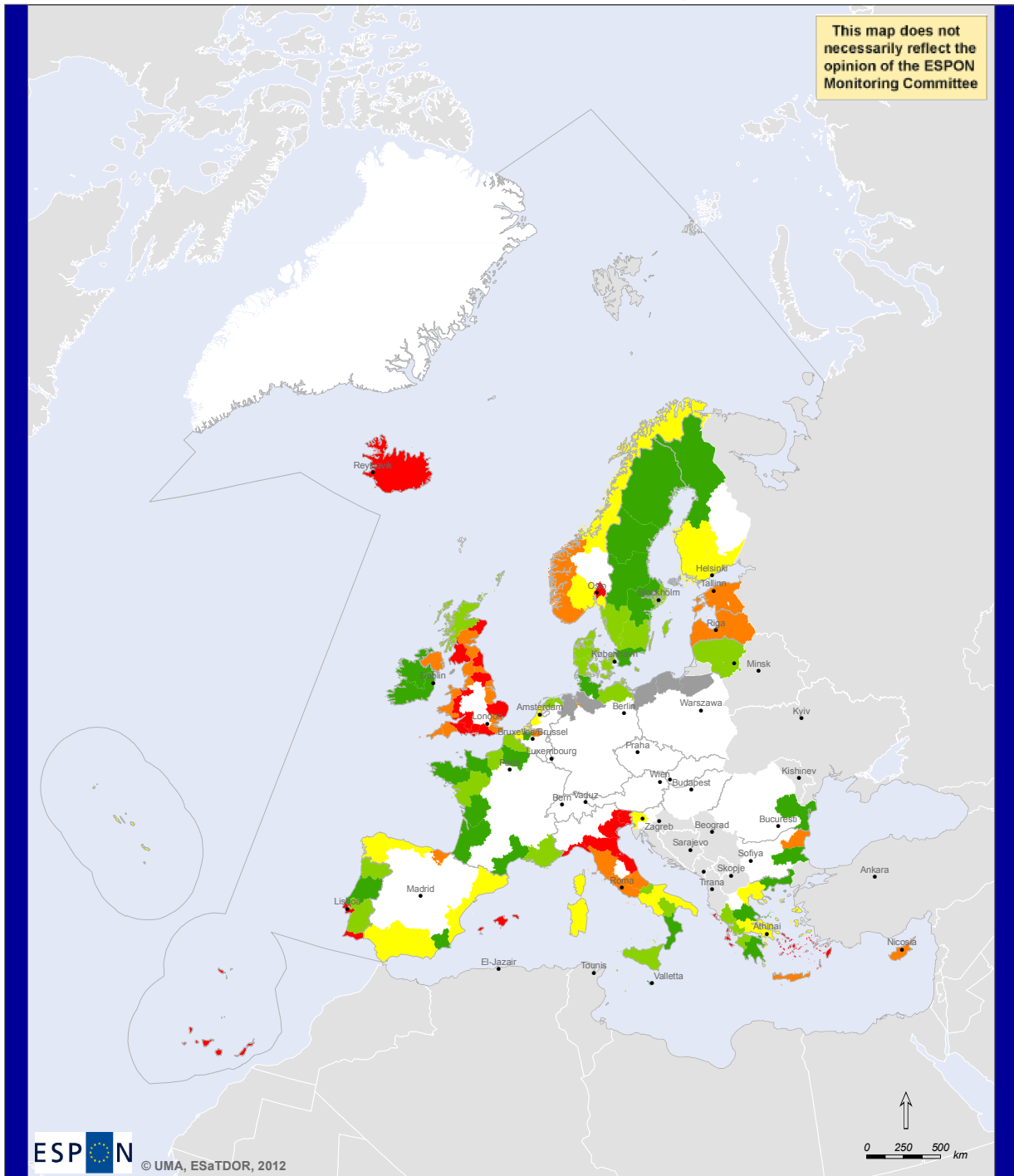
<b>Organic Inputs</b>	<b>Invasive Species</b>	<b>Inorganic Inputs</b>	<b>Category name</b>
-	0*	-	-
1 – 60	1 – 60	0.1 – 320	Very Low
60 -120	60 -120	320 - 640	Low
120 – 180	120 – 180	640 - 960	Medium
180 - 240	180 - 240	960 – 1,280	High
240 – 7,662	240 – 3,030	1,280 – 10,186	Very High

This gives an emerging picture for the European part of the Black Sea as follows. There is a generally low level of maritime jobs, though with a locally higher level around Constanta, reflecting the maritime cluster referred to above, and indicating the potential for growth. Transport is similarly at a low level overall, but again with a higher level of activity offshore from Constanta, reflecting its port activity. Environmentally, the Black Sea shows a similar pattern as in other European seas of problems closer to the coast, but with an area of particular concern in the shallower north western waters.

The information from these three composite maps and using data for other European seas examined by ESaTDOR can be drawn together to produce a typology of European maritime regions which is shown in schematic form in Map BL28. Although the overall picture for the Black Sea is somewhat partial due to lack of data for some countries, the influence of ports in Romania and Bulgaria leads this coastline to be classified as a Regional Hub, with a variety of economic development opportunities, most related to tourist development, Short Sea Shipping and servicing the energy sector. The low levels of traffic currently experienced in the Black Sea relative to other European seas means that the deeper waters are classified as being rural in character. Given more complete data this picture could change considerably.



# Maritime Employment (as a percentage of total employment), 2009




 © UMA, ESaTDOR, 2012
 
 Thematic data: Economic Significance Composite Map.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

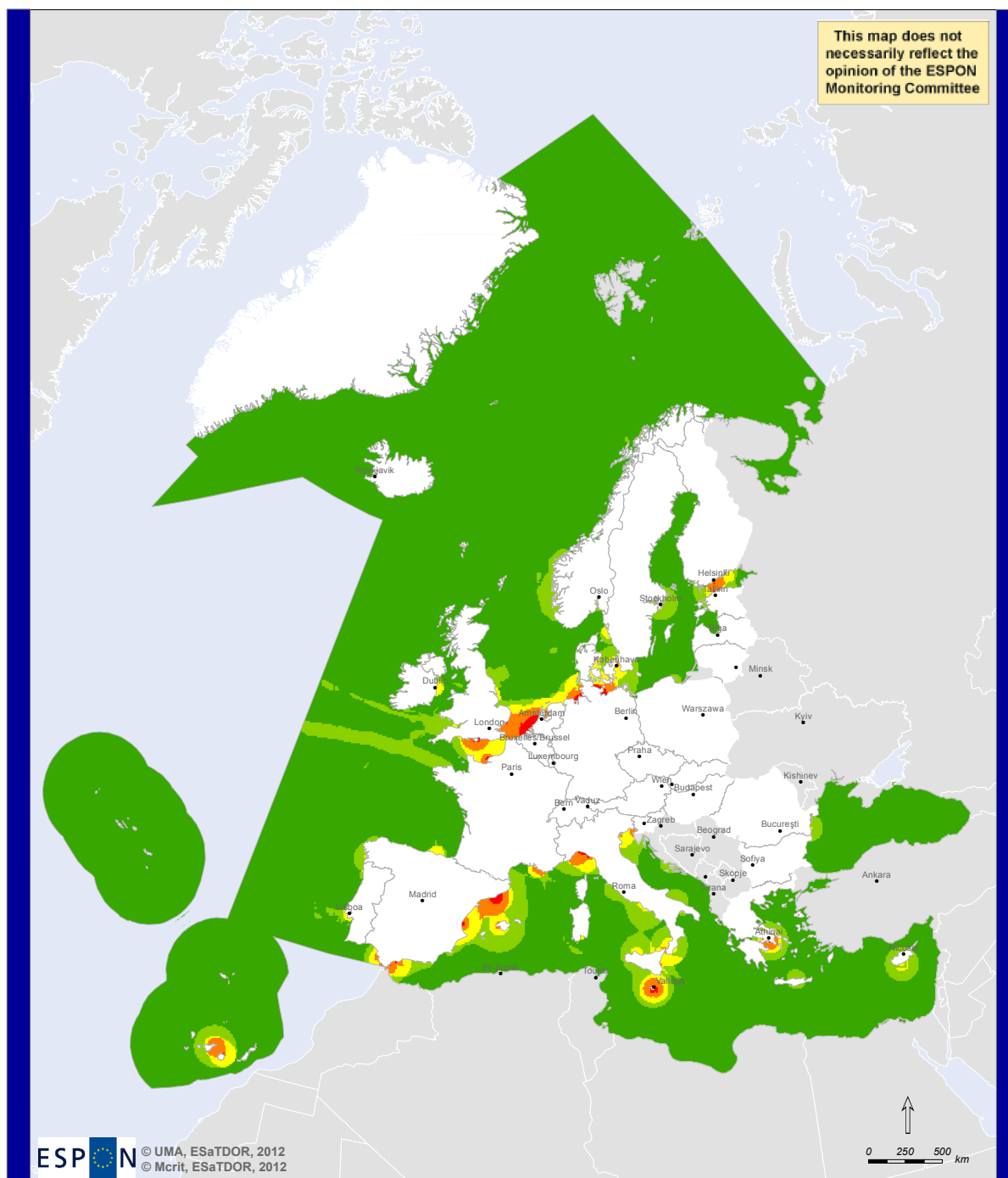
**Total Maritime Employment Composite Map (percentage of total employment within each NUTS2 region)**

- Very Low (5.42 - 15.52)
- Low (15.53 - 17.60)
- Medium (17.61 - 21.06)
- High (21.07 - 24.69)
- Very High (24.70 - 36.35)
- No data

*NOTE: This composite map consists of data from the European Cluster Observatory on persons employed in fisheries, shipbuilding, other traditional maritime sectors, sectors associated with the maritime cluster, tourism and transport as a percentage of total employment within each NUTS2 region.*

**Map BL25.** Composite map of maritime employment (as a percentage of total employment), 2009

# Maritime Flows




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Thematic data: Flows Composite Map.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

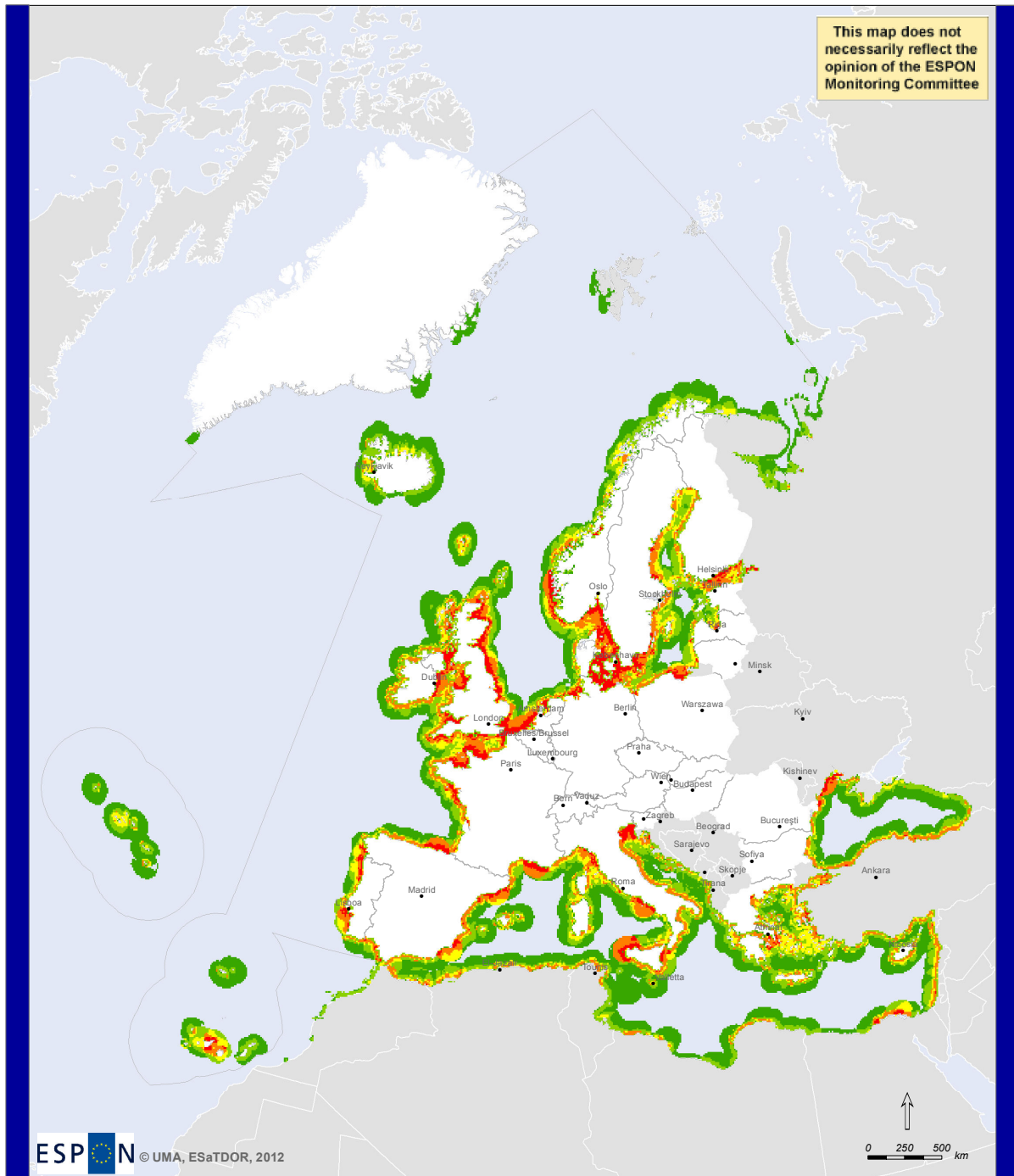
## Flows Composite Map

- Very Low
- Low
- Medium
- High
- Very High

*The Flows composite map is a proxy to land-sea interactions of goods, people, energy and information based on the analysis of flow magnitudes and interchange nodes. Influence of interchange nodes is higher with proximity to node and size of associated flow (container traffic, cruise traffic and LBK traffic plus Gb/s through cables). See Chapter 5 of the ESaTDOR Scientific Report for more information.*

**Map BL26.** Composite map of maritime flows

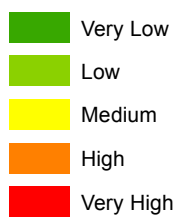
# Environmental Pressures




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Thematic data: Environmental Pressures Composite Map.  
 Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
 Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

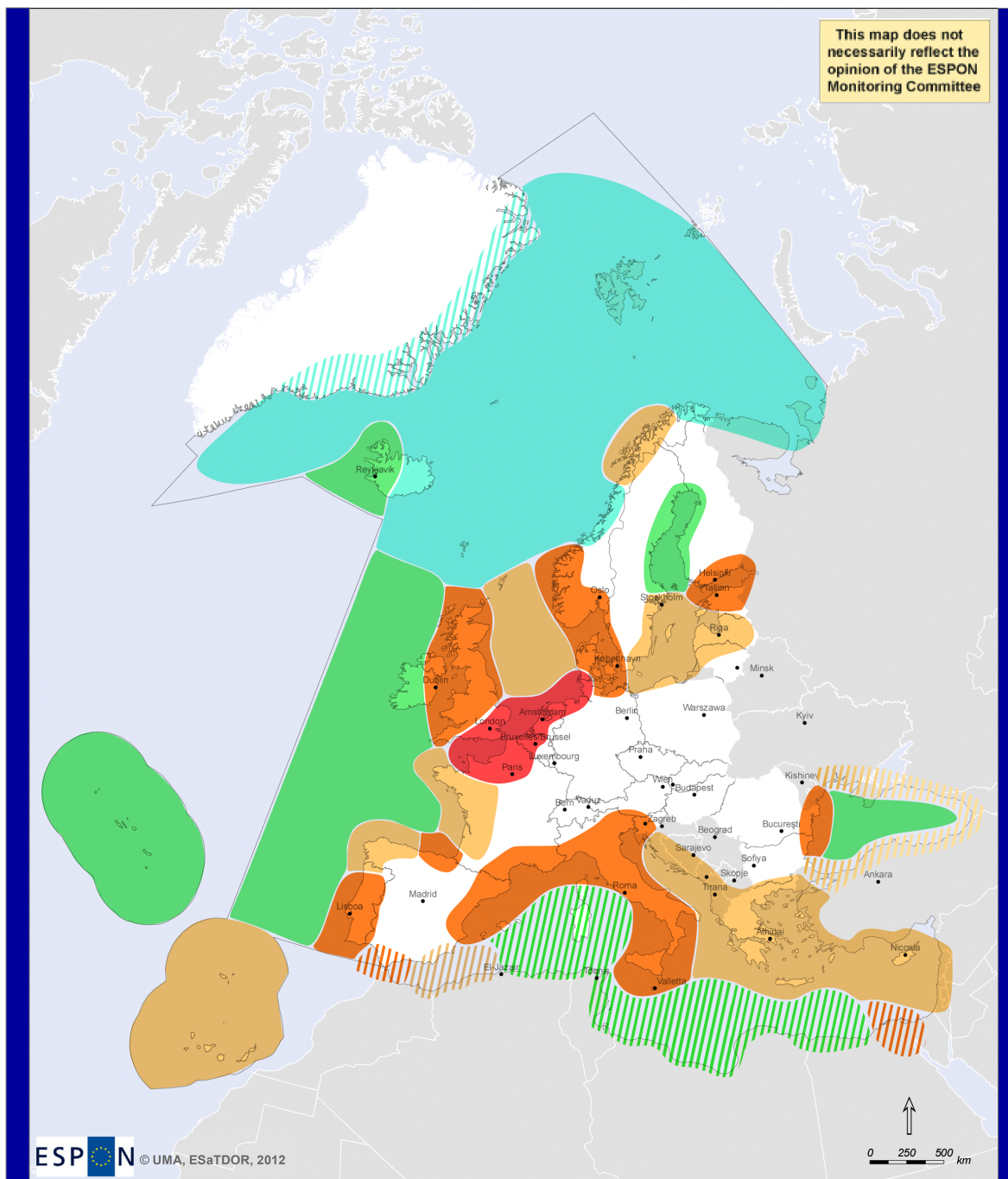
## Environmental Pressures Composite Map



*This map is based on three data sets: incidence of invasive species, organic pollution (pesticides) and inorganic pollution (fertilisers).*

**Map BL27.** Composite map of environmental pressures

# Typology of European Maritime Regions



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Thematic data: Typology Map, Economic Significance and Environmental Pressures Composite Maps  
Land boundaries: © EuroGeographics Association and ESRI. Regional level: NUTS2.  
Sea boundaries: OSPAR Convention, EU Integrated Maritime Policy and EEZ.

## Regions derived from typology map

- European Core
- Regional Hub
- Transition
- Rural
- Wilderness
- Typology influenced by lack of data

*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.*

**Map BL28.** Typology of European maritime regions (schematic map)

## 6. Key Territorial Development Opportunities and Risks

The future developments of energy, transport and economic use will continue to increase the risks to environmental condition. Current investments in treatment plants and other environment related projects will lead to visible improvements in Bulgaria and Romania, but a lot of efforts should be made all countries in the region.

A focus on implementation of the environmental strategic plan, approved by the Black Sea countries, looks to be very important.

The economic data and improving socio-economic indicators, at least until the onset of the global financial crisis, demonstrated that this was, and hence could be again, one of the fastest growing regions of the world. However, wide ranging disparities among and within the states of the region remain.

Despite the diversity of the countries in question in terms of size, economic structure and levels of development, a number of challenges and issues concern the region as a whole. Their measurability is made more difficult by the different levels of integration of the countries into the global economy and the EU. Contrast for example Greece, Romania, Bulgaria and Turkey with the relatively small and sometimes isolated economies of Moldova and the states of the Caucasus. Then we need to consider the challenges of social heterogeneity, the political system and economic structure of Ukraine and the challenges of economic diversification faced by energy exporters, Russia and Azerbaijan.

All countries of the Black Sea region will remain service-oriented. In Russia, Ukraine and Georgia, about 60 percent of gross value added originates in the services sector; the respective shares are somewhat smaller in Bulgaria, Romania and Turkey. In Bulgaria, Turkey and Georgia tourism is of growing importance — though still below its potential. At the same time, Romania, Turkey, and particularly Georgia (20 percent of gross value added) are still highly dependent on agriculture.

The maritime transport will continue to develop due to the economic growth and oil/gas transport.

When compared with other areas of Europe, Black Sea appears to be less developed in respect of ferry services. It is expected that ferry traffic will increase significantly in the 5-10 years.

Most of the Black Sea, both the shelf and the deeper areas, is believed to be prospective for oil and gas. Indeed, numerous discoveries have been made on the shelf of Ukraine (including the Sea of Azov), Romania, and Bulgaria.

Russia excluded, imports of oil and gas are rapidly rising in volume and value, to the extent that they cause considerable foreign trade deficits in some countries, for example Bulgaria.

Previously inaccessible technology is now increasingly available. And — except for the Ukraine — all of the countries have improved the terms of access for investors in the petroleum industry in general, in offshore exploration, and in production business in particular.

Similar opportunities may exist offshore of Georgia, Ukraine, and Bulgaria. Similar to the North Sea of 50 years ago, the Black Sea may be on the verge of becoming a major oil and gas producing area.

Last global tendencies in energy field indicate that the Black Sea region plays an important role in formation of new energy map of the Eurasian continent, which in perspective will contain such aspects, as diversification of oil and gas supplies, new routes of transportation of energy sources to the European markets and ensuring security of these projects. The concept of wider Black Sea region implies along with Russian oil and gas resources an increasing role of the energy sources of the Caspian basin with participation of Trans-Caspian countries – Iran, Kazakhstan and Turkmenistan in regional energy projects. The Black Sea region is a strategically important region as well as for its own fossil reserves.

## **Energy and Pipelines**

### Opportunities

- *New pipelines*  
Construction of export pipelines to deliver hydrocarbons to the European markets will improve access to Caspian energy resources.
- *Fossil fuel development*  
The latest research leads to extension of efforts in development of potential offshore exploitation in the Turkish area. In the Georgian area it is possible to see future developments also. However, transport of fossil energy will lead to increased shipping capacities in connection with further extend of pipeline networks.
- *Marine Renewables*  
There is a wind potential in the area. Romania and Bulgaria started to invest in onshore wind power and Ukraine has taken into consideration this field. All countries in the region should focus on this potential and its extension offshore.
- *Regional development*  
The new role of the countries in the region (Bulgaria and Romania) as distributors on transportation routes will give them the opportunity of regional development including creation of employment, new income sources etc.

### Risks

- *Increased oil transport and Bosphorus Strait constraints*  
Future developments of the oil export flows from the Caspian region will increase the tankers passage through straits. Proposed projects, which in perspective will bypass Bosphorus Strait, could eliminate the environmental risks and possibility of physical break of energy supply in the region.
- *Environmental damage associated with new energy transport*  
New developments in energy transport in the Black sea Region will lead to various environmental impacts and will increase the pollution risk due to ships accidents.
- *Need for effective communication*  
The energy cooperation in the region should assure an effective sharing of information in case of an external energy crisis, as well as for assisting the early response and reactions in case of energy threats.
- *Infrastructure development*  
Wider investment policy for the improvement and liberalization of investment opportunities in the energy sector is needed for rehabilitation and modernization of existing energy infrastructure and construction of new energy capacities.

## Transport

### Opportunities

- *Growth of shipping*  
The importance of Black Sea ports in international maritime trade will increase continuously due improved grains harvest and economic development.
- *Development of ferry services*  
The future condition will be favourable to develop ferry traffic.
- *Short Sea Shipping*  
Short Sea Shipping is due to the geographical situation of the Black Sea the major type of maritime transport and is likely to increase further. One other important aspect is integration of short sea shipping with Danube –Maine - Rhine river transport.
- *Cruise activity*  
It is noticeable that more cruise lines adding Black Sea to their offer. Also cruising has started to become a popular travel option for more and more citizens of Black Sea countries.
- *New infrastructure*  
In general there is a sufficient maritime infrastructure in place within the Black Sea Region. Increased shipping, technological revolutions and changes in demand will however lead to constant reconstruction and infrastructural adaption of Black Sea ports.
- *Gas and oil shipping*  
Most of the oil and gas routes (pipelines included) are connected by different Black Sea ports. The future energy developments will lead to increase of gas and oil shipping.
- *Leisure development*  
Use of yachts and sporting boats has increasingly become part of summer holiday resorts offer during the last 5-10 years and it is expect that these activities will increase in the same time with living standards of local citizens. There is a continuous increase in the number of new marinas that are opening or enlarging every year.

### Risks

- *Substandard shipping and maritime accidents*  
The Black Sea remains an area where most of the substandard ships are still trading and this is probably due to use of lower PSC standards. The apparently low number of accidents reported in the EU sector of the Black Sea is due to relatively low traffic volumes in the area.
- *Administrative barriers to shipping*  
Black Sea is an important gate for cargoes entering the European Union and therefore it is extremely important to have in place a fast and effective customs and administrative system for management of cargoes.

## Environment

### Opportunities

- *Improved monitoring and communication*  
The latest environmental related projects lead to improvements in monitoring and exchange of data among Black Sea countries with potential results in increasing of awareness and establishing proper environmental protection measures.
- *Implementation of EU regulations and regional agreements*  
The measures taken by EU countries (Bulgaria and Romania) in order to fulfil European requirements and implementation of initiated environmental projects together with common efforts to put in practice the regional agreements signed by all Black Sea countries may help to obtain better results in environmental protection.

### Risks

- *Eutrophication*  
The anthropogenic eutrophication is the key ecological problem for the coastal Black Sea region (especially it is North-Western part subjected to the strong influence of freshwater input), resulting in dramatic alterations in the chemical and biological regimes.
- *Nutrient enrichment*  
The Black Sea environment continues to be threatened by nutrients discharged to the Sea via rivers, of which the Danube is by far the most important, direct discharges from large municipal/industrial plants and atmospheric deposition of nitrogen to the Sea.
- *Marine living resources*  
Important marine living resources have been greatly affected by alien species introductions, eutrophication, over-fishing and habitats change/damage. Annual total fish catch statistics show an improving situation, but these figures are dominated by catches of anchovy and sprat. There have been recent improvements in catches of some other fish, such as bonito, but turbot, dogfish and whiting catches have either shown no improvement or have fallen over the past decade-or-so. Sturgeons remain endangered. Unsustainable fishing practices are still in relatively common use [2].
- *Biodiversity*  
The invasive alien species have a serious impact on the Black Sea native biological diversity, with negative consequences for human activities and economic interests [12].



## Economic use

### Opportunities

- *Services related to energy transport infrastructure development*  
The new role played by the Black Sea countries in the development of energy transport infrastructure will allow them to increase the connected services and to create a large number of employment opportunities.
- *Agriculture development*  
It is expected that agricultural outputs will increase in the future years in countries like Romania, Ukraine, Bulgaria and Georgia.
- *Increased tourism*  
There is a big tourism potential, including cruising, in the area, which may be exploited with good results.

### Risks

- *Low investments in infrastructure*  
The very low level of the investments in infrastructure will constitute a major barrier in economic development.
- *Administrative barriers*  
The low level of administrative reform in Black Sea countries still it is an important barrier into attract foreign investments and develop the economy of the coastal area.
- *Environmental pressures caused by land use*  
Eutrophication in Black Sea is caused mainly by large amounts of nutrient loads with river and land based sources. The future developments of economic use in the coastal area will increase the pressure on environment.

## **Black Sea Recommendations**

The Black Sea can be considered as a peripheral sea, both in terms of its location in European space, being on the eastern extremities of the EU and also in relation to its proximity and connectivity to other oceans. It is a region which has over the last 20-25 years experienced considerable social and political upheaval. However, it has a strategic importance in terms of its linkages with European Neighbours (Belarus, Ukraine, Moldova and Georgia), Russia and the Caucasus for energy security and other forms of economic development such as the import/export of goods across the Sea and via the Danube corridor. The enclosed nature of the Black Sea creates a unique ecosystem, which is characterised by environmental vulnerability, largely as a result of land based pollution (often from key rivers such as the Danube and the Don); shipping spills and discharge; invasive species and over exploitation of fishing stocks. It is also fair to say that as a regional sea it is relatively under-developed, but with potential in terms of the service sector (particularly tourism), exploitation of oil and gas reserves and potential for new fishery activities (a combination of fishing (if stocks can re-establish themselves) and aquaculture). Nevertheless it will remain relatively peripheral and further exploitation will be dependent on ensuring that the gradual improvement in environmental integrity of the sea is, beginning to be witnessed maintained.

In looking to the future it is recommended that:

1. Efforts should be made to strengthen the mechanisms for collaborative effort between the states that border the Black Sea, particularly in ensuring that efforts aimed and monitoring and enhancing environmental resilience are sustained. It is important to note that the environmental wellbeing of the Black Sea is not just dependent on countries neighbouring the sea, but also those within its landward catchment.
2. New opportunities for further clustered development, particularly in the tourism sector, which is at the moment relatively under-developed should be exploited. A focus on cultural heritage within the Black Sea region offers some potential, but this needs co-ordinating and is dependent upon improving infrastructure, mobility and maintaining environmental quality whilst managing increased pressures from additional tourist trade.
3. The potential of exploiting natural resources - notably oil and gas within the sea, and increasing need for pipelines to transport these resources into Europe needs careful transnational collaboration.
4. The existing governance arrangements for collaborative action in relation to environmental monitoring and protection could be strengthened in order to facilitate a wider debate about development opportunities and potentials rather than simply managing a critical risk. Maybe the Baltic experience offers some useful lessons here.
5. There is probably a need to improve the understanding of the risks and opportunities that the Black Sea has for regional potential, though continuous and sustained broad stakeholder engagement.

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## Interviews

Interview with a representative of Romanian Naval Authority, Mr. Dumitru Bucuresteanu