ICES scientific and advisory services of relevance to the EU Marine Strategy Framework Directive

Introduction

This document highlights the ICES science and advice services available to Member States and the European Commission for the ongoing implementation of the MSFD.

Overview of ICES

Objective and deliverables

ICES, established in 1902, is an intergovernmental organization whose main objective is to improve the scientific knowledge of the marine environment and its living resources, and to use this knowledge to provide sound scientific advice on their use. This advice, provided to Member States and to the relevant competent authorities, is based on principles of sustainability and is underpinned by the ecosystem approach and, where necessary, the precautionary approach.

The ICES scientific network draws upon the expertise from its 20 member states, as well as associated countries. This network consists of more than 4000 scientists from nearly 300 institutes, and ensures that the best available science is accessible for decision-makers to make informed choices on the sustainable use of the marine environment and marine ecosystems.

ICES identifies and prioritizes gaps in marine knowledge of ecological, political, societal, and economic importance, and coordinates the research to fill these gaps at the pan-Atlantic and global level. The ICES Database contains fisheries, oceanographic, contaminants, biological effects, and biological data extending back more than 120 years.

ICES has an outstanding record in delivering scientific publications, data and information, and in providing sound pragmatic management advice requested by member countries and international organizations and commissions, such as OSPAR, HELCOM, NEAFC, NASCO, EEA, and the EC.

Importantly, the procedures used to produce these products are unbiased, non-political, and based on the best available science. ICES advice is peer reviewed prior to release.

ICES contributions to the implementation of the EU Marine Strategy Framework Directive

ICES has contributed throughout the MSFD development and implementation process by creating and managing task groups in cooperation with the Joint Research Center (JRC). These groups provided the background information for the Commission Decision on criteria and methodological standards on good environmental status of marine waters (2010/477/EU). ICES provided guidance to the implementation of Descriptor 3 (commercially exploited fish and shellfish).

ICES activities and expertise related to the application of the ecosystem approach to management of human activities affecting the marine environment and to the implementation of the EU Marine Strategy Framework Directive are summarized in the table below (with further details provided in the Annex).

EU Marine Strategy Framework Directive	ICES Contribution
1. Initial Assessment	Scientific development, benchmarking and operationalization of Integrated Ecosystem Assessments, taking into account MSFD requirements.
2. Good Environmental Status	Operationalize and concept review, including development and test of new assessment methodologies.
2.a Indicators	Review of existing indicators, and selection and development of new integrated CFP and MSFD indicators.
2.b Environmental targets	Development of methodologies to facilitate target setting and evaluation.
3. Monitoring Programmes	Coordination of international monitoring programmes for fish stocks and ecosystems. Development of monitoring guidelines, programmes, and integrated ecosystem surveys.
4. Programmes of Measures	Management strategy evaluation tools for simulation of management measures and review of proposed measures.
5. Marine spatial panning, including marine protected areas	Contributions to the development of next generation ecosystem-based marine spatial planning. Identification and review of proposed MPAs and EBSAs.
6. Interregional cooperation	Supporting compatibility and coherence between regions.
7. Data handling, dissemination, and display	Provision of data related services.
8. Training	Provision of tailor made MSFD relevant training.
9. Engaging the Network	Sponsoring Science symposia and conferences, and participation in external projects towards development, stimulation and synthesis of relevant science. Strengthening cooperative science approaches.

Concluding Comments

ICES is prepared to create frameworks and initiate processes to further the application of the ecosystem approach, specifically with regard to the implementation of the Marine Strategy Framework Directive. This will be accomplished by working together with relevant organizations and Member States.

Existing ICES Services (Data Centre, Training Programme, communication and scientific networks) are already informing the MSFD implementation process, and can easily be expanded to meet future specific MSFD requests.

ICES maintains substantial international long-term data bases on marine living resources and the marine environment required for defining targets and setting thresholds for MSFD indicators. ICES is also uniquely positioned to synthesize

approaches that integrate across indicators, and to craft and tailor outputs and recommendations to the objectives of the Directive.

ICES also established and sponsors a training programme for marine scientists. Course topics range from traditional fisheries assessments to integrated ecosystem assessments. As well, ICES offers training for marine and fisheries managers on how to make best use of scientific advice in policy planning and decision-making. More specific MSFD courses are under preparation.

Annex: ICES portfolio related to MSFD

The following is a more detailed overview of previous ICES activities relevant to the MSFD, including ongoing activities directly targeted at MSFD implementation.

1. Initial Assessment

Scientific development, benchmarking, and operationalization of Integrated Ecosystem Assessments, taking account of MSFD requirements.

ICES is prepared, upon request, to provide support to the EU Commission's Article 12 assessment, either generally or for specific issues such as peer review of the assessment reports prepared by DG ENV. Reviewing these reports could lead to the identification of issues for further development and explicit tasks also for ICES.

ICES is conducting integrated ecosystem assessments (IEAs) in several European ecoregions (Baltic Sea, North Sea, Bay of Biscay, North Western Waters). During the next several years, operational IEAs for these regions will be completed, benchmarked, and available to provide ecosystem advice. During this process, MSFD implementation realities and requirements can be considered and integrated into the process.

The IEAs can, among other things, test the MSFD indicators to evaluate their reliability to detect true changes in the ecosystem.

Currently, the IEAs already provide scientifically sound analyses of ecosystem states and retrospective regime shifts, and could substantially contribute to the assessments conducted according to the MSFD.

2. Good Environmental Status (GES)

Operationalize and concept review, including development and test of new assessment methodologies.

ICES has contributed to the development of the Driver Pressure State Impact Response (DPSIR) approach, including identification of indicators and reference levels. ICES has also been active in developing the Integrated Ecosystem Assessment approach, and used this approach in the OSPAR Quality Status Report process in 2010.

The issue of fishery impacts on the ecosystem has been regularly addressed, and this is of particular importance for the establishment of Good Environmental Status (GES) with respect to descriptors 1, 3, 4, and 6. A review of methods to define GES suitability has been conducted, as has an evaluation of the suitability of existing methods contained in other directives, i.e. the Water Framework Directive (WFD; 2000/60/EC), and the Habitats Directive (HD; 92/43/EEC). Information from these directives has been acquired that could help Member States to define GES.

Based on the requirements of the MSFD, ICES is currently working on:

- a feasibility and relevance evaluation of the combination of pressures/descriptors/indicators;
- identification of oceanic hydrographic elements to help determine status for the 11 MSFD descriptors;
- scientific input to define good environmental status (GES) for the 11 MSFD descriptors, including methods to determine status;
- developing, testing, and reporting on approaches for combining information from indicators and targets into an assessment of status. The focus has been on descriptors 1, 3, 4, and 6, but the criteria and process should be applicable for all 11 MSFD descriptors and their associated indicators and targets.

2.a Indicators

Review of existing indicators, and selection and development of new integrated CFP and MSFD indicators.

ICES can contribute to (a) science-based threshold setting for indicators; (b) verification of pressure-impact relationships needed for indicator selection; (c) risk assessments; and (d) Management Strategy Evaluation (MSE).

ICES work on indicators has involved an assessment of the utility of indicators within a management context, and specifically addressed the time required to detect changes in indicators and the signal strength of indicator values.

Related work has lead to the development of the OSPAR Ecological Quality Objectives (EcoQOs), e.g. on seabirds. ICES has also assessed relevant time-series for eutrophication and advised on biodiversity scoping, sonar activities, and effects on fish and cetaceans. Environmental interactions of wave and tidal energy generation devices have also been evaluated.

Ongoing ICES work related to the MSFD descriptors include:

Descriptor 1: Biological diversity

- review and evaluate current proposed metrics in support of D1, including case studies of proposed indicators, for regional scale assessments of biodiversity status , as well as appropriate geographical scales;
- review and report on existing indicators for biodiversity that are linked to predictable changes in ecosystem function, and/or develop, assess, and report on the feasibility and performance of such indicators.
- Use of video and photographic data in assessment of some benthic species

Descriptor 2: Non-indigenous species

- document introduction and transfers of marine organisms, examine environmental interactions, effects of aquacultural activities on wild populations, pathogens and diseases, and the application of genetics;
- information on harmful phytoplankton that could be potentially transported or introduced by ballast water.

Descriptor 3: Population of commercially exploited fish / shell fish

- provision of technical/scientific information supporting the implementation of the D3, and relevant fisheries-related information for other descriptors (mainly D1, D4, and D6);
- integration of Vessel Monitoring System data (VMS) and commercial catch data for fine scale spatial distribution maps of fishing efforts and catch distribution maps;
- operationalization of EU Data Collection Framework indicators;
- development and calculation of fisheries-related indicators for the EEA.

Descriptor 4: Elements of marine food webs

- development of food web and ecosystem indicators relevant to the MSFD from outputs of model key runs;
- proposed Large Fish Indicator for the state of food webs, with reference baselines developed from historic levels;
- development of ecosystem overviews.

Descriptor 5: Human-induced eutrophication

- synthesized information on harmful algal bloom dynamics and effects;
- prepared and disseminated a report on the impacts of harmful algal blooms on marine mammals and birds;
- consideration of how water quality affects abundance of salmon and sea trout in freshwater ecosystems.

Descriptor 6: Sea-floor integrity

- ecosystem effects of extraction of marine sediments and demersal fishing activities;
- review of practice on the use of habitat maps, and more specifically "Mapping for the MSFD and marine spatial planning";
- review and report on policy drivers relating to the management of seabed habitat, and defined scales for describing the distribution and types of habitat needed to support these drivers;
- review and report on existing mapping exercises and, if necessary, propose and initiate a process for describing habitat in the relevant categories at the relevant scale.

Descriptor 7: Permanent alteration of hydrographical conditions

- identify elements of oceanic hydrography work to help determine status for the 11 descriptors;
- provide views on what good environmental status (GES) might be for specific indicators, including methods to determine status.

Descriptor 8: Concentrations of contaminants

- development of criteria for assessment of contaminants in water, sediment, and biota;
- developed guidelines and background documents on integrated monitoring of contaminants and biological effects.

Descriptor 10: Properties and quantities of marine litter

- development of marine litter data collection reporting in surveys;
- collection of marine litter information in fisheries surveys in the Baltic Sea, the North Sea, and other ecoregions;
- evaluation of the ecological impact of marine litter on mortality (and sub-lethality) of plants and animals.

Descriptor 11: Introduction of energy, including underwater noise

- documentation of how acoustic and complementary methods will contribute with benthic and pelagic observations to the goals of an ecosystem approach;
- quantification of behavioural disturbance to acute and chronic anthropogenic stimuli, including noise effects on marine animals .

2.b Environmental targets

Development of methodologies to facilitate target setting and evaluation.

When setting an indicator reference level that reflects "sustainable use", the threshold of alteration that is unsustainable needs to be identified, and then targets established to avoid exceeding this limit and to attain desired status. This work has led to ICES advice to OSPAR on reference conditions against which thresholds should be defined.

Based on the MSFD, ICES is currently working to develop, test, and report on criteria and a process for evaluating the scientific soundness and feasibility of national proposals for indicators and the targets needed to achieve Good Environmental Status.

3. Monitoring Programmes

Coordination of international monitoring programmes for fish stocks and ecosystems. Development of monitoring guidelines, programmes, and integrated ecosystem surveys.

ICES coordinated surveys perform multiple sampling and, as such, address a complex portfolio of questions. Revisiting the surveys in relation to frequency, international coordination, and design would be a timely exercise and could free capacity for sampling ecosystem approach needs and better serve MSFD goals.

The use of surveys for monitoring fish abundance provides requisite data for fish stock assessments, and the survey data are increasingly important in relation to MSFD GES descriptors on biodiversity, food webs and sea-floor integrity.

The importance of "integration between fisheries and environmental surveys" is a strategic issue to be addressed in the development and coordination of monitoring programmes under the MSFD. Clearly, a strategic monitoring initiative between ICES, interested Member States, and the regional seas commissions would be beneficial.

Such a strategic monitoring initiative would draw on existing ICES and regional seas competencies, and take account of current work in publishing guidelines, technical standards, and coordination of fisheries/environmental surveys and methods. This initiative would also build on work already initiated with HELCOM (e.g. the

HELCOM MORE project) and OSPAR (the proposed KISS project). Further coordination with the United Nations Environment Programme/Mediterranean Action Plan, and Black Sea Commission is anticipated.

ICES is developing a white paper that outlines the benefits and caveats of integrating traditional fish stock surveys with environmental monitoring into ecosystem surveys, and outlines current ICES niches such as technical standards, monitoring techniques, survey design, and training. The paper also considers compatibility between Member States in the design and execution of monitoring programmes, and will highlight the benefits available from an integrated approach.

4. Programmes of Measures

Management strategy evaluation tools for simulation of management measures and review of proposed measures.

The ICES community possesses exceptional modelling capabilities related not only related to fisheries assessments and management strategy evaluation (MSE) but also to ecosystem modelling, integrated ecosystem assessments, risk assessments, and development of risk-based decision support tools.

ICES is striving to provide a modelling "toolbox" to member states, specific to the implementation of the MSFD, to help conduct state-pressure-impact assessments and for evaluation of management measures, indicators, and risks.

5. Marine spatial planning, including marine protected areas

Contributions to the development of next generation ecosystem-based marine spatial planning. Identification and review of proposed MPAs and EBSAs.

ICES is well positioned, in collaboration with regional seas commissions (HELCOM, OSPAR, Black Sea Commission, United Nations Environment Programme/Mediterranean Action Plan) and other involved organizations (VASAB), to contribute and cooperate in further developing the ecosystem-based marine spatial planning (MSP) process. This commitment and expertise was demonstrated during a HELCOM/VASAB, OSPAR, and ICES workshop on MSP in 2011.

ICES manages scientific data relevant to the designation of marine protected areas, and has significant capability to develop methods and protocols for the assessment of ecological coherence of designated areas. ICES also has experience in assessing and peer reviewing proposed MPAs and EBSAs and associated management measures. As well, ICES has expertise in coordinating networking among MPA stakeholders and in eliciting and fostering the necessary cooperation to achieve conservation objectives.

6. Interregional cooperation

Supporting compatibility and coherence between regions.

While regional coherence is the remit of the regional sea commissions, ICES can perform a critical role in ensuring compatibility and coherence among regions where needed, and in facilitating the harmonization and development of common guidelines, standards, and methods.

7. Data handling, dissemination, and display

Provision of data related services.

ICES has a dedicated Data Centre that provides a range of data handling, quality control, and data products for direct use in regional and sub-regional assessments.

The Data Centre offers a suite of online data portals with a catalogue of available data types and options to download primary data, aggregated data products, and maps and graphs.

ICES has worked closely with the Regional Seas Commissions (OSPAR and HELCOM), and the European Environment Agency to provide quality datasets that can be directly used in their assessment tools and products.

The ICES Data Centre provides a reporting and data product database to support the Data Collection Framework (DCF), and ICES has extensive experience in providing assessment-ready products to the scientific advisory process. As an extension of this, ICES now hosts the Regional Fisheries Database (Commercial Catches), which is supported through Commission DCF funding.

In addition, the ICES Spatial Facility (an INSPIRE-compliant GIS catalogue and viewing service) provides an overview of the spatial products and maps being developed in the ICES community.

The Data Centre is part of the EMODNET Chemistry and Biology consortium, and also is represented on the SeaDataNet steering committee. The Data Centre is also a key marine partner in the European Topic Centre on Inland, Marine and Coastal (EEA), and has provided extensive support, advice, and tools to facilitate the EIONET reporting, indicator production, and visualization of marine-related information under the Water Framework Directive. As a direct extension of this, ICES works closely with the EEA to support the Commission working group for the MSFD on Data and Information (WG-DIKE) and has supported ongoing efforts on the reporting concept and reporting platform WISE-Marine, and the activities of the Thematic Working Groups in the INSPIRE process

8. Training

Provision of tailor made MSFD relevant training.

ICES sponsors and operates a Training Programme. A number of courses in this Programme are relevant to the MSFD, such as “Fisheries Management to meet biodiversity conservation needs”, “Integrated ecosystem assessments”, “Survey design and evaluation” and “Opening the box: Stock Assessment and Fisheries advice for stakeholders, NGOs, and policy-makers”. ICES has added two new courses relevant to the implementation of the MSFD: “Communicating Science and Advice” and “Analysing and visualization of VMS and EU logbook data using the VMS tools R package”.

ICES will consider developing additional courses focused on specific MSFD issues (as requested or needed, and is receptive to receiving proposals for such courses.

9. Engaging the network

Sponsoring Science symposia and conferences, and participation in external projects towards development, stimulation, and synthesis of relevant science. Strengthening cooperative science approaches.

Every year, ICES sponsors various international science symposia and organizes the ICES Annual Science Conference.

Marine Strategy 2012: ICES is co-sponsoring the symposium "Research and ecosystem-based management strategies supporting the implementation of the Marine Strategy Framework Directive" (Marine Strategy 2012) to be held 14–16 May 2012 in Copenhagen, Denmark.

ICES Annual Science Conference 2012: The 2012 ICES Annual Science Conference will be held in Bergen, Norway. The conference provides the scientific community a forum to showcase research developments on current issues. This year's ASC includes 18 Theme Sessions, many dealing with issues relevant to MSFD implementation, and one session deals directly with the MSFD: "Theme Session G: Implementation of the European Union Marine Strategy Framework Directive (EU MSFD): Implications of science and policy".

ICES participates in various externally funded projects, related to the implementation of the MSFD, including:

ECOKNOWS – Effective use of ecosystem and biological knowledge in fisheries (September 2010–2014). ICES is a partner organization in this project, which aims to improve the use of biological knowledge in fisheries management. Models will be used incorporating important knowledge of biological processes, and statistical inference methods will be used to allow this knowledge to be integrated and updated in stock assessments. The methodology developed will be important in implementing the Ecosystem Approach to Fisheries Management.

STAGES - Science and Technology Advancing Governance of Good Environmental Status' project (mid 2012–mid 2014). ICES is a partner organization in this project, which is focused on ensuring that relevant knowledge already generated through marine environment research is identified, and the results made available to decision and policy-makers and MSFD stakeholders. The project consortium has been tasked to identify knowledge gaps, and highlight needs for further research to improve the scientific underpinning needed for implementation of the MSFD.

EMODNET - European Marine Observation and Data Network. ICES is part of the EMODNET Chemistry and Biology consortium. EMODNET supports the provision of data on scales defined by the regions and sub-regions of the MSFD, and is linked to the part of the Water Information System for Europe (WISE) that will be developed for dealing with marine information (WISE-Marine).

More facts about ICES

ICES Convention and geographic scope

The International Council for the Exploration of the Sea (ICES) was established in 1902 by exchange of letters between participating countries. In 1964, through an agreed Convention, ICES received a legal foundation and full international status.

The Convention covers the Atlantic Ocean and its adjacent seas. ICES has focused on the North Atlantic Ocean, the North Sea, and the Baltic Sea. Members of the ICES community include all 20 coastal states bordering these marine areas.

The ICES cooperative network extends far beyond its member states, and encompasses international organizations, various associated countries, and scientific institutes/scientists worldwide.

Resources

The 20 member countries of ICES are: Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, United Kingdom, and the United States of America. ICES comprises a network of more than 4000 scientists from almost 300 institutes, with about 1600 scientists participating regularly in ICES working groups.

The ICES Secretariat has been based in Copenhagen, Denmark, since 1902. The Secretariat (53 staff) provides secretarial, administrative and scientific support. Moreover the Secretariat hosts major international fisheries and survey, oceanography and ecosystem databases, providing an essential tool for ICES science and advisory work.