

The Sidney Consensus: Marine Ecosystem-based Management Principles

The principles governing effective implementation of marine ecosystem-based management (EBM) in British Columbia, Canada, are listed below and followed by supporting elaborations of concepts. *The Sidney Consensus* was developed collaboratively by Marine EBM Gaps workshop participants representing academia, federal government, First Nations, industry, non-governmental organizations, and the provincial government.*

Principles:

EBM¹ recognizes that human activities occur in the **context** of nested and interconnected social and ecological systems² (including those in/on air, land, and water) that are:

- complex,³
- evolving,⁴ and
- dynamic.⁵

The **purpose** of marine EBM is to ensure that the individual, interactive, and cumulative effects of human activities on ecological systems do not preclude multi-generational sustainable use of ecosystem products and services.⁶ This is accomplished by:

- directing and regulating human activities and actions (including consumptive, restorative, mitigative, enhancing, destructive, disruptive, etc.) towards long-term goals of maintaining/enhancing ecosystem
 - resilience,⁷ and
 - structural and functional integrity;⁸ and
- supporting human activities that lead to
 - sustainable human communities and economies,⁹
 - sustainable ecosystem service provision,¹⁰ and
 - fairness in the distribution of benefits and costs within and across generations, locally and globally.¹¹

It therefore follows that the **process** of marine EBM:

- is integrative and place-based in concurrently managing a broad set of human activities, based on their interactions within social-ecological systems¹² (rather than separately managing activities by economic sector);
- incorporates the best available science and traditional/inter-generational knowledge,¹³ and monitors against stated objectives that are
 - precautionary,¹⁴
 - systematic,¹⁵
 - adaptive,¹⁶ and
 - proactive and pragmatic;¹⁷ and
- is fair, striving for meaningful inclusion of all groups in a process that is
 - collaborative and participatory, and
 - recognises and respects aboriginal rights and title.¹⁸

* Draft principles (http://pacmara.org/ebm_dialogue) were refined by: Jon Chamberlain, BC Ministry of Agriculture and Lands; Kai Chan, University of British Columbia; Heather Coleman, PacMARA; Steve Diggon, Coastal First Nations; Dan Edwards, Area A Crab Association; Kim Houston, Fisheries and Oceans Canada; Michelle Molnar and Bill Wareham, David Suzuki Foundation. Please cite as: Chamberlain, et al. 2010. The Sidney Consensus: Marine EBM Principles. PacMARA Working Group. <http://pacmara.org>

Supporting Elaborations:

1. EBM is an ecosystem approach to management that considers connections between people and ecosystems, as well as connections among ecosystem components. EBM is place-based (see #12), but must recognize that it may have an impact on a much broader spatial and temporal scale.
2. Most resources cannot be effectively or reliably managed individually because they are connected to other resources within the same ecosystem, and to other ecosystems and social systems (such as economic, legal, and political, systems).

Understanding ecosystem and human interactions in the context of coupled social-ecological systems implies recognizing that there will be frequent cases of multiple causality and indirect effects that cross spatial and temporal scales in complex ways: one phenomenon may have multiple causes (both social and ecological), and it may result in numerous unintended side-effects (again, both social and ecological).

3. Cause and effect relationships do not follow simple or straightforward pathways. Interactions among and between species and social-ecological subsystems are often non-linear (outputs are not directly proportional to inputs) and operate at and across multiple scales, such that patterns at any scale are a product of processes operating at multiple scales.
4. Species, ecosystems, and societies evolve concurrently, and each component can change independently, with, or because of others. These changes are therefore difficult to predict.
5. Many natural and human processes that affect ecosystems and societies are subject to change over time at diverse temporal scales.
6. Cumulative effects alter the environment through a combination of diverse past, present and future activities. EBM must consider the effects of multiple human activities and actions, and their potential interactions. These effects may be additive, synergistic, or antagonistic.
7. Resilience traditionally refers to an ecosystem's overall ability to maintain continued functioning in the face of change, and to recover from impacts to species and habitats, including cumulative effects and catastrophic events.

Ecological resilience has more recently been defined as the finite capacity of a system to adapt and maintain core structures and functions despite disturbance. While this can be considered negative when systems are in an undesirable state, here "resilience" applies to maintaining desirable structures and functions, such that adaptive capacity is a key element of resilience.

8. The structure of an ecosystem includes many pieces both biological (e.g., the species in an area and the size of individuals) and physical/chemical (e.g., habitat quality and oceanic conditions). Ecosystem functions are the processes such as nutrient cycling and energy transfer that result from interactions between organisms and also their physical environments. Integrity is inherently a value-based and therefore subjectively defined term, but it generally implies that ecosystems have not been fundamentally compromised.
9. Maintaining/enhancing sustainable human communities and economies means that communities are planned, built, or modified to meet the diverse needs of the present generation, without compromising the ability of future generations to meet their needs. Sustainable development relies on healthy and productive ecosystems that continue to maintain their integrity and serve their function if altered.
10. Service provision describes the ecosystem processes that yield benefits for people, directly or indirectly. These include provisioning services (e.g., food), regulating services (e.g., flood control), cultural services (e.g., spiritual benefits), and supporting services (e.g., nutrient cycling).
11. EBM should promote responsible and respectful resource management that leads to sustainable opportunities for coastal communities. Benefits include opportunities and indirect benefits provided by ecosystem services. Costs

broadly range from that of management itself to a variety of consequences, including foregone opportunities. Here, fairness means that all stakeholders and constituents have equal moral standing, and that the process should involve deliberation rather than dictation. Fairness recognizes that humans are not the only entities dependent on ecosystems, but cannot be measured objectively. Global considerations are important because BC's resources are globally unique and significant.

12. The connection between social and ecological systems is important, and exists on many levels in time and space. Human societies and globally interconnected economies depend upon functioning ecosystems and the services they provide. The systemic interdependencies among natural and social processes occur at different temporal and spatial scales.

EBM starts from a perspective that is inherently "place-based" rather than the traditional "population-based" or "sector-based" approaches to management. This shift means that spatial patterns within the ecosystem that may be relevant to its functioning or to the potential impacts of various uses of the ecosystem are considered and accounted for in management. It also places attention on challenges posed when the spatial boundaries for management decisions differ from the spatial scale on which the population, community, or ecosystem processes are functioning. The hierarchical nesting of ecosystem processes means that there is no single spatial scale that is "right" for all policies and management measures. Rather, "place-based" means that policies and management must function coherently in each "place" they are applied, taking into account the particular social and ecological context of a place, as well as the spatial scales of key ecosystem processes and pressures associated with the human activities being managed.

13. EBM must be informed by science (but not science alone), including both natural and social science e.g., socioeconomic analysis, social and environmental impact assessment, risk assessment, stakeholder preference analysis, and statistical studies. Traditional, intergenerational and local knowledge should also inform the EBM process; such information could include social, economic and ecological components. These diverse sources of information can inform managers of potential risks and rewards of alternate approaches to EBM, and help reduce the risk associated with uncertainty. All information is most useful when it is accepted by participants and interested parties.
14. The precautionary approach to resource management means being cautious of potential risks, including when understanding and information are limited. This approach does not treat a gap in information as a reason to stall or avoid taking action to prevent harm to a resource. Lack of full scientific certainty is not a reason for postponing effective measures. Thus, policy-makers can take discretionary action to protect ecosystems and societies from exposure to harm when data are uncertain, or inadequate.
15. A systematic process is characterized as an organized, co-ordinated, orderly, and explicit set of procedures.
16. Most loosely, adaptive management is a process in which management decisions are changed as more information about the action or resource becomes available through monitoring and evaluation efforts. Our use of 'adaptive management' refers to a *purposeful* approach that entails (1) recognizing the limitations that current uncertainties place on decision-making, (2) establishing a decision framework to clearly outline how and when management decisions will change to reduce those uncertainties, (3) monitoring (ideally through a scientific approach of testing hypotheses) for effectiveness, (4) providing pre-determined approaches to adapt management measures based on the monitoring results, and (5) structuring policy decisions in order to learn from monitored outcomes.
17. EBM should allow new ideas and be forward-thinking to improve future management and assist decision-making in a timely manner, given the current state of information.
18. First Nations are historically tied to their ancestral territories and have played integral roles in these ecosystems.