













Panel 3: Lessons learned from implementation of ecosystem approaches at the national level in developed States

### **A Practical Approach to Ecosystem-Based Management**

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Application of ecosystem approaches to the management of ocean activities does not need to be inordinately complex. In its simplest form, ecosystem-based management involves consideration of the impacts of a single activity on the biological, chemical and physical components of the ecosystem. In its more complex and challenging application it focuses on the dynamic interactions between the species within an ecosystem, between the biological components of an ecosystem and environmental processes influencing them, between inter-connected land, air and marine systems and finally between and among the core components of the marine ecosystem subjected to the stresses of multiple human activities.

In Canada ecosystem approaches to management are being applied in two distinct but complementary ways. In a more holistic fashion through an integrated approach to oceans management and at the same time through the modification of existing and generation of new sector specific policies, regulations and management approaches. This presentation will provide a brief outline of the two approaches currently being applied and will highlight a few pre-requisites for successful implementation of an ecosystem approach. Suggested elements of an international work-plan to advance ecosystem-based management will be outlined for consideration.

Canada is a federation with legislative responsibility for the regulation and management of ocean related activities distributed among several federal agencies. Generally speaking, the national government has overall responsibility for the management of oceans; provincial and territorial authorities are primarily responsible for land based activities. To provide a legislative base for a unified and modern ma -1.15 -0.15m,aD(67ial a(iru)5.(th)5.6ori

vigour or productivity of the ecosystem and water and habitat quality properties of the ecosystem.

In terms of the area based approach, our national policy framework sets out two complementary approaches to guide the application of the ecosystem approach: management of Large Oceans Management Areas (LOMAs), and management of Coastal Management Areas. In terms of Large Ocean Management Areas, all marine waters within Canadian jurisdiction have been delineated into 17 ecoregions, the boundaries of which have been set to capture large-scale ecosystem features and patterns including geomorphologic, oceanographic and ecological characteristics. The LOMAs extend from the coast out to the outer boundary of the Exclusive Economic Zone. Within these large regions, are the smaller, nested coastal management areas. These areas deal primarily with issues related to the land-water interface and land-based activities that have an impact on the marine environment.

Via our Oceans Action Plan, we have advanced our ecosystem-based management approach in five priority Large Ocean Management Areas -three in the Atlantic Ocean, one in the Pacific Ocean, and one in the Arctic Ocean. For each of these areas, existing baseline information on the status and trends of physical habitats (soil and subsoil), the water column, oceanographic processes and biological components including their trophic relationship is being assembled. An inventory of human activities is also being compiled and an assessment of the individual and cumulative impacts of these activities on significant components of the ecosystem is being conducted. As well, purely practical considerations such as administrative, historical, cultural uses as well as other management approach and zoning schemes are being considered.

To facilitate application of the area-based approach, guidance tools have been developedng schem-base2 on i



impacted areas and species also supports the ecological basis for the design of Canada's ecosystem-based network of Marine Protected Areas.

It is at this point, that the area-based and objective-based approaches are combined and that the process to define specific priority ecosystem objectives is initiated. The concept of ecosystem-based management has been simplified for application to ocean management by the development of an Ecological Framework which focuses on the three key elements which contribute to ecosystem health. These elements include the biological organization or structure of the ecosystem, the vigour or productivity of the ecosystem and finally the physical and chemical properties of the ecosystem. The Canadian framework for an ecosystem-based approach initially focuses on the articulation of "goal statements" for each of these elements.

The biological organization or structure of the ecosystem considers the biological diversity (at three levels of organization, genetic diversity, species diversity and habitat diversity) as well as the ecological role and interactions of the various biological components. Organization of the ecosystem is also defined by the trophic structures, the complexity of the food webs, the age structure and relationships, as well as the spatial distribution of the biological components. Ecosystem objectives focused on organisation are therefore set to "conserve enough components so as to maintain the biodiversity and natural resilience of the system".

The vigour of the ecosystem addresses the productivity of the ecosystem with particular attention to interactions affecting energy flows and reproductive capacity. The overall goal to maintain productivity is therefore expressed as "conserving the function of each component of the ecosystem so that it can play its natural role in the food web and contribute to the overall productivity of the ecosystem.

The abiotic properties of the ecosystem that is the nature of the oceanographic processes as well as the physical and chemical quality of its components influence both ecosystem structure and function. As such, the goal is to "conserve the geological, physical and chemical properties of the ecosystem so as to maintain the overall marine environmental quality".

These overarching goal statements (or what may be referred to as "conceptual objectives") serve as the equivalent of "policy statements". If however, they are to provide planners and regulators with the guidance needed to manage human activities; they need to be much more specific, measurable and operational.

Two different but complementary approaches to the identification of operational objectives are currently being tested in the five large oceans management areas situated in waters of the Beaufort Sea, off the north central coast of British Columbia, in the Gulf of St. Lawrence, on the Eastern Scotian Shelf and in Placentia Bay and the Grand Banks of Newfoundland and Labrador. The bottom-up or activity based approach involves establishing ecosystem-based objectives based on a review of the activities which may have a significant impact of specific ecosystem properties or components. This approach

is particularly useful in incorporating local and traditional knowledge and in data poor areas.

The top-down or ecosystem property-based approach is based on the identification of key ecosystem properties and components without prior consideration of human activities which may be impacting the system. Combining the two approaches blends the rigour of the scientific process associated with the ecosystem driven analysis with the more management oriented impact driven approach. Identifying ecosystem objectives is made even more practical and efficient with the if ecologically and biologically significant species and areas and the rare and depleted species and habitats needing rehabilitation are identified early in the process.

The identification of Ecosystem Objectives and selection of the indicators most suited to track the ecosystem property are at various stages in the five large ocean integrated management areas in Canada. Nevertheless, key lessons have already been learned. Above all, there is a need for a high degree of patience. The process to develop an objective-based integrated oceans management plan for one of the large, data rich ocean management area has taken almost eight years.

To be effective, application of an ecosystem-based approach to management requires good but not perfect science, but most importantly requires scientific assessments and advice which integrate data collected for very different purposes, over different spatial and temporal scales.

Another challenge facing the scientific community has been the requirement to provide “un-ambiguous” and risk-based scientific advice in support of decision-making. While the starting point must be the use of existing scientific and anecdotal data, critical data gaps will emerge, and must be taken into account in managing the risk. Ecosystem-based scientific advice and selection of management measures cannot wait for critical data gaps to be filled. There needs to be a willingness to work with some uncertainty. We do not have, nor will we ever know all of the answers; but we do need to embrace adaptive management in order to regularly re evaluate advice and adjust management decisions as information becomes available to fill the critical data gaps.

Application of an ecosystem approach does not have to be complex or frightening; it can be progressive and evolutionary. Canada has incorporated key elements of the ecosystem approach into a variety of legislative, regulatory, policy and management instruments. Recent Canadian legislation, such as the Species at Risk Legislation provides for the development of ecosystem-based and multi-species recovery strategies. Amendments to older statutes such as the Canadian Environmental Assessment Act have also incorporated the concept.

A number of fishery related policies in Canada address the concept of an ecosystem approach to management. For example, the Policy Framework for the Conservation of Pacific Salmon targets the restoration and management of genetically diverse wild salmon populations and their supporting habitat including management of watershed

areas of critical importance to the different life stages of salmon. Traditional single species assessment and management has evolved towards an Objective-Based Fisheries Management approach in which conservation objectives including trophodynamic linkages are identified and respected.

Application of an ecosystem approach is also being included in policies and regulatory instruments affecting other marine sector-specific activities. One such example is the identification of alternative ballast water exchanges zones, selected because of their ecological conditions non-conducive to the survival of invasive species thereby reducing risk to structural and functional damages to the ecosystem. A policy is also being developed to address impacts on benthic habitats and sensitive areas with particular attention on sensitive and ecologically significant habitat areas. Similarly the development of an ecosystem-based assessment of the impact of seismic sound on critical biological functions of key ecosystem components contributed to improved policy and regulatory instruments which guide oil and gas development in Canada.

It is my view that a collaborative international work-plan to advance ecosystem-based management should be developed. Such a work-plan should include the collation and interpretation of the international body of social and ecologic science related to a specific planning area combined with a review of human activities which may be impacting that