ESaTDOR
European Seas and Territorial Development Opportunities and Risks

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This report presents a more detailed overview of the analytical approach to be applied by the project. This Applied Research Project is conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Sue Kidd, Lynne McGowan and David Shaw
School of Environmental Sciences, the University of Liverpool, UK
(Project Lead Partners)

Holger Janßen
Leibniz Institute for Baltic Sea Research, Warnemünde, Germany

Kalliopi Sapountzaki
Harokopion University of Athens, Greece

Louis Wassenhoven
National Technical University of Athens, Greece

Haris Kokkossis
University of Thessaly, Greece

Alison Gilbert and Ron Janssen
Vrije Universiteit Amsterdam, Netherlands

Torunn Kvinge and Ove Langeland
Norwegian Institute for Urban and Regional Research, Oslo, Norway

Alina Bostina and Costel Stança
Constanta Maritime University, Romania

Andreas Littkopf and Dania Abdul-Malak
University of Malaga, Spain

Andreu Ulied and Oriol Biosca
MCRIT, Barcelona, Spain

Joaquin Farinos-Dasi
University of Valencia, Spain

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1 More detailed overview of the analytical approach to be applied

Europe 2020, the EU's economic growth strategy advocates smart, sustainable and inclusive growth as the key direction of travel in order to achieve the European goals of social, economic and environmental cohesion. The fifth cohesion report *'Investing in Europe's Future*' published at the end of 2010, suggested that regional disparities are diminishing, but if the goals for Europe are to be achieved, better co-ordination and integration between regional development and European and national policies is required.

Whilst to date much attention has been placed on the terrestrial environment (indeed this is the implicit focus of the Territorial Agenda of the EU), there is growing recognition and realization that the interface between the land and the sea (integrated coastal zone management) and indeed the seas themselves and the important resources within these environments need to be more carefully considered and managed in an integrated manner (maritime spatial planning). It was within this context that the EU's Integrated Maritime Policy (IMP) was established in 2007 in order to "enhance the optimal development of all-sea related activities in a sustainable manner". This recognized the need for greater integration between fragmented sectoral policies and frameworks for action that operated at a variety of different spatial scales, from regional, to national, to transnational within both EU space, but also globally. A recent "*Progress Report on the EU's Integrated Maritime Policy"* (DG Maritime Affairs and Fisheries, 2010) has been published assessing developments since the IMP was first introduced. The report sets out key orientations for future development including:

- The enhancement of integrated maritime governance and cross-cutting policy tools;
- The implementation of sea basin strategies;
- The definition of the boundaries of maritime sustainability;
- The development of the international dimension of IMP, and
- A renewed focus on sustainable economic growth, employment and innovation

These orientations are particularly relevant to this ESPON applied research project which seeks to contribute to the emerging policy debate by exploring in greater detail the land sea inter-actions and the extent to which various marine based activities can contribute to economic growth and societal wellbeing, whilst at the same time ensuring that critical environmental assets are effectively managed and where necessary protected. More particularly this research proposal seeks to:

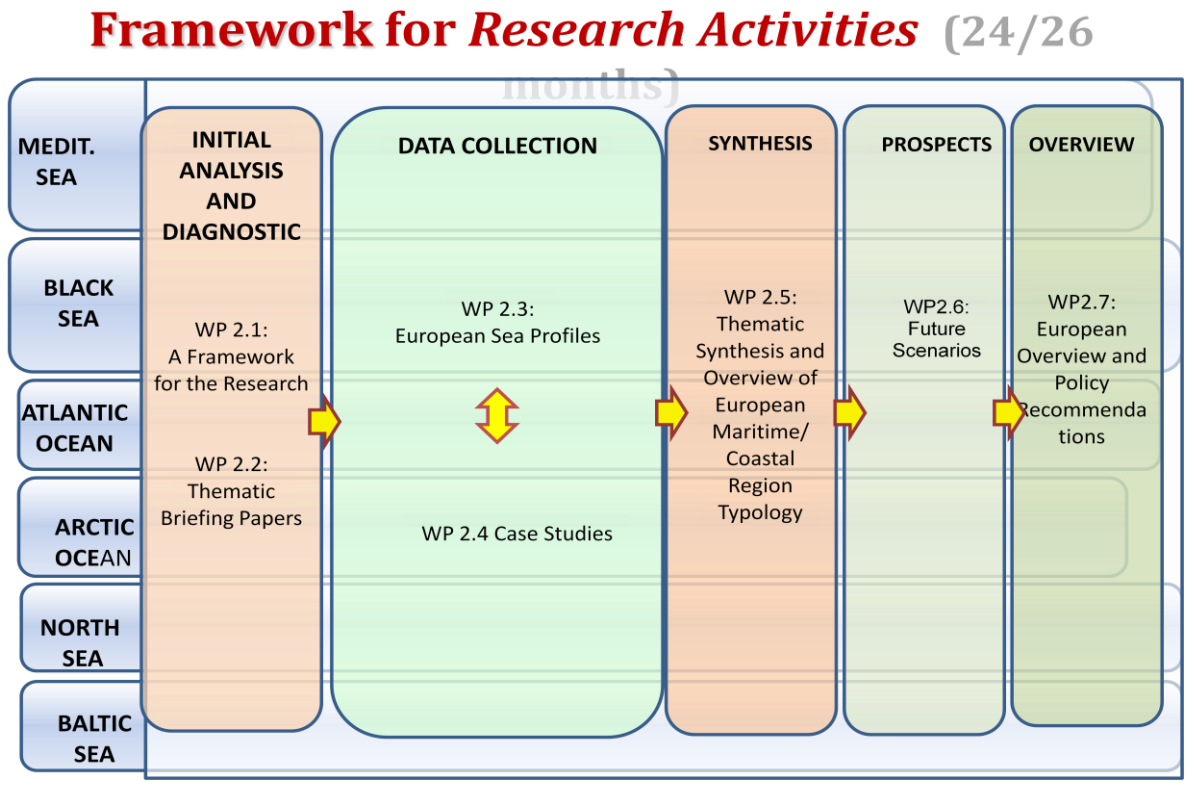
- Map the different types of sea use across Europe with the objective of creating a typology (or typologies) of different types of coastal/sea regions drawing upon existing ESPON terrestrial typologies as appropriate;
- Identify various development opportunities (and constraints) for different types of sea/coastal region;

- Explore best practice examples of terrestrial-marine and maritime governance to provide advice and guidance on how these critical assets can be efficiently, effectively and democratically managed; and
- Make policy recommendations and identify further areas for applied policy research designed to maximize the opportunities of and minimize the human impacts on the critical marine assets of Europe.

The analytical approach follows a five step process (see figure 1):

- Stage 1 is an **initial analysis and diagnostic phase** exploring what is already known about both the European seas, but also thematic priorities around which the research is focused. This will inform the production of more detailed briefs for the next stage
- Stage 2 is a period of intense **data collection**, both in terms of collating existing data sets for the European seas, but also through case studies providing an evaluation of how various existing governance arrangements have been working in practice
- Stage 3 is a period of **synthesis** and reflection as the information is consolidated into digestible elements
- Stage 4 considers future **prospects** and is a period of scenario building and testing, based on an understanding of the opportunities and challenges facing the European seas
- Stage 5 involves the development of an **overview** including clear policy recommendations, and suggestions for further prioritisation of research.

Figure 1 The Analytical Approach.



Whilst this framework suggests a sequential approach, development of policy recommendations and reflections on the importance of the European seas in meeting the Lisbon and Gothenburg agendas will be a key consideration throughout and will inform the focus and approach at each stage.

2 Methodology and hypothesis for further investigation

In addressing the five stages of the research, as Figure 1 indicates a series of work packages have been developed and the objectives, methodology and outputs for each of these are outlined below.

WP 2.1: A Framework for the Research/Inception Report

Objective: To refine and extend the framework for the research

Tasks:

- Identification of key literature / data sources in relation to each European sea
- Development of an initial typological framework for maritime/coastal regions
- Selection of case study areas
- Development of the research approach and methodology
- Refinement of project management arrangements and risk assessment

Key Outputs: Inception Report

This work stream forms part of the initial Analysis and Diagnostic stage of the project and is designed to provide a more in-depth framework for the research upon which subsequent work packages will build. The outputs are reflected in this Inception Report with its associated annexes.

A key aspect has been the development of a baseline understanding of data availability in line with the overall project specifications. Using a standard checklist, partners with designated European sea responsibilities have been charged with undertaking an initial assessment of sea boundary considerations, data sources in relation to each thematic area, other European Union funded projects which may be relevant to the research, and existing sea level and sub-sea level governance arrangements which may be explored in more detail as case studies in WP2.4 (See annexes 1 – 6). Partners with thematic responsibilities have undertaken a similar thematic assessment (See annexes 7 – 10). In addition guidance on data collection (See Annex 11) and case study selection has been produced (see section 6). WP2.1 has also entailed reflection upon the possibility of establishing an initial typology of maritime/coastal regions drawing upon existing ESPON typologies which could be tested and refined through subsequent stages of the project. The outcomes of these deliberations are set out in section 4 of this report.

WP 2.2: Thematic Briefing Papers

Objective: To specify detailed data collection requirements

Tasks:

- Initial thematic review of data availability across each European sea drawing upon output of WP2.1 to identify the potential to produce common data sets recognising inter-linkages where appropriate
- Initial thematic overview of relevant policy frameworks and identification of key trends and future development considerations
- Preparation of thematic briefing papers and data collection templates

Outputs: Briefing papers and data collection templates on General Data Protocols and Mapping Requirements, Economic Use; Energy, Cables and Pipelines; Transport and Shipping; Coastal and Marine Environment; Coastal and Marine Governance Case Studies

WP2.2 is the second work stream that forms part of the initial Analysis and Diagnostic stage of the project. Building upon the work undertaken in WP2.1 this will start with refinement of the draft General Data Protocols and Mapping Briefing Paper which will address generic issues and confirm approaches including matters related sea boundaries for the project. This will then guide the definition a robust set of thematic indicators which are compatible with a map-making facility and would be able to provide a consistent, homogenous, reliable and up-datable European database. These more detailed requirements related to the key sectoral aspects of the project specification will be set out in individual briefing papers covering: Coastal and Marine Environment, Economic Use (including fishing, aggregate extraction, tourism etc.); Energy, Cables and Pipelines; Transport and Shipping. These papers will also be informed by an associated overview of relevant policy frameworks and the identification of key trends and future development considerations that might need to be reflected in data gathering activities. Inter-linkages between each of the areas will also be considered to maximise efficiencies and synergies in data gathering and with an eye to the development of new complex/ multifaceted indicators which could be used to distinguish the socio-economic situation, development potential, and competiveness of different types of maritime/coastal region. In addition, further attention will be given to data collection requirements of the Case Studies

Work Package 2.3: European Sea Profiles

Objective: To collect data for each European sea according to the guidance set out in W2.1 and WP2.2

Tasks:

- Collect data related to the existing situation and trends in relation to each theme
- Identify key spatial inter-linkages
- Identify current conflicts and challenges

- Identify and characterise existing clusters of maritime industries
- Identify development opportunities
- Distinguish different types of maritime/coastal region
- Produce a summary profile of each European sea

Outputs: Interim Report and European Sea Profiles

Using the guidance set out WP2.1 and WP2.2, WP 2.3 forms the most substantial part of the Data Collection stage of the project. Here partners with designated European Sea responsibilities will lead the collection of information on: the existing situation and trends in relation to each theme; key spatial linkages; and current conflicts and challenges. This will provide the basis for an assessment of the present state of development of clusters of maritime industries and of future development opportunities associated with each sea. In turn this will inform the definition of the spatial distribution of different types of maritime/coastal region and the initial development of an associated typology. The activities in this work stream will be closely aligned with WP2.4 related to the case studies and towards the end of the Data Collection phase, a stakeholder from each sea area will be invited to consider the findings of both work streams and contribute to a SWOT analysis. The outputs will be mapped and together with an associated commentary and summaries of the case studies will be collated into a series of European Sea Profiles.

It is anticipated that this work stream will be undertaken between June 2011 and January 2012 and as a consequence the Interim Report will be due around half way through the programme of work. This will provide a valuable opportunity to take stock of progress, gain feedback from the ESPON Managing Committee and the ESPON Sounding Board on the interim findings, and adjust and refine the approach where necessary.

WP 2.4 Case Studies

Objective: To provide a more in depth assessment of the governance experience of different maritime/coastal regions and the potential transferability of good practice.

Tasks: (For each case study)

- Documentary analysis and data collection related to each thematic area in order to develop and understanding of spatial structure and dynamics of environmental/human interactions and relationships
- Identification of maritime related policies, plans, agreements, conventions and relationships to territorial planning
- Identification of actors and stakeholders involved and their role, influence, participation and contribution to decision making
- Identification of future opportunities, threats, conflicts and obstacles to action
- Development of conclusions and recommendations related to lessons and potential transferability of good practice.

Outputs: Contributions to European Sea Profiles and Case Study Synthesis Report

The second component of the Data Collection phase of the project, and running in parallel with WP2.3, is WP2.4 which concerns the case studies. These are intended to provide a more in depth analysis of existing governance arrangements related to the key themes of the research project and a more detailed understanding of the specific development opportunities and challenges in different types of maritime/coastal region. It is envisaged that 3 case studies will be undertaken in each European sea area and the basis for case study selection is considered in more detail in Section 6 of this report. Each case study will entail a combination of documentary analysis, data collection and analysis and stakeholder interviews and round table discussions where appropriate. The particular emphasis will be on collating more qualitative data that complements the greater emphasis on quantitative data in WP2.3. A key focus will be upon the identification of potentially transferable lessons and good practice related to maritime development and governance.

Outputs from the case studies will flow in two directions. Firstly, as noted above, case study summaries will be incorporated within the relevant European sea profile. Secondly, the summaries will appear in the case study synthesis report that will be produced as part of WP2.5.

WP 2.5: Thematic Synthesis Reports

Objective: To synthesise the outputs of WP 2.3 and WP2.4

Tasks:

- Production of a series of thematic synthesis reports for the EU
- Review and refinement of European sea region typology
- Mapping of key inter-linkages at the EU scale

Outputs: European Thematic Profiles and Data Overview

Based upon the outputs of WP2.3 and WP2.4, WP 2.5 will draw together material at the EU scale.

Following on from the Thematic Briefing Papers produced in WP2.2, partners with thematic responsibilities will produce a series of Thematic Synthesis Reports which will provide an EU wide overview of findings in relation to Economic Use; Energy, Cables and Pipelines; Transport and Shipping; Coastal and Marine Environment; Coastal and Marine Governance and the Case Studies. The reports will include maps and a commentary covering the existing position, potential development trajectories and key opportunities and recommendations for future data collection, policy options and research.

In addition, a separate report will be produced reflecting upon the Data Protocols and Mapping Briefing Paper produced in WP2.2. This will synthesise results related to the application of the maritime/coastal region typology and findings related to key maritime/coastal relationships and interlinkages. The report will include maps and a commentary together with associated recommendations related to future data collection, issues.

Work Package 2.6: Future Scenarios

Objective: To create spatially explicit policy scenarios for the sustainable development of European Maritime/Coastal Regions.

Tasks:

- Undertake and overview of existing scenarios on Maritime/Coastal areas
- Identify the determining driving factors on Maritime and Coastal Areas
- Explore the impact on maritime/coastal areas related to the thematic development trajectories identified on WP 2.5
- Identify sustainable development scenarios for different Maritime/Coastal Regions
- Identify opportunities for new forms of integrated planning and development between inland and coastal regions of Europe and with wider non EU areas.

Outputs: Future Scenario Report

WP2.6 provides an opportunity to step back and reflect upon the overall picture that has emerged and also to think more radically about future scenarios for the sustainable development of European maritime/coastal regions. This will be undertaken initially through a EU level expert/stakeholder workshop which will explore how the development trajectories and opportunities identified in the various thematic synthesis reports and previous maritime/coastal related scenario building exercises (e.g. IPCC-SRES) might inform the future planning of different types of maritime/coastal region and create opportunities for new forms of integrated planning and development between inland and coastal regions of Europe and with wider non EU areas. In this work the DPSIR approach (Driver, Pressure, State, Impact and Response) could be used as a framework and links will be made to a range of research projects being undertaken as part of the EU's Maritime Affairs research programme. These scenarios will then be 'road tested' in each of the sea area. The output will be summarised in a Future Scenario Report.

WP2.7: European Overview and Policy Recommendations

Objective: To draw together the main results of the project and identify policy recommendations in support of integrated maritime policy development in the EU.

Tasks:

- Produce a summary document showcasing the main result of the project
- Produce a short executive summary
- Produce a scientific report

Outputs: Final Report, Executive Summary and Scientific Report

WP2.7 will draw together the main findings of the project through a family of three documents.

The first is the main (max 50 page) report which is aimed at key European and national policy makers and researchers with a strong interest in territorial development and the rapidly growing areas of integrated coastal zone management and marine planning and management. The report will draw upon the outputs of WPs 2.3, 2.5 and 2.6 and will provide a selected overview of the existing characteristics of Europe's maritime/coastal regions, thematic development trajectories and potential future development scenarios. In addition it will highlight examples of transferrable good practice and set out clear policy options for policy makers consistent with the ambitions of Europe 2020.

Accompanying this report will be a short (max 10 page) executive summary which will be designed for circulation to a wider audience of stakeholders.

Finally a scientific report will be produced detailing the research methodology, definitions and data protocols used. A particular feature will be discussion of the rationale behind the maritime/coastal region typology. A complete set of maps produced by the project will be included and recommendations for future data collection and updating and priorities for research will be set out.

Dissemination of the Results

Dissemination of the outputs from the research has been identified as a separate work package (WP3). This is conceived as this being an ongoing process whereby the research team engages proactively with the scientific and practitioner community throughout the research. It will primarily involve the Lead Partner and other Project Partners working in various regional and international contexts.

Whilst most of the dissemination will take place towards the end of the project this work package will involve:

- Presentation and discussion of the methodology and interim results at various internal and external ESPON seminars during the project itself
- Specific activities organized by the TPG during the project in the form of project workshops involving with interested stakeholders.
- Recurring articles about the project and its results in a well established international coastal and marine e-newsletter such as EUCC Coastal News
- Looking for interaction and feedback between the project and decision makers and politicians towards the end of the project to feed into policy recommendations but also guides and handbooks. In this context it will be important to look for innovative ways of engagement
- Presentation and discussion of the methodology and results at various scientific meetings and international conferences. This will be an ongoing dissemination that can involve all of the project partners
- Production of various academic journal articles targeted at different types of academic and practice communities e.g. Town Planning Review, Marine Policy etc.
- Presentation of the results at a national level, co-operating with relevant ESPON co-ordinating points to provide national and trans-national seminars to deal with the specifics of particular regional seas, or sectoral priorities and to learn from experiences elsewhere.
- Creation of a Spatial Data Infrastructure (SDI) for integrated spatial data information and knowledge. The SDI will harmonize and normalise data coming from WP 2.2, WP 2.3, WP 2.4, WP 2.5 and WP 2.6, as well as those data from externals sources. This will provide a data platform /data network for making available the data, information and tools that we have used for developing maps, statistics and analysis.

3 Review of the main literature, data sources, etc.

Preparation of the Inception Report has entailed an initial review of key literature and data sources using a series of standard headings and data collection templates to aid comparability. Annexes 1 – 6 set out the findings in relation to each of the seas, whilst annexes 7 – 10 relate to each of the main research themes. An initial overview of some of the key issues raised by this exercise is set out below.

Sea Boundary Issues

A key area for consideration relates to the appropriate boundaries to use for the research and the annexes reveal the variability of definitions that are in place at the present time. There was much discussion about this at the first team meeting in Liverpool. This concluded that the preferred sea boundaries for data collection were the Marine Strategy Framework Directive Marine Regions and Marine Sub Regions, and in relation to the Arctic, ESPON marine space as defined by the areas covered by the Exclusive Economic Zones of Norway and Denmark. This means that mapping would in the main be at NUTS Level 0 (but see discussion about disaggregation of data for countries bordering more than one sea, below). However, it was recognised

that different data sets use different sea boundary definitions which do not necessarily conform to national jurisdictions. For example, OSPAR divisions are at variance with the MSFD Marine Regions in some key respects. Equally, it was recognised that marine areas of relevance to EU Integrated Maritime Policy extend beyond EU or ESPON marine space, reflecting for example ecosystem functioning and marine transport routes and that in some instances a wider sea level view was therefore important. This was felt to be particularly significant in relation to the Arctic. In addition, discussions on the scope for consistent mapping on an equivalent basis to NUTS Levels 1, 2 and 3 (explored further in section 4) highlighted the challenges presented in moving towards finer grain mapping of sea use. At this exploratory stage in the development of ESPON marine mapping capacity, it is therefore concluded that a pragmatic approach is required and that we should accept fuzzy boundaries for now, evaluate alternative marine mapping methods that are currently in use: and recognise that a key output from the project will be recommendations related to future data collection and mapping protocols for European marine space.

Data Issues

The initial reviews of literature and data sources related to the seas/themes which are the focus of this research also highlight some challenges for the project. For example, preliminary investigations in the North Sea (and other seas) indicate that an abundance of data could be available across the range of research themes, some being centralised within organs such as EUROSTAT, the European Environment Agency and ICES. However access, varying spatial characteristics and other compatibility considerations are expected to emerge as key issues in harnessing data for ESPON mapping purposes. Similarly the review undertaken in the Mediterranean is interesting in highlighting the absence of homogeneous statistical information that distinguishes between terrestrial and marine areas in a clear way. Although some rich data sources have been developed for this region, for example through MEDSTAT, these are centred on socio economic and to a lesser extent transport matters and their relationship to maritime space is not well articulated. This lack of land/sea disaggregation is similarly highlighted as an issue in the initial thematic review of energy, cables and pipelines. Particular problems are also envisaged in using data sets where countries border more than one sea as in the UK, Norway, Denmark, France and Spain. Areas of information paucity have also been identified through the initial review exercise. For example marine litter and underwater noise, both key aspects of marine pollution are cited as areas where data is presently scarce. In addition, marine aggregate extraction emerges as a key maritime industry where data may be limited.

These matters were also the subject of considerable debate at the first team meeting in Liverpool, and paralleling the conclusion on sea boundaries, it was felt that an open minded approach to data gathering was required at this formative stage in ESPON coastal/maritime mapping capacity. Although a key objective is to deliver a series of consistently mapped data layers and associated publically available data sets covering all six European seas, it

was felt that the project could also play a valuable role in highlighting opportunities for future maritime data and mapping development. These might include recommendations to extend access to, or to harmonise key European maritime data sets. Equally, it might involve pointing to areas of good practice within a particular sea which could be applied more generally, or identifying critical gaps in data coverage that should be filled to support integrated maritime policy development.

4 Use of existing ESPON results relevant for this project

The mission of the ESPON 2013 Programme is to:

> "*Support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory by (1) providing comparable information, evidence, analyses and scenarios on territorial dynamics and (2) revealing territorial capital and potentials for development of regions and larger territories contributing to European competitiveness, territorial cooperation and a sustainable and balanced development*".

For this particular project the previous and ongoing ESPON projects raise some interesting insights but also challenges for delivery. It is self evident based on the objectives of the ESPON programme that focus to date has been very much on territorial/land based dynamics while this research seeks to explore in much greater detail maritime dynamics that will impact territorial cohesion. This in turn means that land sea interactions will become vitally important and this will raise issues related to the scale at which maritime assets can effectively mapped, and the extent to which land based typologies that have been developed so far can be transposed to the seas. This section briefly begins to review these matters in relation to some of the existing ESPON projects.

ESPON research can be broadly divided into four categories of activity and some results have important inputs and lessons for this project, but equally we believe that this project can in itself feed into some of the ongoing ESPON projects. The following sections briefly consider the relevant ESPON projects by categories of research.

i) Applied Research and ii) Targeted Analysis

These projects focus on themes or issues demanded by policy makers or undertaken in conjunction with various stakeholders. Some of the projects undertaken so far have interest for this project and lessons that can be drawn are listed in Table 1.

Table 1 Applied Research /Targeted ESPON Projects related to ESaTDOR

	Relevance to ESTADOR	
Territorial Impacts of European Fisheries Policy (ESPON 2.1.5)	One of the few projects with a direct sea land interface, but challenges in terms of data availability at any or appropriate spatial scales	Completed
Territorial Trends of the management of Natural Heritage (ESPON 1.3.2)	Exclusively land based and little if any reference to marine assets	Completed
Territorial Trends of energy services and networks, territorial impacts of EU Energy Policy (ESPON 2.1.4) (	Land based datasets, although clear expectation that some of the energy supplies/resources are or could be offshore in character	Completed
RERISK (Regions at risk of energy poverty) (2010)	Promotion of offshore energy as a mechanism of tackling this issue	Completed
Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion (ESPON 1.2.1) (2004)	Explores points and flows across seas in European space, but data a little dated	Completed
TRACC (Transport Accessibility at Regional/Local Scale and Patterns in Europe)	Potential for exploring land sea flows of goods and people	Ongoing
EUROISLAND (Development of the Islands: European island and Cohesion Policy	Analysis based on terrestrial data and little information regarding surrounding seas	Ongoing

Only two of the projects can be seen to have the seas and the resources from the seas at the heart of the research, ESPON Project 2.1.5 and EROISLANDs, although both look at the territorial in terms of land based dynamics. Other projects are thematic in nature, related to transport, energy or natural or cultural heritage and with the exception of research on transport projects, which examines flows of people and goods across the seas (although the data from ESPON 1.2.1 dates back to 2002) none really acknowledge in visual terms the importance of the seas for territorial development. One feature is that the narrative in these reports recognises the importance of the assets that can be extracted from the sea and that these

could be underutilised resources. Thus for example RERISK suggests that offshore energy systems might be an option in response to fuel poverty.

A second issue which seems to be a recurring theme is both the availability of data and the extent to which it is available at the appropriate spatial scale. Often the data may only be available at NUTS level 0, which creates difficulties for this project (as also indicated in section 3) when nation states border different regional seas. The second issue identified in the ESPON 2.1.5 project was with fisheries, even at a NUTS level 3 scale, direct fishing activities were too fine to map at anything other than a point scale.

This project creates some unique challenges in terms of the spatial units at which land and seas data (particularly seas data) can be effectively mapped in spatial units that make comparable sense. Developing a suitable approach /approaches will in part depend on better understanding of data availability across European territory as whole and at individual sea level. At this point a number of key issues are felt to require closer examination. First can data be disaggregated between resources that are terrestrially generated and those that are marine based. Secondly, for sea based data will this be available for the entire ESPON space (31 countries, i.e. the entire territory of EU 27, Iceland, Liechtenstein, Norway and Switzerland) and the EU Candidate Countries (Croatia, Former Yugoslav Republic of Macedonia, Turkey) and the Western Balkans. Until our data scoping exercise has been completed the answer to this question remains unknown. But this will still mean that for some seas, notably the Mediterranean, Black Sea and Arctic, much of the data will lie beyond the territorial aspirations identified in the ESPON Hyper-Atlas project.

Hence many of the applied and targeted research projects provide useful insights and potential data sets, but this project has unique challenges to be faced, which can only be resolved as progress is made in an iterative way.

iii) Scientific Platform

Clearly the scientific projects of ESPON will also be of relevance to this project and we will need to be lively to the scope for mutually beneficial interaction with projects such as the ESPON Database 2013 and Hyper-Altas. Already in terms of our initial review of data availability we are aware of the expectations of the INSPIRE directive, and this will be used in scoping the availability of data.

One of the projects under the scientific platform that has informed our thinking to date is the Typology Compilation Project and its interim report that is publically available. This document begins to examine the diversity of typologies that have been developed by ESPON and other European projects from a terrestrial environment perspective. One of the reasons for reviewing this work was a realisation that the typology used in the tender document was not a typology as the categories were neither continuous nor mutually exclusive of one another. Our recent review work therefore explored further the extent to which existing typologies could be mapped onto the European

seas in any meaningful way and may therefore be useful to our project. In total some fifty six typologies were analysed by Bohme and his team divided into eight broad categories (see table 2)

Table 2 ESPON overview of existing typologies

Typology Type	Nos of Typologies Reviewed
Urban areas	8 typologies
Region regions	18 typologies
Sparsely populated regions	4 typologies
Regions in industrial transition	1 typology
Cross-border regions	12 typologies
Mountainous regions	6 typologies
Islands	3 typologies
Coastal regions	4 typologies

In terms of the three coastal typologies identified it was felt that extrapolating these out into the seas, raised a number of problems. For example, two were quite simplistic based on population density or population trends and did not explore land and sea inter-relationships. The third created a typology of coastal regions at NUTS level 3 but is felt that this was probably too complicated to extrapolate in any meaningful way out into the seas, given the anticipated limitations of marine related data. The final typology, which also emerged from ESPON project 2.1.5 also identified coastal regions at NUTS 3 and then identified either regions or ports that were important places for landing fish. Whether this bears any relationship as to where the fish are caught is a mute point. Nevertheless none of the land based typologies really offers a justifiable approach that we feel merits adoption in our project at this point in time, for example in relation to case study selection (see section 6). Instead we have concluded that the formulation of a new coastal/maritime typology is likely to be a key output rather than input in our work.

iv) Transnational Networking Activities

There are currently two projects under this stream, NORBA (Nordic-Baltic Dialogue on Transnational Perspectives in Spatial Planning) and INTERSTAT (ESPON in Integrated Development Strategies). Both are concerned with disseminating best practice from ESPON to policy makers. Recognising the potential of maritime assets in facilitating or constraining territorial development and the fact that this aspect of territorial development tends not to be fully acknowledged, it is hoped that this project can contribute positively to this dialogue.

5 Distribution of work packages among partners, the breakdown of the project's budget on the individual partners per budget line

For a detailed breakdown of work among partners see section 7. A breakdown of the projects budget is shown in Table 3 below.

Table 3: Breakdown of Project Budget By Partner and Budget Line

Budget Line	**UK - Liverpool**	**Norway-Norsk**	**Spain-MCRIT**	**Spain – Malaga**	**Spain-Valancia**	**Germany-Leibniz**	**Netherlands-Vrije**	**Greece-Thessaly**	**Romania-Constanta**
Staff	€ 149,352.12	€ 65,176.12	€ 30,705.00	€ 47,487.50	€ 15,461.43	€ 45,066.17	€ 69,905.73	€ 26,363.00	€ 39,726.93
Administration Costs	€ 34,094.29	€ 14,878.49	€ 7,009.38	€ 10,840.50	€ 3,529.57	€ 10,287.76	€ 15,958.17	€ 6,018.17	€ 9,068.92
Travel and Accommodation	€ 47,058.59	€ 18,795.39	€ 7,629.62	€ 9,826.00	€ 9,322.00	€ 14,481.07	€ 18,054.10	€ 9,918.83	€ 16,301.15
Equipment	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00
External Expertise and Services	€ 25,800.00	€ 2,400.00	€ 4,000.00	€ 2,400.00	€ 2,400.00	€ 2,000.00	€ 6,000.00	€ 2,400.00	€ 0.00
Total Budget	€256305.00	€101250.00	€49,344.00	€70,544.00	€30713.00	€71387.00	€109918.00	€44,700.00	€65097.00

6 Project specific part

Elaboration of the analytical part of the proposal regarding the project's relation to Cohesion Policy

We recognise that a key motivation for this project is to inform the development of European Cohesion Policy and the contribution that Integrated Maritime Policy and Maritime Spatial Planning can play in promoting economic, social and territorial cohesion. These important linkages are identified in section 1 of this Inception Report which provides an overview of the anlytical approach to the project. Here it is made clear that the development of policy recommendations and reflections on the importance of the European seas in meeting the Lisbon and Gothenburg agendas will be a key consideration throughout and will inform the focus and approach at each stage of the work.

Case studies and their selection

Case studies are an important component of the research design and since the submission of the original proposal and based on a more thorough examination of the existing ESPON typologies (see section 4) a new proposal is now made suggesting a criteria based approach to the selection of the case studies (based on three case studies per regional sea). The importance of the case studies in providing an in depth assessment of the effectiveness of different governance approaches to maritime/coastal regions and the potential transferability of good practice still remains valid and the method of providing a detailed brief and template so that various partners can collect and report on the information in a consistent way remains valid.

Whilst the details of the case study templates are still to be refined, in generic terms it is envisaged that they will include the following core components:

- Introduction: A short description of the governance regime and geographic area covered.
- An examination of the spatial structure of the area and nature/human interactions
- Key issues and links with land development and potential conflicts
- A summary of existing coastal/maritime related policies, plans, agreements and conventions and relationships to terrestrial planning
- Identification of actors and stakeholders involved and their role and influence in decision making
- An assessment of future opportunities, threats, conflicts and obstacles to action.
- Identification of lessons to be learned with particular reference to EU integrated maritime policy.

Furthermore there is an expectation that results from the case studies will feed into both the European Sea Profiles and into a synthesis report on the case studies whereby generic lessons and the identification of good practice can be shared.

As mention in section 4 above, following on from a more careful exploration of existing ESPON and other typologies, we are now proposing a revised rational for the selection of the case studies which is outlined below, along with the proposed case studies themselves.

The case studies operate at different spatial scales and there are certain criteria we suggest using for selecting and justifying specific case studies (see Table 3).

The primary selection criterion is that the projects or governance arrangements must be transnational in nature, i.e. all the case studies must include the co-operation of more than one nation state. Secondly we feel that it is important that one of the case studies in each sea examines a governance arrangement that has been put in place to try and manage the maritime resources at a least the level of the sea itself. It is evident from our initial review of governance arrangements that in some sea level initiatives, identified across Europe as examplars of best practice (e.g. VASAB) the focus has been on managing the sea in a holistic way. In other cases the focus is more on the management of particular resources or issues. The third criterion for case study selection is that there should also be case studies which relate to transnational arrangements at sub-sea level. These could be exploring land/ sea interactions, managing resources and protection vulnerable ecosystems that are mobile and transcend national boundaries or looking to establish economic growth opportunities for example through coordinated energy supply systems. Table 3 sets out our proposed case study selection.

Consideration of VASAB's work on maritime spatial planning

It should be noted that VASAB is identified as the sea level case study for the Baltic in recognition of the special standing that it has received as an exemplar of sea level governance arrangements.

Overview of Existing European Funded Projects

Annex 12 summarises the main maritime related European funded research projects that we have identified so far. These will be investigated further as possible data sources in WP2.2 and WP2.3.

Table 3 Suggested Case Studies

	Arctic	**Atlantic**	**Baltic**	**Black Sea**	**Mediterranean**	**North Sea**
Sea Level Case Studies	The Northern Dimension	Atlantic Arc	VASAB	Black Sea Synergy	Mediterranean Sea Programme	OSPAR
Sub-regional seas/ thematic case studies	Maritime delimination treaty between Norway and Denmark	British Irish Council Energy Grid	Helsinki Convention	The Commission on the Protection of the Black Sea Against Pollution	MEDGovernance Programme Or EURAM- IIVEE	Nutrient Abatement and Eutrophic-ation Policies for the North Sea
	Maritime delimination treaty between Norway and Russia or The Joint Norwegian Fisheries Commission	Solway Firth Partnership	EU Baltic Sea Strategy	Black Sea Regional Energy Centre or Black Sea Global Ocean Observing System	Adriatic Sea Partnership	Trilateral Cooperation on the Protection of the Wadden Sea

7 Overview of more detailed deliveries and outputs envisaged by the project

Partner	Key Deliverables/Outputs						
	WP2.1	**WP2.2**	**WP2.3**	**WP2.4**	**WP2.5**	**WP2.6**	**WP2.7**
University of Liverpool, England Atlantic and Energy	**Inception Report** plus Atlantic and Energy Annexes	Energy Briefing Paper	Atlantic Profile plus **Interim Report**	Atlantic Case Study Summary	Energy Synthesis Report	EU Workshop Atlantic Scenario Summary Future Scenario Report	**Final Report Summary Report Scientific Report**
NIBR Institute, Norway Arctic and Economic Use	Arctic and Economic Use Annexes	Economic Use Briefing Paper	Arctic Profile	Arctic Case Study Summary	Economic Use Synthesis Report	Arctic Scenario Summary	
VU University IVM, Netherlands North Sea and Environment	North Sea and Environmt. Annexes	Environmt. Briefing Paper	North Sea Profile	North Sea Case Study Summary	Environment Synthesis Report	North Sea Scenario Summary	
MCRIT, Spain Mediterranean and Transport	Med. and Transport Annexes	Transport Briefing Paper	Med. Profile		Transport Synthesis Report	Med. Scenario Summary	
UVEG – IIDL, Spain, and Thessaly, Case Studies	Case study selection guidance	Case Study Briefing Paper	Input to Med. Profile	Med. Case Study Summary	Case Study Synthesis Report		
Malaga, Spain Data Protocols and Mapping	Data /mapping Annex	Data /Mapping Briefing Paper			Data/Mapping Synthesis Report	Mapping input to scenario report	Mapping input to final reports
Constanza, Romania Black Sea	Black Sea Annex		Black Sea Profile	Black Sea Case Study Summary		Black Sea Scenario Summary	
Liebniz Institute, Germany Baltic Sea	Baltic Sea Annex		Baltic Profile	Baltic Case Study Summary		Baltic Sea Scenario Summary	

8 Indication of likely barriers that the project implementation might face

Risk	Assessment of Significance	Response
Partner Issues		
Failure of a partner to deliver an agreed outcome on time	**Amber/Red** This could be of significance at all stages of the project but particularly so in relation to WP2.1 and WP2.2 as these set the framework for the key data collection phase of the project and may hold up progress here. It would also be of significance towards the end of the project if outputs delayed the preparation of the final report	Development of a clear work programme detailing partner responsibilities, outputs and time frames and dates of Project Team Meetings and associated work briefings Monthly management group meetings via skype/conference calls Fortnightly email updates to all partners from Lead Partner Appointment of project manager to maintain dialogue with partners and hopefully identify potential delivery issues at an early point.
Withdrawal of partner due to unforeseen circumstances	**Amber** It is felt that this is unlikely to happen, but it could cause a temporary hold-up to aspects of the work until a replacement is found.	Responses as above plus the development of a stakeholder data base by the Lead Partner for project dissemination purposes,that may be used to identify potential sub-contractors to meet any capacity shortfall.

Risk	Assessment of Significance	Response
Data Issues		
Data availability and consistency related to particular seas or thematic areas	**Red** It is envisaged that this is likely to be the most challenging issue for the project. The project specification emphasises the need to provide consistent, reliable and updatable data that is compatible with a map-making facility. A balance may however need to be struck between the ambition to be comprehensive both geographically and thematically and in the consistency of spatial units of analysis used.	Early identification of problems in data availability has been a key element of WP2.1. and as this Inception Report has highlighted a range of data related issues have been identified, including varying definitions of sea boundaries, difficulties in developing meaningful boundaries at the sub-sea scale, data availability and compatibility disaggregation of data in a way that distinguishes between terrestrial and marine use and between different seas etc. Further attention will be given to the data situation in EU candidate countries and other countries in the Western Balkans, and the subsequent development of recommendations about the geographical coverage of the research. We would value a discussion on these matters with the ESPON Unit and the ESPON Sounding Board at the meeting in Malaga in April. The analysis so far suggests that although a key objective is to provide consistent maps of sea use as far as this is possible, a key outcome of the work will be recommendations related to future maritime data availability and management. Close liaison will also be important with the ESPON Managing Committee and the ESPON Sounding Board during WP2.2 and WP2.3 as our understanding develops.

9 Orientation of the project previewed towards the Interim Report

Preparation of this Inception Report and the associated tasks which have formed WP2.1 of this ESPON Applied Research Project, have been helpful in refining our approach to the project, gaining a better understanding of data availability and clarifying some of the key challenges that the project will need to address over the coming months. This is the first time that ESPON has directed its attention in a major way to exploring the territorial development opportunities and risks associated with European seas. Our early work on the project has highlighted the value of this type of research which is perhaps long overdue. However, it has also revealed a complexity of issues related to sea boundary definition, data access and compatibility, disaggregation of data between territorial and marine space and the difficulty in developing meaningful units of analysis for European marine space. These issues have been highlighted in this report and key conclusions at this point include the need to: adopt an exploratory approach, accept fuzzy boundary definitions for now; and examine varying practice in relation to marine mapping both between the different European seas and across the different areas of thematic interest. We would welcome discussion on these matters and the approach proposed with the ESPON Team and Sounding Board at our meeting in April. The outcome of this meeting can then be fed into WP2.2 which entails the preparation of a series of briefing papers that will guide the main data gathering phase of the research which will start in June 2011. The Interim Report which is due in September 2011 will report on the first phase of this activity and will provide a further opportunity to reflect upon the approach and orientation of the research.

10. ANNEXES

European Seas Overview

1 Arctic Ocean
2. Atlantic Ocean
3. Baltic Sea
4. Black Sea
5. Mediterranean Sea
6. North Sea

Thematic Studies

7. Economic Use
8. Energy, Cables and Pipelines
9. Environment
10. Transport

Data Collection and Other Research

11. Data Collection Guidelines
12. Research Projects Relevant to ESaTDOR
13. Project timeline

Annex 1: The Arctic Ocean

Introduction

The Arctic Ocean is located in the Northern Hemisphere and mostly in the Arctic North Polar Region. It is the smallest and shallowest of the world's five major oceans, and it has a total coastline of 45,389 km[1]. The average depth of the ocean is app. 1000m/3400 ft, and the very deepest point is in the Eurasian basin – 5450m/17900 ft. The total area of the ocean is 14.056 million sq km. This includes Baffin Bay, Barents Sea, Beaufort Sea, Chukchi Sea, East Siberian Sea, Greenland Sea, Hudson Bay, Hudson Strait, Kara Sea, Laptev Sea, Northwest Passage, and other tributary water bodies. The Bering Strait connects the Arctic Ocean with the Pacific Ocean and the Greenland Sea is the chief link with the Atlantic Ocean. A sparse network of air, ocean, river, and land routes circumscribes the Arctic Ocean. The greatest inflow of water comes from the Atlantic by way of the Norwegian Current, which then flows along the Eurasian coast.

The Arctic Ocean is divided into two basins, the Eurasian Basin, and the North American Basin, by the Lomonosov Ridge. There are also submarine ridges between the Arctic and Atlantic Oceans. This results in a large stagnant pool of cold water at the bottom of the Arctic Ocean, since land and submarine ridges block water from flowing out. The main current in the Arctic Ocean is the East Greenland current. This current is strong due to the number of rivers that flow into the Arctic Sea, the low rate of evaporation, and the land and submarine ridges surrounding the ocean. Two other weak currents flow out of the Arctic Ocean, the Labrador Current which runs through Smith Sound and Baffin Bay, and one that runs out of the Bering Strait. There is also a circular current in the Arctic Basin which is created by water deflecting off of Northern Greenland.

The climate of the Arctic is characterized by long, cold winters and short, cool summers. There is a large amount of variability in climate across the Arctic, but all regions experience extremes of solar radiation in both summer and winter. Some parts of the Arctic are covered by ice (sea ice, glacial ice, or snow) year-round and nearly all parts of the Arctic experience long periods with some form of ice on the surface. Average January temperatures range from about −40 to 0 °C (−40 to +32 °F), and winter temperatures can drop below −50 °C (−58 °F) over large parts of the Arctic. Average July temperatures range from about −10 to +10 °C (14 to 50 °F), with some land areas occasionally exceeding 30 °C (86 °F) in summer.

The Arctic consists of ocean that is largely surrounded by land. As such, the climate of much of the Arctic is moderated by the ocean water, which can never have a temperature below −2 °C (28 °F). In winter, this relatively warm water, even though covered by the polar ice pack, keeps the North Pole from being the coldest place in the Northern Hemisphere, and it is also part of the reason that Antarctica is so much colder

[1] This entry gives the total length of the boundary between the land area (including islands) and the sea. CIA World Fact Book 2010.

than the Arctic. In summer, the presence of the nearby water keeps coastal areas from warming as much as they might otherwise[2].

Compared with other regions consisting of land and sea, the Polar Regions remain relatively unexplored. Recent research, however, indicates that studying these regions is the key to understanding the underlying processes that have and will determine outcomes for the entire earth, and particularly the understanding of the relationship between the Arctic region's atmosphere and global climate in past, present and future. Endangered marine species in the Arctic Ocean include walruses and whales, and it is a fragile ecosystem slow to change and slow to recover from disruptions or damage.

In recent years the polar ice pack has thinned allowing for increased navigation and raising the possibility of future sovereignty and shipping disputes among countries bordering the Arctic Ocean. Estimates about when the Arctic Ocean could be consistently ice-free during the summer season vary greatly, from 2013 to 2060[3]. The melting of the Arctic ice has re-stimulated interest in maritime shipping lanes and sea floor exploration but it also poses economic, military and environmental challenges to the governance of the region.

Economic activity is limited to the exploitation of natural resources, including petroleum, natural gas, fish, and seals. The opening up of the Arctic will provide access to new reserves of the energy and other natural resources. The US Geological Survey estimates that the Arctic contains up to 30 per cent of the world's undiscovered gas and 13 per cent of the world's undiscovered oil resources. In addition the region contains vast amounts of coal, nickel, copper, tungsten, lead, zinc, gold, silver, diamonds, manganese, chromium and titanium[4]. Coastal and sea-related recreation and tourism may also be developed further in the future.

Arctic Ocean Boundaries

The Arctic Ocean is bordered by Greenland, Canada, Alaska, Russia, and Norway (the littoral states), and sparsely populated areas (see Map 1). There are no larger cities, long distances between settlements and local employment based on natural resources is limited.

The total area inside boundaries of Arctic Circle is 26 million km², of which land areas constitute 8 million km². The Arctic Ocean is encircled by shallow shelf waters. In the Northeast Atlantic these include the Barents Sea off Norway's northern coast and the Kola Peninsula in northwest Russia. Progressing eastward and northward from there is:

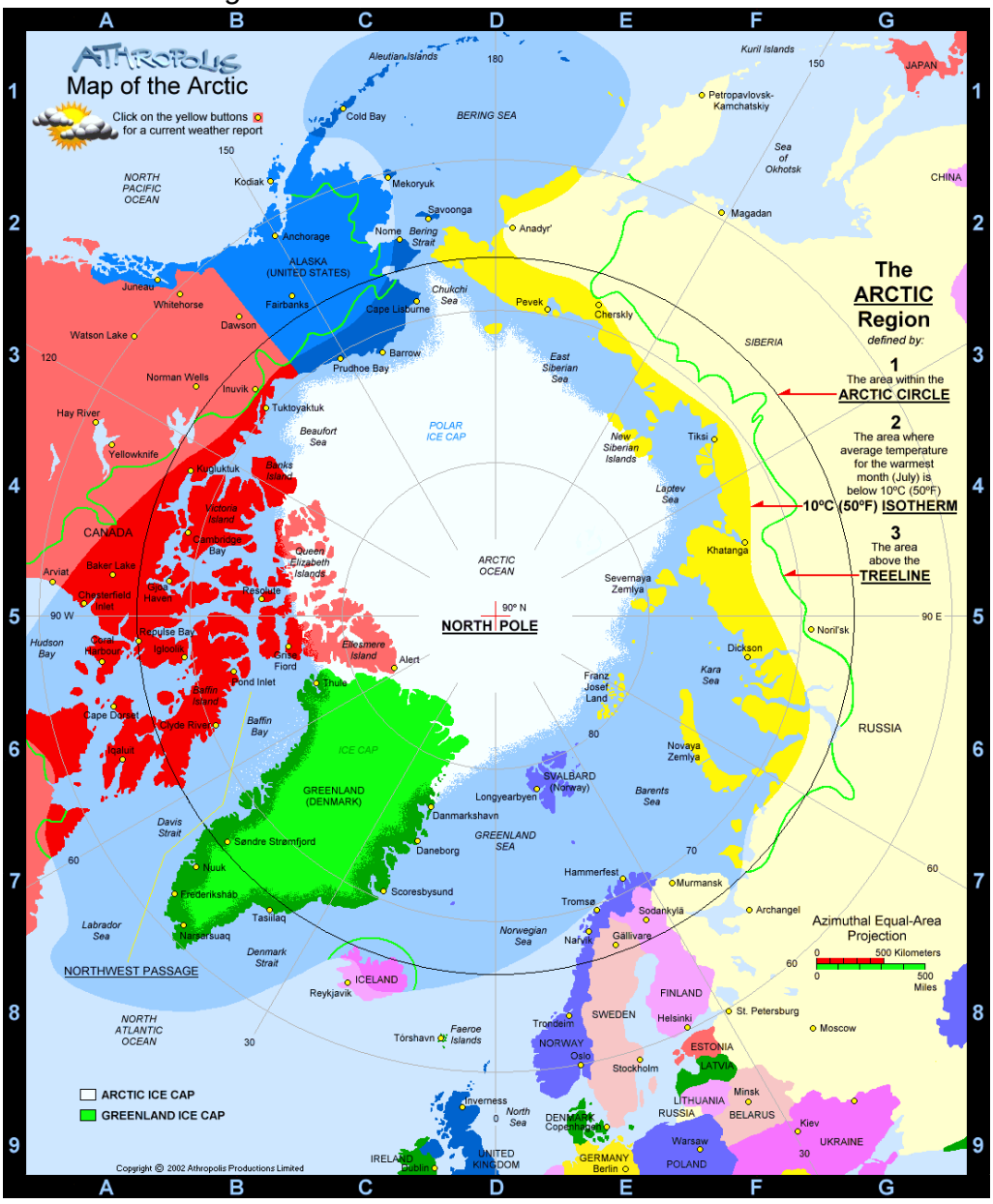
[2] http://en.wikipedia.org/wiki/Climate_of_the_Arctic

[3] For estimates of 2013, 2040 and 2060 see Grupta, A., 'Geopolitical implications of Arctic melt-down', *Strategic Analysis*, vol. 33, no. 2 (Mar. 2009), p. 174; Arctic Council, *Arctic Marine Shipping Assessment 2009 Report* (Arctic Council: Apr. 2009), p. 30; and US National Snow and Ice Data Center, 'Arctic Sea ice shrinks as temperatures rise', Press release, 3 Oct. 2006, <http://nsidc.org/ news/press/2006_seaiceminimum/20061003_pressrelease.html>.

[4] Gautier, D. et al., 'Assessment of undiscovered oil and gas in the Arctic', *Science*, 29 May 2009. ECON, *Arctic Shipping 2030: From Russia with Oil, Stormy Passage, or Arctic Great Game?*, ECON Report 2007-070 (ECON: Oslo, 2007), p. 4.

the island of Novaya Zemlya (off Russia's northern coast — with its Eastern shore on the Kara Sea); the Laptev Sea (off Russia's central northern coast), the East Siberian Sea (off Russia's northeast coast), the Chukchi Sea (north of the Bering Straits), Beaufort Sea (north of Alaska and western Canada), and lastly the Lincoln Sea and the Wandel Sea (also known as the McKinley Sea), both of which are north of Greenland[5]. The maritime jurisdictions and boundaries of nations in the Arctic region are shown in Map 2.

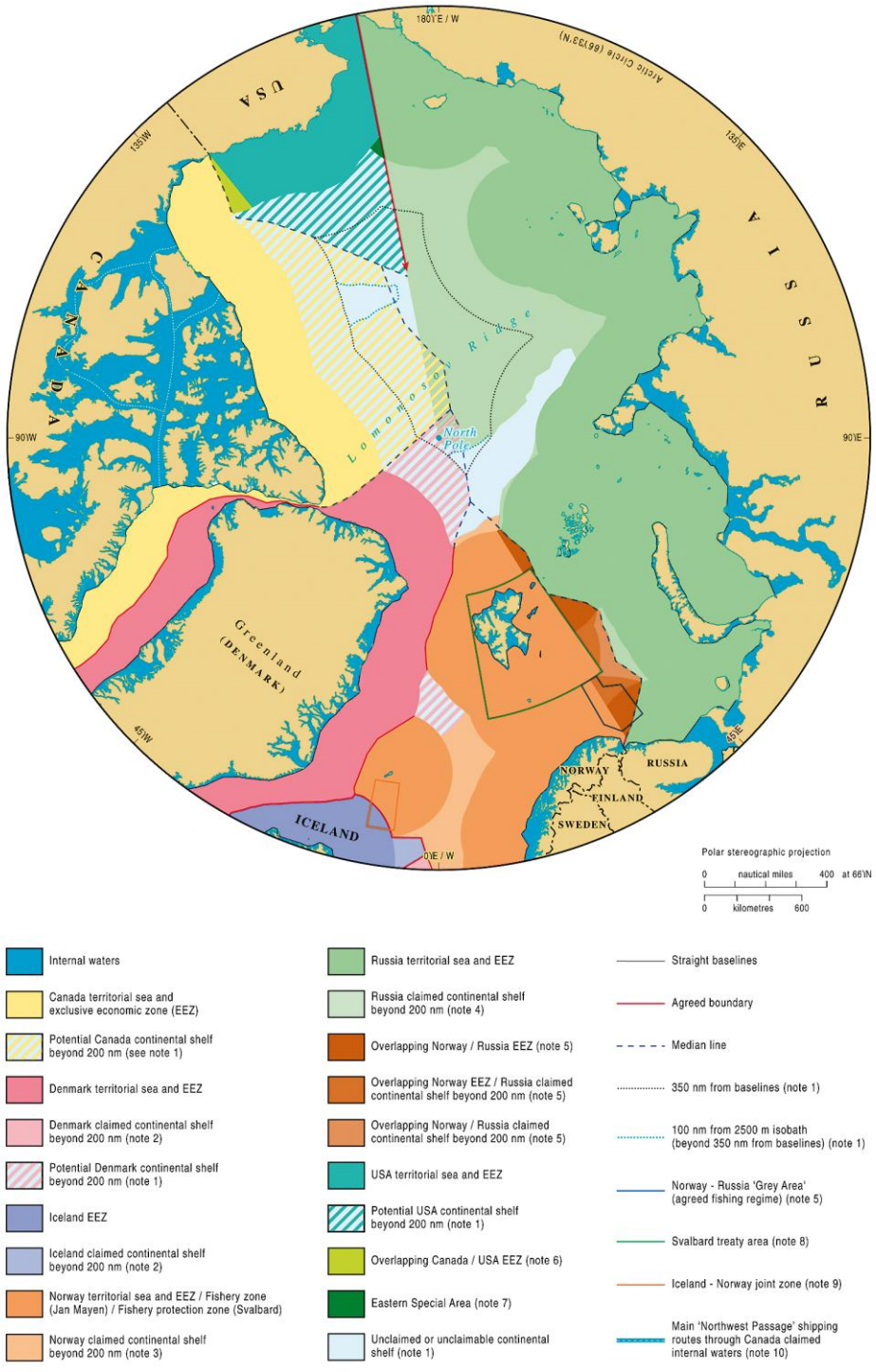
Map 1: The Arctic Region



Source: http://www.athropolis.com/map2.htm

[5] http://www.imr.no/temasider/havomrader_og_okosystem/arktis/arktis/en

Map 2: Maritime jurisdictions and boundaries in the Arctic Region



Source: http://www.dur.ac.uk/ibru/resources/arctic

Arctic Ocean – Environment

The Arctic Ocean is a unique ecosystem. Major threats to Arctic biodiversity are climate change and overharvesting which is occurring for some species in some sectors of the Arctic. Endangered marine species in the Arctic include walruses and whales. There has also been an increased development of pollution in the Arctic. The region is characterised by a relatively harsh climate with extreme variations in light, temperature and ice cover. The flow of oceanic water through Region I is dominated by the so called "Global Conveyor Belt" with warmer surface water arriving in the region in the East, sinking at high latitudes and dense cold deep water flowing southward through the Denmark Strait in the West.

Climate change may have a profound impact on Arctic sea mammals such as polar bears, seals and whales, and sea birds. This includes changes to their food base, with more southern species replacing many of the fat-rich Arctic species that they currently feed on; more direct and indirect competition from species moving up from further south; increased disease risks; higher pollution loads due to increased run-off from rivers in industrialized areas further south and, greater impacts from human activity, including increased shipping, and increased development in oil, gas or mining as well as tourism.

The Arctic ice pack is thinning, and in many years there is also a seasonal hole in the ozone layer. Reduction of the area of Arctic sea ice reduces the planet's average albedo, possibly resulting in global warming in a positive feedback mechanism. Research shows that the Arctic may become ice free for the first time in human history between 2012 and 2040.

Many scientists are presently concerned that warming temperatures in the Arctic may cause large amounts of fresh melt water to enter the North Atlantic, possibly disrupting global ocean current patterns. Potentially severe changes in the Earth's climate might then ensue.

Other environmental concerns relate to the radioactive contamination of the Arctic Ocean from, for example, Russian radioactive waste dump sites in the Kara Sea and Cold War nuclear test sites such as Novaya Zemlya (http://en.wikipedia.org/wiki/Arctic_Ocean).

The Arctic is a fragile ecosystem slow to change and slow to recover from disruptions or damage, such as the thinning polar icepack. Oceanic circulation systems and rivers draining into the Arctic waters transport a range of toxic substances that originate or volatilize further south, including various persistent organic pollutants (POPs). Low temperatures create an arctic “cold trap”, or sink, for some of these POPs, preventing further transport. The main concern surrounding offshore oil and gas activities in the Arctic is the risk of major accidents involving large-scale oil spills, a risk higher than in temperate zones.

Arctic Environment Databases:
http://maps.grida.no/go/graphic/human-impact-on-the-arctic-environment-2002
http://www.grida.no/publications/vg/arctic/

Arctic Ocean - Economic Use

The Arctic Ocean is rich on natural resources such as oil and gas, fish, marine mammals (polar bears, seals and whales), and minerals such as coal, nickel, copper, tungsten, lead, zinc, gold, silver, diamonds, manganese, chromium and titanium.

Fisheries: The only significant Arctic fisheries occur at present in the Barents Sea and to the east and south of the Norwegian Sea. However, climate change might bring increased productivity in some fish stocks and changes in spatial distributions of others. New areas may become attractive for fishing with increased access due to reduced sea ice coverage. For some of the Arctic high seas waters there is not yet an international conservation and management regime in place. This might lead to unregulated fisheries.

Oil and gas: The Arctic region holds potentially as much as 25% of remaining undiscovered reserves of oil and gas in the world, and the largest reserves are expected to be found in the Russian part. The melting of the Arctic ice cap makes these resources more easily accessible, and it may also increase the attractiveness of the Arctic as a transit route for goods between Asia, the US and Europe.

Tourism: Cruise ship traffic in the Arctic region has increased significantly in recent years. According to the AMSA database more than 1.2 million passengers travelled in 2004 to Arctic destinations aboard cruise ships; by 2007 that number had more than doubled. As passenger and cruise vessel traffic continues to increase in the Arctic, infrastructure and passenger safety needs will become of increasing concern. The large number of tourists already cruising Arctic waters now exceeds the emergency response capabilities of local communities.

Economic Use Databases:
http://ec.europa.eu/maritimeaffairs/index_en.html
http://ec.europa.eu/dgs/maritimeaffairs_fisheries/index_en.htm
Rivers database: http://www.nasco.int/rivers.html
EU Maritime affairs: http://ec.europa.eu/maritimeaffairs/
Atlas of the Sea
http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/#theme=themeGovernance2.subthemeIMPSeaBasins&=null&extent=-34.4_28.4_61.4_70.6

Arctic Ocean – Energy, Cables and Pipelines

The Arctic region holds potentially as much as 25% of remaining undiscovered reserves of oil and gas in the world, and the largest reserves are expected to be found in the Russian part (ECON 2007). Onshore areas in Canada, Russia, and Alaska already have been explored for petroleum but most of the Arctic, especially offshore, is essentially unexplored with respect to petroleum. The Arctic Circle encompasses about 6 percent of the Earth's surface, an area of more than 21 million km² (8.2 million mi²), of which almost 8 million km² (3.1 million mi²) is onshore and more than 7 million km² (2.7 million mi²) is on continental shelves under less than 500 m of water.

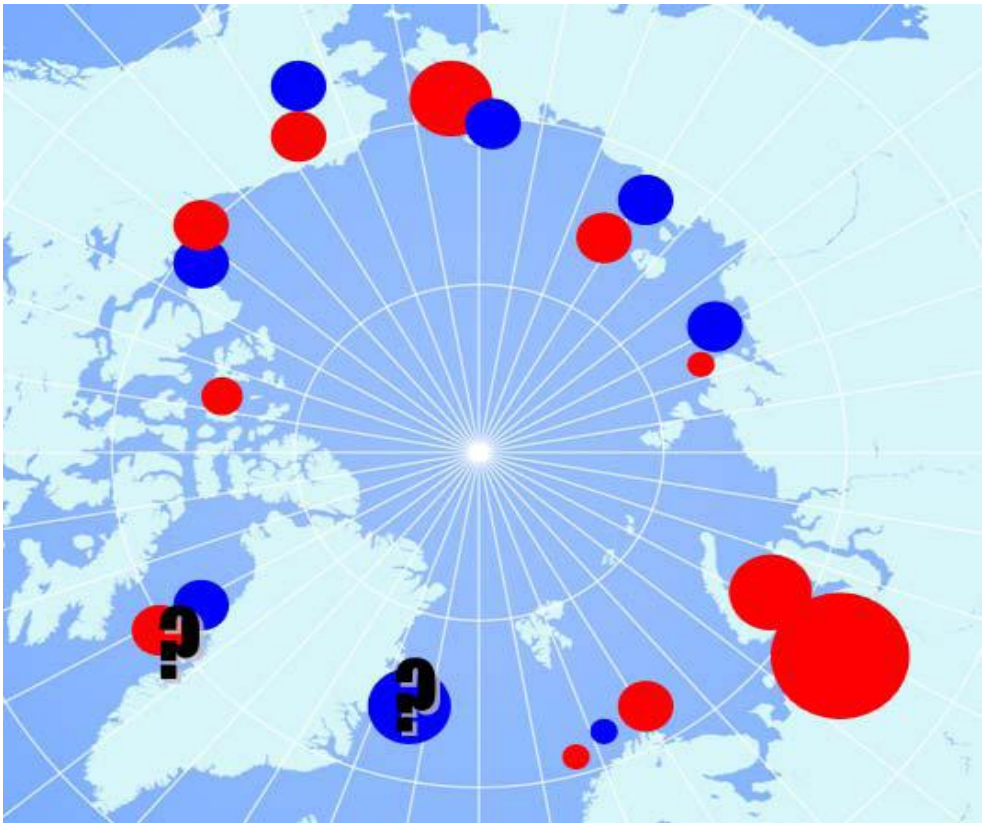
The extensive Arctic continental shelves may constitute the geographically largest unexplored prospective area for petroleum remaining on Earth (USGS 2008). Some of the largest oil and gas fields are the Goliat and Snøhvit fields which are located in the Barents Sea northwest of Hammerfest, Norway, and the Russian Arctic Shtokman field, and the enormous gas fields on Yamal Insel in Russia.

Large Arctic oil and natural gas discoveries began in Russia with the discovery of the Tazovskoye13 Field in 1962 and in the United States with the Alaskan Prudhoe Bay Field in 1967. Approximately 61 large oil and natural gas fields have been discovered within the Arctic Circle in Russia, Alaska, Canada's Northwest Territories, and Norway. Fifteen of these 61 large Arctic fields have not yet gone into production; 11 are in Canada's Northwest Territories, 2 in Russia, and 2 in Arctic Alaska.

Forty-three of the 61 large Arctic fields are located in Russia. Thirty-five of these large Russian fields (33 natural gas and 2 oil) are located in the West Siberian Basin. 15 Of the eight remaining large Russian fields, five are in the Timan-Pechora Basin, two are in the South Barents Basin, and one is in the Ludlov Saddle. Of the 18 large Arctic fields outside Russia, 6 are in Alaska, 11 are in Canada's Northwest Territories, and 1 is in Norway.

According to the USGS mean estimate, the Arctic holds about 22 percent of the world's undiscovered conventional oil and natural gas resource base, about 30 percent of the world's undiscovered natural gas resources, about 13 percent of the world's undiscovered oil resources, and about 20 percent of the world NGL resources. Map 3 (below) shows the location of oil and gas resources of the Arctic.

Map 3: Oil and gas resources in the Arctic – existing and potential



● = Gas, ● = Oil

Pie sizes are roughly indicative of size of remaining undiscovered reserves, but there are huge uncertainties. Source: ECON.

So far cables and pipelines are not well developed in the Arctic sea region. There is the Snøhvit project in Northern Norway, transporting gas from Snøhvit offshore oilfield to Melkøya Island. In Russia there are specific plans to construct pipelines from onshore fields in the Timan-Pechora region to the Barents Sea coast as well as to increase terminal capacity in Barents ports.

Energy Databases:
http://www.usgs.gov/resources_envirohealth/
http://energy.usgs.gov/arctic/

Cable and Pipelines Databases:
World pipeline maps
http://www.theodora.com/pipelines/world_oil_gas_and_products_pipelines.html

Arctic Ocean - Transport

There is a long history of Arctic marine transport conducted primarily around the ice-free periphery of the Arctic Ocean. Year-round navigation has been maintained since 1978-79 in the ice-covered western regions of the Northern Sea Route (between the port of Dudinka on the Yenisei River and Murmansk). Previous Arctic marine transport studies for the Northern Sea Route, Canadian Arctic, Alaska's coastal seas and other regions have significant relevance to developing any future regulatory framework for the Arctic Ocean.

Within 12 nautical miles from the shore, states are free to "adopt laws and regulations for the prevention, reduction and control of marine pollution from foreign vessels" as long as such measures do not impede innocent passage. In the Exclusive Economic Zone, considerably less leeway remains: coastal states can unilaterally only set rules "conforming to and giving effect to generally accepted international rules and standards established through the competent international organization or general diplomatic conference" – meaning through the International Maritime Organisation (Stokke 2009).

According to the AMSA Shipping Database there were approximately 6,000 individual vessels, many making multiple voyages, in the Arctic region during the AMSA survey year. Half of these were operating on the Great Circle Route in the North Pacific that crosses the Aleutian Islands. Of the 6,000 vessels reported, approximately 1,600 were fishing vessels. Nearly all shipping in the Arctic today is destinational, conducted for community re-supply, marine tourism and moving natural resources out of the Arctic.

Regions of high concentrations of Arctic marine activity occur along the coasts of northwest Russia, and in the ice-free waters off Norway, Greenland, Iceland and in the U.S. Arctic. Significant increases in cruise ships, a majority not purpose-built for Arctic waters, have been observed in the summer season around Greenland within the past decade. There have been recent marine operations in the ice covered central Arctic Ocean for scientific exploration and marine tourism.

There is a general lack of marine infrastructure in the Arctic, except for areas along the Norwegian coast and northwest Russia, compared with other marine regions of the world with high concentrations of ship traffic. Gaps in hydrographical data exist for significant portions of primary shipping routes important to support safe navigation. Except in limited areas of the Arctic, there is a lack of emergency response capacity for saving lives and for pollution mitigation. There are serious limitations to radio and satellite communications and few systems to monitor and control the movement of ships in ice covered waters. The current lack of marine infrastructure in all but a limited number of areas, coupled with the vastness and harshness of the environment, makes conduct of emergency response significantly more difficult in the Arctic.

Transport Databases:
AMSA Shipping database: http://www.arcticdata.is/

Arctic - Sea Level Governance

One of the major issues in discourse of Arctic related matters has in recent years been the governance of the Arctic region. In public debates one often forgets that the Arctic is an area situated on land of eight Arctic states as well as a large sea area defined as high seas under international law. In a following short feature, the contemporary governance scheme of the Arctic region will be discussed and the different legal and political settings participating in the Arctic governance introduced[6].

The Law of the Sea Convention (UNCLOS) is the basic law for governance of the Arctic Ocean but in addition there are several treaties and agreements, and organisations dealing with Arctic Sea governance. OSPAR is one of the mechanisms by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic. The fifteen governments are Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom. Region I constitutes approximately 40% of the OSPAR maritime area.

According to Saksina (2009), there are several gaps and loopholes in the current international legal framework:

- There is no regional fisheries management organization for the entire region. Meanwhile, overfishing and illegal, unreported and unregulated fishing continues;
- There is no adequate control of the environmental impacts of petroleum extraction, despite the vast amounts of oil stored below the Arctic;
- There are no internationally binding rules to regulate operational pollution from offshore installations;
- There are no special IMO fuel content, discharge, emission or ballast water exchange standards (ballast waters have transported invasive species such as zebra mussels across the world, creating ecological havoc);
- There are no navigation standards and comprehensive mandatory or voluntary IMO routing system for ships, and;
- There are no legally binding special construction, design, equipment and manning standards.

[6] http://www.arcticportal.org/features/features-of-2010/the-arctic-sea-challenges-in-governance

Table 1: Global and Seas level governance arrangements for the Arctic Ocean

Governance Arrangement	**Area of Coverage**	**Focus of activity**
Law of the Sea Convention (UNCLOS)	All global seas. The UN has no direct operational role in the implementation of the Convention. There is, however, a role played by organizations such as the International Maritime Organization, the International Whaling Commission, and the International Seabed Authority.	Defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. Contain a number of provisions - setting limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, protection of the marine environment, scientific research, and settlement of disputes.
International Maritime Organization (IMO)	IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.	Guidelines for Ships Operating in Arctic Ice-covered Waters.
Arctic Council (AC)	Member States of the Arctic Council are Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, Russian Federation, Sweden, and the United States of America. In addition to the Member States, the Arctic Council has the category of Permanent Participants. This category is open equally to Arctic organizations of Indigenous peoples	Inter-governmental forum established in 1996, no legal, binding authority. Provide a means for promoting cooperation, coordination and interaction among the Arctic States.
The Arctic Ocean Sciences Board (AOSB)	A non-governmental body that includes members and participants from research and governmental institutions in Canada, China, Denmark, Finland, France, Germany, Iceland, Japan, Korea, Norway, Poland, Russia, Sweden, Switzerland, the United Kingdom and the United States of America.	The long-term mission of the AOSB is to facilitate Arctic Ocean research by the support of multinational and multidisciplinary natural science and engineering programs.

Table 1: Global and Seas level governance for the Arctic (Continued)

Governance Arrangement	Area of Coverage	Focus of activity
The Northern Dimension (ND) policy, drawn up in 1999, is a common policy shared by four equal partners: the European Union, Norway, Iceland and the Russian Federation	The policy covers a broad geographic area, from the European Arctic and Sub-Arctic to the southern shores of the Baltic Sea, countries in the vicinity and from north-west Russia in the east, to Iceland and Greenland in the west.	The policy's main objectives are to provide a common framework for the promotion of dialogue and concrete cooperation, to strengthen stability and well-being, intensify economic cooperation, and promote economic integration, competitiveness and sustainable development in Northern Europe.
The OSPAR Commission	North-East Atlantic	Protect the marine environment of the North-East Atlantic.
The North East Atlantic Fisheries Commission	The NEAFC Convention Area covers the Atlantic and Arctic Oceans east of a line south of Cape Farewell - the southern tip of Greenland (42° W), north of a line to the west of Cape Hatteras - the southern tip of Spain (36° N) and west of a line touching the western tip of Novya Semlya (51°E). The Baltic and Mediterranean Seas are excluded.	Maintain the rational exploitation of fish stocks in the Convention Area, taking scientific advice from ICES, the International Council for the Exploration of the Sea.
Northwest Atlantic Fisheries Organization (NAFO)	The NAFO Convention Area encompasses a very large portion of the Atlantic Ocean and includes the 200-mile zones of Coastal States jurisdiction (USA, Canada, St. Pierre et Miquelon and Greenland)	Contribute through consultation and cooperation to the optimum utilization, rational management and conservation of the fishery resources of the Convention Area.
North Atlantic Salmon Conservation Organization (NASCO)	North Atlantic	To conserve, restore, enhance and rationally manage wild Atlantic salmon
The International Whaling Commission	All oceans in the world	To keep under review and revise as necessary the measures laid down in the Schedule to the Convention which govern the conduct of whaling throughout the world

Arctic Sub-Seas Level Governance

There are several multi- and bilateral governance agreements at sub-sea level addressing different topics such as transport, environment, fisheries and energy (oil and gas).

Table 2: Sub-seas level governance arrangements for the Arctic Ocean

Name of Governance Arrangement	Area of Coverage	Focus of activity
The Joint Norwegian-Russian Fisheries Commission	The Barents Sea	Norway and Russia share the stocks of cod, haddock and capelin in the Barents Sea and have a joint management of these fishery resources.
Maritime delimitation treaty between Norway and Russia	The Barents Sea and Arctic Ocean	The treaty contains provisions concerning Norwegian-Russian fisheries cooperation, and on the exploitation of any petroleum deposits that extend across the delimitation line.
Maritime delimitation treaty between Norway and Denmark	The Greenland Sea	Provisions concerning fisheries, minerals and petroleum.

Arctic Ocean - Conclusions

The Arctic Ocean is located in the Northern Hemisphere and mostly in the Arctic North Polar Region and characterised by long, cold winters and short, cool summers. The area remains relatively unexplored but expected to contain large natural resources. The Arctic Ocean is bordered by Greenland, Canada, Alaska, Russia, and Norway (the littoral states), and to sparsely populated areas. There are no larger cities, long distances between settlements and local employment based on natural resources is limited.

The Arctic Ocean is a unique but fragile ecosystem and major threats to Arctic biodiversity are climate change and overharvesting. Global warming and increasing temperatures in the Arctic may cause large amounts of fresh melt water to enter the North Atlantic, possibly disrupting global ocean current patterns.

The Arctic Ocean is rich in natural resources such as oil and gas, fish, marine mammals and minerals. It holds potentially as much as 25% of remaining undiscovered reserves

of oil and gas in the world, and the largest reserves are expected to be found in the Russian part. The North-West passage and Northern Sea Route are the main Arctic transit routes, and global warming may make it possible for ships to transit the Arctic for longer periods.

The Arctic Ocean is an area situated on land of eight Arctic states as well as a large sea area defined as high seas under international law. The Law of the Sea Convention (UNCLOS) is the basic law for governance of the Arctic Ocean but in addition there are several treaties and agreements, and organisations dealing with Arctic Sea governance. However, there are also several gaps and loopholes in the current international legal framework.

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http://aosb.arcticportal.org/index.html
http://www.imo.org/Pages/home.aspx
http://www.geopoliticsnorth.org/
http://eeas.europa.eu/north_dim/index_en.htm
http://www.un.org/Depts/los/index.htm
http://www.geopoliticsnorth.org/index.php?option=com_content&view=article&id=27&Itemid=37
http://geology.com/energy/arctic-oil-and-gas-potential/
http://ec.europa.eu/maritimeaffairs/
http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/#theme=themeGovernance2.subthemeIMPSeaBasins&=null&extent=-34.4_28.4_61.4_70.6
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Annex 2: the Atlantic Ocean

Introduction

The North East Atlantic forms the western borders of Europe and is an important sea bridge to trading partners in the Americas and many other parts of the world. If the Arctic and North Sea regions are excluded, it comprises OSPAR's Celtic Seas, the Bay of Biscay and Iberian Atlantic Coast, and Wider Atlantic regions. To the east of these seas are the European countries of the United Kingdom, Republic of Ireland, France, Spain and Portugal, and the Azores represent the only populated land mass within the Wider Atlantic. The Portuguese island of Madeira lies outside the Wider Atlantic region. Beyond Exclusive Economic Zones, fisheries regions, the OSPAR Convention and UN Convention on the Laws of the Sea provide the main governance mechanisms for the High Seas of the North East Atlantic.

The area contains wide variations in coastal and marine topography ranging from fjordic sea lochs, to sand dunes, bays, estuaries and numerous sandy beaches to extensive areas of continental shelf and abyssal plain. In the Celtic Seas and to the west of France, waters are relatively shallow (less than 200m) and there is a wide

continental shelf, although this shelf becomes much more narrow around the Iberian Peninsula. Beyond the continental slope, parts of the the Wider Atlantic reach a depth of approximately 2000m (Rockall Trough, west of Scotland) and 5800m (Peak Deep, west of the Iberian Peninsula). It also has a rich and varied ecology with the large range of habitats in the region supporting a diverse range of fish and fauna and being of particular importance to migratory birds. Coastal areas facing the Atlantic have a temperate climate, being warmed by the North Atlantic Drift, itself a northern extension of the Gulf Stream.

The patterns of human activity in the area are similarly diverse , reflecting the extensive scale of the region which encompasses both core and periphery areas of Europe. As a consequence some parts of the region could be classified as rural and even wilderness seas. However, many parts are much more urban in character being the focus of significant coastal development and related maritime activity, including fishing, marine transport, mineral extraction, oil and gas exploration and tourism. The main ports and urban centres of the Atlantic region include Lisbon, Porto, Bilbao, Santander, Nantes-St. Nazaire, the Severn Estuary (Bristol/Cardiff), Cork, Dublin, Belfast, Liverpool and Glasgow.

Here, human pressures present significant challenges to the health of the marine environment with depletion of fish stocks, marine pollution (primarily from shipping traffic and accidents such as the sinking of the Prestige oil tanker in 2002), pressure to develop coastal lands for tourism, significant erosion on the Portuguese and French coasts and damage to fragile habitats all issues of concern.

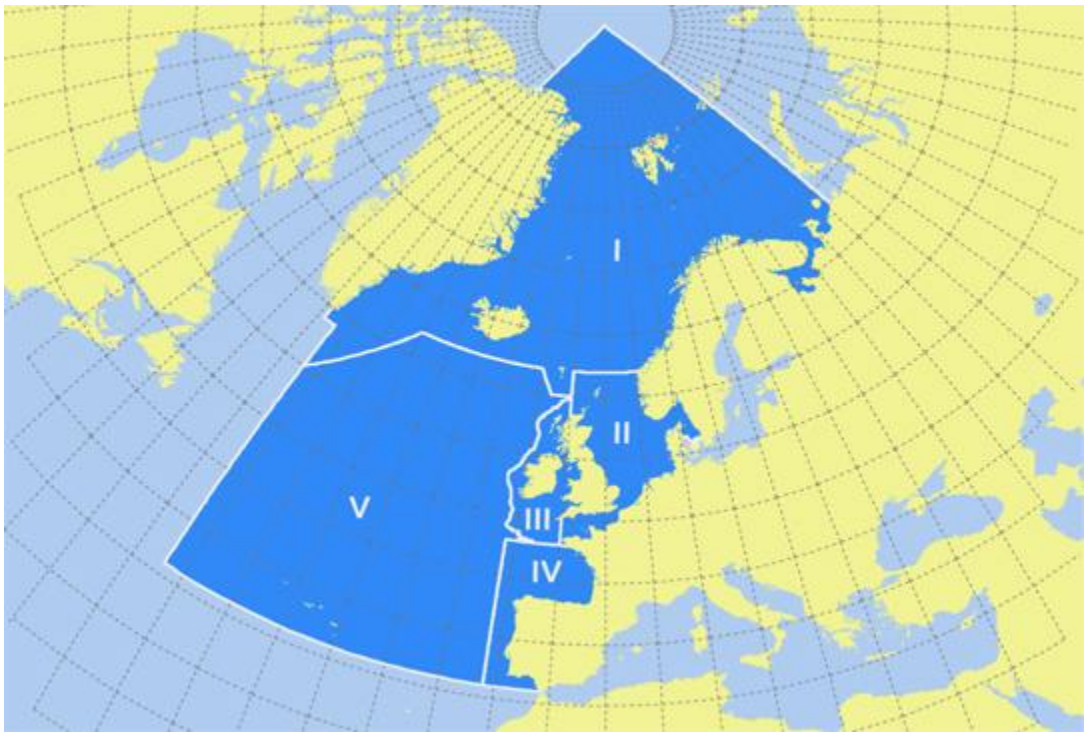
Looking to the future the region presents significant opportunities to address the climate change challenges of Europe through extensive renewable energy development and carbon capture and strorage. Such developments present important opportunities to create new sources of high technology ‘green’ employment very much in line with the ambitions of Europe 2020.

Atlantic Ocean Boundaries

As an open sea, there are several ways in which the boundaries of the Atlantic for the purpose of this research may be defined. To the south east, the Atlantic borders the Mediterranean Sea at the Gibraltar Strait, and in the north east extends around the top of Scotland to the Orkney Islands and Shetland Isles to the border of the North Sea. In terms of ESPON space, the Canary Islands, Madeira and the Azores are included as territories of Spain and Portugal respectively.

There are four main sources of information that may be used to delineate other boundaries and sub-seas of the Atlantic. Under the OSPAR regions used in the introduction section and shown in Map 4 below, the Celtic Seas (Region III) and Bay of Biscay and Atlantic Iberian Coast (Region IV) represent the near Atlantic, whilst the Wider Atlantic (Region V) extends out from 10°W off the Iberian coast to the mid Atlantic at 42°W.

Map 4: OSPAR Regions of the North East Atlantic

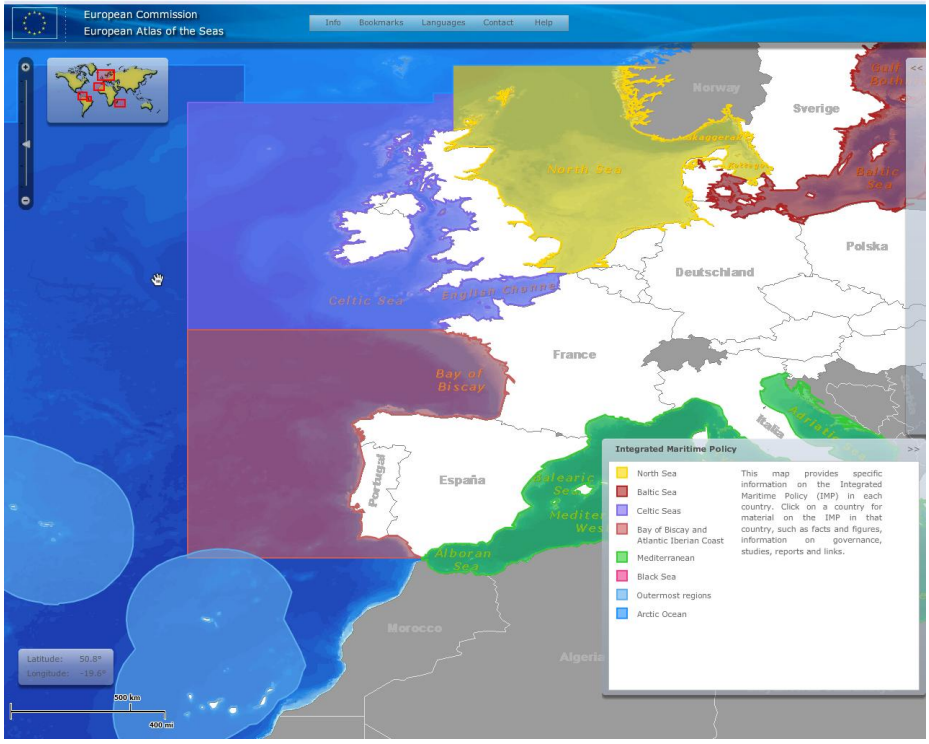


Source: http://www.noordzeeloket.nl/ecoqos/en/ospar/maritime/

For the purpose of the European Commission's Integrated Maritime Policy, the Atlantic consists of the Celtic Seas bordering Ireland, the UK and northern France (therefore including the English Channel) and the Bay of Biscay and Atlantic Iberian Coast. These regions are shown in Map 5. The Canaries, Madeira and the Azores are classed as "Outermost regions".

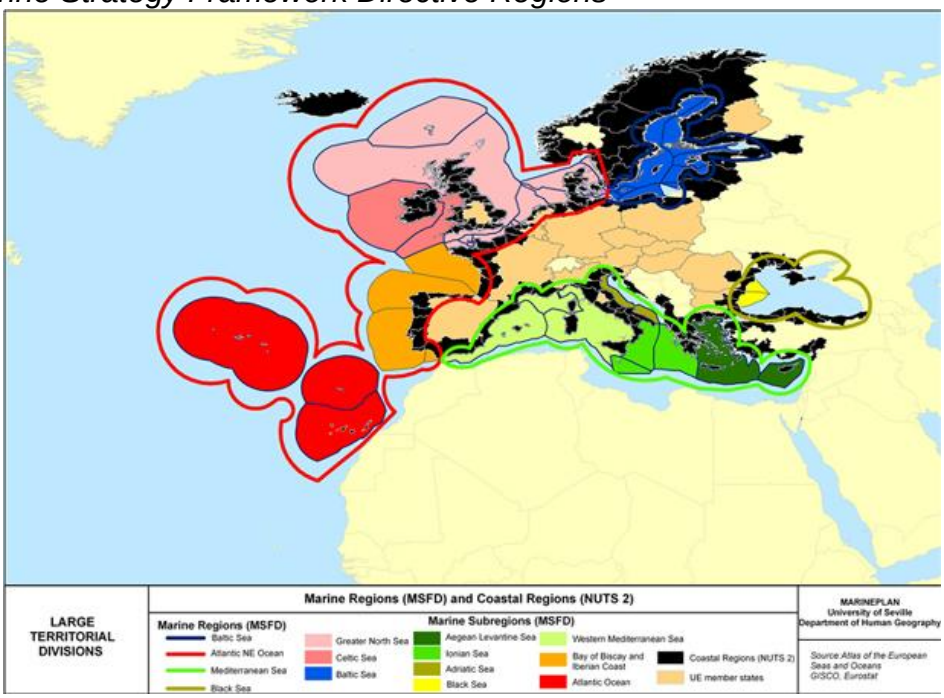
The third set of boundaries is those defined to support implementation of the Marine Strategy Framework Directive. Under the Directive, the North East Atlantic is divided into four marine sub-regions, namely the Celtic seas, Bay of Biscay and the Iberian Coast, Atlantic Ocean and also the Greater North Sea, which has been considered as a separate entity from the Atlantic altogether for the purposes of this research (see Map 6).

Map 5: EC Integrated Maritime Policy Regions



Source: DG Mare, Maratlas

Map 6: Marine Strategy Framework Directive Regions



Source: http://www.eurocean.org/np4/327.html

The Atlantic Arc Commission, one of six Conferences of Peripheral Maritime Regions of Europe, provides the fourth way of delimiting the Atlantic area. Map 7 (below) shows the members of the Atlantic Arc.

Map 7: Atlantic Arc member regions

Source: http://arcatlantique.org/index.php?act=1,2,4

A key consideration for future research is the inclusion of the English Channel as a sub-sea of either the Atlantic or North Sea. In all but one of the boundaries listed in this section, the Channel is assigned to the North Sea region. Therefore it is recommended that research related to the English Channel should be included as part of the Greater North Sea.

Atlantic Ocean – Environment

The Atlantic provides a wealth of ecosystem goods and services, including fisheries, energy, transport routes and tourist amenities and services. At the seas level, climate change poses the greatest threat to the health of the Atlantic, and many changes to

ecosystems are already taking place. Sea surface temperatures are increasing, with the North East Atlantic showing changes in temperature above the global mean for the period from 1994 onwards (OSAPR, 2010). This has resulted in changes to the distribution and abundance of species, with the movement north of non-indigenous warm water and tropical species such as sea bass and red mullet. Over the past four decades, plankton characteristic of warmer water have experienced a regime shift, advancing northwards by 10° latitude in the North Sea and Atlantic, whilst there has been a retreat of cold water species such as Arctic assemblage planktons (WWF-UK, 2005:24). Seasonal changes to reproduction patterns have also affected feeding relationships between predators and prey.

For most of the Atlantic coast, predicted sea level rise is between 1 and 2 millimetres per year, and reaching 2-5mm/year in the English Channel, although for the Irish Sea area there is a predicted fall in sea levels of -1 to -5mm per year[7]. In some coastal areas, erosion poses a serious risk to habitats and urbanised coastal areas. In Portugal, for example, 782Km of coastline in the Lisboa e Vale do Tejo region is classed as under the influence of coastal erosion, with a population of approximately 830,000 living within this same area and 485 Km^2 of areas with high ecological value being under threat (EUROSION Project, 2004).

Although the Atlantic does not suffer from marine pollution problems to the same extent as other European seas such as the Baltic, there are some areas where these problems are particularly concentrated such as the busy shipping lanes of the English Channel and at the coast of Brittany (OSPAR, 2010). Although the volume of oil released by accidental spills or illegal discharge is decreasing, observations show that spills of up to an estimated 100m^3 are not uncommon and air pollution (nitrogen oxide and sulphur dioxides) from ship exhausts and cargo tanks is increasing (see OSPAR Commission, 2010).

High levels of runoff from agricultural sources contribute to eutrophication, with several estuaries in the Republic of Ireland and North West France considered to be problem areas. The Atlantic Iberian coast is largely free from eutrophication, although the large river basins of the Guadalquivir in Spain and the Mondego river in Portugal are recognised as potential problem areas by the most recent application of the OSPAR Common Procedure for evaluating eutrophication status.

Environment Data Sources
DG Mare *European Atlas of the Seas*
http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm
EUROSTAT http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes
European Environment Agency http://www.eea.europa.eu/data-and-maps
OSPAR Quality Status Report 2010: http://qsr2010.ospar.org/en/index.html

[7] DG Mare, Maritime Atlas

Atlantic Ocean - Economic Use

Fishing/aquaculture
Whilst fisheries production (including aquaculture) in Europe as a whole has declined in recent years, the North East Atlantic remains the most important fisheries resource to Europe, providing 72.6% of catches by the EU-27 in 2007.

In the Celtic Seas, blue whiting, mackerel and herring are some of the main species caught, whilst in the Bay of Biscay and Iberian Atlantic sardine, mackerel, hake and tuna are caught. Fishing is a major contributor to the coastal economies of Spain and Portugal, with the largest and fourth largest fishing fleets in the EU respectively. Whilst Spain's fishing activities cover both the Atlantic and Mediterranean Seas, over one half of Spain's fishing vessels are registered in the Atlantic facing region of Galicia, with Vigo being Europe's leading deep sea fishing port.

Of Europe's total aquaculture production from 2004-2007, 55% of this came from Atlantic waters. The main species produced include mussels, Atlantic salmon, oysters, sea bream and rainbow trout. The total value of aquaculture production in the Atlantic Arc countries was €1.6 billion in 2007, although this figure includes production in the North Sea and English Channels.

Fisheries data sources:
FAO Yearbook of Fishery Statistics
http://www.fao.org/fishery/statistics/en
DG Mare *European Atlas of the Seas*
EUROSTAT

Tourism
Coastal tourism takes a number of forms on the Atlantic, from destinations on the remote, unspoilt coastlines of Western Scotland, Ireland and Wales to the beach resorts of the Algarve and Andalucia. Tourist arrivals to OSPAR regions between 1998 and 2007 show a relatively stable number of approximately 15 million visitors per year to Region III (Celtic Seas) and an increase of 34 to 48 million visitors per year in Region IV (Bay of Biscay and Iberia). Several ports connect tourists to coastal destinations, such as those at Cork, Santander and Cadiz, with Lisbon and Bilbao major cruise ship destinations.

The continuing demand for coastal tourism and recreation has potential to cause severe environmental damage through increased pressure on local infrastructure, with implications for energy use, sewage outflows, marine litter and waste management. In France, for example, coverage of built-up areas within 1Km of the shoreline exceeds 45% (European Commission, 2009b).

Tourism data sources:
EUROSTAT

Aggregates and Mineral Extraction
Exploitation of the Atlantic seabed for sand and gravel for beach nourishment and construction tends to be concentrated in a few small areas. In the Celtic Seas, the Irish Sea and Bristol Channel provide the main aggregate resources for the UK and Ireland, although overall the Irish Sea contributes less than 3% of England's total aggregate extraction. In the Bay of Biscay the coast and estuaries of the Loire, Brittany, Charente and Gironde account for over 70% of France's marine aggregates (Claveleau and Desprez, 2009). In Spain, extraction has been limited to La Coruna in Galicia for beach replenishment. The most recent figures for aggregate extraction according to the ICES Working Group on Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT) show there is no data readily available for marine aggregates in Portugal.

Aggregates and mineral extraction data sources:
ICES Working Group on Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT), http://www.ices.dk/reports/SSGHIE/2008/wgext08.pdf

Atlantic Energy, Cables and Pipelines

In the Atlantic, the production of oil and gas is limited, with gas only produced in areas of the Irish Sea, Bay of Biscay and the Gulf of Cadiz. However, the Atlantic offers great opportunities for renewable energy, both from offshore wind farms and tidal or wave power, thus contributing to the Europe 2020 objectives of smart and sustainable growth through research and development of green technology, increasing use of renewable energy and at the same time reducing greenhouse gas emissions.

Offshore wind farms currently operating in the Atlantic Arc include Arklow Bank (Ireland), North Hoyle, Burbo Bank, Rhyl Flats, Robin Rigg and Maryport (UK, Irish Sea). With smaller Exclusive Economic Zones, the potential for wind energy in France, Portugal and Spain is reduced, though it has been projected that the Atlantic as a whole could generate over 1,100TWh of electricity from wind power in a zone 10-30Km offshore (EEA, 2009:22).

A survey of projected energy generation in Europe by the Energy Research Centre of the Netherlands shows that capacity for tidal, wave and ocean energy is due to grow considerably by 2020, with the UK predicted to generate 66% of the EU's total tidal, wave and ocean electricity. This is followed by 19% in France, 7% in Portugal, and 4% each in Spain and Ireland (Beurskens and Hekkenberg, 2011:100).

However there are potential constraints for offshore renewable energy in terms of shipping routes, marine protected areas, military use of offshore areas, oil and gas

exploration, recreational uses and visual impacts that may have consequences for the location of any proposed developments.

Comprehensive data sources regarding submarine pipelines in the Atlantic (oil, gas and other petrochemicals) are not readily available, however there is a pipeline connecting the gas fields of the Irish Sea with Ireland, Scotland and the Isle of Man. Several onshore pipelines connect to ports and oil refineries such as Whitegate (Ireland), Milford Haven (UK), Donges (France), Sines (Portugal) and Huelva (Spain).

A number of submarine telecommunications cables that connect Europe with North America make their landfall on the coasts of European countries adjacent to the Atlantic. These include the Hibernia Atlantic cable (landings in Ireland, and the UK), the Apollo cable system (UK and France), and Columbus III (Portugal and Spain). Several other cables connect the northern and southern regions of the Atlantic Arc, including Rioja-1 (UK and Spain), VNSL Western Europe (Portugal and the UK) and SEA-WE-ME-3 (UK, France and Portugal).

Energy, cables and pipelines data sources:
Wind Energy: the Facts http://www.wind-energy-the-facts.org

National Renewable Energy Plans of the EU27 – Information
http://www.ecn.nl/units/ps/themes/renewable-energy/projects/nreap/
European Wind Energy Association: www.ewea.org

Kingfisher Information Service – Cable Awareness
http://www.kisca.org.uk/charts.htm#option2

Atlantic Ocean Transport

The Atlantic Arc acts as a gateway for maritime transport, connecting shipping routes to mainland Europe via the Gibraltar Straits, English Channel and North Sea, and also connecting the ports of the Atlantic Arc along a north-south axis from Portugal to the Irish Sea, forming the western Europe section of the EU's Motorways of the Sea transport corridors. The development of this corridor forms one of the Trans-European Transport Network (TEN-T) priority projects to be implemented by 2020.

Of the ports along the Atlantic Arc, Bilbao and Las Palmas, Gran Canaria are among the top twenty European ports for volume of containers handled, with 443,000 and 1 million TEUs (twenty foot equivalent units) passing through each port respectively in 2009. Milford Haven on the south west coast of Wales is the Atlantic Arc's biggest port in terms of gross weight, handling 39.3 million tonnes of cargo (mostly liquid bulk goods moving in and out of the nearby oil refinery) in 2009.

Passenger transport is also highly important to the Atlantic Arc, with the ferry crossings of the main Irish Sea ports (Holyhead, Dublin, Stranraer, Belfast and Rosslare) carrying the greatest number of passengers annually (between 1 and 2.2 million), whilst Santander and Bilbao in Spain are the busiest passenger ports of the Bay of Biscay and Atlantic Iberian coast, carrying over 100,000 passengers each in 2007.

The European Commission's *Maritime Transport Strategy 2018* (Commission of the European Union, 2009) notes that both maritime freight and passenger transport are due to increase, and thus the infrastructure must be in place to meet demands for maritime transport. Therefore there are several opportunities for maritime transport and associated industries in the Atlantic Arc to benefit from the development of intra-EU short sea shipping, research and development clusters, and the promotion of measures to facilitate better connection of islands and long-distance intra-EU passenger transport through quality ferry and cruise services, which will support links between the outermost islands of the Atlantic (Azores, Canary Islands and Madeira) and mainland Europe.

Transport data sources:
International Maritime Organisation
http://www.imo.org/KnowledgeCentre/Pages/Default.aspx
EUROSTAT
European Commission, Maritime Affairs (DG Mare)
European Commission, Mobility and Transport (DG Move)

Atlantic - Sea Level Governance

At the sea-wide level, governance arrangements (shown in table 3 below) are largely sectoral, such as those related to fisheries, environmental protection and shipping.

Table 3: Seas level governance arrangements for the Atlantic Ocean

Governance Arrangement	Area of Coverage	Focus of activity
Atlantic Arc Commission	Atlantic Ocean	The Atlantic Arc Commission seeks to integrate cooperation projects of varying scale, covering all the areas of sustainable regional development, into a coherent strategy. With post-2006 European policies in mind, the Regions have prepared an Atlantic Spatial Development Perspective (ASDP), which identifies actors, actions and policies to implement at different levels in order to support the sustainable growth of the Atlantic Arc. Priority Action Themes **include** transport - improving internal and external accessibility, inter-modality, developing maritime links; sustainable development, particularly ICZM; fisheries (within the constraints of the CFP) and research, innovation and improving competitiveness.
OSPAR	NE Atlantic	OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic by identifying threats to the marine environment and ensuring that measures are put into place to protect it. OSPAR undertakes monitoring and assessment of the seas to ensure compliance with internationally agreed goals.
North East Atlantic Fisheries Commission	NE Atlantic	The NEAFC decides upon conservation and management measures that support the sustainable exploitation of fisheries in the international waters of the North East Atlantic, including the Wider Atlantic, Banand Hole (Smuthavet) and the Barents Sea.
North Atlantic Salmon Conservation Organisation (NASCO)	North Atlantic (including USA, Canada, Greenland and Iceland)	NASCO facilitates international cooperation in order to conserve, restore, enhance and rationally manage wild Atlantic salmon. NASCO initiatives extend to the protection and management of salmon habitats in inland waterways and actions designed to minimise the impacts of aquaculture on wild salmon stocks.
International Commission for the Conservation of Atlantic Tunas	Whole Atlantic, Baltic, North, Mediterranean and Black Seas	Responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent seas. ICCAT also monitors and collects data on other fisheries species caught during tuna fishing that are not investigated by another international fishery organization.

Atlantic Sub-sea level Governance

Table 4: Sub-seas level governance arrangements for the Atlantic

Governance Arrangement	Area of Coverage	Focus of activity
British-Irish Council	Irish Sea, English Channel	The BIC cooperates on areas of mutual interest for the devolved administrations of the UK, Isle of Man, Ireland and the Channel Islands, including collaborative spatial planning, transport, energy and the environment. The Environment Group has discussed how the Council could help deliver OSPAR objectives, along with the European Marine Strategy, sustainable development and biodiversity. In relation to energy, the marine renewables workstream has interests in developing energy grids and supply, and experience related to MSP. The spatial planning group met for the first time in 2009 and is yet to decide on a future work programme.
North Western Waters/South Western Waters Regional Advisory Councils	(NWW) Western Scotland to Brittany, and (SWW) Brittany-Gibraltar, Azores and Canary Islands	The RACs were established as part of reforms to the common Fisheries Policy and contribute to the sustainable exploitation of fisheries through making recommendations on behalf of their members to the EC and participating in consultations on EU projects and legislation (such as MPAs). NWW and SWW are currently collaborating on the GEPETO project (fisheries management and transnational objectives), part of the INTERREG IVB Atlantic Area Programme.
Bonn Agreement	North Sea, Celtic Seas, English Channel	The Bonn Agreement was established to ensure cooperation between its Contracting Parties in preventing and responding to marine pollution incidents from shipping and offshore installations. Activities carried out under the Bonn Agreement include surveillance, adopting common operational approaches for cleaning operations, joint responses and research and development.
Solway Firth Partnership	Solway Estuary (Scotland-England)	The Solway Firth Partnership is a voluntary coastal management partnership which supports the implementation of ICZM in a transnational area. SFP activities include fisheries, promoting the cultural and natural assets of Solway Firth, SAC management, research projects (including a feasibility study for renewable energy), and acting as a stakeholder in the consultations on Scottish and English Marine Spatial Plans.
Severn Estuary Partnership	Wales-England	The Severn Estuary Partnership is a voluntary initiative led by local authorities and other statutory groups involved in management of the Severn Estuary which aims to coordinate management activities, promote the estuary and provide an interface between organisations and the public through consultation and dissemination. The Partnership provides the secretariat for a number of groups with statutory responsibilities on the Severn including management of the Severn European Marine Site, shoreline management and flood risk planning.

At a sub-seas level, the more intensively used and relatively enclosed waters of the Irish Sea provide the greatest challenges for transnational marine governance, hence the

large number of sub-seas governance arrangements listed in table 4 related to this area. The Irish Sea represents a particularly complex area as this is bordered by six nations and includes some estuaries which span national borders such as the Solway and Severn, and therefore the examples of sub-seas governance cited for this area have a particular focus on coordinated responses to cross cutting issues such as conservation and renewable energy. Beyond the Celtic Seas, governance related to fisheries provides the main sector-based arrangements.

Atlantic Ocean Conclusions

The long, linear form and outwards looking nature of the European Atlantic coast provides several challenges for maritime and coastal governance, not least due to the range of different activities and pressures facing each of the nations along the Atlantic Arc. Furthermore, the limited number of sub-seas governance arrangements related to the Atlantic, with most concentrated on British-Irish waters, could indicate that transnational governance is not as well developed in those European seas where neighbouring countries look towards each other over a relatively smaller maritime space. However beyond this initial phase of the research, more attention should be paid to exploring future governance arrangements for the Atlantic, particularly in light of the Atlantic Arc Commission's proposal for an integrated strategy for the Atlantic Arc (Atlantic Arc Commission, 2010) which takes in some of the main themes of *Europe 2020*, such as developing environmental technologies and the economic potential of maritime clusters, reducing environmental impacts and increasing renewable energy use.

Although there are a number of data sources readily available for the Atlantic, there are potential problems in disaggregating data sets at the national level for nations which border the Atlantic and another sea such as the UK (Atlantic and North Sea) and Spain (Atlantic and Mediterranean). In this case, where data is available at NUTS-2 level this should be used. A further problem of disaggregation relates to the boundaries of seas, for example where the North Sea or English Channel are included as part of a greater North East Atlantic, such as the North East Atlantic Fisheries Zone. In these circumstances, sub-sea or country specific data may be unavailable or difficult to access.

Atlantic References

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Bonn Agreement Secretariat (2009) *1969-2009: 40 Years of the Bonn Agreement,* http://www.bonnagreement.org/eng/html/welcome.html

Claveleau, D. And Desprez, M. (2009) *Marine aggregates in France: current production, materials, constraints experienced and expected and future development,* paper presented at the European Marine Sand and Gravel Group Conference, 7-8 May 2009 Frentani Conference Centre, Rome, Italy

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Annex 3: the Baltic Sea

Introduction

The Baltic Sea is an epicontinental and enclosed, non-tidal, relatively shallow (mean and maximum depth 50 and 640 m, respectively) ecosystem that was formed after the last glaciation (~10,000-15,000 ybp). It is the only inland sea wholly in Europe and is one of the largest brackish-water basins in the world. The Baltic Sea area is situated within a transitional climate region between the Atlantic marine and Eurasian continental systems, which determines the hydro-climatic conditions of the region. Temperature and salinity markedly decrease along a SW to NE gradient with the latter determined by both 1) the amounts and frequencies of saline, oxygenic-rich inflows from the North Sea through the Danish Straits and 2) riverine freshwater inflows influenced by precipitation. This brackish ecosystem is inhabited by relatively few species compared to other European seas; many of them live on the brink of their possibilities (ed. Rheinheimer, 1995).

The catchment area is home for more than 85 million people within 14 states. Population densities vary from 500 inhabitants/km² in southern urban areas to less than 10 inhabitants/km² in northern parts of Finland and Sweden. At the same time the large catchment makes the Baltic Sea highly vulnerable to the variety of human activities. Like other regional seas, the Baltic Sea is facing several human-induced challenges, most of which have recently either intensified or substantially modified in their nature (HELCOM, 2010). Three of the most prominent changes in the Baltic Sea during the 20th century were overfishing, severe increase in eutrophication and sharp drop of seal abundance. The main economic activities in the Baltic Sea region in terms of value are shipping, tourism and extraction of resources (essentially fish stocks). Energy production and supply has become an important driver for new and intensified uses (e.g. increased oil shipping from Russia, NordStream gas pipeline, offshore wind farms and cables, new coastal power plants).

The Baltic Sea shows gradients from west to east and from north to south. The ice cover during normal winters, for instance, occupies up to 50% of the sea area in the northeastern part of the Baltic Sea. Costs and risks for shipping are according to this. The southern part of the Baltic Sea is hampered by ice only in infrequent severe winters, which is then usually not as thick as in the northern part. Another example is the composition of seabed sediments which is changing from mostly sandy and muddy sediments in the south-western part over hard clay and mud in the central Baltic to increasing hard bottom complexes in the northern part. Together with other conditions (e.g. salinity, see above) this has impacts on the allocation of habitats or on species types and biodiversity as well as on productivity and services of the Baltic Sea.

Baltic Sea Boundaries

Being an enclosed sea (bordered by Denmark, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland and Germany) the definition of an overall sea boundary is limited to the transition region between Baltic Sea and North Sea. Different existing definitions can be found, most of them closely linked to specific views or purposes. The International Hydrographic Organization (IHO, 1953) has defined the limits of the Baltic Sea in this transition area as follows:

In the Little Belt: a line joining Falshöft (54°47′N 9°57.5′E / 54.783°N 9.9583°E / 54.783; 9.9583) and Vejsnæs Nakke (Ærø: 54°49′N 10°26′E / 54.817°N 10.433°E / 54.817; 10.433).

In the Great Belt: a line joining Gulstav (South extreme of Langeland Island) and Kappel Kirke (54°46′N 11°01′E / 54.767°N 11.017°E / 54.767; 11.017) on Island of Laaland.

In Guldborg Sound: a line joining Flinthorne-Rev and Skjelby (54°38′N 11°53′E / 54.633°N 11.883°E / 54.633; 11.883).

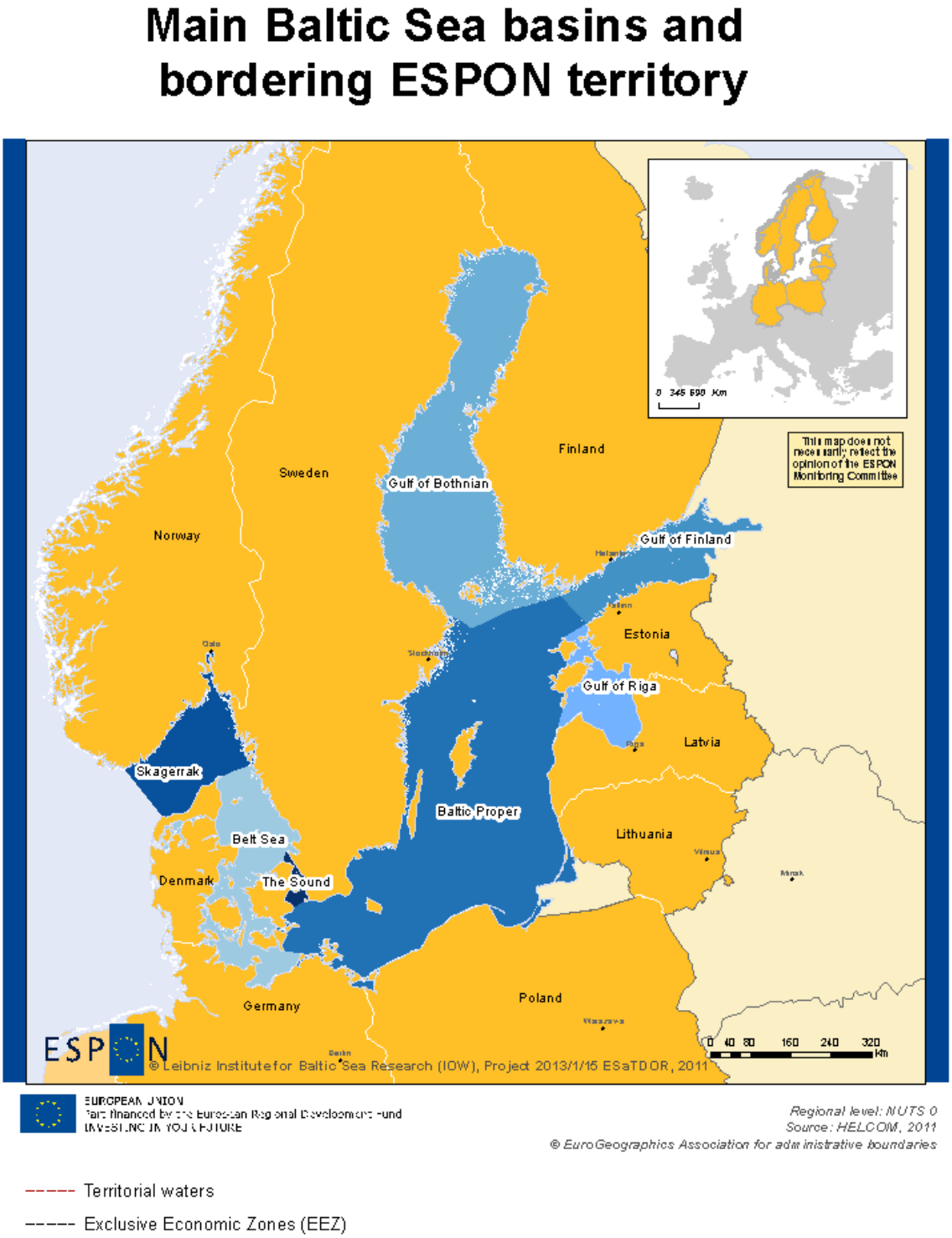
In the Sound: a line joining Stevns Lighthouse (55°17′N 12°27′E / 55.283°N 12.45°E / 55.283; 12.45) and Falsterbo Point (55°23′N 12°49′E / 55.383°N 12.817°E / 55.383; 12.817).

Within the Integrated Marine Policy (IMP) of the European Commission (EC), the border of the Baltic Sea basins is usually drawn on the border to the Kattegat. This means a line between Ebeltoft and Sjællands Odde.

HELCOM again has no clear definition of the Baltic Sea boundaries. On most HELCOM maps the Kattegat is included in the Baltic Sea. On some maps also the Skagerrak is part of the Baltic Sea. The later corresponds of the definition of the Baltic Sea Region as it used by the European Regional Development Fund (ERDF).

For the purposes of this ESPON project we recommend to include the Kattegat into the Baltic Sea definition because of its direct links to water catchments in Denmark and Sweden. This is in accordance with the Baltic Sea drainage border (see Map 8) as it was defined by the Baltic Drainage Basin Project (BDBP). Furthermore we will try to map available information also for the Skagerrak region to get a full picture on spatial issues in the Baltic Sea Region.

Map 8: the Baltic Sea and surrounding territory



Source: ESPON

Baltic Sea – Environment

Eutrophication, or the effects of nutrient enrichments, is perhaps the most significant challenge in the Baltic Sea Region with threats to the marine environment and coastal development. Impacts of eutrophication, among others, are murky water, algae blooms, reduced distribution of benthic habitats or oxygen depletion resulting in the death of fish. Nutrients originate from a variety of activities. Phosphorus originates mainly from point sources (municipalities) while nitrogen mainly originates from diffuse sources (here: agriculture).

Hypoxia or even anoxia can be caused and/or intensified by eutrophication. Partly they are also caused or intensified by the limited inflow of salty oxygen-rich water from the North Sea. Oxygen depletion in the Baltic Sea may be episodic, annually occurring in summer or autumn (common) or persistent (deep basins of the Baltic Sea).

Other environmental issues are the living conditions of marine and freshwater species in the Baltic Sea as well as the limited biodiversity. Furthermore, hazardous substances (heavy metals, chemical substances, persistent organic pollutants) and pumped (chemical) munitions are of concern for the Baltic Sea.

Environment Data Sources:
European Commission, DG Mare *European Atlas of the Seas*
EEA
HELCOM http://maps.helcom.fi/website/mapservice/index.html

Baltic Sea - Economic Use

Agriculture plays an important role in the Baltic Sea Region. Between 60% and 70% of the drainage area in Denmark, Germany and Poland consists of arable land (HELCOM, 2010). In the Baltic States the percentage is 30-40% while only about 10% of the catchment in Sweden, Finland and Russia is arable. Silviculture is of importance in Sweden and Finland. Almost half of the Baltic Sea catchment area is forest (48%).

Fisheries have been in decline in the Baltic Sea since the 1980s. Cod, sprat and salmon are the most important fish stocks in the Baltic Sea for international markets. Other, mostly locally important commercial fishes are pikeperch, pike, perch, vendace, whitefish, burbot and eel (HELCOM, 2010). The interest in aquaculture is increasing in the Baltic Sea. So far marine aquaculture is operated mainly in Finland and Sweden. During the scoping phase only isolated data could be found.

Coastal tourism is of great economic importance in all Baltic Sea states. With respect to climatic conditions mainly the southwestern destinations in Denmark and Germany and partly in Sweden and Poland have developed a complex tourism infrastructure. A rising

number of cruise ships enter and cross the Baltic Sea mainly during the summer season and calling mainly in urban ports.

Data Sources:
HELCOM http://maps.helcom.fi/website/mapservice/index.html

Fisheries:
http://www.eea.europa.eu/data-and-maps/figures/total-catch-in-ices-and-gfcm-fishing-regions-of-europe-in-2006

Baltic Sea - Energy, Cables and Pipelines

Energy production has so far been a minor issue in the Baltic Sea. Currently oil is extracted on only two platforms in Polish and Russian waters. However, offshore wind farms are of increasing importance. Eleven operating wind farms and about 32 planned wind farms show a clear trend. Most of the current large wind farms are operated in the southwestern Baltic Sea. The wind farms will lead to a number of new power cables. Today most of the power cables are linkages between neighbouring countries or between islands and the mainland. Several existing and planned communication cables complete the cable network across the Baltic Sea.

Three gas pipelines are planned (Baltic Gas Interconnector, Baltic Pipe) or under construction (NordStream), connecting existing or new pipelines of the European natural gas network.

Baltic Sea – Transport

With up to 15% of the world's cargo transportation the Baltic Sea is one of the most heavily trafficked seas in the world. Approximately one half of the ships in the Baltic Sea are cargo vessels, 14% are tankers and 11% passenger vessels (in number of 2008, HELCOM, 2010). Maritime traffic is predicted to increase. This is especially true for oil transportation in the eastern part (Gulf of Finland) due to the export of Russian oil. 380,000 ship calls have been counted in the year 2008. Annually there are some 120-140 ship accidents in the Baltic Sea (2008: 288) (HELCOM, 2010).

Transport Data Sources
EUROSTAT:
http://epp.eurostat.ec.europa.eu/tgm/mapToolClosed.do?tab=map&init=1&plugin=1&language=en&pcode=ttr00009&toolbox=types

Baltic Sea Level Governance

For the governance of the Baltic Sea and Baltic Sea Region several tools and bodies have been developed over recent years and decades. The “Convention on the Protection of the Marine Environment of the Baltic Sea Area" – more usually known as the Helsinki Convention – is addressing the protection of the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. The Helsinki Convention has existed in different forms since 1974.

Since 1990 there has been intergovernmental multilateral co-operation between eleven countries of the Baltic Sea Region in spatial planning and development (VASAB – Vision and Strategies around the Baltic Sea 2010). VASAB has published a VASAB long-term perspective (2030) for the territorial development of the Baltic Sea Region (BSR) in 2009 considering Maritime Spatial Planning (MSP) as a core instrument for the development of the BSR. Together with HELCOM (Helsinki Commission, the governing body of the Helsinki Convention) VASAB operates a joint working group on MSP.

The European Commission adopted a Communication on the EU Strategy for the Baltic Sea Region on 10 June 2009 (European Commission, 2009). The Strategy aims at coordinating action by Member States, regions, the EU, pan-Baltic organisations, financing institutions and non-governmental bodies to promote a more balanced development of the Region. The strategy wants to make this part of Europe more:

1. environmentally sustainable,
2. prosperous,
3. accessible and attractive,
4. safe and secure.

About 80 projects have been (co-)financed by the European Union to achieve these goals.

Many further governance initiatives exist in the Baltic Sea Region (listed in table 5), like the Council of the Baltic Sea States (CBSS), the Baltic Sea States Subregional Co-operation (BSSSC), the Union of the Baltic Cities (UBC) and the Agenda 21 for the Baltic Sea Region (Baltic 21). Additionally further conventions have been established for the protection of the Baltic Sea. An example besides the HELCOM Conventions is the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS). And finally most of the international sea conventions apply for the Baltic Sea, like UN Convention of the Law of the Sea (UNCLOS), the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), the International Convention for the Prevention of Pollution from Ships (MARPOL), the EU Bathing Water Directive (BWD), the EU Water Framework Directive (WFD) and the EU Marine Strategy Framework Directive (MSFD).

Table 5: Seas level governance arrangements for the Baltic Sea

Governance Arrangement	Area of Coverage	Focus of activity
Helsinki Convention	Baltic Sea	The Helsinki convention was an important starting point for co-operation in governing the Baltic Sea. Initially focused mainly on eutrophication, pollution and the protection of the marine environment it has developed to a integrative management convention.
VASAB	Baltic Sea Region	VASAB has mainly been focused on spatial development on land but has in the recent years shown a clear interest in Maritime Spatial Planning. VASAB operates a joint working group on MSP in co-operation with HELCOM
EU Baltic Sea Strategy	Baltic Sea Region	Aiming at coordinating action by Member States, regions, the EU, pan-Baltic organisations, financing institutions and non-governmental bodies to promote a more balanced development of the Baltic Sea Region on project basis.
CBSS	Baltic Sea Region	Founded in 1992 the Council of the Baltic Sea States aims for co-operation around the Baltic Sea after the end of the cold war.

Baltic Sea – Conclusions

The Baltic Sea is a unique sea with a variety of special characteristics. A mixture of marine and freshwater species form sensitive ecosystems with a limited biodiversity. At the same time the Baltic Sea is under high pressure not only due to the use of the sea itself but also because of the land use in the bordering countries.

This has been understood by the Baltic Sea states as early as during the cold war. Despite their political and economical differences they agreed on a joint effort for the protection of their common sea more than 35 years ago. This co-operation has achieved a lot in recent decades. But old problems together with new pressures still require joint forces and new management concepts for the successful management of the Baltic Sea.

In general, there is a good status of homogenous statistical information on and around the Baltic Sea. However, as a result of the scoping phase it has to be stated that Baltic Sea wide data on topics like aquaculture, maritime industry and fish processing seems to be insufficient or hard to access.

Baltic Sea References

European Commission (2009) *Communication on the European Union Strategy for the Baltic Sea Region,* COM(2009) 248.
IHO (1953) *Limits of Oceans and Seas, 3rd edition.* [Online]. International Hydrographic Organization. 1953. http://www.iho-ohi.net/iho_pubs/standard/S-23/S23_1953.pdf [Accessed: 14th February 2011]
HELCOM (2007) *HELCOM Baltic Sea Action Plan.* [Online]. November 2007. http://www.helcom.fi/stc/files/BSAP/BSAP_Final.pdf [Accessed: 3rd February 2011]
HELCOM (2010) *Atlas of the Baltic Sea,* Helsinki
Rheinheimer, G. (ed.) (1995) *Meereskunde der Ostssee,* Berlin Heidelberg: Springer

Annex 4: the Black Sea

Introduction

The Black Sea is an inland sea bounded by Europe, Anatolia and the Caucasus and is connected to the Atlantic Ocean via the Mediterranean Sea (see Map 9 below). The Bosphorus strait connects it to the Sea of Marmara, and the strait of the Dardanelles connects it to the Aegean Sea region of the Mediterranean. These waters separate eastern Europe and western Asia. The Black Sea also connects to the Sea of Azov by the Strait of Kerch.

The Black Sea has an area of 436,400 km^2 (168,500 sq mi) (not including the Sea of Azov), a maximum depth of 2,206 m (7,238 ft), and a volume of 547,000 km^3 (131,200 cu mi). The Black Sea forms an east-west trending elliptical depression which lies between Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine. Only 2 neighbouring countries belong to the EU, namely Romania and Bulgaria. The Black Sea is constrained by the Pontic Mountains to the south, the Caucasus Mountains to the east and features a wide shelf to the north-west. The longest east-west extent is about 1,175 km. Important cities along the coast include Batumi, Burgas, Constanţa, Giresun, Hopa, Istanbul, Kerch, Kherson, Mangalia, Năvodari, Novorossiysk, Odessa, Ordu, Poti, Rize, Samsun, Sevastopol, Sochi, Sukhumi, Trabzon, Varna, Yalta and Zonguldak.

Map 9: the Black Sea region

Source: http://www.iapscience.com/img/Black_Sea_map.png

The Black Sea has a positive water balance; that is, a net outflow of water 300 km^3 per year through the Bosphorus and the Dardanelles into the Aegean Sea (part of the Mediterranean 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, leading to a significant anoxic layer well below the surface waters. The Black Sea also receives river water from large Eurasian fluvial systems to the north of the Sea, of which the Don, Dnieper and Danube are the most significant.

The population of the greater Black Sea basin is more than 160 million people.

The eutrophication of the Black Sea due to the excessive loads of nutrients via the rivers and directly from coastal countries has led to radical changes in the ecosystem since the 1960s. This has had a major transboundary impact on biological diversity and human use of the sea, including fisheries and recreation.

Co-operation for the protection of the Black Sea environment takes place in the framework of the Convention on the Protection of the Black Sea against Pollution (Black Sea Convention). The European Union has recently been granted official observer status to the Commission work.

In environmental and health terms, the Danube - Black Sea region suffers from very acute problems. The Danube is subject to pressure from irrigation, industry, fishing, tourism, power generation, navigation and not the least as the final destination of urban wastewater.

These intensive uses have created severe problems of water quality and quantity and drastically reduced biodiversity in the basin. Pollution ending up in the Black Sea and affects a very large area. This is why the EU is striving to make the countries of the region work closer together and is heavily involved in improving the state of environment in the region.

Under the Danube River Protection Convention (DRPC) and the Convention on the Protection of the Black Sea against Pollution (Black Sea Convention), environment programmes have been drawn up defining strategies and identifying hot spots for which investment interventions are needed. The International Commission for the Protection of the Danube River (ICPDR) is implementing the DRPC and the Black Sea Commission is implementing the Black Sea Convention.

In April 2007 the European Commission put forward a Communication from the Commission to the Council and the European Parliament on the Black Sea Synergy - a new regional cooperation initiative. This initiative was set up to complement existing policy and is intended as a flexible framework to ensure greater coherence and policy guidance. Environment is highlighted as one of the sectors where increased regional co-operation will be of added value.

Black Sea Boundaries

The Black Sea is an inland sea with a total coastline of 4.340 Km (without Sea of Azov) bounded by Bulgaria, Romania, Ukraine, Russia, Georgia, and Turkey.

The seabed 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 it is over 200 km wide and has a depth ranging from 0 to 160 meters. 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.

Summary of EEZ Zones in the Black Sea[8]

Bulgaria
Fishing Zone /EEZ
Declared a 200Nm EEZ-Fishing Zone by Decree in 1987

Continental Shelf
In July 1987 by the *Act Governing Ocean Space of Bulgaria*, the limits of the Continental Shelf were to be established by Agreement between states with adjacent or opposite coasts on the Black Sea according to international law.

In December 1997 the *Agreement between the Republic of Turkey and the Republic of Bulgaria on determination of the boundary in the mouth area of the Mutludere/Rezovska River and delimitation of the maritime areas between the two states in the Black Sea* was concluded.

Romania
Fishing Zone/EEZ
Decree No. 142 of 25 April 1986 of the Council of State concerning the establishment of the Exclusive Economic Zone of Romania in the Black Sea established a 200Nm EEZ.

Ukraine
Fishing Zone/EEZ
The Law of the Ukraine on the exclusive economic zone, from 1995 established an EEZ of a maximum breadth of 200Nm.

Continental Shelf
The Ukraine confirmed to Turkey in 1994 its agreement to the former 1978 Continental Shelf Agreement.

Russian Federation
Fishing Zone/EEZ
A Decree issued in March 1984 established a 200Nm EEZ. The USSR Council of Ministers had approved a list of geographical co-ordinates defining the position of baselines for measuring the

[8] http://www.blacksea-commission.org/

breadth of the TS, the EEZ and the CS in the USSR for the Baltic Sea and the Black Sea and Arctic Ocean. The 1998 Federal Act on the exclusive economic zone of the Russian Federation reiterated the 200-nm breadth of the EEZ.

Continental Shelf

Under a Decree from 1968 the USSR declared a continental shelf beyond its territorial sea to a depth of 200 meters, or beyond that limit, to where the depth of the superadjacent waters admits of the exploitation of the natural resources of the said areas. In addition, the seabed and the subsoil of depression entirely surrounded by the CS of the USSR irrespective of their depth were made part of the Soviet continental shelf.

The Decree also provided that where the boundary of the CS of the USSR was adjacent to those of other States, that the boundary was to be determined by agreement. But in the absence of an agreement and unless special circumstances were justified. For States opposite to the USSR and those contiguous the law provided for the equidistant median line to be measured from the baselines of the USSR and the other States. The Federal Law on the Continental Shelf of the Russian Federation, adopted by the State Duma in 1995 established a 200Nm continental shelf.

Georgia
In 1973 Turkey and the USSR defined the territorial sea ratified by the USSR in 1974 and Turkey in 1982). The Protocol between Turkey and USSR concerning the Establishment of the Maritime Boundary were confirmed by Georgia in 1986.

Turkey
Fishing Zone /EEZ
By Decree of the Council of Ministers Turkey declared a 200Nm EEZ in the Black Sea. Turkey and the USSR in 1987 established the EEZ as delimited by the Turkish Decree. They also confirmed that the border of EEZ would constitute the same boundary as was agreed to by Turkey and USSR for the continental shelf by the Agreement dated 23 June 1978.

Continental Shelf
Turkey and the USSR concluded concerning the delimitation of the Continental Shelf in the Black Sea in 1978 and agreed upon coordinates for a continental shelf in the Black Sea between the two States.

Black Sea - Environment

During the last few decades eutrophication has been identified as a key ecological problem for the coastal Black Sea regions and especially for its northwestern part where strong anthropogenic nutrient and pollution loads have resulted in dramatic alterations in chemical and biological regimes.

In addition to eutrophication, other high priority transboundary ecological problems are the decline in living resources (mostly fish stocks), chemical pollution, biodiversity change, habitat destruction, alien species invasions, climate-change impacts, and mesoscale variability of the circulation system.

The Commission on the Protection of the Black Sea Against Pollution (the Black Sea Commission) established in implementation of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), its Protocols and the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea (latest version adopted in 2009).

The recent state of eutrophication in coastal and shelf waters is assessed in terms of nutrient enrichment levels, limiting nutrients in different water regimes, chlorophyll and dissolved oxygen concentrations.

The contribution of chemical pollution has been evaluated, and followed by an assessment of the pelagic and benthic systems and marine living resources. The assessment mainly focuses on the western coastal zone that has been subject to worst environmental degradation with respect to other coastal regions, and this is compared with the interior basin wherever appropriate. Modulation of the ecosystem properties by climate-induced changes is also highlighted.

There is a tendency of improvement and rehabilitation of coastal ecosystems of the Black Sea after 1995 under constraints for the implementation of environment policies and restructured economic activities. Trends of improvement are visible both for water quality parameters and structural and functional properties of biota, when compared with conditions observed from the mid 1970s to the early 1990s.

On the other hand, oil pollution still appears to be an ongoing concern along major shipping routes and in coastal areas around river mouths, sewerage outfalls, industrial installations and ports. There is no evidence of significant heavy metal, pesticides and other persistent organic pollutants (such as polychlorinated biphenyls, PCBs, or polyaromatic hydrocarbons, PAHs) in surface waters although elevated levels of these substances in hotspots around industrial centres and ports suggest the need for their continuous monitoring.

Following the 1986 Chernobyl accident, the present level of radioactivity does not pose a health hazard to humans and environment but it is important to monitor its changes. Bottom sediments in many coastal regions around the sea continue to possess high levels of TPHs, DDT and HCH pollutions without any major reduction over the last 10 years. Nevertheless, conditions gradually progress to the south along the western coast and to the east away from the source region of the pollution and eutrophication.

The pelagic ecosystem of western Black Sea coastal waters has improved noticeably due to weakening of anthropogenic pressures. It is inferred by reduced nutrient inputs and fewer algal blooms, lower algal biomass, recovery of some algal populations, increasing plankton biodiversity, decreasing opportunistic and gelatinous pressures, and re-appearance of some native fodder zooplankton and fish species and increasing edible zooplankton biomass. The current relatively low nutrient inputs, especially phosphorus, are mainly attributed to the economic recession after the collapse of the former Soviet Union.

The phosphorus limitation prevails most notably along the coastal zone whereas the nitrogen limitation dominates within the outer shelf and deep basin. The climatic warming during the 1990s and the early 2000s also played an important role for the limitation of primary production. Its relative contribution to the overall improvement of the pelagic system of the western coastal and shelf waters remains to be substantiated by modelling studies. A switch to the cold climatic conditions in the future (as in the 1980s) may promote more intense phytoplankton production and thus disturb the present quasi-stable pelagic ecosystem structure.

The prominent changes were encountered in the structure of benthic communities of the Romanian and Ukrainian coastal waters.

Black Sea Environment Databases

Black Sea Commission
http://www.blacksea-commission.org
EEA Statistics*:* http://www.eea.europa.eu/data-and-maps
EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html
World Bank Data. Little Green Data Book
http://siteresources.worldbank.org/INTEEI/936214-1146251511077/22180399/LGDB2009.pdf
http://data.worldbank.org/

Black Sea - Economic Use

Fishing

The EU fisheries ministers political agreement on fixing for 2011 established the fishing opportunities for certain fish stocks applicable in the Black Sea, including a reduction of 10% in the EU total allowable catches (TACs) in the Black Sea for turbot and sprat.

In addition, it was agreed that regional cooperation on fishing in the Black Sea should be established to promote sustainable stock management. They also invited the Commission to propose the establishment of minimum landing and mesh sizes for the turbot fishery in the Black Sea, while underlining that the TAC levels established for 2011 have been set at a level taking into account the continuous application of national provisions existing in Bulgaria and Romania in this regard.

Tourism

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.
In the last ten years the most popular European coastal destinations, namely the Mediterranean regions, have been mirrored by the regions bordering on the Black Sea.

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 Bulgaria the number of establishments increased at an average rate of +13.7% each year in the period 2000-2005. Although the sea resorts along the coastline is the result of tourist development over the last decade, big hotels, motels and tourist properties in Varna and Bourgas have been tourist destinations since early times. With its port, Varna is the centre of the North Black Sea coastline, and is noted for its cultural heritage, while Bourgas is one of the most important industrial centres in the country.

Romania, another emerging Eastern European tourism destination, recorded a positive trend. In Romania, the absence of tides and currents, combined with the medium latitude, the low altitude and the eastern exposure of the coast, results in a long tourism season, with over 14 hours of sunshine a day at the height of summer, 24-25 sunny days a month in the summer, and water temperatures between 23° and 26°C in July and August.

The gateway to all the coastal destinations is the city of Constanta, the main Romanian port. The tourism model characterising this European coastal area is similar to that of Bulgaria. Apart from the modern facilities offered by the seaside resorts, tourists can visit many historical sites, ancient monuments and traditional villages preserving their cultural heritage. The Romanian coastal region of Sud-Est is also famous for its vineyards and its spas, especially in Eforie Nord and Mangalia where there are specialized mud-baths.

Most accommodation is in medium to large-sized hotels. Conversely, the average size of other collective establishments is lower and their number has been reducing in recent years. Besides bathing tourism, cultural tourism has been developed based on Greek remains of the 7th century BC. Health tourism is an increasing target market, thanks to the good reputation of the Black Sea for curing joint ailments and the development of spas specialising in mud baths and internationally famous treatments.

Cruise tourism in the Black Sea region represents 1% of cruise tourism in the European Union.

Black Sea Economic Use Databases

FISHSTAT. Food and Agriculture Organization (FAO)
http://www.fao.org/fishery/statistics/software/fishstat/en
FAOSTAT. Food and Agriculture Organization (FAO)
http://www.fao.org/corp/statistics/en/
World Travel and Tourism Council
http://www.wttc.org/eng/Tourism_Research/Economic_Data_Search_Tool/
World Tourrism Organisation
http://www.unwto.org/facts/menu.html
EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html
World Bank Data
http://data.worldbank.org/
International Monetary Fund Data and Statistics
http://www.imf.org/external/data.htm

Black Sea – Energy

Each country in the Black Sea Region 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.

In November 2006 the 2nd Energy Ministerial Conference was held under the Baku Initiative28 sponsored by the European Commission, and a new Energy Road Map was agreed which set a long-term plan. 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 Black Sea region has made good progress in mobilising existing instruments and resources. The Republic of Moldova, Turkey and Ukraine have confirmed their intention to engage in formal negotiations to join the Energy Community Treaty, which provides for the implementation of the Community *acquis* in the electricity and gas sectors. Georgia was accepted as an observer in December 2007. Concerning energy infrastructure, the Commission has sponsored a feasibility study on a Trans-Caspian-Black Sea Gas Corridor which is examining all the transportation options (pipeline and non-pipeline).

Cables and Pipelines

The current capacity of the main oil pipelines carrying crude oil to Black Sea ports is in the region of 1.7 million bpd. This equates to around 82 million tonnes per annum. If all current expansion plans to pipelines feeding Black Sea ports go ahead, this will lead to an increase in capacity of 55 per cent. An increase in the capacity of pipelines feeding Black Sea load ports will have a corresponding impact on the number of tankers transiting the Bosporus.

The Brody – Odessa pipeline was originally designed to deliver Caspian oil to Poland. The flow of the pipeline has been reversed to deliver Russian oil to Odessa for export through the Bosporus. There are plans to extend the pipeline to Plock in Poland (and thence to Gdansk) and reverse its flow once again.

If all proposed new pipeline developments take place and all pipelines operate to maximum capacity, throughputs will increase from 3.15 million bpd to 8.7 million bpd. The Pan European Oil Pipeline, from Constantza in Romania to Trieste in Italy, will result in no net increase in ships as it will feed directly into the West European pipeline network at Trieste. The net increase in capacity requiring shipment by sea would, therefore, be 3.75 million bpd at maximum operational capacity.

Energy, Cables and Pipelines Databases

BP Statistical Review of World Energy, BP 2010.
http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622
DG ENERGY Statistics
http://ec.europa.eu/energy/publications/statistics/statistics_en.htm
EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_production_and_imports
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
US Energy Information Administration. Independent Statistics and Analysis. Country Briefs.
http://www.eia.doe.gov/cabs/index.html
IEA Statistics
http://www.iea.org/stats/index.asp
http://epp.eurostat.ec.europa.eu/portal/page/portal/medstat/introduction/
SESRTCIC. Statistical Economic and Social Research and training centre for Islamic Countries. *Statistical Yearbook for Islamic Coutries. 2008,* 2009
World Pipelines maps
http://www.theodora.com/pipelines/world_oil_gas_and_products_pipelines.html
OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html
World Bank Data
http://data.worldbank.org/

Black Sea – Transport

The Black Sea is a complex geopolitical area connecting two continents and a large number of countries. In this area, the trade and transport of strategic Oil and Gas supplies is central, the European Union's Black Sea coast is long and deploys a number of Sea ports and Sea-River ports and Canals in the territories of the Member states Bulgaria (Varna and Bourgas) and Romania (Constanza and Galati).

The larger port in the Black Sea is Constanza and it serves hinterlands in large neighbouring countries such as Russia, Turkey and Ukraine. From Constanza feeding activities cover the whole Black Sea range. Its role will be even more reinforced if navigation along the Danube is improved. The canal Danube-Constanza connects the river to the harbour itself. Presently, it is estimated that Romania receives 1.2 million containers per year, 90% of which have as their destination Romania itself (natural hinterland). Most of the remnant is transhipped to Ukraine in feeder vessels.

Constanza still offers many possibilities of expansion for such different sectors as oil, dry bulk (coal, iron ore, cereals, etc.) and containers. The Romanian authorities wish to enhance the performance of the port, transforming it into a great hub. Plans also exist to add ro-ro and ferry terminals.

Authorities also wish to improve the railways and roads connections, as in Romania the most severe problem is linked with the connection to the hinterland: roads, railways and, of course, the Danube. The Danube represents an enormous comparative advantage to Romania which has 25 inland ports along their 1000 km stretch of Danube.

The Black Sea has strategic links with the Caspian and with the Mediterranean via the Bosporus where crossings are naturally limited in terms of frequency of passage and size of ships, this also determines the potential for further development.

Exports of crude oil from Black Sea ports averaging at over 100 million tonnes a year are expected to continue to rise, resulting in continued seaborne transits via the Bosporus and increased use of eastern Mediterranean ports linked to new pipelines intended to bypass the Bosporus.

Novorossiysk is the main export port in the Black Sea, accounting for 70% of oil loaded at Black Sea ports.

The European Commission has started streamlining the various transport cooperation efforts. It has launched exploratory talks with the countries of the region on extension of the trans-European transport networks.

The Commission has begun to implement the Motorways of the Sea concept in the Black Sea, closely linked to the TRACECA programme. Work has started to extend the

Common Aviation Area to the Black Sea countries, involving improvement of safety oversight and strengthening of the civil aviation authorities.

Black Sea Transport Databases
IMO GISIS – International Maritime Organisation Global Integrated Information System
http://gisis.imo.org/Public/Default.aspx
ESPO Rapid Exchange System
http://www.espo.be/Facts_and_Figures/Statistics.aspx
ITOPTF. International Tanker Owners Pollution Federation Limited. Data&Statistics.
http://www.itopf.com/information-services/data-and-statistics/
DGMOVE Statistics
http://ec.europa.eu/transport/publications/statistics/statistics_en.htm
UNCTADStat. World Merchant Fleet Statistics
http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx
Container Trades Statistics.
http://www.containerstatistics.com
COMEXT
http://epp.eurostat.ec.europa.eu/newxtweb/
EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home
OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html
World Bank Data
http://data.worldbank.org/
United Nations Conference on Trade and Development
http://www.unctad.org/

Sea Level Governance in the Black Sea

In the framework of the recently adopted Integrated Maritime Policy for the European Union the Commission is promoting better cooperation between national authorities responsible for offshore government activities, including in the Western Black Sea region, through the creation of an integrated network of maritime surveillance systems. In this context, it will also look at the possibility of extending such a network to other non-EU Black Sea littoral states.

The Black Sea countries have already established Exclusive Economic Zones and are currently preparing a regional Strategy for Integrated Coastal Zone Management. The Commission will complete a Road Map in order to facilitate the development of maritime spatial planning by the end of 2008.

The Commission established a European Marine Observation and Data Network for all sea basins, including the Black Sea. EU fisheries management measures have been

established in the Council Regulation fixing the fishing opportunities and the conditions relating to certain fish stocks applicable in the Black Sea for 2008.

These measures refer only to Bulgaria and Romania while fisheries management and a comprehensive ecosystems approach needs to involve all countries around the Black Sea. Therefore the Commission has started working on options for establishing regional fisheries management cooperation. The results of this analysis and the concrete proposals will be consulted on with the Member States and the Black Sea coastal states.

Table 6: Governance arrangements for the Black Sea

Governance Arrangement	**Area of Coverage**	**Focus of activity**
Organization of the Black Sea Economic Cooperation	Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey, Ukraine	Multilateral political and economic initiative aimed at fostering interaction and harmony among the Member States, as well as to ensure peace, stability and prosperity encouraging friendly and good-neighbourly relations in the Black Sea region.
Black Sea Euroregion	Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Serbia, Turkey, Ukraine	Platform for co-operation complementary to existing national intergovernmental co-operation initiatives, acting in the limit of regional and municipal competencies.
Black Sea Memorandum of Understanding on Port State Control	Bulgaria, Georgia, Romania, Russia, Turkey, Ukraine	Establishment of Port State Control regime in the Black Sea region.
Black Sea Forum for Dialogue and Partnership	Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Turkey and Ukraine.	The key focus is on the complex interactions between the decision-makers, especially outside the government field, under no pressure of reaching a political consensus among all member states. The Forum encourages regional initiatives and communication among both stakeholders, and the state and private partners.

Table 6 Continued: Governance arrangements for the Black Sea

Governance Arrangement	Area of Coverage	Focus of activity
The Commission on the Protection of the Black Sea Against Pollution	Black Sea countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine)	Implements the provisions of the Convention and the Black Sea Strategic Action Plan. There are seven BSC Advisory Groups which provide their expertise and information support to the Commission and Secretariat on following sectors: (a) pollution monitoring and assessment (PMA); (b) control of pollution from land based sources (LBS); (c) development of common methodologies for integrated coastal zone management (ICZM); (d) environmental safety aspects of shipping (ESAS); (e) conservation of biological diversity (CBD); (f) environmental aspects of the management of fisheries and other marine living resources (FOMLR); and (g) information and data exchange (IDE).
Black Sea Regional Energy Centre (BSREC)	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, i.e. Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey and Ukraine. Since 1999, the Former Yugoslav Republic of Macedonia, and since 2001, Serbia have become members of the BSREC as well.	The Black Sea Regional Energy Centre acts as a focal point for energy related activities, aimed at developing of co-operation between the Black Sea region countries and the EU in the energy field. Apart from its international activities, the BSREC is actively involved in the Bulgarian energy issues, acting as a Bulgarian energy society.
Black Sea Global Ocean Observing System	Bulgaria, Georgia, Romania, Russia, Turkey and Ukraine.	Foster operational oceanography in the Black Sea basin. To collaborate with and to maximise the benefits from the existing activities of the EuroGOOS and the Med-GOOS, promoting the integration of these activities within the framework of the GOOS.

Black Sea – Conclusions

The Black Sea represents an interesting challenge for transnational governance as many of the Black Sea states are non-EU countries, however existing arrangements such as the Commission on the Protection of the Black Sea Against Pollution and newer arrangements such as Black Sea Synergy provide a good basis for further cooperation.
In terms of data availability, European Union sources such as EUROSTAT provide useful information for Romania and Bulgaria, however more specific regional datasets covering the whole Black Sea region need to be further investigated.

Annex 5: the Mediterranean Sea

Introduction

The Mediterranean Sea has 46,000km of coastline, covering three different continents – Europe, Asia and Africa. Only 7 neighbouring countries belong to the EU, namely Spain, France, Italy, Slovenia, Greece, Malta and Cyprus.

Generally shallower in the northern areas, the Mediterranean has an overall average depth of about 1500m. The deepest point in the Mediterranean is 5267m at a point known as the Calypso Deep in the Ionian Sea. The Eastern Basin ranges 4000m to 5000m in depth, while the Western Basin ranges between 2500m and 3500m. The Mediterranean Sea covers an area of 2.7 million km², six times larger than the Black Sea and seven times larger than the Baltic Sea. It extends for 3.860km, from the Strait of Gibraltar on the west to the entrances to the Dardanelles and the Suez Channel on the East, while the north-south dimension of the Mediterranean Sea at its widest is 1600km, being on average about 800km.

Due to its condition as a semi-enclosed sea, its waters are renewed only every 70 years. The Strait of Gibraltar is the only natural connection point of the sea, linking to the Atlantic Ocean. This direct linkage creates certain unique flow and wave patterns, created due to the interaction of various regional and global evaporative forces, tidal forces, and wind forces. According to *Nature*[9], the Mediterranean Sea would have filled 90% of its volume in a major flood event 5 million years ago during a time period of time lasting less than two years, poured in from the Atlantic Ocean. In fact, the Mediterranean Sea has had a peculiar geological history, such as having been a closed sea, having almost dried, or having had tropical climate. These changes have implied drastic variations in the Sea level and its salinity.

The current environmental status and development patterns of the Mediterranean are highly contrasted. As a zone of exchange and of fracture at the same time, the region is still in search of stability. The level of wealth disparities in the Mediterranean areas is very important. While EU countries in the northern rim have GDP per capita levels ranging from $20.000 to $40.000, countries in the southern rim are in most cases 10 times lower. These substantial differences are a source of important migration fluxes from the South to the North, especially in the last 15 years, mostly in Gibraltar and Sicily. In Spain, there are currently 5.7 million foreign residents, and almost 14% of them are originally from Morocco. In France, there are 4.9 million inhabitants born abroad, 1.5 million in the Maghreb – many of them currently have French nationality. In Italy, there are 4.5 million foreign residents, almost 15% originally from the Maghreb, mostly from Morocco and Tunisia.

[9] *Nature 462, 778-781 (10 December 2009) Catastrophic flood of the Mediterranean after the Messinian salinity crisis. D. Garcia-Castellanos, F. Estrada, I. Jiménez-Munt, C. Gorini, M. Fernàndez, J. Vergés & R. De Vicente1*

In the light of existing shared concerns there have been attempts to increase cooperation among countries in the Mediterranean region, particularly since 1995's Euromediterranean Conference of Foreign Affairs Ministers in Barcelona, which marked the start of the Euromediterranean Partnership. Representing 39 governments (including EU27's) and over 700 million people, the Partnership has been intended as a framework for engagement and development, for political, economic, and social relations, dialogue and regional co-operation. Initiatives such as the MEDA co-operation programmes with the EU - involving a budget of nearly 9.000 million euros, and a similar amount in EIB loans for supporting the private sector and for a variety of infrastructure projects have taken place. Steps have also been taken towards creating a Euro-Mediterranean Free Trade Area (EMFTA).

In 2008 the Union for the Mediterranean was launched to build on the Barcelona Declaration of 1995, promoting its goals and reinforcing the acquis of the Barcelona Process by upgrading their relations, incorporating more co-ownership in their multilateral cooperation framework, strengthening equal footing governance and translate it into concrete projects, thus delivering concrete benefits for the citizens of the region.

Sea Boundaries

The Mediterranean Sea is an intercontinental sea situated between Europe to the north, Africa to the south, and Asia to the east. With some 46.000km of coastline, it contains two major basins, the eastern and the western, separated by the Sicily Channel (430m sill depth) and the Strait of Messina (80m sill depth).

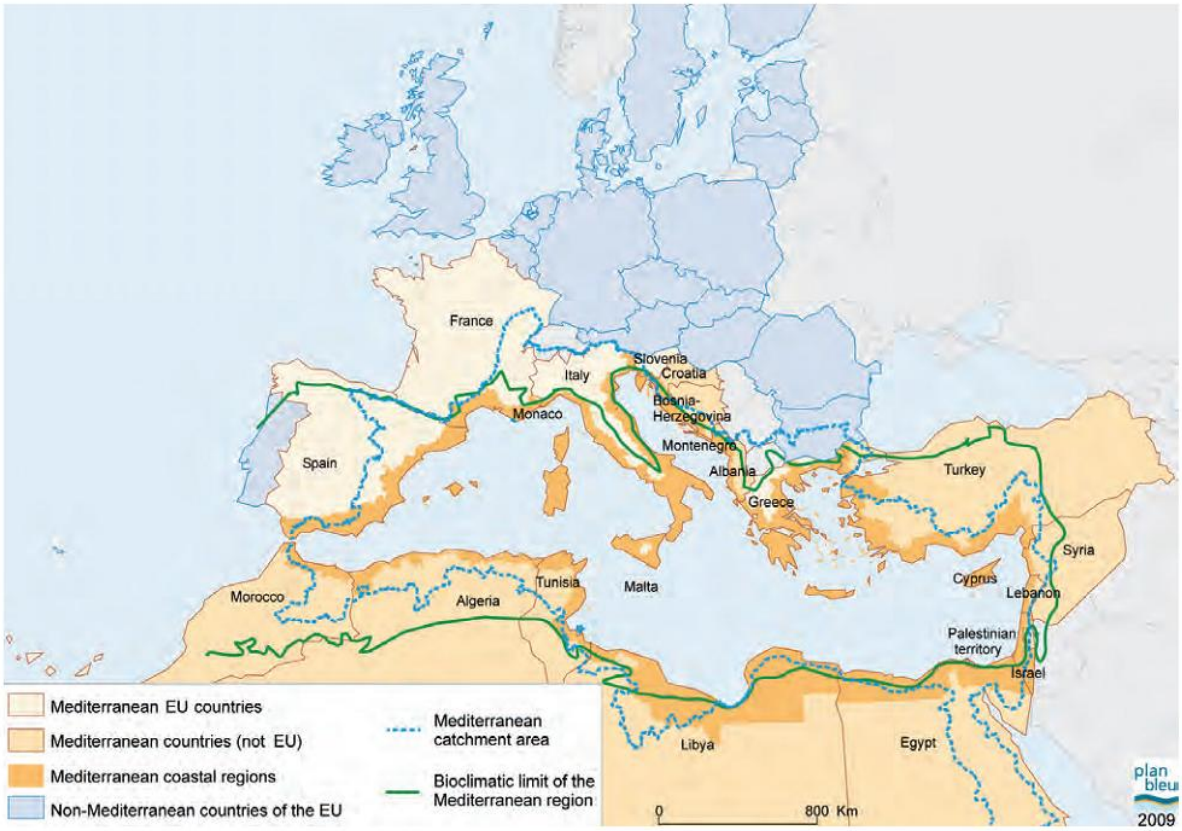
The major sub-basins include a number of regional seas. The Eastern Basin includes the Aegean Sea, Ionian Sea and Leventine Sea, while the Western Basin includes the Alboran Sea, Balearic Sea, Ligurian Sea and the Tyrrhenian Sea. In addition, the Adriatic Sea is separated from the Eastern Basin by the Strait of Otranto (800m sill depth).

The Mediterranean Sea covers three different continents –Europe, Asia and Africa- and hosting 21 neighbouring countries along its coastline (see Map 10). Out of these 21 countries, only 7 belong to the EU, namely Spain, France, Italy, Slovenia, Greece, Malta and Cyprus. The other riparian countries are Morocco, Algeria, Tunisia, Libya and Egypt in Africa; Egypt, Israel, Lebanon, Syria and Turkey in Asia; and Turkey, Albania, Montenegro, Bosnia and Herzegovina, Croatia and Monaco in Europe. Most non EU member countries in Europe have applied for accession to the Union.

A large part of the sea is under the high-sea regime due to the partial or non-declaration of Exclusive Economic Zones.

In biogeography, the “Mediterranean Basin” also refers to the lands around the Mediterranean Sea that have a Mediterranean climate, with mild, rainy winters and hot, dry summers, which supports characteristic Mediterranean forests, woodlands, and scrub vegetation. This category would also include Portugal which in fact is only limited by the Atlantic Ocean.

Map 10: the Mediterranean Sea region



Source: UNEP/MAP-Plan Bleu: State of the Environment and Development in the Mediterranean, 2009.

Mediterranean - Environment

The Mediterranean region shares a unique climate and natural and cultural heritage among the 21 riparian countries and territories where environmental and development issues are particularly acute.

The Mediterranean Sea is home to 8% of all known marine *species* even if only representing 0.8% of the planet's ocean surface accordingly. Its 22,500 endemic vascular plant species are more than four times the number found in all the rest of Europe according to Conservation International. Diversity is essentially concentrated in the West of the basin and in shallow depths. According to Plan Bleu, Mediterranean natural land ecosystems are also substantially richer in diversity than most European areas. Reforestation in the Northern Mediterranean countries is taking place with the abandonment of marginal zones while in the South ecosystems are still mostly exposed to human pressures.

The Mediterranean basin is more threatened by *climate change* than most other regions of the world, especially the Southern and Eastern rim. Climate change effects are already visible in the region: in the Spanish Peninsula and the south of France, with mean temperatures having risen by nearly 2°C since the 1970s according to Plan Bleu. Temperatures have also increased in the Maghreb, although in a difficult to quantify magnitude due to incomplete information. Rainfall has dropped by 20% in several Southern European regions, and could continue to fall during the 21st century up to an additional 35% by 2700 according to the EU Water Initiative report *Water Scarcity and Drought*.

Water availability shortages are a threat in most regions in the Basin. 180 million inhabitants live with less than 1.000m3 per year per capita (average water consumption per inhabitant in Spain is estimated on 2.725m3 per year and per capita in 2008, according to CEDEX). Water deficits are striking especially hard in Southern and Eastern Mediterranean countries. Non-conventional water resources such as reuse of wastewater, desalination and other technical developments to increase exploitable potential of water resources (i.e. reloading of underground water in Tunisia) are being exploited already but costs are very important, especially energy inputs and byproducts (i.e. 4kWh are necessary for desalinating 1m3 of water in Barcelona's 2009 constructed water desalination facility according to its manager, resulting in approximately 1.5kg CO_2 / m³).

All countries in the Mediterranean are affected by *desertification* and land degradation in some degrees according to the Secretariat of United Nations Convention to Combat Desertification (UNCCD). The main problems of the Mediterranean soils are irreversible losses due in particular to increasing soil sealing and soil erosion, which will continue and probably increase as a result of climate change, land-use changes and other human activities. According to tentative estimates, at the present rates of erosion, considerable areas in the Mediterranean currently not at risk may reach a state of ultimate physical degradation, beyond a point of no return within 50-75 years according to UNCCD.

Waste is responsible for the greatest pressures on the environment. Closely correlated with economic growth and in particular with consumption patterns and production trends, the quantity of waste generated has steadily increased. In the Northern Mediterranean Countries, the yearly volume of waste production increased by 19% over the period 2000-2005 versus a growth of only 1.9 % in GDP over the same period. In the Southern and Eastern rims the situation is comparable. Although the organic fraction of waste is diminishing, the fraction of high calorific value waste is growing strongly to the increased amount of packaging.

Mediterranean - Environment Databases

Plan Bleu Datasets: http://www.planbleu.org/indexUK.html

SIMEDD. Mediterranean Information System on Environment and Development

http://www.planbleu.org/methodologie/Simedd_Uk.html

SEMIDE-EMWIS. Euro-Mediterranean Information System on know-how in the Water Sector.
www.semide.net

EEA Statistics*:* http://www.eea.europa.eu/data-and-maps

EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home

MEDSTAT. The regional statistical co-operation programme between: the 27 EU Member States and 10 Mediterranean countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, occupied Palestinian territory, Syria, Tunisia and Turkey. http://epp.eurostat.ec.europa.eu/portal/page/portal/medstat/introduction/

OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html

World Bank Data. Little Green Data Book
http://siteresources.worldbank.org/INTEEI/936214-1146251511077/22180399/LGDB2009.pdf
http://data.worldbank.org/

Mediterranean - Economic Use

Fishing in the Mediterranean is characterized by its biodiversity which allows the development of region-specific fauna and fisheries. Production is essentially concentrated on the continental shelf and capture fishing on the coasts. In the Mediterranean, yearly volumes are limited, around 1.6 million tons/year, but very intensive in the regional context. According to FAO a strong demand over limited resources, poor governance and failure of institutions and policies in most countries are elements of the unsustainability of fishing activity in the Mediterranean.

As regards to *aquaculture*, large differences exist between Mediterranean countries. While representing some 27% of total production in the EU countries, aquaculture already represents 60% and even 84% respectively in countries such as Egypt or Israel. According to Ciheam, while Israel bases its development on high intensive production systems requiring large investments, Egypt is working on semi-intensive systems intended to satisfy national consumption. On the other hand, countries such as Algeria, Portugal, Morocco or Tunisia have very low proportions of aquaculture, either due to high fishery catches or to low levels of investment (Franquesa, Oliver, Basurco 2008).

Tourism is an essential economic activity in all riparian countries of the Mediterranean. At the crossroads between 3 continents, the countries attract 30% of the world's international tourism according to the World Tourism Organization; in 2007 alone, they attracted close to 275 million international visitors. As a source of employment and foreign currencies, international tourism contributes to the growth of national economies. However, the economy of highly specialized destinations where tourism is the prevalent economic sector is highly vulnerable to downturns in tourism activity. The seasonal and spatial concentration of tourist activities strongly amplifies their impacts on the environment, generating pressures on water resources and natural environments, mostly due to coastal construction, and increasing waste production.

Mediterranean - Economic Use Databases

CIHEAM. International Centre for Advanced Mediterranean Agronomic Studies.
http://www.ciheam.org/index.php/en/observatory/indicators

FISHSTAT. Food and Agriculture Organization (FAO)
http://www.fao.org/fishery/statistics/software/fishstat/en

General Fisheries Commission for the Mediterranean (FAO)
http://www.gfcm.org/gfcm/topic/16103/en

FAOSTAT. Food and Agriculture Organization (FAO)
http://www.fao.org/corp/statistics/en/

World Travel and Tourism Council
http://www.wttc.org/eng/Tourism_Research/Economic_Data_Search_Tool/

Plan Bleu Datasets
http://www.planbleu.org/indexUK.html

SIMEDD. Mediterranean Information System on Environment and Development
http://www.planbleu.org/methodologie/Simedd_Uk.html

EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home

MEDSTAT. The regional statistical co-operation programme between: the 27 EU Member States and 10 Mediterranean countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, occupied Palestinian territory, Syria, Tunisia and Turkey.
http://epp.eurostat.ec.europa.eu/portal/page/portal/medstat/introduction/

SESRIC. Statistical Economic and Social Research and training centre for Islamic Countries. *Statistical Yearbook for Islamic Coutries. 2008,* 2009
OECD. Statsportal.
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html

World Bank Data :http://data.worldbank.org/

International Monetary Fund Data and Statistics
http://www.imf.org/external/data.htm

Mediterranean - Energy

Energy resources in the Mediterranean are essentially composed of oil and gas, some 5% of the world's reserves concentrated in the southern rim. In 2006, fossil energy (gas, oil, coal) accounted for 80% of the energy supply in all Mediterranean countries, and up to 94% in Southern and Eastern Mediterranean countries. The share of natural gas and nuclear energy has grown steadily since the 1970s, while the share of oil has dropped to currently 43% from 68% in 1971. Despite the considerable potential in renewable energy and the spectacular growth in windmill-produced electricity, reaching 21 GW in 2007 compared to 3 GW in 2000, these forms of energy only still represent 6% of the regional energy balance.

Total energy demand is marked by the growth of demand in electricity, at a much faster pace than GDP, of primary energy consumption and of demographics, particularly in the Southern and Eastern Mediterranean Countries: a fourfold increase in total demand and multiplication by a factor of 14 in electricity consumption since 1971.

Four countries are major producers of hydrocarbons in the Mediterranean: Algeria, Libya, Egypt, and Syria. They account for 22% of oil and 35% of gas imports throughout

the Basin in 2005. All the other countries in the region are net energy importers. According to *BP statistical review of energy 2010*, Libya of 44.300 million barrels, Algeria had a proved oil reserve of 12.200 million barrels in 2008, Egypt of 4.200 million barrels, and Syria of 2.500 million barrels. Italy reports a 1.000 million barrels reserve. They all had globally larger proved reserves in 2008 than in 1999. Proved reserves for gas were of 4.50 trillion cubic meters for Algeria, 2.15 for Egypt, 1.54 for Libya, 0.28 for Syria and a symbolic 0.06 for Italy.

In the Northern Mediterranean countries, final demand per sector shows that transport has recorded the strongest rise in consumption in 30 years, posting 35% in 2005. In the Southern and Eastern Mediterranean countries, consumption has increased in all sectors, and is highest in the industrial and residential sectors.

Along with the growing awareness of the importance and interest of energy efficiency, it can be globally observed that since 1980, the Northern Mediterranean Countries show a reduction in energy intensity, pointing to cumulative savings of 1.300 Mtoe over the period 1980-2006. In the South, observations show no real evolution in global energy intensity levels, although more rational consumption levels are posted by several Southern and Eastern Mediterranean Countries.

Some studies have proposed the possibility of erecting tidal power generating stations within the strait of Gibraltar, to be powered from the predictable current in the strait. In the 1920s and 1930s, the Atlantropa project proposed damming the strait to generate large amounts of electricity and lower the sea level of the Mediterranean by several hundreds of meters to create large new lands for settlement, but the project has never been activated.

Mediterranean – Energy Databases

BP Statistical Review of World Energy, BP 2010.
http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622

DG ENERGY Statistics
http://ec.europa.eu/energy/publications/statistics/statistics_en.htm

EUROSTAT. Statistical office of the European Union
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_production_and_imports
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home

US Energy Information Administration. Independent Statistics and Analysis. Country Briefs.
http://www.eia.doe.gov/cabs/index.html

IEA Statistics: http://www.iea.org/stats/index.asp

Plan Bleu Datasets: http://www.planbleu.org/indexUK.html

SIMEDD. Mediterranean Information System on Environment and Development http://www.planbleu.org/methodologie/Simedd_Uk.html

MEDSTAT. The regional statistical co-operation programme between: the 27 EU Member States and 10 Mediterranean countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, occupied Palestinian territory, Syria, Tunisia and Turkey. http://epp.eurostat.ec.europa.eu/portal/page/portal/medstat/introduction/

SESRTCIC. Statistical Economic and Social Research and training centre for Islamic Countries. *Statistical Yearbook for Islamic Coutries. 2008,* 2009

OECD. Statsportal.

Mediterranean - Cables and Pipelines

The Trans-Mediterranean pipeline runs from the Hassi R'Mel gas field in Algeria to Sicily, via Tunisia. The pipeline connects with continental Italy and Slovenia. Completed in 1983 and doubled in 1994, the current capacity of pipeline is 30.2 billion cubic meter (bcm) of natural gas per year. There are plans to expand the capacity up to 33.5bcm by 2012.

The Maghreb-Europe Gas pipeline was completed in 1996 and connects Hassi R'Mel via Morocco with Córdoba in Spain, where it ties into the Spanish and Portuguese natural gas transmission networks. The MEG had an initial capacity of the pipeline of 8.6bcm per year, which was later expanded to 12bcm.

Under construction, Medgaz is a new deepwater pipeline over 210km from Beni Saf on the Algerian coast to Almería in Spain. The pipeline will deliver 8bcn per year of natural gas to Spain and the rest of the EU. The Medgaz pipeline is expected to start operating in 2011.

Galsi is responsible for the development, construction and operation of a new pipeline connecting Algeria to Sardinia and Tuscany. The initial capacity will be 8bcm of natural gas per annum, and is expected to become operational in 2014.

Greenstream pipeline is a natural gas submarine pipeline from Libya to Italy. The pipeline runs from Mellitah in Libya to Gela in Sicily. Its initial capacity was of 8bcm of natural gas per year, but it was later increased to 11bcm.

The Arab Gas Pipeline is a natural gas pipeline in the Middle East, with a capacity of 10.3bcm. It exports Egyptian natural gas to Jordan, Syria and Lebanon, with a separate line to Israel. In 2006 an agreement was reached to build the pipeline's extension through Syria to the Turkish border. From there, the pipeline will be connected to the planned Nabucco Pipeline for the delivery of gas to Europe.

The Nabucco pipeline is a proposed natural gas pipeline from Turkey to Austria diversifying natural gas suppliers and delivery routes for Europe. The pipeline attempts to lessen European dependence on Russian energy. If built, the pipeline is expected to be operational by 2015 and it will carry 31bcm of natural gas per year.

The Sumed pipeline is an oil pipeline in Egypt, running from the Ain Sukhna terminal on the Gulf of Suez to offshore Sidi Kerir on the Mediterranean Sea. It provides an alternative to the Suez Canal for transporting oil from the Persian Gulf region to the Mediterranean. It was set in service in 1977. It has a capacity of 2.5 million barrels per day, but in 2009 it only carried 1.1 million. An extension is being considered which would traverse the Red Sea from Ain Sukhna to the Saudi coast near Sharm al Sheikh, and from there to the terminal of Saudi Arabia's main east-west pipeline in Yanbu.

SEA-ME-WE 4 is an optical fibre submarine communications cable system complementary to SEA-ME-WE-3, approximately 18.800km long, and provides the primary Internet backbone between South East Asia, the Indian subcontinent, the Middle East and Europe. It runs under the Mediterranean.

I-ME-WE (India-Middle East-Western Europe) is a 13.000km submarine communications cable system between India and France. The design capacity is 3.84 Terabits per second. It has been operational since 2009.

EIG (Europe India Gateway) is a submarine communications cable system planned to connect the UK, Portugal, Gibraltar, Monaco, France, Libya, Egypt, Saudi Arabia, Djibouti, Oman, United Arab Emirates, and India. It is planned to be capable of delivering up to 3.8 terabits per second. The cable system is scheduled in the second quarter of 2010.

FLAG cable is a 28.000km long submarine communications cable containing optical fibre that connects the United Kingdom to Japan. Its Europe-Asia segment is the fourth longest cable in the world, running from the UK to Spain, lying in the Mediterranean bed and exiting through Egypt towards India.

Mediterranean - Cables and Pipelines Databases
World Pipelines maps
http://www.theodora.com/pipelines/world_oil_gas_and_products_pipelines.html

Plan Bleu Datasets: http://www.planbleu.org/indexUK.html

SIMEDD. Mediterranean Information System on Environment and Development
http://www.planbleu.org/methodologie/Simedd_Uk.html

EUROSTAT.

MEDSTAT. The regional statistical co-operation programme between: the 27 EU Member States and 10 Mediterranean countries: Algeria, Egypt, Israel, Jordan,

Lebanon, Morocco, occupied Palestinian territory, Syria, Tunisia and Turkey. http://epp.eurostat.ec.europa.eu/portal/page/portal/medstat/introduction/

SESRIC. Statistical Economic and Social Research and training centre for Islamic Countries. *Statistical Yearbook for Islamic Coutries. 2008,* 200

OECD. Statsportal.

World Bank Data*:* http://data.worldbank.org/

Mediterranean – Transport

The traffic intensity in the Mediterranean accounts for 30% of total World maritime traffic, with more than 200,000 vessels over 100 tonnes crossing the sea annually, but it is mostly a passing traffic: today only 25% of the Asiatic traffic resulting from globalisation enter Europe through Mediterranean ports while 75% of freight continues through Gibraltar up to Northern European ports. An important share of container business in the Mediterranean is transhipment traffic, with some specialised ports such as Algeciras in Spain (3.3MTEU), Gioia Tauro in Italy (3.7MTEU), Marsaxlokk in Malta (2.3MTEU), and Tanger-Med in Morocco, currently under development. Still, the Mediterranean ports are willing to increase their share in the maritime sector by planning important rail projects intended to enlarge their hinterlands up to central Europe.

Maritime traffic in the 20 major ports of the southern and eastern Mediterranean rims in 2004 represented only 15% of the traffic in the 20 major ports of the EU. Traffic flows are mainly south-north direction and dominated by exports of gas and oil. Flows south-south and south-east account for about one sixth of all south-north trade, and are also composed of 50% oil. Traffic tends to intensify under the pressure of the Turkish economy, the countries of Central Europe and the CIS, and Gulf countries. The strengthening of Turkey as a platform for exchange is thus confirmed particularly with regard to container shipping.

The current situation of transport in the Mediterranean can be characterised in terms of:

- a necessary distinction between domestic transport and international transport, the latter being essentially maritime as land exchanges between neighbouring countries are limited. Seaborne trade between Mediterranean littoral States represents only 18% of the total Mediterranean littoral States' trade,

- international transport in the southern rim takes place mainly with the EU, even if trade with other countries, especially Asian countries grows fast due to globalization,

- there is an insufficient integration of international supply chains with a significant break at ports,

- the development of inland transportation is mostly based on the predominance of road sector and therefore dependent on oil,

- rail transport is very limited and mostly corresponding to urban and peri-urban transport.

According to *Plan Bleu*, economies are finding it difficult to improve transport efficiency: in the Southern and Eastern Mediterranean countries, transport energy intensity is still high but has improved since 1990 (from 69 to 57 tonnes equivalent for 1M€ of GDP between 1990 and 2005), while have remained stable in the northern rim at 33 tonnes equivalent for 1M€ for the last 15 years. There does not seem to be any real decoupling between transport and economic growth. In 2005, the transport sector in the Mediterranean accounted for 20% of total CO_2 emissions and for a little under 2% of global transport-related CO_2 emissions. Emissions in the Southern and Eastern Mediterranean Countries have grown by 65% from 1990 to 2005, and by only 25% in the Northern Mediterranean countries.

The Barcelona process in 1995 led to the establishment of the EuroMed Transport Project. The latter, led by the European Commission has established a Blue Paper and a Regional Action Plan for Transport for the Mediterranean 2007-2013 (PART). This includes priorities to establish an integrated transport system harmonizing procedures, reforming the structures responsible for different transport systems and improving safety and monitoring flows. This is part of the European Neighbourhood Policy.

In general, there is a lack of homogenic statistical information on transport around the Mediterranean. Despite efforts in the framework of MEDSTAT, data availability is still relatively scarce, and centred basically on infrastructure endowment rather than on traffic.

Mediterranean – Transport Databases

DESTIN Project Database 2005

SECEG. *"Informe estadístico 2001. Base de datos Socio-Económicos y de flujos de tráfico Europa-África",* 2002

IMO GISIS – International Maritime Organisation Global Integrated Information System
http://gisis.imo.org/Public/Default.aspx

ESPO Rapid Exchange System
http://www.espo.be/Facts_and_Figures/Statistics.aspx

ITOPTF. International Tanker Owners Pollution Federation Limited. Data&Statistics.
http://www.itopf.com/information-services/data-and-statistics/

DGMOVE Statistics

http://ec.europa.eu/transport/publications/statistics/statistics_en.htm

UNCTADStat. World Merchant Fleet Statistics
http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx

Container Trades Statistics.
http://www.containerstatistics.com

COMEXT
http://epp.eurostat.ec.europa.eu/newxtweb/

SIMEDD. Mediterranean Information System on Environment and Development
http://www.planbleu.org/methodologie/Simedd_Uk.html

EUROSTAT. Statistical office of the European Union

MEDSTAT. The regional statistical co-operation programme between: the 27 EU Member States and 10 Mediterranean countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, occupied Palestinian territory, Syria, Tunisia and Turkey.
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OECD. Statsportal.

World Bank Data

Mediterranean - Sea Level Governance

The key tools for conservation and sustainable use of Mediterranean Sea are regulations on fisheries, aquaculture, maritime traffic, and spatial planning for marine protected areas, fisheries reserves, and restricted zones for all human activities. Table 7 below shows some of the main seas-level governance arrangements for the Mediterranean.

For the coastal areas and its management, governance has been strengthened recently with the new Barcelona Convention Protocol on Integrated Coastal Zone management (ICZM). The governance of the Mediterranean needs to be improved in the open sea given the complexity of the cultural and political situation, according to Center for Mediterranean Cooperation of the IUCN. A large part of the sea is under the high-sea regime due to the partial or non-declaration of Exclusive Economic Zones.

Conservation and sustainable use are the key priorities of numerous partners in the Mediterranean: the Mediterranean Action Plan - UNEP/MAP (Barcelona Convention, Protocols) and its regional activity centres (Special Protected Areas - RAC/SPA, Priority Actions Programme - PAP/RAC, Blue Plan, Marine Pollution Emergency Response -

REMPEC), the General Fisheries Commission for the Mediterranean - GFCM (FAO), the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area - ACCOBAMS, the WWF (Mediterranean Programme Office), and the Network of Managers of Marine Protected Areas in the Mediterranean - MedPAN, as well as relevant international conventions (the Convention on Wetlands-RAMSAR, Convention on Biological Diversity and others).

Table 7: Seas-level governance arrangements for the Mediterranean

Governance Arrangement	**Area of Coverage**	**Focus of activity**
Union for the Mediterranean (2008)	27 EU member states, the European Commission and 16 Mediterranean countries. Foreign Affairs Ministers in Marseille decided that the League of Arab States shall participate in all meetings at all levels of the Union for the Mediterranean.	The Union for the Mediterranean is a multilateral partnership with a view to increasing the potential for regional integration and cohesion among Euro-Mediterranan partners. The Union for the Mediterranean is inspired by the shared political will to revitalize efforts to transform the Mediterranean into an area of peace, democracy, cooperation and prosperity. The creation of a joint secretariat is a key stone in this partnership. The Secretariat will contribute to reinforcing co ownership of new Mediterranean relations and achieving visibility through economic projects.
UNEP Mediterranean Action Plan, MAP (1975, 1995)	The 22 Contracting Parties are: Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, the European Community, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Serbia and Montenegro, Slovenia, Spain, Syria, Tunisia, Turkey.	The main objectives of the MAP were to assist the Mediterranean countries to assess and control marine pollution, to formulate their national environment policies, to improve the ability of governments to identify better options for alternative patterns of development, and to optimize the choices for allocation of resources.
Inter-Mediterranean Commission (IMC) of the CPMR (1973)	IMC has fifty member regions in 10 different countries (Cyprus, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain and Tunisia). Its purpose is to be open to all the different sub-national levels in all Mediterranean countries.	The Inter-Mediterranean Commission (IMC) of the CPMR was created in Andalusia in 1990 to express the shared interests of Mediterranean regions in important European negotiations. The mission of the IMC developed to encompass the issues raised in all the regions bordering the Mediterranean Sea, in particular after the 1995 Barcelona declaration.

Table 7 Continued: Seas level governance, Mediterranean

Governance Arrangement	Area of Coverage	Focus of activity
Mediterranean Sea Basin Programme (2007–2013)	117 regions belonging to 19 different countries are eligible to the Programme. 15 countries have already adhered to the Programme: Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, Morocco, Palestinian Authority, Portugal, Spain, Syria and Tunisia.	The multilateral cross-border cooperation "Mediterranean Sea Basin Programme" is part of the new European Neighbourhood Policy (ENP) and of its financing instrument (ENPI, European Neighbourhood and Partnership Instrument) for the 2007-2013 period: it includes the European Union (EU) and partner countries regions placed along the shores of the Mediterranean Sea. The programme is structured according to four priorities, based on the EU orientations for the cross-border cooperation component of the ENPI: 1) promotion of socio-economic development and enhancement of territories; 2) promotion of environmental sustainability at basin level; 3) promotion of better conditions and modalities for ensuring the mobility of persons, goods and capitals; 4) promotion of cultural dialogue and local governance.
UCN - Centre for Mediterranean Cooperation IUCN-Med (1994)	The IUCN-Med's members include government agencies and conservation organizations from: Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Italy, Jordan, Lebanon, Monaco, Montenegro, Morocco, Portugal, Slovenia, Serbia, Spain, Syrian Arab Republic, Tunisia, Turkey, United Kingdom	The objectives, which reflect the significant areas of work that the IUCN Centre for Mediterranean Cooperation will fulfil in order to achieve its goal, are making knowledge, information and experience available regarding the conservation and management of Mediterranean biodiversity and natural resources for sustainable-use and rehabilitation efforts; strengthening and supporting IUCN members and Commissions in the region to mainstream social, economic and environmental dimensions in policy-making, management, and the conservation of biodiversity and natural resources and promoting, both globally and regionally, Mediterranean policies on conservation and sustainable development, and supporting mechanisms for their implementation.
Institutional and Economic Instruments for Sustainable Water Management in the Meditteranean Region Project (6th framework programme)	The INECO members include government agencies and instituitons from: Greece, France, Italy, Cyprus, Tunisia, Egypt, Lebanon, Syria, Algeria and Morocco:	INECO is a Coordination Action Project supported by the European Commission (6th Framework Programme), and addressing the Specific Measures in Support of International Cooperation (INCO Programme) - Mediterranean Partner Countries (MPC) Thematic Priority. The objective of INECO is to establish a Mediterranean network of research institutes, public authorities and stakeholders for promoting common research and analysing decision making practices on the application of institutional instruments in the water sector.

Mediterranean Sub-Sea Governance

There are many governance agreements at a sub-sea level, with several states participating, and addressed to different subjects of work, such as transport, environment, spatial development, fisheries, immigration. The next table (Table 8) provides only a small set of such agreements on different sectors.

Table 8: Sub-seas governance arrangements for the Mediterranean

Governance Arrangement	**Area of Coverage**	**Focus of activity**
Arab Maghreb Union (1989)	Morocco, Algeria, Tunisia, Libya and Egypt	The Arab Maghreb Union is a Pan-Arab trade agreement aiming for economic and political unity in North Africa. The idea for an economic union of the Maghreb began with the independence of Tunisia and Morocco in 1956, but only in 1989, the agreement was formally signed by all member nations. Strategic relevance of the region is based on the fact that, collectively, it boasts large phosphate, oil, and gas and it is a transit centre to southern Europe.
Euro-Mediterranean free trade area (1995)	EU and several partners in the Mediterranean	Based on the Barcelona Process and the European Neighbourhood Policy, it is intended to constitute a free trade area in the Mediterranean. There are currently free trade agreements with Algeria (2005), Egypt (2004), Israel (2000), Jordan (2002), Lebanon (2006), Morocco (2000), Palestinian Authority (1997), Tunisia (1998) and Turkey (1996).
MEDGovernance programme 2007-2013	Six regions of Italy, Spain and France (Andalusia, Catalonia, PACA, Piedmont, Lazio, Tuscany)	The MEDGOVERNANCE project was implemented in the framework of the MED interregional cooperation programme, gathering together 6 regions (Andalusia, Catalonia, PACA, Piedmont, Lazio, Tuscany) with their respective research and training institutes. The project started in 2009 with a diagnosis phase analyzing the governance framework for the preparation and the implementation of major policies affecting the Mediterranean region in five policy fields: transportation; competitiveness and innovation; environment; culture; and migration. For each of these fields, the issue of “multilevel governance” and, more particularly, of the actual contribution of regions to these policies was investigated.

Table 8 Continued: Sub-seas governance arrangements for the Mediterranean

Governance Arrangement	Area of Coverage	Focus of activity
Oujda Declaration on the conservation and sustainable development of the Alboran Sea (2009)	Organised jointly by IUCN and the National Institute of Fisheries Research (INRH, Morocco), with support from the Department of Environment and Territorial Planning of the Provincial Council of Malaga and the Development Agency for East Morocco, over the 3 days, gathered more than 200 experts and representatives from various institutions and NGOs from Spain, Morocco and Algeria.	This declaration acknowledges the role of the Alboran Sea as an environmental motor within the Mediterranean as a whole; its significant diversity and environmental wealth; its vulnerability; social and economic activities; as well as the political, social and cultural diversity. Likewise, it highlights the need to ensure sustainable development and the conservation of natural resources and biodiversity. This must be conveyed by drawing up development projects respectful to the environment as these are exceptional opportunities for developing suitable and innovative ideas for the Alboran region. The document also considers the importance of education and raising awareness in issues regarding conservation and underlines the need to take into consideration the sub-regional, regional and international conventions and legislations relevant to the Alboran region.
SNED-SECEG (1979)	Morocco and Spain	The SECEG and the SNED are two twin State Societies, one Spanish and one Moroccan, created for the Study of a Fixed Link Communication through the Strait of Gibraltar. They are aimed at conducting studies on the fixed communication between Europe and Africa across the Strait and on the systems best suited to carry it out, as well as the promotion of the project. The societies are ruled under the Convention on Technical and Scientific Cooperation of 1979 signed by the governments of both countries. The coordination of activities is done by a Mixed Comity constituted by 5 Spanish members and 5 Moroccan members.
Fisheries Partnership Agreement between the European Communities and Morocco (2006)	EU and Morocco	The agreement is aimed to cooperate in promoting the introduction of responsible and sustainable fisheries. The major objectives of the agreement are to establish cooperation in the fisheries sector with a view to introducing responsible fishing in Moroccan fishing zones, the conditions governing access by Community fishing vessels to Moroccan fishing zones, the arrangements for policing fisheries in Moroccan waters to prevent illegal fishing and the establishment of partnerships between companies aimed at developing economic and related activities in the fisheries sector.

Table 8 Continued: Sub-seas governance arrangements for the Mediterranean

Governance Arrangement	Area of Coverage	Focus of activity
Adriatic Sea Partnership (2006)	6 countries in the Adriatic (Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia)	Originally a Slovenian initiative in cooperation with the Regional Environmental Center, the Adriatic Sea Partnership (ASP) was launched at the Mediterranean Action Plan (MAP) sub-regional conference on the Sustainable Development Strategy for the Adriatic in Portoroz, Slovenia, June 5-6, 2006. Through various international initiatives, the Adriatic countries have begun to make commitments for protection and management of the Adriatic Sea region, including a Contingency Plan for the Adriatic, a Ballast Waters Management Plan, an Integrated Coastal Zone Management Plan, and a common strategy under the EU Marine Strategy and the EC Water Framework Directive
EURAM - IIVEE	3 regions in Spain (Catalonia, Valencia and Balearic Islands), Andorra and 1 department in France (Pyrénées-Orientales)	The IIVEE is an institution that brings together entrepreneurs, professionals and institutions in the Spanish regions of Catalonia, Valencia and the Balearic Islands, in Andorra, and in the Pyrénées-Orientales department in France, with the aim of promoting cooperation between regions of the north-western Mediterranean, having a shared historical, linguistic, social, and economic structure background. The geographical horizon of work is the association is the EURAM, the “Euro Region of the Mediterranean Arch”.

Mediterranean Sea - Conclusions

The Mediterranean region shares a unique climate and natural and cultural heritage among the 21 riparian countries and territories where environmental and development issues are particularly acute. Most environmental concerns are shared among all partners, mostly climate change effects and overexploitation of natural resources such as water or fisheries. This shared concern is the origin of a substantial number of governance agreements among riparian countries, very especially between the EU and southern and eastern rims’ countries.

In relation to transport, the Mediterranean Sea hosts the major Far East – Europe maritime route, but most traffic is passing by. Larger ports in the Mediterranean are transhipment. Internal traffic is mostly dominated by south-north traffic, generally carrying energy products, while transversal traffic and seaborne is relatively reduced, even among EU partners despite the efforts in promoting the Motorways of the Sea programme. South-north transport is also heavily sustained on pipelines, especially for gas, from Algeria and Libya to Europe.

Current development patterns of the Mediterranean are highly contrasted: it is a zone of exchange and of fracture at the same time, and the region is still in search of stability. Wealth levels in EU countries are about 10 times higher than in the Maghreb, a situation that has lead to very important migration processes since the mid 1990s. Today, some 3 million people living in Spain, France and Italy were born in the Maghreb.

In general, there is a lack of homogenous statistical information focused on the Mediterranean, aside from macro statistics provided by international organisations such as IMF or the various UN agencies.

Despite efforts in the framework of MEDSTAT, data availability is still relatively scarce and centred basically on socioeconomic data and to some extent transport. Most available data is produced in the framework of international institutions (i.e. Plan Bleu), cooperation action programmes of the EU (i.e. EuroMed), or research projects of the EU Framework Program (i.e. INECO). There are also good specialised datasets (i.e. CETMO for the West Mediterranean, now being extended to the East Mediterranean).

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Annex 6: the North Sea

Introduction

The Greater North Sea is situated on the continental shelf of northwestern Europe, opening into the Atlantic Ocean via the Norwegian Sea to the north and the Channel to the south-west, and into the Baltic Sea to the east. It has a surface area of ~750 000 km^2, a volume of about ~94 000 km^3, and an average depth of ~90 m with a maximum of 725 m. The sea's catchment covers an area of some 850000 km^2.

Riparian nations (Belgium, Denmark, France, Germany, the Netherlands, Norway and United-Kingdom) and the North Sea's catchment are densely populated and highly industrialised. Major activities include fishing, sand and gravel extraction, and offshore winning of energy – exploitation of oil and gas reserves, including the laying of pipelines, and current and future development of wind farms. The North Sea is one of the most frequently traversed sea areas of the world with two of the world's largest ports situated on its coasts (Rotterdam and Hamburg). The coastal zone is used intensively for recreation, urban development and agriculture.

The North Sea is situated in cool-temperate latitudes with a climate strongly influenced by the inflow of water from the Atlantic Ocean and by large scale westerly air circulation which frequently contains low pressure systems. Freshwater run-off and river

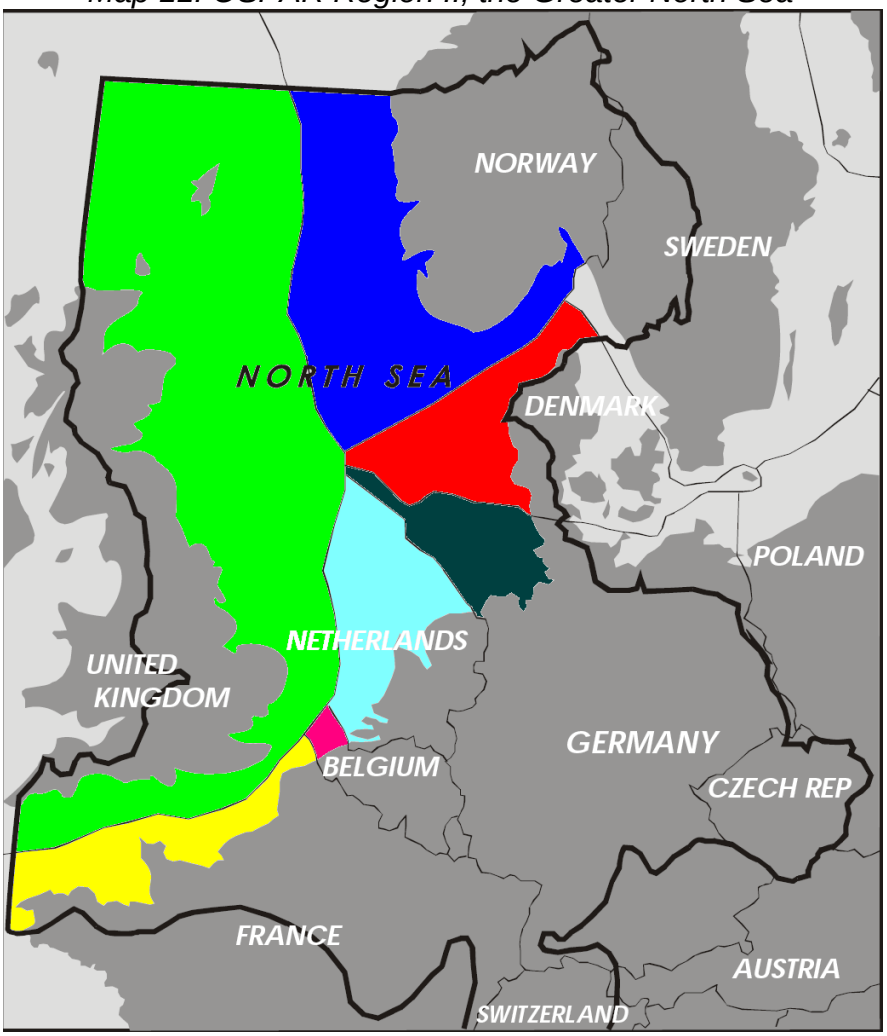
discharges mix with oceanic water within a roughly anti-clockwise circulation. Shallower areas of the North Sea (<30 m) are normally fully mixed by tidal action, whereas in deeper areas, the upper 30 m are usually mixed by wind action.

Biological systems in the North Sea are rich and complex. Shallow rocky areas in the vicinity of the Channel are colonised by extensive forests of kelp. Most of the sea's bed is covered by sandy sediment habitats that support large populations of flatfish. The Fladen Ground in the north is a large area of muddy seabed with abundant *Nephrops* (scampi). Extensive estuaries with mudflats and salt marshes are important areas for migrating waterfowl and waders. The Wadden Sea in the southeast is the largest area of intertidal mudflat in the world with abundant shellfish and patches of seagrass. It is a crucial stopover for millions of migrating birds. In the northwest of the North Sea, offshore islands support major colonies of seabirds. Benthic and pelagic processes in the North Sea are strongly coupled and work together to make the sea highly productive, supporting large commercial fish stocks as well as substantial populations of key prey species, such as sandeels.

Sea Boundaries

The Greater North Sea is bounded by the coastlines of England, Scotland, Norway, Sweden, Denmark, Germany, the Netherlands, Belgium and France, and by imaginary lines delimiting the western approaches to the Channel (5°W), the northern Atlantic between Scotland and Norway (62°N, 5°W), and the Baltic in the Danish Straits (Map 11). Map 11 also shows the continental shelves of riparian nations and the extent of the North Sea's catchment. Norway is the only riparian nation that is not a member of the EU.

Map 11: OSPAR Region II, the Greater North Sea

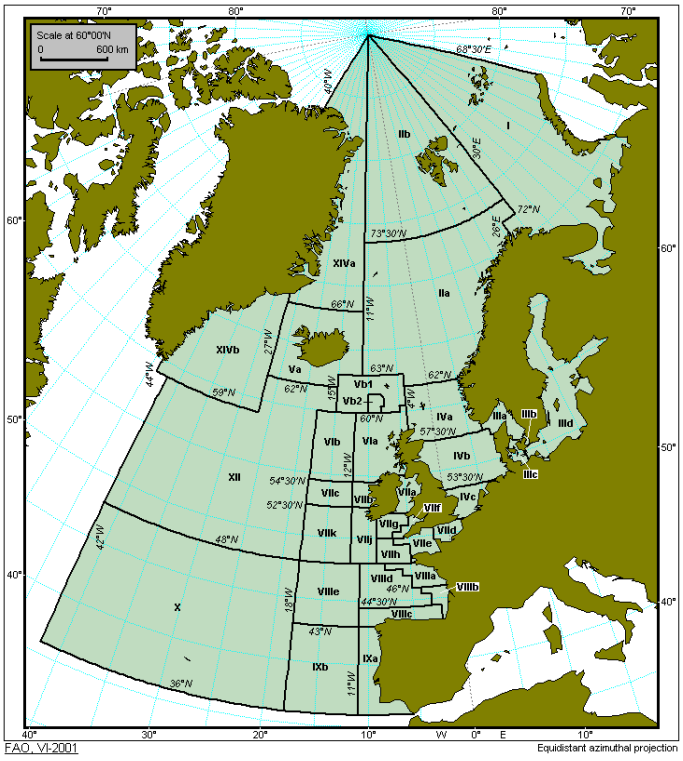


Source: Martin Pastoors/MASPNOSE - https://www.surfgroepen.nl/sites/CMP/maspnose/

The Greater North Sea is Region II as overseen by OSPAR, the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic (see Map 12). The North Sea is also Area IV of ICES (the International Council for the Exploration of the Sea), which coordinates and promotes marine research on oceanography, the marine environment, the marine ecosystem, and on living marine resources in the North Atlantic. ICES is a network of scientists and institutes linked by an intergovernmental agreement (the ICES Convention) to add value to national research efforts. It is an important data source. In the ICES boundaries, Area IV excludes the Channel, which is included in Area VII (see Map 13).

Map 12: The Greater North Sea, Region II within OSPAR (OSPAR Commission 2000)

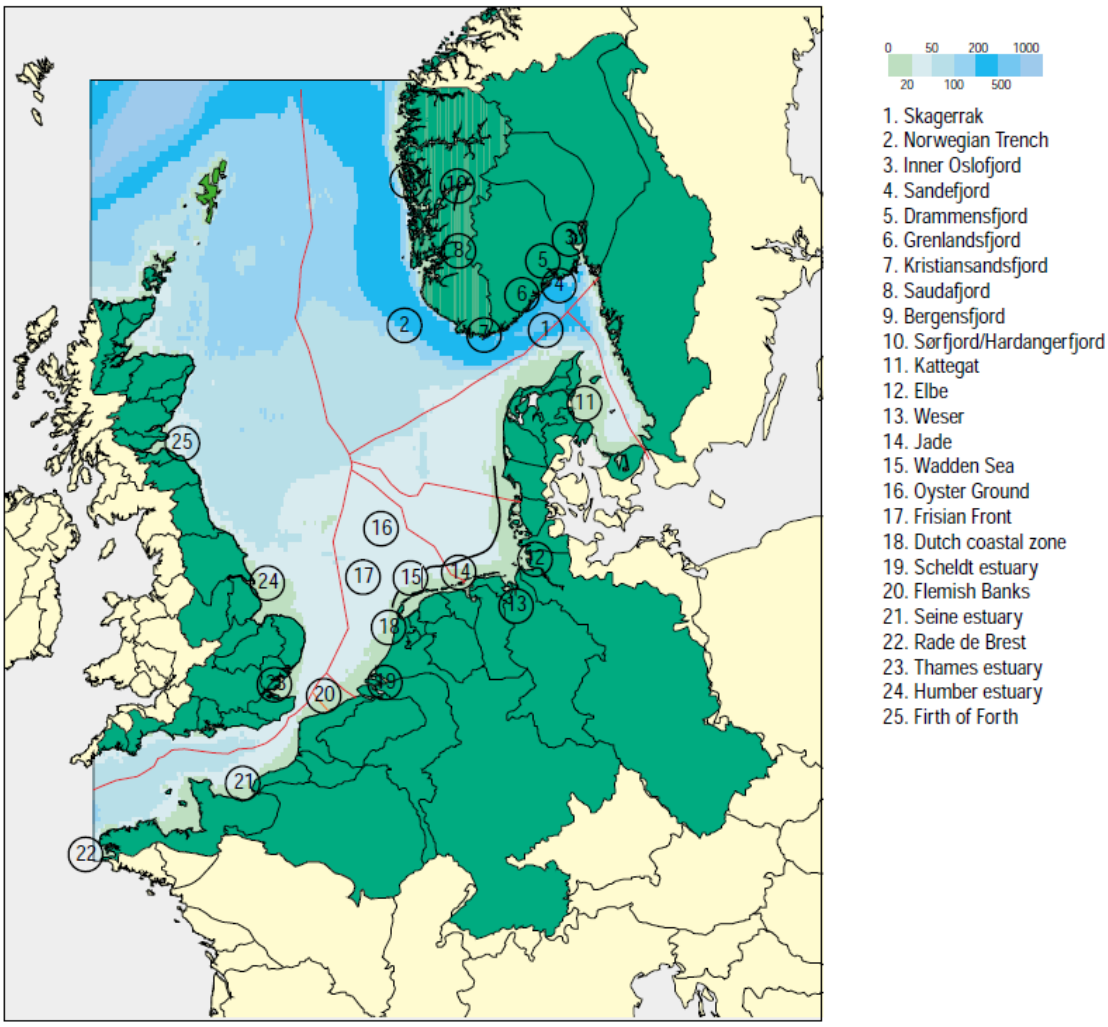
Map 13: Division of the NE Atlantic by ICES



Map 14 initiates consideration of ecological boundaries, by indicating depths and locating focus areas identified by OSPAR. Focus areas comprise a mix of coastal (e.g. river estuaries), open sea (e.g. Frisian Front), and sub-regional habitats, and may:

- comprise typical and valuable habitat for marine life;
- be under (anthropogenic) stress;
- be of strategic or economic importance; or,
- have been the focus of scientific research so that a relatively large amount of information supports our understanding of the area's functioning of such an area.

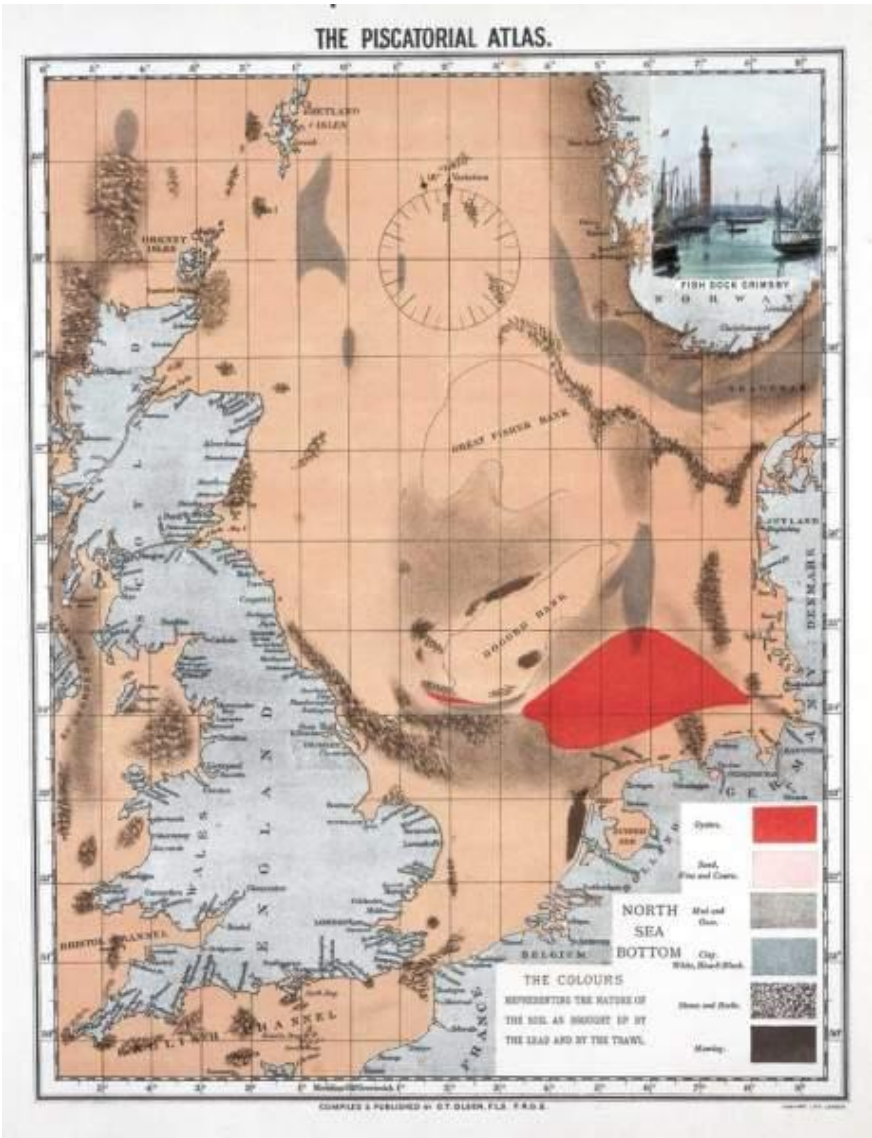
Map 14: Bottom topography, catchment, and focus areas of the Greater North Sea



Source: OSPAR Commission (2000)

Coastal habitats have changed considerably due to urbanization and development, including ports and harbours, tourisms and coastal defense. Open sea habitats have also been undergoing change. Map 15 is taken from the Olsen Piscatorial Atlas (1883) and shows the diversity of habitats in the late 19th century.

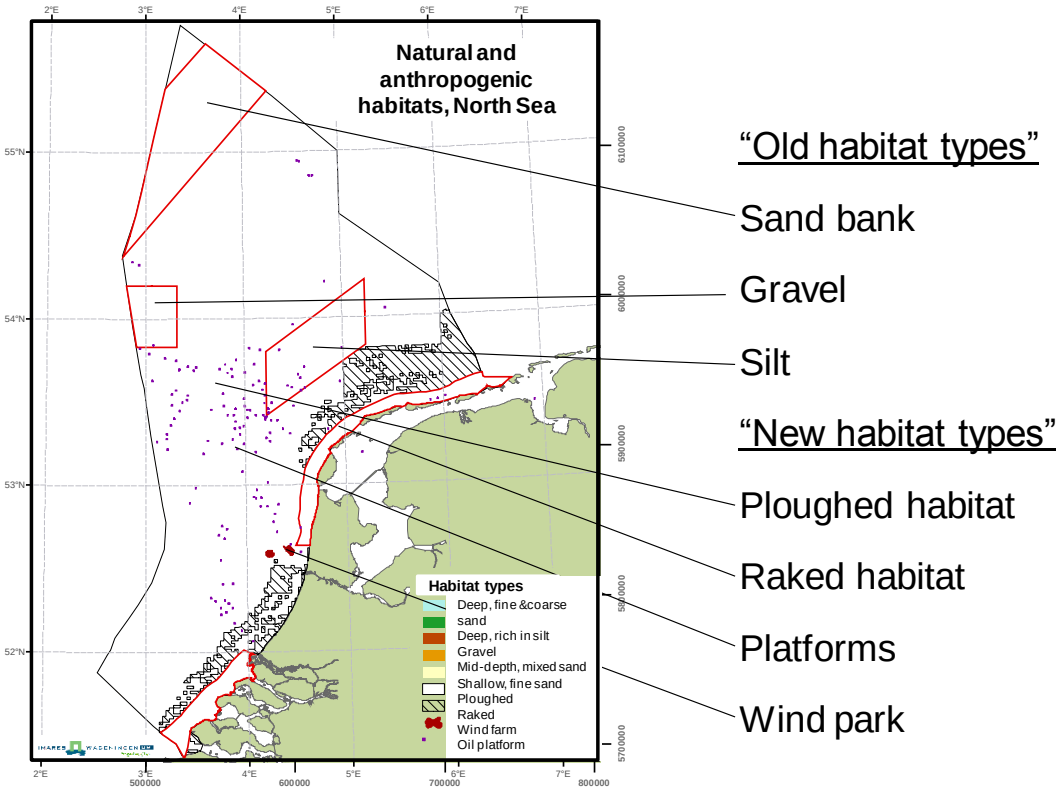
Map 15: Benthic habitats of the North Sea circa 1880



Source: Olsen, 1883, (in Lindeboom *et al,* 2008)

The Oyster Grounds (red) and the moorlog (black band off the Dutch coast in Map 15) are two habitats that no longer exist. The Oyster Grounds, a 20,000km^2 bank of oysters, was overfished in the early 20th century. The area still bears the name, but living oysters have disappeared. The grounds formed a deeper 'bowl' between the two diverse and productive habitats – the Frisian Front and the Doggers Bank – marking the transition from the shallow southern North Sea and the deeper middle North Sea: Frisian Front and the Doggers Bank. Both habitats have some conservation status. The moorlog was comprised of coarse peat deposits and formed a hard substrate for attaching organisms. It has been lost to erosion and burial. New hard habitats are emerging, scattered around the middle and southern North Sea, largely as a result of energy winning (oil platforms, wind farms, pipelines). Ploughed and raked habitats (see Map 16) are new habitats that result from frequent and destructive bottom trawling (Lindeboom *et al*. 2008).

Map 16: Habitats on the Dutch Continental Shelf



Source: Lindeboom et al, 2008

North Sea – Environment

Measures of environmental status of the North Sea derive from three sources, which overlap to varying degrees:

1. OSPAR Ecological Quality Objectives (EcoQO) (OSPAR Commission, 2007, 2009);
2. Good Ecological Status (Water Framework Directive); and,
3. Good Environmental Status (Marine Strategy Framework Directive).

OSPAR's EcoQO system, under development since 1992, and associated Quality Status Reports provide an overview of environmental quality and issues in the North Sea (OSPAR Commission 2000, 2009). The EcoQO system will provide examples of objectives and indicators for use in defining Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD). A summary of the status of the North Sea, derived from OSPAR's most recent Quality Status Report and based on EcoQOs is provided in Table 9.

Table 9: Summary of OSPAR's 2010 Quality Status Report for the North Sea environment (OSPAR Commission 2010)

Successes	Some fish stocks improved. Fisheries management changing for the better: long-term management plans for key stocks and substantial decreases in destructive practices (beam and otter trawling) in some areas. Excessive discards of fish are being to be addressed. Signs that fish communities near the seabed may be starting to recover.
	Reduced inputs of hazardous substances and nutrients. Target for reducing P inputs generally met; mixed and limited success with N target. Inputs of Hg and Pb to the sea from several major rivers have dropped.
	Good MPA coverage; 5.4% of the waters and seabed protected. Challenge is to integrate management of these MPAs with wider spatial plans.
Ongoing concerns	Eutrophication on coasts, especially the eastern coast from Belgium to Norway, and in some small estuaries and bays of eastern England and north-west France. Associated problems include fish dying in the fjords and decline in sugar kelp.
	Concentrations of metals (Cd, Hg, Pb) and persistent organic pollutants above background in some offshore waters, and unacceptable in some coastal areas. E.g., Pb levels unacceptable at 40% of locations monitored, while PAHs and PCBs were at unacceptable levels at more than half of the monitoring sites.
	Litter. E.g. > 90% of fulmars have microscopic plastic particles in their stomachs.
	Progress towards sustainable fishing is slow despite successes reported above. Particular concerns: poor status of cod stocks, by-catch of rays, sharks, porpoises and dolphins.
	Breeding failure of seabirds in northern North Sea, possibly due to the combined effects of climate change and fishing on key prey species.
	Damage to seabed habitats, especially shallow sediment habitats by bottom fishing practices.
	Impacts of climate change due to a high pace of warming over the past 25 years. Changes observable in plankton and fish communities. Some fish (silvery John dory, sea bass and red mullet) becoming more common further north; decline in North Sea cod stocks faster than would be expected from impact of fishing alone.
	Coasts of the southern North Sea susceptible to sea-level rise and erosion, so increase in coastal defence and pressure on seabed habitats from sand extraction for beach nourishment.

What is interesting in the selection of descriptors and indicators in the context of Good Environmental Quality (European Commission, 2010) is the absence of climate and climate-related issues, such as climate forcing, global warming and acidification. The North Sea ecosystem has experienced regime shifts apparently as a result of climatic shifts (Drinkwater 2002; Beaugrand 2004); anthropogenic pressures and climate signals can interact and become confounded (Kenny *et al.* 2009). Environmental quality needs to be assessed in the context of climate forcing and variability, as is clear from trends in eutrophication (McQuatters-Gollop *et al* 2007, 2009).

North Sea – Environment Databases:
http://www.eea.europa.eu/data-and-maps
http://ecosystemdata.ices.dk/
http://www.ices.dk/datacentre/guidelines.asp
http://qsr2010.ospar.org/en/index.html
http://www.mnp.nl/mnc/x-en-1-d9.html
http://www.waddensea-secretariat.org/QSR-2009/index.htm

http://geodata.grid.unep.ch/

North Sea - Economic Use

The countries bordering the Greater North Sea carry out within it major fishing activities, the extraction of sand and gravel (and maerl, but limited to France), offshore activities related to the exploitation of oil and gas reserves including the laying of pipelines, and use it as a transport route and for dumping dredged material. The last two uses – energy and transport – are discussed separately. The coastal zone is also heavily used for urban development (housing, ports and harbours) as well as recreation and tourism.

Fisheries

Fishing is a well-established activity in the North Sea, and there is a wealth of fisheries data. The North Sea is a highly productive large marine ecosystem (LME) supporting average landings of 2.5 million metric tons of fish and shellfish every year. The total biomass (adding food for predatory fish species, birds and mammals) is approximately 10 million metric tons. The Food and Agriculture Organization (FAO) 10-year trend shows a decrease from 2.5 million tons in 1990 to 2.3 million tons in 1999 (FAO, 2003). The species caught for human consumption can be divided into pelagic species – herring (*Clupea harengus*), mackerel (*Scomber scombrus*), horse mackerel (*Trachurus trachurus*) – and demersal species – cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangus*), saithe (*Pollachius virens*), plaice (*Pleuronectes platessa*) and sole (*Solea solea*). Landings from industrial fisheries account for more than half the total landing weight and consist mainly of sand eels (*Ammodytes spp*.), Norway pout (*Trisopterus esmarki*) and sprat (*Sprattus sprattus*). There are also several commercially important shellfish species of molluscs and crustaceans, including shrimp, crab, lobster, oysters, mussels and scallops (OSPAR Commission 2010).

Changes in the abundance of commercially important fish stocks have been monitored since the 1950s. All are heavily exploited and the majority of those landed for human consumption are considered to be in a seriously depleted condition. Analytical assessments of all commercially important species are carried out by the International Council for the Exploration of the Seas (ICES).

Various fishing restrictions (closures, restrictions on the number of vessels, fishing gear and time) have been put in place to try to control fishing mortality, but these are not systematic. Overall fishing effort is falling and, combined with restrictive catch limits, both pelagic and demersal catches are declining (http://www.eoearth.org/article/North_Sea_large_marine_ecosystem).

Mariculture is dominated by shellfish farming in the southern North Sea. In Scotland and Norway, salmon and trout are produced.

Sand and gravel extraction

Around 50-60 million m^3 of marine mineral deposits are extracted each year, mainly for the construction industry, for use as fill sand, or for beach nourishment. Sand and gravel are the main material extracted, but maerl (calcareous seaweed) is extracted in France to improve agricultural soils and as a filter in water treatment. Small amounts of shell are extracted in the Netherlands, for example for paving hiking trails (OSPAR Commission 2010).

Tourism and recreation

The coast in general is popular for recreational and tourism activities, and particularly in the southern North Sea. Tourist arrivals numbered some 80 million in 2007 (OSPAR Commission 2010).

Coastal infrastructure

The coastal zone of the North Sea has become heavily urbanised and industrialised. To facilitate this development, land has been reclaimed to extend ports and provide associated industrial zones. Coastal defence structures have been installed to prevent erosion and protect against flooding at vulnerable sites. Techniques include dykes, groynes, seawalls and beach nourishment. Many ports, marinas, piers and other infrastructure have been created. Maintenance of the navigability of ports, harbours and their approaches, involves dredging. Most dredge spoil is dumped at nearby, established sites (OSPAR Commission 2010).

North Sea – Economic Use Databases:

http://www.eea.europa.eu/data-and-maps/indicators/status-of-marine-fish-stocks/status-of-marine-fish-stocks-1
http://www.ices.dk/fish/CATChSTATISTICS.asp
ICES Statlant database
FAOstat, EUROSTAT

http://www.sandandgravel.com/news/page.asp?v1=8
http://ec.europa.eu/maritimeaffairs/index_en.html
http://ec.europa.eu/dgs/maritimeaffairs_fisheries/index_en.htm
http://ec.europa.eu/maritimeaffairs/
Atlas of the Sea

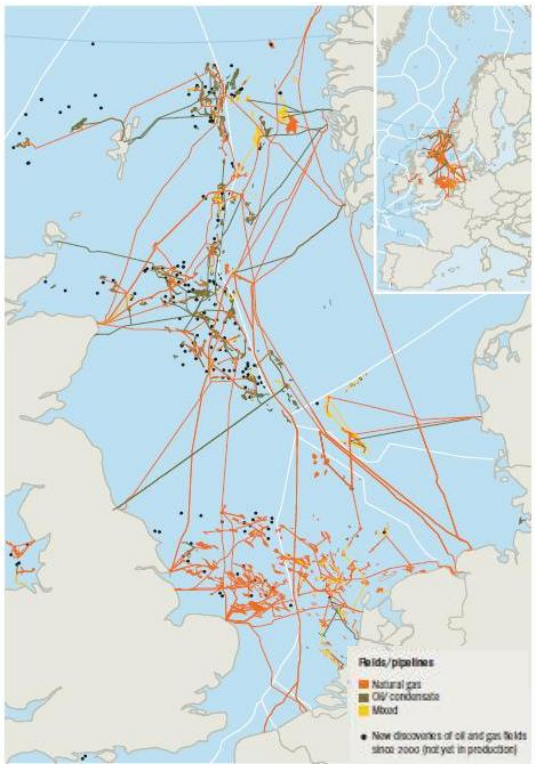
North Sea Energy, Cables and Pipelines

Energy is won via oil platforms and, more recently, wind farms. Oil and gas production has peaked in the North Sea and is now declining. The total amount of oil and gas produced has decreased by about 14% since 2001 to around 442 million TOEQ in 2007 while the number of offshore installations has increased, indicating a shift to smaller fields. A network of pipelines connects the oil and gas fields with an onshore distribution network (see Map 17).

Over the past ten or so years, energy production by offshore wind farms has emerged as a new use of coastal and shallower offshore waters. Map 18 shows the location of operational, authorised and planned wind farms in OSPAR Region II in 2009.

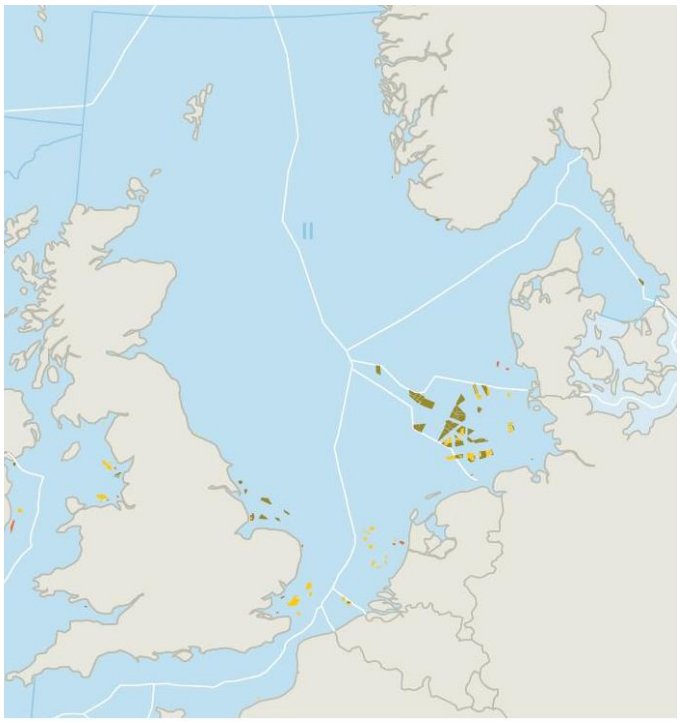
Submarine cables have a long history in telecommunications services and are increasingly important for transmission of electricity. As can be seen in Map 19, the southern North Sea in particular has a high density of cables.

Map 17: Offshore oil and gas fields under exploitation, new discoveries not yet in production and pipelines in 2009



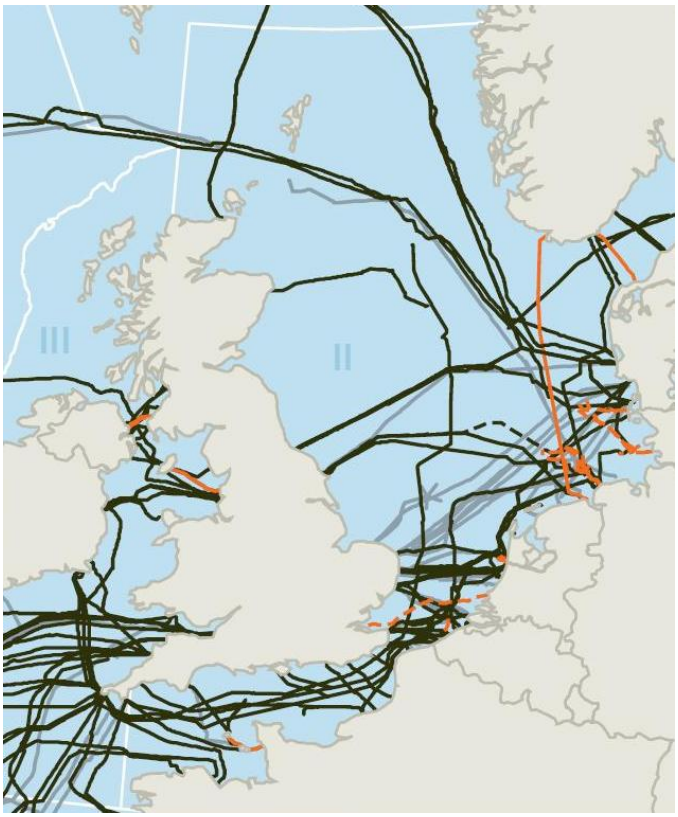
Source: *OSPAR Commission (2010)*

Map 18: Location of operational, authorised and planned wind farms in OSPAR Region II in 2009



Source: OSPAR Commission (2010)

Map 19: Undersea cables in the North Sea



Source: OSPAR Commission (2010)

North Sea Energy, Cables and Pipelines Databases:
European Wind Energy Association, offshore statistics 2009
http://rod.eionet.europa.eu/obligations/448
World pipeline maps
http://www.theodora.com/pipelines/world_oil_gas_and_products_pipelines.html

North Sea - Transport

The North Sea contains some of the busiest shipping routes in the world. Daily, more than 400 ships pass through the Channel and more than 600 ships cross (including 200 ferries) the Strait of Dover. Most of Europe's largest ports are situated on North Sea coasts and rivers, namely Hamburg, Bremen, Amsterdam, Rotterdam, Antwerp, Le Havre, and London, with Rotterdam/Europoort being the most important. Container transfer in the main ports is increasing rapidly. Approximately half the shipping activity in the Greater North Sea consists of ferries and roll-on/rolloff vessels on fixed routes (OSPAR Commission 2010).

North Sea Transport Databases:

EUROSTAT

Sea Level Governance

As has already been mentioned, the North Sea is bounded by seven nations, of which all except Norway are members of the EU. All nations claim 12 nautical miles of territorial waters, within which they have exclusive fishing rights. The exploitation of the natural marine resources of the North Sea follows a number of conventions, declarations and regulations. These include the Geneva Convention on the Continental Shelf (1958), the joint declaration of the Commission of the European Union on the coordinated extension of jurisdiction in the North Sea through the establishment of Exclusive Economic Zones (1992), and European Commission directives and regulations within the Common Fisheries Policies. All in all a large number of instruments from international bodies, such as the United Nations, the International Maritime Organization, and the European Union, exist to conserve natural resources, protect the environment and ensure health and safety standards.

The European Community laws protect the environment in terms of air and noise, chemicals and industrial risks, nature conservation, waste and water. The relatively recent Marine Strategy Framework Directive promotes and integrates environmental considerations into all relevant policy areas and forms the basis for a future Maritime Policy for the EU. Ecosystem management issues were discussed at the Fifth International Conference on the Protection of the North Sea. The Oslo and Paris Conventions (OSPARCOM) contain a number of supporting legislative and policy

instruments. The North Sea Network of Investigators and Prosecutors (NSN) works for the enforcement of international rules and standards to protect the marine environment from pollution by shipping. However, such rules and standards will only be effective if properly enforced, providing a key challenge for governance.

Table 10: Seas level governance arrangements in the North Sea

Governance Arrangement	**Area of Coverage**	**Focus of activity**
Law of the Sea Convention (UNCLOS)	All global seas. The UN has no direct operational role in the implementation of the Convention. There is, however, a role played by organizations such as the International Maritime Organization, the International Whaling Commission, and the International Seabed Authority.	Defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. Contain a number of provisions - setting limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, and protection of the marine environment, scientific research, and settlement of disputes.
International Maritime Organization (IMO)	IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.	
International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978	Marpol 73/78 is designed to minimize pollution of the seas, including dumping, oil and exhaust pollution. Its stated object is: to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.	Marpol 73/78 is one of the most important international marine environmental conventions. All ships flagged under countries that are signatories to MARPOL are subject to its requirements, regardless of where they sail, and member nations are responsible for vessels registered under their respective nationalities.[1]

Table 10 continued: Seas level governance arrangements in the North Sea

Governance Arrangement	Area of Coverage	Focus of activity
The OSPAR Commission	North-East Atlantic	Greater North Sea is Region II of OSPAR.
The North East Atlantic Fisheries Commission	The NEAFC Convention Area covers the Atlantic and Arctic Oceans and so includes the North Sea	Maintain the rational exploitation of fish stocks in the Convention Area, taking scientific advice from ICES.
The International Council for the Exploration of the Sea	Atlantic, Arctic and Baltic Seas	Coordinates and promotes marine research on oceanography, the marine environment, the marine ecosystem, and on living marine resources in the North Atlantic
The International Whaling Commission	All oceans in the world	To keep under review and revise as necessary the measures laid down in the Schedule to the Convention which govern the conduct of whaling throughout the world
European Commission	Regional seas of member states	Directives and policies on exploitation of resources, pollution and environmental quality

Sub-sea level Governance in the North Sea

A number of the focus areas identified in the North Sea boundaries section (Map 14) lend themselves to subs-sea level governance. The largest is the Wadden Sea to the southeast. Apart from a diversity of economic activities (fisheries and mariculture, oil and gas winning/exploration, recreation and tourism), the Wadden Sea also has a history of conservation and recently was awarded World Heritage Status. Its management involved cooperation among the Netherlands, Denmark and Germany. EU regulations of relevance include the Bird and Habitats Directives and the Water Framework Directive.

Table 11: Governance arrangements at the sub-North Sea level

Governance Arrangement	Area of Coverage	Focus of activity
Trilateral Cooperation on the Protection of the Wadden Sea	Wadden Sea in the SE North Sea; bounded by mainland and a chain of offshore islands; cooperation among Netherlands, Germany and Denmark.	Since 1978, focused on protection and conservation of the Wadden Sea covering management, monitoring and research, as well as political matters. A Joint Declaration on the Protection of the Wadden Sea was agreed in 1982, and a refreshed declaration was adopted in 2010 together with the Trilateral Wadden Sea Plan 2010.
Arc Manche	English Channel	The mission of the Arc Manche Assembly is to promote the Channel area as a specific and a coherent entity for territorial co-operation at European Union level. Its actions are chiefly centred on seaborn and coastal dimensions but it also recognises the need to deepen exchanges with large European areas. Arc Manche is active on issues such as transport, port development and maritime safety, innovation, preservation of natural and coastal environments, achieving a balance between economic and environmental interests and taking advantage of the position of the Channel in Europe.

North Sea Conclusions

The North Sea catchment supports a substantial proportion of Europe's population. The North Sea itself is a productive ecosystem that has a history of use and misuse. The ecosystem is, in many ways, quite robust, largely because of the strong Atlantic influence. However the diversity of anthropogenic pressures, from sea-based activities such as fishing to land-based drainage, combined with climate forcing and the less understood effects of climate change, pose a threat to environmental quality. Recognition of this threat prompted the institution of OSPAR, whose activities serve as a lead in the implementation of the recent Marine Strategy Framework Directive with its emphasis on the ecosystem approach to management.

There is abundant data, some of which is centralised within organs such as EUROSTAT, European Environmental Agency, ICES, FAOSTAT. However issues such as access, compatibility and spatial characteristics can be expected to emerge during this project.

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Olsen, O.T. (1883), “*The piscatorial atlas of the North Sea, English and St. George's Channels, illustrating the fishing ports, boats, gear, species of fish (how, where, and when caught), and other information concerning fish and fisheries*”, Taylor and Francis, London, UK.

Annex 7: Economic Use

Introduction

Economic use is mainly connected to the maritime sectors (shipping, shipbuilding, marine equipment, offshore supply, maritime services, dredging, navy and coastguard, seaports); coastal and sea-related recreation and tourism (recreational boating, coastal tourism, cruise tourism); fisheries (fishing, fish processing, aquaculture), energy production (petroleum, renewable energy sources) and mineral extraction. In addition to mapping the importance of these activities in the different European territories when it comes to value added and employment, an aim of the project is to investigate the existence and development of industrial clusters.

Industrial clusters are characterized by related industries that are embedded within a supporting infrastructural and institutional environment (Porter 1990, 1998). Backward and forward linkages, technological externalities and sunk costs are assumed to generate the self-reinforcing agglomeration of economic activities (see, for example, Fujita et al. 1999; Henderson et al. 2001; Krugman 1991). For example, the higher demand for a certain type of intermediate good, the easier it is for suppliers to reach the necessary critical mass to exploit internal economies of scale, which in turn may lower prices and thereby create advantages for producers that use these intermediates. Another example of economic externalities that may be connected with industrial clusters is knowledge diffusion; that is, one firm gains access to another firm's competence without paying for it. A common labour pool facilitates such knowledge diffusion.

Most empirical work has been based on two different concepts of clustering of interconnected economic activities: the theory of *flexible specialization* and *industrial districts* (Piore and Sabel 1984; Pyke and Sengenberger 1990) and the theory of competitive advantages and *industrial clusters* (Porter 1990, 1998). Although Porter emphasizes the spatial dimension of clusters, regions have been often used synonymously with nations in the empirical studies in which Porter's hypothesis is tested.

Economic Use - Governance and Policy Context

EU's Integrated Maritime Policy (IMP) was defined by the Commission in 2007 through the so-called Blue Paper and the accompanying Action Plan, following an extensive year-long consultation with stakeholders and the general public. Concerning economic growth the *Progress Report on the EU's Integrated Maritime Policy: questions and answers MEMO/09/455* (Brussels, 15 October 2009) states the following: The Community needs to support sustainable economic growth for maritime activities through further exploration of the possibilities linked to marine resources, including

deep-sea ocean technologies, emerging markets and industrial innovation, as well as through the cross-sectoral "cluster" approach to maritime economic activities.

Economic growth can also be stimulated through encouraging eco-tourism and tourism linked to the conservation of natural and/or cultural maritime heritage. Reinvigorating economic activity must be coupled with new quality standards in terms of sustainability. This could entail, for example, a scheme to replace older ships, leading to more efficient and less polluting maritime transport, while providing impetus for European shipbuilding. Another new opportunity for improved coordination is the reform of the Common Fisheries Policy. The coordination mechanism of the Integrated Maritime Policy will make it easier to align priorities and actions in the field of fisheries with development in maritime regions, with the implementation of the Marine Strategy Framework Directive and with employment issues.

Table 12: Key Directorates for Economic Use

DIRECTORATES		
DG Enterprise and Industry	**General Areas of Responsibility (all relevant to the maritime economy)**	Business regulation, competitiveness, innovation, research and development, standardisation (technical specifications), raw materials, international affairs, satellite navigation, small and medium sized enterprises (SMEs), sustainable and responsible business practices and the single market for goods and services.
DG Mare	**Relevant Areas for Economic Use**	Under the integrated maritime policy relevant policy actions for DG Mare relate to integrated maritime governance, maritime spatial planning, marine science, maritime clusters, energy infrastructure, maritime transport and coastal tourism. DG Mare is also responsible for implementing the Common Fisheries Policy
DG Environment	**Relevant Areas for Economic Use**	Application and enforcement of environmental laws, protection of natural resources, environmental monitoring and assisting sustainable business development.
DG Economic and Financial Affairs	**Relevant Areas for Economic Use**	Development of economic and employment policies, implementing financial assistance programmes
DG Employment, Social Affairs and Inclusion	**Relevant Areas for Economic Use**	Developing employment policies, labour market analysis, assisting education and skills development programmes

Table 13: Key European legislation and policy related to economic use

Arrangement	Area of Coverage	Focus of activity
Common policy Commission Decision 2005/629/EC on **establishing a Scientific, Technical and Economic Committee for Fisheries.**	Fisheries	The implementation of Community policy for fisheries and aquaculture requires the assistance of highly qualified scientific personnel, particularly in the application of marine and fisheries biology, fishing technology, fisheries economics or similar disciplines, or in connection with the requirements of research and data collection in the fields of fishing and aquaculture.
Commission Green Paper: **Towards a future Maritime Policy for the Union: a European vision for the oceans and seas** [COM (2006) 275 final - Not published in the Official Journal].	Maritime sectors	The Green Paper is in line with the Lisbon Strategy. Its aim is to achieve sustainable development by reconciling the economic, social and environmental dimensions of the exploitation of the seas and oceans. The EU is the world's leading maritime power in terms of: maritime transport, coastal tourism, offshore energy production, shipbuilding technologies related services. The EU is also the leader in a number of probable growth areas, such as the building of cruise ships, renewable energy and ports.
Communication from the Commission of 17 March 2006 on **A renewed EU Tourism Policy - Towards a stronger partnership for European Tourism** [COM(2006) 134 final - Not published in the Official Journal].	Tourism	The objective of the first set of measures is better regulation. The Commission wants to ensure that the impact assessments for new proposals related to tourism take the competitiveness of the industry into account. It also plans to screen pending legislative proposals and simplify existing European legislation. The Member States are also called upon to carry out exercises of this kind in order to avoid a cumulative administrative burden which could damage the industry's competitiveness.
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on **An Integrated Maritime Policy for the European Union** [COM(2007) 575 final].	Maritime Sectors	The following projects are of particular importance : – A European Maritime Transport Space without barriers – A European Strategy for Marine Research – National integrated maritime policies to be developed by Member States – An European network for maritime surveillance – A Roadmap towards maritime spatial planning by Member States – A Strategy to mitigate the effects of Climate Change on coastal regions – Reduction of CO2 emissions and pollution by shipping – Elimination of pirate fishing and destructive high seas bottom trawling – An European network of maritime clusters – A review of EU labour law exemptions for the shipping and fishing sectors.
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on **Europe, the world's No 1 tourist destination – a new political framework for tourism in Europe** [COM(2010) 352 final].	Tourism	In line with the Lisbon Treaty, the main aim of European tourism policy is to stimulate competitiveness in the sector, while being aware that in the long term, competitiveness is closely linked to the 'sustainable' way in which it is developed. This aim is clearly linked to the Union's new 'Europe 2020' economic strategy. The Commission recognizes the substantial importance of maritime and coastal tourism as a catalyst for economic development and intends to carry out actions to encourage its development as part of the EU's integrated maritime policy.

Table 13 continued: Key European legislation and policy related to economic use

Name of Arrangement	Area of Coverage	Focus of activity
Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on **Guidelines for an Integrated Approach to Maritime Policy: Towards best practice in integrated maritime governance and stakeholder consultation.** [COM(2008) 395 final – Not published in the Official Journal].	Maritime Sectors	These guidelines form a central part of the Communication on an Integrated Maritime Policy for the European Union (Blue Paper) adopted by the Commission in October 2007 and approved by the European Council in December 2007. These guidelines also form part of the United Nations' 1982 Convention on the Law of the Sea and the World Summit on Sustainable Development in Johannesburg in 2002.
Regulation (EC) No 762/2008 of the European Parliament and of the Council of 9 July 2008 on the submission by Member States of statistics on aquaculture and repealing Council Regulation (EC) No 788/96 (Text with EEA relevance)	Fisheries	Member States shall submit to the Commission statistics on all the aquaculture activities conducted in freshwater and saltwaters on their territory.
Commission Staff Working Document Annex Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on **The concept of clusters and cluster policies and their role for competitiveness and innovation: Main statistical results and lessons.** SEC(2008)2637 {COM(2008) 652 final}	Cluster	The main objective of this Working Paper of the Commission Services is to present and further analyse the concept of clusters and to inform about main policy approaches in support of clusters. It accompanies and provides the rationale for the Communication on "Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy".
Communication from the Commission on **Developing the international dimension of the Integrated Maritime Policy of the European Union** [COM(2009) 536 final – Not published in the Official Journal].	Maritime sectors	This strategy covers a number of domains (for example the protection of marine biodiversity, climate change, maritime safety) which necessitate international and integrated solutions. The Commission describes its strategy to strengthen its authority in multilateral and bilateral relations in the domain of maritime affairs. This strategy should allow the EU to exercise greater influence over international debate on marine issues in order to safeguard its economic and social interests and increase protection of the environment. Regional approaches have been launched for the Arctic, the Baltic, and the Mediterranean.

Key EU related Data Sources for Economic Use

Industrial clusters

"Europe of the sea" project. http://www.europedelamer.org. The maritime clusters taken into account are those of: Schleswig-Holstein (Germany), Møre og Romsdal (Norway), Nord-Pas de Calais (France), Valencia (Spain), Aquitaine (France).

Marine cluster Bulgaria. (www.marinecluster.com) Presentation by Ilze Atanasova. (http://www.european-network-of-maritime-clusters.eu/downloads/5_74.pdf) (http://www.varna.bg/invest/resume3101_en.htm)

STARNET Regio (http://www.starnetregio.eu/Sections.aspx?section=1.122)

Industrial Specialization and regional clusters in the ten new EU member states. Stockholm School of Economics. (Sövell et al. 2006).

Maritimt forum, Norway and Dutch Maritime Network in cooperation with European Network of Maritime Clusters. 2006. Dynamic European Maritime clusters. (http://www.european-network-of-maritime-clusters.eu/publications/9.pdf).

Policy Research Corporation (2008), The role of Maritime Clusters to enhance the strength and development of European maritime sectors. *Annexes.*

Maritime industries

Eurostat Yearbook 2010. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-CD-10-220/EN/KS-CD-10-220-EN.PDF

European Commission, Maritime Affairs. (http://ec.europa.eu/maritimeaffairs/)

Community of European Shipyards' Association (http://www.cesa.eu/)

AWES Association of European Shipbuilders-and- Shiprepairers (http://www.acronymfinder.com/Association-of-European-Shipbuilders-and-Shiprepairers-(EU)-(AWES).html)

EMEC European Maritime Equipment Council (http://www.emec-marine-equipment.org/) (http://www.emec-marine-equipment.org/marine_equipment/cluster_emec.asp)

Fisheries

European Commission Maritime Affairs and Fisheries (2010): Facts and figures on the Common Fisheries Policy. Basic Statistical Data. (http://ec.europa.eu/fisheries/documentation/publications/pcp_en.pdf)

European Commission Maritime Affairs and Fisheries: Publications (http://ec.europa.eu/fisheries/documentation/eu_fisheries_key_facts/index_en.htm)

Eurostat: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=fish_aq_v&lang=en

Eurostat: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=fish_ca_inw09&lang=en

FARNET... the European Fisheries Areas Network https://webgate.ec.europa.eu/fpfis/cms/farnet/

Food and Agriculture Organization of the United Nations (FAO) Fisheries and Aquaculture Department. http://www.fao.org/fishery/statistics/en

OECD: Fish landings in domestic and foreign ports 2007. Thousand tonnes. Source: OECD Factbook 2010 p 169
OECD: Aquaculture 2007. Thousand tonnes. Source: OECD Factbook 2010 p 169

Coastal tourism
Eurostat: Bed places in hotels & similar establishments (1000) 2008. Eurostat yearbook 2010, Table 7.13. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-CD-10-220/EN/KS-CD-10-220-EN.PDF
OECD: Arrivals of non-resident tourists in hotels and similar establishments or at borders. Thousands hotel nights 2007. OECD Factbook 2010 p 247

Energy and Mineral extraction
Eurostat: Energy production 2007 (Source: Eurostat Yearbook 2010 Table 11.11)
Eurostat: Primary production of renewable energy 2007 (Source: Eurostat Yearbook 2010 Table 11.12)
Eurostat: http://epp.eurostat.ec.europa.eu/

Economic Use - Conclusions

There are several challenges connected with the measurement of clusters. Basically, one could apply statistical methods or case studies or a combination. In addition to employment and value added in the different industries within a cluster, linkages between the industries (for instance by means of input-output analyses) should be mapped. Furthermore, the assessment of possible agglomeration in a region due to maritime activities requires econometric analyses and extensive data. In this project the mapping as well as description of cluster development will be based on easy accessible data from statistic bureaus (included OECD and Eurostat) and secondary sources. An interesting question is whether outsourcing of activities from one country to another can give as a result that previously local or national clusters become regional or international. To investigate this question we want to describe to what extent vertical division of labour take place across the European regions based on a review of existing literature and databases (see above).

For necessary data collection in the ESaTDOR project, classification of industries (based on NACE) will be provided by NIBR.

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Annex 8: Energy, Cables and Pipelines

Introduction

European Seas are an important source of the EU's conventional energy resources thanks to the significant offshore reserves of oil and gas, especially in the North Sea. However, these resources are in decline, with the UK having experienced a particularly steep drop since 2000 from its position as the dominant producer of primary energy. This, along with the decrease in conventional onshore resources, has led to the EU becoming increasingly reliant on energy imports, especially from Russia, Norway, Libya and Algeria (though Norway's North Sea reserves are also set to decline). More than half of the EU's energy now comes from outside the EU, raising growing concerns about energy security and hence the need to find new resources and diversify supply.

This and the EU's commitment to reduction of greenhouse gas emissions provide the underlying rationale of recently formulated EU energy policy (see below). Policy is also directed to completion of the internal energy market and the development of transnational energy networks. Hence the Treaty of Lisbon places energy at the heart of European activity, with an emphasis on market-based tools (taxes, subsidies and the CO_2 emissions trading scheme) and developing energy technologies (for energy efficiency and renewable and low-carbon energy). The Gothenburg / sustainable development strategy prioritises combating climate change and the transition to clean forms of energy production.

European Seas are recognised as an important focus for the achievement of these goals. Firstly, rapid and large-scale deployment of offshore wind energy is anticipated, especially in the shallower northern seas, to be followed in the longer term by other marine renewables. Secondly, and closely associated with this, marine grid systems will be developed to enable more efficient electricity transmission across regions. Thirdly, the potential for carbon storage under the seabed will be explored.

The seas will also play a continuing, and in some respects, growing role in the current patterns of energy production and distribution. It is anticipated that newly discovered offshore hydrocarbon reserves will be exploited, especially in the Arctic Ocean. Conventional resources will continue to be transported by ship, including from new points of supply, such as for liquefied natural gas. The network of gas pipelines will be expanded, with new links from the east and the south of the EU crossing marine areas. Similarly, the seabed will continue to host the growing network of telecommunications cables.

Energy, Cables and Pipelines - Global Governance and Policy Context

A number of international bodies have emerged to represent and coordinate the energy industry. They have responded to particular energy issues, such as the oil crises of the 1970s, though have more recently turned their attention to the challenges of energy security and climate change, with a growing emphasis on the need to shift to more sustainable systems of energy production and consumption.

The energy sector has increasingly been characterised by economic liberalisation, with state-owned monopolies giving way to privatised, fragmented and competitive structures under state regulation.

Supra-national policy has been expressed through many hundreds of bilateral and multilateral agreements addressing varied and specific aspects of energy generation, supply and use.

Table 14: Key governance arrangements related to energy, cables and pipelines

Name of Governance Arrangement/Policy Initiative	**Area of Coverage**	**Focus of activity** 100 words max
International Energy Agency	Conventional and renewable forms of energy production and supply.	Intergovernmental organ-isation advising its member countries (mostly western nations) on reliable, affordable and clean energy systems.
World Energy Council	Conventional, renewable and new forms of energy production and supply.	Promotion of sustainable supply and use of energy. World's premier energy gathering.
CIGRE: International Council on Large Electric Systems	Electricity systems.	International association for promoting knowledge etc about the development of electricity grid systems.
United Nations Environment Programme	Sustainable development	Climate change and renewable energy are a priority area.
IPIECA	Oil and gas, environmental and social issues.	Association linked to UN concerned with responsible production of oil and gas.
International Sustainability Energy Assessment	Database of international energy treaties.	See http://cees.colorado.edu/isea/
Energy Charter Treaty	International agreement for energy trade, transit and investments.	

EU Level Governance and Policy Context

The EU has legislated in various aspects of the energy sector since its beginnings, having its roots partly in the European Coal and Steel Community and the European Atomic Energy Community.

However, a comprehensive energy policy has only taken shape in recent years. The Energy Policy for Europe, agreed in 2007 and reviewed in 2010, establishes core objectives of competitiveness, sustainability and security of supply. The strategy is geared towards a 20% reduction in greenhouse gas emissions from all primary energy sources by 2020; working towards stronger international carbon reduction agreements; improving energy relations with neighbouring territories, including Russia and north Africa; development of technology; and enabling further market competition, to complete the internal energy market. Offshore wind energy and transnational offshore grid

systems have been identified as key elements of the strategy. The EU is extending its internal energy market to some adjoining countries through the Energy Community.

Technological development is being pursued through the Strategic Energy Technology (SET) Plan of 2008. Current initiatives include supporting the development of wind turbines for offshore applications; carbon capture and storage systems; and a European transmission network.

Energy policy is closely linked with climate policy (DG Climate Action), supported by the EU's Emissions Trading Scheme, and offshore energy with the integrated maritime strategy (DG Mare).

Table 15: Directorates for Energy, Cables and Pipelines

DIRECTORATES		
DG Energy	**General Areas of Responsibility**	Energy policy, hydrocarbons, renewable energy, nuclear energy, energy and electricity infrastructure, energy efficiency, energy technology and innovation.
	Relevant Areas for Seas	Energy policy, hydrocarbons, renewable energy, energy and electricity infrastructure, energy technology and innovation.
DG Climate Action	**Relevant Area for Marine Energy**	International and EU climate policy, carbon capture and storage, emissions trading.
DG Mare	**Relevant Area for Marine Energy**	Integration of marine energy, maritime clusters.

Table 16: Key EU legislation and policy related to energy, cables and pipelines

Critical Policy Documents	
Energy for the Future, Communication of the Commission, 1997	Promotion of renewable sources of energy; "enormous potential for offshore wind farms".
A European Strategy for Sustainable, Competitive and Secure Energy (COM 105), 2006	Prioritises internal electricity and gas markets, a European grid, investment in generation, security of supply, etc. Three core objectives: sustainability, competitiveness, security of supply.
An Energy Policy for Europe, Communication of the Commission, 2007	Commitment to a low consumption economy based on more secure, more competitive and more sustainable energy. Objectives involve ensuring the smooth functioning of the internal market in energy, security of strategic supply, concrete reductions in greenhouse gas emissions caused by the production or consumption of energy and the EU's ability to speak with a single voice on the international stage.
Second Strategic Energy Review: an EU energy security and solidarity action plan (COM 781) 2008	Proposes connecting the remaining isolated energy markets in Europe; developing a southern gas corridor for the supply of gas from Caspian region and Middle Eastern sources; making use of liquefied natural gas; Europe with the Southern Mediterranean through electricity and gas interconnections; developing gas and electricity interconnections crossing Central and South-East Europe; developing interconnections between the electric networks of the North-West of Europe so as to optimise wind energy in the North Sea.
Energy 2020: A strategy for competitive, sustainable and secure energy (COM 639) 2010	Further action needed to achieve 2007 strategy. Priorities: Achieving an energy efficient Europe; Building a truly pan-European integrated energy market; Empowering consumers and achieving the highest level of safety and security; Extending Europe's leadership in energy technology and innovation; Strengthening the external dimension on the EU energy market.
Offshore Wind Energy: action needed to deliver on the energy policy objectives for 2020 and beyond, Communication of the Commission, 2008	Encourages member states to turn to marine wind energy in the pursuit of wider energy goals where possible.
Energy infrastructure pri-orities for 2020 and beyond: A Blueprint for an integrated European energy network (COM 677/4) 2010	Sets out a strategy for upgrading and developing energy network infrastructure in the EU in order to enable the achievement of wider energy goals.
Supporting early demonst-ration of sustainable power generation from fossil fuels [COM 13) 2008	The financial stakes and an initiative for an early demonstration of the capture and storage of CO2.
An Integrated Maritime Policy for the European Union, Communication of the Commission (COM 574), 2007	Highlights importance of Europe's seas to energy supply, especially renewable resources, and transportation.

Table 16 continued: Key EU legislation and policy related to energy, cables and pipelines

Related EU Legislation (Directives/Regulations)	
Directive on the Promotion of the Use of Energy from Renewable Sources, 2009/28/EC. Amending / repealing 2001/77/EC, 2003/30/EC.	Sets national indicative targets for renewable energy production from individual member states, in order to achieve the EU's overall target of 20% by 2020.
Regulation establishing a programme to aid economic recovery by granting Com-munity financial assistance to projects in the field of energy, 663/2009.	Sets up a European Energy Programme for Recovery to fund projects in gas and electricity infrastructures, offshore wind energy and carbon capture and storage.
Concerning Common Rules for the Internal Market in Electricity, 2009/72/EC. Amending / repealing 2003/54/EC.	Overcoming obstacles to an internal European market for electricity.
To Improve and Extend the Greenhouse Gas Emission Allowance Trading Scheme of the Community, 2009/29/EC. Amending 2004/101/EC, 2003/87/EC, 96/61/EC.	Establishing and reforming the EU's emissions trading scheme.
On the Geological Storage of Carbon Dioxide 2009/31/EC. Amending 85/337/EEC, 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation 1013/2006.	Providing for carbon storage sites.
Related EU Programmes & Bodies	
Energy Community Treaty	The Energy Community extends the EU internal energy market to South East Europe and beyond on the grounds of a legally binding framework.
Trans-European Networks	Information networks
Europe's Energy Portal http://www.energy.eu/	Invaluable source of information about organisations, legislation, production etc.
European Energy Forum	Forum within the EU for energy debate.
ISLENET: European Islands Network on Energy and Environment	Sustainable energy for smaller European islands.

Key EU-related Energy, Cables and Pipelines Data Sources

Information should be sought under the following headings.

- Hydrocarbons
    - Current and projected distribution of offshore oil and gas facilities and levels of exploitation
    - Current and potential patterns of offshore exploration for oil and gas

- Renewable energy sources
    - Patterns of estimated levels of marine renewable energy resources (wind, wave and tidal)
    - Patterns of current and projected offshore wind energy capture
    - Distribution of current and potential projects for other marine renewable energy sources
- Networks
    - Distribution 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
    - Potential patterns of offshore carbon storage capacity

Country statistics and some maps showing conventional and renewable energy production and resources are available from a number of sources, *but there is no disaggregation into onshore and offshore information, making these sources of little use at present.*

IEA
http://www.iea.org/stats/index.asp

OECD
http://www.oecd.org/statsportal/0,2639,en_2825_293564_1_1_1_1_1,00.html

DG Energy
http://ec.europa.eu/energy/publications/statistics/statistics_en.htm

Eurostat
http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/introduction

Europe's Energy Portal
http://www.energy.eu
EEA
http://www.eea.europa.eu

BP
http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622

Some sources have information on offshore energy resources, especially with regard to offshore wind energy.

EEA: offshore wind energy dataset and offshore wind energy potential.
http://www.eea.europa.eu

Europe's Energy Portal: economic support for offshore wind energy.
http://www.energy.eu/#renewable

Offshore Center Danmark: information about individual projects in each country.
http://www.offshorecenter.dk/offshorewindfarms.asp

USGS: oil and gas resources.
http://pubs.usgs.gov/of/1997/ofr-97-470/OF97-470I

Pipeline information is available, including very low-resolution maps; this indicates offshore pipelines.
World Pipelines Maps
http://www.theodora.com/pipelines/world_oil_gas_and_products_pipelines.html

Cable information is available via:
International Cable Protection Committee
http://www.iscpc.org

Detailed data for some areas, eg the UK.
http://www.kisca.org.uk/charts.htm

Disappointingly, DG Mare's *European Atlas of the Sea* contains no information on energy. However, *Atlas de la Europa Maritima* should be explored.
Other possible sources of information include:

- National government etc sources
- Regional sea organisations (eg OSPAR, HELCOM, Mediterranean Action Plan, Bucharest Convention)
- Industry sources, including trade associations (eg European Wind Energy Association, International Association of Oil & Gas Producers)

However, pursuing a large number of disparate sources is likely to prove time-consuming and may not provide compatible data.

Energy, Cables and Pipelines - Conclusions

Data on marine energy and related issues is available, but suffers from the fact that it is often combined with onshore information, and given only under national-level statistics. More specific offshore information is likely to be available from national or industrial sources, but it may prove difficult to access this in a consistent manner, and the

resources of the ESTDOR project may not allow for this kind of painstaking research. It may be more productive to approach EU institutions that have access to underlying data with requests for information. Specific information on some areas of marine energy are, however, more easily available, such as on offshore wind energy and pipelines.

Energy, Cables and Pipelines References

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Annex 9: Environment

Introduction

Europe's regional seas have suffered severe environmental degradation due to human pressure. These pressures relate to marine and coastal activities (e.g. fisheries, mariculture, coastal development, coastal defence, shipping, and offshore energy winning), but also derive from activities in the seas' catchments affect (notably agriculture, industry and urbanisation). Declining environmental quality has prompted a diversity of measures and policies at a range of spatial scales. The European Community has enacted a number of directives addressing environmental quality in general, and water and marine quality in particular. Examples include the Birds and Habitats Directive, the Nitrates Directive, Urban Wastewater Treatment Directive, the Water Framework Directive (WFD, 2000/60/EC) and the recent Marine Strategy Framework Directive (MSFD, 2008/56/EC).

Not all riparian nations of Europe's regional seas are members of the EU. International cooperation has led to regional seas commissions that provide support for an international and cooperative perspective on regional sea quality. Examples include the OSPAR Commission (northeast Atlantic, including the North Sea) and the Helsinki Commission (Baltic Sea). This annex focuses on the North Sea to illustrate the theme, and so draws on various documents (and especially the Quality Status Reports) of the OSPAR Commission.

OSPAR initiated the development of ecological quality objectives in 1992 (OSPAR Commission 2007, 2009), which form much of the basis for the periodic quality status reports (OSPAR Commission 2000, 2010). Nine ecological quality objectives have been developed: spawning stock biomass of commercial fish species; harbour and grey seal population trends; harbour porpoise by-catch; proportion of oiled guillemots; plastic particles in seabird stomachs; contaminants in seabird eggs; proportion of large fish in (demersal) fish community; imposex in dogwhelks; and, eutrophication. These topics provide an indication of key environmental issues in both the North Sea and northeast Atlantic.

The Water Framework Directive introduced the notion of Good Ecological Status. However this directive is only of relevance to coastal waters. Borja et al (2010) provide a comparison of the approaches taken in the WFD and MSFD. As outlined in OSPAR Commission (2009), EcoQOs are, to some extent, making way for the descriptors that will drive identification of Good Environmental Status, as per the Marine Strategy Framework Directive. The descriptors themselves are presented as objectives, abbreviated to:

1. Biological diversity is maintained;

2. Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems;

3. Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock;

4. All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity;

5. Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters;

6. Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected;

7. Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems;

8. Concentrations of contaminants are at levels not giving rise to pollution effects;

9. Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards;

10. Properties and quantities of marine litter do not cause harm to the coastal and marine environment; and,

11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

These descriptors, and the indicators decided upon in 2010 (European Commission 2010), will form the basis of future monitoring and quality assessment of all European seas, at least as with regards EU member states. Good Environmental Status is to be achieved by 2020.

Available environmental databases focussing on the northeast Atlantic were used and cited within the OSPAR Quality Status Reports. The European Environmental Agency hosts much of the available data. Data is also held in national databases, and, in some cases, but individual institutions (whether research or governmental). Development of indicators for the MSFD will involve substantial expansion of some databases and rationalisation of others. Clearly some descriptors are more data-rich than others. Compare, for example, the abundance of data on eutrophication and the relative paucity of data on marine litter (UNEP 2009) let alone underwater noise.

Environment - Global Governance and Policy Context

A number of international, even global, conventions relate to the environment, some of which are specific to the marine environment. The term ‘biodiversity’ is the catch cry of modern environmental concern and a number of international conventions deal with this issue, either explicitly or implicitly. Older conventions, such as MARPOL, reflect the early issues with the environment, but are still very relevant. Chemical contaminants inevitably find their way to marine environments. There are a rapidly growing number of contaminants - emerging contaminants derived from new substances that are a product of modern lifestyles. Our knowledge of their potential environmental impacts (endocrine disruptors provide an example) is limited and associated data and databases on sources let alone environmental concentrations are often absent, of a short time series, or of limited spatial coverage. Aspects of habitat are included with the Ramsar Convention, relevant for coastal zones. The table below (table 17) also includes the various regional sea commissions as these are involved in coordinating actions among EU and non-EU nations.

Table 17: Environment - Global governance and policy context

Governance Arrangement/ Policy Initiative	**Area of Coverage**	**Focus of activity**
Convention on Biological Diversity (CBD)	Biodiversity	The conservation of biological diversity The sustainable use of the components of biological diversity The fair and equitable sharing of the benefits arising out of the utilization of genetic resources
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Trade and endangered species (e.g. bluefin tuna)	Aims is to ensure that international trade in specimens of wild animals and plants does not threaten their survival
IUCN Red List of Threatened Species	Biodiversity	Identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and Provide a global index of the state of change of biodiversity.
International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978	Pollution from ships	Marpol 73/78 is designed to minimize pollution of the seas, including dumping, oil and exhaust pollution. Its stated object is: to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances.
Convention on Wetlands (Ramsar, Iran, 1971) -- called the "Ramsar Convention"	Wetlands, coastal zones	Maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories.
The International Council for the Exploration of the Sea (ICES Convention)	Research on oceanography, the marine environment, the marine ecosystem, and on living marine resources (http://www.ices.dk/indexfla.asp)	To advance the scientific capacity to give advice on human activities affecting, and affected by, marine ecosystems.

Table 17 continued: Environment - Global governance and policy context

Governance Arrangement/ Policy Initiative	**Area of Coverage**	**Focus of activity**
Baltic Marine Environment Protection Commission (aka HELCOM)	Baltic Sea: Denmark (the Danish Maritime Safety Administration); Estonia; the European Community; Finland; Germany; Latvia; Lithuania; Poland; Russia; and Sweden. http://www.helcom.fi/	Governs the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention); HELCOM works on protection of the marine environment of the Baltic Sea
1976 Barcelona Convention	Mediterranean Sea	1976 Barcelona Convention for Protection against Pollution in the Mediterranean Sea is a regional convention to prevent and abate pollution from ships, aircraft and land based sources in the Mediterranean Sea.
Bucharest Convention on the Protection of the Black Sea Against Pollution	Black Sea: Bulgaria, Romania, Ukraine, Russia, Georgia, Turkey. Black Sea Commission (http://www.blacksea-commission.org/main.asp)	control of land-based sources of pollution; dumping of waste; and joint action in the case of accidents (such as oil spills
OSPAR Commission	Mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the EC, cooperate to protect the marine environment of the North-East Atlantic (http://www.ospar.org/)	1972 with the Oslo Convention against dumping was broadened to cover land-based sources and the offshore industry (Paris Convention of 1974); conventions were unified, up-dated and extended by the 1992 OSPAR Convention. A new annex on biodiversity and ecosystems was adopted in 1998 to cover non-polluting human activities with affects on the sea.

Environment - EU Level Governance and Policy Context

The EU has legislated on various environmental aspects, ranging from such perspectives as water quality (draining into regional seas), habitats, and birds. Recent initiatives see a move toward incorporating environmental aspects in sectoral policies, such as the Common Agricultural and Common Fisheries Policies. Notably here is the interplay between the EU's Marine Strategy Framework Directive and its Integrated Maritime Policy (IMP – see http://ec.europa.eu/maritimeaffairs/subpage_en.html).

The key legislation for the environment of Europe's seas is the Marine Strategy Framework Directive. Adopted in July 2008, the MSFD aims to achieve or maintain a good environmental status by 2020 at the latest. It is the first legislative instrument in relation to the marine biodiversity policy in the European Union, as it contains the explicit regulatory objective that "biodiversity is maintained by 2020", as the cornerstone for achieving good environmental status. It enshrines in a legislative framework the ecosystem approach to the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use.

The Commission Decision on criteria and methodological standards on good environmental status (GES – European Commission 2010) of marine waters in the framework of Article 9 (3) of the MSFD contains a number of criteria and associated indicators for assessing good environmental status, in relation to the 11 descriptors of good environmental status laid down in Annex I of the Directive. The criteria build on existing obligations and developments within the EU legislation, covering further relevant elements of the marine environment, not yet addressed in the acting policies. Once adopted, the Decision will be a major stepping stone to establish precise objectives for the achievement of GES within the implementation of the MSFD.

Table 18: Directorates relevant to Environment

DIRECTORATES		
DG Environment (http://ec.europa.eu/dgs/environment/index_en.htm)	**General Areas of Responsibility**	protect natural habitats, defend clean air and water, ensure proper waste disposal, improve knowledge of the toxicity of chemical substances, and help European businesses move towards a sustainable economy
	Relevant Areas for Seas	Water quality (e.g. Nitrates Directive, Water Framework Directive), birds, habitats, ecosystem approach
DG Energy	**General Areas of Responsibility**	Energy policy, hydrocarbons, renewable energy, nuclear energy, energy and electricity infrastructure, energy efficiency, energy technology and innovation.
DG Mare	**Relevant Area for Environment**	Fisheries policy (http://ec.europa.eu/fisheries/cfp/index_en.htm)

Table 19: *Key EU legislation and policy related to environment*

Key Directives	
UWWT Directive	Established minimum requirements for urban wastewater treatment
Nitrates Directive	Placed limits on the surface application of nutrients
Birds Directive	Created a comprehensive scheme of protection for all wild bird species naturally occurring in the Union
Habitats Directive	Together with the Birds Directive, creates an ecological network of special protected areas, known as "Natura 2000".
Water Framework Directive	Requires that all inland and coastal waters within defined river basin districts reach at least good status by 2015 and defines how this should be achieved through the establishment of environmental objectives and ecological targets for surface waters
Marine Strategy Framework Directive (http://ec.europa.eu/environment/water/marine/index_en.htm)	establishes a comprehensive structure within which Member States are required develop and implement cost effective measures, necessary to achieve or maintain "good environmental status" in the marine environment. Good Environmental Status must be achieved by the year 2020 at the latest.

Key EU related environment data Sources

EUROSTAT:
http://epp.eurostat.ec.europa.eu/portal/page/portal/environment/introduction

European Environmental Agency:
http://www.eea.europa.eu/data-and-maps

Waterbase:
http://www.eea.europa.eu/publications/brochure_2006_0305_112834

ICES:
http://ecosystemdata.ices.dk/
http://www.ices.dk/datacentre/guidelines.asp

HELCOM:
http://www.helcom.fi/GIS/en_GB/HelcomGIS/

FAOSTAT:
http://faostat.fao.org/default.aspx

Large Marine Ecosystems Database. Sea Around Us Project: http://www.seaaroundus.org/lme/lme.aspx

Environment – Conclusions

Some environmental data are held in accessible databases, notably those managed by EUROSTAT, EEA, ICES and the various regional sea commissions. These will be augmented by national databases from nationally-sponsored monitoring programmes. There is also considerable data to be found in/extracted from publications. However both topic and regional coverage will be erratic, let alone consistency and spatial coverage of the data. The Mediterranean and Black Seas are generally less data-rich than the northeast Atlantic Ocean (and related seas such as the North Sea) and the Baltic Sea. An improvement in this situation can be expected in coming years, with implementation of the MSFD and associated assessments of environmental status.

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Annex 10: Transport

Introduction

Today, there are more than 1200 ports in the coasts of the European Union but most traffic is concentrated in a few major ports, most notably in the Atlantic and Northern ranges. In 2009, only 15 ports managed more than 40 million freight tones (general cargo, containers, solid bulk and liquids), and only the 3 largest ports in the EU concentrated 37% of all maritime freight managed in EU ports, all in the North of the continent (Rotterdam with 387MTn, Antwerp with 158MTn and Hamburg with 110MTn).

The increasing traffic of manufactured goods from China, Japan and other Far East countries currently runs and will most likely continue to run through Suez channel and the Mediterranean Sea. Even with an upgraded Panama Channel, the Far East – Europe route through Suez is still shorter, between 25% and 60% in distance and between 7% and 50% in travel time depending on the origin/destination ports. Most interestingly, a primary element with potential to alter current east-west flow patterns is related to climate change: with an increased global temperature the Arctic Sea route could become practicable for significant periods of the year, with shortened travel distances for Japanese and Korean ports and for some Chinese ports. This scenario, however, seems only reasonable in the long term and difficulties for navigation (necessity of icebreakers, short opening period, few easily accessible ports of refuge) would still remain, making it difficult to exploit.

Today, only 25% of the Asiatic traffic enters Europe through the Mediterranean ports, while 75% of freight continues through Gibraltar up to Northern European ports with an additional two days of travel, and subsequent increase in CO_2 emissions. With a total maritime container throughput of an estimated 90.7 million TEU in 2008, only 13 ports managed more than 1MTEU and 40% of the total traffic was concentrated in the four largest ports, all in the Northern range. An important share of container business in the Mediterranean is transhipment traffic (i.e. 95% in Algeciras and 50% in Valencia in 2009), with the Atlantic ports still being the major entrance for goods bound to the Mediterranean area. However, Mediterranean ports are attempting to increase their share in the maritime sector by planning important rail projects intended to enlarge their hinterlands up to central Europe.

Figure A below shows three alternative scenarios for the development of shipping in European seas, each displaying a different volume of maritime transport passing through the Mediterranean. In particular, the possibility of an Arctic shipping corridor will substantially reduce traffic.

Figure A: alternative scenarios for maritime freight transport

Source: Baltic Scenario Forum, (2009)

Currently the two major cornerstones of EU maritime policy are the implementation of the Motorways of the Sea and the effective reduction of environmental impacts of the maritime sector.

The Marco Polo programme aims to shift a substantial part of the increase in international road freight traffic to short-sea shipping, rail and inland waterways, or to a combination of modes of transport in which road journeys become as short as possible. The promotion of the Motorways of the Sea requires simplified maritime procedures for intra EU trips and to this end the action plan to establish a European maritime transport space without barriers has been developed.

On the other hand, various communications by the Commission urge an effective reduction of emissions of shipping, reduction of maritime accidents and reduction of their environmental impact. The “Greening Transport” communication urged the promotion of sustainable mobility and internalized external costs of maritime transport, while reducing greenhouse gas emissions from the sector by 2009 and lower sulphur contents of maritime fuel.

Transport - Global Governance and Policy Context

Table 20: Key transport-related global governance and policy arrangement

Governance Arrangement/Policy Initiative	Area of Coverage	Focus of activity
International Convention for the Safety of Life at Sea 1974	Shipping safety	The International Convention for the Safety of Life at Sea (SOLAS) is an international maritime safety treaty, which in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The first version of the treaty was passed in 1914, dating the most recent from 1974, with several amendments since then. The SOLAS 1974, requires flag States to ensure that their ships comply with minimum safety standards in construction, equipment and operation. It includes articles setting out general obligations and international requirements which have derived in most cases onto national laws. SOLAS divides international waters into regions as well.
IMO Convention on Facilitation of International Maritime Traffic (IMO FAL Convention) 1967	Efficient international shipping	The Convention's main objectives are to prevent unnecessary delays in maritime traffic, to aid co-operation between Governments, and to secure the highest practicable degree of uniformity in formalities and other procedures. In particular, the Convention reduces the number of declarations which can be required by public authorities. In its Annex, the Convention contains "Standards" and "Recommended Practices" on formalities, documentary requirements and procedures which should be applied on arrival, stay and departure to the ship itself, and to its crew, passengers, baggage and cargo.

EU Level Governance and Policy Context for Transport

Table 21: Key European Directorates, Legislation and policy for Transport

Directorate Title DG MOVE (Mobility and Transport, formerly DG TREN)	**General Areas of Responsibility**	Road and rail transport, air transport, inland waterways and martime transport. General transport policy making. TEN-T development.
	Relevant Areas for Seas	Maritime transport policy, and TEN-T network of ports of European Interest
Related EU Legislation (Directives/Regulations)		
Council Directive 87/540/EEC of 9 November 1987		On access to the occupation of carrier of goods by waterway in national and international transport and on the mutual recognition of diplomas, certificates and other evidence of formal qualifications for this occupation
Council Directive 93/75/EEC of 13 September 1993 *Later amended by directives 97/34/EC, 98/55/EC, 98/74/EC*		Concerning minimum requirements for vessels bound for or leaving Community ports and carrying dangerous or polluting goods
Council Directive 94/57/EC of 22 November 1994 *Later amended by directives 97/58/EC, 2001/106/EC*		On common rules and standards for ship inspection and survey organizations and for the relevant activities of maritime administrations
Council Directive 95/21/EC of 19 June 1995 *Later amended by directives 98/25/EC, 98/42/EC 1999/97/EC, 2001/106/EC*		Concerning the enforcement, in respect of shipping using Community ports and sailing in the waters under the jurisdiction of the Member States, of international standards for ship safety, pollution prevention and shipboard living and working conditions (port State control)
Commission Directive 96/40/EC of 25 June 1996		Establishing a common model for an identity card for inspectors carrying out port State control (Text with EEA relevance)
Council Directive 96/50/EC of 23 July 1996		On the harmonization of the conditions for obtaining national boatmasters' certificates for the carriage of goods and passengers by inland waterway in the Community

Table 21 continued: Key European Directorates, Legislation and policy for Transport

Related EU Legislation (Directives/Regulations)	
Council Directive 98/18/EC of 17 March 1998 *Later amended by directives 2002/35/EC, 2003/24/EC, 2003/75/EC,*	On safety rules and standards for passenger ships
Council Directive 98/41/EC of 18 June 1998	On the registration of persons sailing on board passenger ships operating to or from ports of the Member States of the Community
Council Directive 1999/35/EC of 29 April 1999	On a system of mandatory surveys for the safe operation of regular ro-ro ferry and high-speed passenger craft services
Directive 2003/25/EC of the European Parliament and of the Council of 14 April 2003 *Later amended by directives 2005/12/EC*	On specific stability requirements for ro-ro passenger ships (Text with EEA relevance)
Directive 2005/35/EC of the European Parliament and of the Council of 7 September 2005	On ship-source pollution and on the introduction of penalties for infringements

Table 22: Other programmes and documents relevant to transport

Other Programmes and Documents	
Marco Polo II programme[10]	The Marco Polo II programme aims to shift a substantial part of the expected increase in international road freight traffic to short-sea shipping, rail and inland waterways, or to a combination of modes of transport in which road journeys are as short as possible. It should hence reduce environmental impacts through a modal shift. The programme, which will run until the end of 2013, finances projects that stimulate modal shift or traffic avoidance, promote cooperation and know-how sharing, as well as innovative actions to improve synergies between modes, and "motorways of the sea" (section 4.1.2.1).
TEN-T	The Trans-European Transport Networks are a planned set road, rail, air and water transport networks designed to serve the entire continent of Europe. The TEN-T policy is intended to increase the co-ordination in the planning of infrastructure projects by the member states. TEN-T envisages coordinated improvements to primary roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems, so as to provide integrated and intermodal long-distance high-speed routes for the movement of people and freight throughout Europe. In the framework of the TEN-T, a network of seaport of European Interest was proposed and is currently under revision[11], and a general scheme of Motorways of the Sea.
EU Research Program	Research co-funded by the European Commission under the various Research Framework Programmes has given support to the exploration and implementation of the Motorways of the Sea, and the environmental impacts study of transport.
Strategic goals and recommendations for the EU's maritime transport policy until 2018. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions COM(2009) 8	These strategic goals and recommendations of the Commission Communication refer to two main issues: i) The ability of the maritime transport sector to provide cost-efficient maritime transport services adapted to the needs of sustainable economic growth of the EU and world economies and ii) The long-term competitiveness of the EU shipping sector, enhancing its capacity to generate value and employment in the EU, both directly and indirectly, through the whole cluster of maritime industries.

[10] Regulation 1692/2006 of the European Parliament and of the Council of 24 October 2006 establishing the second "Marco Polo" programme for the granting of Community financial assistance to improve the environmental performance of the freight transport system (Marco Polo II) and repealing Regulation 1382/2003, OJ L 328, 24.11.2006, p. 1

[11] See the study "Ports and their connections within the TEN-T" financed by the DG TREN, and finished in December 2010.

Table 22 continued: Other programmes and documents relevant to transport

Other Programmes and Documents	
Communication and action plan with a view to establishing a European maritime transport space without barriers COM(2009) 10	The communication states the need to simplify maritime procedures for intra EU trips, mostly in order to support the development of Short-sea shipping. The action plan includes for the short term (by 2010) the "Simplification of customs formalities for vessels only sailing between EU ports", a "Guidelines for speeding up documentary checks related to animal and plant products carried between EU ports" and the "Rationalisation of documents requested under different bodies of legislations". For the mid term (by 2013), it urges for the "simplification of administrative formalities for vessels sailing between EU ports, but having a call in a third country or a free zone", an "Enhanced electronic data transmission", an "Administrative single window", the "Simplification of rules on carriage of dangerous goods by sea".
A sustainable future for transport: Towards an integrated, technology-led and user friendly system (Communication from the Commission) COM(2009) 279	This communication states the low degree of shifting transport to more efficient modes, including through the development of short sea shipping. It also states that the maritime sector is a valuable alternative to land transport in the view of the large amount of coast km and seaports in the EU. It adds that the full implementation of the European Maritime Space without Barriers and the maritime transport strategy for 2018 can make the 'motorways of the sea' a reality and exploit the potential of intra-European short sea shipping. Logistics operations using synergies between sea and rail and/or river also have great potential for development
Greening Transport (Communication from the Commission to the European Parliament and the Council) COM(2008) 433	This communication claims for promoting sustainable mobility and internalising external costs of transport. In the maritime sector, the communication urged to increase safe to prevent accidents involving ships, passengers and crew, and to reduce their environmental impact. It also urged to specify concrete measures to reduce greenhouse gas emissions from the sector by 2009, stating the need of the Commission to take action if the IMO had not done so by then. Commission action might include integrating the sector into the EU's ETS. This strategy will be evaluated in 2013. In the short term, the communication urged to further reducing the sulphur content of liquid fuels, including maritime transport fuels.
European Integrated Maritime Policy COM (2007) 575	In the transport sector, the European Maritime Policy basically proposes to work for the objectives of creation of a European Maritime Transport Space without barriers (it urges to the simplification of administrative and customs formalities for intra-EU maritime services), the reduction of CO2 emissions and pollution by shipping (supports the creation of the Motorways of the Sea/Short-sea shipping networks), and a review of EU labour law exemptions for the shipping and fishing sectors. It urges to prepare a comprehensive maritime transport strategy for 2008-2018. It also urges the commission to propose a new ports policy, taking account of the multiple roles of ports and the wider context of European logistics.

Table 22 continued: Other programmes and documents relevant to transport

Other Programmes and Documents	
White Paper on Transport	The *White Paper on Transport* is the document of strategic reflection providing the conceptual framework for the CTP, having had substantial influence on EU, national and regional policies since 1992 (i.e. liberalisation of transport markets and modal change from road to rail). The 2009 EC communication triggered the debate for the 2011 White Book revision, proposing that focus should now turn on improving efficiency of the transport system through co-modality, technology development, and priority infrastructure investment on links with highest returns.

Key EU related Data Sources for Transport

The Council Directive on Maritime Statistics that came into full effect in 2000 will gradually become the main source of short-sea data when it will be able to provide sufficient data series, in tonne-kilometres, to analyse trends. The Commission has instituted a working group of national statisticians in view to improve the quality of statistics and allow coherent comparisons between modes by converting the tonne-based short-sea data into tonne-kilometres used in other modes. The Commission continues to work towards a single, reliable statistical source for Short Sea Shipping. (http://ec.europa.eu/transport/publications/statistics/statistics_en.htm)

Rapid Data Exchange System (RES) by ESPO (European Sea Ports Organisation). The Rapid Data Exchange System (RES) was launched about 14 years ago, on the initiative of ESPO. The idea was to arrange a voluntary exchange of data between ports, on a confidential basis between participating ports, and to have the results available as quickly as possible. From 2010, the ESPO RES quarterly statistics on European ports traffics are also available on the ESPO website. (http://www.espo.be/Facts_and_Figures/Statistics.aspx)

EUROSTAT. Statistical office of the European Union. The data feature several different aspects: Transport of goods – tonnes transported and tonne-kilometres (TKM), Transport of people – number of transported passengers and passenger-kilometres (PKM), Traffic – Stock of vehicles and vehicle-kilometres (VKM); Six different transport modes: road, rail, pipeline, inland waterways, sea and air. Some data collections go back to 1980, while others start more recently. (http://epp.eurostat.ec.europa.eu/portal/page/portal/transport/introduction)

COMEXT. Being a dataset for foreign trade, Comext provides specific detailed trade volumes from EU countries to other EU and non-EU countries. Trade statistics track the value and quantity of goods traded between EU Member States (intra-EU trade) and between Member States and non-EU countries (extra-EU trade). As most international trade with non-EU partners is performed on the maritime level, Comext is a valuable

data source for international maritime transport. (http://epp.eurostat.ec.europa.eu/portal/page/portal/external_trade/introduction)

IMO GISIS – International Maritime Organisation Global Integrated Information System. This database provides statistics on Merchant Marine such as port reception facilities, legislations and local regulations in different countries, maritime incidents and accidents, green house gas emissions of ships, contact points in different countries. (http://gisis.imo.org/Public/Default.aspx)

ITOPTF. International Tanker Owners Pollution Federation Limited, Data and Statistics. ITOPF maintains a database of oil spills from tankers, combined carriers and barges. This contains information on accidental spillages since 1970, except those resulting from acts of war. The data held includes the type of oil spilt, the spill amount, the cause and location of the incident and the vessel involved.

http://www.itopf.com/information-services/data-and-statistics/

UNCTAD Stat. Datasets for the United Nations Conference on Trade and Development. It contains datasets for the Merchant Marine, at a country level, in terms of dimensions of fleets (1980-2010) and liner shipping connectivity index (2004-2010). This last indicator reports a country's integration level into global liner shipping networks, and is generated upon the number of ships of a country, the total container-carrying capacity of those ships, the maximum vessel size, the number of services, and the number of companies. The data are derived from Containerisation International Online. (http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx)

Transport – Conclusions

Data related to European ports is relatively extensive, but not always publicly available due to commercial concerns. The most relevant sources in the context of the ESPON project are probably the RES database from ESPO, and the UNCTAD Stat database.
Eurostat is also an important secondary source for data on maritime traffic. The Maritime Statistics section, and the Comext database are regularly used as reference.
Finally, other databases may provide additional information relative to Merchant Fleet sizes (UNCTAD), or to environmental impacts and accidents in marine transport (ITOPTF and IMO IGIS).

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World Bank Data (http://data.worldbank.org/)

Annex 11: 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 Directive 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 (which is not a primary data source, but rather an integrator of data) being:

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 and coastal questions for a better understanding of major aspects of land-sea interactions. The approach followed is coherent with the INSPIRE Directive principles, addressing 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 for 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 should 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 neighbouring countries),
- Activities or issues within your country that have an influence externally – on other countries or on areas beyond national jurisdiction.

B. Data

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

D. Gaps - what is not known (gaps in knowledge) and recommendations to address these gaps.

E. 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 should be noted 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.

Annex I
1. Coordinate reference systems 2 Geographical grid systems 3 Geographical names 4 Administrative units • types of coastal and 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 • Nature conservation zones, • Marine protected areas

Annex II

1 Elevation:
- Bathymetry,
- Shoreline change,

2 Land cover
3 Orthoimagery
4 Geology:
- Benthic topography,

Annex III

1 Statistical units
2 Buildings
3 Soil
4 Land use:
- 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:
- coastal bathing waters quality,
- Water quality,

6 Utility and governmental services
7 Environmental monitoring Facilities
8 Production and industrial facilities:
- coastal and maritime industries

9 Agricultural and aquaculture facilities
10 Population distribution and demography
- population size,
- population density

11 Area management/restriction/regulation zones & reporting units:
- Regional and local conservation initiatives,

12 Natural risk zones:
- 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 costal 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.

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)

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)

2. 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 between2 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 250m 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[12]:

- 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:

[12] http://library.oceanteacher.org/OTMediawiki/index.php/Metadata_Standards

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

Annex 12: Existing research projects relevant to ESaTDOR

Existing /Ongoing Research Projects related to ARCTIC OCEAN

Programme	Spatial Scale	Thematic Focus of the Project	Lead Partner	Project Dates	Description
INTERREG					
Climate Change: Impacts, Costs and Adaptation in the Baltic Sea Region (BaltCICA).	Baltic Sea Region	The BaltCICA Project is designed to focus on the most imminent problems that climate change is likely to cause in the Baltic Sea Region. The concentration of large parts of the population and many larger cities in coastal areas make the region especially sensitive to climate change. Changes in precipitation and flood patterns as well as rising sea level can affect not only the built environment but also water availability and quality.	The Geological Survey of Finland (GTK).	February 2009 to January 2012.	The BaltCICA project counts with excellent science-stakeholder cooperation – the involved local partners are developing their climate change adaptation strategies within the framework of the project. The BaltCICA Project is part-financed by the EU Baltic Sea Region Programme 2007 - 2013. The lead partner of the project is the Geological Survey of Finland (GTK) and the partnership comprises 24 partners including municipalities, regional authorities and research institutes.

ARCTIC OCEAN Continued

Programme	Spatial Scale	Thematic Focus of Project	Lead Partner	Project Dates	Description
ESPON					
ESPON ***Territorial impacts of European fisheries policy (ESPON Fisheries)***	ESPON space	European Fisheries Policy have to deal with internal European matters like preservation of natural resources, access to production areas, social, economic and demographic consequences, and at the same time face the global competition in European markets.	Norwegian Institute of Urban and Regional research (NIBR)	July 2004 to November 2006	The project will investigate changes and ongoing processes affecting European countries and their regions and look into territorial impacts on Europe of these changes in view of the aim of cohesion, territorial balanced and sustainable development and polycentrism. Moreover potentials and preconditions for innovation in the marine sector will be considered.
Climate change and territorial effects on regions and local economies (ESPON Climate)	ESPON space	The project shall analyse how and to which degree climate change will impact on the competitiveness and cohesion of European regions and Europe as a whole. In addition, it shall investigate in which way policy can contribute to mitigate climate change, and to adapt to and manage those results of climate change that cannot be avoided, while making sure that synergies of mitigation and adaptation policies are being exploited.	Technical University Dortmund, Germany	February 2009 to October 2011	The project deals with the impacts of climate change on the European regions and their economies as well as the consequences for spatial planning. It seeks to analyse the regional sensitivities towards climate stimuli and the likely economic effects of climate change on European regions also considering mitigation and adaptation measures. Eventually, the project aims at the development of new potential regional typologies with respect to the multitude of aspects and consequences in the context of climate change.

Existing /Ongoing Research Projects related to ATLANTIC OCEAN

Programme	Spatial Scale	Thematic Focus of Project	Lead Partner	Project Dates	Description
EU 7th Framework					
ODEMM Options for Delivering Ecosystem-Based Marine Management	Europe	Implementing an ecosystem approach to marine environmental management	University of Liverpool (UK)	2010-2013	Aims to develop a set of fully-costed ecosystem management options that would deliver the objectives of the Marine Strategy Framework Directive, the Habitats Directive, the European Commission Blue Book and the Guidelines for the Integrated Approach to Maritime Policy. The key objective is to produce scientifically-based operational procedures that allow a transition to fully integrated management.
HERMIONE Hotspot ecosystem research and Man's impact on European seas (HERMIONE)	NW Europe (Arctic, N Atlantic) and Mediterranean	Advancing knowledge of the functioning of deep-sea ecosystems and their contribution to the production of goods and services through interdisciplinary research	National Oceanographic Centre, Southampton (UK)	Apr 2009 to March 2012	Researching ecosystems including cold-water corals, canyons, cold and hot seeps, seamounts and open slopes and deep-basins. The project will make strong connections between deep-sea science and user needs. Enhancing education and public perception of deep-ocean issues through major EU aquaria. These actions, together with GEOSS databases that will be made available, will create a platform for discussion between stakeholders, and contribute to EU environmental policies.
SECOA Solutions for Environmental Contrasts in Coastal Areas	Europe, Asia	Managing natural coastal resource use for the sustainable development of coastal settlements	Sapienza University, Rome (It)	Dec 2009 – Nov 2012	Investigating areas of global/international and national/regional importance, SECOA will contribute to an advancement of knowledge in terms of institutional development, conflict mitigation, more effective and fair distribution of scarce resources, creating consensus and establishing management approaches for stakeholders. SECOA will also contribute to the design of new measures, plans and programs for ICZM.

ATLANTIC OCEAN Continued

Programme	Spatial Scale	Thematic Focus of Project	Lead Partner	Project Dates	Description
INTERREG					
IVA – Two Seas	NW Europe	Cross-border cooperation	Regional Council of Nord-Pas de Calais (Fr)	2007-2013	Providing financial support for cross-border cooperation under the priority areas of 1) Creating an economically competitive, attractive and accessible area, 2) Promoting and enhancing a safe and healthy environment, and 3) Improving quality of life. This is in addition to sharing good practice, particularly on projects with a maritime dimension.
IIIB – CorePoint COastal REsearch and POlicy INTegration	NW Europe	Development and implementation of Integrated Coastal Zone Management (ICZM) solutions	CMRC, Cork (Ire)	2004-2008	Using trans-national cooperation to build European and local capacity for ICZM, promoting social and political responsibility for the coast, influencing national spatial policies on ICZM and to develop an integrated coastal information management system for north west Europe.
IVB – IMCORE Innovative Management for Europe's Changing Coastal Resource	NW Europe	Promoting trans-national, innovative and sustainable approaches to reducing the Ecological, Social and Economic impacts of climate change	CMRC, Cork (Ire)	To 2011	Partners will work together to develop tools to identify the key processes that lead to the socio-economic consequences of climate change. Couplets will also prepare adaptive management plans for climate change scenarios in their local area, based on priorities such as maritime heritage and coastal conservation, MSP, integrated working, regeneration, renewable energy, public participation, biodiversity and information systems.
IVC **- Multi-modal Innovation for Sustainable Maritime & Hinterland Transport Structures (Port Integration)**	Europe-wide	Energy and Sustainable Transport	City of Hamburg, Ministry for Econ. and Labor Affairs	Jan 2010 – Dec 2012	Recognising imbalances between the use of transport modes on land and at sea, the project aims to identify, exchange and transfer best practice examples in the transport sector with the aim of an overall integration of related policies. It focuses on transport chains as a whole by combining best practice examples dedicated to maritime transport with those tackling issues of hinterland transport.

ATLANTIC OCEAN Continued

Programme	Spatial Scale	Thematic Focus of Project	Lead Partner	Project Dates	Description
ESPON 2013					
GEOSPECS - Geographic Specificities and Development Potentials in Europe	Europe-wide	European perspective on specific types of territories	University of Geneva	Feb 2010 – Dec 2012	Aiming to provide a coherent transversal framework to characterise the past trends, state and potential future developments of geographical specificities for territorial policy and regional development. Key outputs will include an update and extension of the ESPON Database through additional data on specific types of territories and regions gathered within the project, and maps revealing the specific types of territories and regions as mentioned before (border areas, highly or sparsely populated areas, inner periphery, mountain areas, islands, coastal zones, outermost regions) and their strengths and weaknesses as well as new typologies aiming at the clustering of regions.
Database 2013	Europe-wide	Database and data development	University of Paris 7 Denis Diderot (Fr)	July 08 – Feb 2011	Developing the ESPON database through integrating data sources, reconstituting data series and exploring new themes. The Project will also produce updated versions of the ESPON mapping tool facility, covering the entire EU plus Norway, Switzerland, Iceland and Liechtenstein.
Typology Compilation	Europe-wide	Regional typologies	**Spatial Foresight GmbH**, Luxembourg	Mar 2009 – Jan 2010	Review of existing typologies and developing/testing new typologies for territories receiving particular attention from policy makers.

Existing /Ongoing Research Projects related to BALTIC SEA

Programme	Spatial Scale	Thematic Focus of the Project	Lead Partner	Project Dates	Description
EU 7th Framework					
VECTORS	Europe	Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors	Plymouth Marine Laboratories	2011-2015	VECTORS will elucidate the drivers, pressures and vectors that cause change in marine life, the mechanisms by which they do so, the impacts that they have on ecosystem structures and functioning, and on the economics of associated marine sectors and society. IOW is a partner in VECTORS
KnowSeas	Europe	Knowledge-based Sustainable Management for Europe's Seas	Scottish Association for Marine Science	2009-2013	The overall objective of the project is to provide a comprehensive scientific knowledge base and practical guidance for the application of the Ecosystem Approach to the sustainable development of Europe's regional seas.
INTERREG					
BaltSeaPlan	Baltic Sea	MSP in the Baltic Sea	Bundesamt für Seeschifffahrt und Hydrographie	2009-2012	With a learning-by-doing approach BaltSeaPlan will overcome the lack of relevant MSP legislation in most Baltic SeaRegion countries. Seven Baltic Sea areas shall develop pilot maritime spatial plans.
Baltic Master II	Baltic Sea	Maritime transport and shipping safety	Region Blekinge	2009-2012	The overall aim of Baltic Master II is to improve the on-land response capacity to oil spills in the Baltic Sea as well as to enhance the prevention of pollution from maritime transport.

Existing /Ongoing Research Projects related to BLACK SEA

Programme	Thematic Focus of the Project	Lead Partner	Project Period	Description
EU 7th Framework:				
ENVIROGRID@Black Sea Catchment	*"Building Capacity for a Black Sea Catchment Observation and Assessment System supporting Sustainable Development"*	Université de Genève	2009-2013	The Black Sea Catchment is internationally known as one of ecologically unsustainable development and inadequate resource management, which has led to severe environmental, social and economic problems. The EnviroGRIDS @ Black Sea Catchment project addresses these issues by bringing several emerging information technologies that are revolutionizing the way we are able to observe our planet. **EnviroGRIDS** aims at developing a Black Sea Catchment Observation System that will store, analyze, visualize and disseminate information on past, present and future states of the region to assess and predict its sustainability and vulnerability.
INCONET-EECA	*S&T International Corporation Network for Eastern European and Central Asian Countries*	Centre for Black Sea Studies, ICBSS, Greece		The project will address policy stakeholders from the EU/AC and EECA countries. The aim is to establish and sustain three dedicated S&T Policy Dialogue Platforms: one biregional EU/AC with all Eastern European and Central Asian countries, and two bilateral platforms for the respective dialogues of EU/AC with Russia and with Ukraine. The project will address policy stakeholders from the EU/AC and EECA countries. The aim is to establish and sustain three dedicated S&T Policy Dialogue Platforms: one biregional EU/AC with all Eastern European and Central Asian countries, and two bilateral platforms for the respective dialogues of EU/AC with Russia and with Ukraine.
UP-GRADE BS-SCENE	*Up-Grade Black Sea scientific network*	Mariene Informatic Service Maris BV, Voorburg, Netherlanden	2009-2011	The UP-GRADE BS-SCENE project is an FP7 EU funded project running from 2009-2011 that is building and extending the existing research infrastructure (developed under FP6 project BlackSeaScene 1) with an additional 19 marine environmental institutes/organizations from the 6 Black Sea countries. Implementing FP6 RI SeaDataNet project standards regarding common communication standards and adapted echnologies will ensure the datacenters interoperability. Main output will be on-line access to in-situ and remote sensing data, meta-data and products.

BLACK SEA Continued

Programme	Thematic Focus of Project	Lead Partner	Project Period	Description
EU 7th Framework:				
BS-ERA.NET		National Centre for Programme Management Romania	2009-2011	BS-ERA.NET is a networking project aimed at integrating the participating countries from the Black Sea extended region in the European Research Area by linking research activities within existing national, bilateral and regional RTD programmes. The types of the activities that are planned during the implementation period of the project are as followings: - Information exchange between Member States, Candidate countries and Black Sea Region countries promoting an effective and efficient international scientific EU cooperation strategy at EU level; - Definition and preparation of joint activities; - Implementation of the designed mechanisms and instruments in order to harmonize stand alone activities at national and regional level.
ASCABOS	*Program for Capacity Building in the Black Sea Region towards Operational Status of Oceanographic Services*	IO-BAS	2006-2008	ASCABOS is designed to strengthen the communication system ensuring flexible and operative infrastructure for data and information exchange between partners and end users. ASCABOS aims to increase public awareness and to stimulate and motivate the utilization of operational oceanographic information in regional management and decision-making practices. ASCABOS supports achievement of these crucial objectives by initiating an educational and training programme designed for young scientists and wide spectrum of end users. Considerable work has been performed on compiling meta-databases on the Black Sea environmental data, information and research within previous international initiatives and projects.

BLACK SEA Continued

Programme	Thematic Focus of Project	Lead Partner	Project Period	Description
EU 7th Framework:				
ARENA (CEEX)	*" A Regional Capacity Building and Networking Programme to Upgrade Monitoring and Forecasting Activity in the Black Sea Basin"*	Black Sea GOOS		The Project has the following general objectives:: -Scientific foundation of the decisional capacity regarding the activities connected with marine and coastal environment; -Insure the sustainable development conditions of the possibilities of turning to account the services and goods offered by marine environment; -Mitigation economically, socially and environmentally the risks generated by extreme events and hazards, in the condition of their frequency and magnitude increase. The Project has certain specific objectives: -Strengthening the logistic capacity expertise and performance of the national institutes involved in operational oceanography; -Achievement of an integrative Platform of the national capacities, to reach the operational status of the operational oceanography; -Set -up of an operational technological transfer of oceanographic data and products to the end-users;
MICORE (FP7)	*Morphological Impacts and Coastal Risks Induced by Extreme Storm Events*	Department of Earth Sciences University of Ferrara, Italy (uniFe)	2005-2015	With a multidisciplinary and integrated approach in natural hazards research, the MICORE project provides an opportunity for European science to guide and support the implementation of the International Strategy for Disaster Reduction and its framework for action.
Other				
ECBSea	*Project on Environmental Collaboration for the Black Sea*	Kyiv, Ukraine	2007-2009	The Project's overall objective is to contribute to the sustainable development of the Black Sea Basin by prevention and reduction of pollution to the Black Sea (from river discharges or direct discharges) and sustainable management of natural resources and protection of biodiversity of the Black Sea basin.

BLACK SEA Continued

Programme	Thematic Focus of Project	Lead Partner	Project Period	Description
Other				
CoMSBlack	*The Cooperative Marine Science Programme for the Black Sea*	Intergovernmental Oceanographic Commission (IOC)	Since 1991	Objectives include: • to provide an assessment of the natural and anthropogenically - induced environmental changes using historical data; • to provide an assessment of man-made and natural influences on the ecosystem structure and function in the water column and benthos; • to develop multiple and interactive scale models that will be applicable to studies concerned with the ecology and biogeochemistry of the Black sea.
EROS 2000	*European River-Ocean System Project*		1994-1998	To develop an integrated approach to the eutrophication, contaminant problem, particle transfer, sedimentation and biogas production of the north-western Black Sea through the establishment of fine resolution coupled hydro dynamical -biogeochemical models of the river and marine systems in order to describe and predict the response of the coastal ecosystem to natural variability and anthropogenic factors such as changes in land use and hydraulic management.
TU-BLACK SEA	*Ecosystem Modelling as a Management Tool for the Black Sea*	Institute of Marine Sciences, Middle East Technical University, Erdemli, Turkey	1996-1998	To establish a data base management system in all the Black Sea countries for environmental and oceanographic data pertinent to the goals of this program; • To provide cross-training and unifying scientific equipment and to carry out intensive and extensive joint in-situ observations and monitoring to assist in the development of appropriate infrastructure and capabilities for future research activities; and • To develop interdisciplinary community models for the dynamics of the lower trophic levels of the biological community affected by anthropogenic changes and physical processes.
BSREP phase II	*The Black Sea Ecosystems Recovery Project*	GEF (Global Environmental Facility)	2004-2007	The project in its Tranche 2 will continue supporting the Black Sea regional aspects of the Black Sea Partnership for Nutrient Control. It will assist and strengthen the role of the Black Sea Commission (of the Bucharest Convention for the Protection of the Black Sea against Pollution) and ensure the provision of a suite of harmonised legal and policy instruments for tackling the problem of eutrophication, and release of certain hazardous substances, and to facilitate ecosystem recovery. An important feature of the project is its encouragement of broad stakeholder participation. The project will also enable a new suite of indicators for monitoring the effectiveness of the measures taken by the Partnership.

Existing /Ongoing Research Projects related to ENERGY

Programme	Spatial Scale	Thematic Focus of the Project	Lead Partner	Project Dates	Description / relevance to ESaTDOR
EU 7th Framework Programme					
MUSTANG	Europe	Development of a methodology for the qualification of deep saline aquifers for CO2 storage	Uppsala University	2009-	Assessing potential for geological carbon storage sites, including at sea
MARINA	Europe	Evaluation of multi-purpose platforms for marine renewable energy	Acciona, Spain	2010-2014	Development of technologies for integrated offshore renewables
ORECCA	Europe	Innovative, cost efficient and environmentally benign offshore renewable energy conversion platforms for wind, wave and other ocean energy resources	Fraunhofer Institute, Germany	2010-2011	As above
INTERREG					
IVC: POWER Programme: WICO : Wind of the Coast	Europe	Inter-regional programme aimed at driving Low Carbon Economies. WICO - wind energy systems along coastlines	Province of Ravenna, Italy	?	Integration of small-scale renewables to coastal economies.
IVB: POWER Cluster	North Sea region	Developing the North Sea Offshore Wind Power Cluster	BIS Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung, Germany	01/07/2008 - 30/06/2011	Development of offshore wind energy infrastructure in the North Sea
IVB: SUBMARINER	Baltic region	Sustainable Uses of Baltic Marine Resources	?	June 2010 - Sept 2013	Effects of offshore energy production for the Baltic environment.

ENERGY Continued

Programme	Spatial Scale	Thematic Focus of the Project	Lead Partner	Project Dates	Description / relevance to ESaTDOR
ESPON Projects					
RERISK	Europe	Regions at Risk of Energy Poverty	Innonbasque, Spain	July 2008 – July 2010	Potential for offshore energy supply and offshore grid systems to benefit regions at risk of energy poverty.
CLIMATE	Europe	Climate Change and Territorial Effects on Regions and Local Economies in Europe	TU Dortmund University, Germany	March 2009 – Apr 2011	Consequences of climate change for patterns of energy demand, affecting potential patterns of marine energy supply?

Existing /Ongoing Research Projects related to ENVIRONMENT

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
6th and 7th Framework Programme				
AWARE: How to achieve sustainable water ecosystems management connecting research, people and policy makers in Europe (FP7)	Ecosystems-Based Management		2009 -	The AWARE project addresses the anthropogenic deterioration of water ecosystems in coastal areas. Three areas will be studied: (a) the Gulf of Riga, (b) the Southern North Sea, and (c) Po Delta /Sacca di Goro. The specific objective of the AWARE project is to explore with reference to each of the above three case studies: how scientific knowledge is used in policy formulation and implementation, and how policy managers interact with the public and civil society.
COEXIST: Interaction in coastal waters: A roadmap to sustainable integration of aquaculture and fisheries (FP7)	Marine Spatial Planning	Institute for Marine Research, Bergen, Norway	2010 -	COEXIST brings together 13 partner institutions from 11 countries with expertise in both aquaculture, fisheries and governance. Partners will look at operations in five case study areas and use the experience of local stakeholders, combined with the outcomes of existing international case studies, to evaluate the performance of current spatial management tools. This information will then be synthesised to produce guidelines for best practice in spatial planning for the fisheries and aquaculture industries and for use by the European Commission and its policy makers with a view to assisting in the implementation of the EU's Integrated Maritime Policy.
CoralFISH (FP7)	Ecosystems-Based Management	NUI Galway, Ireland	2008 -	CoralFISH will assess the interaction between corals, fish and fisheries, in order to develop monitoring and predictive modelling tools for ecosystem based management in the deep waters of Europe and beyond. Two FP6 projects (PROTECT & HERMES) have already identified the need for information concerning the interaction between fish and cold water coral habitats. CoralFISH brings together a unique consortium of deep-sea fisheries biologists, ecosystem researchers/modellers, economists and a fishing industry SME, who will collaborate to collect data from key European marine eco-regions.
ECASA: Ecosystems Approach to Sustainable Aquaculture (FP6)	Ecosystems-Based Management	SAMS, Oban, UK	2004-07	ECASA undertook a fieldwork programme involving sites ranging from the Atlantic waters of Norway and Scotland, the Baltic and the Mediterranean. ECASA included both fin and shell fish marine aquaculture and has actively sought stakeholder participation from the outset.

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
6th and 7th Framework Programme				
ECOKNOWS: Effective use of ecosystems and biological knowledge in fisheries (FP7)	Ecosystems-Based Management	University of Helsinki, Finland	2009	The general aim of the ECOKNOWS project is to improve knowledge in fisheries science and management. ECOKNOWS seek to improve the use of large existing biological and environmental databases, published papers and survey data sets provided by EU data collection regulations and stored by ICES and EU member countries and the extensive information present in FishBase (www.fishbase.org). The developed methodology will be of importance for implementation of the Ecosystem Approach to Fisheries Management.
ECOST (FP6)	Ecosystems-Based Management	University of Portsmouth, , UK	2005 - 2010	The main aim of the ECOST project is to develop a new approach to assess the societal cost of fishing activities and fishing policies. The project takes the wider perspective of equipping public decision-makers and society with the appropriate tools and methods needed to take into account not only immediate economic and social profits, but also the costs engendered by fishing activities which relate as much to ecosystems as to societies.
ECOSUMMER: Ecosystem approach to Sustainable Management of the Marine Environment and its living Resources (FP6)	Ecosystems-Based Management	University of Aberdeen, UK	2006 - 2009	Aims to train the next generation of marine scientists in concepts such as adoption of an ecosystem approach to exploitation of marine resources, to promote ecological, environmental, economic and social sustainability and preserve biodiversity. A consortium of eight internationally-recognized universities and marine science institutes in UK, Spain and Greece offers early stage training in a range of topics related to the project theme, with particular emphasis on an ecosystem approach to sustainable management of living marine resources.
ELME: European lifestyles and marine ecosystems (FP6)	Ecosystems-Based Management	University of Plymouth, UK	2004 - 2007	Bringing marine ecosystems into policies for sustainable development requires better information on the causal connections between human pressures and the changing state of the systems. This is particularly important at a time when the European Community is expanding, re-examining its agricultural and chemical policies, implementing a new fisheries policy and exploring new ways to protect marine systems. ELME will enhance understanding of causality, forecast the impacts of divergent development scenarios and inform evolving Community policies.

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
6th and 7th Framework Programme				
IMAGE: Indicators for fisheries MAnaGement in Europe (FP6)	Ecosystems-Based Management	IMARES, Netherlands	2006 - 2009	The project 'Indicators for fisheries MAnaGement in Europe' (IMAGE) seeks: - to develop an operational framework of candidate indicators to support ecosystem-based fisheries management, - to elaborate these indicators into comprehensive dashboards to support management decision making, - to develop methodology to integrate this information into tools supporting the decision making process, - to develop a framework that can evaluate management strategies based on indicators, and - to test their applicability in regional case studies, taking into account the diversity of the fishery systems in Europe.
MEECE: Marine Ecosystem Evolution in a Changing Environment (FP7)	Ecosystems-Based Management	Plymouth Marine Labs, UK	2008 -	MEECE aims to increase ecosystem modelling predictive capacities. Using a combination of data synthesis, numerical simulation and targeted experiments MEECE intends to boost our knowledge and develop the predictive capabilities needed to learn about the response of marine ecosystems. MEECE will also develop methods to integrate the dynamic response of marine ecosystems to the combined effects of various anthropogenic and natural drivers in order to provide decision making tools to support the EC Marine Strategy, EC Maritime Policy and the EC Common Fisheries Policy.
MEFEPO: Making the European Fisheries Ecosystem Operational	Ecosystems-Based Management	University of Liverpool, UK	2007	MEFEPO will focus on how best to make current institutional frameworks responsive to an ecosystem approach to fisheries (EAF) management at regional and pan-European levels in accordance with the principles of good governance. This will involve stakeholder interaction and the integration of existing knowledge in ecological, fisheries and social research to develop a decision making process which integrates a wide breadth of interests. MEFEPO will focus on three geographical areas and their respective Regional Advisory Committees (RACs): the North Sea AC, the North-Eastern Waters RAC and the South-Western RAC.

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
6th and 7th Framework Programme				
MESMA: Monitoring and Evaluation of Spatially Managed Areas (FP7)	Marine Spatial Planning	IMARES, Netherlands	2009	The MESMA project focuses on marine spatial planning and aims to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluation and implementation of Spatially Managed Areas (SMAs). The project results will support integrated management plans for designated or proposed sites with assessment methods based on European collaboration.
PEGASO: People for Ecosystem Based Governance in Assessing Sustainable Development of Ocean and Coast (FP7)	Ecosystems-Based Management	Universitat Autonoma de Barcelona, Spain	2010	The aim of PEGASO is to build on existing capacities and develop common novel approaches to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea Basins in ways that are consistent with and relevant to the implementation of the ICZM Protocol for the Mediterranean. PEGASO will use the model of the existing ICZM Protocol for the Mediterranean and adjust it to the needs of the Black Sea. The building of a shared scientific and end users platform is at the heart of our proposal linked with new models of governance.
PROTECT: Marine protected areas as a tool for ecosystem conservation and fisheries management (FP6)	Ecosystems-Based Management, Marine Spatial Planning	Danish Institute for Fisheries Research (DIFRES), Denmark	2005 - 2008	PROTECT is an interdisciplinary, policy-oriented research project aiming to enhance the decision basis for the development and management of marine protected areas (MPAs) in Europe as part of an ecosystem-based approach to fisheries management. The objectives of PROTECT are to evaluate the potential of MPAs as a tool in fisheries management and protection of sensitive species, habitats and ecosystems and to outline a suite of scientifically based monitoring, assessment and evaluation tools for assessing the impact of MPAs on fisheries, marine ecosystems, and to assess the effect of different levels of protection, including the impact and socio-economic effects of MPAs on fishing communities.

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
6th and 7th Framework Programme				
SPICOSA: Science Policy Interface for Coastal Systems Assessment (FP6)	Ecosystems-Based Management	IFREMER, France	2007 -	SPICOSA will develop a Systems-Analysis Framework (SAF) that generates Decision-Support Tools (DST) for integrated Ecological, Social, Economic (ESE) assessments needed for policies aiming at the sustainability of Coastal Zone (CZ) Systems. SPICOSA will be an IP consortium of natural, economic, and social scientists that will generate new knowledge (about prognostic methods for complex systems); address social needs (by promoting sustainability and improving science-policy interface), and contribute to research infrastructure change (by promoting international and multidisciplinary integration).
INTERREG				
BALANCE: Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning (INTERREG III)	Ecosystems-Based Management, Marine Spatial Planning	Danish Forest and Nature Agency, Denmark	2005-07	Conflicting priorities and lack of integrated management planning is a key obstacle for resolving the problems of environmental degradation in the Baltic. An ecosystem-based approach to management, based on transnational spatial planning, would be a strong tool to overcome this challenge. Spatial planning is needed for a holistic planning and informed decision-making and would also contribute to a cost-effective and successful implementation of EC Directives, HELCOM recommendations and related policy documents.
GAUFRE: Towards a Spatial Structure Plan for Sustainable Management of the Sea (INTERREG III)	Marine Spatial Planning	Maritime Institute, Ghent University, Belgium	2003 - 04	The second scientific Support Plan for a Sustainable Development policy (SPSD II) aims to promote multidisciplinary research in order to balance economic, social and ecological aspects, being the pillars of sustainable development. The development of a spatial structure plan for the Belgian part of the North Sea fits within this framework. GAUFRE tries to make a first attempt towards such a structure plan. The main aim of the project is the delivery and the synthesis of the scientific knowledge on the use and possible impacts of use functions. Consequently, a first proposal of possible optimal allocations of all relevant use functions in the Belgian part of the North Sea (BPNS) will be formulated.

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
INTERREG				
PLANCOAST (INTERREG III)	Marine Spatial Planning	Ministry of Transport, Building and Regional Development Mecklenburg–Vorpommern	2006 - 2008	The coastal zones of the Adriatic, Baltic and Black Sea are facing severe pressures from development. Multiple sea and coast-based activities such as tourism, transport, fishery/aquaculture and energy generation are constantly growing. The challenge is to make the most of the economic potential of the seas in a sustainable manner – by avoiding conflicts and creating maximum synergies between the various interest groups. Integrated Coastal Zone Management (ICZM) meets this challenge from a versatile point of view.
POWER: Pushing Offshore Wind Energy Regions (INTERREG III)	Marine Spatial Planning	Bremerhavener Gesellschaft für Investitionsförderung und Stadtentwicklung mbH (BIS)	2004 - 2007	The POWER project unites North Sea regions with an interest in supporting and realising the economic and technological potentials of offshore wind energy. The project assesses environmental and planning as well as acceptance issues of offshore wind farms, supports the development of a reliable supply chain for the sector, and elaborates skills development measures. The central aim of POWER is to unify these regions, to learn from each other, to set up common strategies overcoming economic changes, to respond to new educational needs and to give thereby a positive impetus to a continuing sustainable development in the North Sea Region.
SUSFISH: Shellfish productivity in the Irish Sea: Working towards a sustainable future (INTERREG IV)	Marine Spatial Planning	University of Wales, Bangor	2009	SUSFISH will produce guidelines for future fisheries management, ensuring sustainable development of the shellfish industry in Ireland and Wales for the next 50-100 years. This will be achieved by assessing the effects of climate change (via oceanographic models) on shellfish productivity in the Irish Sea and determining adaptation or mitigation strategies for the industry, including recommendations for protection of certain areas (Marine Spatial Planning- MSP).

ENVIRONMENT Continued

Programme	Thematic Focus of Project	Lead Partner	Project Dates	Description
Other EU funded projects				
Beaufort Ecosystems Approach to Fisheries Management	Ecosystems-Based Management	UCC Marine Institute, Ireland	2007 -	The Work Programme of the Beaufort Ecosystems consortium aims to harness and integrate the diverse research expertise required to develop a Centre of Excellence on the Island of Ireland that focuses on the development of an Ecosystem Approach to Fisheries Management (EAF).
BIOFUN: Biodiversity and Ecosystem Functioning in Contrasting Southern European Deep-Sea Environments: from viruses to megafauna	Ecosystems-Based Management	ICM-CSIC, Barcelona, Spain	2008 -	The aim of BIOFUN is to characterise, under an ecosystem approach, two deep-sea habitats – the mid-slope and abyssal plain – including for the first time the analysis from viruses to megafauna, to understand the linkages between biodiversity patterns and ecosystem functioning in relation to environmental conditions along a gradient of increased oligotrophy from West to East.
PISCES: Partnerships Involving Stakeholders in the Celtic Sea Ecosystem (LIFE+)	Ecosystems-Based Management	UCC, Ireland and the Environment Council	2010	The PISCES project will employ an innovative process to empower stakeholders to create their own practical guidelines that can deliver an ecosystem approach in the Celtic Sea. This is a pioneering project - the first to translate EU and UK marine policy into practical outputs for multiple sectors and across a multinational area. PISCES enables people who use the Celtic Sea to develop their own guidelines to deliver an ecosystem-based approach to managing their marine environment.
SEANERGY (EACI Intelligent Energy Programme)	Maritime Spatial Planning	European Wind Energy Association	**2010**	The SEANERGY 2020 project will formulate concrete policy recommendations on how to best deal with maritime spatial planning (MSP) and remove MSP obstacles that stand against the deployment of offshore renewable power generation. It will provide policy recommendations for a more coordinated approach to MSP and for a larger deployment of offshore renewable (wind, wave, tidal). These recommendations will be promoted and addressed to different national, regional and European authorities and disseminated to the different maritime users through meetings and workshops organised in four different sea basins (Atlantic, Mediterranean, Baltic and North).

ENVIRONMENT Continued

Additional Research Programmes

- Advanced tool for scenarios of the Baltic Sea ECOsystem to SUPPORT decision making ***(EcoSupport)***
- Calcification by Marine Organisms ***(CALMARO)***
- Environmental Impacts of Alien Species in Aquaculture ***(IMPASSE)***
- European catchments, catchments changes and their impact on the coast ***(EUROCAT)***
- European Land-Ocean Interaction Studies ***(ELOISE)***
- European Project on Ocean Acidification ***(EPOCA)***
- ***HYPOX*** - In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies
- Integrating Multiple Demands on Coastal Zones with Emphasis on Aquatic Ecosystems and Fisheries ***(INCOFISH)***
- International Action for the Sustainability of the Mediterranean and the Black Sea Environment ***(IASON)***
- Land-Ocean Interactions in the Coastal Zone ***(LOICZ)***
- Marine Biodiversity and Climate Change ***(MarClim)***
- Marine Biodiversity and Ecosystem Functioning- EU Network of Excellence ***(MarBEF)***
- Predictive habitat mapping in the English Channel for marine resource management ***(CHARM)***
- Southern European Seas: Assesssing and Monitoring Ecosystem changes ***(SESAME)***
- Sustainable management of deep-water fisheries and their impact on marine biodiversity ***(DeepFish)***
- Understanding the Mechanisms of Stock Recovery ***(UNCOVER)***
- Working Group on Risk Assessment and Monitoring of Existing and Emerging New Chemicals in the European Marine and Coastal Environment - ***WG POL***

Annex 13: Timeline for ESaTDOR Project

Work Package	Activity	2010		2011												2012												2013	
		N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F-Jun
1	Project Management				IcR				TM		ItR					TM					TM		DR					FR	
2.1	Research Framework/ Inception Report																												
2.2	Thematic Briefing Papers																												
2.3	Seas Profiles																												
2.4	Case Studies																												
2.5	Thematic Synthesis Reports																												
2.6	Future Scenarios																												
2.7	European Overview/ Policy Recommendations																												
3	Dissemination																												

Deadlines

Inception Report (IcR) - 1 March 2011
Interim Report (ItR) - 1 September 2011
Draft final Report (DR) - 1 September 2012
Final Report (FR) - 16 January 2013
Team Meeting (TM)

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