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Joint DFO/KnowSeas, and ICES Workshop on Quality Assurance in MSP (WKQAMSP)

28 February–1 March 2012

Dartmouth, Canada

Fisheries and Oceans Canada   Pêches et Océans Canada

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Executive summary

With the increasing importance of marine spatial planning (MSP) throughout the ICES area and in North America, quality assurance elements of integrated management, environmental assessment and marine spatial planning were identified and discussed. Workshop members recognized that there is little guidance available to assess the quality of marine spatial planning albeit integrated management and environmental assessment initiatives. The quality of the advice (e.g. scientific data, modelling of environmental processes, proposals for of management actions) entering the planning process inevitably affects the quality of the outputs, as well as in the intermediate stages of data processing, consultations etc. Members agreed that quality assurance would build quality into the process to ensure that the resulting plan meets the requirements at the onset of the initiative.

The workshop was organized along three themes being (1) quality assurance of scientific advice, for example through application of peer review advisory processes, (2) quality assurance of mechanisms or processes involved in planning aspects of MSP, and (3) auditing of implemented management plans and their performance. In the first session, presentations focused on the importance of unbiased scientific peer review processes in the formulation of management advice. The presentation also covered approaches to validate the usability of data in decision-making as well as a systems approach to facilitate the integration of multidisciplinary information including consultation and appraisal in support of science and policy development. Of particular interest was the discussion regarding the development of decision-making risk criteria similar to the context of Maximum Sustainable Yield used in fisheries management as means of applying this to planning and setting decision rules in MSP. In the second session, the presentation examined quality assurance aspects in terms of governance, objective setting, regulatory processes and adaptive management systems from an ecosystem-based management approach. Members emphasized the need for a quality assurance system to ensure that decision-making and planning processes of MSP initiatives are holistic in their approach. Such a system would provide assurance that the resulting plan meets objectives set at the onset of the initiative. It would also ensure the effectiveness and efficiency of human and financial resources involved in the planning initiative. From the perspective of a quality assurance system, tools, such as the Ecosystem-Based Management System (EBMS) would also ensure that the ecosystem approach and adaptive management concepts are fully imbedded in the planning and decision-making processes. Session three brought together quality assurance aspects and perspectives related to environmental effects monitoring, regulatory decision-making as well as regulatory verification and auditing of environmental management plans. In addition to discussions regarding risk management criteria of regulatory decision-making, presentations also included a review of land planning theories within the context of MSP. In addition, the use of environmental management policy gap analysis was discussed as a form of quality assurance to ensure that spatial management strategies are being developed in accordance with existing policies and practices.

Workshop members found that elements of quality assurance are embedded in a variety of environmental planning activities as they relate to integrated management, environmental assessments and marine spatial planning. Members recognized that management quality assurance needs to be set apart from quality assurance of scientific advice and that quality assurance for developing plans is not the same as for

implementation such as licensing, environmental assessments and integrated management. In addition to bringing clarity and a new way of thinking about the links between MSP processes and quality assurance, the workshop demonstrated that quality assurance elements can be found in advisory processes, data and evidence gathering and decision-making along each step of the MSP process. The issue is that quality assurance is being implemented on an ad hoc basis and that a quality assurance system would greatly benefit MSP processes in terms of the quality of the resulting plan.

Potential next steps from this workshop would involve a review paper of quality assurance elements of actual MSP, IOM and EA processes in the form of a case study to identify best practices. This would be conducted against a series of questions which were developed during the workshop (Table 1). The review would then provide the basis for the development of a quality assurance system that would be embedded in existing planning processes providing guidance and best practices to people involved in such process.

1 Introduction

Today, existing and new sea uses are increasing in terms of temporal and spatial intensity in coastal and marine waters. This development increases the pressure on coastal and marine ecosystems, but at the same time can also result in spatial conflicts between the different sea uses. As a result, a whole range of new policies are evolving to accommodate this trend. In addition, new instruments for managing the increasing diversity of marine uses Marine/Maritime Spatial Planning (MSP) are emerging.

According to the UNESCO-IOC Marine Spatial Planning Initiative, MSP is defined as a "public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that have been specified through a political process" (www.unesco-ioc-marinesp.be). In this sense, MSP is understood as a normative approach to the development, ordering and securing of space (Douvere and Ehler, 2009)[1]. As marine spatial planning often (and particularly in Europe) goes beyond internal waters and territorial seas, international legal frameworks such as the UN Law of the Sea (UNCLOS), international conventions such as the Convention on Biological Diversity (CBD) and international policies (e.g. on fisheries) also need to be considered.

Currently, there are a number of ongoing MSP initiatives that are at different stages of development and implementation from early planning and pilot projects to established statutory systems. In Europe for example, experiences with spatial plans in the sea exist in Germany, the Netherlands, Norway and Belgium. However, the UK and Poland and several other countries have started MSP efforts. Several EU or nationally funded projects have looked into MSP processes, for example MESMA (www.mesma.org), MASPNOSE (www.surfgroepen.nl/sites/CMP/maspnose), Plan Bothnia (http://planbothnia.org), BALANCE (www.balance-eu.org), BaltSeaPlan (www.baltseaplan.eu), PlanCoast (www.plancoast.eu), KnowSeas (www.knowseas.com) and Coastal Futures (Lange et al. 2010). Similar initiatives are pending in other regions of the world, for example North America and China. Concurrently, environmental planning activities and regulations are increasingly being considered farther offshore. One of the most visible policies of this kind is the EU Marine Strategy Framework Directive (MSFD). However, other policy approaches are being considered and implemented to establish ecosystem-based-management approaches in the US and Canada.

Against this backdrop, WGMPCZM, in their 2011 meeting, discussed the issue of quality assurance for activities related to data and information quality used for planning and regulatory decisions in addition to the decision-making processes of plan development and implementation. As most initiatives related to spatial planning in marine areas are rather recent, little progress has been pursued in terms of evaluation and monitoring of implemented plans. However, the members of the WGMPCZM recognized that this will be a significant issue in the coming years. .Based on these discussions, WGMPCZM recommended to ICES that this particular workshop be held in collaboration with the EU funded project KnowSeas (www.knowseas.com) and Fisheries and Oceans Canada (DFO) bringing together a small group of experts

[1] Douvere, F. and Ehler, C. (2009). New perspectives on sea use management: Initial findings from European experience with marine spatial planning. Journal of Environmental Management, 90: 77–88.

from planning practices and science (including natural and social scientists) to discuss how to link quality assurance practices to planning practices based on their knowledge from administrative work and several scientific projects. The list of participants is available in Annex 1. The Terms of Reference (ToRs) and programme for the workshop are in Annex 2. Annexes 3 to 6 include extended abstracts of the presentations given during the workshop.

2 Opening of Workshop

Roland Cormier (DFO) welcomed the participants to the Workshop, reminded them of its objectives and introduced the agenda in addition to a set of criteria to be kept in mind for discussions. Andreas Kannen (HZG) welcomed the participants and introduced the discussions in WGMPCZM on the topic of quality assurance in MSP at the working group meeting in March 2011 in Hamburg providing the rational for this workshop. He further introduced related work from the KnowSeas project funded by the European Community's Seventh Framework Programme [FP7/2007-2013] under grant agreement number 226675.

3 Key Note: Presentation by Mike Elliott

In order to introduce workshop participants to issues and concepts used in ecosystem assessments, Mike Elliott from the Institute of Estuarine and Coastal Studies of the University of Hull provided a keynote on "The 7-tenets, the DPSIR/DPSWR/DPSIRR philosophy', ecological and socio-economic carrying capacity and the Ecosystem Approach – how to get sustainable estuarine, coastal and marine management". An extended abstract and illustrative references are included in Annex 3.

The presentation focused on the context of Marine Spatial Planning and the complexity of the sea area in terms of competing interests, different demands of the different stakeholders, an ad hoc system of ownership and use, and a confusing governance system which may be costly or time consuming for users. It then emphasized the main vision (that 'There is only one big idea in marine environmental management - to protect and enhance ecological functioning and ecosystem services while at the same time delivering societal benefits') and named the main aim to reconcile this vision with the problems inherent in that context.

The objectives are then to ensure recovery and coping with the legacy of historical development, the protection of endangered coastal and marine ecosystem functions, the harmonization of legal and administrative frameworks, the delivery of economic prosperity and societal benefits as well as coping with climate change and moving environmental baselines. In addition, there is the need for an inventory of the data, information and evidence required not only for the scientific status but also the governance and economic frameworks. Finally the talk illustrated that, while we often are concerned with the management of the effects, we really need to be concerned with the management of the causes. It is arguable that if there are adverse effects then either management has failed or society has agreed that it is willing to tolerate these in order to get economic benefits even if this may be a short-term view and hence go against the need to ensure sustainability of use.

4 Session 1: Quality Assurance of Scientific Advice in MSP

Decision-making in MSP needs to be based on sound quality information and advice. Four presentations specifically looked at information and advice from different perspectives. Two presentations (Eugene Nixon and Roland Cormier) covered scientific advisory processes (not necessarily linked to MSP, but to marine and environmental management issues), one (Patricia Almada-Villela) looked into a QA process in MSP and one (Josianne Stöttrup) covered the systems approach perspective. Extended abstracts of the presentations can be found in Annex 4.

Scientific advisory processes such ACOM and CSAS are structured peer review processes. These processes review the validity of data, models and methods based on scientific literature and expert opinion. Elements of quality assurance include the production of research documents, the development of standard models and methods as well as the formulation and publication of the advisory documents. The peer review processes also ensure transparency where some processes include stakeholder observers and external participants. Although most of the available data can be very general, the implications of scientific uncertainty in the management context are placed at the centre of peer review process. Post-normal science combines numbers and data with expert judgment on the reliability of the data. Given this scientific uncertainty, policies are not unlikely to reach all aims in one step. Precautionary and adaptive management approaches allow for incremental thinking in this context. Historically, fish stock management and the concept of MSY have played a central role in the trade-off frontiers. The MSY concepts (setting of ecological criteria and action points) can also be applied to spatial management of activities, as long as appropriate indicators of "spatial health" are defined based on the pressures and mitigating measures. Indicators need to be able to pick up on thresholds that separate trade-offs as well as natural variations and scale. Although ICES and CSAS advisory processes and knowledge have traditionally focused on fish stock assessments and population modelling, more spatially relevant information is being generated such as maps of spawning and nursery grounds, information on fishing activities, fishing intensity, the proportion of catch discarded, significant ecological areas, risk thresholds, or the spatial implications of climate change and its impacts on fisheries.

The challenge, however, lies in the bridging of science and policy to support, in part, decision-making processes while setting ecological criteria and thresholds for the management of ecological risks. In England, the MMO uses an evidence-based approach to Marine Planning. Evidence covers various forms of economic, social and environmental information and data (e.g. spatial datasets, expert reports, projects, etc.), which is then subjected to a QA process. Critical evidence gaps are identified and filled in a targeted manner using a process that is also subject to QA. When collecting evidence, the following criteria apply:

- Defining MMO requirements: What is the purpose of this evidence?
- Framing the question: What would good evidence look like?
- Risk assessment: What are the risks of obtaining this evidence? (delivery, financial, reputational, legal)
- Prioritization: Is this evidence a must have, should have, could have, would like?

- Assessing the quality of the evidence: validity, accuracy, timeliness, reliability, relevance, completeness, auditing
- Confidence assessment: low, medium, high
- Independent peer review: internal/external
- Caveats: What are the caveats with respect to this evidence?

Planning decisions are based on evidence of variable quality and quantity. MMO also applies QA to decision-making processes (e.g. marine licensing) and is seeking international accreditation.

The SPICOSA project has used systems thinking to facilitate the integration of information from a multidisciplinary perspective to create science/policy models that can be used for communication and scenario building. Differences in terminology are a challenge in relation to multidisciplinary integration work. For example the social sciences tend to be more descriptive while the natural sciences tend to be more quantitative, given the data and interpretations. A key question was how to integrate ecological, social and economic concerns to form the basis of an Ecological, Social and Economic analysis (ESE). This comprises of a system design, formulation, appraisal and output, with simulation analysis providing insights when considering various scenarios. ESE is a science-policy integration and communication tool, allowing for conflict analysis.

Session 1 identified key quality assurance issues in terms of scientific advisory processes, data and evidence validation as well as integration of multidisciplinary knowledge within a systems approach. It also identified quality elements such as communication and consultation with stakeholders and the public as well as implementation of developed plans. Other quality assurance elements also included ecological risk criteria such as MSY approaches for fisheries management or ecological contexts such as the eelgrass HADD criteria[2]. Such criteria play an important role in characterizing the health of the ecosystem synonymous to symptoms in a human health context in terms of risks where system thresholds and the tipping points may indicate ecosystem overload and imminent degradation. Such risk criteria are then used in deciding what management or mitigation measures should be taken, if any. Quality assurance, however, requires the use of SMART (Specific – Measurable – Accepted – Realistic - Timely) objectives to ensure that management plans are effective at delivering what they are originally developed for. It was noted, however, that management QA needs to be set apart from quality assurance of scientific advice. Furthermore, QA for developing plans is not the same as QA for implementation such as licensing, environmental assessments and integrated management.

[2] DFO. 2012. Definitions of harmful alteration, disruption or destruction (HADD) of habitat provided by eelgrass (Zostera marina). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/058.

5 Session 2: Quality Assurance of mechanisms and processes developing MSP

Session 2 included presentations covering the KnowSeas EBMS (Ecosystem Based Management System) and the role of transnational cooperation (Andreas Kannen) and values (Kira Gee) for the development of spatial plans as well as the regulatory approach guided by the Canadian Environmental Assessment Act (CEEA, Wade Landsburg). Extended abstracts of the presentations can be found in Annex 5.

With the advent of the present economic crisis, attention to environmental considerations is lessening given the need to generate growth. At times, there is a perception that the balance between environmental needs and development may not be part of such priority. Despite this perception, recent environmental policies tend to be more proactive and aim at eliminating or preventing environmental degradation via development of joint social-ecological visions. In order to bring together economic development and environmental protection, these policies require improved dialogue and consensus building between stakeholders in consideration to ecosystem outcomes, values and expectations. In addition, the governance structures need to provide clear leadership based on legislative competencies or agreements that identify who are accountable for the implementation of the planning process. There may be a need for organizational change in planning and management that would bring a broader range of actors with different values, perceptions and attitude into the process: "the world needs much more action from a broader range of people-action that is informed, committed, and inspired-to help us all in an era of increasing change (J. Kotter HBS)". There is also a need for more normative text, definitions and methods used by practitioners involved in marine spatial planning, integrated management and environmental assessments in addition to academic contributions. QA is expected to bring such a change over time as the practice develops.

MSP requires a particular attention to ongoing economic developments and allocations of space based on ecological, social and economic constraints, people's cultural values, equity and fair distribution of advantages and disadvantages between all involved and affected. Although MSP initiatives can be strategic, the implementation should recognize regional thinking that incorporates diversity of local issues, actors, interests, cultural values, and history while establishing the connectivity between the ecosystem and human activities nationally and trans-nationally. There is a need to develop methods and approaches to adequately represent tangible and intangible cultural values from a geospatial perspective for planning. It is difficult to integrate narrative or descriptive cultural information into a spatial planning context. However, areas of high aesthetic value for example, technically represent significant cultural ecosystem areas that should be considered as any other ecological or economic component.

In Session 2, the discussions emphasized the need for a QA system to ensure that decision-making and planning processes approach MSP from a holistic approach. Such a system would provide assurance that the resulting plan meets objectives set at the onset of the initiative. It would also ensure the effectiveness and efficiency of human and financial resources involved in the planning initiatives. From the perspective of a quality assurance system, tools such as the Ecosystem-Based Management System (EBMS) would also ensure that the ecosystem approach and adaptive management concepts are fully imbedded in the planning and decision-making processes.

6 Session 3: Auditing of integrated plans and their performance

This session brought together quality assurance aspects and perspectives as they relate to environmental effects monitoring (Eric Tremblay), regulatory decision-making (Sophie Bastien-Daigle presented by Roland Cormier) as well as regulatory verification and auditing of environmental management plans (Paulette Hall and Carole Godin). In addition to discussions regarding risk management criteria of regulatory decision-making, presentations also included a review of land planning theories within the context of MSP (Louis Wildenboer) and the use of environmental management policy gap analysis (Matthew Hardy). Extended abstracts of the presentations can be found in Annex 6.

Environmental effects monitoring must ensure that the observed status and trends reflect the management measures of any implemented management plan. The Canadian Water Network aims at combining academia and management requirements via a management governance structure where scientific proposals are evaluated by a management review process and by a scientific review process, both working in parallel. Such an approach ensures that the scientific development of the environmental effects monitoring program are tightly linked to management needs in terms of measuring the performance or effectiveness of the implemented management measures.

As part of regulatory decision-making, the merit of each management option has to be assessed against their potential of achieving the set objectives as well as their socio-economic implications and policy repercussions. Risk management criteria are used to classify the decision-making risks for each management option considered to allow for a level playing field comparison between management entities. This quality assurance approach has proven very valuable in the preparation of regulatory affect assessment statements.

Renewable energy development is a major driver of offshore activities in Ireland and Western Europe. The importance of clarity in the MSP process from the perspective of industry was highlighted. This review of MSP in relation to the needs of the renewable energy industry emphasized the need for clear MSP definitions and the use of classical spatial planning concepts. In such practices, there are multiple considerations to be made including norms and criteria that relate to values, resource location, market access, stakeholder involvement, regulatory direction and their spatial interactions, as well as the assumptions that may have to be made in decision-making and historical location of wind farms. Not addressing such issues during the planning process can jeopardize the implementation with the risk of having to start the entire planning process over again. Elements of quality assurance include proper definition of the planning area that accommodates multiple users and interest, clear and measurable objectives, land sea connectivity of the development being proposed as well as norms and criteria that provide some level of predictability for industry and stakeholders.

During the planning process, management measures that are being considered can be spatial and temporal allocations as well as being environmental quality guidelines. MSP tends to involve several jurisdictions and their implicated industry sectors with the result that environmental management measures are scattered across multiple legislative tools and organizations. Policy gap analysis aims at identifying where management measures may be missing or where management measures may need enhancement in order for the plan to achieve its objectives. MINOE (Management

Identifying the Needs of Oceans Ecosystems) is a tool that facilitates the analysis of a wide range of legislative, policy and best management practices documents to identify gaps. Combined with cause and effects analysis of pressures and environmental effects, the bow tie analysis[3] of the potential gaps can validate the results in consultation with regulators and stakeholders. Such approach ensures that the planning process focus its resources to the development of the right management measure.

In addition to environmental effects monitoring, regulatory verification and auditing are also key quality assurance elements designed to ensure that planned management measures have been implemented as per the specifications outlined in the plan. Such approach favours the development of standard criteria to ensure consistency and repeatability. Audits can focus on various aspects of MSP such as a specific peer review process, data acquisition, agreements or guideline performance. A key element of QA is the need to ensure that such verification and audits are conducted under the authority and oversight of legislation or agreements so to ensure that corrective actions can be implemented if non-conformities are found. It is noted, however, that audits conducted against legislative requirements may result in a non-compliance issue in relation to a specific regulation. The audit process of identifying the scope, conformity criteria and corrective action to address non-conformities found is consistent with continuous improvement principles of QA.

7 General Discussion and Conclusions

Quality assurance approaches are used in a wide variety of processes. In MSP, the planning process is composed of multiple steps each requiring aspects of decision-making, peer review, consultation, communication and validation. Quality assurance elements include the usability input of data and scientific advice, stakeholder perspectives and advice as well as policy formulation. Given the extensive involvement of human and financial resources that are required for such planning initiatives, quality assurance provides some level of assurance that the resulting plan will have high acceptability among regulators, stakeholders and the public. It will also assure that the plan is implementable from the perspective of the effectiveness and feasibility of the management measures while ensuring transparency and traceability.

Elements of quality assurance were found in each presentation regarding planning and management activities as they relate to integrated management, environmental assessments and marine spatial planning. The results of an analysis of each presentation show individual elements of quality assurance (Figure 1).

Technically, management QA needs to be set apart from quality assurance of scientific advice. Furthermore, QA for developing plans is not the same as QA for implementation such as licensing, environmental assessments and integrated management. However, participants agreed that the elements of quality assurance of the planning phases of MSP are similar as with the licensing or implementation of MSP plans. In addition, they also indicated that the workshop brought clarity and a new way of thinking about the links between MSP processes and quality assurance. Quality assurance was found to be embedded in all advisory processes, data and evidence gathering, decision-making in each step of the MSP process, communication and

[3] ISO. 2009. Risk Management - Risk Assessment Techniques. International Standards Organization. IEC/ISO 31010.

consultation with stakeholders and the public as well as any subsequent evaluation of the planning or implementation processes.

Participants also agreed that quality assurance is not a new concept in MSP process. Although there are marked differences between quality assurance, quality control and auditing, elements of quality assurance, however, is already being implemented on an ad hoc basis. Participants agreed that a quality assurance system would greatly benefit MSP like processes in terms of the quality of the resulting plan and in reducing unnecessary iterations and ensuring the effective and efficient use of human and financial resources that are deployed for such initiatives. It is always less costly and risky to build quality into the process than to make corrections after the plan is finished and risking the disengagement of participants. Coupled with adequate monitoring and auditing of implemented plans, such approach would also support adaptive management principles.

Table 1. Quality Assurance Questions for the review.

Quality Assurance Elements of MSP	Best Practices
What are the authorities, bodies or forum under which this MSP initiative is being undertaken?	Legislation, International and National Bodies, Agreements, MOU's, Accepted Practice
How did you arrive to the plan objectives?	SMART Objectives, Horizon Scanning, Visioning, Stakeholder Engagement, Norms, Link to high level policy objectives, Standardization and definition of terminology, Space and Region determination
What is your plan development process?	Terms of reference, Public advisory process, Expertise and competencies of internal and external contributors, Boundaries and timelines (project plan), Evidence and data Validation; Conceptual and management scenario options, Gap and evidence needs analysis
What norms (principles, standards, policies and guidelines) were used in the development of the plan?	Evidence and data quality standard; Modelling methodology, Spatial Requirements, Risk management
What are the decision criteria for each step of the development process?	Appropriately defined evidence, Human and financial resources, Creditability and reputation, Policy risks, Indicators and thresholds (MSY), Validity, Reliability, Auditability, Statistically sound, Checklist; Risk Criteria of the spatial allocation
How can you ensure the traceability of the evidence used and decisions made during the development process?	Record Keeping, Minutes of meetings, Status reports
What is your public notification requirements, stakeholder consultation plan as well as integration and feedback of the advice received?	Document the stakeholder interactions and advice, Stakeholder interaction tools, Communication plans, Stakeholder feedback reports
What is the plan implementation strategy and deployment plan?	Adoption and approval of the plan by the authority. Stakeholder and public advisory on the implementation, Education and communication strategies, Project plan outlining timeline, resources, finances and leads, Gap analysis of the implementation, Non spatial management requirements
What are your environmental social and economic effects monitoring requirements as well as performance audit and review plans?	Environmental, social and economic affects, Audit findings and corrective actions, Authority accountable to conduct the evaluations and reviews

Quality Assurance System for MSP

MSP QA Quality Assurance Elements	ACOM	CSAS	MMO	SAF	EBMS	National Transnational	Cultural Values	CEAA	CWN	SARA	Offshore Renewable Energy	Gap Analysis	Auditing
MSP QA Authority Forum Bodies			Element: Marine & Coastal Act			Element: OSPAR HELCOM VASAB		Element: Regulatory Authority	Element: Norst-EMP Consortium	Element: Regulatory Authority	Element: External Context		Element: Joint Audit Approval
MSP QA Quality Objectives			Element: England Marine Planning	Process: System Approach	Process: Risk Analysis	Element: Vision		Element: Regulatory Habitat Provision	Element: Environmental Effects Monitoring	Element: Regulatory Impact Assessment	Element: Applied Planning Science	Element: Environmental Effect Centric	Element: Scope
MSP QA Quality Mmgt Process	Process: Science Peer Review	Process: Science Peer Review	Process: Evidence Peer Review	Process: ESE Analysis		Element: Transnational Topics		Process: Federal Coordination Regulations	Process: Management Science Peer Review	Process: SARA Listing Process	Process: Define Planning Process	Process: MINOE	Process: Audit Plan
MSP QA Standards	Element: Data Methodolgies	Element: Ecological Criteria	Element: Data Checklist Standards	Element: Models		Element: Coherence Harmonization	Element: Tangible Intangible Cultural Values	Element: Project Risk Classification	Element: Conflict of Interest Disclosure	Element: Listing Default Position	Element: Norms		
MSP QA Decision Criteria	Risk Criteria: MSY	Risk Criteria: Ecological Risks	Risk Criteria: Evidence Usability			Element: Key Principles Geospatial Boundaries	Risk Criteria: Spatial Carrying Capacity	Risk Criteria: Law List Triggers	Risk Criteria: Selection & Rating Criteria	Risk Criteria: Management Decision Implication	Element: Resource Location	Element: Bow Tie Analysis	Element: Conformity Criteria
MSP QA Traceability	Element: Advisory Documents	Element: Research Advisory Documents	Element: Audit Trail	Element: Forms Meta Data Models	Element: Information Management	Element: National International Language		Element: PATH	Element: Documentation	Element: Ecological Socio-Economics			Element: Documentation
MSP QA Reporting Consultation	Element: Advice & Reports	Element: CSAS Website	Element: Marine Planning Portal	Element: Kercoast Stakeholder Perceptions			Process: Stakeholder Involvement	Element: Public Registry	Process: Stakeholder Involvement Feedback	Process: Stakeholder Consultation	Process: Stakeholder Engagement	Process: Regulatory Validation	Element: Observation Findings
MSP QA Evaluation			Element: Evaluation		Process: Audit	Element: Timetable Evaluation	Process: Stakeholder Feedback	Process: CESD Audits			Process: Evaluation of the Plan	Element: Gap Analysis	Process: Performance Compliance CESD Audit

Legislation And Regulator	Institutional Bodies	Tools

Figure 1. Quality assurance elements extracted from the presentation of the workshop.

8 Recommendations

Potential next steps from this workshop would involve a review paper of quality assurance elements of actual MSP processes including integrated management and environmental assessment processes as a case study to identify best practices. This would be conducted against a series of questions which were developed during the workshop (Table 1). The review would then provide the basis for the development of a quality assurance system that would be embedded in existing MSP processes providing guidance and best practices to people involved in such process.

Recommendation	For follow up by:
1. WGMPCZM to discuss the results of this workshop and potential follow-on activities during their meeting in Copenhagen on 20–23 March 2012	WGMPCZM
2. WGMPCZM to get engaged in the review paper of quality assurance elements of actual MSP processes as a case study to identify best practices	WGMPCZM
3. SIASM / STIG-MSP to support the review paper of quality assurance elements of actual MSP processes as a case study to identify best practices	SIASM / STIG-MSP

9 Acknowledgements

The organizers would like to thank the Bedford Institute of Oceanography (BIO) for providing its main meeting room and facilities for the workshop and for offering a guided tour through the institute. The organizers would also like to thank DFO and KnowSeas for their support and participation.

Annex 1: List of participants

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Annex 2: ToRs, Workshop Programme, Agenda

PROGRAMME

Joint DFO, KnowSeas and ICES Workshop on
Quality assurance of scientific and integrated management processes for use in marine planning and coastal zone management (WKQAMSP)

Date: 28-29 February and 1 March, 2012

Venue: Bedford Institute of Oceanography, Dartmouth (Halifax), Nova Scotia, Canada

Terms of reference

The need for the Workshop has arisen through the increasing importance of marine spatial planning (MSP) throughout the ICES area, and more widely. It is largely an untested process, and as yet there is little guidance available on how to assess the quality of the output of plans and management activities. The quality of the advice (e.g. scientific data, modelling of environmental processes, proposals for of management actions) entering the planning process will inevitably affect the quality of the outputs, as will the intermediate stages of data processing, consultations etc. The purpose of this Workshop is to bring together and document best current practice in the quality assurance of all stages in the marine spatial planning process, so that practitioners have guidance available on how to assess, and challenge, quality throughout the MSP process. The Workshop will cover:

1. Quality assurance of scientific advice, for example through application of peer review advisory processes in:
    a. Validation of the underlying purpose of the plan,
    b. Validation of data, analytical methods and the resulting formulation of advice by internal/external advisory and expert groups.
    c. Validation of GIS based information through provision of standardized metadata.
    d. Incorporation of scientifically published papers and other sources of documented knowledge into the advisory process.
2. Quality assurance of mechanisms or processes involved in developing MSP:
    a. Assessment of the likelihood of achieving policy objectives under alternative management strategies.
    b. Best practice in governance issues, including the development of terms of reference for decision authorities in relation to the roles and responsibilities of advisory bodies.

   c. Best practice in consultation processes with key stakeholders (environmental agencies, industry, fisheries, other users of the sea, local communities) to assess the acceptability of the management plan outcomes.

   d. Public hearings and reporting requirements.

3. Audit of integrated management plans and their performance in terms of:

   a. Scientific monitoring of environmental effects to support the assessment of the effectiveness of management measures.

   b. Scientific monitoring of socio-economic and cultural effects to support the assessment of the effectiveness of management measures.

   c. Formalized auditing procedures applied for administrative processes and implemented management measures from the perspective of operational effectiveness.

   d. Approaches for corrective action and follow-up activities to address non-conformities found during scientific monitoring, auditing and regulatory verification.

   e. Reporting requirements of responsible authorities for stakeholders including industry, conservation bodies, and the general public from the perspective of transparency in decision-making.

The workshop will be organized around the following activities:

Presentation and discussion of the background information

- Existing experience of the use of the quality assurance in marine spatial planning, integrated management and environmental assessments will be presented, reviewed, and collated.

Output from the Workshop in the form of proceedings to the WGMPCZM

- Guidance on approaches, tools and practices for the assessment, development and implementation of management plans.
- Recommendations for further development regarding scientific peer review processes, governance and consultation processes as well as auditing practices in order to overcome some of the gaps identified during the workshop.

WKQAMSP will report by 25 April 2012 (via WGMPCZM and SSGHIE) for the attention of SCICOM.

WKQAMSP - Day 1 (February 28)	
8h00 - 8h30	**Registration** *(BIO Main auditorium)*
8h30 - 9h00	**Welcome and Opening Remarks** *By: Roland Cormier (Canada) and Andreas Kannen (Germany)*
9h00 - 9h30	**Workshop Keynote** • *By: Mike Elliott (UK) - Tenets in environmental management*
9h30 - 10h00	**Session 1: Quality assurance of scientific advice** • *By: Eugene Nixon (Ireland) - ACOM*
10h00 - 10h30	*Nutrition break*
10h30 - 11h30	**Session 1 *(continued)*** • *By: Roland Cormier (Canada) - Scientific advisory processes in decision-making (CSAS)* • *By: Patricia Almada-Villela (UK), MMO - Evidence based approach* • *By: Josianne Støttrup (Denmark) - Spicosa Systems Approach Framework*
11h30 - 12h00	**Expert Panel discussion (Session 1)**
12h00 - 13h30	*Lunch (BIO cafeteria)*
13h30 - 15h00	**Session 2: Quality assurance of mechanisms or processes involved in developing MSP** • *By: Rafael Sardá (Spain) - The KnowSeas concept for an Ecosystem Based Management System* • *By: Andreas Kannen (Germany) - National and transnational Cooperation in MSP* • *By: Kira Gee (Germany) - QA in MSP: A question of values?* • *By: Wade Landsburg (Canada) - EA (CEEA) consultation processes*
15h00 - 15h30	*Nutrition break*
15h30 - 16h00	**Expert Panel discussion (Session 2)**
16h00 - 16h30	**Plenary discussion** *(participants and observers)*
16h30	**End of Day 1**
17h00 - 19h00	Meeting of WKQAMSP Co-Chairs and Expert Panel for summary of the day *Brownlow Boardroom, Park Place Hotel & Conference Centre Ramada Plaza*
19h00	WS Dinner *(at own expense); venue to be announced*

WKQAMSP - Day 2 (February 29)	
8h30 - 9h00	**Summary of Day 1** *(BIO Main auditorium)* *By: Roland Cormier (Canada) and Andreas Kannen (Germany)*
9h00 - 10h00	**Session 3: Audit of integrated management plans and their performance** • *By: Eric Tremblay (Canada), CWN - Environmental monitoring;* • *By: Roland Cormier (Canada), SARA - Risk based decision making criteria;*
10h00 - 10h30	*Nutrition break*
10h30 - 11h30	**Session 3** ***(continued)*** • *By: Louis Wildenboer (Ireland) Primary Locational Factors & Spatial Relationships - Offshore Renewable Energy Generators(OREGs)* • *By: Matthew Hardy (Canada) - Policy gap analysis & MINOE;* • *By: Paulette Hall and Carole Godin (Canada) - Auditing of assessment processes and management measures*
11h30 - 12h00	**Expert Panel discussion (Session 3)**
12h00 - 13h30	*Lunch (BIO cafeteria)*
13h30 - 16h30	**Plenary** *Elaborate on criteria, necessary mechanisms and potentially meaningful measures to be used in:*
16h30	**End of Day 2**
17h00 - 19h00	Meeting of WKQAMSP Co-Chairs and Expert Panel for summary of the day *Brownlow Boardroom, Park Place Hotel & Conference Centre Ramada Plaza*
WKQAMSP - Day 3 (March 1)	
8h30 - 9h00	**Summary of Day 2** *(BIO Main auditorium)* *By: Roland Cormier (Canada) and Andreas Kannen (Germany)*
9h00 - 10h00	**Plenary discussion** - summing up, conclusions from the group…
10h00 - 10h30	*Nutrition break*
10h30 - 12h00	**Next Steps** *(plenary)* <u>Objectives</u>: Workshop reporting, moving forward & recommendations…
12h00	**End of workshop**
WKQAMSP - Day 4 (March 2)	
9h00 – 14h00	**Report preparation**

Annex 3: Abstract and illustrative references for the keynote

Extended Abstract: The 7-tenets, the DPSIR/DPSWR/DPSIRR philosophy', ecological and socio-economic carrying capacity and The Ecosystem Approach – how to get sustainable estuarine, coastal and marine management

Mike Elliott, Institute of Estuarine & Coastal Studies (IECS),
The University of Hull, UK

Coastal and marine areas have long been degraded by many uses and users, especially causing habitat loss which may be temporary (e.g. water quality problems) or permanent (e.g. land claim). There are impacts on them from outside influences (exogenic unmanaged pressures) and internal influences (endogenic managed pressures). The latter are focused on what we put in to systems (pollutants, infrastructure) and what we take out (space, sediment, energy, biological resources). Management responses are required to increase the ability of an area to accommodate natural or anthropogenic hazards such as sea-level rise and storm-surges while at the same time deliver benefits for society. Unless these pressures are managed then ecosystem structure and functioning are impaired and ecological carrying capacity will be reduced even if socio-economic carrying capacity is increased albeit in the short-medium term. In addition, as these habitats also fulfil an economic role such as the production of food, sequestration of carbon, nutrient cycling, providing recreation, absorbing flooding, etc. Hence their degradation ultimately affects human and ecological health and societal wealth generation. Thus habitat recreation, restoration and management have to balance the maintenance of ecosystem services and the protection of biodiversity while at the same time delivering socio-economic benefits such as supporting ports and allowing sustainable extraction. We need the ability to fulfil 'The Ecosystem Approach' *sensu stricto* but within a nested-DPSIR approach (or its developments DPSWR/DPSIRR) which links activities (Drivers), Pressures, State Changes, Impacts on humans (Welfare) and Responses (and Recovery) not only within the coastal/marine area to be managed but also outside it. We need a management framework which includes the habitat needs for the main organisms, the conservation goals and management indicators and objectives. In order for management to know when it has achieved them, those objectives have to be SMART (specific, measureable, achievable, realistic and time-defined). Any successful and sustainable management of these areas has to fulfil the 7 tenets: that action have to be environmentally/ecologically sustainable, economically viable, technologically feasible, socially desirable/tolerable, legislatively permissible, administratively achievable and politically expedient. (And perhaps effectively communicable and culturally comfortable!) We have experience in management to aim for 'triple wins' with benefits for ecology (i.e. better and increased habitats which may recreate losses from historical land claim), public safety (i.e. protection against flooding and erosion which affects lives and property) and economy (i.e. the reduction in the costs of maintaining flood defences).

The presentation focuses on the Context of Marine Spatial Planning (that we have a complex sea area, competing interests, differing demands of the different stakeholders, an ad hoc system of ownership and use, and a confusing governance system which may be costly or time consuming for users). It then emphasize the main Vision (that 'There is only one big idea in marine environmental management - to protect and enhance ecological functioning and ecosystem services while at the same time delivering societal benefits') and has the main Aim to reconcile this vision with the problems inherent in that context. It then has the Objectives (to ensure recovery/coping with historical legacy, to protect endangered coastal and marine ecosystem functions, to harmonize a legal and administrative framework, to deliver economic prosperity and societal benefits and to cope with climate change and moving baselines). Next there is the need to emphasize that there needs be an Inventory of the data, information and evidence required not only for the scientific status but also the governance and economic framework. Finally the talk illustrates that while we often are concerned with the management of effects we really need to be concerned with the management of causes – it is arguable that if there are adverse effects then either management has failed or society has agreed that it is willing to tolerate these in order to get economic benefits. Of course, this may be a short-term view and hence goes against the need to ensure sustainability of use.

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Annex 4: Presentation Abstracts Session 1

ACOM

Eugene Nixon, Marine Institute, Ireland

Eugene Nixon gave a presentation on the Quality Assurance of Scientific Advice in which he provided an introduction to ICES covering the countries that are members and the affiliated countries which demonstrated the global nature of the ICES network. It was pointed out that the ICES network contains approximately 2000 scientists working in more than 100 expert groups. The ICES advisory programme is based on best available science to deliver advice to member countries, the European Commission and international commissions such as HELCOM, OSPAR, NASCO and NEAFC on the sustainable use of living marine resources and protection of the marine environment.

ICES advice is consistent with international agreements by applying the precautionary approach as agreed under the UN Fisheries Agreement of 1995 and is progressively moving towards full implementation of maximum sustainable yield in keeping with the spirit of the decisions made at the World Summit on Sustainable Development in Johannesburg 2002.

The ICES advisory operates in an open and transparent way in which observers have access to all stages with the process except for the Expert Group which compiles and analyses that data (see figure). The Expert Groups prepares the material for use in preparing the advice and the output of the expert group is peer reviewed before going to the Advice Drafting Group which prepared the draft advice. It is the Advisory Committee that finalizes and releases the advice. Member Countries have access to all stages of the process. ICES advice is seen as credible and legitimate by its clients primarily because it is based on best available data and science and the openness and transparency of the process.

Examples of the spatial distribution of fish spawning and nursery grounds along with the spatial distribution of fishing activities in part of the ICES area were presented showing the range and scale that fisheries management needs to operate. It was pointed out that there is uncertainty in the information available and that this is compounded by the effects of climate change. It is important that ICES identify and communicate these uncertainties and that should be managed by including all interests in the interface between science and policy for ICES to maintain its credibility. The work by Dankel *et al*. 2011, 'Advice under uncertainty in marine systems. ICES Journal of Marine Science, 69: 3–7' was referred to in this regard.

A brief description of the MSY approach was presented to communicate the difficulty in managing stocks in a spatial way. Some examples of trade-off between fishing and conservation identified by WGECO were presented to illustrate that spatial restrictions on fisheries may not have the as large an economic effect as might be expected as trade-off frontiers are very often not linear.

A brief overview of the ICES Strategic Initiative on MSP was presented and the availability of the overview report on ICES activity on MSP on the website at http://www.ices.dk/projects/ Draft%20MSP%20Overview.pdf was identified. The two workshops on MSP in Lisbon 2010 and 2011 were mentioned and reference was made to the usefulness of the MSP training simulation game 'MSP Challenge 2011' developed by Delft University and funded by the Dutch government. The presentation ended by a very short introduction to the ICES Data Facility as a very good source of marine spatial data, see http://geo.ices.dk.

Scientific Advisory Processes in decision-making in Canada (CSAS)

Roland Cormier, Fisheries and Oceans Canada, Canada

In terms of scientific support and quality assurance to decision-making, the Canadian Scientific Advisory Secretariat of Fisheries and Oceans Canada (DFO) manages peer review processes that are conducted to address a number of scientific questions related to the management of Canadian oceans and the conservation of marine and freshwater resources. The issues examined relate to the health of marine ecosystems, the conservation of species at risk, and the status and trends of different stocks of fish, invertebrates and marine mammals in Canada. Being an important pillar of sound decision-making in management and policy formation, the advisory process aims at providing information on the consequences of policy and management options, and the likelihood of achieving policy objectives under alternative management strategies and tactics. When objectives are stated explicitly, science evaluates which options are most likely to achieve them, and which options are likely to fail. In addition to being science-based information for policy formation and development of management approaches, the advisory documents also form the basis for subsequent consultative processes with stakeholders and advisory bodies. With a committment to quality, objectivity, and inclusiveness in its overall scientific advisory process, the whole process is intended to make sure that DFO Science meets its advisory responsibilities fully, in ways that are predictable to all participants, and give all interested parties a clear understanding of their roles and responsibilities. The process is based on the SAGE (Scientific Advice for Government Effectiveness) Principles and Guidelines:

- Decision-makers should cast a wide net consulting internal, external and international sources to assist in the early identification of issues requiring science advice.
- Decision-makers, policy advisors and scientists should communicate emerging issues requiring advice, and improve the connections between research and potential policy or regulatory issues.
- Departments should support and encourage their science and policy staffs to establish linkages with each other and with external and international experts.
- Departments should maximize interdisciplinary and international cooperation, and the use of expertise across government departments and levels of government, to identify, frame and address horizontal issues.
- Departments should maximize the use of new and existing science and expert advisory bodies

The Secretariat plays a key QA communication and transparency role of all science advice formulation while ensuring that the science information and advice to clients meet all the SAGE guidelines; that the advice is timely, cost-effective, and reliable; that all clients are provided with stable and consistent service, with roles and responsibilities clearly understood by all participants; that full accountability is attributed to the Department and clients, while maintaining independence from policy influence.

There are nine considerations in the formulation and planning for the advice:

1) Will the product of the meeting will be advice on policy or management?
2) What is the history of DFO Science in dealing with the type of issue?
3) What is the breadth of interest in the issue?
4) What expertise is available within DFO?
5) How much lead time is available between the request and the need for a response?
6) Is the question "What do we know about the issue?"
7) Is the question "What could be done [by the client] to address the issue?"
8) Is the question "How can something be achieved?"
9) Is the question "How much of something [e.g. harvest of a fish stock] can be permitted?"

In addition to the advisory documents, research documents presenting materials and methods as well as result analysis are produced for every aspect that was included in the advice are available to the public via the Internet. Where preliminary analysis is needed, workshop proceedings are also prepared as part of a multi-iterative process that will lead to the advice.

Over the years, ecosystem and environmental questions have been added to the typical fisheries list of questions going to the science peer review process. These include criteria for the identification of ecologically and biologically significant areas and species as well as risk criteria that are used as the ecosystem basis for management.

MMO Evidence Based Approach – Summary

Dr Patricia Almada-Villela, Marine Management Organisation, UK

MMO Roles and Responsibilities: The MMO was established in 2010 to promote the UK government's vision for clean, healthy, safe, productive and biologically diverse oceans and seas. It is a non-departmental public body given powers under the Marine and Coastal Access Act 2009 covering England and it has the mandate for marine planning. The MMO has a wide range of responsibilities: a) implementing a new marine planning system; b) licensing marine works; c) fisheries management, including administering the European Fisheries Fund (EFF) in England; and d) marine nature conservation and enforcement. Its sponsors include: the Department of Environment, Food and Rural Affairs, the Department of Energy and Climate Change, Ministry of Defence, Department of Transport and the Department for Communities and Local Government.

Evidence Based Approach: The MMO principles for using evidence are based on its Corporate Plan that states that the MMO will use the best available evidence in its decision-making. In addition, use of evidence in based on the Principles of Better Regulation. MMO defines evidence as 'Information and/or data that informs MMO's decision-making'. The MMO aims to achieve sustainable development and therefore, evidence must consider economic, social and environmental aspects and comes in a range of forms, from spatial raw datasets to expert reports. The scale of coverage varies greatly from small projects (e.g. potential impacts to seagrass from human activity) to large, long-term programmes (e.g. ecosystem services, cumulative effects). Evidence is used in the MMO by all its operational functions: marine planning, licensing, marine conservation and enforcement and fisheries management.

Addressing Critical Gaps in Evidence/Knowledge: The MMO has identified eight priority areas for its Evidence Programme: 1) co-location; 2) cumulative effects, 3) fisheries management, 4) socio-economics, 5) seabed habitat mapping, 6) marine protected area management, 7) ecosystem management, and 8) data mining (private and public sectors). In addition, ad hoc commissions can be achieved by filling in evidence requests forms specifying the evidence needs and the purpose.

Towards an Integrated Evidence Base: The MMO is working with its delivery partners, statutory nature conservation bodies, industry, academia, NGOs and research councils to build an integrated marine evidence base that can be shared and used by everyone. This collaboration would ensure that we maximize efforts and budgets, minimize duplication and enhance coherence and consistency in our research efforts.

Quality Assuring Evidence at the MMO: Evidence also comes from multiple sources including commercial, public, private and academia, with an associated variation in quality assurance or quality processes. The MMO has developed, published and implemented a quality assurance policy and processes. The MMO QA has three separate but related processes: 1) Quality assuring MMO's decision-making process (licensing); 2) Quality assurance of evidence; and 3) Quality Management System (towards ISO accreditation). In addition, as part of item 2) QA of evidence, there are three further checklists for: a) geospatial data; b) QA of evidence for planning and other functions; and c) QA of evidence to support licensing decisions. The MMO is working with its data suppliers and providers of evidence requesting them to provide the MMO with copies of their own quality assurance processes. The MMO also requests adherence to the government's Joint Code of Practice for Research.

MMO Quality Assurance Criteria

QA Item	Criteria
Defining MMO requirement	What is the purpose of the evidence?
Framing the question	What good evidence would look like?
Risk assessment	Delivery, financial, reputational, legal
Prioritization	Must have, should have, could have, would like
Assess quality	Validity, accuracy, timeliness, reliability, relevance, completeness (defined in QA Policy), auditability and production quality standards
Confident assessment	Low, medium, high
Independent peer review	Internal / external
Caveats	Must be included in assessment

Addressing Poor Quality Data or Products: Assigning a level of confidence to evidence guides the MMO user as to how best to use such evidence. A 'low' confidence level does not preclude the user of using such evidence; it signals how much weight it places on such evidence. High quality evidence will be used with more confidence than low quality evidence and will also be used in a more prescriptive manner. When critical gaps in evidence are identified, the Evidence Data and Knowledge Management team will commission, manage and peer review any the process in its entirety ensuring that evidence produced is best available and fit for purpose.

The SPICOSA Systems Approach Framework (SAF)

Josianne G. Støttrup, Technical University of Denmark,
National Institute of Aquatic Resources, Denmark

One of the major challenges to achieving the objectives of ICZM and MSP is the practical implementation. How do we go about it? How do we do it? The approach is very important to achieving the goals and a systematic approach is rarely witnessed in the real world.

The Systems Approach Framework (SAF) designed by EU project SPICOSA is a methodology aimed to bridge the "how to" gap and has demonstrated from the diverse applications tested a scale independence. A handbook on SPICOSA SAF is provided at www.spicosa.org. The SAF is a method that focuses on understanding the systems' function (processes and dynamics) superimposed on an understanding of a systems' structure – its composition in different spatial scales. Scientific methods normally investigate objects and iterate between hypothesis and proof. The Systems Approach iterates between resolution and accuracy. The SAF aims at understanding the controlling mechanisms (governance, public perception and stakeholder interests), integrating interdisciplinary research and promoting dialogue.

The SPICOSA SAF aims to provide the bioeconomic models to guide management as to when to act relative to cost of system recovery and degree of system resilience, what to do and how to do it. The basis for the SAF is to estimate the limits of use in a natural system for sustainable use. The policy concern is to minimize controversy over use and conservation. Main economic concern is to minimize the cost of system use and the expense of their maintenance and scientific concerns aim to maximize our ability to understand and predict system behaviour.

Eighteen study sites participated in the SPICOSA SAF; 8 of these had a Primary Policy Issue related to Wasting (the input of mass or energy different in either substance, frequency or quantity to its previous state), 6 to Harvesting (the extraction of mass or energy exceeding the system production capacity) and 4 to Modifying (system interventions in a manner that impair or damage system function; Hopkins et al. 2012). Most of the sites had at least two of each of environmental, economic and social concerns involved in the resolving of the Policy Issue chosen. The SPICOSA SAF involves 4 major steps that integrate ecological, social and economic sciences and include stakeholder engagement from start to end. The four steps include:

The Design step where stakeholders and governance structure are mapped, issues are identified together with stakeholders (including managers) and develop conceptual models. These conceptual models help to define the boundaries for the issue in question – geographical and information boundaries.

The Formulation step is where the submodels for the ecological and socio-economic components are put together, calibrated and validated and discussed with stakeholders

The Appraisal step is where the complete model is merged and further calibration and validation takes place. The scenarios are agreed upon and prepared.

The Output step is the final step of the first loop. Here the scenario simulations take place and the results are presented to stakeholders and evaluated. This could be the end generating new policies, new decisions, changed stakeholder perceptions or new inter-stakeholder interactions. It may also generate a need for a new loop as new questions arise or new changes take place in the system. A documentation report documents the process at each step and the model software used, allows for documentation of data used and sources, apart from having a highly user-friendly interface.

The results now published in a Special Feature on "A Systems Approach for Sustainable Development in Coastal Zones", Ecology and Society (http://dx.doi.org/10.5751/ES-04553-160425), showed examples of how the SAF could demonstrate among other things, effectiveness (or lack of) of policy options, newer perspectives gained from a holistic view by examining subcomponents and the value of the ecological, economic and social components of the integrated analyses.

Annex 5: Presentation Abstracts Session 2

The Ecosystem-Based Management System (EBMS): a standardized way to bring Ecosystem Approach related concepts into practice

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1 Introduction

The intense pressure on coastal and marine ecosystems elsewhere in the world calls for preventive and protective action at all levels - local, national, regional and global. Different states and regions have addressed strategies to reach a sustainable use of these domains while maintaining its ecosystem functions and integrity: Australia (Oceans policy, 1998; Commonwealth coastal policy, 1995), Canada (Oceans action Plan, 2004), United States (Oceans Act, 2000; An Ocean Blueprint, 2004), Europe (Water Framework Directive, 2000; Marine Strategy Directive, 2008; Maritime Policy Blue Book,). All these policy frameworks respond to the overlying principle of sustainable development and called for the use of the Ecosystem Approach, a principle driven management concept that focuses on the relationship between human society and the ecosystems that supports it. This new approach offers new opportunities for sustainable use of the sea but requires better understanding of how marine social-ecological systems operate, how they generate goods and services, how well these benefits are captured and sustained, how human degradation of the systems affects human welfare and generates costs, and the complex social relations and value systems underpinning human governance of marine systems. The understanding and commitment to the application of these concepts is critical for the future of oceans and coasts and must play a primary role in decision-making; the use of systematic environmental management tools can provide the foundation for a sustainable development implementation plan at all levels of management.

Prior to the emergence of the Ecosystem Approach (EA) and other integrated approaches to environmental management, ecological and anthropogenic systems were generally managed separately, with a different set of objectives and associated management frameworks. It is now recognized that human activity and the ecosystems in which they occur cannot be separated and should be managed as a whole. This forms the fundamental basis for the application of the EA and has resulted in the emergence of the concept of social-ecological systems. Social-ecological systems reflect the inextricable link between society and ecology. Bearing in mind the fact that the MSFD defines the overall objective of Good Environmental Status (GES) in largely ecological terms, where the IMP is more focused on human aspects of marine management, the EA (referred to as Ecosystem-Based Management-EBM in many of its policy applications) is a valuable concept that draws together the objectives of both policies. However, currently the concepts of the EA and EBM are often not fully differentiated, which may be viewed as a reflection of the absence of a clearly defined framework for implementation.

The purpose of this paper is to introduce an operational framework, a systematic process able to translate the Ecosystem Approach concept or its Ecosystem-Based Management version into tangible management practices, this framework constitutes the Ecosystem-Based Management System (EBMS).

2 The Ecosystem-Based Management System (EBMS)

Management is about making decisions. In this context, management of environmental public goods and services is about making the best decisions for societies and for the effective functioning of these public goods. The use of the Ecosystem Approach into practice requires using Adaptive Management principles. The Ecosystem-Based Management System (EBMS) wants to constitute the way to introduce this adaptive management framework. The EBMS has been designed to combine classical Quality (Environmental) Management System (QMS-EMS) theory with the Ecosystem-Based Management (EBM) principles. EMS's are useful frameworks through which organizations can reduce their environmental impact, improve their environmental performance, and provide relevant information to the public and other interested parties. The EBM, on the other hand, represents a policy framework for the application of the Ecosystem Approach concept ELI, 2009). Used in conjunction with each other, EMS may be viewed as a useful tool for delivering the Ecosystem Approach (EA) which, in turn, may be expressed through the implementation of EBM. We use the term Ecosystem-Based Management System (EBMS) to define a systematic approach that links the EMS tool with the EBM framework. The EBMS is intended then to provide a systematic approach for the principles of the EA by introducing them into a clear, familiar, managerial framework. In order to account for this shift in approaches to environmental management, we have adapted the different elements and clauses associated with the traditional EMS framework (using the ISO 14001 as example to be the most well known used one) to reflect an ecosystem orientated approach. Part of this adaptation includes some changes to the general terminology associated with EMS as it applies to EBMS.

The basic design of the Ecosystem-Based Management System (EBMS) can be divided into three components (a three pillar structure: the managerial pillar, an information pillar, and a participatory pillar). The managerial pillar is the basis of the system, the one that resembles a formal Environmental Management System (EMS), while the information pillar and the participatory pillar provide necessary inputs for the functioning and performance of the managerial system, as well as to facilitate a wider use of sustainable development principles such as integration, adaptability, transparency or participation. Figure 1 shows how the three different pillars of the EBMS work together.

The conceptual thinking underpinning the managerial pillar is the policy cycle assessment developed inter alia by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP, 1996) This policy cycle follows the classical PDCA (Plan-Do-Check-Act) managerial scheme, the so-called Deming cycle (Deming, 1986), a continuous quality improvement model consisting of a logical sequence of four repetitive steps that uses an iterative logic for the continuous improvement and adaptation of the systems under management. The Deming cycle is a classical example of quality assurance mechanisms. The information pillar is designed to assist the managerial pillar with user-friendly tools than can facilitate the flow of information into the decision-making process, while the participatory pillar in the Ecosystem-Based Management System (EBMS) should seek to enhance communication with stakeholders and to service needs for capacity building.

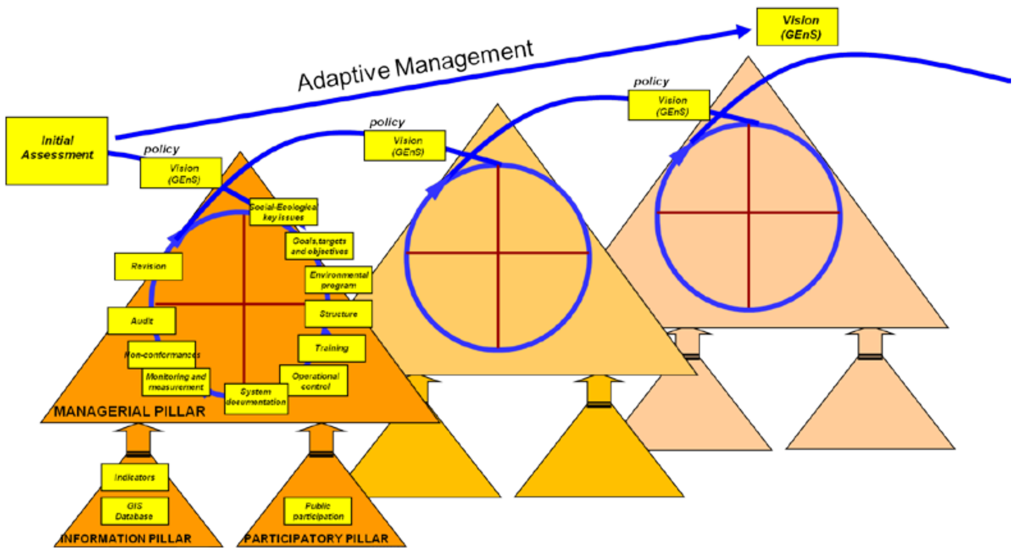

Figure 1. The Ecosystem-Based Management System structure.

The Managerial Pillar

An initial assessment of the Social-Ecological System under management (its present "status quo") and the desired vision to reach by their management (in the present case for the European Union, its Good Environmental Status (GEnS) are first required. The iterative policy cycles of planning, implementation, checking, and reviewing, will take place. The area of planning will perhaps be the most challenging and will require a combination of good managerial tools and continuous dialogue with interested stakeholders. An important element of this policy is the identification and prioritization of the issues informs policy and planning. In this context, a process tool called DEMA (for DEcision MAking) has been proposed to make decision-making more analytical and systematic. DEMA is based on a classical Risk Analysis (RA) process defined previously and is intended to help marine and coastal managers to set priorities for action within the Ecosystem-Based Management System (EBMS). DEMA will assess the likelihood and consequences of potential problems associated with hazards events and/or activities (actions or lack of action) that could distance us from reaching and/or maintaining Good Environmental Status (GEnS), including their causative factors. Then implementation, using input-output projects, and checking, quality assurance of their actions, of the management plan (program objectives and targets) coming from DEMA will take place. Finally the revision of the cycle will take place to move into a next cycle.

The Information Pillar

The Pillar is designed to create an interoperable database to assist management with user-friendly tools than can facilitate the flow of information into the decision-making process. An Information Factory (IF) is then developed. This IF will be developed using a GIS-Web Data platform concept, supported by analytical tools, and suitable for a wide range of scaling activities. In the Ecosystem-Based management System, this tool is called the GIS-Seas tool which works in an open space. An interoperable Metadata Catalog Web Service that import MEDIN templates and follow INSPIRE EU Directive is used together with a web mapping tool and a map visualization template.

The Participatory Pillar

The Pillar seeks to enhance communication with stakeholders and to service needs for capacity building. Good Environmental Status (GES) is ultimately determined by the needs of society. It is unlikely that goals based on a return to pristine conditions could be achievable so the process has to be forward looking and relies on a dialogue with stakeholders about what is feasible in future and how this relates to the maintenance of ecosystem services. In order to provide users of the system and other stakeholders with a good tool for Capacity Building and Training, the Ecosystem-Based Management System (EBMS) develops and enhances stakeholder capacity in the form of the ESCA tool, a web-based product which can be assessed by any stakeholder with interest in the area.

3 Conclusions

New integrated management programmes, systematic approaches combining effective governance structures (EGS) with formal managerial systems (EBMS) can constitute an invaluable opportunity to learn from past practices, develop new skills, gain fresh insights and lead the way in which future management of the seas should be done. The use of the Ecosystem-.Based Management System (EBMS) intends to develop standard tool for the management of the marine environment that can be used at different spatial scales. The EBMS is aimed to introduce the Ecosystem Approach (EA) into practice; it standardized a common set of tools, introducing a common language for scaling problems; and it constitute an easy way for knowledge transfer and adaptive management.

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National and transnational cooperation in MSP

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Over the last years Marine Spatial Planning (MSP) has evolved in many parts of the world as a concept aiming to integrate human demands for using marine space and resources. Existing spatial plans for sea areas are usually developed within national or sub-national boundaries without significant interaction with neighbouring regions or countries. But particularly the European Regional Seas such as the North Sea, the Baltic Sea, the Mediterranean Sea or the Black Sea are marine areas with many riparian countries, which often face similar developments concerning sea use or where activities in one country affect activities in neighbouring countries. On the other hand the historical and political as well as the cultural and socio-economic context of the different countries can vary significantly. As well planning approaches, traditions and philosophies vary. Activities like shipping and fishing, but also ecosystem processes act across national boundaries and ask for transnational cooperation including balancing costs and benefits between regions and countries. A new development asking for transboundary action are plans for electricity grids within the North Sea and the Baltic Sea connecting wind farms (and other sources of electricity) between several countries. In light of these transboundary interactions, MSP processes and outcomes need to be evaluated not only along sector oriented and national objectives, but also from looking at their impacts on Regional Sea scale. Based on experiences from the BaltSeaPlan project[4], the presentation introduces and discusses principles developed within a multinational MSP context in the Baltic Sea.

BaltSeaPlan has developed a vision for MSP in 2030 for the Baltic Sea space (Gee et al. 2011)[5]. The vision is based on equal weight of social, economic and ecological aims, objectives and targets that have been formulated by different transnational bodies in the Baltic Sea, existing policy targets formulated at EU and national levels and ongoing development trends in the Baltic proper. Out of an analysis of this context and meetings with BaltSeaPlan partners four key topics, which require transnational cooperation, have been identified:

- A healthy marine environment,
- a coherent pan-Baltic energy policy,
- safe, clean and efficient maritime transport and
- sustainable fisheries and aquaculture.

All of these topics include trends that affect all states around the Baltic Sea and effects that go across borders as well as international targets and/or policy goals. For MSP this implies that consultation, data and information exchange and a cooperative approach is needed to deal with these topics even within national or sub-national MSP processes. Therefore formal and informal bodies are required as platforms for cooperation and information exchange. While formal bodies might provide the political support and official guidance and/or commitment for transnational cooperation in

[4] www.baltseaplan.eu

[5] Gee, K., Kannen, A., Heinrichs, B. (2011) BaltSeaPlan Vision 2030 - Towards the sustainable planning of Baltic Sea Space. BaltSeaPlan Project. ISBN 9783869872506.

MSP, informal bodies allow early exchange of information between authorities and can also involve representatives from science, NGOs and industry when needed.

As a step towards harmonization of planning approaches three key principles have been identified in the BaltSeaPlan vision:

- Pan-Baltic Thinking, which requires MSP to take a holistic approach, putting long-term objectives first, be guided by formulated objectives and targets, recognize spatial differences between different regions, fair distribution of advantages and disadvantages of human sea use and harmonization of sea space planning and adjoining terrestrial areas;
- Spatial Efficiency, which implies the promotion of the co-use of multiple activities within sea areas, avoidance of the use of the sea as repository for problematic land uses and priority for immovable sea uses and functions; and
- Connectivity Thinking, focusing on the connections that exist between areas and linear elements, e.g. shipping lanes and ports, connections between habitats, breeding grounds and feeding grounds (e.g. blue corridors and migration routes).

To conclude, MSP at every spatial or administrative level needs to recognize and include the wider context of larger scales and needs to think across its specific planning boundaries. This is supported if visions at each scale such as the transnational BaltSeaPlan vision exist and are documented. In quality assurance for MSP processes this needs to be tackled, e.g. by including transnational cooperation mechanisms as a criterion in evaluation and auditing. Furthermore the agreement on joint principles which may guide decision-making such as the ones developed out of BaltSeaPlan form a starting point for harmonization even if administrative settings and specific planning traditions and philosophies in the different countries are recognized as an existing reality or even appreciated as an element of fruitful diversity.

Quality assurance in MSP – a question of values?

Kira Gee, Helmholtz-Zentrum Geesthacht, Institute for Coastal Research, Germany

The purpose of MSP is to allocate limited sea space in the best possible way, acknowledging and balancing the different demands placed on the marine environment. As such, MSP is really a continuous process of negotiation which needs to navigate between the often different value sets, interests and priorities of a wide range of stakeholders. In this process of negotiation, it is essential to acknowledge the breadth of values associated with the sea as well as confluences and disagreements of values as one of the root cause of agreement and conflict. It is also important to acknowledge that these confluences and disagreements may be temporary, leading to shifting alliances over time.

This presentation combines two perspectives to arrive at a comprehensive understanding of values. First is the view of values as objects of value, i.e. the perspective of the sea as a collection of goods and benefits. In assessing the impact of sea use change on marine goods and services, the economic perspective tends to be predominant, including monetary costs and benefits of sea use change (e.g. job creation, internal costs etc.) Intangible values are commonly neglected in this context because they are subjective and difficult to trace, requiring questionnaire-based approaches and direct stakeholder contact. Nevertheless, it is often these intangibles that are particularly important to stakeholders. A recent survey from the German North Sea coast shows that residents have an emotional view of the sea, which is in marked contrast to the dispassionate view of the sea held by planners or developers. Aesthetic, symbolic and heritage values can weigh more than tangible economic values: In the German case study, the perceived risk to these intangible values is shown to be the key reason for rejecting offshore wind farming. The concept of cultural ecosystem services is a useful framework for tracing intangible values.

A second perspective of values is also important here. This is the view of values as held values, i.e. the innate driving forces that cause us to value certain goods or behaviours more highly than others. Held values are important because they influence beliefs and with these attitudes, which in turn come into play during processes of negotiation. The survey on the German North Sea coast also reveals a strong moral sense in residence of what use is right for the sea. Apart from symbolic values of nature, the moral sense that “humans have an obligation to protect the marine environment and ensure it is not harmed” comes across particularly strongly. Although the example here is local residents, similar value sets and world views are encountered in groups, organizations and authorities, impacting on views of and consequently decisions taken about marine space.

The lesson for MSP, and for quality assurance in MSP, is that socio-economic assessment during the respective stages of the MSP cycle must take into account the immaterial values ascribed to the sea just as much as material values. This requires the use of concepts such as CES, as well as time to make these values visible and accessible to the planning process. Second, the link between inner convictions and attitudes should be recognized. Understanding deeper value sets has implications for situations of conflict in MSP, where understanding the reasons for particular attitudes is a prerequisite for establishing limits of acceptable change and negotiating trade-offs. A “no” to offshore wind farming for example can have many reasons, ranging from moral and ethical values, to NIMBY concepts, or the belief that better alternatives exist. A combined value assessment is presented which can help work towards a solid foundation for decision-making about marine space.

Environmental Assessment Consultation Processes

Wade Landsburg, Fisheries and Oceans Canada, Canada

Consultation under the *Canadian Environmental Assessment Act* (*CEAA*) generally refers to consultation with the public, stakeholders and aboriginal right holders. This presentation considers all mechanisms that contribute to the exchange and consideration of information within the environmental assessment process (EA) providing a high level of quality assurance for Canadians.

A federal EA is conducted to ensure that projects are carefully reviewed before federal authorities take action in connection with them so that projects do not cause significant adverse environmental effects. Consultation mechanisms help provide Canadians with a transparent EA process that permits open questioning for proposed projects.

Fisheries & Oceans Canada consults for many reasons. For example, our Fisheries Management Sector has ongoing consultations with fish harvesters, aboriginal communities and stakeholders as part of the advisory process to manage Canada's fisheries.

Often consultations are a matter of good governance while under the CEAA consultation is usually a statutory requirement and expected by Canadians. It is worth noting that *S.35(2)* of the *Fisheries Act* is one of the most common triggers for an EA in Canada considered by many Canadians to be one of the most powerful pieces of environmental legislation in Canada.

At a minimum all EAs are listed in the Canadian Environmental Assessment Registry which is a conduit for public participation in the EA process. As the complexity of a project and the likelihood of significant adverse impacts increases, the level of consultation increases proportionally.

Fisheries and Oceans Canada has a variety of tools to deliver quality EA products including:

- National Habitat Management Training Program
- Policy Guidance documents
- CEA Agency Training Programs
- The Annual Report to Parliament

Replacement and Model Class screening are utilized for reviewing project types of the same class of activities. While the initial investment of time and resources in these EA processes is significant, the resultant product is a much stronger resulting in both effective and normalized management measures. Quality assurance best practices would greatly help individual department/agency involved in environmental assessment process under C*EAA* in terms of consultation and decision-making processes across departments and Agencies.

Annex 6: Presentation Abstracts Session 3

The Northumberland Strait – Environmental Monitoring Partnership (NorSt-EMP): working towards a Regional Cumulative Effect Monitoring Framework

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Fisheries & Oceans Canada, Canada

Northumberland Strait is a 200 km long, 15–40 km wide, semi-enclosed shallow body of water that separates Prince Edward Island from the east coast of New Brunswick and the northwest coast of Nova Scotia in the southern Gulf of St Lawrence in eastern Canada. Land draining to the Strait includes some twenty distinct watersheds comprising an aggregate land area of 16,910 km^2. Major activities within the area include commercial fishing (lobster, scallop, herring), aquaculture (oyster, blue mussel), fish processing, agriculture, peat moss harvesting, forestry, and tourism.

Northumberland Strait has provided sustenance to Mi'kmaq, Acadian and British communities for centuries. Over the last two decades, however, local residents have become concerned about declining fisheries resources in the rivers, estuaries and Strait itself. Initially, the construction of Confederation Bridge (1993–1997) was blamed but it soon became clear that broader changes were occurring in the environment. Some of these changes were obviously related to anthropogenic activities on various spatial and temporal scales, but others were not. In 2005 the federal Minister of Fisheries and Oceans instituted a working group to address these concerns and in 2007 an Ecosystem Overview Report (EOR; AMEC, 2007) was published. Recommendations leading from the EOR included research into the physical and biological oceanography of the Strait and its marine environmental quality. This research is being carried out by DFO through an Ecosystem Research Initiative (ERI) funded from 2008-2012. While the ERI is doing an excellent job of characterizing Northumberland Strait, it does not address the following priority identified in the EOR: **"…analysis of the surrounding watershed … to measure inputs of nutrients or other materials to the Strait via associated estuaries. This is an essential step in quantifying estuary-Strait coupling with implications for assessing eutrophication as well as dispersal of contaminants".** Serious gaps still exist in our understanding of the ecological processes that link human activities with freshwater, estuarine and marine ecosystem health. This situation limits attempts at applying integrated ecosystem management. The need, and the opportunity, is to develop a monitoring network to measure the health of our rivers and estuaries, to connect land uses with estuaries, and estuaries with Northumberland Strait. To design such a network and develop appropriate indicators and reference points we first need to do research to understand the relationships connecting stressors, from all levels, to effects.

Stakeholder consultations during preparation of the Northumberland Strait EOR revealed that, **"Many expressed profound concerns about the future of fisheries and other commercial, cultural and recreational activities occurring in and along the Strait. … As a general statement, it can be reported that participants believe that the Northumberland Strait is an ecosystem that, by its very nature, is particularly vulnerable to stresses from human activities. They also believe that the health of the Northumberland Strait ecosystem is failing rapidly and that meaningful and prompt intervention is essential"** (GTA Consultants, 2006).

There is a great deal of monitoring being carried out in the Northumberland Strait region, for many different purposes. Monitoring is being done in virtually every watershed of Northumberland Strait. Some of these programs have been collecting data for several decades. The list of programs speak to considerable capacity but it is recognized that these monitoring initiatives are not coordinated and it is likely that there are redundancies and gaps in what is being collected. Currently, the databases of each program are managed by their respective organizations. The NorSt-EMP consortium felt very strongly that the information collected should be incorporated and analysed as a whole to help ascertain the issues identified in the Strait. However, there are information gaps. Some were identified in the 2007 Northumberland Strait EOR (AMEC, 2007), including inputs of nutrients, sediments and contaminants to Northumberland Strait from bordering watersheds.

In 2010, the support for developing a Northumberland Strait - Environmental Monitoring Partnership (NorSt-EMP) was achieved by bringing together stakeholders from the region. Subsequently, all groups doing monitoring, regulating monitoring or benefitting from monitoring in the watersheds around Northumberland Strait were engaged in 2011 through meetings and consultations to establish the NorSt-EMP Consortium Node so as to apply to the Canadian Water Network (CWN) for funding over a three year period to develop a Regional Cumulative Effects Monitoring Framework.

A national call for proposals was launched by the CWN in 2011 to find a research team that would address the concerns raised by the NorSt-EMP stakeholders. The chosen research team will develop and produce as their project output a recommended sampling strategy to improve cumulative effects assessment in the estuaries of Northumberland Strait region within the following categories, as identified and prioritized by the stakeholders:

1) Nutrient, sediment and/or contaminant impacts of land-based activities on fish
2) Nutrient, sediment and/or contaminant impacts of land-based activities on invertebrates
3) Nutrient, sediment and/or contaminant impacts of land-based activities on submerged aquatic vegetation

The recommended sampling strategy should provide the NorSt-EMP with the minimum essential elements for establishing a regional monitoring framework in support of cumulative effects assessment with consideration of sample station selection, indicator selection, sampling methods, reference site selection and sampling frequency.

A total of five research proposals were received by CWN. The Consortium Node Committee was responsible for evaluating and recommending proposals that would fulfil the needs of the Consortium. The review and selection process was carried out by two independent committees, one formed with Consortium members and one composed of independent international scientific experts. The Consortium committee evaluated the proposals to ensure they met the Consortium's needs while the expert committee evaluated the proposals for their scientific value and merit. A total of seven NorSt-EMP members were selected for the committee and represented the federal departments, non-governmental organizations, and the private sector. Several elements were put in place to ensure the consistency, fairness and quality assurance of the process. A series of five criteria were adapted from the CWN. The use of anonymous reviewers, colour coding and a weighted decision matrix was instrumental to the neutrality of the review process. The committee worked by consensus and agreed to maintain strict confidentiality. Each member was asked to declare any conflict of interest before each committee's session.

As a result of this process a research contract of $592K over a three year period has been awarded to a researcher and his team. The aim is to have a Regional Monitoring Framework for a Cumulative Impacts Assessment in the Northumberland Strait in 2015.

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Species at risk listing framework

Sophie Bastien-Daigle (Presented by Roland Cormier),
Fisheries and Oceans Canada, Canada

Status assessment and listing of a wildlife species at risk under Canadian legislation is a multidisciplinary process involving sciences and regulatory decision-making. In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) – an independent body of scientific experts from across the country - is responsible to conduct species status assessments to determine the classification of a species at risk following a number of internationally recognized criteria, including those developed by IUCN. These assessments are based on the best available information of the biological status of a species, including scientific, community and aboriginal traditional knowledge. Yearly, COSEWIC provides its assessment report to the Minister for the Environment and the Canadian Endangered Species Conservation Council (CESCC) for consideration. It is important to understand that COSEWIC does not make the decision about subsequent measures to protect and recover the species and that responsibility belongs to government with input from the public. The Minister for Fisheries and Oceans, the federal responsible authority for aquatic species, must consider the COSEWIC reports and decide on the next course of action for all aquatic species.

The Act require that a response statement from the Minister be provided within ninety days of receiving the COSEWIC assessment results and that a listing decision be made within 9 months or that it be referred back to COSEWIC for further information or considerations. During this period, the department must consult with other federal and provincial departments, First Nation and Aboriginal communities, industries, non-government organizations and all affected Canadians to determine the implications of listing the species under the Act. In addition, the department identifies a number of management options that could lead to protection and recovery of the species in relation to the listing decision. This element is part of the requirements of the regulatory impact assessment to reduce the regulatory burden and to ensure any new legal measure meets streamlined regulatory standards in Canada. In determining the options, considerations are given to measures under alternative legislations that could be implemented to mitigate threats to the species. As part of the evaluation, a recovery potential assessment, socio-economic impact analysis and broad consultations are done to assess the implications of each management option considered. A number of reports are prepared to present the management options in terms of identification of the species' protection and recovery objectives and its potential for recovery, an identification of regulatory and non-regulatory options available and benefits and costs of implementing these management options.

Risk criteria are then used to rank the management options in terms of their ecological, socio-economic and corporate implication in order to recommend a particular listing option. Ecological risk criteria, for example, consider the potential risks of the decision on population and extinction probability, on the species habitat and distribution, on the ecosystem and biodiversity and on the presence or absence of threats. Socio-economic risk criteria are based on Canada's Treasury Board guidelines to assess the impact of regulatory decisions on its citizens. They consider the impacts in terms of how industries, First Nations and Aboriginal Organization, communities and regional organizations and Canadian consumers and households may be affected. These elements may factor in such things as the additional costs of operation affecting a local community and their traditional activities or livelihood and employment issues. Corporate risk criteria consider the repercussions in terms of manageability with existing human and financial resources to potential litigation risk or simply risks to the department's reputation at the local, regional and international level. In the end, the risk criteria approach allows for an informed comparison between management decisions as their relative risks in relation to the options presented.

From a quality assurance perspective, having preset criteria to classify the risks of management options informs the decision-makers of the implications and consequences of the decision at hand. It also provides a documented rationale, traceability and objectivity to the decision.

Note: in this text, the Act refers to Canada's Species at Risk Act.

Quality assurance in MSP – Primary Locational Factors & Spatial Relationships – Offshore Renewable Energy Generators(OREGs)

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Member of Marine Research Network, Ireland

In particular, in applying MSP as a process, strategic policy or development framework it is important to compare the different definitions noted in the evolution of MSP in the EU. It is the definition and the application of MSP for a specific purpose to address a specific shortcoming, i.e. in conservation, development or social regimes, etc, which will determine the actual format of MSP. This in turn can be compared to the applied science of spatial planning/strategic planning and regional planning, as applied to the sea, to be used directly or indirectly as an objective prediction and decision-making tool.

The BaltSeaPlan's definition indicates it as a new tool comparable to spatial (physical) planning on land, with the added complexity of the sea and where terrestrial and marine space are equally important. The IMSP Handbook indicates Integrated Marine Spatial Planning (IMSP) as a combination of terrestrial spatial planning and Integrated Coastal Zone Management, with coasts and seas seen as constituent parts in terms of ecology and socio-economic factors. Finally, the EU Blue Book sees it as a fundamental and neutral tool to manage and arbitrate competing activities and interests on coasts and seas by using the integrated management approach and spatial planning towards sustainable development of marine economic activities. In comparison to this, the applied science of spatial planning or spatial planning theory can be defined as the spatial organization, prioritization and maximization of marine use functions in a 'functional space' with limited resources, -accessibility and -transportation systems.

The need for regulated spatial planning derives from market failure where certain services, interest and needs do not naturally reconcile themselves, i.e. the provision of health services, large-scale infrastructure services, environmental protection, national energy security, etc. Central to spatial locational theory are the nodal or central place (growth pole) theories (Chistaller, Loch, Perroux) and axial/corridor development theory, and the interactions between these nodal and axial locations and their combined influence spheres or regions.

In applying MSP and in the interest of quality assurance, spatial planning theory can be used either directly or indirectly to enhance quality, predictability and in particular objectivity. In this context, it is critical to identify the functional space or region within which you plan to apply the MSP process, as the type, extent and character of the region will have a deterministic effect on the outcome of the plan. Choices such as oceanography, marine geology, administrative/municipal/sovereign jurisdictions, ecology, economy, socio-economic, etc. lead to plans with different outcomes. For example different plan outcomes can be conservation-, eco-tourism-, development-offshore grid plans, fisheries plans etc. Informed decisions are required to understand the induced outcome, limitation and interface of the MSP plan with other plans and their respective regions. In order to further set the purpose and function of a plan it is important to set clear visions, aims and objectives, which will give direction and measurable milestones against which the progress, success, impact or project drift of the plan could be measured.

The presentation considers the problem of existing and future location of different marine uses, functions, environmental areas, physical developments, etc. within the sea. This complex question can only be considered from a spatial planning perspective, by analysing and understanding the primary locational factors of these marine uses. This in turn establishes a rationale against which proximate marine use can be considered and their particular relationships and interdependencies. This problem is currently being further analysed and researched by the author of the presentation, and findings will be available in future papers and publications.

The renewable industries' concerns and support of MSP will have an important bearing on the quality, outcome and success of future plans. From detailed stakeholder participation on the draft Offshore Renewable Energy Development Plan (OREDP) 2011 of Ireland, the following industry issues were identified: i.) anticipating delays in offshore consenting process while plans are prepared. ii.) no intermediate consenting procedures in place iii.) disconnection between energy market regulatory connection consents and offshore physical development consenting regimes iv.) disconnection with on- and offshore transmission network planning. v.) failure of the idea of first-come-first-served for offshore physical development consenting vi.) lack of plans giving a degree of predictability and certainty for consents and therefore, investment certainty. vii.) Divergence of onshore and offshore physical development consenting regimes vi.) ever-growing environmental assessment related administrative and cost burden on marginal and emerging new technology projects, etc.

Some known developer led locational factors are first-come-first serve, more recently Leasing Rounds, proximity to the developer, resource potential (when resource is limited), avoidance of environmental designations, technology capabilities at the time of development, water depth and geology/geomorphology, etc. Plans and policies have to date assisted little in structuring the location settlement patterns of offshore renewable energy generators (OREGs) and at best has been ad-hoc and at worse has been laisser-faire.

If emerging spatial location and settlement patterns of OREGs are considered from a spatial locational theory point of view, certain spatial implications can be deduced. For example, first location or nodal location is likely to have a significant impact on future location and settlement pattern. Second, OREG settlement occurs relative to more than one functional space, with different drivers and motivations that are not necessarily apparent when these regions are considered separately, third OREG is responding to a national need and not a local need. These spatial implications and a number of others, now being analysed and researched will have a considerable impact on the quality, predictability and outcome of future MSP plans.

The quality assurance of MSP as a process, policy or plan, among others, are determined by the regional space it will apply to, and the vision, aims and objectives set for the plan. Emerging spatial location and settlement patterns of OREG can either help form or distort well intentioned MSP plans if not better understood.

Regulatory Gap Analysis Approach with MINOE

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Regulatory and policy fragmentation (i.e. the lack of integration) is considered to be a key impediment to effective management and planning of coastal and marine activities. Regulatory instruments[1] (e.g. laws, regulations, policies, practices, etc.) are typically designed to manage activities on a sector-by-sector based without considering existing management measures or the implications on the interests of other jurisdictions. The consequence can be inability to be effective in meeting ecosystem as well as economic objectives across multiple jurisdictions, ineffectiveness of control or mitigation measures, or duplication of efforts.MINOE[2,3,4].is an analytical tool which is an acronym for "Management Identifying the Needs of Oceans Ecosystems"(http://minoe.stanford.edu/) which was developed to assist policymakers, scientists, and others involved in ecosystem-based management initiatives. It allows for the systematic analysis and navigation within an indexed inventory of regulatory instrument documents by searching the texts for the co-occurrence of relevant terms.

In practice, the complex regulatory landscape that is organized jurisdictionally and spatially can confound accountabilities when attempting to address the cumulative environmental effects of a number of activities. An analysis of potential regulatory gaps and non-gaps (i.e. existing management strategies) can help regulators to assess if enhanced management measures are needed and to prioritize issues by focusing efforts on regulating the activities which are considered to have the greatest potential to contribute to environmental effects. This understanding also allows for the strategic application of control or mitigation measures that can be applied in targeted, equitable, operationally effective and cost-efficient approaches.

The regulatory gap analysis approach being developed considers the application of existing sector-based measures which control and/or mitigate environmental effects within an ecological unit. A "bow tie analysis"[5] is being applied to visualize where the management measures exist for activities and pressures relevant to environmental effects. The outcome of this work will facilitate a joint regulatory validation process through existing inter-jurisdictional governance bodies with the purpose of aligning regulatory instruments and leveraging resources for more effective planning and management of activities. This can provide the basis for joint-planning to resolve regulatory gaps, implementation gaps, or effectiveness gaps.

[1]Treasury Board. 2007. Assessing, Selecting and Implementing Instruments for Government Action. ISBN 978-0-662-05036-0. 35p.

[2]Ekstrom, J.A. 2009. California current large marine ecosystem: publicly available dataset of state and federal laws and regulations. Marine Policy, 33: 528–531.

[3]Ekstrom, J.A. and O.R. Young. 2009. Evaluating functional fit between a set of institutions and anecosystem. Ecology & Society, 14(2): 16.

[4]Ekstrom, J. A., Lau, G., Spiteri, D. J., Cheng, J.C.P., and Law, K.H. 2010a. MINOE: A software tool toanalyze ocean management efforts in the context of ecosystems. Coastal Management, 38(5): 457–473.

[5]IEC/ISO 31010. 2009. Risk Management – Risk Assessment Techniques. p. 64–66

Auditing of assessment processes and management measures

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The Department of Fisheries and Oceans (DFO) has several regulatory tools and delegated authorities to ensure fish, fish habitat, the oceans and wildlife species are protected: the Fisheries Act, the Oceans Act, the Species at Risk Act and the Canadian Environmental Assessment Act among others in addition to several regulations enabled under them. Each of the Maritimes provinces – Prince Edward Island, New Brunswick and Nova Scotia – also have regulatory instruments aimed at environmental protection. A coordinated approach between Federal and Provincial governments, respectful of their jurisdictions and accountabilities, has been developed for the management of human activities that could have an environmental effect/impact. To formalize this review process, agreements between jurisdictions have been developed whereas steering committee and technical committee(s) were established.

A range of management tools have been developed to streamline the review process for low-risk referrals and thus reduce the time required for regulatory reviews and decisions. DFO's requirements are therefore included in provincial regulatory tools – guidelines, licences permits in the provinces of New Brunswick, Nova Scotia and Prince Edward Island. Moreover, an integrated referral system has been developed and is being implemented for more than 25 years. To further streamline the review process, certification programs are in place in Nova Scotia and in New Brunswick for some sectors (forestry) providing the certified installer the capacity to be excluded from the project assessment review process.

Based on the level of risk of the proposed projects, only a small percentage (~20%) requires DFO's input. For these, the DFO Gulf region issues formal advice through letters and authorizations for projects that are medium to high risks. A regulatory verification of these projects is done to assess implementation of the conditions outlined in these approvals and assess compliance to the Fisheries Act. Where non-conformities are found, corrective actions are requested and an investigation may be triggered to assess whether enforcement actions are required.

Audits conducted by the Commissioner to the Environment and Sustainable Development also provide information on the performance of the Department and its program in achieving its mandate. It is also a mean by which authorities can demonstrate to the public and to the stakeholders their performance in the delivery of their mandate and programs. That being said, the region has also performed several audits to evaluate the effectiveness of the management framework and its associated implemented control measures. Process undertaken included: getting the approval from governance committee, initial meeting with provincial partner and auditee in order to agree on audit process, development of an audit plan, field observation, data analysis, reporting (including findings, recommendations and identification of critical non-conformities), auditee corrective action plan and tabled report to governance committee.

The success of the performance audits will be facilitated when the following elements are present: the development of an audit programme that will cover all types of audits to be conducted over a period of time; the formal approval of the audit(s) by the steering committee under an agreement; the development of an audit plan outlining the objective, scope, resources, project management, reporting; an engagement to resolve non-conformities; proper documentation; qualification of the team; use of a common vocabulary and knowledge of the audit process among all partners. The results of the performance audits and of environmental effects monitoring are indicators of the effectiveness of the ecosystem based management framework. Some of the quality elements that are in place and provide for continuous improvement of the program include criteria – regulatory instruments, process – streamlined referral system, governance – agreements and its committees, evaluation and reporting – regulatory verification and audits. The results of the performance audits and of environmental effects monitoring are indicators of the effectiveness of the ecosystem based management framework.