Part-financed by the European Union
(European Regional Development Fund)

MULTI-LEVEL GOVERNANCE
IN MARITIME SPATIAL PLANNING
THROUGHOUT THE BALTIC SEA REGION
PartiSEApate

"Enhancing Research for Marine Spatial Planning"

Coastal Research and Planning Institute, Klaipeda University

28-29 of May, Klaipeda, Lithuania

Author of the report: Daniel Depellegrin, Nerijus Blažauskas

Goals of the workshop:

- To establish dialog between research and Maritime Spatial Planning
- Identification of applicability of research on marine ecosystems and socio – economic valuation of ecosystem services to support Marine Spatial Planning
- To reflect on current and future research topics in order to cover knowledge gaps and therefore facilitate the Marine Spatial Planning
- To Elaborate potential research priorities to be addressed for the BONUS Call 2013 themes related to the MSP

Participants

31 persons participated in the workshop in total

- from BSR:

Sweden	Aquabiota, Swedish Agency for Marine and Water Management (SwAM)
Finland	BONUS - Secretariat
Germany	sustainable-projects GmbH (s.Pro) - PartiSEApate External Project Coordination Office
Latvia	Baltic Environmental Forum, Kurzeme Planning Region, Latvian Institute of Aquatic Ecology, VASAB Secretariat
Lithuania	Coastal Research and Planning Institute (CORPI), Klaipeda University, Lithuanian Fishery Service, Curonian Spit National Park
Poland	University of Gdańsk
Russia	Atlantic Branch of P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences
Norway	Institute of Marine Research (IMR)

- outside BSR:

The Netherlands	Wageningen University

1. Structure of the workshop

The workshop was structured into 3 thematic sessions:

Session 1: Ecosystem based approach in MSP
This session focused on the identification of current research efforts that can support the understanding of the ecosystem based approach and further implementation needs. Application examples from species distribution modelling (SDM) were illustrated and how predictive biological mapping can be applied for MSP (PreHab and MARMONI project). Further considerations on the importance of small scale detection of marine assets, their temporal variability and the complex interactions in marine fauna and reflection in delineation of protected areas was presented in the context of the DENOFLIT Project.

Session 2: Socio – Economic Valuation of Ecosystem Services (ES) to support MSP
This session introduced the concept of ecosystem services assessment, applicable socio - economic valuation methods for the evaluation of marine areas. The session was followed by a series of case studies on socio – economic valuation of marine biodiversity in the Gulf of Gdansk and two case studies on the research base for MSP in Norway and state of MSP in the Kaliningrad District (Russia).

Session 3: Interdisciplinary session
This session aimed to discus and answer the pre-prepared guiding questions, divided into three thematic blocks and focused on ecosystem based approach (question blocks A + C) moderated by Sergej Olenin (CORPI) and the integration of socio – economic indicators of ecosystem services into MSP (question blocks B +C) moderated by Dolf de Groot (Wageningen University). Additionally case studies on Land – Sea integration related to coastal landscape protection and eutrophication mitigation strategies in the Gulf of Gdansk were presented and discussed in plenary session.

2. Role of research in implementation of ecosystem based approach in MSP:

Guiding questions:

- *Brief overview on the scientific and legal framework of the ecosystem based approach and application in MSP*
- *What methods/ tools/models can be applied to address ecological connectivity and its spatial and temporal dimension? What indicators/values can be involved?*
- *What methods/tools/models/ measurements are needed to improve evidence on habitats heterogeneity, connectivity, spatial distribution, etc…?*
- *How do today's Nature Management and Conservation targets serve their purpose if we consider ongoing ecological changes. Are present MPA valid in 20 – 100 years' time? Are there new areas that should get special attention due to their importance or uniqueness? What is the optimum size of MPAs? What tools/models are needed to address such issues?*
- *Which methods/ tools/models can be used to monitor and evaluate effects of a Marine Spatial Plan?*

The Marine Strategy Framework Directive (MSFD) adopted in July 2008 aims at achieving or maintaining 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 enriches 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. In order to achieve the objective the Member States have to develop Marine Strategies which serve as Action Plans and which apply an ecosystem-based approach to the management of human activities.

It was stressed that biological mapping techniques are fundamental aspect for the implementation of the ecosystem based approach in MSP due to the following functionalities:

1. Multi - Criteria analysis to map valuable habitats
    - GIS analysis
    - HELCOM biotopes (HUB) via random forest techniques
2. Conservation value mapping
    - Application of Convention on Biological Diversity (CBD) criteria
    - Biological maps and field data
    - Identification of trophic relations
3. ES service mapping
    - Connectivity between habitats and large fish population
    - Identification of ecological structures and ES provision
4. Scenario based impact assessment
    - Evaluation of eutrophication management scenarios according to Baltic Sea Action Plan (BSAP) targets -> cost – benefit assessment tools
    - Predictive species distribution model (SDM) based on planning scenarios
5. Ocean zoning tools (the following GIS based tools are applied for integration of conservation values into planning and multiple species connectivity assessment)
    - Nature Serve Vista (http://www.natureserve.org/prodServices/vista/overview.jsp)
    - Marxan & Marxan with zoning (http://www.uq.edu.au/marxan/)
    - Cumulative Impact assessment tools (http://ebmtoolsdatabase.org/tool/cumulative-impacts-assessment-tool)
    - Zonation (http://ebmtoolsdatabase.org/tool/zonation)
    - Atlantis (http://ebmtoolsdatabase.org/tool/atlantis)
    - Marine Maps (http://marinemap.org/)

It was further noted that there is a specific requirement by the sector for a stronger stakeholder involvement, development of consultation methods and the need for socio – economic valuation studies in order to better address research topics to decision makers. At the same time stakeholder experience needs to be considered for the development of bio – economic models in terms of data input, model calibration and iteration.

Participants stressed the need for further research related to the size of MPAs. It was intuitively clear that the knowledge on size of MPA must be defined as a function of the specific ecological and socio - economic context. Furthermore research should investigate the role of networks of MPA and possibly assess the ES provision derived from the ecological networks. A further consideration was made on the need for tools to measure the ecological effects on management of MPA, the benefits obtained, and address compensation mechanisms for the impacted sectors.

3. Integration of socio-economic valuation of ecosystem services into MSP

Guiding questions:

- *Brief overview on the concept of the ecosystem services and their importance in management of human activities and sea space.*
- *What are opportunities and implications of using economic evaluation of ES for the management of marine areas? Could the understanding of space requirements change with the application of monetary indicators? How would they change?*
- *What are existing tools/models that address changes in quality and quantity of ecosystem services provided by marine biodiversity? What indicators are involved?*
- *Which tools/models/ frameworks are required to address user-user or user – environment conflicts in MSP? What indicators/ values should be involved? What role can socio – economic valuation of ES play in the conflict assessment?*

The MSFD explicitly requires member states to take into account social and economic aspects when preparing and implementing their marine strategies. The four key economic requirements of the MSFD are presented in the following list:

- Initial assessment of a member states' marine waters, including economic and social analysis (ESA) of the use of those waters, and of the cost of degradation of the marine environment (Art. 8.1(c) MSFD).
- Establishment of environmental targets and associated indicators describing GES, including due consideration of social and economic concerns (Art. 10.1 in connection with Annex IV, no. 9 MSFD)
- Identification and analysis of measures needed to be taken to achieve or maintain GES, ensuring cost-effectiveness of measures and assessing the social and economic impacts including cost-benefit analysis (Art. 13.3 MSFD)
- Justification of exceptions to implement measures to reach GES based on disproportionate costs of measures taking account of the risks to the marine environment (Art. 14.4 MSFD) (Bertram and Rehdanz, 2012)

As mentioned previously the MSFD requires the application of an ecosystem-based approach to the management of human activities and it further mentions that intact marine ecosystems provide a wide variety of benefits to society through the goods and services they offer. Marine Ecosystem Services refer to the goods and services provided by marine ecosystems including the open sea,

coastal areas and estuaries. ES provided by marine environment can be divided in the following 4 categories (adopted from Arcadis Belgium 2010; Beaumont et al., 2007):

Table: The four marine ES provided by the marine environment

Provisioning services	**Regulating services**
• Provision of food • Provision of genetic resources/medicine • Provision of energy (wind, wave, tide) • Provision of other renewable resources for other purposes (jewellery, souvenirs, etc.) • Provision of non-renewable resources • Provision of space and transport routes	• Gas and climate regulation • Storm and flood protection • Erosion control • Bioremediation of waste • Water purification and detoxification
Cultural services	**Supporting services**
• Recreation and leisure • Aesthetics and inspiration • Cultural heritage and identity • Spiritual and religious values • Science and education	• Primary production • Biogeochemical cycling • Ecosystem stability and resilience • Habitats • Food web dynamics • Biodiversity

The socio – economic valuation of ES can be based on several economic valuation methods:

- *Direct market based*: estimates economic values for ecosystem products or services that are bought and sold in commercial markets (e.g. fishery).
- *Indirect Market Valuation*: estimates economic values for virtually any ecosystem or environmental service. People states directly their willingness to pay (WTP) for a specific environmental service. Methods: Avoided Cost, Factor Income, Travel Cost, Hedonic Pricing, replacement costs.
- *Contingent Valuation Method*: introduces a hypothetical market for an environmental good expressed by the Willing to pay (WTP).

It was noted that one method of ensuring the integration of social, economic and environmental demands and pressures, as required by the Ecosystem Approach, is to utilise the concept of ecosystem goods and services. ES can be applied as performance indicator on how different ecosystem – based management measures or planning scenarios can affect human wellbeing.

It was stressed that as guiding principle the Total Economic Value (TEV) should be used, because it tries to capture all components that contribute to the value of ecosystem goods and services for humans.

One comment was made to the indicators used in ES assessment e.g. €/ha/yr. One participant argued the fact that for MSP this indicator is not suitable due the 3 dimensional perspective of the sea and sea uses. A possible solution was identified in the use of volumetric indicator e.g. €/m³/yr.

A marine ES assessment framework (or marine ES typology) can provide the metrics to assess quantity, quality and value of benefits obtained from different sea uses and address change in ES. In

the context of MSP, tradeoff analysis was identified as suitable tool for conflict assessment. In this context we would like to refer to the following case studies, White et al., 2012; Guerry et al., 2013 and Lester et al., 2013. It was however mentioned that conflicting uses might be not only 2 dimensional (e.g. fishery-windfarms), but might be competing on 3 dimensions (e.g. fishery-windfarm-tourism-habitat protection), also called three-way tradeoff. Tools are needed that can address these multiple dimensions of conflicts and provide sets of management options.

Other usage of ES in planning were identified by impact analysis and project evaluation (EIA) in order to address environmental damage and changes in ecosystem functions and values and integrated cost – benefit analysis as required by the MSFD.

It was further noticed that the knowledge on ecosystem services in coastal areas is much more extended compared to offshore areas. An extension of the ES framework should possibly include offshore areas.

It was stated that cultural values assessment have higher impact on political level due to their better understanding by the broad public opinion e.g. windfarm development and visual impact (aesthetic value). At the same time although cultural values are concentrated in coastal areas, they are the most difficult to assess and quantify. In this context the sector stressed the need for further research on the impact of different sea uses on the socio – cultural context. A specific example mentioned is the uncertainty related to visual impact from offshore windfarm on the real estate market. Does the real estate value of housing increase or decrease with the presence of an offshore wind farm? The same need for visual impact analysis was stressed for aquaculture installation or port development.

An important initiative which was mentioned is "*The Economic of Ecosystems and Biodiversity*" (TEEB), launched in 2007 and aiming to study the economics related to biodiversity loss. On EU level the initiative aims to map and quantify ES by 2014, estimate ES values in physical and monetary units by 2020 for each member state and is part of the EU Biodiversity Strategy, which aims to "*improve knowledge of ecosystems and their services in the EU*".

It was further noted that the so called "*Ecosystem Service Partnership*" (http://www.es-partnership.org/esp/79125/5/0/50), a worldwide network of ES experts can be used as platform to facilitate practical application of ES assessment in the Baltic Sea. The network includes several working groups, among others ES – biodiversity, ES – planning and ES –tradeoff analysis.

Availability of research data for MSP purpose

Guiding questions:

- *What kind of data/information would researchers see as necessary in order to make a knowledge based decision in MSP?*
- *What kind of databases are used for data and information management in research? How can they contribute to MSP? What are gaps of these information systems?*
- *What can be the contribution of specific database of economic indicators of ES to MSP? How could this data be collected/aggregated and made available to decision makers?*

It should be noted that evaluation of marine ES in the Baltic Sea Region is still in an early stage compared to other seas in the world. This does not mean that economic valuations do not exist, but the sharing of this type of indicators in the sector is not a common practice or the availability of common platforms to store econometric indicators is still lacking support in the BSR.

Furthermore it was noted that there are many ES valuation methods available and that their application in different geographic contexts can consistently differ. An illustrated short coming is a lack of guidelines on how to harmonize socio – economic indicators of ES from different geographic contexts in order to provide region specific indicators potentially applicable on Pan Baltic level. For this purpose a review mechanism for ES indicators based on expert groups should be established in order to ensure a quality control on monetary indicators. Suggested meeting interval of the group could be biennial period.

A series of databases were mentioned which include socio-economic valuation indicators of marine and coastal ecosystem services (including the Baltic Sea) and which could be used as information source or as baseline for the development of a specific MSP related indicator database:

- Marine Ecosystem Service Partnership (http://www.marineecosystemservices.org/explore): contains over 1900 entries on indicators divided by country and by resource type: fishery, tourism, aesthetic value
- Ecosystem Service Evaluation toolkit (http://www.esvaluation.org/): global natural capital valuation toolkit for planners and managers used to incorporate economic indicators of natural resources into a common database.
- Ecosystem Service Indicators Database (ESID) (http://www.esindicators.org/): database on ecosystem service metrics and indicators.

An existing tool for tradeoff analysis is the so called Marine InVest Model. (http://www.naturalcapitalproject.org/InVEST.html): The Marine Integrated Valuation of Ecosystem Services and Tradeoffs is a toolset to map, model and value multiple services provided by marine ecosystems. Outputs are provided in biophysical, monetary and non-monetary terms. At the current state Marine InVest can model food provision from fishery and aquaculture, coastal protection, recreation and energy from waves. Economic values can be estimated in monetary terms with avoided damage, treatment costs and market valuation.

As mentioned previously it is important to develop existing databases and systems rather than create new ones for short term projects perspective. A central database for MSFD data should be made available and linked with an MSP data depositarium, additional data requirements should focus on socio – economic data, ecosystem services and natural science data. An overall view by the participants was that on a project level, databases were maintained only during the project life time and responsibilities and financial support for their further maintenance are not specified enough (maximum duration of maintenance of project results for 5 years after the project closure is usual practice) or lacking. It was evidenced that the usefulness of databases only rises towards the final stage of a project, when system requirements and usability of the database are improved/ensured.

A requirement of the sector is a stronger data management policy supported by inter – governmental organizations (HELCOM) and through a network of national research institutions.

4. Overview on the major research priorities & gaps to support MSP process and possible research synergies

Guiding questions:

- *Which are major research priorities of research that can support the ecosystem based approach?*
- *Which are major research priorities of research that can support Integration of socio-economic valuation of ecosystem services into MSP?*
- *Where do you see possible joined methodological synergies from models/tools /frameworks presented at the workshop?*
- *What are the main pan-Baltic co-operation needs with regard to research?*
- *What are possibilities for development of a cross – border tool for MSP with the major aim to keep sea use management coherent in cross-border context? What could be major requirements of such a prototype tool? How can socio – economic valuation of ES serve for cross-border tool development?*

Development of a marine ecosystem services (ES) typology applicable in Marine Spatial Planning in and applicable to different sea uses. The aim of the framework is to provide methodological guideline for ecosystem service provided by a specific sea use and its potential impact to other ES. Possible extension of the ES framework should include offshore areas. The development of the typology should go hand in hand with further development of assessment techniques and support the spatial coverage/extension of marine ES assessment in the Baltic Sea and provide means for sharing monetary and non – monetary indicators. In this context the impact of invasive species on fishery and marine habitats and their ecological and socio – economic consequences needs to be further investigated.

There is the need to develop and apply tradeoff analysis tools based on ES provided by a specific sea use. Tradeoff analysis system should enable to assess tradeoffs not only between two conflicting uses (2 dimensional perspective) but be capable to address multiple uses conflicts/benefits. The assessment may focus on the establishment of an "*optimum frontier*" of a specific sea use, without causing damage to a coexisting sea use.

Cultural values of ecosystem were identified as important ecosystem services on a political level due to their easier understanding by the broader community (e.g. offshore wind farming and aesthetic values). Tools are required to assess cultural values of coastal areas and address the impacts produced by different sea uses on them (offshore windfarm, port development, aquaculture, pipelines). In this context Visual Seascape assessment techniques were identified as tool to address visual impacts from any development at sea (Countryside Agency and Scottish Natural Heritage, 2002; Hill et all., 2001; Grant 2006). It was noticed that only restricted amount of studies provide guidelines on visual seascape assessment although visual impact are part of EIA (Falconer et al., 2013). As an example the Nordstream pipeline project in the Baltic Sea was mentioned, where visual impacts were part of project specific impact investigations for "*the protection of humans and*

landscapes" and addressed for three protection zones, seaward route (12nm and EEZ), dumping site (12nm) and the landward route (landfall corridor) (see also Nord Stream, 2009).

Offshore Windfarming, tourism, environmental protection and new uses are seen as the main stakeholders for the development of the sector. In particular offshore wind farming is seen as a boost for MSP due to its space requirements and in parallel there are a growing research needs in terms of impacts of this sector on local employment (direct and indirect), electricity prices, value of estate, shipping and navigation, air quality, noise level, fishery, tourism, coastal nature values and landscapes.

On an overall perspective participants stressed the need to share knowledge and experience on how MPA are managed on Pan-Baltic level (conservation regimes, uses, restrictions, etc…) and on how Baltic MPAs contribute to the protection of marine biodiversity in terms of ecosystem health and connectivity. The sector stressed the need to shift the understanding of MPA as "*physical space*" to be conserved towards the protection of biodiversity as "*value*" represented by the marine ecosystem. In this context evidence based management (EBM) was mentioned as guiding concept to link scientific method to evaluate practice. Additional efforts are required to improve valuation methodologies and the need for valuation tool kits addressing biological/ecological and socio – economic values of MPA.

In terms of methodological synergies, the linkage of species distribution models (SDM) with ecosystem services assessment tools was stressed. The coupling of SDM with monetary indicators of ES would enable to generate spatial explicit cost – benefit models and further contribute to impact assessment (Bergström et al., 2013; Rees et al., 2013).

PartiSEApate's pilot cases were mentioned as suitable research areas to test several tools and models presented in the Workshop due to their transnational character. Some of the most relevant transnational topics identified in the pilot cases could be used as playground for the tools and enrich them with further functionalities (e.g. extension of cultural values assessment, development of monetary indicators for different sea uses, bio – economic models). It was remarked that the ongoing stakeholder consultations and sectorial workshops could provide further insights on research needs for MSP.

It is essential to further develop stakeholder involvement techniques.

Expectations of sector/ topic towards Maritime Spatial Planning

- *Expectations/fears/hopes of researchers towards MSP. Why MSP is important for them?*
- *How does the researchers wish to be consulted by maritime spatial planners? At what stage? What type of representatives? national? regional? Baltic? What should be avoided during consultation?*

The research sector sees MSP as a boost for new research topics especially with the upcoming of new uses of the sea space such as aquaculture and wave energy. Furthermore it was noted that the added

value of MSP as a tool is that it requires data gathering in the marine area, resulting in systematic surveys and data collection of environmental parameters at sea.

Another important aspect mentioned by the sector is the EU proposal for an integrated MSP/ICZM directive. The sector considers this initiative as particularly relevant for research activities on land-sea connectivity.

5. Overall conclusions/key findings

At the current state there is no unified marine ES service framework which can be applied for MSP and for specific uses of the sea space. There is the need to develop tradeoff models which take into account conflicts among different sea uses and support decision making.

Cultural values assessment and the impact of different sea uses on the socio – cultural context require further research especially on the impacts on local employment, electricity prices, value of estate, shipping and navigation, air quality, noise level, fishery, tourism, coastal nature values and landscapes.

A great interest was shown in the development of databases for monetary indicators of ES to be implemented for MSP purposes and the need to develop standardization techniques for those indicators in order to be applicable in different regional scales.

MSP is an essential tool for the sector and an incentive for new data collection in the marine environment, resulting in development of systematic surveys and data collection of environmental parameters at sea. Elaboration and analysis of these data requires research expertise.

A clearly expressed need by participants is the sharing of experience and knowledge on the management of marine areas and in particular of MPA in order to have a better understanding of different planning and management approaches (*What works and what doesn`t?*). In this context the sector stressed the need for new stakeholder involvement and communication techniques.

Eutrophication is one of the most challenging environmental problems in the Baltic Sea. In terms of socio – economic analysis defined in the MSFD, research priorities need to focus on the (1) identification Ecosystem Services impacted by eutrophication, complementary to a marine ecosystem services framework for MSP, (2) support of regional assessment studies addressing the socio – economic dimension of the problem including development of regional socio – economic indicators and (3) modelling of consequences of eutrophication mitigation measures by coupling species distribution models (SDM) and ES (e.g. cost – benefit analysis).

Participants stressed the usefulness of the workshop especially due to its interdisciplinary character and the opportunity to establish new contacts and potential project partnerships. At the same time, the methods and tools presented at the workshop induced participants to slightly rethink their on-going project application in order to include some of the illustrated techniques at the workshop. On

overall the workshop contributed to strengthen the network for research in MSP and elaborated several themes to be considered in the MSP BONUS Call of 2013.

Reference

1. Arcadis Belgium (2010). Inventory of the socio-economic activities affecting the Belgian marine waters and the related developments within the European Marine Strategy Framework (Directive 2008/56/EC). FPS Health, Food Chain Safety & Environment – DG Environment – Marine Environment Service. Project number 11-005435, Final Report.

2. Beaumont N.J., Austen M.C., Atkins J.P., Burdon D., Degraer S., T.P. Dentinho, Derous S., Holm P., Horton T., van Ierland E., Marboe A.H., Starkey D.J., Townsend M., Zarzycki T., 2007. Identification, definition and quantification of goods and services provided by marine biodiversity: Implications for the ecosystem approach. Marine Pollution Bulletin 54 (2007) 253–265.

3. Bergström U., Sundblad G., Downie A.L., Snickars M., Boström C., and Lindegarth M., 2013. Evaluating eutrophication management scenarios in the Baltic Sea using species distribution modeling. Journal of Applied Ecology 2013, doi: 10.1111/1365-2664.12083.

4. Bertram C., and Rehdanz K., 2012. On the Environmental Effectiveness of the EU Marine Strategy Framework Directive. Kiel Institute for the World Economy (ifw) no. 1760.

5. Countryside Agency and Scottish National Heritage, 2002. Landscape character assessment: guidance for England and Scotland. CAX 84, CA, Cheltenham, 96 pp.

6. Falconer L., Hunter D.C., Telfer T.C., Ross L. G., 2013. Visual, seascape and landscape analysis to support coastal aquaculture site. Land Use Policy 34 (2013) 1– 10.

7. Grant, A., 2006. Landscape/seascape carrying capacity for aquaculture. Scottish Natural Heritage Commissioned Report No. 215 (ROAME No. F04NC12), 143 pp.

8. Guerry A.D., Ruckelshaus M.H., Arkema K.K., Bernhardt J.R., Guannel G., Kim C.-K., Marsik M., Papenfus M., Toft J.E., Verutes G., Wood S.A., Beck M., Chan F., Chan K.M.A., Gelfenbaum G., Gold B.D., Halpern B.S., Labiosa W.B., Lester S.E., Levin P.S., McField M., Pinsky M.L., Plummer M., Polasky S., Ruggiero P., Sutherland D.A., Tallis H., Day A., & Spencer J., 2012. Modeling benefits from nature: using ecosystem services to inform coastal and marine spatial planning, International Journal of Biodiversity Science, Ecosystem Services & Management, 8:1-2, 107-121.

9. Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, J., Williams, A., 2001. Guide to Best Practice in Seascape Assessment. Countryside Council for Wales, 68 pp.

10. Lester S. E., Costello C., Halpern, B.S., Gaines S.D., White, C., Barth J.A., 2013. Evaluating tradeoffs among ecosystem services to inform marine spatial planning. Marine Policy Volume 38, March 2013, Pages 80–89.

11. Nord Stream, 2009. Nord Stream Environmental Impact Assessment. Documentation for Consultation under the Espoo Convention. Nord Stream Espoo Report: Annex

12. Rees S.E., Attrill M. J., Austen M. C., Mangi S.C., Rodwell L.D., 2013. A thematic cost-benefit analysis of a marine protected area. Journal of Environmental Management 114 (2013) 476–485.

13. White C., Halpern B.S., and Kappel C.V., 2012. Ecosystem service tradeoff analysis reveals the value of marine spatial planning for multiple ocean uses. www.pnas.org/cgi/doi/10.1073/ pnas.1114215109.