

4TH GLOBAL CONFERENCE ON OCEANS, COASTS, AND ISLANDS

Working Group on Achieving Ecosystem Management
and Integrated Coastal and Ocean Management by
2010 in the Context of Climate Change

Working Group on Progress Indicators



POLICY BRIEF ON EBM/ICM AND INDICATORS FOR PROGRESS



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Global Forum on Oceans, Coasts, and Islands--Strategic Oceans Planning to 2016

The Global forum on Oceans, Coasts, and Islands has undertaken a strategic planning effort for the period 2006-2016 to develop policy recommendations for specific next steps needed to advance the global oceans agenda aimed at governments, UN agencies, NGOs, industry, and scientific groups. To this effect, Working Groups have been organized around 12 major topic areas related to the global oceans commitments made at the 2002 World Summit on Sustainable Development and to emerging issues facing the global oceans community.

The Working Groups have been organized and coordinated by the Global Forum Secretariat, under the direction of Dr. Biliانا Cicin-Sain, Co-Chair and Head of Secretariat, Global Forum on Oceans, Coasts, and Islands, and involving the following staff from the Gerard J. Mangone Center for Marine Policy, University of Delaware: Miriam Balgos, Kateryna Wowk, Caitlin Snyder, Shelby Hockenberry, and Kathleen McCole.

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Global Forum on Oceans, Coasts, and Islands

**Working Group on Ecosystem-based Management and Integrated Coastal
and Ocean Management and Indicators for Progress**

Policy Brief:

**Ecosystem-based Management and Integrated Coastal and Ocean
Management and Indicators for Progress**

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Foreword

Working Group on Ecosystem Management (EBM) and Integrated Coastal and Ocean Management (ICM) by 2010 in the Context of Climate Change and Working Group on Indicators for Progress

Achievement of the global goals established by heads of State at the 2002 World Summit on Sustainable Development is essential for attaining sustainable development of oceans and coasts. Yet, implementing the paradigms of Integrated Ocean and Coastal Management (ICM) and Ecosystem-based Management (EBM) at national and regional levels and in areas beyond national jurisdiction (64% of the ocean) has proven difficult and faced many obstacles. Global Conference participants in Hanoi will assess (within the limits of available data) the extent to which, and under what circumstances, progress is being (or not being) made in achieving implementation of ICM and EBM in areas of national jurisdiction (coastal zones and Exclusive Economic Zones), in various transboundary ocean regions, and in ocean areas beyond national jurisdiction. A major aspect of this work will be to determine what kind of indicators on ecosystem-based management and integrated ocean and coastal management are needed in order to take stock of tangible progress achieved in addressing coastal and ocean management challenges.

With regard to EBM and ICM, the WSSD established goals to:

- Encourage the application of the ecosystem approach by 2010 for the sustainable development of the oceans, particularly the management of fisheries and conservation of biodiversity.
- Promote integrated coastal and ocean management at the national level and encourage and assist countries in developing ocean policies and mechanisms on integrated coastal management.
- Assist developing countries in coordinating policies and programs at the regional and sub-regional levels aimed at conservation and sustainable management of fishery resources and implement integrated coastal area management plans, including through the development of infrastructure.

Two Global Forum Working Groups— Working Group on Ecosystem Management (EBM) and Integrated Coastal and Ocean Management (ICM) by 2010 in the Context of Climate Change and Working Group on Indicators for Progress--have been working in tandem to produce initial information on the application of EBM/ICM at national and regional areas and in areas beyond national jurisdiction, as well as on indicators that have been utilized by various international and national entities to measure progress on EBM/ICM. The information contained in this Policy Brief is at a preliminary stage of development at this point and will be much revised and enriched through the discussions at the Global Conference related to the EBM/ICM issues and through the application of insights arrived at by the ten other Working Groups on topics related to EBM/ICM.

Following the Global Conference, the results of the discussions and of all the Working Groups will be used to prepare a global report providing a report card on how far we have come, what obstacles must be overcome, what needs to be done, what emerging issues must be addressed, what funding is needed, and what capacity must be developed to further propel the implementation of integrated and ecosystem-based management approaches to governance of the world's oceans. The report card will also take into consideration the effects of climate change on ocean and coastal ecosystems and peoples, as outlined in the 2007 IPCC report of the Intergovernmental Panel on Climate Change.

Major Discussion Goals on EBM/ICM at the Global Conference

Given the preliminary information developed in this Policy Brief, the main discussion goals on EBM/ICM at the Global Conference are:

1. To reiterate overall agreement on the conceptual basis of EBM/ICM and their interrelationship.
2. To review in detail, to the extent possible given the available information, the existing experiences of applying the EBM and ICM practices at national and regional levels, and in areas beyond national jurisdiction.
3. To consider and develop recommendations on modalities for mobilizing ongoing systematic review of progress (or lack thereof) on a periodic basis in this area through the combined actions of national and international entities.
4. To consider and develop recommendations on the indicators that might be utilized in such systematic review of progress.
5. To consider and develop recommendations on priority actions that should be undertaken by national and international entities to further advance the application of ICM/EBM in national and regional areas and in areas beyond national jurisdiction.

The special collaboration of various offices of the US National Oceanic and Atmospheric Administration (National Marine Fisheries Service, National Ocean Service (including the Coastal Services Center)) in the preparation of this Policy Brief is acknowledged with sincere thanks.

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Policy Brief:

Ecosystem Management and Integrated Coastal and Ocean Management by 2010 in the Context of Climate Change

1. INTRODUCTION

Over half of the world's population lives along the coast on only 10% of the Earth's land, creating intense pressure on coastal habitats and resources. Much of the booming global population relies on oceans for food, waste disposal, energy production, marine transportation supporting an increasingly global economy, and views the coasts as source of inspiration and a preferred leisure destination.

Nearly 75% of the world's marine capture fisheries are considered to be fully or overexploited and have essentially reached their maximum potential at about 100 million metric tonnes/year (FAO 2006). Any additional catches will likely come from rebuilding depleted stocks, but instituting effective policies to do so vary considerably across the globe.. Ensuring sustainable harvest of the ocean's valuable resources is but one aspect of managing multiple uses and expectations from ever more crowded oceans and coasts. It is widely recognized in governmental policies and by the public that natural resource management policies need to take a more holistic, or ecosystem approach. Concurrently, coastal managers are recognizing the challenges inherent to managing coastal resources based on small scale, political boundaries and are also embracing a more holistic, integrated approach to management. Consequently, managers are now augmenting single species, resource-specific management plans to incorporate ecosystem-based management (EBM) approaches to

natural resource management and integrated coastal management

Closely related to EBM is the concept of integrated coastal management (ICM). A well-documented approach with a history of implementation in countries worldwide, ICM shares a host of principles with EBM, and the two concepts are generally regarded as complementary, yet with differing areas of emphasis. The driving force of ICM is typically accommodating multiple to achieve sustainable development of coastal and ocean areas. EBM offers a more explicit focus on maintaining ecosystem service functions. Although ICM is articulated and embraced in a number of international and national policies and agreements, and EBM is a more recent paradigm with conceptual work still underway, the two practices will be needed in concert to address the monumental challenges facing the world's coastal and ocean areas.

Global Goals on EBM and ICM

The Johannesburg Plan of Action (JPOA) of the World Summit on Sustainable Development (WSSD) calls for “the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision V/6 of the Conference of Parties to the Convention on Biological Diversity.” Significant progress has been made in the technical development and implementation of the ecosystem approach to management (EBM). EBM is being implemented widely, both as a formal approach and informally through local, national, and international multi-sectoral management efforts. The concept has been incorporated widely in national ocean policy statements (e.g., EU Marine Strategy, Canadian Oceans Act, Report of the U.S. Commission on Ocean Policy), national legislation (e.g., U.S. Endangered Species Act), international and intergovernmental agreements (e.g., APEC’s Bali Plan of Action, Convention for the Conservation of Antarctic Living Marine Resources, Benguela Current Commission, Guinea Current Commission, UNEP Regional Seas Programme) and a host of research, assessment and management programs (e.g., the Large Marine Ecosystem (LME) programs).

The JPOA also calls for the “promotion of integrated coastal and ocean management at the national level and encouragement and assistance to countries in developing ocean policies and mechanisms on integrated coastal management.” Although the JPOA suggested no explicit deadline for achieving this goal, much progress has been documented in this area, specifically in adoption and implementation of major international ocean agreements, new ICM initiatives

by national and local governments, the development of new ocean and coastal knowledge, data, and information systems, and the creation of new ocean and coastal management funding initiatives. Recent estimates indicate that over 100 countries have now implemented ICM programs, due in part to ICM being recommended for ocean and coastal management in key international guidance such as the UN Conference on Environment and Development (UNCED), including Agenda 21, the Rio Declaration of Principles, the Climate Change Convention, the Biodiversity Convention, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, and the Barbados Programme of Action for the Sustainable Development of Small Island States. Additionally, ICM principles have been articulated and embraced by a number of international institutions including the Organization for Economic Cooperation and Development (OECD), the World Bank, and the World Conservation Union.

The purpose of this policy brief is to broadly assess the progress in the achievement of the WSSD goal on the implementation of ICM and EBM by 2010 by: determining trends in the operationalization of ecosystem management and integrated coastal and ocean management; identifying gaps in implementation; assessing potential for improvement; and recommending tangible priority next steps to decision-makers.

The WSSD 2010 goals on achieving ecosystem management and integrated coastal and ocean management is of primary concern for this report, though it is influenced by and linked to many of the other WSSD goals and targets

being addressed by other Global Forum Working Groups. Challenges to assessing progress toward these goals include the need to mobilize political and public will, the need for adequate funding and capacity development, and the need for integration among sectors and agencies. If progress is to be made on ecosystem management and integrated coastal and ocean management, the overarching, cross-cutting issues of poverty reduction, capacity development, compliance and enforcement, monitoring and evaluation, and public education and outreach will have to be concurrently addressed.

The Imperative of Addressing Climate Change Impacts Through EBM/ICM

The oceans play a significant role in regulating the global climate and moderating weather systems around the world. Changes in climate can have a profound impact on the functioning of ocean, coastal and island ecosystems, such as through changes in coastal flooding, storm intensity, and changing current patterns. The 2007 Intergovernmental Panel on Climate Change reports significant warming, sea level rise, increased storm activity, changing precipitation and wind patterns, and ocean acidification, among other climate change effects, that affect each region differently. These trends are projected to increase and continue with a 2.0 to 11.5 Fahrenheit degree rise and a 7.08 to 23.22 inch sea level rise during the 21st century, and increasing threats to biodiversity and essential habitats. Unfortunately, the most severe effects will be felt by developing countries, those that least contributed to the problem and the least able to adapt (see the report from

the Global Forum Working Group on Oceans, Climate, and Security).

Six key issues impact coasts and oceans and need to be addressed through a coordinated program of action:

- increasing acidification of the oceans and its impacts on sensitive plants and animals, such as coral reefs, bivalves, crustaceans, and plankton,
- loss of sea ice at both poles, and the ensuing impact on Arctic and Antarctic ecosystems,
- climate change impacts on fresh water flows and corresponding impacts on coastal habitats and anadromous species,
- sea level rise and its impacts on coastal ecosystems and communities,
- ocean warming effects on the productivity of marine ecosystems and distribution patterns of animals and invasive species, and
- understanding the simultaneous impacts of long-term climate change on ocean ecosystems in the context of natural scales of variation in ocean climate.

SIDS are especially vulnerable to climate change with a high risk of beach erosion, sea level rise, coral bleaching, and water resource reduction. In addition, SIDS are heavily dependent upon marine and coastal resources to support local economies and livelihoods and have little capacity for adaptation. Also vulnerable are communities in river and coastal flood plains, areas with extreme weather, and areas of rapid growth and urbanization. The effects of climate change will exacerbate

many of the problems and issues already occurring in the marine environment (see the report of the Global Forum Working Group on Small Island Developing States).¹

2. STATUS AND TRENDS IN OCEAN AND COASTAL ECOSYSTEMS AND PEOPLES

A wide variety of assessment studies have been carried out in recent years to assess status and trends in ocean and coastal ecosystems and peoples. Deteriorating coastal conditions and increased multiple uses highlight the need to approach ocean and coastal management through EBM and ICM.

Among the major studies that have been carried out are the following: Millennium Ecosystems Assessment—Status and Trends in World Ecosystems; Global Marine Assessment – 2003 and Assessments of Assessments GRAME Survey (ongoing); Millennium Development Goals (MDGs)—Tracking Progress in Coastal Areas; Census of Marine Life; FAO Status of World Fisheries and Aquaculture (SOFIA) and the Ecosystem Approach to Fisheries; Status of Coral reefs of the World (GCRMN/ICRAN); Global International Waters Assessment (GIWA); UN Millennium Project; Global Environment Outlook (GEO) Year Book 2007; Global Biodiversity Outlook; GESAMP –“A Sea of Troubles;” Intergovernmental Panel

on Climate Change (IPCC); Global Ocean Observing System; Regional Assessments –OSPAR, HELCOM, Regional Seas Programme, Regional Fishery Bodies; State of the Nation’s Ecosystems –Heinz Report; World Wildlife Fund Living Planet Index; and Global Marine Species Assessment.

Implementing EBM requires baseline and monitoring data for both ecological and socioeconomic components of the ecosystems. Despite the above major studies, currently there are only a few marine ecosystems with systematically collected, long-term data on the status and trends of natural and social systems. This lack of data and long-term monitoring capacity is a significant impediment to the implementation of the ecosystem approach. Data on the socioeconomic status of coastal communities is also essential in order to determine whether the Millennium Development Goals (MDGs) are being met in coastal communities. With no periodic assessment of the socio-economic status of coastal communities, it is not possible to measure progress on the MDG goal of alleviating poverty in the context of coastal areas.

Most of the global marine and environmental assessments that have been conducted have found serious declines in marine living resources, losses of coastal habitats, elevated pollution levels, poor water quality in many areas, and overall deterioration of the marine environment exacerbated by the effects of climate change. Coastal communities and local economies are adversely impacted by such trends as poverty, land use changes, overfishing, nutrient loading, sewage, and developments which put the capacity of the marine environment beyond its sustainable limit.

¹ The Global Forum Working Group on Climate, Oceans, and Security is addressing these issues as will the Working Group on Small Island Developing States. The Climate group will assess effects both in terms of community-related impacts (adaptation, environmental refugees, public health) and ecologically-related impacts (natural disasters, sea level rise, ocean acidification, ocean warming) on specific regions and SIDS countries.

3. EBM AND ICM AND THEIR INTER-RELATIONSHIP

EBM: An Emerging Scientific Consensus

Over the past decade, broad consensus has emerged on the principles that constitute an EBM. Publications, such as the report of the U.S. Ecosystems Principles Advisory Panel (EPAP) (1999), Sissenwine and Mace (2001), McLeod et al.(2005) and Sissenwine and Murawski (2004) Murawski (2007) have elaborated sets of principles or objectives that should be included in any attempt to apply EBM. Intergovernmental organizations such as the Convention on Biological Diversity (CBD 2006) and the Food and Agriculture Organization of the United Nations (FAO) (FAO 2005) have published guidelines for the application of an ecosystem approach. Initiatives such as the Large Marine Ecosystem projects have attempted to operationalize EBM in a regional, international context. Taken together, these constitute significant experience with the development and implementation of EBM.

Although there is not a single set of agreed principles or operational objectives for EBM, there is substantial overlap among the efforts cited above. For the purposes of gauging progress toward the JPOA goals, it would be useful for the 4th Global Conference to establish a general set of principles for EBM so that governments, NGOs, IGOs and others can establish performance measures of EBM implementation and

assess future accomplishments. Below is a proposed common set EBM principles taken from multiple sources. Table 1 shows the sources of the principles.

Common EBM Principles:

- EBM is geographically specified, with ecosystem units corresponding to the temporal and spatial scales of management challenges.
- EBM takes into account ecosystem knowledge and uncertainties and applies a precautionary approach in cases where predictive ability is limited.
- EBM recognizes that ecosystem change is inevitable.
- Priority targets of EBM should include the conservation of ecosystem structure and function.
- In EBM, management should be decentralized to the lowest appropriate level.
- EBM should encourage participation from all relevant stakeholders and scientific disciplines.
- EBM should strive to balance diverse societal objectives that result from resource decision making and allocation.
- Recognizing that ecosystem processes are characterized by varying temporal scales and lag-effects, objectives for EBM should be set for the long term.
- EBM should be implemented incrementally and adaptively.

Table 1. Various sets of principles for an Ecosystem Approach to Management.

Principle	Source						
	Australia	CBD	EPAP	FAO	McLeod et al (2005)	Sissenwine Murawski (2004)	U.K.
#1 – Geographically specified		X			X	X	X
#2 – Takes into account uncertainty	X		X	X	X	X	
#3 – Change is inevitable		X	X			X	
#4 – Conserves ecosystem structure and function	X	X		X	X	X	
#5 – Management should be decentralized		X					X
#6 – Involves all relevant sectors	X	X	X		X	X	
#7 – Balances diverse societal objectives		X				X	
#8 – Recognizes temporal scales and lag effects		X			X	X	X
#9 – Implemented incrementally and adaptively	X		X		X	X	

ICM: An Established Framework

With several decades of application, much has been written about ICM and numerous case studies of ICM implementation and associated lessons learned have been documented (Clark 1996; Cicin-Sain and Knecht 1998; Chua 2006). A host of international agreements and organizations, such as the Convention on Biological Diversity (CBD), the United Nations Environment Programme (UNEP), and the Food and Agriculture Organization (FAO) have articulated frameworks, goals, and principles of ICM, and despite minor variations, there is generally a great degree of consensus on what distinguishes ICM from other management approaches. The World Bank (1998) offers the following distinguishing characteristics of ICM:

- ICM moves beyond traditional approaches, which tend to be sectorally oriented and fragmented in character and seeks to manage the coastal zone as a whole using an ecosystem approach where possible.
- ICM is an analytical process that advises governments on

priorities, trade-offs, problems, and solutions.

- ICM is a dynamic and continuous process of administering the use, development, and protection of the coastal zone and its resources towards transparently-agreed objectives.
- ICM employs a multidisciplinary, holistic systems perspective, which recognized the interconnections between coastal systems and uses.
- ICM maintains a balance between protection of valuable ecosystems and development of coast-dependent economies. It sets priorities for uses, taking account of the need to minimize the impact on the environment, to mitigate and restore if necessary, and to seek the most appropriate siting of facilities. These are the activities contained in Environmental Impact Assessments.
- ICM operates within established geographic limits that usually include all coastal

resources, as defined by governing bodies.

- ICM seeks the input of all important stakeholders to establish policies for the equitable allocation of space and resources in the coastal zone. An appropriate governance structure is essential for such decision making and oversight.
- ICM is an evolutionary process, often requiring iterative solutions to complex economic, social, environmental, legal, and regulatory issues.
- ICM integrates sectoral and environmental needs. ICM should be implemented through specific legal and institutional arrangements at appropriate levels of the government and the community.
- ICM provides a mechanism to reduce or resolve conflicts that may occur, involving resource allocation or use of specific sites as well as the approval of permits and licenses.
- ICM promotes awareness at all levels of government and community about the concepts of sustainable development and the significance of environmental protection. It is proactive (incorporating a development planning element) rather than reactive (waiting for development proposals before taking action).

EBM and ICM: Similarities and Differences

There are broad similarities between EBM and ICM, especially in regard to the shared goals of maintaining functioning ecosystems and the sustainable use of coastal and marine resources. A further examination of the operation of EBM and ICM also

highlights important similarities, particularly the guiding principle of integration (inter-sectoral and inter-governmental) and the emphasis on management of human activities (de Mooy 2007²).

There are, however, key distinctions between the two approaches in terms of defining ecosystems and the priority of the management approach. In defining ecosystems, both process-based and place-based approaches are utilized, though spatial boundaries are generally needed to define the parameters of an ecosystem in which to effectively manage human activities. However a managed area is defined for the purposes of governance, though, ecosystems processes influence coastal and marine environments at many scales. Thus, the influences to the coastal area that should be considered will range further out to sea as well as further inland.

The issue of priority rests on whether EBM assumes an implicit primacy of the ecosystem. Some sources suggest that: 1) the three central elements of sustainable development – environment, economy, and social equity – are not equally weighted; and 2) although humans are part of the ecosystem, human activities are generally considered as “impacts” to healthy, functioning ecosystems. Other sources acknowledge the goal of EBM as the sustainable use of coastal and marine resources – noting, however, that in striving toward sustainable

² Paper written by Jennifer de Mooy on *Ecosystem-based Management (EBM) and Integrated Coastal and Ocean Management (ICM): Issues and Implications for Operationalization* as part of the Working Paper Series on Progress on Meeting the Global Goals of Achieving Ecosystem Management and Integrated Coastal and Ocean Management by 2010 in the Context of Climate Change (see Annex x).

development, there may be difficult choices between environmental, economic, and social goals. The implied principle may be that ecosystem health is a priority for the reason that without it, ecological services and resources cannot meet human economic and social needs. In comparison, ICM sources more clearly and consistently regard sustainable development as a key goal – assuming a balance of the three elements of environment, economy, and social values.

Among the many ICM programs operating worldwide, the guiding principle of integrated management – at both sectoral and governmental levels – is the vehicle for achieving sustainable uses of the coastal environment.

In conclusion, EBM presents a valuable set of principles, but the practice of operationalizing EBM is still evolving. ICM adopts many of the same principles and adds significant experience of application. Both approaches are highly complementary – indeed, putting their shared principles into practice illustrates the strength of the integrated approach to the coastal and ocean management (de Mooy 2007).

The UNICPOLOS process in 2006 incorporated a module on demystifying the concepts and understanding the implications which clarified the

similarities and distinctions among the two approaches.

4. IMPLEMENTATION OF EBM AND ICM AT NATIONAL AND REGIONAL LEVELS AND IN OCEAN AREAS BEYOND NATIONAL JURISDICTION

Implementation of EBM and ICM at the National Level

Coastal/Nearshore Management

ICM has now been implemented in about 100 countries around the world. However, many of these initiatives have been focused on estuaries and small areas of coasts instead of national programs. Successful pilot projects should now be scaled up to national efforts on ICM. Furthermore, implementation of ICM and EBM at the national level is not being tracked systematically. Informal efforts have nonetheless been made. A study by Sorensen in 2002 showed that there were more than 700 ICM initiatives (including at the local level) in more than 90 nations around the world (Sorensen 2002). Data collected by Cicin-Sain et al in 2000 showed significant increase in ICM efforts around the world from 1993 to 2000 (Table 2), although there were substantial differences in the extent of ICM activity in various regions of the world (Cicin-Sain et al, 2000).

Table 2: Coastal Countries with ICM Efforts, 1993 and 2000 Comparison

Continent	Coastal countries	1993		2000	
North America	3	3	100%	3	100%
Central America	7	4	57%	7	100%
Europe	33	11	31%	30	91%
Asia	17	13	62%	14	82%
South America	11	5	45%	8	73%
Caribbean	13	5	45%	8	62%
Near East	15	6	40%	7	47%
Oceania	17	7	33%	8	47%
Africa	37	5	13%	13	35%
Total		59		98	

Source: Cicin-Sain et al 2000.

Unfortunately, there are no data available at the global level to ascertain further progress (or lack thereof) in integrated coastal and ocean management since the efforts noted above.

Aggregate data on the Convention on Biological Diversity (CBD) Third National Reports does show that as of January 2007, 83 coastal or island nations and the European Community have submitted Third National Reports

to the Secretariat of the CBD (an additional 28 reports were submitted by non-coastal States for a total of 112 reports). Of the parties to the Convention who had not yet submitted their Third National Reports, 65 were coastal or island nations. Only 12 of the 37 small island developing States identified by CBD had submitted reports as of January 2007. Tables 3 a-c show some of the results of these reports.

Table 3(a) *Has your country established and/or strengthened institutional, administrative and legislative arrangements for the development of integrated management of marine and coastal ecosystems?*

	No. of Countries	Percent of reporting Countries	Percent of reporting coastal Countries
No	5	4.46%	5.95%
Early stages of development	35	31.25%	41.67%
Advanced stages of development	17	15.18%	20.24%
Arrangements in place	24	21.43%	28.57%
Not applicable	0	0.00%	0.00%

The majority of reporting countries are in the early stages of addressing needed institutional, administrative and legislative arrangements for integrated

management. More than a quarter of countries report that the necessary arrangements are already in place.

Table 3(b) Has your country implemented ecosystem-based management of marine and coastal resources, for example through integration of coastal management and watershed management, or through integrated multidisciplinary coastal and ocean management?

	Number of Countries	Percent of reporting Countries	Percent of reporting coastal Countries
No	12	10.71%	14.29%
Early stages of development	45	40.18%	53.57%
Advanced stages of development	15	13.39%	17.86%
Arrangements in place	8	7.14%	9.52%
Not applicable	0	0.00%	0.00%

Table 3(c) Has your country identified components of your marine and coastal ecosystems, which are critical for their functioning, as well as key threats?

	No. of Countries	Percent of reporting Countries	Percent of reporting coastal Countries
No	11	9.82%	13.10%
Plans for a comprehensive assessment of marine and coastal ecosystems are in place	17	15.18%	20.24%
A comprehensive assessment is currently in progress	21	18.75%	25.00%
Critical ecosystem components have been identified, and management plans for them are being developed	27	24.11%	32.14%
Management plans for important components of marine and coastal ecosystems are in place	17	15.18%	20.24%
Not applicable	0	0.00%	0.00%

Exclusive Economic Zone Management

A recent development on which there is growing documentation, however, concerns integrated oceans management further offshore than most coastal management efforts, incorporating the 200-mile Exclusive Economic Zone (EEZ). In the last decade, a growing number of nations have undertaken concerted efforts to articulate and implement an integrated vision for the governance of their EEZ

areas—to harmonize existing uses and laws, to foster sustainable development, to protect biodiversity and vulnerable resources and ecosystems, and to coordinate the actions of the many government agencies that are typically involved in ocean affairs. It is estimated by the Nippon Foundation Research Task Force on National Ocean Policies that about 40 countries have taken concrete steps toward cross-cutting and integrated national ocean policy

(Cicin-Sain, VanderZwaag, and Balgos, 2008). At The Ocean Policy Summit held in Lisbon, Portugal, October 10-14, 2005, countries and regions reported on their efforts to develop integrated ocean policies to deal with multiple use conflicts among uses, users, and management agencies, degradation of marine resources, and missed opportunities for economic development. These different national policies are remarkably congruent in terms of overall principles and most recognize the need for transparency, public and stakeholder involvement, incentives for cooperative action, and a national ocean office with clearly articulated responsibilities.

Countries which have adopted such principles in their national ocean policies include Australia, Brazil, Canada, China, United Kingdom, Russian Federation, Jamaica, New Zealand, Norway, Portugal, United States, India, Japan, Mexico, Philippines, and Vietnam. Principles which have been incorporated into national ocean policies include sustainable development/sustainability, integrated management, ecosystem-based management, good governance, adaptive management/best available science, precautionary approach, preservation of marine biodiversity, stewardship, multiple use management, and economic/social development and poverty alleviation. This analysis can be viewed in detail in a forthcoming book by Cicin-Sain, VanderZwaag and Balgos, 2008).

Implementation of EBM and ICM at Regional (Transboundary) Level

Much effort has been focused on managing regional ocean areas in recent decades, in recognition of the interdependencies of marine resources and ecosystems. Still unclear, however, are the 'on the ground'

effects of these efforts. Though most regional programs have incorporated principles of ICM and EBM, and many have agreed upon indicators inherent in each concept, there is not much available information on the extent to which nations have operationalized the concepts in ocean and coastal management, and even less information on the effects these management provisions are having in regional ocean areas. Further research and analysis is needed to determine the direct effects ICM and EBM provisions incorporated within each program are having on regional ocean areas.

Assessment

A recent assessment of the application of integrated coastal and ocean management approaches and ecosystem-based management approaches in the context of regional ocean governance has shown that eighteen (18) Large Marine Ecosystem³ (LME) projects funded by the Global Environment Facility, approved or in the preparation stage, are mobilizing to address issues of overfishing, fishing down food webs, habitat loss, and coastal pollution. Nine of these projects have completed the Transboundary Diagnostic Analysis process to identify issues and their root causes, and have further prioritized coastal and marine issues. Nine LME projects have also developed the Strategic Action Program (SAP) development process for their region, requiring national commitment to institutionalize the SAP. All LME projects have incorporated principles of ICM and EBM, and those in operation have adopted ICM and EBM

³ Large Marine Ecosystems are ocean areas typically 200,000 km² or greater, which are characterized by distinct bathymetry, hydrography, productivity, and trophically dependent populations (Duda and Sherman 2002).

indicators (see Tables 4a-d for summaries of the application of EBM and ICM in LMEs and Regional Seas Programmes (Wowk 2007)). However, the extent to which the principles and practices of ICM and EBM have been applied by nations is unclear (Wowk 2007). At the 4th Global Conference on Oceans, Coasts, and Islands an LME Working Group will further assess progress made in LMEs, challenges to managing LMEs, and provide guidance for the enhanced management of LMEs.

- Eleven GEF approved projects underway: Baltic; Benguela Current; Black Sea; Gulf of Guinea; Mediterranean; Patagonia Shelf/Maritime Front; Red Sea; South China Sea; Western Pacific Warm Water Pool-SIDS; Yellow Sea; and Gulf of Mexico and Caribbean Sea.

⁴ Paper written by Kateryna Wowk on *Achieving Ecosystem Management and Integrated Coastal and Ocean Management in Regional Ocean Areas* as part of the Working Paper Series on Progress on Meeting the Global Goals of Achieving Ecosystem Management and Integrated Coastal and Ocean Management by 2010 in the Context of Climate Change (see Annex x).

Table 4a: Application of ICM/EBM to LME approved projects

Framework	Application
Baseline information	9 of the 11 approved LME projects have prepared or are preparing a TDA
Guiding principles of ICM/EBM	9 of the 11 projects have incorporated ICM/EBM principles in a SAP
ICM/EBM indicators	9 of the 11 projects have agreed to ICM/EBM indicators in a TDA
Operative monitoring / evaluation functions	9 of the 11 projects have operative monitoring and evaluation functions
Legally binding instrument	No legally binding instruments at this time
Domestic legislation	9 of the 11 projects have agreed upon a SAP in which the countries committed to making institutional arrangements and taking policy actions, based on sound science, to address the issues identified in the TDA.
Meeting of member states	All Large Marine Ecosystem projects are discussed at an annual meeting, though it is not clear if all member states are required to attend
Goal achievement	9 of the 11 projects have achieved the goal of problem identification; the achievement of other goals is not clear at this time

Under the UNEP Regional Seas Programme eighteen (18) regions are mobilizing to address issues of sustainable management of ecosystems and biodiversity, land- and sea-based pollution, and coastal development and integrated coastal zone management. Twelve Regional Seas Programmes (RSPs) have adopted legally binding conventions, most with associated protocols on specific issues, and 15 of the RSPs have adopted Action Plans.

The majority of RSPs have incorporated principles of ICM, and have agreed upon ICM indicators to measure success.

- Six UNEP/RSPs administered by the UNEP/RSP: Caribbean Region, East Asian Seas; Eastern Africa Region; Mediterranean Region; North-West Pacific Region; and Western Africa Region.

Table 4b: Application of ICM/EBM to UNEP/RSP administered programs

Framework	Application
Baseline information	All 6 UNEP/RSPs administered programs have baseline information incorporated in their respective Action Plans; information typically includes: levels and effects of marine pollutants; ecosystem studies; studies of coastal and marine activities; and assessments of social and economic factors.
Guiding principles of ICM/EBM	All 6 programs have incorporated ICM principles; incorporation of principles specific to EBM is unclear at this time
ICM/EBM indicators	All 6 programs have identified ICM indicators; identification of indicators specific to EBM is unclear at this time
Operative monitoring / evaluation functions	4 of the 6 programs have operative monitoring and evaluation functions
Legally binding instrument	4 of the 6 programs have a legally binding instrument
Domestic legislation	The status of domestic legislation of member states is unclear at this time
Meeting of member states	All member states to conventions meet annually to discuss progress and provide recommendations for enhanced governance
Goal achievement	Unclear at this time

• Seven UNEP/RSPs administered by a regional organization: Black Sea Region; North-East Pacific Region; Red Sea and Gulf of Aden; ROPME

Sea Area; South Asian Seas; South-East Pacific Region; and Pacific Region.

Table 4c: Application of ICM/EBM to regionally administered regional seas programs

Framework	Application
Baseline information	All 7 UNEP/RSPs administered by a regional organization have baseline information incorporated in their respective Action Plans; information typically includes: levels and effects of marine pollutants; ecosystem studies; studies of coastal and marine activities; and assessments of social and economic factors.
Guiding principles of ICM/EBM	All 7 programs have incorporated ICM principles; incorporation of principles specific to EBM is unclear at this time
ICM/EBM indicators	All 7 programs have identified ICM indicators; identification of indicators specific to EBM is unclear at this time
Operative monitoring / evaluation functions	6 of the 7 programs have operative monitoring and evaluation functions
Legally binding instrument	6 of the 7 programs have a legally binding instrument
Domestic legislation	The status of domestic legislation of member states is unclear at this time
Meeting of member states	All member states to conventions meet annually to discuss progress and provide recommendations for enhanced governance
Goal achievement	Unclear at this time

- Five RSPs administered by independent programs: Arctic Region; Antarctic Region; Baltic Sea; Caspian Sea; and North-East Atlantic Region.

Table 4d: Application of ICM/EBM to independent regional seas programs

Framework	Application
Baseline information	3 of the 5 independent programs have baseline information
Guiding principles of ICM/EBM	3 of the 5 programs have incorporated principles of ICM and EBM
ICM/EBM indicators	3 of the 5 programs have agreed upon ICM and EBM indicators
Operative monitoring / evaluation functions	3 of the 5 programs have operative monitoring and evaluation functions
Legally binding instrument	3 of the 5 programs have a legally binding document
Domestic legislation	The status of domestic legislation of member states is unclear at this time
Meeting of member states	All member states to conventions meet annually to discuss progress and provide recommendations for enhanced governance
Goal achievement	Unclear at this time

Fewer programs have incorporated principles and indicators specific to EBM, though this is likely to change as the concept gains momentum, consensus, and international acceptance. The recent meeting of the UNEP/RSPs addressed the next steps following the global strategic directions, 2004-2007, with a major focus on ecosystem approaches (Wowk 2007). There is growing interest in the consistent application of the ecosystem management approach to the management of regional seas. Toward this goal, the Regional Seas Programme is currently developing a “Manual on the Ecosystem Approach to the Regional Seas Programmes”.

This manual seeks to follow up the commitments of the 2002 Johannesburg World Sustainable Development Summit to “encourage the application by 2010 of the ecosystem approach” to the management of human activities that may affect the oceans (UNEP Regional Seas Program 2007). The work by a Chatham House Panel, with government support, developed a comprehensive suite of recommended best practices for regional fisheries management organizations (RFMOs), which, among other objectives, addresses the challenge of implementing ecosystem-based

management approaches to fisheries (Lodge et al 2007).

Protocol on Integrated Coastal Zone Management in the Mediterranean: A Model

Despite several international and national efforts in recent decades to ensure sustainable management of coastal natural resources, coastal areas throughout the Mediterranean still face severe pressures and problems, which threaten coastal resources and undermine the viability of economic activities. With the significance of the coastal areas widely recognized and with intense pressure to act in the face of the alarming state of the coastal areas in the region, e.g., increasing population growth on the south shores, changing agricultural production systems towards more intensive and resource demanding uses in the north and in the south, industrial development and expanding transport infrastructure, mostly for expanding tourism leading to increasing concentration of population and economic activities in coastal areas, a feasibility study of a regional legal instrument on sustainable coastal area management in the Mediterranean was recommended by the 12th meeting of the Contracting Parties of the 1995 Barcelona Convention⁵, held in Monaco in November, 2001. The Feasibility Study, prepared in 2002/3, demonstrated the need for a regional legal instrument, at both the technical and environmental levels. Preference among stakeholders was established

⁵ The Barcelona Convention is the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, signed in Barcelona on 16 February 16, 1976, as amended on 10 June 1995 to address sustainable development challenges. The Barcelona Convention and its Protocols are the legal basis of the Mediterranean Action Plan (UNEP/MAP), the first Regional Sea Programme developed by the United Nations Environment Programme.

for a legal binding instrument, rather than a “soft” instrument, which was justified by the alarming state of coastal areas in the region and the disadvantages of a status quo (Priority Actions Programme 2005-2006). After a series of consultations, the Final Act of the Conference of the Plenipotentiaries on the ICZM Protocol was signed in Madrid on January 21, 2008.

The ICZM Protocol mandated the establishment of a common framework for the integrated management of the Mediterranean coastal zone and provides for the implementation of necessary measures to strengthen regional co-operation for this purpose. The implementation of this new legal instrument for international cooperation is acknowledged as an opportunity to provide a model for the management of other regional seas⁶.

Implementation of EBM and ICM in Areas Beyond National Jurisdiction⁷

The question of governance of the 64% of the oceans that lies beyond national jurisdiction looms as a major issue that countries will need to address and negotiate over in the next decade. This is an area where many ocean industries operate producing important benefits to the global and regional economies. While there has been substantial progress in recent years in achieving integrated oceans governance in areas under national jurisdiction and in regional seas areas, governance of areas beyond national jurisdiction at

⁶ For more information about the Protocol on Integrated Coastal Zone Management in the Mediterranean, download the ICZM protocol at <http://www.pap-thecoastcentre.org/razno/PROTOCOL%20ENG%20IN%20FINAL%20FORMAT.pdf>

⁷ This issue area is being addressed in-depth by the Global Forum Working Group on Governance of Marine Areas Beyond National Jurisdiction.

present remains largely sectorally-based and fragmented. This means that it is difficult to address interconnected issues (such as fishing issues; extraction of genetic resources; maritime transportation; pollution; offshore oil and gas development; marine scientific research; climate change; carbon sequestration and storage). There are, moreover, significant differences of opinion among developed and developing countries, industries, and environmental interests, on what needs to be done to improve governance of these important ocean areas.

There are ongoing formal and informal policy development initiatives underway, with the intent to contribute to clarifying the issues, laying out various perspectives, developing options, and identifying possible avenues for consensus-building among disparate interests. A Global Forum Working Group on Governance of Marine Areas Beyond National Jurisdiction is addressing these issues, and their key findings will be subsequently incorporated into this report.

Scientific investigations in the high seas are moving forward at an accelerated pace, in part driven by commercial interests in marine genetic resources and in part by the unfolding of the richness in biological diversity in these marine areas, and the need to acquire sound scientific basis for management interventions, particularly for vulnerable marine ecosystems. For example, the Hotspot Ecosystems Research at the Margin of European Seas (HERMES) is contributing information on the natural drivers controlling ocean margin ecosystems, topographic maps, mapping of ecosystem and habitat occurrence, description of habitat and ecosystems,

understanding biodiversity and ecosystem functions, forecasting changes in ecosystems, inventories of deep-sea habitats, identification of priority ecosystems in need of protection, strategies for the sustainable use of marine resources, methods and baselines for monitoring, and technology advancement (HERMES 2006).

In the case of deep seabed habitats such as hydrothermal vents, information is needed on how specific human uses affect ecosystem structure, functions, and properties. It is important to emphasize that ecosystem-based management aims to maintain the integrity of the ecosystem not only for its value in providing human needs and wants, but also for its intrinsic value. Although research activities and/or bioprospecting currently represents the major threat to hydrothermal vents, it is also important to study the potential impacts of potential uses such as seabed mining and development of hydrogen fuel as well as of global climate change. An array of ecological indicators has to be monitored in order to assess the effectiveness of management strategies in addressing the objectives of maintaining biodiversity, species distribution and abundance, primary production and reproduction, trophic interactions, mortalities below thresholds, species health, water and sediment quality, and quality of deep seabed habitats (UNESCO 2006a).

5. PRIORITY POLICY ISSUES

Challenges and Obstacles to the Implementation of EBM and ICM

Despite the demonstrated progress, some general challenges remain to the

full implementation of EBM and ICM. These include:

- Insufficient data and information on marine ecosystem structure, function, and processes to permit a more comprehensive and technical EBM and ICM;

In some areas, both a lack of overall data collection and a complete understanding of ecological processes limit the implementation of EBM and ICM. Such limited data often allows for qualitative, rather than quantitative, understanding of relationships.

- Institutional and sectoral resistance and inertia;

Limited knowledge and resources often lead to resistance against change in management policies. Resistance can also occur due to sector-specific management authorities reluctance to relinquish authority, lack of high level cooperation, objections to specific measures (e.g. marine protected areas), and perceived costs.

- Lack of appropriate decision frameworks to manage the complexity, uncertainty, and tradeoffs inherent in an EBM;

There is often inadequate information to conclusively address all technical issues and managers must balance risk. Priorities for science to reduce uncertainty and improve risk assessment must be addressed. Improved models are needed to better assess the risk associated with alternative policy options and better understand the costs and benefits associated with each one.

- Lack of political will;

There is often a lack of political will to make decisions in controversial and/or uncertain situations. The challenge is to use the accumulation of knowledge gained in uncertain circumstances to adapt and improve EBM measures. Another challenge arises when there are disparities between ecosystem boundaries and political jurisdiction creating a lack of political due to the question of authority.

- Lack of capacity to implement the new, more challenging, approaches;

EBM can be challenging when the institutions to implement new management practices are not already in place. Many nations may lack the scientific support and management structures to implement these new ideas. Furthermore, poorly organized management structures can lead to policy gaps. Frequently, managers are tied to existing legislation and do not have the capacity to implement new strategies.

- Limited funding for ecosystem science and management institutions;

Lack of funding is often the greatest challenge and appears to be a universal issue. The fiscal and human resources needed to support scientific research are often not present and can be an impediment to EBM implementation. Consequently, EBM will often have to rely on existing data and be incorporated into the management frameworks already operating.

- Lack of monitoring and evaluation practices;

The use of indicators and performance measures can be essential to recognizing needed programmatic

adaptations and can help demonstrate the results and utility of a program. Although there exist a number of localized monitoring and evaluation efforts, there is no coherent, widely recognized set of indicators with which to gauge the implementation and effectiveness of EBM and ICM.

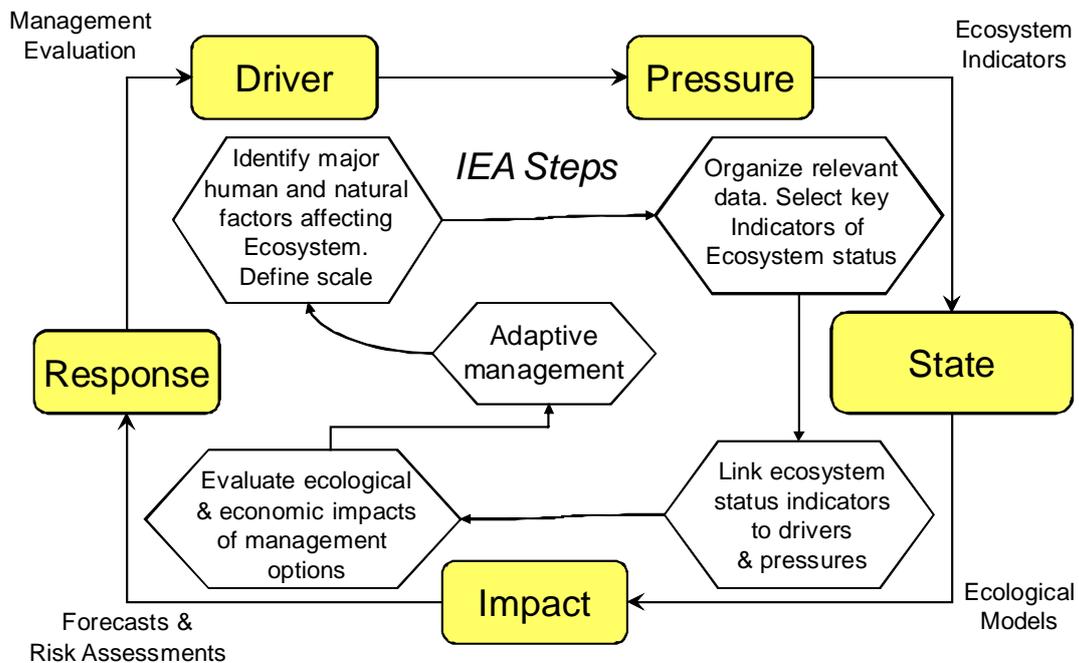
- Inadequate process guidance for implementation of ICM and EBM;

Although a number of sources have offered frameworks and explicit procedural guidance for implementation of ICM, EBM is often characterized as a set of guiding principles rather than a clearly defined process. As such, managers struggle with how to operationalize EBM and how to put those concepts into action.

- Lack of widespread adoption of integrated ecosystem assessments as a framework for implementing EBM/ICM

It is widely recognized that an integrated approach to the integrated governance, ecosystem science and decision making is required to undertake complex management requirements of EBM/ICM. One tool for this is an integrated process of assessment enveloping problems identified through governance structures, scientific monitoring, and decision support tools. Integrated ecosystems assessments offer such a framework, and, if implemented more widely, would allow progress on many of the issues identified above. A process diagram for integrated ecosystem assessments (IEAs) follows:

Development of Integrated Ecosystem Assessments



6. GOALS, TARGETS, AND OBJECTIVES TO ADDRESS PRIORITY AREAS

Incorporate ICM into EBM and vice versa

- Strengthen linkages between ICM and EBM initiatives
- Develop governance arrangements to incorporate both ICM and EBM
- Foster implementation of EBM and ICM by sharing of baseline information, best practices, and lessons learned during implementation.
- Build capacity to support ecosystem-based management and integrated coastal management programs

Develop and Implement Measures of Progress

A review of existing progress indicators for ecosystem management and integrated coastal and ocean management, as well as a review of the issues surrounding implementation of such indicators is currently being undertaken by the Global Forum Working Group of Indicators for Progress⁸ and work to date is included in the Appendix. Included in the review are the ICM indicators developed by IOC, GESAMP, The World Bank, IUCN, The European Commission, OECD, Coastal Resources Center, University of Rhode Island, NOAA, PEMSEA, and the EBM principles and indicators developed by COMPASS, CBD, United Nations, General Assembly, OSPAR Commission. Please see the

⁸ The Global Forum Working Group on Indicators for Progress has been organized to examine the development of a common set of indicators to gauge global progress in achieving critical coastal and ocean goals.

draft report of the Working Group in the Appendix. Many thanks are due to Margaret Davidson, Ginger Hinchcliff, and Zac Hart of the NOAA Coastal Services Center for preparing the Appendix.

As indicated in the above discussion, some progress has been made in the implementation of EBM and ICM. However because these concepts are broad, any targets or objectives for their improved implementation must be defined more specifically. For this purpose, a limited number of process measures could be established to track implementation of EBM and ICM relative to JPOA goals. The following set of process measures is being put forward as an example:

- The number of countries implementing multi-sectoral approaches to resource management (OECD 1997, Rupprecht Consult and International Ocean Institute 2006).
- The number of countries with fishery management processes that include habitat protection, by-catch reduction, place-based management, and regulations to end overfishing.
- The number of countries with ICM plans in place (OECD 1997, Olsen 2003, PEMSEA 2003, Rupprecht Consult and International Ocean Institute 2006)
- The number of countries that have developed and/or implementing UNEP GPA National Plans of Action.
- The number of UNEP Regional Seas conventions adopting LBA protocols.
- The number of countries with MPAs and/or marine zoning structures implemented (OECD

1997, Pomeroy et al. 2004, The World Bank 2004)

- The number of countries with national-level legislation incorporating an ecosystem approach and integrated coastal and ocean management.
- The number of international agreements or plans of action incorporating or calling for ecosystem approaches.
- The number of regional GEF LME programs implemented (PEMSEA 2003)
- The number of countries with public participation procedures included in the established ICM or EBM policy formulation (OECD 1997, The World Bank 2004).

Organize Periodic Assessments of Progress Made

Since no international organization is responsible for the tracking the progress of ICM/EBM planning and implementation activities, monitoring and evaluation of progress made has, in the past, been carried out on an informal basis.

There is a need to mount cross-national and international agency collaboration to measure systematically progress achieved in EBM/ICM on a periodic basis, most likely every 2-3 years. Global Conference participants should discuss alternative modalities for getting this important job accomplished.

Scaling up of the Application/Adoption of EBM and ICM

Well-supported pilot or demonstration sites of ICM or EBM tend to be successful. However, when scaling up from pilot sites to more widespread replication, a large percentage of the replicate sites may fail and the initial

success rate may be quite low. Over time, as experience is gained, and if the promoting institutions exhibit an adaptive management and learning culture, the success rate could eventually improve.

Enabling legislation that creates interagency/interministerial mechanisms at the national level to coordinate the ICM/EBM application and empowers and legitimizes local community and government control to establish subnational ICM, and EBM initiatives is very important. The absence of such legislation will slow the speed at which replication can occur, and the presence of such legislation will increase the rate at which replication can proceed.

Capacity development

The lack of capacity to implement EBM/ICM is perhaps the most difficult problem, both in developing and in the developed world. The Global Forum Working Group on Capacity Building has developed a set of recommendations on possible capacity development initiatives that should be taken into account.

In addition, the National Research Council of the USA recently completed a study titled: *“Increasing capacity for stewardship of oceans and coasts: A priority for the 21st century”* (NRC 2007). They concluded:

“Given the increasing stress on the world’s oceans and coastal resources from population growth, climate change, and other factors, it is vital to grow capacity—the people, the institutions, and technology and tools—needed to manage ocean resources. Many initiatives focus on specific projects rather than on growing capacity as a goal unto itself, resulting in activities that are not funded or sustained past the typically short

project lifetime. The most successful capacity-building efforts are based on periodic needs assessments and include plans to maintain and expand capacity over the long term.”

The NRC study notes the following gaps needed to more fully realize the objectives of ecosystem-based management world-wide:

- Documentation of changes in capacity through assessments that use a consistent set of criteria. Regular assessments will be needed to help programs to adapt to changing needs in long-term capacity-building efforts. Some common criteria will facilitate comparisons through time and across programs, but assessments will need to be tailored to fit the circumstances and characteristics of specific programs.
- Funding of capacity-building through diverse sources and coordinated investments by local, regional, and international donors. Building sustainable programs requires longer-term support than is typically provided by individual donors.
- Support of dynamic and committed leaders, usually local, to develop a culture of stewardship and to work with the community to develop and implement a plan of action to sustain or improve ocean and coastal conditions. Effective leaders also serve as mentors and role models that can motivate future leaders.
- Development of the political will to address ocean and coastal management challenges. Political will requires building a base of support for ocean and coastal stewardship through greater awareness of its long-term societal benefits. Public discussion of the costs and benefits of environmental sustainability—stimulated by the mass media, information campaigns, and educational programs—will heighten awareness of and build political will for necessary changes in the processes of planning and decision-making.
- Establishment of continuing-education and certification programs to build the capabilities of practitioners. This will enable current and future generations of professionals to adapt and apply the best practices to ocean and coastal management in diverse settings.
- Networking of practitioners to increase communication and support ecosystem-based management along coastlines, in estuaries, and in adjoining large marine ecosystems and watersheds. The networks will facilitate collection and integration of information and knowledge, new technologies, and Web-based data management systems in support of locally implemented, regionally effective, ecosystem-based management.
- Collaboration among programs in neighboring countries through the founding of regional centers to encourage and support integrated ocean and coastal management. The centers would link education, research, and extension to address issues of concern in the region and provide an issue-

driven, problem-solving approach to capacity-building.

In order to fill these gaps, the National Research Council study provided the following recommendations:

RECOMMENDATION 1: Future investments in capacity-building should be anchored by periodic needs assessments used to develop regional action plans.

RECOMMENDATION 2 : Capacity should be built to generate sustained funding for ocean and coastal governance.

RECOMMENDATION 4: Capacity-building programs should include programs specifically designed to develop, mentor, and reward leaders.

RECOMMENDATION 5: Networks should be developed to bring together those working in the same or similar ecosystems with comparable management or governance challenges to share information, pool resources, and learn from one another.

RECOMMENDATION 6: Regional centers for ocean and coastal stewardship should be established as “primary nodes” for networks that will coordinate efforts to fulfill action plans. These centers will require a contingent of experience-based professionals and infrastructure to serve as a resource for the entire network.

RECOMMENDATION 7: Progress in ocean and coastal governance should be documented and widely disseminated.

RECOMMENDATION 8: A high-level summit should be held on capacity-building for stewardship of

oceans and coasts. This summit should be held to demonstrate political will, with commitments to end fragmentation, and to build action plans for capacity-building based on regional needs assessments that integrate with other programs that address ocean and coastal stewardship issues.

Summary

In summary, to assist nations in building and maintaining capacity to implement EBM/ICM, the international community needs to:

--Provide support for nations to implement EBM/ICM approaches, especially in terms of adaptation to climate change and natural resource management.

--Assess progress and facilitate information exchange and best practices

--Undertake a funded, systematic effort to track and monitor ICM/EBM at national and regional levels and in marine areas beyond national jurisdiction, using common indicators, perhaps with regional and national leads.

--Fund information clearinghouses and networks, availability of experts, and the development of best practices, utilizing case analyses.

--Implement capacity building objectives as detailed above.

Strategic Opportunities for Advancement

Numerous opportunities exist for accelerated progress toward the JPOA EBM and ICM goals. These include:

- The GEF work plan. GEF continues to support, through

its International Waters, Biodiversity and Climate portfolios, projects and programs that include the ecosystem approach (e.g., the LME projects) and ICM. These efforts should be continued and increased.

- The UNEP GPA work plan. UNEP is working with countries to develop National Plans of Action (NPAs) for land-based activities. Countries that have not developed NPAs should be strongly encouraged to do so.
- Regional Fishery Management Organizations and national fishery management efforts. Fishing is a major perturbation in marine ecosystems. RFMOs and national governments should be encouraged to continue efforts to implement EBM, as called for by the UN Fish Stocks Agreement and relevant UNGA resolutions.
- National legislation. The explicit adoption of EBM and ICM principles in national and local legislation will accelerate progress in global

implementation of these approaches. For example, in the U.S., an effort is underway to refine and reauthorize the national Coastal Zone Management Act embraces EBM and ICM.

- Continued clarification of the EBM. As global discourse on EBM concepts and methodology continues to clarify how this approach is put into practice, the dramatic similarities between ICM and EBM will become even more apparent, and resource managers will gain a better understanding of how to operationalize these concepts.
- High level workshops to develop the principles for integrated ecosystem assessments (e.g., through UN-FAO)

Participants in the Global Forum should acknowledge these opportunities and work toward their implementation as means of helping achieve the goal of implanting EBM and ICM in the 2010 time frame.

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APPENDIX

Working Group on Indicators for Progress Global Forum on Oceans, Coasts, and Islands

Introduction

Among the thirteen Working Groups of the Global Forum is the “Indicators for Progress” Working Group, charged with examining development of a common set of indicators to gauge global progress in achieving critical coastal and ocean goals.

The Indicators for Progress Working Group has focused on development of indicators for the Global Forum’s Theme 1: Achieving Ecosystem Management and Integrated Coastal and Ocean Management by 2010.

This Appendix reviews the literature on implementation of ICM and EBM measures. As performance measurement often becomes increasingly complex as the scale of measurement and thus the number of parties involved increases, measurement at the global scale will be challenging. This review is intended to identify key lessons learned in indicator implementation—lessons that will aid in development of new global indicators or scaling up of existing regional and national indicators into a global assessment.

The following experiences with use of indicators are summarized using a common organizational framework:

Principles and Indicators of Integrated Coastal Zone Management (ICM)

Intergovernmental Oceanographic Commission (IOC)

Joint Group of Experts on the Scientific Aspects of Marine

Environmental Protection (GESAMP)

The World Bank

IUCN

The European Commission

Organization for Economic Cooperation and Development (OECD)

Coastal Resources Center, University of Rhode Island

National Oceanic and Atmospheric Administration (NOAA)

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Principles and Indicators of Ecosystem-based Management (EBM)

Coastal Marine Perception Application for Scientific Scholarship (COMPASS)

Convention on Biological Diversity (CBD)

United Nations, General Assembly

Protection of the Marine Environment of the North-East Atlantic (OSPAR) Commission

Other Coastal and Ocean Resource Reports:

United Nations CSC

World Resources Institute (WRI)

Global Programme of Action for the
Protection of the Marine
Environment from Land-Based
Activities (GPA/UNEP)

European Environment Agency (EEA)

Document/Project Title

A Handbook for Measuring the Progress and Outcomes of Integrated Coastal and Ocean Management, (2006)

<http://unesdoc.unesco.org/images/0014/001473/147313e.pdf>

Authoring Agency/Organization(s)

Intergovernmental Oceanographic Commission (IOC) of UNESCO

Primary Point(s) of Contact

Stefano Belfiore, Julian Barbieri, Robert Bowen, Biliiana Cicin-Sain, Charles Ehler, Camille Mageau, Dan McDougall, Robert Siron

Document/Project Summary

"Step-by-step guide to help users in developing, selecting and applying a common set of governance, ecological and socioeconomic indicators to measure, evaluate and report on the progress and outcomes of ICOM interventions." Also includes "results, outcomes and lessons learned from eight pilot case studies conducted in several countries."

Proposed Principles or Criteria

"ICOM is based on several principles, with sustainable development being the overarching principle":

- Sustainable development of coasts and oceans (maximize

the economic, social and cultural benefits that can be derived from these ecosystems without compromising their health and productivity);

- Environment and development principles (principles endorsed by the international community at the 1992 UNCED and in subsequent international agreements, e.g., the right to develop, inter-generational equity, environmental assessments, precautionary approach, polluter-pays principle, and openness and transparency in decision-making);
- The special character of coasts and oceans (high productivity, great mobility and interdependence of coastal and ocean systems, as well as their linkages with terrestrial areas, which requires managing these systems as a single, integrated unit).

Proposed Indicator Framework

Each of three categories includes goals, objectives, indicators, and parameters used to measure the indicators. Goals in each category are provided below.

Categories	Goals
Governance	Ensuring adequate institutional, policy and legal arrangements
	Ensuring adequate management processes and implementation
	Enhancing information, knowledge, awareness and participation
	Mainstreaming ICOM into sustainable development; economic instruments mainstreaming
Ecological	Organization: conserve the ecosystem structure - at all levels of biological organization – so as to maintain the biodiversity and natural resilience of the ecosystem
	Vigour: conserve the function of each component of the ecosystem so that its role in the food web and its contribution to overall productivity are maintained

	Quality: conserve the geological, physical and chemical properties of the ecosystem so as to maintain the overall environmental quality
Socioeconomic	A healthy and productive economy
	A healthy and productive environment
	Public health and safety
	Social cohesion
	Cultural integrity

Lessons Learned/Recommendations for Indicator Development

- Strategies on applying indicators and involving local/regional stakeholders depends on the cultural background of the area in question, so documentation and evaluation of different strategies is beneficial when devising a monitoring and evaluation system.
- Selection of indicators should be preceded by analysis of different analytical frameworks to identify key issues and elements to be examined.
- Focusing on the attributes associated with the phases of the ICOM cycle will provide a reference framework for developing indicators.
- Indicator users should establish criteria for the assessment of progress for different cycles because measurement of some aspects of ICOM (e.g. socioeconomic and ecological) involves a timeline of decades rather than years or one cycle.
- Worldwide or trans-regional comparisons based on a few indicators could motivate users to apply indicators in their region and support dissemination of the ICOM indicators. Application of similar indicators in different countries or areas would allow comparisons and allow case

studies to learn from one another.

- The application of indicators requires a sound understanding of their definition and description, so IOC is considering the translation of this handbook in major languages.

Document/Project Title

The Contributions of Science to Integrated Coastal Management, (1996)

<http://www.fao.org/docrep/meeting/003/w1639e/w1639e00.htm>

Authoring Agency/Organization(s)

Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)

Primary Point(s) of Contact

N/A

Document/Project Summary

"In this report, GESAMP draws on experience from programmes in different geographic and socioeconomic settings to identify how science and scientists can contribute to the effectiveness of Integrated Coastal Management (ICM)."

Proposed Principles or Criteria

"The concept of an integrated approach to the management of coastal areas is intentionally broad and has four elements:

- **Geographical:** It takes account of interrelationships and interdependencies (viz., physical, chemical, biological, ecological) between the terrestrial, estuarine, littoral and offshore components of coastal regions;
- **Temporal:** It supports the planning and implementation of management actions in the context of a long-term strategy;
- **Sectoral:** It takes account of interrelationships among the various human uses of coastal areas and resources as well as associated socio-economic interests and values;
- **Political/Institutional:** It provides for the widest possible consultation between

government, social and economic sectors and the community in policy development, planning, conflict resolution and regulation pertaining to all matters affecting the use and protection of coastal areas, resources and amenities.

Proposed Indicator Framework

N/A

Document/Project Title

Guidelines for Integrated Coastal Zone Management, (1996)

http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1996/08/01/000009265_3961219091924/Rendered/PDF/multi_page.pdf

[wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1996/08/01/000009265_3961219091924/Rendered/PDF/multi_page.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1996/08/01/000009265_3961219091924/Rendered/PDF/multi_page.pdf)

Authoring Agency/Organization(s)

The World Bank

Primary Point(s) of Contact

Jan C. Post and Carl G. Lundin,
Editors

Document/Project Summary

A brief guidance document discussing major issues in coastal zone management, principles of integrated coastal zone management (ICZM), and guidelines for development of ICZM programs.

Proposed Principles or Criteria

“ICZM focuses on three operational objectives:

- Strengthening sectoral management, for instance through training, legislation, and staffing;
- Preserving and protecting the productivity and biological diversity of coastal ecosystems, mainly through prevention of habitat destruction, pollution, and overexploitation;
- Promoting rational development and sustainable utilization of coastal resources.”

“ICZM’s distinguishing characteristics are that it:

- Moves beyond traditional approaches, which tend to be sectorally oriented and fragmented in character and seeks to manage the coastal zone as a whole using an

ecosystem approach where possible;

- Is an analytical process that advises governments on priorities, trade-offs, problems, and solutions;
- Is a dynamic and continuous process of administering the use, development, and protection of the coastal zone and its resources towards democratically agreed objectives;
- Employs a multidisciplinary, holistic systems perspective, which recognized the interconnections between coastal systems and uses;
- Maintains a balance between protection of valuable ecosystems and development of coast-dependent economies...;
- Operates within established geographic limits, as defined by governing bodies, that usually include all coastal resources;
- Seeks the input of all important stakeholders to establish policies for the equitable allocation of space and resources in the coastal zone...;
- Is an evolutionary process, often requiring iterative solutions to complex economic, social, environmental, legal, and regulatory issues;
- Integrates sectoral and environmental needs...;
- Provides a mechanism to reduce or resolve conflicts that may occur, involving resource allocation or use of specific sites as well as the approval of permits and licenses;
- Promotes awareness at all levels of government and community about the concepts of sustainable development and

the significance of
environmental protection...”

Proposed Indicator Framework

N/A

Document/Project Title
 Score Card to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas, (2004)
http://www.icriforum.org/mpa/SC2_eng_nocover.pdf

A short, straightforward self assessment tool to help marine protected area (MPA) managers and local stakeholders identify where they are succeeding and where they need to address gaps, and ultimately to determine their progress along a management continuum.

Authoring Agency/Organization(s)
 The World Bank

Proposed Principles or Criteria
 N/A

- Primary Point(s) of Contact**
- Marea E. Hatziolos, Senior Coastal and Marine Specialist, Environment Department, The World Bank, Email: mhatziolos@worldbank.org
 - Francis Staub, AJH Environmental Services, Email: fstaub@environmentservices.com

Proposed Indicator Framework
 The scorecard proposes indicators in each of the six stages, or elements of evaluation, described in the World Commission on Protected Areas (WCPA) Framework for protected area management. Progress for each indicator is graded on a scale of 0-2 or 0-3 to develop a final score.

Document/Project Summary

Element of Evaluation	Indicators
Context	Legal status—does the MPA have legal status?
	MPA regulations—are unsustainable human activities (e.g. poaching) controlled?
	Law enforcement—can staff sufficiently enforce MPA rules?
	MPA boundary demarcation—are the boundaries known and demarcated?
	Integration of the MPA in a larger coastal management plan—is the MPA part of a larger coastal management plan?
	Resource inventory—is there enough information to manage the area?
	Stakeholder awareness and concern—are stakeholders aware and concerned about marine resource conditions and threats?
Planning	MPA objectives—have objectives been agreed?
	Management plan—is there a management plan and is it being implemented?
Inputs	Research—is there a program of management-oriented survey and research work
	Staff numbers—are there enough people employed to manage the protected area?
	Current budget—is the current budget sufficient?
Process	Education and awareness program—is there a planned

	education program?
	Communication between stakeholders and managers—is there communication between stakeholders and managers?
	Stakeholder involvement and participation—do stakeholders have meaningful input to management decisions?
	Indigenous people—do indigenous and traditional peoples resident or regularly using the MPA have input to management decisions?
	Staff training—is there enough training for staff?
	Equipment—is the site adequately equipped?
	Monitoring and evaluation—are biophysical, socioeconomic, and governance indicators monitored and evaluated?
Outputs	Context indicators—have context indicators (above) been improved?
	Products and services
	Mechanisms for stakeholder participation in decision-making and /or management activities (e.g. advisory council)—are mechanisms available to ensure stakeholder participation?
	Environmental education activities for stakeholders (e.g. public outings at the MPA)—have education activities been developed for stakeholders?
	Management activities—have the two critical management activities been improved to address threats?
	Visitor facilities—does the MPA have sufficient visitor facilities?
	Fees—if fees (entry fees, tourism, fines) are applied, do they help MPA management?
	Staff training
Outcomes	Objectives—have MPA objectives been addressed?
	Threats—have threats been reduced?
	Resource conditions—have resource conditions improved?
	Community welfare—has community welfare improved?
	Environmental awareness—has community environmental awareness improved?
	Compliance—are users complying with MPA regulations?
	Stakeholder satisfaction—are the stakeholders satisfied with the process and outputs of the MPA?

Document/Project Title

How Is Your MPA Doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness, (2004)
<http://effectivempa.noaa.gov/guidebook/guidebook.html>

Authoring Agency/Organization(s)

IUCN—The world Conservation Union

Primary Point(s) of Contact

Robert S. Pomeroy, John E. Parks, Lani M. Watson

Document/Project Summary

A guidebook offering a process and methods to evaluate the effectiveness of management actions in attaining goals and objectives that are specific to MPAs, the marine environment and coastal communities.

Proposed Principles or Criteria

N/A

Proposed Indicator Framework

The document identifies 42 indicators in three categories and discusses how each of those indicators relate to common goals and objectives associated with MPA use

Category	Indicator
Biophysical	Focal species abundance
	Focal species population structure
	Habitat distribution and complexity
	Composition and structure of the community
	Recruitment success within the community
	Food web integrity
	Type, level and return on fishing effort
	Water quality
	Area showing signs of recovery
	Area under no or reduced human impact
Socioeconomic	Local marine resource use patterns
	Local values and beliefs about marine resources
	Level of understanding of human impacts on resources
	Perceptions of seafood availability
	Perceptions of local resource harvest
	Perceptions of non-market and non-use value
	Material style of life
	Quality of human health
	Household income distribution by source
	Household occupational structure
	Community infrastructure and business
	Number and nature of markets
Stakeholder knowledge of natural history	
Distribution of formal knowledge to	

	community
	Percentage of stakeholder group in leadership positions
	Changes in condition of ancestral and historical sites/features/monuments
Governance	Level of resource conflict
	Existence of a decision-making and management body
	Existence and adoption of a management plan
	Local understanding of MPA rules and regulations
	Existence and adequacy of enabling legislation
	Availability and allocation of MPA administrative resources
	Existence and application of scientific research and input
	Existence and activity level of community organization(s)
	Degree of interaction between managers and stakeholders
	Proportion of stakeholders trained in sustainable use
	Level of training provided to stakeholders in participation
	Level of stakeholder participation and satisfaction in management
	Level of stakeholder involvement in surveillance
	Clearly defined enforcement procedures
	Enforcement coverage
	Information dissemination

Document/Project Title

Evaluation of Integrated Coastal Zone Management (ICZM) in Europe, (2006)

<http://www.rupprecht-consult.eu/download/Evaluation%20of%20ICZM%20in%20Europe%20---%20FINAL%20REPORT.pdf>

Authoring Agency/Organization(s)

The European Commission appointed the International Ocean Institute (IOI), a nonprofit organization, and Rupprecht Consult - Forschung & Beratung, GmbH, an independent and specialized consulting and research company, to conduct the analysis.

Primary Point(s) of Contact

Rupprecht Consult - Forschung & Beratung, GmbH (project coordinator)

Document/Project Summary

This analysis, requested by the European Commission, assesses

progress in implementation of the EU ICZM recommendation of 2002 as well as degree to which countries' ICZM strategies observe the eight principles of good ICZM agreed as part of the 2002 Recommendation. The analysis includes the 24 coastal Member States of the European Union, and results are reported for each of the five European regional seas: the Baltic Sea, the North Sea, the Atlantic (North-East region), the Mediterranean Sea and the Black Sea.

Proposed Principles or Criteria

The document describes eight principles of good ICZM agreed as part of the EU ICZM Recommendation of 2002 (see below).

Proposed Indicator Framework

A single indicator is proposed for each of the eight principles of good ICZM:

Eight Principles of Good ICZM	Indicator
A broad overall perspective (thematic and geographic) which will take into account the interdependence and disparity of natural systems and human activities with an impact on coastal areas.	Is there a holistic thematic and geographic perspective in the process?
A long-term perspective which will take into account the precautionary principle and the needs of present and future generations.	Is there a long-term perspective envisaged?
Adaptive management during a gradual process which will facilitate adjustment as problems and knowledge develop. This implies the need for a sound scientific basis concerning the evolution of the coastal zone.	Is an adaptive management approach applied during a gradual process?
Local specificity and the great diversity of European coastal zones, which will make it possible to respond to their practical needs with specific solutions and flexible measures.	Is the process local context specific?
Working with natural processes and	Does the ICZM respect and work with

respecting the carrying capacity of ecosystems, which will make human activities more environmentally friendly, socially responsible and economically sound in the long run.	natural processes?
Involving all the parties concerned (economic and social partners, the organisations representing coastal zone residents, non-governmental organizations and the business sector) in the management process, for example by means of agreements and based on shared responsibility.	Is the process based on participatory planning and management?
Support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate.	Does the process support and involve all relevant administrative bodies?
Use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management.	Is there a balanced combination of instruments in planning and management?

Document/Project Title

Integrated Coastal Zone Management: Review of Progress in Selected OECD Countries, (1997)

http://www.safecoast.org/editor/databank/File/OECD%20-%20coastal_zone_management.pdf

Authoring Agency/Organization(s)

Organisation for Economic Co-operation and Development (OECD)

Primary Point(s) of Contact

N/A

Document/Project Summary

A publication examining the degree to which OECD countries have implemented ICZM as contained in an OECD Council Recommendation adopted on 23 July 1992. Results of

the analysis are based on a questionnaire survey of OECD countries, carried out in late 1995 and early 1996.

Proposed Principles or Criteria

Although the report does not offer explicit ICZM principles or criteria, the evaluation of countries' ICZM efforts is based on guidelines that accompanied the OECD's 1992 Recommendation on ICZM. Those guidelines, which could be interpreted as principles, are mirrored in the indicators below.

Proposed Indicator Framework

The report identifies 13 indicators that assess progress on specific ICZM guidelines, in multiple subject areas, offered by the OECD:

Subject Area	Indicator(s)
National CZM objectives and co-ordinating mechanisms	Have policy objectives specific for the coasts and their resources been identified and adopted formally?
	Has an authority been designated to co ordinate actions concerning ICZM across national, regional and local government agencies?
Indicators and monitoring	a) Have coastal environmental indicators been developed? If yes, are these indicators being monitored on a regular basis?
	b) Is there a specific section on coastal resources or the coastal zone in a regularly published state of the environment report?
Sectoral objectives and enforcement	Have environmental objectives been developed and adopted for the following ICZM aspects?: land-use planning and zoning, coastal waters planning, conservation requirements, ecosystem protection and restoration, discharge limits, water quality for receiving waters and for waters flowing into the coastal zone, control and reducing inputs from polluting and hazardous substances.
	Have monitoring and enforcement procedures been established for the objectives listed in the previous question, and are these maintained?
EIA and public participation	Have Environmental Assessment procedures, including economic and social criteria, been established that apply to the coastal zone?

	Are public participation procedures included in the established coastal zone management policy formulation or Environmental Assessment processes?
The Polluter Pays Principle and resource pricing	Has the Polluter-Pays-Principle been adopted as a basis for dealing with pollution in coastal zone management?
	Are coastal zone resources being priced at levels that reflect social costs of use and depletion?
Enforcement of CZM objectives	Has national level legislation been enacted to enforce coastal zone management objectives?
Fisheries	a) Has a pro-active policy been established to achieve sustainable management and conservation of fisheries resources at the international, national and regional levels, ensuring co-operation of the relevant authorities? b) If yes, has this policy been successful?
Tourism	Is a designated co-ordinating authority in place with the mandate to balance tourism development and the carrying capacity of the coastal zone?
Agreements on shared or common coastal waters	a) Is your country a contracting party to an international agreement that covers international cooperation for the management of shared or common coastal waters? b) If yes, does this international co-operation cover the preparation, implementation and monitoring of an integrated action plan that is consistent with other coastal zone management initiatives?

Document/Project Title

“Frameworks and Indicators for Assessing Progress in Integrated Coastal Management Initiatives,” (2003), in journal *Ocean and Coastal Management*
http://www.crc.uri.edu/download/Olsen_Frameworks.pdf

Components of the report also available in

A Manual for Assessing Progress in Coastal Management (1999)
http://www.crc.uri.edu/download/SEL_003F.PDF

Authoring Agency/Organization(s)
 Coastal Resources Center, University of Rhode Island

Primary Point(s) of Contact
 Stephen B. Olsen

Document/Project Summary

This academic manuscript offers two frameworks for assessing progress in ICM over the extended periods of time involved. The first framework is based on four “orders” of outcomes pursued by ICM. The second framework is

based on the widely recognized, five-step ICM policy cycle.

Proposed Principles or Criteria

The author identifies three characteristics that ICM initiatives must observe to advance the broader coastal management goals of “specific improvements in the bio-physical environment” and “specific improvements in the quality of life of the human populations in the area of concern.” ICM initiatives must:

1. “be sustainable over long periods of time;
2. be capable of being adapted to often rapidly changing conditions; and
3. provide the mechanisms to encourage or require particular forms of resource use and collaborative behaviors among institutions and user groups”

Proposed Indicator Framework

The first framework observes four “orders” of coastal governance outcomes and proposes indicators to mark progress in achieving those outcomes.

Outcome	Indicator Categories
1 st Order (enabling conditions)	Constituencies that actively support the ICM initiative
	A formal governmental mandate for the program with the authority necessary to implement a course of action
	Resources, including sustained annual funding, adequate to implement the plan of action
	A plan of action constructed around unambiguous goals
	The institutional capacity necessary to implement the plan of action
2 nd Order (changes in behavior)	Changes in the behavior of institutions and interest groups
	Changes in behaviors directly affecting resources of concern
	Investments in infrastructure supportive of ICM

	policies and plans
3 rd Order (the harvest)	Improvements in some coastal ecosystem qualities Improvements to some societal qualities
4 th Order (sustainable coastal development)	Unknown

The second framework observes the widely recognized five steps of the

ICM cycle and proposes indicators to assess progress in each step.

Step of the ICM Cycle	Indicator(s)
Step 1: Issue identification and assessment	An assessment of the principal environmental, social and institutional issues and their implications
	Identification of the major stakeholders and their interests
	Selection of the issues upon which the ICM initiative will focus its efforts
	Definition of the goals of the ICM initiative
	Active involvement of stakeholders in the assessment and goal setting process
Step 2: Preparation of the plan	Scientific research on selected management questions
	Boundaries of the areas to be managed defined
	Documentation of baseline conditions
	Definition of the action plan and the institutional framework by which it will be implemented
	Development of institutional capacity for implementation
	Testing of Second Order behavioral change strategies at pilot scales
	Active involvement of stakeholders in planning and pilot project activities
Step 3: Formal adoption and funding	Formal endorsement of the policies/plan and provision of the authorities necessary for their implementation
	Funding required for program implementation obtained
Step 4: Implementation	Behaviors of strategic partners monitored, strategies adjusted
	Societal/ecosystem trends monitored and interpreted
	Investments in necessary physical infrastructure made
	Progress and attainment of Third Order goals documented
	Sustained participation of major stakeholder groups
	Constituencies, funding and authorities sustained
	Program learning and adaptations documented
Step 5: Self assessment and external evaluation	Program outcomes documented
	Management issues reassessed
	Priorities and policies adjusted to reflect experience

	and changing social/environmental conditions
	External evaluations conducted at junctures in the program's evolution
	New issues or areas identified for inclusion in the program

Document/Project Title

Coastal Zone Management Act (CZMA) Performance Measurement System, (ongoing)

http://coastalmanagement.noaa.gov/success/czm_perf_measures.html

Authoring Agency/Organization(s)

National Oceanic and Atmospheric Administration (NOAA), Office Ocean and Coastal Resource Management (OCRM)

Primary Point(s) of Contact

Kate Barba, Chief, National Policy and Evaluation Division, Office of Ocean and Coastal Resource Management, NOAA, Kate.Barba@noaa.gov.

Document/Project Summary

An effort underway to measure national progress in achieving the desired outcomes of the U.S. Coastal Zone Management Act of 1972. The system consists of contextual indicators, which measure specific

pressures on the nation's coasts, and performance indicators, which measure outcomes produced by the National Coastal Zone Management Program and National Estuarine Research Reserve System (NERRS), the two programs mandated by the CZMA. The performance measures for the National Coastal Zone Management Program are collected in six categories and are the focus of this summary.

Proposed Principles or Criteria

A "visioning" effort to more clearly articulate the goals and principles of U.S. coastal zone management is underway.

Proposed Indicator Framework

The system identifies six focus areas of the CZMA and prescribes performance measures for each. Performance measurement data is collected annually from each of the nation's individual state coastal management programs for integration into a national assessment.

Category	Indicator(s)
Government coordination and decision-making	% of federal consistency projects submitted where the project was modified due to consultation with the applicant to meet State CZM policies
	# of a) educational activities offered by the CZM program and b) participants, by category
	# of a) training opportunities offered by the CZM program and b) participants, by category
Public access	# of new public access sites added through acquisition or easement using CZM funds
	# of existing public access sites that have been enhanced using CZM funds
	# of sites where public access sites are a) created, b) protected, or c) enhanced through CZM regulatory activities
Coastal habitat	# of acres of key coastal habitats a) created or b) restored using CZM funds
	# or acres of key coastal habitats

	protected by acquisition or easement using CZM funds
	# of acres of key coastal habitats lost or gained due to activities subject to core CZM regulatory programs
Coastal water quality	% of marinas in the coastal zone participating in a Clean Marina designation program
	# of volunteer monitoring program activities in coastal watersheds conducted with CZM funds
	# of miles or # of sites monitored by volunteer programs
	# of coastal communities supported by CZM funds in developing or implementing ordinances, policies, or plans to control or prevent polluted runoff to coastal waters
Coastal hazards	# of communities in the coastal zone that have a) undertaken activities to reduce future damage from hazards and b) implemented educational programs or campaigns to raise public awareness of coastal hazards using CZM funds
	# of coastal communities supported by CZM funds in a) developing and implementing local plans that incorporate growth management principles and b) port or waterfront redevelopment plans

Document/Project Title

Sustainable Development Strategy for the Seas of East Asia: Regional Implementation of the World Summit on Sustainable Development Requirements for the Coasts and Oceans (2003)

<http://www.pemsea.org/pdf-documents/sds-sea/SDSSEA-Full.pdf>

Authoring Agency/Organization(s)

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Primary Point(s) of Contact

Regional Programme Director, GEF/UNDP/IMO Regional Programme on Partnerships in Environmental Management for the Seas of East Asia, (632) 920-2211, info@pemsea.org, www.pemsea.org

Document/Project Summary

This document describes a strategy adopted by East Asian countries for integrated coastal and ocean management of East Asia seas. The

document also details specific strategies and action programmes for implementing the Strategy and discusses how to monitor implementation progress.

Proposed Principles or Criteria

Although the document discusses principles for implementation of the Strategy, it does not discuss the broader principles of ICM.

Proposed Indicator Framework

The document suggests monitoring institutional, operational, and environmental indicators to assess implementation of the Strategy. The document proposes interim institutional and operational indicators for use until final indicators, desired targets or reference values for each indicator, and protocols for assessing them are widely agreed upon. Indicators are offered for monitoring Strategy implementation at the regional, local, and subregional levels, as well as for implementation of the Strategy by other stakeholders.

National Implementation

Category	Indicator
Institutional	Coastal/marine policy <ul style="list-style-type: none"> • # of countries under development • # of countries in place
Operational	National coastal and marine environmental strategy <ul style="list-style-type: none"> • under development • in place
	National coastlines with land-and-sea-use development plans <ul style="list-style-type: none"> • length of coastline under development • length of coastline in place

	<p>Ship waste reception facilities in ports and harbors</p> <ul style="list-style-type: none"> • % of ports/harbors with licensed facilities and services under development • % of ports/harbors with licensed facilities and services in place
	<p>National marine and coastal areas under environmental management programmes</p> <ul style="list-style-type: none"> • total area under development • total area in place
	<p>River basins under ecosystem development and management programmes</p> <ul style="list-style-type: none"> • total river basin area under development • total river basin area in place

Local Implementation

Category	Indicator
Institutional	<p>Local governments empowered to manage marine coastal resources</p> <ul style="list-style-type: none"> • # of countries under development • # of countries in place
Operational	<p>Local coastal strategies</p> <ul style="list-style-type: none"> • under development • in place
	<p>Length of municipal coastlines under an integrated management program</p> <ul style="list-style-type: none"> • length of coastline under development • length of coastline in place
	<p>ISO 14000 certification of local governments</p> <ul style="list-style-type: none"> • # of certifications under development • # of certifications in place
	<p>Sewage treatment</p> <ul style="list-style-type: none"> • % of coastal urban population with treatment facilities under development • % of coastal urban population with treatment facilities in place
	<p>Drinking water</p> <ul style="list-style-type: none"> • % of coastal urban population with treated water supply under development • % of coastal urban population with treated water supply in place
	<p>Waste management</p> <ul style="list-style-type: none"> • % of coastal urban population with garbage collection and licensed disposal facilities under development • % of coastal urban population with garbage collection and licensed disposal facilities in place

Subregional

Category	Indicator
Institutional	Intergovernmental environmental management mechanisms for transborder areas and LMEs <ul style="list-style-type: none"> • # of mechanisms under development • # of mechanisms in place
Operational	Transborder marine areas/LMEs under environmental management plans <ul style="list-style-type: none"> • total transborder/LME marine area under development • total transborder/LME marine area in place
	Sea areas with regional contingency plans and compensation systems <ul style="list-style-type: none"> • sea area under development • sea area in place

Implementation by other stakeholders

Category	Indicator
Private sector	# of ISO 14000 certification of industries and private enterprises <ul style="list-style-type: none"> • under development • in place
Civil society	# of registered environmental NGOs <ul style="list-style-type: none"> • under development • in place
Academe/scientific community	# of graduates from undergraduate or postgraduate programmes on environmental/coastal management <ul style="list-style-type: none"> • under development • in place
	# of graduates from short-term training programmes on environmental/coastal management <ul style="list-style-type: none"> • under development • in place
	Level of funding of environmental research and development programs supported by national/international programmes <ul style="list-style-type: none"> • under development • in place

Document/Project Title

Scientific Consensus Statement on Marine Ecosystem-Based Management, (2005)

Authoring Agency/Organization(s)

Published by the Communication Partnership for Science and the Sea (COMPASS), signed by 221 academic scientists and policy experts

Primary Point(s) of Contact

K.L. McLeod, J. Lubchenco, S.R. Palumbi, and A.A. Rosenberg, COMPASS.

Document/Project Summary

This brief document presents national scientific consensus on understanding of marine ecosystems and the concepts of ecosystem-based management. Specifically, the document discusses the meaning of ecosystem-based management, the meaning of an ecosystem, core scientific knowledge about ecosystems, key elements of ecosystem-based management, and actions consistent with an ecosystem-based approach.

Proposed Principles or Criteria

“Ecosystem-based management:

- emphasizes the protection of ecosystem structure, functioning, and key processes;
- is place-based in focusing on a specific ecosystem and the range of activities affecting it;
- explicitly accounts for the interconnectedness within systems, recognizing the importance of interactions between many target species or key services and other non-target species;
- acknowledges interconnectedness among

systems, such as between air, land and sea; and

- Integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependencies.”

The report also includes key elements of ecosystem-based management articulated by the U.S. Commission on Ocean Policy and the Pew Oceans Commission. EBM:

- makes protecting and restoring marine ecosystems and their services the primary focus, even above short-term economic or social goals for single services;
- considers cumulative effects of different activities on the diversity and interactions of species;
- facilitates connectivity among and within marine ecosystems by accounting for the import and export of larvae, nutrients, and food;
- incorporates measures that acknowledge the inherent uncertainties in EBM and account for dynamic changes in ecosystems;
- creates complementary and coordinated policies at global, international, national, regional, and local scales, including between coasts and watersheds
- maintains historical levels of native biodiversity in ecosystems to provide resilience to both natural and human-induced changes;
- requires evidence that an action will not cause undue harm to ecosystem functioning before allowing that action to proceed;

- develops multiple indicators to measure the status of ecosystem functioning, service provision, and effectiveness of management efforts; and
- Involves all stakeholders through participatory

governance that accounts for both local and wider public interests.

Proposed Indicator Framework
N/A

Document/Project Title

The Ecosystem Approach (CBD Guidelines), (2004)

Authoring Agency/Organization(s)

Secretariat of the Convention on Biological Diversity (CBD)

Primary Point(s) of Contact

The Secretariat of the Convention on Biological Diversity,
secretariat@biodiv.org

Document/Project Summary

A guidance document offering a description of the ecosystem approach to management, as well as 12 principles of the ecosystem approach along with their rationale, suggested annotations to the rationales, and implementation guidelines.

Proposed Principles or Criteria

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:
 - (a) Reduce those market distortions that adversely affect biological diversity;
 - (b) Align incentives to promote biodiversity conservation and sustainable use;

- (c) Internalize costs and benefits in the given ecosystem to the extent feasible.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

The document also offers five points of “operational guidance for application of the ecosystem approach:”

1. Focus on the functional processes and relationships within ecosystems.
2. Enhance benefit-sharing.
3. Use adaptive management practices.

4. Carry out management actions at the scale appropriate for the issue being addressed, with decentralization to the lowest level, as appropriate.

5. Ensure intersectoral cooperation.

Proposed Indicator Framework

N/A

Document/Project Title

Report on the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its seventh meeting (2006)

Authoring Agency/Organization(s)

United Nations, General Assembly

Primary Point(s) of Contact

N/A

Document/Project Summary

Proceedings of the seventh meeting of the United Nations Open-ended Informal Consultative Process, which was established in 1999 to facilitate review of developments in ocean affairs and law of the sea by the UN General Assembly. The topic of the seventh meeting was ecosystem approaches and oceans.

Proposed Principles or Criteria

An ecosystem approach should:

- Emphasize conservation of ecosystem structures and their functioning and key processes in order to maintain ecosystem goods and services;
- Be applied within geographically specific areas based on ecological criteria;
- Emphasize the interactions between human activities and the ecosystem and among the components of the ecosystem and among ecosystems;
- Take into account factors originating outside the boundaries of the defined management area that may influence marine ecosystems in the management area;
- Strive to balance diverse societal objectives;
- Be inclusive, with stakeholder and local communities'

- participation in planning, implementation and management;
- Be based on best available knowledge, including traditional, indigenous and scientific information and be adaptable to new knowledge and experience;
- Assess risks and apply the precautionary approach;
- Use integrated decision-making processes and management related to multiple activities and sectors;
- Seek to restore degraded marine ecosystems where possible;
- Assess the cumulative impacts of multiple human activities on marine ecosystems;
- Take into account ecological, social, cultural, economic, legal and technical perspectives;
- Seek the appropriate balance between, and integration of, conservation and sustainable use of marine biological diversity; and
- Seek to minimize adverse impacts of human activities on marine ecosystems and biodiversity, in particular rare and fragile marine ecosystems.

Implementation of an ecosystem approach could be achieved through:

- Its inclusion in the development of national policies and plans;
- Encouraging and supporting marine scientific research, in areas within and beyond national jurisdiction, in accordance with international law;
- Understanding, through increased research, the

impacts of changing climate on the health of marine ecosystems, and developing management strategies to maintain and improve the natural resilience of marine ecosystems to climate variations;

- Understanding, through increased research, the impacts of underwater noise on marine ecosystems and taking into account those impacts;
- Where appropriate, strengthening regional fisheries management organizations, adapting their mandates and modernizing their operations in accordance with international law;
- Strengthened and improved coordination and cooperation within, and, in accordance with international law, between and among States, intergovernmental organizations, regional scientific research and advisory organizations and management bodies;
- Effective and full implementation of the mandate of existing multilateral organizations, including those established under UNCLOS;
- Application of the Rio Principles and the use of a broad range of management tools for the conservation and sustainable use of marine biodiversity, including sector specific and integrated area-based management tools on a case-by-case basis, based on

the best available scientific advice and the application of the precautionary approach and consistent with international law;

- Identifying and engaging stakeholders to promote cooperation;
- Sectoral approaches and integrated management and planning on a variety of levels, including across boundaries, in accordance with international law;
- Effective integrated management across sectors;
- Advancement of the Plan on Implementation of the World Summit on Sustainable Development, including, inter alia, the elimination of destructive fishing practices, the establishment of marine-protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors; and
- Conducting, in accordance with national legislation and international law, assessments in relation to marine activities likely to have a significant impact on the environment.

Proposed Indicator Framework

N/A

Document/Project Title

EcoQO Handbook: Handbook for the Application of Ecological Quality Objectives to the North Sea. First Edition. (2007)

http://www.ospar.org/documents/dbase/publications/p00307_EcoQO%20Handbook%202007%201st%20edition.pdf

Authoring Agency/Organization(s)

OSPAR Commission

Primary Point(s) of Contact

N/A

Document/Project Summary

A guide to implementation of North Sea ecological quality objectives (EcoQOs), or indicators, developed to support application of the ecosystem approach to management in the area. The EcoQOs measure progress in reaching the desired level of elements within ten ecological quality issues.

Proposed Principles or Criteria

N/A

Proposed Indicator Framework

The report describes ecological quality objectives for each of 25 elements within ten ecological quality issues. See the full report to view the objectives, which are fairly detailed.

Ecological Quality Issues	Ecological Quality Elements
Commercial fish species	Spawning stock biomass of commercial fish species in the North Sea
Marine mammals	Seal population trends in the North Sea
	By-catch of harbour porpoises
Seabirds	Proportion of oiled common guillemots among those found dead or dying on beaches
	Mercury concentrations in seabird eggs
	Organohalogen concentrations in seabird eggs
	Plastic particles in stomachs of seabirds
	Local sand eel availability to black-legged kittiwakes
	Seabird population trends as an index of seabird community health
Fish communities	Changes in the proportion of large fish and hence the average weight and average maximum length of the fish community
Benthic communities	Imposex in dog whelks (<i>Nucella lapillus</i>) or other selected gastropods
	Density of sensitive (e.g., fragile) species
	Kills in zoobenthos in relation to eutrophication
	Changes in zoobenthos in relation to eutrophication
Plankton communities	Phytoplankton chlorophyll a
	Phytoplankton indicator species for eutrophication
Threatened and/or declining species	Presence and extent of threatened and/or declining species in the North Sea, as shown on the initial OSPAR list
Threatened and/or declining habitats	Restore and/or maintain the quality and extent of threatened and/or declining habitats in the North Sea, as shown on the initial OSPAR list

Eutrophication	Eutrophication status of the North Sea
	Winter nutrient (DIN and DIP) concentrations
	Phytoplankton chlorophyll a
	Phytoplankton indicator species for eutrophication
	Oxygen
	Kills in zoobenthos in relation to eutrophication
	Changes in zoobenthos in relation to eutrophication

Document/Project Title
 United Nations Commission on Sustainable Development (CSD), (2007)
<http://www.un.org/esa/sustdev/natlinfo/indicators/isd.htm>

implementation of the Work Programme on Indicators of Sustainable Development adopted by the Commission on Sustainable Development (CSD) at its Third Session in April 1995 and presented to the CSD in 2001.”

Authoring Agency/Organization(s)
 United Nations Division for Sustainable Development

Proposed Principles or Criteria
 N/A

Primary Point(s) of Contact
 Matthias Bruckner, Associate Sustainable Development Office, Division for Sustainable Development, United Nations Department for Economic and Social Affairs, Email: brucknerm@un.org.

Proposed Indicator Framework
 The set consists of 96 indicators, 50 of which are designated as core indicators, with the remaining indicators allowing for a more comprehensive and differentiated assessment of sustainable development by countries. The indicators are presented in a framework of 14 themes, and additional sub-themes. One of the 14 themes is Oceans, seas and coasts.

Document/Project Summary
 “The CSD indicator set is based on the previous two editions, which have been developed, improved and extensively tested as part of the

Theme	Sub-theme	Core Indicator	Other Indicator
Oceans, seas, and coasts	Coastal zone	Percentage of total population living in coastal areas	Bathing water quality
	Fisheries	Proportion of fish stocks within safe biological limits	
	Marine environment	Proportion of marine area protected	Marine trophic index
			Area of coral reef ecosystems and percentage live cover

Document/Project Title

Pilot Analysis of Global Ecosystems (PAGE): Coastal Ecosystems, (2001)
http://pdf.wri.org/page_coastal.pdf

Authoring Agency/Organization(s)

World Resources Institute

Primary Point(s) of Contact

Lauretta Burke (WRI), Yumiko Kura (WRI), Ken Kassem (WRI), Carmen Revenga (WRI), Mark Spalding (UNEP-WCMC), Don McAllister (Ocean Voice International)

Document/Project Summary

“Pilot Analysis of Global Ecosystems (PAGE): Coastal Ecosystems analyzes quantitative and qualitative information and develops selected indicators of the condition of the world's coastal ecosystems and marine fisheries. Specifically the study looks at measures that show the degree of

human modification of coastal zone and what we know concerning five important goods and services provided by coastal ecosystems.” The report synthesizes existing reports and is one in a series of five PAGE reports on five main categories of ecosystems: agriculture, forests, freshwater systems, grasslands, and coastal and marine ecosystems.

Proposed Principles or Criteria

N/A

Proposed Indicator Framework

The report proposes indicators in the broad area of coastal zone extent and change as well as indicators for five important goods and services provided by coastal ecosystems: shoreline stabilization, water quality, biodiversity, food production: marine resources, and tourism and recreation.

Category	Indicator
Coastal zone extent and change	Coastal zone extent
	Characterization of natural features
	Extent of natural habitats
	Loss of natural habitats
	Natural versus altered land cover within 100km of coastline
	Human population within 100 km of coastline
	Disturbance to benthic community—distribution of trawling grounds
Shoreline Stabilization	Natural versus altered land cover within 100 km of coastline
	Beach area/profile
	Severity and impact of natural hazards
	Vulnerability to erosion and coastal hazard
	Low-lying areas
Water Quality	Eutrophication parameters
	Harmful algal blooms (HABs) events
	Global occurrence of hypoxic zones
	Shellfish bed closures
	Beach closures

	Beach tar balls
	Persistent organic pollutants (POPs) and heavy metal accumulation in marine organisms
	Oil spills (frequency and volume)
	Solid waste accumulation on beaches
Biodiversity	Species richness
	Conservation values
	Threatened species
	Habitat degradation—coral bleaching
	Threats to habitat
	Threats to ecosystem structure
Food Production	Analysis of the condition of fish stocks
	Commercial harvest of important fish stocks
	Percentage change in catch from the peak year
	Change in trophic composition of fish catch
Tourism and Recreation	Value to tourism and employment in the tourism sector
	Importance of tourism to the economy
	Tourist arrivals
	Equitable distribution of tourism benefit—leakage of tourism revenue

Document/Project Title

The State of the Marine Environment:
Trends and Processes, (2006)
<http://www.gpa.unep.org/documents/soe - trends and english.pdf>

Authoring Agency/Organization(s)

Global Programme of Action for the
Protection of the Marine Environment
(GPA) of the United Nations
Environment Programme (UNEP)

Primary Point(s) of Contact

Dr. Ljubomir Jeftic (Research and
Compilation)

Document/Project Summary

The authoring agency, GPA, is
committed to dealing with nine land-
based threats to the marine
environment. This report provides a

broad update on the global status of
these nine threats, providing regional
and sometimes national examples.

Proposed Principles or Criteria

N/A

Proposed Indicator Framework

The document offers a broad
assessment of global status in nine
primary land-based threats to the
coastal and marine environment, but
does not propose specific indicators for
those threats: sewage, persistent
organic pollutants (POPs), radioactive
substances, heavy metals, oils
(hydrocarbons), nutrients, sediment
mobilization, marine litter, and
physical alteration and destruction of
habitats.

Document/Project Title

Europe’s environment—the fourth assessment (2007)

http://reports.eea.europa.eu/state_of_environment_report_2007_1/en

Authoring Agency/Organization(s)

European Environment Agency (EEA)

Primary Point(s) of Contact

European Environment Agency,
 eea.europa.eu, eea.europa.eu/enquiries
 for inquiries.

Document/Project Summary

“The latest in a [series of assessments of the pan-European environment](#) published over the past 15 years by the EEA, the report assesses environmental progress in 53 countries — an area with a total population of more than 870 million people. The region includes: Eastern Europe, Caucasus and Central Asia (EECCA), South Eastern Europe (SEE), as well as

Western and Central Europe (WCE).

The report highlights priority areas such as environment-related health concerns (issues related to air quality, inland waters, soil, hazardous chemicals), climate change, biodiversity loss, overuse of marine resources, the current patterns of production and consumption, and pressures caused by economic activities (agriculture, tourism, transport, energy). The document includes a chapter (5) entitled “Marine and Coastal Environment.”

Proposed Principles or Criteria

N/A

Proposed Indicator Framework

The document identifies seven key marine and coastal issues across pan-European seas and discusses multiple sub-issues, or broad indicators, within each of those key issues.

Key Issues	Sub-issues
Eutrophication	Extent of eutrophication
	Loads and sources of nutrients
	Nutrient concentrations
	Chlorophyll-a
Fisheries	Fish catches
	Fishing fleets
	Status of fisheries
	Ecological impacts
Pollution from hazardous substances	Inputs and sources of hazardous substances
	Trends in concentrations and impacts of hazardous substances
Oil pollution	Accidental oil spills
	Operational oil discharges from ships
	Pollution from the oil industry
Invasive alien species	Modes, rate of introduction and responses
Coastal zones	Concentration of population and major urban developments
	Natural assets and protected areas
	Development of coastal zones and related habitat loss
Climate change and seas	Sea surface temperature
	Sea level rise

	Arctic ice cover
	Climate change impacts on marine ecosystems
	Acidification of the seas

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