



ESaTDOR

European Seas and Territorial Development, Opportunities and Risks

ANNEX 14 to the Scientific Report:

Data and Mapping: Technical Information

Applied Research 2013/1/5

Version 16/1/2013

ANNEX 14: Data and Mapping Technical Information

Contents

PART A: Detailed methodology for Maps prepared for the ESaTDOR project	2
PART B: Data collection Guidelines for mapping the different types of Sea uses across Europe	12
PART C: Data Collection Template	17
PART D: Further details on EMODnet data coverage and technical details	20
PART E: Additional information on the main outcomes expected from ISIS.....	21

List of Tables

Table 1 “General Context” maps produced	2
Table 2 “Maritime Economy” maps produced	3
Table 3 Employment in Fisheries defined.....	4
Table 4 Employment in other traditional maritime sectors defined	4
Table 5 Other sectors associated with the maritime cluster defined.....	5
Table 6 Employment in Tourism defined.....	6
Table 7 Energy and Undersea Infrastructure maps produced.....	7
Table 8 Environment maps produced.....	8
Table 9 Transport maps produced.....	10
Table 10 Annex I of the INSPIRE Directive	13
Table 11 Annex II of the INSPIRE Directive	14
Table 12 Annex III of the INSPIRE Directive (with additions relevant for ESaTDOR)	14
Table 13 Data collection template.....	17
Table 14 Data collected by EMODnet.....	20

PART A: Detailed methodology for Maps prepared for the ESaTDOR project

The general Context Maps produced in the ESaTDOR project are listed below. Maps are at single sea and Europe wide level. Data are classified in the way it is shown: punctual data, ESaTDOR Raster Grid 10x10 or NUTS regions.

Table 1 "General Context" maps produced

Maps produced at Single Sea Level and Europe-wide level	Geographic scale
Sea Depth	Raster Grid
Marine Ecoregions	Raster Grid
Population density in coastal areas 2008	NUTS
Population density per NUTS2 within water catchment areas	NUTS
Water catchment areas population density	NUTS
GDP in coastal regions (national averages)	NUTS
GDP in coastal regions (coastal average)	NUTS

Sea Depth

This map is based on GEBCO global bathymetry map adapted to Europe showing the water depth within the ESPON Seas in meters.

Marine Ecoregions

This layer shows the large marine ecoregions in the European Sea based on the UNEP – WCMC Global map of Large Marine ecoregions. Polygon limits are adapted to the grid.

Water catchment areas and population density

The creation of this layer is based on population data at NUTS3 (EUROSTAT, 2008) and on the catchment boundaries of the different seas included within the ESPON space (United Nations Environment Programme). The number of population present within each catchment is weighted by the area of the catchment to get the population density per catchment. Map units are persons/km².

Population density per NUTS2 within water catchment areas

The map shows the distribution of population density data at NUTS2 (EUROSTAT, 2008) within the catchment areas of the different seas included within the ESPON space (United Nations Environment Programme). Calculations were not performed. Population density is represented by classes and colors. The map units are persons/km².

Population density in coastal areas 2008

Population density in coastal regions at NUTS 3 compared to the mean national population density for the year 2008 based on EUROSTAT data. The map identifies the areas that have a population density below, equal or above the national mean population density (equal class is given to those countries constituted by a single NUTS 3 region). Map units are in persons/km².

GDP in coastal regions (national averages)

A comparison between the GDP of the ESPON seas coastal regions (NUTS2) and the average GDP calculated for their respective country for the year 2009 based on EUROSTAT and STATISTICS NORWAY data. The map identifies the areas that have a population density below, equal to or above the national mean (equal class is given to those countries constituted by a single NUTS 2 region). Map units are in Euros/inhabitant.

GDP in coastal regions (coastal average)

This is a comparison of GDP in the year 2009 at NUTS 2 between the GDP of the ESPON seas coastal regions and the average GDP calculated for them (EUROSTAT and STATISTICS NORWAY data). The map identifies the areas where the GDP is below or above the coastal mean. Units are in Euros/inhabitant.

The Maritime Economy Maps produced in the project are listed in the following table:

Table 2 "Maritime Economy" maps produced

Maps produced at Single Sea Level and Europe-wide level	Geographic scale
Employment in the tourism sector	NUTS
Employment in other traditional maritime services	NUTS
Employment in other sectors associated with the maritime cluster	NUTS
Employment in the transport sector	NUTS
Employment in fish sector	NUTS
Employment in shipbuilding sector	NUTS
Number of hotel beds per square km	NUTS

Employment in different clusters

These maps represent the importance of different maritime clusters versus the total employment in ESPON seas coastal regions at NUTS 2 level. The analysis is done for year 2009 based on the information from the European Cluster Observatory. There are two versions of these maps: the first shows the percentage of total employment represented by the cluster and the other the total number of employees within it. Data for the regions of Denmark, Ireland and Slovenia are at national level because there are no employment data available for NUTS 2 regions. Following are listed all the sectors included in each of the clusters:

Table 3 *Employment in Fisheries defined*

Employment in FISHERIES includes:	
Marine fishing	Freshwater fishing
Marin aquaculture	Freshwater aquaculture
Processing and preserving of fish, etc	Production of oils and fat
Manufacture of prepared meals and dishes	Manufacture of cordage, rope, twine and netting
Manufacture of machinery for food, beverage and tobacco processing	Repair of other equipment
Wholesale of other food, included fish, crustaceans and molluscs	Retail sale of fish, crustaceans and molluscs in specialized stores
Technical testing and analyses	research and experimental development on biotechnology
Other research and experimental development on natural sciences and engineering	

Employment in shipbuilding includes:

- Building of ships and floating equipment
- Building of pleasure boats
- Repair and maintenance of ships and boats

Employment in other traditional maritime services

This sector includes:

Table 4 *Employment in other traditional maritime sectors defined*

Employment in OTHER TRADITIONAL MARITIME SERVICES	
Manufacture of other tanks, reservoirs and containers of metal	Manufacture of wire products, chain and springs
Manufacture of instruments and appliances for measuring, testing and navigation	Manufacture of electricity distribution and control apparatus
Manufacture of wiring devices	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
Manufacture of fluid power equipment	Manufacture of other pumps and compressors
Manufacture of taps and valves	Manufacture of bearings, gears, gearing and driving elements
Manufacture of ovens, furnaces and furnace burners	Manufacture of lifting and handling equipment
Manufacture of non-domestic cooling and ventilation equipment	Manufacture of other general-purpose machinery n.e.c.
Manufacture of machinery for mining, quarrying, and construction	Manufacture of other special-purpose machinery n.e.c.
Repair of machinery	Installation of industrial machinery and equipment
Agents involved in the sale of fuels, ores,	Agents involved in the sale of machinery,

metals and industrial chemicals	industrial equipment, ships and aircraft
Agents specializing in the sale of particular products or ranges of products n.e.c.	Wholesale of electronic and telecommunication equipment and parts
Wholesale of machine tools	Wholesale of mining, construction and civil engineering machinery
Wholesale of other machinery and equipment	Renting and leasing of construction and civil engineering machinery and equipment
Renting and leasing of other machinery, equipment and tangible goods n.e.c.	

Employment in other sectors associated with the maritime cluster

This sector includes:

Table 5 Other sectors associated with the maritime cluster defined

OTHER SECTORS ASSOCIATED WITH THE MARITIME CLUSTER	
Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	Casting of steel
Casting of light metals	Casting of non-ferrous metals
Manufacture of metal structures and parts of structures	Manufacture of doors and windows of metal
Manufacture of central heating radiators and boilers	Treatment and coating of metals
Machining	Manufacture of electric lighting equipment
Manufacture of other electrical equipment	Manufacture of agricultural and forestry machinery
Manufacture of other furniture	Repair of fabricated metal products

Employment in transport sector

This sector includes:

- Freight rail transport
- Freight transport by road
- Transport via pipeline
- Sea and coastal freight water transport
- Inland freight water transport
- Warehousing and storage
- Service activities incidental to land transportation
- Service activities incidental to water transportation
- Cargo handling
- Other transportation support activities

Employment in the tourism sector

This sector includes:

Table 6 *Employment in Tourism defined*

Employment in TOURISM	
Wholesale of other household goods	Retail sales in non-specialized stores
Retail sale in sporting equipment	Passenger rail transport
Sea and coastal water passenger water transport	Inland passenger water transport
Passenger air transport	Service activities incidental to air transport
Hotels and similar accommodation	Holiday and other collective accommodation
Recreational vehicle parks, trailer parks and camping ground	Other accommodation
Restaurants and mobile food service activities	Event catering activities
Other food services n.e.c.	Beverage serving activities
Buying and selling of own real estate	Renting and operation of own or leased real estate
Management of real estate on fee or contract basis	Renting and leasing of cars and light motor vehicles
Renting and leasing of recreational and sports goods	Advertising agencies
Renting and leasing of other personal and household goods n.e.c.	Renting and leasing of water transport equipment
Activities of employment placement agencies	Temporary employment agency activities
Travel agency activities	Tour operator activities
Tourist related services n.e.c.	General cleaning of buildings
Organization of conventions and trade shows	Other business support service activities n.e.c.
Sports and recreation education	Performing arts
Supporting activities to performing arts	Artistic creation
Operation of art facilities	Museum activities
Operation of historical sites, etc	Botanical and zoological gardens and nature reserves activities
Gambling and betting activities	Operation of sports facilities
Fitness facilities	Other sports activities
Activities of amusement parks and theme parks	Other amusement and recreation activities
Hairdressing and other beauty treatment	

Tourism intensity: Number of hotel beds per square km

This map represents the tourism intensity (number of establishments, bedrooms, and bed places per area) in ESPON seas coastal regions at NUTS 3 level for the year 2009 based on EUROSTAT data. The layer was obtained by dividing the total number of establishments, bedrooms and bed places of each region by its surface. The units are in establishments/km².

Energy and Undersea Infrastructure maps are listed below:

Table 7 Energy and Undersea Infrastructure maps produced

Energy and Undersea Infrastructure Maps produced at Single Sea Level and Europe-wide level	Geographic scale
Oil and gas platforms	Raster Grid
Employment in the Oil and Gas Sector	NUTS
Existing wind farm capacity	Points
Wave power potential	Points
Undersea cables (length)	Raster Grid
Undersea cables (capacity)	Raster Grid

Oil and gas platforms

The map is produced from a dataset about Oil Rigs of the National Center for Ecological Analysis and Synthesis. This dataset is produced from 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. We have integrated the data into the 10km x 10km grid on the basis of presence or absence of light in every cell, which does not mean that the whole cell is occupied by oil rigs or gas platforms.

Employment in the Oil and Gas Sector

This map represents the importance of oil and gas sector within the total employment in ESPON seas coastal regions at NUTS 2 level for the year 2009, based on the information from the European Cluster Observatory. There are two versions of this map: the first shows the percentage of total employment represented by the cluster and the other the total number of employees within it. Data for the regions of Denmark, Ireland and Slovenia are at national level because there are no employment data available for NUTS 2 regions.

This sector includes:

- Extraction of crude petroleum
- Extraction of natural gas
- Support activities for petroleum and natural gas mining

Existing wind farm capacity

The data sets are produced by 4C Offshore/LORC Knowledge. The map represents the exact location and power of each of the windfarm existing in this database. The map units are in Watts / m² (W/m²).

Wave power potential

The map is produced in connection with the WorldWaves development project and through the integration of the high quality wave model data from the European Centre for Medium Range Weather Forecasts (ECMWF) and site-specific global satellite altimeter. The mean wave value energy

is calculated based on 10 year/ 6 hourly time series of wave energy. Every point of the database is represented in the map. The map units are in Kilowatts per meter (Kw/m).

Undersea cables (length)

The undersea Cable map (www.cablemap.info) is a consolidation of all the available information about the undersea communications infrastructure. A line shapefile with the geometries of the cables and an associated table is provided in the web site. The cable length is measured as the total length of the cable (or the cables) that goes through a 10km x 10km cell. The map units are meters.

Undersea cables (capacity)

The undersea cable capacity map shows the capacity of the cable in a cell or the sum of capacities of all cables that go through a 10km x 10km cell. The map units are Gigabytes per second.

Environment Maps are in the following table:

Table 8 Environment maps produced

Environment Maps produced at Single Sea Level and Europe-wide level	Geographic scale
Protected areas	Raster Grid
Bathing sites	Points
Increase in sea surface temperature	Raster Grid
Organic inputs	Raster Grid
Inorganic inputs	Raster Grid
Invasive species	Raster Grid

Protected areas

The map is produced based on the databases Natura2000 and CAFF protected areas. Original features were converted to a 1km x 1km grid. For each of the 1km cells a yes/no condition was used, being yes for any cell intersecting with any polygon of the Natura2000/CAFF protected area. Then, a statistical calculation was done to set how many 1km cells for each 10km cell (%) were occupied by protected areas. Then, a mask was applied to differentiate between land and sea protected areas. Land protected areas were selected only in a coastal strip of 20km inland. The map unit is percentage of the grid size occupied by protected sites.

Invasive species

The map is produced using the 'invasive species database', a raster digital dataset published in 2008 by National Center for Ecological Analysis and Synthesis. NCEAS used the location data of more than 1,000,000 ships to create ship tracks and converted it into 1km grid. Ship locations and services of each port were included also in the calculation at a raster 1km resolution. NCEAS describe the process as follows: 'To model the spatial impact of invasive species, we used a diffusive plume model to mimic invasion fronts and spread the value for each port at 1 km² resolution into adjacent waters'. They limit the action to 1000km from ports and to shallow waters. With this database, the mapping team used a statistical tool to calculate the average value for each 10km cell. The map unit is number of invasive species per grid square.

Organic inputs

A very complex process is used to obtain the 'Organic pollution (transformed)' database by National Center for Ecological Analysis and Synthesis. Essentially they use point of discharge based on watersheds, then apply a model of coastal dynamics. National statistics of FAO are used for nutrient and non-point organic pollution for the years 1993-2002 and distributed along the landscape based on human population densities and land use categories. With this database the mapping team has used a zonal statistics tool to calculate the average values for the 10 km grid.

Bathing sites

Under Bathing Water Directive 76/160/EEC a report has been produced for 2010 where a catalogue of bathing spots all over Europe is included. Each bathing site is classified in a four category classification. Even though it is a spread sheet, it is georeferenced, as each spot has coordinates. A geographic file was directly created from these spots. The four categories are those that Directive uses for its classification.

Increase in SST

The Sea Surface Temperature data is directly retrieved from NOAA's 'Optimum Interpolation (OI) Sea Surface Temperature (SST) V2'. According to the NOAA metadata specifications 'monthly fields are derived by a linear interpolation of the weekly optimum interpolation (OI) version 2 fields to daily fields then averaging the daily values over a month'. The optimum interpolation (OI) sea surface temperature (SST) analysis is produced weekly on a one-degree grid. The analysis uses in situ and satellite SST's plus SST's simulated by sea-ice cover. Before the analysis is computed, the satellite data is adjusted. Monthly data was used to define the sea surface temperature for the year 1982 (first complete year of the series) and the year 2011 (last complete year) the result being the difference between both years mean values. One-degree data is transformed into 10 km grid using average values by area occupied.

Inorganic inputs

NOTE: Data for inorganic inputs has been used in the "Environmental pressures" composite map only.

For inorganic inputs map, the mapping team performed a raster calculation to assign data to the 10 km x 10 km grid based on statistics (average value weighted by area of the target cell occupied by each original cell). The original data comes from the National Center for Ecological Analysis and Synthesis. For inorganic pollution a model was used under the assumption that most inorganic pollution comes from urban runoff: 'Non-point source inorganic pollution was modeled with global 1 km² impervious surface of NGDC center of NOAA program'. Again, this data is modeled using watersheds to define pouring point into the sea and coastal dynamics to model the spread of the values into coastal waters.

Transport Maps produced for the ESaTDOR project are listed below, classified either as single sea level or Europe wide level. Data are classified according to how data are shown, punctual data (data sets mapped punctually for each port), ESaTDOR Raster Grid 10x10 or Country Level (NUTS0).

Table 9 Transport maps produced

Maps produced at Europe-wide level	Geographic scale
Economic influence of container ports	Raster Grid
Economic influence of cruise ports	Raster Grid
Marine exposure due to port influence based on port proximity/volume of cargo	Raster Grid
Marine exposure due to port influence based on port proximity/liquid energetic products	Raster Grid
Intensity of use/shipping lanes	Raster Grid
Short sea shipping by direction	NUTS0
Short sea shipping 2004 – 08	NUTS0
Maps produced at Single Sea Level	Geographic scale
Total shipping at ports by weight of goods (all ports)	Ports
Total shipping at ports by direction	Ports
Total shipping at ports – average annual increase in traffic	Ports
Container shipping – all ports	Ports
Container shipping – by direction	Ports
Container shipping by average annual traffic increase	Ports
Cruise activity at ports (all ports)	Ports
Cruise activity by passenger type	Ports
Increase in cruise passengers	Ports
Ferry passengers at ports (all ports)	Ports
Average annual traffic increase of ferry passengers	Ports

Punctual data are shown at Single Sea Level: Arctic Sea, Atlantic Ocean, Baltic Sea, Black Sea, Mediterranean Sea and North Sea. Data are linked to each single port. Punctual transport data located in ports has been transformed to buffers around the ports based on the ESaTDOR 10 km x 10 km grid. To calculate the influence of a port onto a sea cell, a potential accessibility approach based on the sea has been applied. The influence of a port onto a sea based grid cell is assumed to increase with the size of the port and to decline with the distance which separates them.

Numerically, the influence of a port on a cell i equals to:

$$I_i = A \cdot \exp(-\beta \cdot d_i)$$

A = Activity of the port (depends on the data set dealt with, e.g. total cargo, TEUs, cruise passengers, tonnes of liquid bulk ...)

β = a constant representing the decaying factor

d = distance separating the port from the cell i

A cell may be affected by more than one port if there is more than one close enough (maximum distance to consider is **100km**). The total influence of the activity is the sum of the influences of all ports within reach:

$$I_{total} = \sum I_{Port_i}, \text{ for every port } i \text{ within reach}$$

The β Parameter is the decaying factor. The value of the beta parameter controls the range at which the influence of a port can still be perceived. Small values of beta allow for influences of a port to be perceived far away (for beta 0.008 the influence of the port remains at 50% at 100km of distance, see Figure 1 below), whilst large values of beta reduce the range of this influence (for beta 0.15, the influence of a port is not noticed beyond 25km). In ESATDOR, β has been chosen as 0.04.

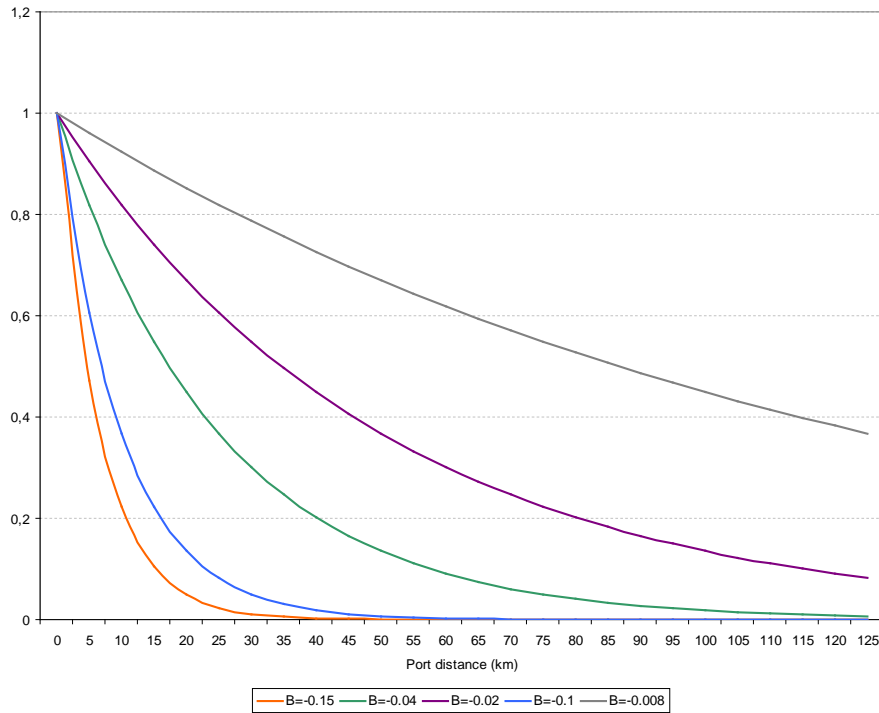


Figure 1 Assigned weight of port in terms of distance to origin, for different values of the β -parameter

According to this methodology, the transport maps produced are those produced in raster format from the list above.

PART B: Data collection Guidelines for mapping the different types of Sea uses across Europe

Current Status

The ESPON project specification emphasizes the need to provide consistent, reliable and updatable data that is in compliance with the INfrastructure for SPatial InfoRmation in Europe initiative (INSPIRE) Directive Principles. This data needs to be comparable amongst different regional Seas' units, structured and defined for GIS and mapping purposes in order to improve our understanding of land-sea interactions

Specifically, the ESPON project will be informed by the INSPIRE which aims at making relevant, harmonized and good quality geographic information available for the purpose of formulation, implementation, monitoring and evaluation of Community policy-making. There are 5 general principles of the INSPIRE Directive; the most important for our project being (which is not a primary data source, but rather an integrator of data):

1. It should be possible to combine seamlessly spatial data from different sources and share it between many users and applications (seamless combination), and
2. Spatial data needed for good governance should be available on conditions that are not restricting its extensive use (easy discovery).

The aim of this document is to set guidelines for data collection covering marine & coastal questions for a better understanding of major aspects of land-sea interactions.

The approach followed is coherent with the INSPIRE Directive principles which addresses 34 spatial data themes which are subdivided in the three annexes of the directive.

Whenever relevant to ESPON purposes, the themes identified by INSPIRE are used as the basis of data collection. Two additional themes, in relevance with the aim of ESPON, and not covered by the themes of INSPIRE, are added to Annex 3.

During the data gathering of this project, the recommended structure set in this document needs to be followed. This guide is expected to reflect a complete review of each spatial theme.

The data sets listed below, issues and gaps are suggestions and examples only. The examples may not be relevant to every country, and are by no means the only areas to be addressed. The general description should be comprehensive, exhaustive, fully referenced and highlighting any national and/or regional state of the coast/ocean reports that are available. It should review current knowledge and knowledge gaps. The document should be written clearly and throughout the text, for each numbered section, inserts should be provided on:

A. AREAS OF CONCERN.

- Identification of Sea use and practices at the local, national, levels; in addition to uses or coastal/ marine issues within your country that are caused or influenced by other countries / regional or international activities,
- Regional issues (shared by neighboring countries,
- Activities or issues within your country that have an influence externally – on other countries or on areas beyond national jurisdiction.

B. DATA. Data sets relevant to each ESPON relevant theme (not raw data sets, here I refer to numeric or spatial information).

C. GAPS. What is not known (gaps in knowledge) and recommendations to address these gaps.

D. All literature used should be entered into the extended bibliography (Annex I)

Spatial Themes

The 34 spatial data themes addressed by the INSPIRE Directive are subdivided in the three annexes of the directive as presented in the table below. It is to note that this exhaustive list includes themes that are not necessarily applied to the marine / coastal contexts. The definition of each of the listed themes is available in the INSPIRE data specifications website. ⁱ

Table 10 Annex I of the INSPIRE Directive

Annex I of the INSPIRE Directive	
1.	Coordinate reference systems
2.	Geographical grid systems
3.	Geographical names
4.	Administrative units
	<ul style="list-style-type: none"> • types of coastal & maritime borders • sea boundaries, • National and sub national costal zones and maritime borders
5.	Addresses
6.	Cadastral parcels
7.	Transport networks
8.	Hydrography
9.	Protected sites
	<ul style="list-style-type: none"> • Nature conservation zones, • Marine protected areas

Table 11 Annex II of the INSPIRE Directive

Annex II of the INSPIRE Directive
1 Elevation: <ul style="list-style-type: none"> • Bathymetry, • Shoreline change, 2 Land cover 3 Orthoimagery 4 Geology: <ul style="list-style-type: none"> • Benthic topography

Table 12 Annex III of the INSPIRE Directive (with additions relevant for ESaTDOR)

Annex III of the INSPIRE Directive
1 Statistical units 2 Buildings 3 Soil 4 Land use: <ul style="list-style-type: none"> • coastal and marine existing and planned initiatives, • marine scientific research, • shipping, • exploitation of raw materials, • pipelines and submarine cables, • energy production (especially wind energy), • fisheries and mariculture, • military uses, • protection of the marine environment 5 Human health and safety: <ul style="list-style-type: none"> • coastal bathing waters quality, • Water quality, 6 Utility and governmental services 7 Environmental monitoring Facilities 8 Production and industrial facilities: <ul style="list-style-type: none"> • coastal and maritime industries 9 Agricultural and aquaculture facilities 10 Population distribution and demography <ul style="list-style-type: none"> • population size, • population density 11 Area management/restriction/regulation zones & reporting units: <ul style="list-style-type: none"> • Regional and local conservation initiatives, 12 Natural risk zones: <ul style="list-style-type: none"> • Marine contaminants, • Trawling effects, • Coastal erosion, • Natural disturbances (tsunamis...), • Coastal and maritime pressures 13 Atmospheric conditions 14 Meteorological geographical features

- Valid indicators on climate variability triggering regime shifts,
- Climate change effects,
- Sea temperature

15 Oceanographic geographical features

- Oceanographic conditions,
- depth
- current velocity
- wave exposure
- residence time
- mean water temperature
- mixing characteristics
- turbidity
- mean substratum composition
- shape
- *water temperature range*
- Sea level,
- Sea rise

16 Sea regions

17 Bio-geographical regions

- Valid indicators for describing marine and coastal ecosystems
- Ecoregions (Ecosystem types)

18 Habitats and biotopes

19 Species distribution

20 Energy network and sources

- Hydrocarbons;
 - Renewable energy including patterns of estimated levels of marine renewable energy resources (wind, wave and tidal);
 - Patterns of current and projected offshore wind energy capture; and distribution of current and potential projects for other marine renewable energy sources;
 - Networks of existing and projected energy-related, sea-bed pipelines and cables and their land-fall;
 - Potential patterns of future offshore grid systems, including their integration with terrestrial grids;
 - Carbon storage including potential patterns of offshore carbon storage capacity.
- Wind energy,

21 Mineral Resources

Added themes to Annex III

22. Socio-economic development

- Seaports and shipbuilding,
- Settlements and traffic areas in coastal and marine regions,
- seaside resorts,
- logistics and on sea use,
- communication networks,
- Social and cultural infrastructures,
- Sea related recreational facilities and tourism including recreational boating,
- Coastal and cruise tourism,
- maritime equipment,
- maritime services,
- Navy and coastal operations,
- Employment in the fisheries sector and sea related activities,
- Fishing (CPUE)

- Fish processing sector,
- Total aquaculture production and total production per specie,
- Total catches by fishing zone,
- Marine aggregates and mineral extraction, and
- Community aid

23. Marine and coastal policies and governance

- National coastal and marine management strategies,
- International conventions,
- EU position with the wider international context,
- WFD,
- MSFD,
- LMEs
- ICZM,
- IMP
- MSP,
- Governance structure,
- Coast protection measures (against sea rise...)
- Information gathering from international experts from other countries and regions (interviews...),
- Implications of Maritime Planning on Territorial Planning in maritime/coastal regions based on Ecosystem Based Management,
- weaknesses of present arrangements and factors inhibiting opportunities for positive change,
- Degree of coordination and cooperation between administrations, sectors, levels and stakeholders.

PART C: Data Collection Template

1. OCEANOGRAPHIC GEOGRAPHICAL FEATURES

(This section should be repeated to the data for each of the gathered spatial themes)

1.1. Description of the geographical features of the ocean

(an exhaustive description of the distinctive features of the coastal area and the Sea, fully referenced)

i. Areas of concern

ii. Data (check additional notes at the end of the document for more details)

Table 13 Data collection template

Data type	Region	Resolution	Scale	Format	Metadata*	Description
Spatial data	Coastline	National level	1:25000	Shapefile	ID / URL	
Spatial data	Continental shelf			Shapefile		
Arial photographs				Images		Availability, dates, vertical/ oblique
Spatial data	Bathymetry data	Regional level		Vectorial		
Nautical charts of the coast						List of charts, digitized, availability in hard copy/ electronic...
....	

* Insert a unique ID for the full metadata record (s), or a hyperlink to a URL for the metadata record.

iii. Gaps: Data or information still required to complete this section (eg lack of published baseline points)

ESPON Annexes

Annex I. Extended bibliography (may be a virtual annex, linked to searchable website)

Annex II. Metadatabase records: Where data were already available online in the national metadatabase, the existing metadata record is sufficient. Where data were digitized or identified from *another* source, the metadata should be written and uploaded.

Annex III. List of data sets: Where *actual* data sets were handled during the database development the process, in addition to ensuring the data are described in the metadatabase, these should be stored in a standard FTP folder structure, the contents of which should be listed in this annex.

Additional Notes on Data Section

A. Data type: Different types of data could be gathered, and therefore there is a need to identify the type of data presented. A list data may include but is not restricted to:

- Satellite data
- Spatial data
- Aerial photographs
- Nautical charts of the coast
- In-situ water samples
- Ship-based sample collection
- In-shore measurements
- UTRs
- Maps of coastal / marine habitats
- Tide gauge data
- Drifters
- Model outputs

B. Region: The data gathered is expected to be at different scales and covering different regions, therefore, certain regional standards are set:

- Authority,
- National,
- Transnational (intersection between 2 or more countries)
- Regional
- Global

C. Resolution of data. The collected data are expected to be collected in different resolutions, normally the resolution at which it was acquired, and a range of scales to which it is suited. For this project, we identify 4 types of spatial resolution ranges to be used for storing and arranging the collected data for:

- Local resolution
Datasets at a local resolution consist of data produced by a wide variety of organizations from local governments including provincial, and in some cases, municipal levels. These data sets are maintained at a variety of accuracies, typically ranging from 250 m down to around 1m. Normally the resolution used as the standard will be the most detailed resolution of mapping available for that area.
- National resolution
Datasets developed by national organizations and ministries at the level of the whole country. As a general term, national datasets are produced at resolutions between 1:50 000 – 1:1 000 000 covering the whole country.
- Transnational resolution
Datasets developed by two or more neighboring countries. These datasets are produced at different scales including the integrity of the countries or localities of each country sharing common criteria (river basin, common biogeographical region, coastal policy,...).
- Regional resolution
Datasets developed by member States of the European Commission and by European Agencies (EEA; JRC, ETC,...), and normally have different resolutions (fine scale, coarse scale...).

- D. Scale:** The data gathered in this project are heterogeneous in terms of extent and can cover small areas to large regional maps; therefore, there is a need to identify the scale of the maps gathered. The usage of large against small relates to the expressions as fractions (e.g Autonomous coastal region (1:50,000) – National Nautical charts (1: 500,000...)).
- E. Format:** the format of the gathered datasets:
- **Vector:** e.g. ArcInfo Coverages, ArcGIS Shape Files, CAD (AutoCAD DXF & DWG, or MicroStation DGN files), ASCII coordinate data
 - **Raster:** e.g., ArcInfo Grids, Images, Digital Elevation Models (DEMs), generic raster datasets
- F. Metadata:** In order for the metadata to be interoperable and processed in a consistent manner, it is necessary for metadata to be described in a standard way making the gathered information sharing more reliable and universal. In the ESPON project, the application of one of the standards applied in coastal and marine data is accepted, with a special emphasis on the standard ISO 19115. The most widely used metadata standards to describe such data and information are the following: ⁱⁱ
- ISO 19115,
 - Directory Interchange Format
 - US Federal Geographic Data Committee (FGDC)
 - Cruise Summary Report (CSR),
 - Content Standard for Digital Geospatial Metadata,
 - Dublin Core
- G. Description:** *Any additional information concerning a theme that adds information about the theme is expected to be stated under description. Some examples can include:*
- Parameters measured and periodicity
 - List of charts available in hard copy...
 - Descriptive information on coastal currents...

PART D: Further details on EMODnet data coverage and technical details

Data layers are compiled in a Geographic Information System (GIS) and delivered through the OneGeology-Europe web portal. These and the data deliverables associated with the other work packages ensure progress towards Infrastructure for Spatial Information in the European Community (INSPIRE) compliancy – allowing data users across Europe to discover view and download marine geoscience datasets. Furthermore, EMODnet is designed to deliver data and data products that underpin indicators used to assess the state of the marine environment and pressures on it, supporting the implementation of the MSFD and WISE marine. The data collected respected the scales defined by the regions and subregions of the MSFD and comprises four lots. The delivery of the EMODnet data layers is being achieved through the adoption and adaption of technologies developed by the OneGeology-Europe (IG-E) project. The maritime map layers are being delivered using the IG-E portal to allow the delivery of both onshore and offshore geological information via a single portal. The table below specifies the type and coverage of marine datasets compiled by the different lots of the EMODnet project:

Table 14 Data collected by EMODnet

Lot	Theme	Description of data type	Coverage
Lot 1	Hydrographic data	1) water depth in gridded form over whole of maritime basin on a grid of at least quarter a minute of longitude and latitude 2) water depth in vector form with isobaths at a scale of at least one to one million 3) depth profiles along tracklines coastlines 4) underwater features - wrecks, seabed obstructions.	Partners of EMODnet- Hydrography project compile hydrographic data data layers collated for a number of sea regions in Europe: 1) the Greater North Sea, including the Kattegat and stretches of water such as Fair Isle, Cromarty, Forth, Forties, Dover, Wight, and Portland 2) the English Channel and Celtic Seas 3) Western Mediterranean, the Ionian Sea and the Central Mediterranean Sea 4) Iberian Coast and Bay of Biscay (Atlantic Ocean) 4) Adriatic Sea (Mediterranean) 5) Aegean - Levantine Sea (Mediterranean).
Lot 2	Marine geological data	The geology data available includes: 1) sea-bed sediments; 2) sea-floor geology; 3) boundaries and faults; 4) rates of coastal erosion or accumulation; 5) geological events (submarine slides, earthquakes etc.); and minerals).	Partners of the EMODNET-Geology project compile data layers for the Baltic Sea, Greater North Sea and Celtic Sea.
Lot 3	Chemical data	1) Synthetic compounds (i.e. pesticides, antifoulants, pharmaceuticals), 2) heavy metals, 3) radionuclides; 4) fertilisers and other nitrogen- and phosphorus-rich substances; 5) organic matter (e.g. from sewers or mariculture); 6) hydrocarbons including oil pollution.	Partners of the EMODNET-Chemistry project compile data layers for the Mediterranean Sea, Black Sea, and the Greater North Sea.
Lot 4	Biological data	1) biological data, 2) hydrographic data, 3) chemical data, 4) geological data and 5) broad scale habitats	Partners of the EMODNET - Biology project compile data layers for limites European Sea basins including the North Sea, Aegean Sea, and the Arctic Sea.

PART E: Additional information on the main outcomes expected from ISIS

ISIS is not expected to develop a new data management strategy but aims at making use of EU data management strategies. Specifically, ISIS feeds back its demands, expertise and additional monitoring data into EMODnet and plans to test EMODnet. ISIS will use existing knowledge and data to create an open knowledge framework as well as analytical and predictive software tools. Eventually, ISIS will offer a comprehensive model of Europe's Sea which in addition to the three spatial dimensions also includes changes in the temporal dimension.

- Accessibility and management,
- Data standards and data quality,
- Completeness

ISIS main products are listed below:

- Offshore Wind Farms
- Aquaculture;
- Marine Safety, Security & Surveillance;
- Renewable Ocean Energy;
- Marine Transport & Accessibility;
- Marine Leisure and Tourism;
- Hi-tech Marine Services;
- Harnessing Industrial Value of Sustainable Marine Biomaterials;
- Oil and Gas Resources;
- Research, Innovation and Capacity Building;
- The Environment and Climate Change.

ⁱ <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/2/list/7>

ⁱⁱ http://library.oceanteacher.org/OTMediawiki/index.php/Metadata_Standards