

DRAFT FOR COMMENT

ADAPTIVE AND INCLUSIVE OCEANS GOVERNANCE IN
COMPLEX CROSS-SCALE AND TRANSBOUNDARY SETTINGS:
POSSIBLE TOPICS FOR THE OCEANS TASK GROUP

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CONTENTS

Executive Summary

Introduction

Background

Trans-boundary collaboration

Cross-scale, cross-jurisdictional management

Principles for sustainability

Inclusiveness and participatory governance

Subsidiarity/Regional Oceans Governance/Devolution

Marine spatial planning/zoning

Priority topics for OTG work program

Conclusions

ANNEX I—The BC example

ANNEX II—The Arctic

ANNEX III—New oceans uses—carbon sequestration

ANNEX IV—The Lisbon Principles

ANNEX V—Royal Society of Canada/Canadian Global Change Program

Principles for Adaptive and Precautionary Fisheries Management

ANNEX VI—Marine Protected Areas and Other Conservation Initiatives

Executive Summary

It is by now generally accepted that for any cross-scale multi-party governance or management process to be effective, essential core requirements are legitimacy and transparency, accountability and sustainability (to assure the continuity through which organizational and social capital can be built on an enduring basis).

Legitimacy and transparency are paramount in any effective process for integrated, precautionary, ecosystem-based adaptive management such as has been mandated in Canada's Oceans Act; therefore it is essential that institutional arrangements support full participation and engagement of civil society, and the pursuit of inclusive civic science.

Moreover, the "honour of the crown" is now interpreted as entailing a duty to consult and, where possible, accommodate First Nations governments from the earliest stages of planning and design of new initiatives through to full implementation. (See recent Supreme Court of Canada decisions in the Mikisew Cree and Mackenzie Valley Pipeline cases, as well as earlier Haida Nation and Taku River Tlingit decisions.) Therefore governance and management must include appropriate participation of First Nations.

Integrated management demands effective capacity to deal with horizontal issues; it needs institutional structures that realize 'joined-up' government. This entails bringing together a variety of departments at federal level, a range of ministries at provincial level, and quite possibly components or programs in regional or First Nations governments. To make such encompassing involvement feasible, subsidiarity will be an essential feature. The core argument of this paper is that one can only achieve greater horizontal reach and integration by pursuing greater subsidiarity and devolution, through broader networking at more local level.

The fundamental task in implementation of Canada's Oceans Strategy can be described as regional oceans governance, supporting marine spatial planning or ocean zoning at an appropriate ecosystem scale. This entails bringing conservation concerns together with the full range of competing human uses of ocean space and ocean resources. The big challenge in this task (or more generally in integrated management) is effective integration of socio-economic considerations with conservation concerns and objectives to sustain ecological integrity. This will never be possible on the basis of calculation alone, or even as an exercise in evidence-based decision alone; the task can only be pursued as a reconciliation of differing perspectives and conflicting understandings of the evidence, in a subjective process of ongoing deliberation. This is not a recipe for an easy life, or stable and sustained harmony; but it is a realistic conclusion from present understandings of the complex social and ecological systems that interact in all institutions of oceans governance and processes of ecosystem-based management.

For this purpose, the model of shared decision and collaborative land-use planning such as that initiated in BC (the CORE/LRMP model) might provide an example of institutional structures at the planning stage that may successfully achieve these goals. Further implementation of Canada's Oceans Strategy should include exploration of such devolved and participatory processes as one priority topic.

INTRODUCTION

The challenge

It is now the 15th anniversary of Agenda 21 and the Rio Declaration, and past the 10th anniversary of the proclamation of Canada's remarkable Oceans Act. It would be difficult to deny that—at the very least—much remains to be done to realize the intentions of that ambitious commitment. A more skeptical audience will argue that serious operational implementation has yet to be initiated on any committed and sustained scale, although the recent path-breaking success of the ESSIM initiative in achieving, over lengthy negotiations, consensus among a broad group of stakeholders and interests on a five-year plan for integrated management in the Eastern Scotian Shelf area can certainly be claimed as a sign of significant progress (<http://www.mar.dfo-mpo.gc.ca/oceans/e/essim/essim-plan-e.html>). Nevertheless, paraphrasing slightly the 2005 report of the Commissioner of Environment and Sustainable Development, it would perhaps not be unfair to say that “After [10] years, the promise of the *Oceans Act* remains unfulfilled.” This assessment may apply particularly to the goals of collaborative integrative management built on full engagement and cooperation among ENGOs and stakeholders as well as federal, provincial, territorial and First Nations governments that are set out in the 1997 discussion paper, “Toward Canada's Oceans Strategy”.

The purpose of this present paper is to provoke some reflection on the underlying conceptual challenges of realizing the ambitious goals enunciated in Canada's Oceans Act and Oceans Strategy. It will deal not so much with formal organizational structures as with institutions more generally, taking for this purpose the notion of institutions as set out in the following definition: *Institutions are clusters of rights, rules, and decision-making procedures that give rise to social practices, assign roles to participants in these practices, and govern interactions among occupants of those roles. Unlike organizations, which are material entities that typically figure as actors in social practices, institutions may be thought of as the rules of the game that determine the character of these practices.* (Young et al, 1998)

It should be emphasized that this paper is not advocating any particular considered action, organizational form, or organizational design principles. Rather it is suggesting topics that might be explored in the course of a far-reaching review by the Oceans Task Group (OTG) in considering its own future and possibly developing proposals for senior officials and Ministers. Inevitably a thinkpiece or conceptual background paper of this sort will take the form of encouraging experienced practitioners to consider some wild ideas, possibly to respond to an emerging consensus among theorists or outside observers. Inevitably therefore such a paper will seem like urging practical people to contemplate impractical initiatives that experience teaches are ‘not on’. But experience also teaches that occasionally such exercises lead to dramatic structural breaks of great practical importance. If indeed (our perception of) the world has changed, there is need for adaptation in the institutions that govern human activity within that world. More particularly, if we now see complex social-ecological systems as the ecosystem within which we live and carry out a wide range of competing activities, then some fundamental adaptation to the world of continuing change and uncertainty is essential.

To begin, it is important to recognize how extraordinarily ambitious is the language of the Oceans Act itself, which sets out a public requirement and Parliamentary demand for integrated, ecosystem-based, precautionary governance directed toward sustainable development [all of which features lead directly to an inevitably subjective, non-computational process of decision] and ongoing adaptive management [that demands constant monitoring, frequent and timely decisions and continual revision].

This goal demands continuity, sustainability of structure, and continuing commitment in order to build the allegiance, coherence, and social capital essential to acceptance of legitimate executive authority, and to assure compliance with unpalatable requirements.

This Oceans Act language sets out commitments that represent a serious challenge, not simply rhetorical flourishes that can be waved away. The commitment to ecosystem-based management (though it is everywhere unclear what it means precisely) constitutes a hurdle that will prove to be a deal-breaker if it is not successfully surmounted. Pressures on ocean resources and ecosystems are mounting; conflicts are intensifying; these tensions cannot long be camouflaged by language or symbolic re-organization.

It is often said that the problem is not in the science, but in governance. In fact it could be argued that is in neither, but rather (on the science side) in the interpretation of fragmentary, often ambiguous and contested evidence about a highly complex system with uncertain outcomes and (on the governance side) in the interpretation of covenants, policy direction or other statements of intent, and in realization of those intentions through the discretionary action of highly diverse individual agents with conflicting motivations and interests (at least in the short run).

Point of departure

Since it would be a stretch to consider that COS has been successfully implemented, it may be time to re-examine the basic principles, and time to consider possible fundamental changes in structure. Perhaps it may be time to change from the Oceans Task Group (OTG) as it is presently constituted to a broader consultative body in serving the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM). Perhaps it is necessary to recognize that CCFAM itself is not an adequately horizontal body and indeed may embrace within itself an unresolvable tension, in that fisheries and aquaculture, unless very well managed, represent the two activities most threatening to the integrity of marine ecosystems and realization of the goals of the Oceans Act. Perhaps it is feasible to consider distinct coast-wide integrated management organizations in each of the three regions on North Coast, West Coast and East Coast as well as the Great Lakes, with subsidiary management at LOMA scale, and again at the scale of smaller integrated management areas.

As a starting point for thinking about measures to meet the implementation challenge inherent in Canada's Oceans Strategy, Budget 2007 does not seem encouraging, at least as viewed from the outside. The only reference in it to oceans is as quoted in the following paragraph. An allocation of \$19million over 2 years appears to be significantly less than the \$28million allocated for Phase I of the Oceans Plan, over two years to

March 31, 2007. (On the other hand, while the budget is silent on the very existence of the Oceans Action Plan, the recently-released Report on Plans and Priorities for DFO, 2007/8 does at least include the Oceans Action Plan among the seven continuing priorities of the Department.)

In the 2007 federal budget the following text appears.

“Keeping Our Oceans Clean

Canada’s oceans are critical to the social and economic well-being of coastal and rural communities. The Government will support:

- Greater water pollution prevention, surveillance and enforcement along Canada’s coasts (e.g. pollution prevention from contaminated ballast waters, ship waste reduction strategy).
- Further ecosystem assessment and capacity to deal with increased activity in Arctic waters (e.g. shipping, oil spills).
- Increased collaboration with international partners on ocean and transboundary water matters (e.g., Gulf of Maine project with the U.S., ecosystem projects with circumpolar nations through the Arctic Council).

Through this initiative, the Government will increase the scientific knowledge required to further advance the health of the oceans. This will include creating additional marine protected areas around the Scott Islands on the Pacific Coast, Sable Island on the eastern Scotian Shelf, and Lancaster Sound in the eastern Arctic. Six other marine protected areas will also be created along Canada’s coasts, with the specific location to be determined after consultations with coastal communities, environmental groups, industry and other governments.

Budget 2007 allocates \$19 million over the next two years for initiatives that will contribute to keeping Canada’s coastal waters clean. This funding will support the sustainable development, management and protection of ocean resources and water quality.”

Themes from current literature

In the next section, themes from current research are highlighted briefly. In summary, one could see current literature as suggesting that the central challenges to be faced in oceans governance are those of integrated management in a setting of increasing needs for trans-boundary cooperation, and in the context of growing tensions around cross-scale, cross-jurisdictional linkages in complex social-ecological systems in which human activities are taking the form of increasingly large-scale interventions or impacts. Current literature emphasizes greater individual and community engagement in broadly inclusive and participatory processes of governance as essential paths to acceptance of the legitimacy and authority of decisions flowing from those processes. And most significantly, current literature suggests a growing consensus on action in the direction of regional ocean governance, and on marine spatial planning or ocean zoning as the concrete steps to deal more effectively with the contemporary challenges of increasing competition for ocean resources and ocean space. This theoretical focus on regional governance and marine spatial planning will be echoed in the identification of questions for consideration by the OTG in exploring possible directions for concrete future action.

BACKGROUND

Trans-boundary collaboration

It is crucial that this text from Budget 2007 refers to increasing collaboration with international partners on shared oceans and transboundary waters, and interesting that it goes on to cite the Gulf of Maine project and ecosystem projects with circumpolar nations through the Arctic Council. A similarly puzzling two-ocean view is mentioned in the recent paper by Peter Ricketts and Peter Harrison (Ricketts and Harrison, 2007) in which they describe the ‘eighteen deliverables’ identified within DFO to be pursued under Phase I of the Oceans Action Plan (OAP), including “support for the two areas of collaboration between Canada and the United States in the Arctic and the Gulf of Maine”. (Ricketts and Harrison, 2007).

As described below (see Annex I), the West Coast also has a very rich and growing mesh of institutional linkages and collaboration with US counterparts. Indeed current discussions involving the BC Premier and Western Governors seem likely to result in collaborative coast-wide arrangements similar to the Oceans Working Committee established by the New England Governors and Eastern Canadian Premiers at their 2005 meeting.

In the Arctic, the boundary between Alaska and the Yukon (or more generally between Canada and the United States) in the Beaufort Sea remains to be established, and could become an issue if offshore petroleum and mineral extraction development proves to be feasible and potentially economically viable. More generally, the need to continue with the programs now launched for mapping of the continental shelf is urgent; there is potential for overlapping interests among Arctic nations. (See also Annex II.)

Thus, in addition to the ongoing challenge of successful realization of national action to fulfill international commitments to address global issues, oceans governance in Canada faces an increasing array of issues that must be dealt with on the basis of trans-boundary cooperation.

Cross-scale, cross-jurisdiction management

That the proliferation of jurisdictions and the fragmentation of authority and agency would be a central problem plaguing all efforts to introduce effective ecosystem-based management has been recognized for a long time. (See the 1993 report on the Georgia Basin Initiative of the BC Roundtable on the Environment and the Economy for an early lament.)

There is no need to rehearse the litany here. But the point becomes particularly relevant as one attempts to explore and manage the interactions of community-based management utilizing traditional and local knowledge with national and provincial legislation establishing specific responsibilities for Ministers in an administrative setting emphasizing accountability for evidence-based decisions reflecting ‘sound science’, and with a strong concern about commitments that might be perceived as fettering the Minister’s discretion.

In dealing with cross-scale issues, fundamental reference material is found in the work of Elinor Ostrom (particularly her 1990 work on governing the commons) and more generally in the tradition of institutional analysis that emerged from the workshop in Political Theory and Policy Analysis that she founded with Vincent Ostrom twenty-five years ago. (See McGinnis, 1999, for one of a number of volumes describing conclusions from that work.)

Much current work dealing with cross-scale issues is undertaken by participants in the Resilience Alliance, described at <http://www.resalliance.org/index.php?id=560>. A special issue of the journal *Ecology and Society* in 2006, *Exploring Resilience in Social-Ecological Systems*, develops a substantial body of theory and observation on management of human activity in coupled social-ecological systems in which action is distributed over a number of cross-scale institutions that may or may not be well-nested.

Principles for sustainability

In its reference to increased collaboration with international partners, the Budget recognizes one major theme to be faced by the Oceans Task Group—the increasing involvement in cross-border arrangements entailed in ecosystem-based management as well as the increasing cross-scale or cross-jurisdictional challenges arising from the search for integrated management based substantially on local ecosystem knowledge. The theory as to how these challenges are to be handled is relatively easy—nested institutions with well defined boundaries (Ostrom, 1990)—but practice is definitely harder.

One attempt to go further toward practice is contained in discussion of the ‘Lisbon Principles for Sustainable Governance of the Oceans’ developed at a 1997 workshop sponsored by the Independent World Commission on the Oceans. The conclusion from the article is interesting, but counseling against hopes for any top-down design of general application. “We recognize that any attempts to achieve globally optimal ocean governance policies in the face of natural and human uncertainty are chimeras. The best hope lies in raising awareness and including multiple viewpoints in an integrative, adaptive framework structured around a core set of mutually agreed principles. We propose the six Lisbon principles as that core set. Adhering to them will help to ensure that governance is inclusive, inquisitive, careful, fair, scale-sensitive, adaptive, and, ultimately, sustainable.” (Costanza et al, 1998)

Lisbon Principles:

- Responsibility. Individual and corporate responsibilities and incentives should be aligned with each other and with broad social and ecological goals.
- Scale-matching. Appropriate scales of governance will be those that have the most relevant information, can respond quickly and efficiently, and are able to integrate across scale boundaries.
- Precaution.
- Adaptive Management.
- Full cost allocation.

- **Participation.** All stakeholders should be engaged in the formulation and implementation of decisions concerning ecological resources.

These principles are similar to the six principles set out in a report (*Canadian Marine Fisheries in a Changing and Uncertain World*) prepared for the Canadian Global Change Program of the Royal Society of Canada (de Young, Peterman et al, 1999) at almost the same moment as the Lisbon workshop. (A pre-publication draft of the concluding chapter of that report is contained in Annex V.) A priority task for the OTG would therefore seem to be to explore how these widely-agreed principles might be better realized in a reformed institutional framework for oceans governance in Canada.

At a yet broader scale, the emerging area of ‘Earth System Governance’ suggests four more general governance principles or criteria for effective governance (Biermann, forthcoming):

Credibility of governance institutions and trust in their undertakings or commitments;
Stability of basic frameworks of governance, but within which capacity to adjust assures
Adaptiveness to respond to new situations;
Inclusiveness and participatory governance.

Still, it is important to remember that there are no silver bullets. Indeed, in a rather discouraging observation summing up a decade of large-scale research, Oran Young says “But research conducted under the auspices of the project on the Institutional Dimensions of Global Environmental Change (IDGEC) indicates that we cannot expect to come up with design principles that are non-trivial in nature.” (Young, 2007). The IDGEC work suggests a diagnostic approach focusing on four dimensions of any one local setting: the nature of the *problem*, character of the *players*, the content of the *practices* or rules of the game operative in the issue area, and the *politics* of the specific situation. “The key to success lies in sharpening diagnostic skills and maintaining sufficient flexibility to allow for the development of governance systems well-suited to specific situations.”

And in a world of changing situations, responsive, adaptive co-management and adaptive governance are the essential features indispensable in assuring a resilient social-ecological system. And the specific situations, as well as the ultimate actions, are local.

Inclusiveness and participatory governance

Data assembly and computation will not be a sufficient basis for governance as envisaged in the Oceans Act and in Canada’s Oceans Strategy—decisions will be subjective and adaptive, based on deliberation and contingent on monitoring. Of course there will be a need for timely decisions from an accepted executive authority, but as one sees increasing development of increasingly well-funded coalitions of non-government organizations—marine conservation initiatives, marine planning caucuses as well as industry groups—it becomes more challenging to establish clearly the authority of any central executive body.

Legitimacy, fairness and transparency are usually associated with opportunities for those affected by decisions to participate effectively in the processes arriving at those

decisions. Of course the extent of participation may vary from *voice* to *vote* to *veto*; the Supreme Court of Canada has written much on this spectrum in its decisions on governments' duties to consult First Nations and accommodate, where appropriate, their interests. Realistic definitions of consensus will usually involve some agreement on where respectful deference or abstention will permit decisions to be reached even though not all involved are fully satisfied. In a representative democracy, participation with a right to exercise a veto is not plausible. But even so, the growing appeal to multi-party consensus-seeking processes does raise apparent challenges to doctrines of ministerial responsibility that will need to be sorted out in any institutional reforms directed toward participatory mechanisms.

Again it is not necessary to belabour the basic tenets of an extensive literature endorsing the necessity for broadly participatory management and decision processes. These arguments are generally well-known and accepted. (One can see Dobell (2006) for an outline argument and a number of references, and Dobell (2003) for more extensive background.) On these issues, Kearney et al (2007) provide an excellent summary and more extensive documentation of the observations in Dobell (2006)

Subsidiarity/Regional Oceans Governance/Devolution

Oceans governance must deal with cross-border or trans-boundary issues as international matters, but these are very different from one region to another; indeed the whole ecosystem setting, both biogeophysical and human, can be vastly different from region to region, as has just been emphasized above.

The response has generally been to emphasize the need for subsidiarity and regional oceans governance. In their review of the situation in the United States following release of the two national reports on oceans in 2003 and 2004, Hershman and Russell (2006) argue that 'The concept of regional ocean governance ("ROG") is gaining traction in ocean and coastal management as a new way of proactively governing cross-jurisdictional ocean uses, resources and problems' and they go on to identify three themes underscoring this movement: a move to foster institutional change, to advance ecosystem-based management and to recruit regional stewards. They conclude that there has been, in the US, a remarkable amount of institutional change, but note that there remain questions about the staying power of these new initiatives; they observe that the theme of ecosystem-based management is being advanced in many places, with EBM urged and accepted as a primary tool for managing human activities in ocean arenas, but note the continuing concern about how EBM can be operationalized, with, despite many statements of principles, no consensus as to what this expression actually means. (The whole of this special issue of the *Duke Environmental Law and Policy Forum*, Volume XVI, no.2, in Spring, 2006 is devoted to the issue of regional oceans governance, offering a number of perspectives as well as some reports on regional experience.)

Similarly, a briefing paper prepared for a March, 2007 workshop on regional oceans governance notes that both the US Commission on Oceans Policy and the Pew Oceans Commission recommended regional approaches to manage oceans, coasts and Great Lakes across jurisdictional boundaries. Again, while noting that EBM has become

ubiquitous as a focal point for discussion, and increasingly incorporated in legislation, policy and management manuals, the paper observes that there is mounting evidence that practitioners are having difficulty translating the principles of EBM into action.

This last concern is, of course, also the fundamental challenge facing all efforts in Canada as well. To the extent that regional oceans governance is the institutional vehicle for pursuit of ecosystem-based management, the ability to forge some working agreement on the codes of practice and conduct, and the concrete operations manuals, that flow from the commitment to EBM is absolutely critical to any future functioning of the collaborative planning notion that is at the heart of Canada's Oceans Strategy. (This challenge of forging some agreement on an operational understanding of EBM is of course the subject of one of the subsidiary agreements to be negotiated as part of the Canada-BC Memorandum of Understanding on Implementation of the Oceans Action Plan on Canada's West Coast. It is also a continuing challenge in meeting the commitment under the Great Bear Rainforest Agreement—covering the coastal watershed area for DFO's Pacific North Coast Integrated Management Area—to have an accepted understanding of EBM in place and in effect by March 31, 2009. But practically, it seems that the interaction of terrestrial planning as in British Columbia's Great Bear Rainforest Agreements with oceans management as in the DFO PNCIMA LOMA, has not yet been addressed.)

One approach might be to pursue devolution to regional scale following the model of the UK Marine Bill discussion paper (March 2007), which proposes integrating delivery of planning/management/licensing/monitoring and enforcement functions. That discussion paper envisages a Marine Management Organization with responsibility, within established policy, for all planning, management, delivery, licensing and enforcement activities—though interestingly neither offshore hydrocarbon development nor mineral extraction are included (these are left with DOI) and advice on conservation matters likewise is left unchanged in other hands (except for the possibility of interim regulatory action to deal with pressing threats to marine resources or ecological integrity).

Marine spatial planning/zoning

Everywhere the emphasis is shifting toward recognition of the need for more integrated attention at the scale of regional governance. Both the federal and provincial science panel reports on BC offshore hydrocarbon development emphasized the need for clear articulation of areas in which exploration and development would not be accepted as appropriate, and other areas in which special management provisions would be essential. (The recent BC government energy plan underlined this need.) Endless recommendations for, and commitments to, creation of marine protected areas in some form envisage the necessity of networks of such areas carefully defined to reflect necessary conservation goals. See Annex VI.)

A briefing paper, "Regional Oceans Governance: Bridging Theory and Practice" prepared for a workshop of the same name, held in Monterey, California, March 18-20, 2007 convened by the Joint Ocean Commission with substantial foundation financing, sets out a framework for thinking about regional oceans governance as a vehicle to pursue the

goal of effective ecosystem-based management in the face of spatial, temporal and jurisdictional mismatches with ecosystem features. A succinct statement of the idea is set out in a recent short article in *Science*. “Marine spatial planning with comprehensive ocean zoning can help address these problems [of fragmentation and mismatches]. Although property rights and management arrangements in the sea differ from those on land, spatial planning could be initiated with cooperation among federal, state, tribal and local authorities. Zoning would not replace existing fishing regulations or requirements for oil and gas permits, but would add an important spatial dimension by defining areas within which compatible activities could occur.” (Crowder et al, 2006, p. xxx) Hershman and Russell (2006) and Argady (2006) also make the case that regional oceans governance, marine spatial planning, or, bluntly, ocean zoning, is fundamental to any possibility of ecosystem-based management.

A report from the November 2006 UNESCO International Workshop on Marine Spatial Planning at http://ioc3.unesco.org/marinesp/files/FinalConclusionsNextSteps_041206.pdf offers an excellent summary of essential features of marine spatial planning processes and structures.

CANDIDATE PRIORITY TOPICS FOR OTG WORK PROGRAM

Should Canada create a national Oceans Agency? More particularly, one could contemplate a national Oceans Agency governed by a board including federal, provincial, territorial, and First Nations ministers or comparable representatives. Created through ‘mirror legislation’ along the lines of the joint offshore boards on the East Coast, this agency could establish overarching policy for oceans. With such a structure, DFO might become, in effect, DFA, embracing fisheries and aquaculture, and participating as a major player in the new Oceans Agency, but not necessarily as its chair or the Minister through which the Agency would report to Parliament. Such an agency might also be a home for renewed, integrated ocean sciences, within a structure that clarifies and makes more transparent the transition from the science as understood by scientists to the interpretations negotiated by policy-makers and politicians (thus addressing ambiguity inherent in the ‘mille-feuille’ problem identified by concerned scientists; see Pauly, 2007, and also Walters and Haedrich, CJFAS, 1997).

Within the policies established by such a national oceans agency (following the pattern of the proposed Marine Bill in the UK) one might see three regional governance agencies or ‘marine management organizations’, one on each of Canada’s three coasts—likely with a different structure in each—that would pursue a participatory process engaging ENGOs, industry representative and other stakeholders across the full range of ocean uses and interests, including fisheries, offshore hydrocarbon development, shipping, ports, defense and other competing contemporary uses as well as conservation interests. It would be within this body that coast-wide marine mapping and zoning initiatives could be undertaken, on the basis of data and evidence from more local bodies. (In the case of British Columbia, for example, one could imagine these local bodies to be at the scale of PNCIMA, West Coast Vancouver Island Aquatic Management Board, and the Georgia Basin-Puget Sound (Salish Sea) Task Force, with the organizational structures already established or being worked out.) Further devolution to smaller coastal management

areas would permit development of habitat protection and conservation measures as well as detailed management plans structured in a precautionary manner supporting adaptive management decisions based on a system of agreed reference and limit points.

Such a scheme obviously would need careful consideration in many respects. Its functioning, for example, evidently would require some prior agreement on suitable “without prejudice” provisions accepted by First Nations concerned not to compromise future treaty negotiations. The selection of lead agencies capable of representing the full horizontal range of interests within each jurisdiction would be challenging. Within each of the regional oceans governance agencies, responsibility and authority for the detailed management of fisheries, offshore hydrocarbon, transport and similar industrial uses would presumably be carried by the existing bodies established for those purposes. Further exploration of the idea would require study of various scenarios tracking the kinds of decisions to be made within such a structure, in effect constructing the hypothetical regulatory road-map that would confront industries or citizens having to deal with that structure. Such a road-map would undeniably be complex, but anyone who has looked at the roadmaps devised to describe the existing process for achieving permits for offshore activity under the present offshore boards on the East Coast will see that simplicity is not a feature of the present system either. (See for example the array of formidable roadmaps accessible at <http://www.oilandgasguides.com/aguides.htm> .)

It may be that prior to creation of such a national Oceans Agency, all these issues should be explored in an extensive consultative process through creation of an Oceans Commission. Should a decision on that question be deferred pending the formation and report of an Oceans Commission?

Regional oceans governance

Would it be feasible within such an over-arching national Oceans Agency or Marine Management Organization to devolve responsibilities to a regional body with a coast-wide mandate? In the case of British Columbia, could this body be modeled on the participatory, community-based structure of the West Coast Vancouver Island Aquatic Management Board? It seems useful to explore the feasibility of integrated delivery along the lines of the UK MMO in BC at least, based on collaborative planning support structures like CORE/LRMP processes scaled up to a coast-wide coverage, aggregating PNCIMA/WCVI/CCIM/Salish Sea. How could clear lines of accountability be established in such a setting?

Should there be an external body like the Joint Oceans Committee Initiative in the US to ensure public scrutiny of the process of implementation of the Oceans Action Plan, and public pressure on that process, through regular ‘report cards’ or other public processes for monitoring and reporting?

How might it be possible to proceed with regional ocean governance and the zoning priority (to deal with legitimacy and transparency concerns as well as the over-riding imperative of sustainability)? (See US Ocean Commission work, as well as repeated assertions about the need to establish clearly the go/no go areas for purposes of offshore

hydrocarbon development and other possible future new uses (e.g., for carbon capture and storage, as noted in Annex III).

A qualification associated with arguments for subsidiarity and devolution must be noted. In institutional analysis, the concept of ‘fit’ entails the imperative to ensure an appropriate match between the (spatial and temporal) characteristics of the ecosystem and the institutions or regimes created to manage human activities within that ecosystem. “The key biogeophysical aspects of the ecosystem, for example in terms of spatial range, stocks and flows, resilience to shocks, etc. should guide the design of these institutions. Lack of fit, or institutional mismatches in this sense is, indeed, a frequent cause of environmental degradation...However, we contend that a number of shortcomings associated with ‘fit’, notably the difficulties of defining ecosystem boundaries, difficulties of applying the concept to broader macro-level environmental problems involving complex interactions, excessive attention to ecosystem dynamics at the expense of human institutions and insufficient concern for agency and power reduce the usefulness of ‘fit’ in understanding processes of institutional change, especially in the context of broad macro-level environmental problems that ultimately stem from individuals’ ordinary day-to-day behaviour.” (Lehtonen and Karlsson, 2007)

Integrated management/horizontality

How to restructure CCFAM and OTG to deal with the challenge of horizontality in the domestic context?

How to deal with horizontal issues (“joined up government”) in the international context? Could existing or restructured regional implementation committees (OCCs or ORICs) serve as the vehicle for integrated transboundary cooperation, in order to realize the goal of integrated management on the scale of the whole ecosystem concerned, in contrast to existing structures for sectorally specific management? Within any such integrated delivery, possibly relying increasingly on partnering and contracting, how will clear lines of accountability be achieved?

Within an integrated management structure, might it be possible to move significantly toward performance-based regulation, or ‘smart regulation’ to reassure industry and users that regulatory burden and compliance costs need not increase with the more explicit regional oceans governance structure? Two recent articles dealing with regulatory issues in the context of the offshore and onshore oil and gas industry suggest some arguments for pursuing this possibility. (See Grant et al, 2006 and Hanebury, 2006; see also the presentation at http://www.em.gov.bc.ca/DL/offshore/Reports/ORourkeMar16_05.pdf for British Columbia’s take on ‘smart regulation’ in the BC offshore context.).

How to assure legitimacy of unelected non-governmental agents in broadly participatory processes?

Marine spatial planning/zoning

Within zoning process, must inclusiveness, to be effective in the representation of conservation interests as against more immediate oceans economy objectives, assure a

more forceful voice for the oceans and living marine resources by developing legal standing for formal ‘guardians’ with the authority and capacity to initiate legal and diplomatic action on behalf of ocean ecosystems in appropriate circumstances? This proposal, introduced by Christopher Stone in 1993 (Stone, 1993a, 1993b) and repeated subsequently (Stone, 1999), seems not to have enjoyed much support in established institutional circles, but maybe the time has come for reconsideration.

How to assure appropriate engagement of all those affected, including, for example

- a) Consultation with First Nations –Mikisew Cree and MVP decisions dictate role in policy formulation and planning, not just consultation on decisions
- b) Role of conservation coalitions and stewardship groups in both policy formation and implementation
- c) Existing fisheries management bodies
- d) Offshore hydrocarbon boards
- e) MWE and carbon sequestration decisions (or local governments more generally, where land-based discharges are at issue)
- f) The whole mesh of cross-border organizations, both governmental and non-governmental (as in the Georgia Basin-Puget Sound example described in Annex I)

Conclusion

In an earlier paper (Dobell, 2006) for DFO, assessing progress in developing indicators of achievement of socio-economic objectives that might be used in integrated ecosystem-based management, balancing concerns for the ocean economy and human uses with those for ocean ecology and the sustained integrity of marine ecosystems, the central theme was summarized as the requirement “to set the development and use of indicators relating to human activities and needs in ocean and coastal settings in a highly inclusive, pluralistic procedural frame, recognizing that the significance and meaning of any set of indicators will differ across participants and must be established in a deliberative context. Decisions can not flow from balancing numbers alone, but principally from reconciling, adjusting and balancing perspectives (the process of ‘frame reflection’). The resulting conclusions were identified as:

- There is no silver bullet and no obvious success story to which to tie further work.
- It is the planning process, not the plan, that matters in a world of uncertainty, change, and inevitable surprise. Contingency planning, precautionary action and adaptive management—even adaptive governance—will be central. Everything hinges on legitimacy, trust and credibility in the process.
- Sustained commitment and continuity are essential, but in a profoundly uncertain world with limited human knowledge, and limited government influence, certainty can only be sought with respect to principles, not outcomes.
- Integrated, precautionary management demands that the scale at which authority can be exercised matches the scale at which action is possible and knowledge is adequate. Consideration of institutional structure and governance options must deal effectively with issues of scale, subsidiarity, implementation and compliance.

With this orientation, taking the legislated mandate for integrated ecosystem-based precautionary and adaptive management seriously demands some major transformations in institutions for oceans governance.

It is ten years since the federal government's discussion paper, *Toward Canada's Oceans Strategy* was released, indicating that an effective strategy built on the three principles of sustainable development, integrated management and the precautionary approach must be shaped nationally and collaboratively, and undertaking that "With the agreement of federal, provincial and territorial governments, Canada's Oceans Strategy will be targeted for implementation in the year 2000." In light of the implementation lags and difficulties encountered since, a review of ideas and emerging institutions would seem timely.

In undertaking such a review, it is important to face some challenging facts. The first is that legitimate interests do conflict, fundamentally. Even where there may seem to be a harmonious coincidence of expressed views about fundamental goals such as sustainable development, or intergenerational equity, there will probably be (almost) irreconcilable differences around the concrete interpretations of these goals, the relevant time horizons, and—probably operationally the most significant challenge—around judgments as to the balance of the risks and the perceived consequences in one direction or another, or generally around perceptions as to the impacts and the distribution of the burdens arising from possible error.

The big underlying tension of course is that between the goals of ecological integrity and those of economic development. As was painfully evident at the 1992 UN Conference on the Environment and Development, and in the stream of discussion since, this tension pits the good guys from the North, defending the Earth, against the good guys from the South, defending the rights of the poor to the economic and social development that leads to a better life. Nobody denies the validity of either objective, but pressures for current action conflict quite directly and dramatically.

Organizational and governmental responsibilities conflict correspondingly. Federal and provincial jurisdictional powers and obligations differ; organizations speaking for coastal communities reflect priorities different from those representing urban agglomerations. Units promoting the oceans economy pursue different paths from those attempting to protect the oceans ecology.

The sad fact is that decisions must be made that, at any one time, privilege one interest over the other; in the classic sense, these are tragic decisions (Calabrese and Bobbitt, 1978). Those decisions have to be made, somehow. And, ultimately, they have to be made by some executive authority that is viewed as legitimate, that has the power—but more importantly the standing—to tease out continuing compliance with those decisions.

The fundamental issue is not where such decisions are made, but whether they are made, and indeed whether they can be made in a timely manner, and can be accepted even by those for whom they carry bad news and adverse consequences.

This paper has argued that integrated management demands a broader span of interests, and that legitimacy demands a greater degree of representation, inclusiveness, participation. It has argued that such a broader span can only be feasible with deeper devolution, more effective subsidiarity.

The principal suggestion of this paper, thus, is that the OTG should explore possibilities for institutional evolution that will pursue more local discretion over broader horizontal mandates. The goal is to ensure that institutional design 'fits' well the ecosystem characteristics, attempting to locate decisions where the greatest body of relevant knowledge can be found, and where the most direct influences on human decisions rest.

The central question is where do the major spillovers and crucial interactions or linkages occur, and where, therefore, the major divisions of responsibility should be established in a way that best internalizes these spillovers within institutions that fit the ecosystem setting. And where, therefore, the hard decisions can actually be taken in a timely manner through processes that enjoy sufficient respect and offer sufficient flexibility to assure adaptive response to emerging circumstances.

ANNEX: The BC example

Note that in BC, have three transboundary areas covering the Coast:

- PNCIMA, where the ecosystem and bioregion are divided by the BC Alaska-border (as well as by the artificial boundary to the South, though some division is inevitable there, too, and the present dividing line is based on some ecological boundary considerations.
- Salish Sea, divided by the BC-Washington border
- West Coast Vancouver Island and Big Eddy, divided also by BC-Washington border.

Interestingly, in these three regions that together span the West Coast of Canada, each has an emerging dominant First Nations presence. In PNCIMA, the Coastal First Nations coalition, with its linkages across the border into Alaska; in the Salish Sea, the Coast Salish Council; on the West Coast of Vancouver Island, or 'outer shores', the Nuu-chah-nulth and related tribes to the South.

Example: The Salish Sea

Budget 2007 and the DFO report on Plans and Priorities both talked about Gulf of Maine Council. In BC, things are more complex. Consider some elements of the very complex case of the Georgia Basin-Puget Sound setting.

Of course, begin with Canada-BC MOU and subsidiary agreements.

At the federal level, collaboration between the US Environmental Protection Agency and Environment Canada is established in a Joint Statement of Cooperation on the Georgia Basin and Puget Sound Ecosystem (made up of Puget Sound, Georgia Strait and Strait of Juan de Fuca) signed January 19, 2000, to establish a formal Canada-US mechanism. It is under these auspices that the GB-PS Ecosystem Indicators work and the GB-PS Research Conference are organized.

The Northwest Straits Marine Conservation Initiative, with its associated Northwest Straits Commission serving as a Board of Directors, is a federal initiative in the US, authorized by Congress in 1998. Within its organization, seven regional Marine Resource Committees operating largely independently at local level have been established, each created by and accountable to the county in which they are located. The Initiative is confined to the Northwest Straits, and does not relate to southern Puget Sound. It also stops half-way across the Strait of Juan de Fuca, and at the Canada-US boundary that separates the San Juan Islands from the Gulf Islands, underlining well the difficulties of cross-boundary ecosystem-based management.

In Canada, arrangements for operational federal-provincial cooperation are spelled out in the Georgia Basin Action Plan, a framework for collaboration between Environment Canada, Fisheries and Oceans Canada and Parks Canada on the one hand, and (at the time) the BC Ministries of Water, Land and Air Protection and of Sustainable Resource Management (now replaced by Ministry of Environment, but apparently with little change from the earlier posture of disinterest and non-support). GBAP is an outgrowth

of Environment Canada's 1998-2003 Georgia Basin Ecosystem Initiative, itself in some fashion an outgrowth of a 1991 Tri-Council Ecosystem Research Initiative that led to a five-year Fraser Basin ecosystem study, and subsequently to the Georgia Basin Futures Project (as well as to formation of the ongoing Fraser Basin Council). At the same time (1991) the BC Roundtable on Environment and Economy launched its Georgia Basin Initiative, an undertaking that lasted until the Roundtable was disbanded in 1996.

The BC-Washington Environmental Cooperation Agreement signed by the Governor of the State of Washington and the Premier of British Columbia in 1992 led to creation of the Environmental Cooperation Council, which in turn created five special purpose task forces, of which one was the Puget Sound-Georgia Basin International Task Force in 1994 (which in turn formed a Marine Sciences Panel that issued in 1996(?) a major report on marine water quality under the title *Our Shared Waters*). Recommendations from this persuasive and influential report formed part of the priorities list for subsequent work of the International Task Force.

In association with GBAP(?), the Georgia Basin-Puget Sound Transboundary Partnership includes the Environmental Cooperation Council and its International Task Force, EPA, Department of Ecology, and the Puget Sound Action Team (operating out of the office of the Governor).

In Washington, the Governor in December, 2005 created the Puget Sound Partnership, charged to "develop an aggressive 15 year plan to solve Puget Sound's most vexing problems". The Partnership issued its final report in December 2006, and legislation establishing the new Leadership Council recommended in that report is now before the state legislature. The report mentions collaboration with Canada as an element of the work program for the new Partnership, but essentially focuses on the need to get things right south of the border before looking to the complications of trans-boundary ecosystem-based management.

In addition, in response to the recommendations of the Pew Commission and the US Commission on Ocean Policy, the Governor's Office also established the Washington State Ocean Policy Work Group in 2005. Given the intensive work by the Puget Sound Partnership and other bodies in Puget Sound, the Ocean Policy Work Group chose to focus its efforts on Washington's outer coast. The first in its list of key recommendations for immediate action was "establishing a collaborative governance process to continue coordinated management of ocean resource issues", but again with no specific transboundary component identified. The possible links with the Big Eddy initiative described below is obvious.

With support under the EC-EPA cooperation agreement, and financial assistance from the North American Commission on Environmental Cooperation, the Coast Salish Council was formed, bringing together Coast Salish First Nations and tribes from around the Georgia Basin (an expression originally intended to include Georgia Strait and Puget Sound as well as the Strait of Juan de Fuca, but now more often replaced by the label the Salish Sea, preferred by some as more fittingly promoting the sense of place and

cohesion of community essential to sustained ecosystem-based management). (Longo-Hodge, Horizons, 2007)

In addition to these arrangements involving federal, provincial, state and First Nations governments, a wide range of other cross-jurisdictional initiatives have developed at more local scale. One interesting example is the Orca Pass International Stewardship Area, an initiative involving San Juan County, the Islands Trust (the land-use body in the Canadian Gulf Islands) and the Sound and Straits Coalition (a civil society coalition including the Georgia Strait Alliance, the Living Oceans Society and People for Puget Sound).

Another is the Southern Strait of Georgia National Marine Conservation Area Coalition led by CPAWS which is focused on the southern Strait of Georgia, but presses its support for the Orca Pass initiative.

The Pacific Coast Joint Venture was created under the NA Waterfowl Management Plan.

The Baja-Bering initiative proposed initially by the Canadian Parks and Wildlife Society (CPAWS) and supported by a small grant from the tri-lateral Commission on Environmental Cooperation to explore possibilities and priorities for a network of protected areas along the length of the North Pacific coast is now being more actively pursued.

Currently discussions are underway to explore creation of a 'green' Pacific Coast Collaborative involving Alaska, BC, Washington, Oregon and California to "work together on a range of issues, including climate change, ocean health and the environment..." as the recently-issued British Columbia strategic plan accompanying the 2007 BC budget described the undertaking. Presumably this initiative would build on the West Coast Governors' Agreement on Ocean Health announced on September 18, 2006, by Governor Gregoire of Washington State, along with the Governors of California and Oregon. In an announcement of the agreement, it was described as "launching a coordinated ocean and coastal collaboration among the three states. This collaboration will address key ocean and coastal protection and management issues in common including coastal water quality; ocean and coastal habitats; ecosystem-based management; ocean awareness and literacy; scientific information, research and monitoring; sustainable economic development; and the reduction of adverse impacts of offshore development. Specifically, the states will call upon the President and Congress to fund nonpoint pollution programs and send a joint message to the President and Congress that repeats opposition to offshore oil and gas leasing, exploration and development." (This last provision may generate some difficulties for Premier Campbell of British Columbia in arriving at a common posture on oceans resource management.) "In addition, the collaborative effort will support development of a West Coast regional research plan. The governors directed their staffs and agencies to work with stakeholders and develop further recommendations to enhance the regional collaboration with more extensive recommendations due by Fall 2007." (As noted below, the link with the Venus

and Neptune projects already underway in Canada may prove particularly fruitful for purposes of shared scientific information and research.)

Complementing the Georgia Basin-Puget Sound International Partnership is the Big Eddy program, an initiative also launched by CPAWS. It explores the waters beyond what might be considered the outer edge of the Fraser Basin (or the influence of the Fraser River), at the mouth of the Strait of Juan de Fuca, or the fuzzy boundary with the Salish Sea. Interpreted ambitiously, it could be considered as extending northward to the boundaries of PNCIMA, thus, between the two, covering the outer coast of British Columbia and the Olympic Marine Sanctuary. With suitable institutional innovation, one might envisage a management body corresponding to the Big Eddy built on the existing West Coast Vancouver Island Aquatic Management Board as a foundation for a more extended trans-boundary body.

It is interesting to note also that plans for the Neptune project and development of the Venus project would establish the physical infrastructure and scientific foundations for real-time data assembly and monitoring in both the Salish Sea and the Outer Coast (Big Eddy) regions. The crucial requirement for easy and timely sharing of information that underlies any attempt at collaborative management could thus be met in part through these initiatives.

Pacific Marine Conservation Caucus

As concerns for inclusiveness in participatory processes, and engagement of civil society in policy formulation increase, a wide range of institutional mechanisms has been explored. The background to formation of the Pacific Marine Conservation Caucus in British Columbia is described on the caucus website as follows.

“Key to the conservation of marine ecosystems and resources in Pacific Canada is ensuring that the public interest in conservation is afforded the highest policy priority, and that conservation interests are engaged as full and equal stakeholders in fisheries management decisions.

In recent years, government agencies such as Fisheries and Oceans Canada have come to realize that the public interest in conservation must be engaged more directly. The shift is consistent with a worldwide move to involve conservationists in decision-making on fisheries matters.

In April 2003, after considerable and sustained effort by various representatives of the BC marine conservation community, major reforms in fisheries decision-making were announced. These reforms are historic, and for the first time make conservation groups full stakeholders in Fisheries and Oceans decisions on the West Coast.

In response to these developments, the Pacific Marine Conservation Caucus or MCC was established in December 2003. The Caucus was formed independently of DFO and acts as the participating environmental organizations' main method of representing

conservation interests in formal DFO advisory body consultative processes, particularly but not limited to those related to fisheries management”.

The relationship to the BC ENGO Marine Use Caucus is not clear at this point.

ANNEX II—Canada’s North Coast and the Arctic Ocean

It is argued that harvest management structures established through land claims agreements offer good examples of structures encouraging ecosystem-based management and particularly effective use of traditional and local knowledge in promoting sustainable resource use. [To be completed]

ANNEX III Carbon Sequestration—a new use for oceans

An interesting new issue arises with respect to the management and storage of CO₂ and possibly other greenhouse gas emissions. In the UK White Paper discussing the new Marine Bill, the issue is raised and responsibilities assigned to the proposed new Marine Management Organization.

In Canada this could be a very challenging issue. Control of greenhouse gas emissions will rest crucially on the development of technologies for carbon management and storage (See Parson and Keith, *Science*, for general background.) In Alberta, emissions from tar sands operations may be transported for injection into wells for enhanced oil recovery, without much need for ocean space for sequestration in the oceans. But in British Columbia, energy plans relying on extensive use of biomass for power generation, heating and alternative transportation fuels might be expected to create strong pressures for carbon sequestration, and ocean sites may have to be considered for storage. Similar pressures might arise from technologies for coal gasification or exploitation of coal bed methane in the face of binding constraints on carbon emissions. In the Arctic, proposals for ocean sequestration of captured emissions might be expected to accompany coastal economic development initiatives as well as offshore hydrocarbon development, and again storage in the deep ocean may have to be considered..

Sustainability of ocean ecosystems and marine resources in the face of such pressures for this new use of ocean space will entail capable integrated management institutions. There are several considerations to take into account. A recent study by an MIT team notes that if escape to the atmosphere is to be avoided, deposit of CO₂ must take place at depths greater than 3000 metres (MIT, 2007). A number of recent studies have noted the increasing acidification of oceans as a result of carbon depositions from the atmosphere, and have identified substantial damage to coral reefs resulting from such acidification as one among other adverse consequences. (See, among many other references, the Royal Society June 2005 report at <http://www.royalsoc.ac.uk/displaypagedoc.asp?id=13539> , and Caldeira et al, 2007.) In addition to these scientific concerns about consequences of carbon sequestration in the deep oceans, it has also been noted that public opinion rates such ocean sequestration as highly objectionable, about on a par with proximity to nuclear power generation (see Keith et al, 2005??).

ANNEX IV The Lisbon Principles

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VIEWPOINT

Principles for Sustainable Governance of the Oceans

Robert Costanza, Francisco Andrade, Paula Antunes, Marjan van den Belt, Dee Boersma, Donald F. Boesch, Fernando Catarino, Susan Hanna, Karin Limburg, Bobbi Low, Michael Molitor, João Gil Pereira, Steve Rayner, Rui Santos, James Wilson, Michael Young

Pressures being exerted on the ocean ecosystems through overfishing, pollution, and environmental and climate change are increasing. Six core principles are proposed to guide governance and use of ocean resources and to promote sustainability. Examples of governance structures that embody these principles are given.

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The world's oceans are fundamental to the development and sustainability of human society, the maintenance of peace, and the health of the biosphere. But the pressure being exerted by humanity on global resources is such that even the vast oceans are being impacted, and we urgently need a new paradigm for governance of ocean resources in the face of growing uncertainty. A recent workshop in Lisbon, Portugal (1), sought to identify the principles upon which such a new paradigm could be based.

THE PROBLEMS

Five major problems facing the oceans have been identified: overfishing, ocean disposal and spills, the destruction of coastal ecosystems, land-based contamination, and climate change. These range from traditional ocean resource management issues to ever-broader

ecological and social system management issues. Overfishing is notoriously resistant to traditional resource management approaches (2), but moving through the list the problems become progressively more complex and difficult to manage. Uncertainties abound, so that traditional "rational" management approaches based on the underlying assumption of predictability become increasingly unworkable. Because traditional approaches also tend to ignore distributional fairness and to limit participation in the decision-making process, they have limited credibility and lack social support for their implementation among the increasingly broad range of stakeholders involved. Since overfishing is in many ways the simplest of these five problems, it serves as an example. Of 200 major fish stocks accounting for 77% of world marine landings, 35% are currently classified as overfished. Currently, overfishing is diminishing the production of fish as food, limiting the economic productivity of fisheries, restricting subsistence and recreational uses, and reducing genetic diversity and ecological resilience (3). Overfishing has multiple causes, which vary by fishery. Fishing is often treated as a right without attendant responsibilities. Under open access, the right to fish is accorded to anyone, and individuals are encouraged by the incentives of open access to capture as many fish as possible in as short a time as possible. Even with controlled access, fishery management decisions are often made at scales that do not incorporate all sources of ecological information, focus on user groups rather than public owners, and fail to consider all costs and benefits. Rule compliance is generally low and pressures within fishery management lead to decisions that err on the side of risk rather than caution.

LISBON PRINCIPLES OF SUSTAINABLE GOVERNANCE

The key to achieving sustainable governance of the oceans is an integrated (across disciplines, stakeholder groups, and generations) approach based on the paradigm of "adaptive management," whereby policy-making is an iterative experiment acknowledging uncertainty, rather than a static "answer" (4). Within this paradigm, six core principles embody the essential criteria for sustainable governance. Some of them are already well accepted in the international community (for example, Principle 3); others are variations on well-known themes (for example, Principle 2 is an extension of the subsidiary principle); while others are relatively new in international policy, although they have been well developed elsewhere (for example, Principle 4). The six Principles together form an indivisible collection of basic guidelines governing the use of all environmental resources, including, but not limited to, marine and coastal resources.

Principle 1: Responsibility. Access to environmental resources carries attendant responsibilities to use them in an ecologically sustainable, economically efficient, and socially fair manner. Individual and corporate responsibilities and incentives should be aligned with each other and with broad social and ecological goals.

Principle 2: Scale-matching. Ecological problems are rarely confined to a single scale. Decision-making on environmental resources should (i) be assigned to institutional levels that maximize ecological input, (ii) ensure the flow of ecological information between institutional levels, (iii) take ownership and actors into account, and (iv) internalize costs and benefits. Appropriate scales of governance will be those that have the most relevant information, can respond quickly and efficiently, and are able to integrate across scale boundaries.

Principle 3: Precaution. In the face of uncertainty about potentially irreversible environmental impacts, decisions concerning their use should err on the side of caution. The burden of proof should shift to those whose activities potentially damage the environment.

Principle 4: Adaptive management. Given that some level of uncertainty always exists in environmental resource management, decision-makers should continuously gather and integrate appropriate ecological, social, and economic information with the goal of adaptive improvement.

Principle 5: Full cost allocation. All of the internal and external costs and benefits, including social and ecological, of alternative decisions concerning the use of environmental resources should be identified and allocated. When appropriate, markets should be adjusted to reflect full costs.

Principle 6: Participation. All stakeholders should be engaged in the formulation and implementation of decisions concerning environmental resources. Full stakeholder awareness and participation contributes to credible, accepted rules that identify and assign the corresponding responsibilities appropriately.

APPLYING THE PRINCIPLES

The sustainable governance of the oceans will require an ongoing, participatory, and open process involving all the major stakeholder groups (Principle 6). It will also require integrated assessment and adaptive management (Principle 4). Below we give a few examples of institutional strategies that can incorporate many of the Lisbon principles simultaneously. They are only starting points.

Shore-based and co-managed fisheries. Fisheries management has traditionally been carried out on a species-by-species basis. There has been little regard for interactions with other species, ecological effects at relatively small scales, or the pattern of individual incentives created by regulation. In share-based fisheries, rights or "shares" are allocated to the overall fishery and ecosystem, not to individual species. Shares are strictly limited and entry is possible only by purchasing existing shares. In co-management, entry is restricted and a formal governance system instituted. Two examples are the New South Wales (Australia) share-based system and a co-management system under development in the state of Maine (5).

Share-based fishery approaches create local-level management institutions with responsibility for conservation to supplement existing "top down" management structures, which exercise authority over larger-scale constraints. Such decentralization has a number of attributes that facilitate integrated approaches to fisheries management. Local institutions are generally better able to identify the recipients of both costs and benefits, and to assign responsibilities that internalize both. They tend to bring local ecological information about habitat and stock interactions into the management system quickly, at the right scale, and with a minimum of information costs. With individual or group property rights, these systems encourage a more precautionary approach to management. Fishers are more likely to be cautious if their share of the system is at risk and they can reap the benefits of restraint. The principal objective of these systems is the creation of individual incentives that are consistent with the social objective of sustainability. The high level of participation required by the system will result in rules that are credible (that is, that users will have confidence that restraint on their part will

have the intended effect), that provide assurances that others will follow the rules or be sanctioned, and that are equitable in the sense that individual costs are borne roughly in proportion to the benefits received.

Integrated watershed management. Increasingly, regional (for example, Great Lakes, North Sea, Mediterranean Sea, and Baltic Sea) and subregional (estuary management programs) ocean governance schemes are addressing land-based sources of pollution through integrated watershed management approaches (6). Watershed-level analysis can better identify those responsible for the export of downstream problems and aid the implementation of the Responsibility Principle. "Watershed councils" can be effective at involving all stakeholders--both upstream and downstream--in decision-making.

Managing the distribution of human populations, their ecological footprint, and land use is an important component of watershed management (7). Management may involve restricting the spread of land development and limiting density in particularly sensitive coastal and riparian areas, and (particularly in developing nations) taking steps to provide opportunities for settlement away from densely occupied and stressed coastal areas, in line with the Precautionary Principle. Mechanisms can be included to ensure that decisions are made with the full participation of stakeholders, in line with the Participation Principle, and in an adaptive management framework.

Environmental bonding. Environmental bonding incorporates uncertainty about environmental impacts into market incentives by requiring potential polluters to post a financial bond to cover damage that might result from their activities. Bonding complies with the Responsibility Principle by making parties financially responsible for their potential impacts; with the Scale-Matching and The Full Cost Allocation Principles, by internalizing costs at all scales; and with the Precautionary Principle, by requiring payment up front for uncertain future damages. Bonding can provide protection not only against known environmental impacts, but also against unknown factors that could have potentially greater impact on fisheries. But, in order to be effective, bonding must be integral to the design and implementation of governance legislation.

Marine protected areas (MPAs). Currently, MPAs comprise less than 1% of the marine environment. Recent assessments suggest that 20% of marine areas should be designated as MPAs in order to maintain sustainable fish stocks (8). MPAs conform to the Responsibility Principle by allowing fisheries to be sustainable in the face of harvesting pressure and implying a responsible use of the resource; to the Scale-Matching Principle, by providing a solution to marine overfishing that is consistent with the ecological scale of the problem; to the Precautionary Principle, in that they are a form of ecological insurance against the uncertainties inherent in fish population dynamics and harvesting; and to the Full Cost Allocation Principle, in that they allocate the costs of conservation to the appropriate parties (the harvesters), by setting aside a certain percentage of the potential harvest to assure future harvests. To be effective, MPAs need the participation of all stakeholders, including the scientific community, to determine their location, size, and interlinkages. While enforcement by government against the will of the local community is possible, it is much less effective and less politically sustainable than engaging stakeholders in both the establishment and enforcement of the MPAs.

CONCLUSIONS

We recognize that any attempts to achieve globally optimal ocean governance policies in the face of natural and human uncertainty are chimeras. The best hope lies in raising awareness and including multiple viewpoints in an integrated, adaptive framework structured around a core set of mutually agreed principles. We propose the six Lisbon principles as that core set. Adhering to them will help ensure that governance is inclusive, inquisitive, careful, fair, scale-sensitive, adaptive, and, ultimately, sustainable.

REFERENCES AND NOTES

1. The workshop, held 7 to 9 July 1997, was sponsored by the Independent World Commission on the Oceans (IWCO) in conjunction with the Luso-American Development Foundation. More details can be found in R. Costanza and F. Andrade, Eds., *Ecological Economics and Sustainable Governance of the Oceans* (FLAD/IMAR/LPN, Lisbon, 1998). The report includes chapters by most of the co-authors of this article. More detailed articles are also in a forthcoming special issue of *Ecol. Econ.*
2. D. Ludwig, R. Hilborn, C. Walters, *Science* 260, 17 (1993) [Free Full Text] .
3. L. W. Botsford, J. C. Castilla, C. H. Peterson, *ibid.* 277, 509 (1997) [Abstract/Free Full Text]; D. Pauly, V. Christensen, J. Dalsgaard, R. Froese, F. Torres Jr., *ibid.* 279, 860 (1998).
4. C. S. Holling, Ed., *Adaptive Environmental Assessment and Management* (Wiley, Chichester, 1978); C. J. Walters, *Adaptive Management of Renewable Resources* (McGraw-Hill, New York, 1986); K. Lee, *Compass and the Gyroscope* (Island, Washington DC, 1993); L. Gunderson et al., Eds., *Barriers and Bridges to the Renewal of Ecosystems and Institutions* (Columbia Univ. Press, New York, 1995).
5. M. D. Young, *Ocean Coastal Manag.* 28, 45 (1998); J. Wilson, in *Social Implications of Quota Systems in Fisheries*, G. Palsson, Ed. (TemaNord, Copenhagen, 1997).
6. R. I. Naiman, Ed., *Watershed Management: Balancing Sustainability and Environmental Change* (Springer-Verlag, New York, 1994); J. Pelley, *Environ. Sci. Technol.* 31, A322 (1997); I. W. Heathcote, *Integrated Watershed Management: Principles and Practice* (Wiley, New York, 1998).
7. W. E. Rees and M. Wackernagel, in *Investing in Natural Capital: The Ecological Economics Approach to Sustainability*, A. M. Jansson et al., Eds. (Island, Washington, DC, 1994); C. Folke, A. Jansson, J. Larsson, R. Costanza, *Ambio* 26, 167 (1997); N. Bockstael et al., *Ecol. Econ.* 14, 143 (1995).
8. P. J. S. Jones, *Ocean Coastal Manag.* 24, 149 (1994); J. A. Bohnsack, *Oceanus* 63, 71 (1993) ; T. Lauck et al., *Ecol. Appl.* 8, S72 (1998).

ANNEX V

Excerpt from *Canadian Marine Fisheries in a Changing and Uncertain World*

CHAPTER 7: SUMMARY AND CONCLUSION

1. SCOPE OF THIS REPORT

The purpose of this chapter is to reiterate briefly the central points of our analysis, and then to highlight what we see as key orientations for action needed now.

In this report we do not attempt to solve all the problems of fisheries management in Canada. Indeed, our work is not directed particularly to the concrete tasks of fisheries management as such. Rather our terms of reference directed us to look more generally at the impacts of human activities on marine resources in the context of continuing change: physical, biological, economic, and social.

Given the uncertainties and risks involved in human activities that have significant, possibly irreversible, impacts on interdependent marine resources, we were led to a broad ecosystem approach which includes not only the technical processes of fisheries management, but the political processes and social institutions within which the objectives and frameworks for such management are developed.

In its early chapters, this report reviewed the present state of Canadian fisheries in order to develop lessons for the future. In later chapters it proposed principles and options for achieving the three key objectives of biological, social and economic sustainability in fisheries systems, as components of overall ecosystem integrity. A common theme linking these interconnected objectives is conservation of the marine resource for sustainable use. Integrating these three stated objectives requires seeing beyond the short-term needs of any one component of the system -- natural, economic or social -- to the longer-term needs of fisheries systems as a whole.

Ensuring this long-term productive exploitation of living marine resources -- fish and other aquatic species -- implies a stewardship role, a responsibility for the maintenance of these natural resources into the future.

The emphasis in this report has been on three fundamental characteristics of fisheries systems -- change, complexity, and uncertainty -- and on three basic features of human response to them--conservation, cooperation, and compliance. Our aim was to document and analyse fisheries from a broad, integrated perspective, and develop some key principles for guiding those involved in fisheries systems--fishermen, fish processors, residents of fish-dependent communities, scientists, fishery managers and politicians--as they each attempt to respond to the profound uncertainties surrounding continuing change. Following from these

principles are some strategic approaches leading to suggestions for action. We have argued for a positive program of institutional reform reflecting a dramatically altered view of ecosystems and their limits, one that takes into account ongoing change and unavoidable uncertainty. More particularly, we argued for a precautionary approach, an ecosystem approach, an integrated approach, and a participatory approach. The need now is not only to change fisheries management, but also to adapt the broader institutions governing fisheries systems in Canada, in order to respond adequately to ongoing processes of change and to the demands of the resulting social transitions.

This report has illustrated a range of possible institutional designs, in which individuals and economic agents may be led by market forces, cultural traditions, social commitments (implicit or contractual), or negotiated regulations to pursue the goals of biological sustainability, social stability and economic viability. Strategies for information systems and social structures which support such activities in a general social context were outlined. We also identified more specific strategies or methodologies to guide the decisions of all participants in fisheries systems themselves.

The marine ecosystems discussed here thus include humans and their institutional structures. A complex web of dependency now exists as a result of the extensive and growing human exploitation of marine resources. Coastal communities in Canada, indeed worldwide, depend heavily on the marine environment. Our use of ocean resources is now so extensive that the viability of the natural components of the marine ecosystem hinges crucially upon successful measures to limit human harvesting activities and habitat destruction.

The primary motivation for this report, then, is concern about the present and future state of the fisheries, both in Canada and globally. For ever fewer fisheries is it likely that global catch can be increased substantially on any sustainable basis. Yet there is growing demand and growing capacity to catch fish. Within Canada we have experienced the collapse of the Atlantic groundfisheries, with consequent deep social and economic effects. On both the Pacific and the Atlantic coasts, and in the Arctic, we have recognized that our fisheries cannot be viewed in isolation, or through ideological blinkers. Many fish migrate across national borders and out into the open ocean. Living marine resources are vulnerable to long range physical and chemical transport systems as well as local discharges and habitat disturbances. Communities that depend on these fish and other marine resources need a broad, pragmatic, and adaptive perspective. That is what we urge here.

2. SUMMARY: CHANGE, COMPLEXITY AND UNCERTAINTY AS FUNDAMENTAL CHARACTERISTICS OF FISHERIES SYSTEMS

Fishery systems are not static. Both fish and humans are affected by constantly changing physical, economic, socio-political and biological processes. In this report we have provided examples showing how changes in oceanographic conditions can drive variability in growth and survival rates for fish, can cause changes in the distribution of fish, and can lead to changes in abundance. Socio-political processes can cause variability in prices, changes in the cost of fishing and changes in the distribution of fishing vessels, as well as changes in concepts of property or stewardship, and new perspectives on management in an inter-institutional setting.

Linkages within fishery systems illustrate this inherent complexity. Fish depend upon their natural environment; fishing depends upon social and economic conditions as well as the natural environment. Given the complexity and change inherent in this system it is unreasonable to expect the economic and social yield from fishing effort to be constant. Combined with continuing change, this complexity leads to unavoidable uncertainty. Just as there are linkages between components of fisheries which transmit changes, so too for uncertainty. Uncertainty arises from several sources, including human-induced climate change, the inherent variability and complexity of fishery systems, imperfect information, errors in observation, errors in implementation and incomplete compliance with regulations. Thus uncertainty about potential effects of climate change on water temperature and currents or survival rates of fish stocks necessarily results in uncertainty in forecasted trends in abundance and productivity of fish populations. No amount of analysis or improved natural and social science will remove such uncertainty, though they may reduce it. Since uncertainty is present, and will strongly influence our evaluation of options, this uncertainty must be explicitly included as a component of the information base on which decisions in fisheries will be made.

Given change, complexity and uncertainty, there is inevitably risk for those involved in fisheries. For the fish there are risks associated with overexploitation and low abundance. Consequent economic and social risks have become painfully evident in Canada through recent experiences with Atlantic groundfish and Pacific salmon. Uncertainty and risk are always present; both features of fisheries need to be more widely understood and taken into account explicitly by all who make decisions. The present scale of human intervention amplifies the potential risks, with possibly irreversible consequences.

A goal of 'conservation leading to sustainable use' integrates the three objectives for Canadian marine fisheries: biological, social and economic sustainability. The first step in the process for the Canadian public and policy makers must be development of a conservation ethic to be adopted by those involved in the fisheries. The first half of this report

(Chapters 2-4) should provide sufficient information about on-going processes of change to convince readers of the value of such a conservation ethic. Further, there must be principles and strategies that will carry that ethic forward into action and lead to sustainable resource use. Proposed approaches have been discussed in Chapters 5 and 6, and the key ideas are summarized later in this chapter.

It is up to readers of this document to implement these proposed strategies, by seeking consensus on measures that might redirect human activities so as to achieve fisheries that will generate substantial sustainable benefits in the face of ongoing variability, change and uncertainty.

The conservation ethic we envisage is not merely a set of abstract overarching principles to be spelled out in international covenants or codes. As emphasized in Chapter 4, errors in fisheries management creep in at all stages of the process, from estimating the character and state of the system to misjudging the consequences of policy decisions or management action. Ecosystem approaches and precautionary approaches can help in assuring that policy decisions emphasize caution and sustainability in the face of uncertainty in our understanding and knowledge of the system. But even within a broad ethical framework or general code of conduct, only individual moral codes and individual commitment to the responsibilities of stewardship can assure that the actions taken from day to day, at sea and ashore, will lean toward sustainable fisheries in the face of uncertainty and unavoidable risk.

Such individual commitment is only likely to flow in a social structure that is seen as legitimate, with management institutions that command confidence. Assurances of voice and participation in overall governing structures must be part of that contract. As the summary in the next section reminds us, many of the recommendations contained in this report are directed toward the identification of institutional arrangements and management processes which will command the confidence and promote the mutual respect that is essential to sustained cooperative management leading to cohesive and sustainable fisheries systems.

3. SUMMARY: CONSERVATION, COOPERATION AND COMPLIANCE AS A BASIS FOR MANAGING HUMAN ACTIVITIES IN FISHERIES SYSTEMS

The six core principles set out in Chapter 5 suggest ways in which the goal of sustainable fisheries elaborated in Chapter 1 might be pursued even in the face of the difficult systemic problems identified in Chapters 2-4. These principles, which in Chapter 6 are translated into more concrete strategies, are:

1. Incorporate into decision-making an analysis of structural and dynamic complexities of fishery systems.
2. Incorporate into decision-making an analysis of change, uncertainty and risk in all fishery activities.
3. Promote and conserve biological, economic and social diversity.
4. Collect, analyze and openly communicate essential data and information.
5. Estimate, document, and incorporate into decision-making the social and ecological consequences of decisions and actions.
6. Clearly define roles, rights and responsibilities of all fishery participants so as to align their interests with overall objectives of sustainability.

The first two of these principles relate directly to decision processes of individuals and institutions directly involved in fisheries systems, in light of the inherent complexity, variability, change and uncertainty of such systems. Our message is that all participants in management decisions and operational activities must come to recognize that the system and environment within which they work is unavoidably changing and inherently uncertain. Management decisions, investment decisions, harvesting decisions, career decisions, or location decisions cannot be based on an expectation that the future will be like the past, or that stocks which appear, on the basis of recent experience, to be robust and productive will remain so in the future. A consciously and indeed aggressively **precautionary approach (Strategy 1)** is essential, with recognition that preservation of stocks and biological productivity (and hence employment, incomes and community survival) in the future will depend on exploitation strategies not pressing too heavily against harvest limits in the present. For this purpose, explicit processes of **risk assessment, risk management and risk communication (Strategy 2)** may often be essential, and balanced decision processes incorporating the knowledge and perceptions of all participants in fishery systems will always be central.

What is certain about decision-making in fishery systems is the inevitability of surprise. In the face of uncertainty and surprise, a **broad, comprehensive, and continuous flow of information among participants (Principle 4 and Strategy 4)** is critical. This information must include not just announcements or instruction from government managers to fishermen and others in the system, but also the reciprocal flow of fine-grained local knowledge and current monitoring or awareness that comes with intimate involvement in local or traditional activities over years and generations. Critical also is an **integrated approach (Principle 3 and Strategy 3)** to the utilization of such information, adaptively, on an ecosystem basis. This integrated approach views the interdependent system as a whole, on spatial and temporal scales

appropriate to the multiple stocks and ecological services involved, and with provision for coordination across different jurisdictions which may be involved within the ecosystem as a whole. **Principles 3 and 4, and their associated implementation strategies**, thus emphasize the need to promote diversity as a hedge against uncertainty, and to work within the framework of an integrated ecosystem-based management process.

More balanced and integrated precautionary decision-making within fisheries systems demands that ecological consequences of proposed actions be identified and assessed before action is taken. But also, more broadly, to deal with cross-cutting and inter-sectoral issues, there is need to assure that decisions within fisheries systems themselves are integrated within a wider context, including the coastal zone and the regional economy, as well as the cross-sectoral and cross-departmental 'horizontal issues' presently concerning all governments. These larger issues influence the survival of enterprises and communities, and call for much more comprehensive and effective procedures for taking into account both social and ecological consequences of management decisions. In the absence of such procedures, serious unintended impacts will be generated. For example, decisions to adopt particular harvesting or processing technologies may lead to excessive but unrecognized costs of by-catch and waste, as well as social dislocation. Indeed, as emphasized in Chapter 6, we consider these questions of by-catch and waste, along with unanticipated or unintended social consequences, to be among the most fundamental challenges in fisheries management.

Methods to achieve better assessment of presently unpriced and unrecognized consequences were emphasized in the discussion of **Principle 5 and Strategy 5**. Similarly, the social consequences for coastal communities and fish-dependent groups, though they may be impossible to price formally, must be taken into account in some fashion in decision processes at all levels in the system. Some of this balancing of concerns undoubtedly now occurs informally in both government and enterprise decisions. But machinery to ensure greater integration and coherence of administrative measures in responding to policy dilemmas arising in fisheries is a priority for further research and further action.

Finally, on the questions of incentives, institutional design, enforcement, compliance and accountability addressed in the discussion of **Principle 6 and Strategy 6**, several points have been made. First, it is worth highlighting that at some level there must be government involvement to represent the interest of the Canadian public in the stewardship of fisheries resources. This government involvement may be simply in establishing general ground rules, or more actively in initiating community-based management partnerships, or in establishing harvest limits, or in regulating entry, openings, technologies and practice more

specifically. However these options are adopted or combined, there is ultimately the need for the general social purpose to be reflected and carried out in fishing effort by individuals exercising their personal discretion, on the basis of socially recognized rights to do so.

In new institutional arrangements, there are many options. The linkage from general strategies and principles to personal conduct might be achieved through contracting by government institutions with agencies which ultimately authorize effort by individuals or small groups, formal or informal (as envisioned with the provision for 'partnerships' in Bill C-62, the new Fisheries Act proposed in 1996). Or it might occur by delegation to market mechanisms through ITQs to be exercised by individuals who may then group themselves into virtual communities or corporations for purposes of managing the resource more effectively in their collective interest (within the constraints of socially acceptable exercise of these rights). Alternatively, government might allocate quota in a more aggregate form to communities, larger or smaller, formal or informal, who might then choose to organize the involvement of individuals in management plans and harvesting through allocation of individual use rights or through some other mechanisms of community or cooperative (as opposed to corporate) governance.

Experience with some of these institutional arrangements in the contemporary context of a high-technology global economy seems not yet sufficient to permit any final judgments about their relative merits. It is not clear which of these mechanisms mobilizes individual commitment and compliance most effectively, given the ambitious social goals we must pursue in the context of substantial uncertainty about the state of the resource and therefore about fishery systems themselves. From a large and growing literature, no consensus is emerging on even basic questions such as which approach is more likely to achieve the goal of biological sustainability. There is, however, general agreement that different institutional arrangements are likely to be appropriate in different settings, given the characteristics and dynamics of particular resource systems. The pragmatic and adaptive approach to institutional innovation mentioned in **Strategy 6** seems the appropriate response in the circumstances.

The initial definition and distribution of access or management rights is crucial and will inevitably be controversial. We have noted earlier that such rights might in principle be auctioned or 'grand-fathered', or allocated by some other social mechanisms. We also noted that we see the particular issue of the transferability of rights and the mobility of rights holders (the different impacts and relative merits of non-transferable versus transferable quotas, whether in community or individual form) as a crucial question requiring much further research and debate. Since the exercise of the rights, and subsequent transfers (if permitted), will likely generate excess returns or speculative gains, these should be

appropriately taxed. Canadian society, with its collective responsibility for stewardship of the resource, should receive its share of the benefits, while also ensuring that appropriate compensation (at market rates) is paid to labour and capital invested in harvesting, processing and marketing.

But ultimately the most difficult issue is the basic question of who will be excluded, and by what means. Who can get past the barriers to entry inevitably created by rationing of access to the common resource, whether this rationing is accomplished by purchasing power or by administrative fiat, by markets or governments or communities, will remain a sensitive question.

Thus, in summary, Chapter 6 suggested a number of specific strategies. For implementation of the first two principles, it sketched methods to deal with complexity, uncertainty and surprise. With respect to the second two principles, it emphasized the need for integrated ecosystem approaches. Finally, in dealing with the last two principles, the need for broader consideration of social and ecological consequences along with more conventional economic and financial concerns to be reflected both in information flows and in institutional arrangements and incentive systems was stressed. A number of examples were outlined, suggesting that some progress is being made toward implementing these strategies, although many recommendations are far from being widely applied.

Diffusion and adoption of innovative ideas, and implementation of corresponding action, is a slow process. While many of the ideas behind our six principles are becoming widely accepted and endorsed, action to implement them appears fragmented at best. Some have yet to be accepted as practical and workable. Even where action has been initiated, attainment of the desired outcomes (which reflects the adequacy of the policy design or strategy as well as the extent of implementation effort and the degree of compliance) lies well in the future.

Although much has improved even in the two years since the panel writing this report started its work (in January, 1996), there is still a long way to go before we could claim that the conservation goals enshrined in declarations, and the precautionary approaches embedded in policies, are truly in place where it counts, in fisheries throughout Canada. Efforts to extend information flows and methods of ecosystem-based management have had only limited success to date, for a variety of reasons which include financial constraints and institutional barriers, as well as major conceptual and methodological problems in particular settings. And institutional changes to resolve resource conflicts and temper the struggle for shares are still only a dream. Others of our recommendations likewise need further implementation efforts.

We conclude that further action must urgently be taken by all participants in fisheries systems. We must recognize that the long-run synergy and complementarity among the three objectives of sustainable fisheries, linked through the conservation imperative, can be fatally compromised if a focus on short-term goals-- employment, income and revenue generation--or other social or economic factors, press harvesting efforts to levels that leave the biological system critically vulnerable to shocks and surprises that cannot be forecast but which are sure to occur.

4. CONCLUSION

We argue in this report for an ecosystem approach, for risk averse policy, for adaptive management and for resilient institutions. As noted above, current policy priorities and the policy stance within organizations in fishery systems seem--so far as statements of intent are to be believed--to be moving toward an appropriate emphasis on the conservation and stewardship goals we espouse. But again, as has been noted, practical progress has been slow, and there have been some discouraging steps in the wrong direction.

With some recent measures DFO and the federal government appear to be embracing the more open, participatory approach which we advocate. (See, for example, the new Oceans Act passed in 1997, and the DFO Sustainable Development Strategy discussion paper issued in December, 1997.) And the search, expressed within the amended Fisheries Act proposed in 1996 as well as in other statements of the Government of Canada, for new institutional arrangements based on devolution of responsibilities and partnership arrangements, agrees fully with the clarification of responsibilities within community-based co-management, self-governing structures, or market mechanisms urged here.

The test now is in implementation, in the realization of these ideas and intentions. The challenge will be to create a changed corporate culture and new institutional approaches entrenched in the working structures of government and non-government components of fishery systems. There is a very skeptical audience to be convinced of the reality of the actual commitment to conservation, to stewardship, to a precautionary approach, to meaningful participation, to effective co-management, and above all to building and earning trust. And there are signs that the war is not yet won. Budget cuts for science and for monitoring (both within DFO and Statistics Canada, as well as other agencies and other governments) seem extraordinarily short-sighted. And in many cases industry and community pressures for maintaining or increasing harvests continue.

As discussed above, we see an opportunity for the federal government and the Department of Fisheries and Oceans to move toward more effective partnerships with those who make up the fisheries systems and its institutions--fishermen, co-operatives and corporations, community groups, local and provincial governments, university researchers and non-government organizations.

It will be crucial to work out the new role for the federal government and DFO in particular in such a system. The panel notes the need for the Government of Canada to play a clear role in representing the interests of the Canadian public. At the same time, the core functions for DFO are likely to be more strictly defined than in the past. Perhaps within this redefined role, DFO will serve as guarantor of a more decentralized co-managed system in which the roles, rights and responsibilities of the individual players are clear and understood, so that they may exercise necessary discretionary operational authority according to their own perceptions and judgments.

Working out the details of such an adjustment to the appropriate core role for DFO obviously would take us far beyond the scope of this report. As but one example of implementing such changes, there could be use of the concept of precautionary reference points introduced in the 1995 UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks as conceptual foundation for an appropriate delegation of responsibilities within a broad management network. These reference points specify the overall conservation constraints, set by government in the public interest; given these, responsibilities for adaptive management and on-going adjustment of harvest plans in light of changing circumstances and the continuing flow of monitoring information and new knowledge might be carried more fully by the communities and co-management structures which are closest to the resource and most immediately concerned with the health of the ecosystem. If on-going monitoring suggests an emerging risk that limit reference points will be violated, pre-agreed measures to counter that risk must come into play to assure that the primacy of the conservation objective is respected.

In pursuing such an approach, early action to meet Canada's long-delayed commitment to ratify UNCLOS and the 1995 Agreement on implementation of its provisions with respect to straddling stocks and migratory stocks would obviously be desirable.

In the end, one might view the fundamental problem essentially as one of equitably regulating access and guiding the allocation of increasingly scarce and valuable common resources, whether at the level of the human species in competition with other species for food and habitat, or at the level of the individual fisherman, bound by social pressures and personal moral codes. Whether viewed locally or internationally, it is interesting to note that this view brings the task back

to the basic biological problem outlined in Chapter 2, to manage the competition for fisheries resources to meet social and economic goals while ensuring that the current harvest does not exceed the biological productivity of the stock itself.

In this interpretation, fisheries institutions must mediate between the uncertainty of complex natural systems characterized by ceaseless change, and the unpredictability of complex human systems characterized by conflicting interests and distributional concerns. The management of human activities impinging on marine ecosystems will never be exact or perfect, never purely an economic concern, never a matter simply of calculated intervention in a situation fully understood. There is no human power sufficient to manage fishery resources precisely; nor to control outcomes or impacts on the resource resulting from myriad discretionary individual decisions. But there is some limited power--the power of information, the power to exercise authority (when it is accepted as legitimate)--to shape ideas and to intervene in processes of decision so as to influence human activity and the resulting consequences.

The strategies outlined in this document are intended to suggest ways to respond to the need to make important decisions about human intervention in complex systems, with only partial information about uncertain developments, and dramatically different perceptions of risks held by many people with conflicting interests in the decision processes and their consequences.

Not all the counsel in this document can easily be put into practice. Not all of our recommendations will be achieved, or necessarily endorsed, of course. Indeed, as has already been emphasized, there is no single institutional solution to be found--and certainly no single policy stance--to offer the best possible structure for all circumstances or all time. But the effort to develop adaptive processes and structures more consistent with sustainability must be made.

We urge the pressing need for continuing progress in the directions outlined above. The commitment now of substantial resources and social energy to the strategies identified here is essential. A priceless natural and human heritage is at stake.

References

Biermann, Frank. 2007. "'Earth Systems Governance' as a Crosscutting Theme of Global Change Research"., *Global Environmental Change* (forthcoming, 2007)

Calabrese G, and Bobbit P. *Tragic Choices*, 1st ed. New. York, Norton, 1978.

Costanza, R. (1998). "Principles for Sustainable Governance of the Oceans". *Science*, 281. 198- 199. Retrieved April 5, 2007 from <http://www.sciencemag.org/cgi/reprint/281/5374/198.pdf>.

de Young, B., R.M. Peterman, A.R. Dobell, E. Pinkerton, Y. Breton, A.T. Charles, M.J. Fogarty, G.R. Munro, C. Taggart. 1999. *Canadian Marine Fisheries in a Changing and Uncertain World*. Canadian Special Publication of Fisheries and Aquatic Sciences. No. 129:1-199.

Dobell, A. R. 2003. 'The Role of Government and the Government's Role in Evaluating Government: Insider Information and Outsider Beliefs' http://www.law-lib.utoronto.ca/investing/research_papers.htm . Accessed April 12, 2007

Dobell, A. R. 2006. 'Socio-economic considerations in oceans management: Current Practice and Prospects Circa 2006'. Discussion Paper, DFO, May, 2006

Grant, R et al. 2006. "Potential for Performance-based Regulation in the Canadian Offshore Oil and Gas Industry". *Alberta Law Review*, 44, 1 (July, 2006) pp 1-32.

Hanebury, Judith. 2006. "Smart Regulation—Rhetoric or Reality?". *Alberta Law Review* 44, 1 (July, 2006) pp 33-64.

Hershman, Marc and Craig W. Russell. 2006. "Regional Ocean Governance in the United States: Concept and Reality", *Duke Environmental Law and Policy Forum* XVI, 2, p. 227

Kearney, John, et al. 2007. "The Role of Participatory Governance and Community-based Management in Integrated Coastal and Ocean Management in Canada". *Coastal Management* 35, pp 79-104. Downloaded 5 March, 2007.

Lehtonen, Markku and Sylvia Karlsson, "When is 'Fit' not enough in Environmental Governance?" http://www2.bren.ucsb.edu/~idgce/papers/Markku_Lehtonen_2.doc accessed April 12, 2007.

Longo, Justin and R. Anthony Hodge. 2007. "The Ecosystem Dilemma: Discordance between Nature and Culture", *Horizons*, 9, 3, pp 25-30. http://policyresearch.gc.ca/doclib/Horizons_V9N3_e.pdf

McGinnis, Michael D. 1999. *Polycentric Governance and Development*. Ann Arbor: University of Michigan Press.

Ostrom, Elinor. 1990. *Governing the Commons*. Cambridge, Cambridge University Press

Parson, E.A. & D.W. Keith. (1998). Climate Change: Fossil Fuels without Co2 Emissions. *Science*. 282(5391). 1053-1054. Retrieved on April 5, 2007 from <http://www.sciencemag.org/cgi/content/summary/282/5391/1053>.

Ricketts, P. & Peter Harrison. (2007). Coastal and Oceans Management in Canada: Moving into the 21st Century. *Coastal Management*. 35(1). 5-22.

Stone, Christopher. 1993a. *The Gnat is Older than Man*. Princeton: Princeton University Press.

Stone, Christopher. 1993b. "Defending the Commons", in Sands, Philippe (ed), *Greening International Law*. London: Earthscan.

Stone, Christopher. 1999. "Can the Oceans be Harboured? A Four Step Plan for the 21st Century. *Reviel* 8, 1. pp. 37-47.

The Royal Society Policy Document. (2005). "Ocean Acidification due to Increasing Atmospheric carbon dioxide". Retrieved April 5, 2007 from <http://www.royalsoc.ac.uk/displaypagedoc.asp?id=13539>.

Young, O.R. 1998. IHDP Report No. 9, "Institutional Dimensions of Global Environmental Change: Science Plan" Retrieved from <http://www.ihdp.uni-bonn.de/html/publications/reports/report09/index.htm> April 11, 2007.

Arctic Reference List

- Agreement between the government of Canada and the government of the United States of America on Arctic cooperation (1999). Retrieved on April 5, 2007 from http://www.lexum.umontreal.ca/ca_us/en/cts.1988.29.en.html.
- Alta Declaration on The Arctic Environmental Protection Strategy. (2004). Retrieved on April 5, 2007 from http://www.arcticcouncil.org/Archives/AEPS%20Docs/Arctic%20Council_The%20Alta%20Declaration.htm
- Canada's Arctic: Vast, Unexplored and in Demand. (2006). *The Journal of Ocean Technology*, 1(1).
- Committee on Fisheries Twenty-fifth Session (2003). Agenda item 5: Progress Report on the Implementation of the Code of Conduct for Responsible Fisheries and Related International Plans of Action. Retrieved on April 5, 2007 from <http://www.arcticcouncil.org/Archives/Statments/COFI.pdf>
- Johnston, D. M. (2002) The Northwest Passage Revisited. *Ocean Development & International Law*. 33. 145-164.
- McRae, D. (2007). Arctic Sovereignty? What is at Stake? *Behind the Headlines*, 64 (1).
- Pharand, D. (2007). The Arctic Waters and the Northwest Passage: A Final Revisit. *Ocean Development and International Law*, 38. 3-69.
- Report of the Commissioner of the Environment and Sustainable Development (1999). Making International Environmental Agreements Work: The Canadian arctic Experience. Retrieved on April 5, 2007 from <http://www.oag-bvg.gc.ca/domino/reports.nsf/html/c906ce.html>.
- Simon, Mary. 2007. "The Inuit in a Changing World". Address to the Empire Club of Canada, Toronto, 15/2/2007.
- Thomas, H. (2000). Integrated Management Plannign in Canada's Northern Marine Environment: Engaging Coastal Communities. \
- VanderZwaag, D., R. Huebert, & S. Ferrara. (2003). The Arctic Environmental Protection Strategy, Arctic Council and Multilateral Environmental Initiatives: Tinkerins while the Arctic Marine Environment Totters Retreievd on April 5, 2007 from

http://www.law.du.edu/ilj/online_issues_folder/vanderzwaag.final.9.3.pdf.

Marine Protection Reference List

- BC MPA Network Project (2006). Vision, Goal, Objectives and Guiding Principles for the Collaborative Delivery of a BC MPA Network. Retrieved on April 5, 2007 from http://wwf.ca/AboutWWF/WhatWeDo/ConservationPrograms/Marine/MPA_VisionBC_Report.pdf.
- Canada's Federal Marine Protected Areas Strategy (2005). Retrieved April 5, 2007 from http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/mpa-zpm/fedmpa-zpmfed/pdf/mpa_e.pdf.
- Categories for Marine Protection: Australian IUCN Reserve Management Principals for Commonwealth Marine Protected Areas. (1994). Retrieved April 5, 2007 from <http://www.seafriends.org.nz/issues/cons/category.htm>.
- Living Oceans Society and World Wildlife Fund Canada. (2006). Recommendations for Effective Marine Planning Processes: Lessons Learned from Case Studies in Canada, the USA and Australia. Retrieved April 5, 2007 from http://livingoceans.org/PDFs/MarinePlanning_07.pdf.