Ecosystem-based management

Markers for assessing progress

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Foreword

The GPA is the only intergovernmental programme with a specific mandate to address the management interconnectedness between fresh water systems and coastal and marine environments. The UNEP Coordination Office of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) commissioned this expert report in recognition of the importance of promoting the links between fresh water management and the management of coastal and large marine ecosystems.

The complexity of the economic, social and environmental realities requires ecosystem-based, multi-sectoral approaches in policy and management. Actions in the context of the GPA should be embedded in integrated management programmes and frameworks in order to be sustainable. Worldwide, the practice of integrated management of river basins, coastal areas and the marine environment is growing. Many countries are overcoming the separation between the scientific and the political approaches to management of freshwater and the marine environments.

This publication should be considered a practical tool for assessing progress in integrated coastal and river basin management. It highlights the needs and benefits of integrated management, while at the same time providing guidance in establishing the management link.

The report takes a critical look at indicators and how they can be used for management purposes. A number of key questions are raised for consideration: What is progress in integrated management of river and coast? What steps are to be taken for making progress? And how to assess progress made in a practical situation?

The UNEP/GPA Coordination Office and its partners are pleased to present this report and it is our hope that the findings presented here will further support global, regional and national efforts in implementing the Global Programme of Action.

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Abstract

This paper offers a framework for disaggregating the goal of sustainable development into a sequence of tangible levels of achievement. The focus is on outcomes rather than management processes. Sets of markers or indicators are offered that can be used to assess progress in integrated management of river basins, coasts or large marine ecosystems and in programmes that link across these systems. The markers are organized into a framework composed of four Orders of Outcomes. The First Order is achieved by assembling the enabling conditions for the sustained practice of ecosystem-based management. The First Order culminates in negotiating commitments to implement a plan of action directed at a set of priority management issues. The implementation of a plan of action is addressed in the Second Order, as changes occur in the behaviour of institutions and relevant user groups, and the programme succeeds in generating the funds required to sustain a programme over the long term. The Third Order marks the achievement of the specific societal and environmental quality goals that prompted the entire effort. In ecosystems that are much altered by human activities the achievement of a sequence of Third Order goals over long time periods typically marks the path to sustainable forms of development. This Orders of Outcomes Framework is applied to assess progress on issues that integrate across management of coasts and river basins. The paper identifies major lessons that have emerged from coastal and water resources management. It offers guidance on the design and conduct of ecosystem-based management initiatives that address both the impacts of human activities and the need to sustain or restore the goods and services that are generated by healthy ecosystems.

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List of figures, boxes and tables

Acronyms

EU	European Union
FAO	Food and Agriculture Organization of the UN
GEF	Global Environment Facility
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP)
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GWP	Global Water Partnership
IAEA	International Atomic Energy Agency
ICARM	Integrated Coastal Area and River Basin Management
ICM	Integrated Coastal Management
IDRC	International Development Research Institute
IMO	International Meteorological Organization
IRBM	Integrated River Basin Management
IOC	International Oceanographic Commission of UNESCO
IWRM	Integrated Water Resource Management
LME	Large Marine Ecosystem
NGO	Non-governmental organization
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UCC-Water	UNEP Collaborating Centre on Water and Environment
WHO	World Health Organization
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development

River basins, coasts and large marine ecosystems: a shared agenda

1

1.1   Issues that link across ecosystems

River basin management, coastal management and management of large marine eco-systems (LMEs) cannot independently solve many of the challenges posed by intensifying human activity and ecosystem change. Increasingly human activities are causing changes in ecosystems that have transboundary consequences. For example, the pollutants that degrade human health and reduce the goods and services in estuaries and LMEs may originate from human activities far inland that are transported by rivers to the coast. On a planet dominated by the impacts of human activities it is increasingly necessary to design and implement management programmes that address the complex linkages between marine systems, coastal regions and river basins (see Box 1).

Human induced changes in ecosystems have transboundary impacts

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BOX 1   Switzerland joins efforts to protect the North Sea

'At the roof of Europe', Switzerland is a mountainous country far away from any coastline or sea. Switzerland is nonetheless an important participant in ministerial meetings on the protection of the North Sea. Discharge limits for waste waters produced by Swiss industries bordering the River Rhine are set to meet standards designed to restore and maintain the environmental qualities of the North Sea.   <

A defining feature of coastlines is that here freshwater from land drainage mixes with sea-water. River mouth estuaries, lagoons and their associated wetlands are among the most naturally productive ecosystems of the planet and they play critical roles in processing the freshwater, sediments, nutrients and other substances that flow from the land to the sea. Estuaries are the nurseries for a high proportion of the commercially important fish and shellfish. Human activity in a watershed that changes the volume, quality and seasonal pulsing of freshwater flows to estuaries and continental shelves can have profound impacts on the ecology and, the productivity of estuaries and coastal waters, as well as the physical processes that shape a coastline (see Box 2). Such changes may in turn affect human health, the state of important habitats, biodiversity and such economically important activities such as fisheries, tourism and agriculture.

Changes in freshwater flows have major impacts on human well-being and ecosystems across river basins and coasts

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BOX 2   Changes in freshwater flows from river basins to coasts

Many of the management issues that link across river basins and coasts are related directly or indirectly related to how freshwater is being allocated and used. These can be placed into three main categories: changes to the volumes of freshwater that reach the coast and support coastal environments and activities, changes to the quality of freshwater and changes to the pulsing of freshwater flows.

Quantity

At global scale almost seventy percent of the available freshwater is utilized for agriculture. As coastal urban centres expand the competition between agriculture and cities intensifies. One result of both the expansion in irrigated agriculture and the growth of coastal cities is that the volume of freshwater that flows into estuaries and coastal waters is being reduced or even eliminated. This can have a devastating impact on fisheries and the spatial ecological processes that occur in highly complex estuarine systems. Conversely, freshwater inflows to estuaries and coastal waters may increase when urbanizsation reduces the absorption of rainwater into the ground and wetlands or when water from one catchment is transferred into another. Such increases in freshwater flows will also unleash a chain of consequences in a coastal ecosystem.   >

Quality

Changes to the quality of freshwater are often as important as changes to its quantity. As human activity intensifies point and non-point sources of nutrients, chemical contaminants and pathogens are likely to increase, and the quantity of sediment carried by surface waters changes. All of these can have important impacts on the productivity and state of estuaries and coastal water, on the health and livelihoods of the human population and the viability of such economically important sectors as tourism. Contemporary agriculture is dependent upon the application of fertilizers. As a result human society is now fixing nitrogen and making it biologically available at a rate greater than all natural processes combined. The nutrient loads delivered to estuaries and coastal waters are predicted to continue increasing in coming decades. This will make eutrophic conditions, associated coastal dead zones and toxic tides an even greater problem than they are today. Changes to sediment inflows along many coastlines have caused dramatic increases in mud flats and disruptions to navigation in some areas and severe erosion and increased flooding in others.

Pulsing

This describes shifts in volumes of freshwater flows to the coast and the timing of such events. Freshwater flows are higher during the 'wet' season and lower during the 'dry' season. Humans can influence freshwater pulsing by storing and releasing water behind dams for flood control, water supply for agriculture, drinking water, and the generation of electricity. The ecology of estuaries, and in some cases coastal waters, has evolved to take advantage of established pulsing patterns, and the spawning and juvenile stages of estuary-dependent fish and shellfish are closely attuned to shifts in salinity. These are disrupted when human activities change long established patterns. As climate change becomes more apparent floods and droughts intensify. These pulses become less predictable and this can have major impacts on human activity, infrastructure and in extreme instances, reshape shorelines, estuaries and watersheds.   <

To successfully tackle such impacts requires long time frames

The integrated management approaches that are the subject of this paper may require many years to attain their goals. It took many decades to achieve the restoration targets adopted by mature management programmes such as those for the Rhine River and North Sea in Europe and Chesapeake Bay in the United States. Enabling conditions have to be created and well-founded plans have to be set in motion. It is often only after a second or third plan of action is implemented, with increasingly strict limitations on human activities that defined social and environmental goals are achieved and progress towards more sustainable forms of development may have been made. Crucial to success is sustained financial investments and building the institutional capacity to practice ecosystem-based management.

The challenges of addressing human activities within river basins and in coastal areas that effect the state of coastal and marine ecosystems is the subject of the Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-based Activities, coordinated by UNEP. Initiated in 1995, this global programme assists nations in the development of National Plans of Action (NPAs) that address these linked issues and work to mitigate the impacts of human activities that reduce or threaten the goods and services that flow from coastal and marine ecosystems. In 2002 UNEP published a Handbook on the development and implementation of NPAs and in 2006 it was revised and expanded as a Guide. This paper develops the dimension of progress assessment to this series of guidance documents.

1.2   The objectives of this paper

Transboundary management is complex and must span long time periods. It is therefore important to clearly define how success will be achieved and how progress will be assessed. Simplified methods are needed that offer an overview of the status of a given programme at a given time and can trace progress by a consistent set of indicators.

This paper provides a road map for evaluating progress in ecosystem-based management programmes

This paper presents a framework for a sequence of indicators that can be used to mark the advance to more sustainable forms of development at the ecosystem level. This framework identifies the critical outcomes associated with a sequence of accomplishments associated with planning, implementation of a plan of action and the achievement of goals that can be used to gauge progress on that path. These sets of indicators offer several benefits:

· Their relative simplicity in portraying an overview of the essential outcomes of a management process as portrayed by small sets of indicators;

· Their suitability for application to sustained processes of management extending over several decades; and,

· They invite comparison and learning across initiatives.

The framework can assist all those involved in ecosystem-based policy and management

The progress markers presented in this paper facilitate the documentation and analysis of a given programme or portfolio of programmes along a continuum with programme initiation at one end and fulfilment of programme goals at the other. The markers offered in Chapter 4 and detailed in Annex 1 address issues that link across river basins and coasts. They can be modified to assess progress in the management of other ecosystems. The application of these methods should further understanding, dialogue and collaboration among all those involved in the policy making and management of complex ecosystems:

· River basin, coastal and large marine ecosystem managers

· National-level governmental officials in national and international agencies

· Regional and local governmental officials

· Natural and social scientists involved in ecosystem analysis

· Research institutions

· Non-governmental and community organizations

· The many businesses and user groups whose livelihoods are linked to the goods and services that flow from healthy ecosystems.

Ecosystem management: an emerging paradigm

2

We are moving from sectoral towards ecosystem-based management

2.1 The dimensions of ecosystem management

The ecosystem paradigm has emerged as the dominant approach to managing natural resources and the environment. Traditionally, management efforts have been organized around particular uses such as agriculture or tourism, resulting in separate governance regimes for each use. Over time it has become apparent that such a sectoral approach results in conflicts among users and is inadequate in meeting the need for environmental protection. The shift away from the management of individual resources to a systems approach is reflected in the actions of a variety of states (Juda 2003; Laffoley and others 2004) and in the work of international organizations ranging from the International Oceanographic Commission, to the Food and Agriculture Organization, the United Nations Environment Programme, and the Global Environment Facility.

In the years preceding the 1992 United Nations Conference on the Human Environment and Development (UNCED) attention progressively turned toward ecosystem-based management (World Commission on Environment and Development, 1987). The Rio Declaration adopted at UNCED called upon States 'to conserve, protect and restore the health and integrity of the Earth's ecosystem' (Rio Declaration, principle 7, 1992). Agenda 21, adopted at that meeting, concludes that oceans and adjacent coastal areas form 'an integrated whole that is an essential component of the global life-support system.' This realization requires 'new approaches to marine and coastal area management and development, at the national, sub-regional, regional and global levels, approaches that are integrated in content and are precautionary and anticipatory in ambit…' (Agenda 21, 17.1, 1992).

By 1997, the UN Commission on Sustainable Development had found that: *The concept of integrated management of watersheds, river basins, estuaries and marine and coastal areas is now largely accepted in the United Nations system and in most countries as providing a comprehensive, ecosystem-based approach to sustainable development (E/CN.17/1997/2/ Add.16 24 January 1997).*

In simple terms ecosystem-based management recognizes that plant, animal and human communities are interdependent and interact with their physical environment to form distinct ecological units called ecosystems. Ecosystems are transboundary in character, typically cutting across existing political and jurisdictional boundaries and are subject to multiple management systems. Likewise, many human actions and their consequences extend across jurisdictional boundaries and impact the functioning of important eco-systems shared by multiple jurisdictions. For example, the widespread and heavy use of fertilizers employed by modern agriculture many hundreds of kilometres from the coast has resulted in water bodies, as in the Gulf of Mexico adjacent to the Mississippi River delta and many others that are oxygen depleted 'dead zones'.

Ecosystem-based management has been defined as: *…management driven by explicit goals executed by policies, protocols and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem structure and function* (Christensen and others 1996).

The Convention on Biological Diversity adds the following dimensions: *The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.*

For the Millennium Ecosystem Assessment the participating scientists negotiated several other aspects to the definition, among others that an ecosystem approach '*recognizes that humans, with their cultural diversity, are an integral component of many ecosystems*' (MEA 2003).

More and more institutions recognize and promote an eco-system-based approach for managing natural resources and the environment

The Millennium Development Goals further reinforce the recognition that ecosystem health and sustainability are central to the well being of human kind. Capacity building in forms of management that recognise this fundamental truth is a top priority if such issues as poverty and hunger are to be solved.

In ecosystem-based management, the associated human population and economic/social systems are seen as integral parts of the ecosystem. Most importantly, ecosystem-based management is concerned with the processes of change within living systems and sustaining the goods and services that healthy ecosystems produce. Ecosystem-based management is therefore designed and executed as an adaptive, learning-based process that applies the principles of the scientific method to the processes of management. Box 3 describes the shift in focus from traditional to ecosystem-based management.

BOX 3   Ecosystem-based management as a paradigm shift

From	To
Individual species	Ecosystems
Small spatial scale	Multiple scales
Short-term perspective	Long-term perspective
Humans independent of ecosystems	Humans as integral parts of ecosystems
Management divorced from research	Adaptive management
Managing commodities	Sustained production potential for ecosystem goods and services

Source: Lubchenco 1994, Sherman and Duda 1999   <

2.2 Evolving expressions of ecosystem management

Several ecosystem-based schools exist for management of marine, coastal and inland waters

Ecosystem-based management is being advanced at many scales in both terrestrial and aquatic environments. Along coastlines and in estuaries Integrated Coastal Management (ICM) has pioneered integrated approaches to meet the needs for both conservation and development in those areas of the planet where the human population and its associated infrastructure are most concentrated (see Annex 2). As freshwater has become increasingly a limiting factor to human activity Integrated Water Resources Management (IWRM) has become the centrepiece of many programmes and initiatives (see Annex 3). Integrated River Basin Management (IRBM) is guiding the management of natural resources and human activity in land areas defined by the flows of surface waters and applying the IWRM principles. The most productive marine waters defined by the extent of continental margins and coastal currents have been divided into 64 Large Marine Ecosystems (LMEs) and are being managed in accordance with the principles of ecosystem management.

The fundamental principles of all these approaches are the same...

All of these can be considered as expressions of integrated management that, to varying degrees, are embracing the concept of ecosystem-based management. While the spatial scales and the issues addressed differ, the fundamental principles are the same (see also Box 4):

· An ecosystem-based approach that fully recognizes the interconnected nature of living systems and human activity
· The practice of cross-sectoral and decentralized governance that works to nest policies, laws and institutions into a tiered, internally consistent and mutually re-enforcing planning and decision making system
· The application of sound science to the planning and decision making process through a sustained, long-term and adaptive management processes.

...but linkages between them are usually still weak

Today the linkages between these various schools of management are often weak, even though it is increasingly obvious that sustainable management of large marine ecosystems and coastal resources requires management of activities in their associated river basins. A major reason for this is that the development of contemporary approaches to planning and decision making has evolved in different scientific communities and different governmental agencies. In most countries the management of river basins and of coasts have evolved as independent programmes that operate with distinct mandates, authorities, policies and institutional structures. As a result, the operational interaction between river basin managers, coastal managers and those concerned with large marine ecosystems has been limited. However, each group recognizes the need for improved co-operation and synergy.

BOX 4   Management or governance?

The term *governance* has become prominent in many settings where a fundamental rethinking of societal goals, structures and mores is seen as necessary. Governance concerns the values, policies, laws and institutions by which issues are addressed (Olsen and Nickerson 2003, Olsen 2003). Governance defines the fundamental goals, the institutional processes and the structures that are the basis for planning and decision-making. Management, in contrast, is the process by which   >

human and material resources are harnessed to achieve a known goal within a known institutional structure. We therefore speak of business management, park management, and personnel management or disaster management. In these instances the goals and mechanisms of administration are well known and widely accepted. Governance sets the stage within which management occurs.

Ecosystem management would in many instances be better described as *ecosystem governance* since the changes it requires in values, goals, human behaviour and institutions are profound. In this paper, however, we have decided to use the more familiar term 'management'. The World Resources Reports for 2000-2001 and 2002-2004 provide useful descriptions and examples on ecosystem management and environmental governance (WRI 2000 and WRI 2003)   <

2.3 Integrated Coastal Area and River Basin Management

ICARM links management activities in river basins and coastal zones

Integrated Coastal Area and River Basin Management (ICARM) seeks to integrate across the ICM and the IWRM schools of management. ICARM is not a 'new' management concept, but a process that links the management activities in the river basin and the coastal zone, in situations where linked issues make this necessary and appropriate. As used in this paper, ICARM is a process and set of principles that addresses upstream and downstream users, terrestrial and aquatic systems, surface and underground water sources, in river basins and their associated coastal and continental shelf systems (UNEP/GPA 2006; Ipsen and others 2006, see Annex 5).

The next Chapter describes how the principles of ecosystem-based management have been applied to evaluating the process of Integrated Coastal Management (ICM) and Integrated Water Resources Management (IWRM) initiatives. To date the major focus of such evaluations in a developing country context has been on the management process and not on outcomes. Chapter 4 provides a framework for assessing the progress in terms of outcomes. Chapter 5 describes how this Outcomes Framework can be used to assess progress on the ground through ecosystem-based management as this may be applied to ICARM issues and programmes. Chapter 6 considers the future evolution of the ICARM progress evaluation tool.

The current status of programme evaluation in integrated coastal and water resources management

3

3.1   Evaluating processes and outcomes

There are dozens of approaches and methodologies for evaluating projects and programmes. They vary greatly in their purposes, substantive rigor, validity and the persuasiveness of the conclusions they offer. The many methods can be assigned to two broad categories:

· *Process evaluations* are undertaken to assess the internal workings of a project or programme and make adjustments to the management strategies and practices that it is promoting

· *Outcome evaluations* assess the impacts of a programme upon the environment, societal conditions and human activities of concern to a programme. An outcome evaluation works to objectively estimate the relative contributions of a programme's policies and processes to observed social and environmental change.

Most evaluations of ecosystem-based management, particularly in developing country contexts, emphasize process evaluation. This is sensible since in the majority of cases, eco-system-based management, as expressed in ICM, LME, IWRM and ICARM programmes, are an initial departure from traditional sector-by-sector planning and decision making. Such young initiatives are therefore most concerned with identifying and prioritizing the issues that such integrating forms of management must address, conducting the necessary studies, building capacity and winning political support for the actions and policy reforms that such ecosystem-based management requires.

Process evaluations focus on outputs, assessing the actual execution of programmes

Process evaluation typically addresses *outputs* that such initiatives have generated – the number and quality of its reports, the number of people trained, the equipment and services that have been purchased, the degree to which stakeholders have been consulted. Since such programmes have usually benefited from large financial investments by national and international institutions, evaluations are designed to assess the effectiveness and efficiency of the execution of a programme and the degree to which they have met the commitments made to their sponsors. The results are frequently considered confidential and are not widely distributed (Lowry and others 1999 and Lowry 2002).

In this Chapter we briefly review frameworks for organizing such assessments of management processes. In section 4 we describe a framework for assessing the progress in terms of *outcomes*.

3.2   Frameworks for assessing the management process

Agenda 21 stressed integration and precaution but did not provide guidance on how to measure progress

Both Chapter 17 (coasts) and 18 (freshwater) of Agenda 21 adopted at UNCED in 1992 stress the importance of integration and precaution when working to achieve sustainable forms of development. Both Chapters call for management approaches that emphasize the participation of those affected and collaboration among the many agencies of government and groups concerned with how coasts and freshwater resources are developed, used and conserved. They did not, however, provide guidance for how ICM and IWRM initiatives should be designed nor explicit standards by which the achievements of such programmes should be measured. This prompted the preparation of a number of documents (Cicin-Sain

and Knecht 1998; Clark 1996; GESAMP 1996; GWP Technical Advisory Committee 2000; Jønch-Clausen 2004) that set forth the sequence of actions that can lead to the implementation of government sanctioned ICM and IWRM programmes.

A widely used framework for developing ICM programmes was offered by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP 1996). GESAMP presented the policy cycle (see Figure 1) that groups activities associated with five steps, beginning with issue identification and proceeding to participatory planning, and then on to commitment to a course of action. Such planning and policy making should culminate in the implementation of a plan of action and conclude with programme evaluation. When programmes are successful, successive generations of a programme repeat these five steps to address an expanding agenda of issues and/or a larger geographic area. Completion of all five steps can be considered as a 'generation' of coastal management.

FIGURE 1 **The management cycle**

More sustainable forms of coastal development

Formal adoption and funding — **3**

Implementation — **4**

2 — Programme preparation

Evaluation — **5**

1 — Issue identification and assessment

Progressively larger cycle loops indicate growth in project scope

Time
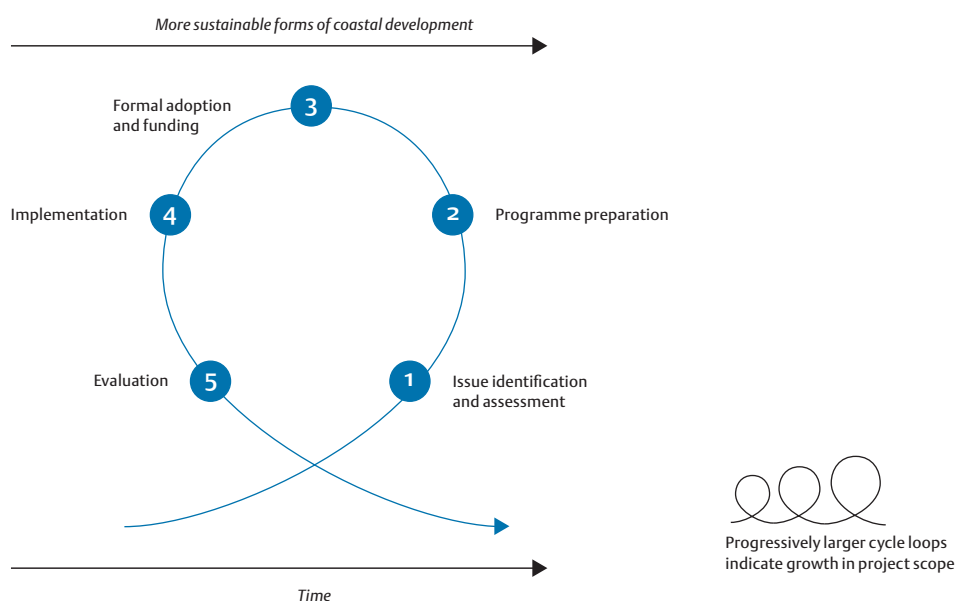
Source: Adapted from GESAMP 1996

Integrated planning and management is often presented as a cycle that links five steps

Similar thinking developed within the freshwater management community. A five-step approach was adopted in 1993 when developing the Uganda Water Action Plan – one of the early IWRM planning programmes undertaken after the Rio Conference. The approach was subsequently adopted and developed by the Global Water Partnership (Jønch-Clausen 2004; GWP Technical Committee 2005) (see Figure 2).

FIGURE 2   **The integrated water resources management cycle**

Establish status
- Water resource issues
- Progress towards IWRM framework
- Recent international developments

Build commitment to reform
- Political will
- Awareness
- Multistakeholder dialogue

Monitor & evaluate progress
- Indicators of progress toward IWRM and water infrastructure development framework

Analyse gaps
- WR management functions required
- Management potentials and constraints

Implement frameworks
- IWRM framework
- Framework for water infra-structure development

Build committment to actions
- Political adoption
- Stakeholder acceptance
- Raise funds

Prepare strategy and action plan
- Enabling environment
- Institutional roles
- Management instruments
- Links to national policies

Source: Jønch-Clausen 2004

3.3   Indicators for assessing ICM as a process

The 'Manual for Assessing Progress in Coastal Management' (Olsen and others 1999) identifies sets of 'essential actions' associated with each of the five steps in the GESAMP cycle. The manual poses lists of questions designed to probe the linkages between the various actions and the five steps (see Table 1) and the objectives and strategies that shaped the design of the programme. The manual invites a team engaged in self assessment, or an external evaluator, to consider, for example, when and how the programme engaged with stakeholders, how issues were analysed and prioritized and if high level decision makers are appropriately involved at critical moments in the planning process. The manual is designed to encourage a learning-based, adaptive management philosophy.

Consistent checklists are a useful tool to evaluate programme progress

An early draft of the manual was applied in 1997 and 1998 to the final evaluations of ICM programmes sponsored by the Global Environmental Facility (GEF) that were designed to protect biodiversity in four regions of Latin America and the Caribbean. Checklists of questions were completed for each programme evaluated with accompanying notes on each answer. This provided an objectively verifiable basis for the conclusions drawn on each programme and a baseline against which future evaluations could assess further progress and the emergence of new issues. The consistent format encouraged comparisons of differences in the country contexts and management strategies at the four sites. In all cases the first planning phase of these programmes, covering three to five years, had progressed

TABLE 1 Actions associated with each step of a generation of ICM

Step	Indicators
STEP 1: Issue identification and assessment	· Principal environmental, social and institutional issues and their implications assessed · Major stakeholders and their interests identified · Issues upon which the ICM initiative will focus its efforts are selected · Goals of the ICM initiative defined · Stakeholders actively involved in the assessment and goal setting process
STEP 2: Preparation of the plan	· Scientific research on selected management questions conducted · Boundaries of the areas to be managed defined · Baseline conditions documented · Action plan and the institutional framework by which it will be implemented defined · Institutional capacity for implementation developed · Behavioural change strategies at pilot scales tested · Stakeholders actively involved in planning and pilot project activities
STEP 3: Formal adoption and funding	· Policies/plan formally endorsed and authorities necessary for their implementation provided · Funding required for programme implementation obtained
STEP 4: Implementation	· Behaviours of strategic partners monitored, strategies adjusted · Societal/ecosystem trends monitored and interpreted · Investments in necessary physical infrastructure made · Progress and attainment of goals documented · Major stakeholder groups sustain participation · Constituencies, funding and authorities sustained · Programme learning and adaptations documented
STEP 5: Self assessment and external evaluation	· Programme outcomes documented · Management issues reassessed · Priorities and policies adjusted to reflect experience and changing social/environmental conditions · External evaluations conducted at junctures in the programme's evolution · New issues or areas identified for inclusion in the programme

Source: Adapted from GESAMP 1996 and Olsen and others 1999

through Steps 1 and 2 and were in the process of defining programme features that could be approved by government as the basis for an initial implementation phase (Step 3). These evaluations, and applications of the manual that was distributed the following year, underscored the importance of local conditions. The existing institutional landscape, the skills and energy of programme leaders and the complexities of the issues in each place turned out to be of particular importance.

A complementary approach has been developed as a set of process indicators for the ICM initiatives undertaken by European Union (EU) Member States (Pickaver and others 2004). This also recognizes that the ICM management cycle can be broken down into a series of discrete, ranked actions. The EU indicator set has been successfully tested in a number of

With 'yes', 'no' or 'don't know' answers to questions trends can be tracked through time

countries and has been revised to 31 actions, grouped into a series of four, discrete, ordered and continuous phases. Rather than assessing progress by the actions associated with each step in the GESAMP ICM cycle, this indicator set groups actions in terms of four gradations of ICM practice (see also Table 2 for some examples):

I   Planning and management are taking place in the coastal zone
II   A framework exists for taking ICM forward
III Most aspects of an ICM approach to planning and management are in place and functioning reasonably well
IV   An efficient, adaptive and integrative process is embedded in all levels of coastal governance and is delivering sustainable use of the coast.

This approach is structured to generate 'yes, no, or don't know' answers to each of the questions posed. To track trends through time, respondents consider each action in two time periods three to five years apart.

TABLE 2   Some selected actions of the EU progress indicators

Phase	Action number & description	National		Regional		Local	
		2000	2005	2000	2005	2000	2005
I Planning and management are taking place in the coastal zone	4 Aspects of the coastal zone, including marine areas, are regularly monitored	Yes	Yes	Yes	Yes	Yes	Yes
II A framework exists for taking ICM forward under-taking actions on the coast	7 Adequate funding is usually available for	No	Yes	No	Yes	No	Yes
III Most aspects of an ICM approach to planning and managing the coast are in place and functio-ning reasonably well	21 Spatial planning of sea areas is required by law	No	DK	No	DK	No	Yes
IV An efficient, adaptive and integrative process is embedded at all levels of governance and is deli-vering greater sustainable use of the coast	25 There is strong, constant and effective political support for the ICM process.	No	No	No	No	No	No

Source: Pickaver and others 2004. DK means 'don't know'

Existing ICM indicator sets mainly assess progress programme planning

The ICM indicators suggested by Olsen and others (1999) and by Pickaver and others (2004) are primarily concerned with assessing ICM processes. They can be used to assess how far a programme has advanced towards implementing a comprehensive and effective programme that is addressing the problems posed by ecosystem change and human activities in a coastal region. Such analysis is helpful in identifying impediments to the further development of an ICM programme and setting priorities for the next phase in a programme's evolution. Both methods are directed primarily at assessing the degree of progress that has been made from actions concerned with issue analysis and planning to the formulation of a plan of action that has been formally approved by government. These are the actions associated with the planning phase (Steps 1 through 3) of the GESAMP cycle.

In developing countries implementation of ICM so far mainly occurs at pilot project level

The 1992 Rio Summit (UNCED) called upon all coastal nations to formulate and implement ICM programmes (Step 4 of the GESAMP cycle or Phase III of the EU indicator set) by the year 2000. A decade later, by the time of the World Summit on Sustainable Development (WSSD) held in 2002 in Johannesburg, it was clear that this goal had not been met. According to one estimate (Sorensen 2000) by the year 2000, not less than 345 ICM initiatives had been undertaken in 95 sovereign and semi-sovereign states. The majority had been designed and implemented in developing nations as four to eight year 'projects' funded primarily by international donors and development banks. The total investment had been at the scale of many hundreds of millions of dollars (Olsen and Christy 2000). Although data are absent on which of these initiatives had crossed the threshold to implementation, it was clear that at national level few had progressed beyond issue analysis and planning. However, many demonstration projects at smaller community and special area management level had advanced into implementation of new policies and practices, and were generating benefits to communities and improving the state of the environment.

Several studies have been commissioned to examine portfolios of ICM initiatives to assess how well they have performed in reference to important features of the practice. A recent example is a detailed examination of the sustainability of ICM initiatives in the Philippines and Indonesia (Christie and others 2005). This three year study concluded that participatory processes, and the generation of social and environmental benefits that are equitably distributed, succeed in building the constituencies that are required to sustain ICM processes. The study reaffirmed that long-term commitment and an adaptive approach is essential to success and can generate positive outcomes even in very difficult contexts. It estimates that the Philippines is investing some $25 million annually in ICM and found that over 100 municipalities and cities have adopted ICM as the unifying approach to managing complex issues. The patterns and conclusions are similar for Indonesia although ICM is at an earlier phase of evolution in that country.

The transition from planning to implementation in ICM programmes is slow

A survey of the principle findings emerging from evaluations of ICM initiatives worldwide (Lowry and others 1999) drew the following conclusions:
· Most evaluations are concerned primarily with performance but combine elements of both process and outcome evaluation

· There is an absence of goals of sufficient clarity to assess progress towards more sustainable forms of coastal development

· The time periods required to complete the planning process and to assemble the pre-conditions for making the transition to the implementation of ICM policies and management procedures is almost always under-estimated.

Many lessons have been learned in ICM pilot projects...

...but only few have made 'the jump' from planning and policy making to sustained implementation

In the absence of an accepted methodology, conclusions from ICM experience have taken the form of generalised observations presented in the form of 'lessons learned'. Many of these offer valuable insights into the processes of ICM. They do not, however, offer an objectively verifiable basis for assessing progress towards the fundamental goal of ICM (sustainable forms of coastal development) or even the more modest short-term objectives of projects and programmes. Whatever the methods of evaluation, a major conclusion that can be extracted from investments in ICM is that few have succeeded to bridge the gap between planning and policy making (Steps 1 through 3 of the GESAMP cycle) and the full scale implementation of a plan of action. This is not to say that investments in ICM have not proved worthwhile. Quite to the contrary, much has been learned about how the principles of ecosystem-based management can be made an operational reality. Significant advances have been made in building institutional capacity and there is an abundance of well documented examples of how substantial the process has been on specific issues and at detailed spatial scales. What is often absent in developing nations are the mechanisms for sustaining successful initiatives over the long term. In many of the poorer nations there are few incentives for making the transition from planning to a sustained implementation of policies and actions.

3.4 Assessments of IWRM initiatives

The same is true for IWRM in developing countries: implementation is at an early stage...

Chapter 18 of Agenda 21, like Chapter 17 on ICM, called for all countries to prepare IWRM action plans by the year 2000 that would improve the management of freshwater resources and their quality. By 1996 only a few had embarked on an IWRM process. In response to this the World Bank, the United Nations Development Programme (UNDP) and a group of donor countries created the Global Water Partnership as a collaborative effort. The objective is to develop the IWRM concept and to promote the implementation of IWRM processes through regional and sub-regional networks. Most countries in the developing world are now committed to the reforms called for by IWRM, but implementation of reformed management policies and plans is in most cases at an early stage.

...and indicators to assess actual impacts remain incipient

Developing indicators for assessing progress towards the implementation of IWRM programmes has begun very recently. The WSSD target of developing IWRM and water efficiency plans by the year 2005 (see the 2002 Johannesburg Plan of Implementation) has accentuated the necessity to develop methods for evaluating progress toward this target. An initial informal survey of progress in IWRM planning in 108 countries (GWP 2004) was based primarily on qualitative statements by local water experts and concentrated on the first three steps of the IWRM Cycle. A number of additional surveys were conducted during 2004 and 2005 (GWP 2006, UNEP 2006 and Japan Water Forum 2006) that also concentrate on establishing the enabling environment, the planning process and to some extent on the

implementation of institutional reform processes. A summary of the IWRM surveys and their scope is given in UCC-Water 2006. The development of outcome indicators that assess impacts on the state of the resource base, local livelihoods, economic development, equitable use, and environmental sustainability remain incipient.

In conclusion, both ICM and IWRM programmes in developing nations have focused primarily on building the institutional capacity to implement integrated forms of analysis and policy making that ecosystem-based management requires. Few programmes have advanced to full scale implementation of a set of policies and a plan of action. As these initiatives mature and take root it becomes increasingly important to balance assessments of management processes with assessments of the *outcomes* of management. In the next Chapter we describe a framework for assessing progress in terms of *outcomes*.

Assessing the outcomes of ecosystem-based management

4

Outcome assessment requires formulation of goals, specific targets and time-frames

4.1   The challenges of outcome evaluation

Changing the focus from evaluating the processes of ecosystem-based management discussed in Chapter 3 to assessing its outcomes requires at least two major changes in the perspective of the evaluators. The first is a much more careful and precise definition of the outcomes that a given generation of a programme is working to achieve. Such outcomes need to be defined as goals that set specific targets for desired ecosystem conditions – both societal and environmental. The second is that the timeframe that must be considered is far longer than that of a typical three to seven year 'project'. These two changes in perspective can in themselves be a major step towards ecosystem-based management. Once in place they will go far in creating a culture of adaptive management in both individual programmes where self assessments are routinely conducted, and within teams conducting the more formal external programme evaluations.

In outcome assessment attention to how the programme has defined its goals is critical. Unambiguous goals that define the desired societal and environmental conditions in the ecosystem subject to the management plan of action becomes the basis for evaluating how much, or how little, progress has been made. The formalization of programme goals in terms of the specific environmental and social outcomes to be achieved usually comes at the end of the planning process in Step 3 of the GESAMP cycle. In process evaluation, on the other hand, evaluation is more concerned with whether the required outputs (reports, people trained) have been generated, with the quality of programme activities and how the programme is responding to external events that are shaping the socio-political context within which the programme is operating.

There have as yet been relatively few attempts to assess the *outcomes* of IWRM and ICM programmes (see for example Hershmann and others 1999; Olsen and Christie 2000; Christie and others 2005).

It is always difficult to attribute achievements solely to a specific programme

A very important limitation to outcome evaluation is that it is usually difficult, and sometimes impossible, to attribute changes in the state of a large ecosystem (both its societal and environmental elements) solely to the efforts of a specific ecosystem management programme. Ecosystem change is usually the result of a web of forces acting simultaneously at many spatial and temporal scales. It is therefore often inappropriate to attribute the failure to reach a desired outcome to a failure of effort or analysis on the part of the programme. The forces of change may have been beyond the control of the programme or different from those predicted by a competent analysis. In process evaluation, on the other hand, the focus on outputs avoids such attribution problems.

4.2   Assessing progress towards more sustainable forms of development

Sustainable development is the stated goal of virtually all contemporary watershed, coastal, and large marine ecosystem management programmes – particularly those funded by international institutions in developing nations. Yet typically very little is said about how progress towards this ultimate objective is to be achieved or how progress

towards increasingly sustainable forms of development will be monitored and evaluated. The 'Orders of Outcomes' framework presented in this Chapter can help fill this gap by offering a sequence of tangible outcomes that, if pursued successfully over long time periods, can indeed produce conditions that are increasingly sustainable.

The outcome indicator concept to assess change over long periods and large areas matured between 1994 and 2003

An Outcomes Framework designed for assessing long term ecosystem change over large spatial areas was developed initially for assessing the benefits attributable to investments in water quality restoration (EPA 1994). The concept was subsequently expanded and adapted as a complement to the ICM policy cycle (Olsen and others 1997 and Olsen and Nickerson 2003) and refined through its application to mature efforts to manage intensively utilized, large coastal ecosystems encompassing coastal waters, estuaries and human activity in adjoining river basins (Olsen and Nickerson 2003). The indicator framework developed for monitoring and evaluation of GEF International Water Projects proposes similar categories (with process, stress reduction, environmental and human well-being indicators that parallel the First, Second, Third and Fourth Order outcomes respectively (GEF 2002).

These outcome frameworks have adopted the term 'orders' to convey the selection of indicators that suggest a high degree of aggregation. Plant and animal taxonomies group many hundreds or thousands of individual species into families, orders and phyla. Similarly, the 'Orders of Outcomes' framework for assessing progress towards sustainable forms of development group the many individual indicators that describe social and environmental characteristics into higher levels of aggregation termed 'orders'. Each order is composed of two to four categories of outcome indicators that together define the sequence of achievements that mark the path to more sustainable forms of development. A recent compilation of the many indicators for environmental and social conditions in coastal and ocean ecosystems has been distributed by the International Oceanographic Commission (IOC 2005).

The First Order examines the enabling conditions required for successful implementation

The 'Orders of Outcomes' framework offers three intermediate, and one final order (see Figures 3 and 5). The First Order defines, in outcome terms, the essential results of completing Steps 1 through 3 of the GESAMP process described in Chapter 3. The First Order examines whether a sufficient level of achievements has been attained that creates the conditions required to successfully implement the plan of action of a programme. The answer will of course depend largely on the issues – the problems and opportunities – upon which the programme has decided to focus. The issues selected will determine the subject matter of the goals of a programme and will provide the reference point for assessing whether the capacity of a programme to practice adaptive ecosystem management, its constituencies and the commitments it has secured from government are sufficient to support the transition to action plan implementation.

The Second Order analyses changes in behaviour that occur during implementation

The Second Order defines the outcomes that are the result of implementing a plan of action and the associated policy reforms suggested by the issue analysis. During implementation of a programme the outcome assessment is directed at documenting and analysing *the changes in behaviour* that are called for by the plan of action. These are grouped into three

categories: changes in the behaviour of target user groups, changes in the behaviour of key institutions and changes in how and where financial investments are made.

**The Third Order assesses long term environmental impacts and societal benefits**

Only when a plan of action has been successfully implemented for a period of several years or even decades can one anticipate benefiting from the Third Order harvest of improved water quality, restored fish stocks, improvements in public health, a more equitable distribution of natural wealth, and the other benefits that motivated and justified the entire endeavour. It is the anticipation of these Third Order Outcomes that justifies the often large financial investments and motivates the many stakeholders and institutions to make the changes in their behaviour that sustained success requires.

The Fourth Order looks at the equilibrium between environment and human society

It is important to recognize that some expressions of First, Second and Third Order outcomes will accumulate concurrently within a given time period. While there are causal relationships between the three Orders, they are not, and should not, be achieved in a strictly sequential order. For example, once some progress has been made in assembling First Order outcomes, programmes should work to achieve some evidence of Second and Third Order outcomes in a learning-by-doing mode. This can be accomplished by small-scale initiatives at the community level. It is usually a mistake to launch a fully integrated programme directed at multiple issues and goals in a large and complex ecosystem supporting a large human population and a diversity of activities. Small-scale pilot projects and carefully targeted efforts for larger areas are the best way to build institutional capacity, constituencies and credibility in a young programme. Often a step-by-step approach can help to achieve sustainable development (a state with a dynamic equilibrium between human society and its environment), but it is not the only way to advance.

FIGURE 3 **Charting progress toward more sustainable forms of development**
Several iterations of the first three orders mark the path to more sustainable forms of development
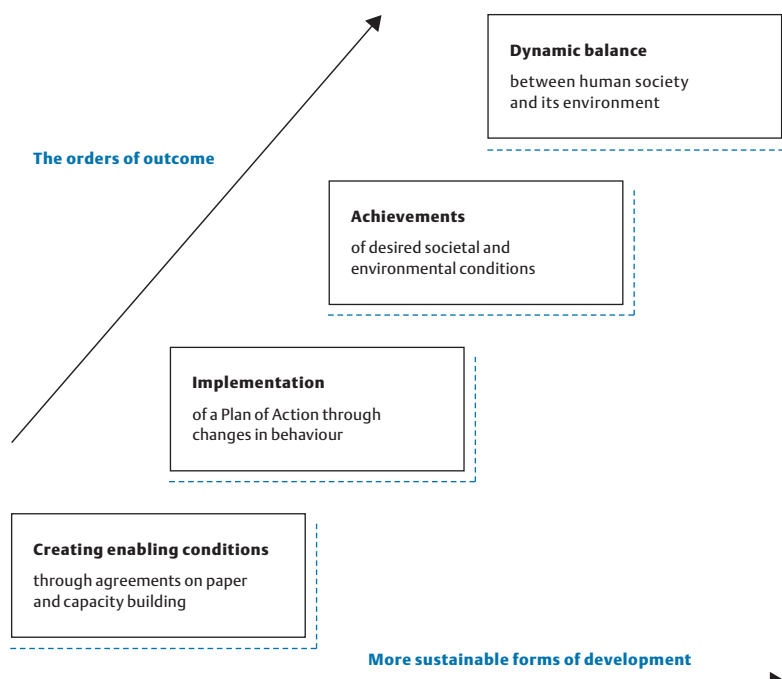
Human beings are now altering ecosystem functions and ecosystem qualities at the scale of the entire planet. Box 5 captures the awesome dimensions of ecosystem change that is underway.

Box 5   The big picture findings of the International Geosphere Biosphere Programme

· **The earth is a system that life itself helps to control.** Biological processes interact strongly with physical and chemical processes to create the planetary environment, but biology plays a much stronger role than previously thought in keeping Earth's environment within habitable limits.

· **Global change is much more than climate change. It is real, it is happening now and it is accelerating.** Human activities are significantly influencing the functioning of the Earth System in many ways. Anthropogenic changes are clearly identifiable beyond natural variability and are equal to some of the great forces of nature in their extend and impact.

· **The human enterprise drives multiple, interacting effects that cascade through the earth system in complex ways.** Global change cannot be understood in terms of a simple cause-effect paradigm Cascading effects of human activities interact with each other and with local- and regional-scale changes in multidimensional ways.

· **The Earth's dynamics are characterized by critical thresholds and abrupt changes. Human activities could inadvertently trigger changes with catastrophic consequences for the earth system.** Indeed, it appears that such a change was narrowly avoided in the case of depletion of the stratospheric ozone layer. The Earth System has operated in different quasi-stable states, with abrupt changes occurring between them over the last half million years. Human activities clearly have the potential to switch the Earth System to alternative modes of operation that may prove irreversible.

· **The Earth is currently operating in a non-analogue state.** In terms of key environmental parameters, the Earth System has recently moved well outside the range of the natural variability exhibited over at least the last half-million years. The nature of changes now occurring simultaneously in the Earth System, and their magnitudes and rates of change, are unprecedented.

Source: IGBP 2001   <

Within this context the concept of sustainable development is deceptively simple – the actions of the current generation to meet its needs must not undermine the prospects for future generations to meet their needs. Yet in most watersheds, coasts and large marine ecosystems the processes of change are predominantly in the direction of increasingly unsustainable forms of development. A major question is whether this trajectory can be corrected by achieving, for example, the Millennium Development Goals and at the same time widely practising the forms of ecosystem-based management discussed in this paper. These are the topics that must be addressed in the Fourth Order.

Ecosystem-based programmes should be cyclical and iterative processes

There are as yet few examples of mature programmes that have effectively implemented action plans over many years directed within large watersheds and their coastal systems or large marine ecosystems. The few documented are primarily in developed countries. They have recorded major achievements in the First, Second and Third Order. They demonstrate that progress is marked by a sequence of process cycle generations, each of which is marked by the selection of issues that are to be addressed, and the implementation of a plan of action designed to achieve goals for those issues. Programmes such as those for the Rhine and North Sea rehabilitation and the Chesapeake Bay Programme (see Box 6) have

demonstrated that in these highly impacted watersheds and associated coastal and marine systems, progress towards improved ecosystem conditions, and more sustainable forms of development have been achieved incrementally through a sequence of linked generations of management. Each subsequent generation increases the scope of the programme by addressing additional issues and defining additional goals while sustaining the gains already made.

Box 6   The Chesapeake Bay programme: goal-driven management

The Chesapeake Bay programme was launched in 1974 as a major study that was to produce a plan to restore the largest and most productive estuary in the US. After almost a decade of expensive studies and exhausting negotiations the programme adopted a single goal in 1983. This called for reducing nitrogen loads to the Bay by 40 per cent by the year 2000. As the programme documented progress in reducing nutrient loads it gained public credibility and political support. Additional goals were nego-tiated by the four state Governors and representatives of the federal government in the region in 1987, 1992 and again in 1999. These quantified and time limited goals have made it possible to evaluate both the processes of management and the outcomes of the programme. The substantial investment made, and achievement or substantial progress on each goal has not led to the full recovery of the bay. It is now known that only limiting population growth and even greater reductions in the nutrients released by agriculture and fossil fuel burning in the 166 000 km2 watershed will advance this region toward sustainable forms of development that would provide future generations with the benefits of a restored and productive bay.   <

Expensive First order conditions ask for an initial focus on a few issues at a large scale...

As noted in Chapter 3, the majority of investments that have been made in integrated coastal management, integrated water resources management, river basin management and large marine ecosystem management since the 1992 Rio Conference have been devoted largely to achieving an initial level of First Order enabling conditions. Because it is difficult, expensive and time consuming to assemble the First Order preconditions and sustain the implementation of a plan of action long enough to generate significant benefits for a wide range of aspects, ecosystem management initiatives have learned that it is practical to adopt two strategies. The first is to follow a step-by-step approach, beginning by focusing on a few important, but tractable, issues. Once a programme has achieved some successes (and capacity is increasing) it can add other dimensions to its plan of action. Sri Lanka's coastal management programme, for example, initially addressed the issue of shoreline erosion and only in its second and third decade became active in the protection and management of critical coastal habitats and cultural sites.

...and for a multi-faceted approach tackling several issues in small demon-stration sites

A second common strategy, sometimes conducted in parallel with the first, is to apply a multi-faceted approach directed simultaneously at several issues within relatively small demonstration sites. This second option has been adopted by many international donors and was a major feature of the ICM programmes sponsored by USAID and conducted by the University of Rhode Island Coastal Resources Center (Olsen and others 2003) and by the International Center for Living Marine Resources Management (Chua 1998) in several developing nations beginning in the early 1980s (see also Box 7). Both strategies are designed to make the transition to ecosystem-based management incrementally and to build the necessary enabling conditions place by place over many years.

> **Box 7   The Great Barrier Reef: sustaining the qualities of a magnificent ecosystem**
>
> Another example of ecosystem-based management at a large scale is Australia's Great Barrier Reef Marine Park. Beginning in the early 1970-s, this programme has succeeded in regulating human activities over the reef and its adjacent marine waters (an area of 345 000km²) in such a way that they do not significantly degrade the qualities and functioning of this large ecosystem. With that major accomplishment in place, it is now clear that sustaining the qualities of the reef into the future requires intensifying human activities in the adjoining river basins.   <

We will now examine the outcomes associated with the First and Second Order in greater detail and offer specific markers that can be used to assess progress in ICARM. Tables with graduated ranking for each marker are presented in Annex 1. Third Order markers will always have to be defined in terms of the environmental and societal goals set by each programme and are therefore not treated in detail in this paper. Similarly, Fourth Order outcome markers will be specific to the ecosystem in question.

4.3   Assembling the enabling conditions: First Order markers

First Order outcomes are the institutional and societal conditions that must be present if an ecosystem-based initiative is to succeed in executing a sustained plan of action designed to influence the course of events in a coastal ecosystem. Experience in a wide diversity of settings suggests that the transition to implementation can be anticipated only when all four of the following outcomes are in place:

1 unambiguous *goals* have been adopted against which the efforts of the programme can be measured,
2 a core of well informed and supportive *constituencies* composed of stakeholders in both the private sector and government agencies actively support the programme,
3 governmental *commitment* to the policies of a programme have been expressed by the delegation of the necessary authorities and the allocation of the financial resources required for long-term programme implementation, and
4 sufficient initial *capacity* is present within the institutions responsible for the programme to implement its policies and plan of action.

Unambiguous goals

Key questions

1 Have ICARM management issues been identified and prioritised?
2 Do the programme's goals define both desired societal and environmental conditions?
3 Are such programme goals time bounded and quantitative (how much by when)?

Experience in ecosystem-based management has demonstrated repeatedly that it is very difficult to negotiate unambiguous goals that crisply define the social and environmental qualities that an ICARM programme will work to achieve. Formal decisions on specific goals therefore usually emerge at the end of the planning process. However, they are presented here as the first of the enabling conditions because the other outcomes – capacity, constituencies and commitment – must be evaluated in reference to the goals that have

First Order outcomes relate to goals, constituencies, commitment and capacity

been selected. Modest goals require a more modest level of achievement in the other three categories of First Order outcomes.

Goals and targets should define both desired environmental state and level of human well-being...

Where human activity is important, ecosystem-based management requires setting and achieving two categories of goals. While the specific goals for individual ecosystems vary according to the issues addressed, the characteristics of the system and the spatial coverage of the effort, all initiatives must be designed to address both the environmental and the societal dimensions of change in the system. A crucial feature of ecosystem-based management is therefore to set goals and targets that define:

· the desired quality of life of the human population in the area of concern (for example, greater equity in how natural resources are allocated, improved or sustained economic standards, reduced conflicts among user groups, reduced risks in hazardous areas)
· desired attributes of the bio-physical environment (for example, the state or aerial extent of wetlands, the abundance of fish stocks and wildlife, and improvements in water quality)

...and be specific

Programme goals need to appeal to the values of society as well as reflect a solid under-standing of the ecosystem and institutional process that must be orchestrated to achieve them. It is difficult to manage what one cannot measure. Without clear goals it is difficult or impossible to assess the long-term impacts of a programme. Such goals should define both the environmental and social conditions that, when achieved, would constitute success. Defining the goal(s) of a programme as 'sustainable development', 'balance among competing activities' or 'ecosystem health' only indicates the desired direction of change but little more. It is more useful to set specific targets that define 'how much, by when'. For example:

· *Water quality:* By 2010, each tributary will achieve a 40 per cent reduction in nitrogen and phosphorus loadings compared to the year 2000 baseline.
· *River-basin management:* By 2010, the headwater areas of the river basins that are forested will have increased by 35 per cent as measured against the year 2000 baseline.
· *Habitat:* By 2010, 15 kilometres of streamside mangrove wetlands in the two municipalities fronting on the upper estuary will be restored as a continuous belt and designated as a reserve. By that year the total area of the mangrove reserve will be not less than 900 hectares.
· *Livelihoods:* By 2015 industrial fishing vessels will have been eliminated from operating within 15 km of the coast and inshore artisan catches will have been restored to the levels that existed in 1985.

Long-term goals make fundamental purposes tangible; shorter-term time-bound targets define steps towards those goals

Goals and targets should address issues and outcomes that the people of the place care about deeply. They are critical when weighing among options and setting priorities, and are the basis for accountability. Specific targets may be difficult to negotiate but they encourage the initiative to focus upon a few, carefully selected priorities and to think through what is feasible within a given time period. While goals associated with time frames of a decade or more make the fundamental purposes of the programme tangible, near-term targets mark the stepping stones to those ends.

Constituencies

Key questions

1 Do the user groups who will be affected by the Programme's actions understand and support its goals, strategies and targets?
2 Do the institutions that will assist in implementing the Programme and/or will be affected by its actions understand and support its plan of action?
3 Is there public support for the Programme?

Stakeholders must be involved in all steps and at all levels

All ecosystem-based management guidelines and experience confirms that programmes need to involve stakeholders in all steps in the policy process. In terms of outcomes this translates into generating constituencies that understand and actively support the programme. Constituencies are essential at the local level within the groups that will be most affected by the implementation of a programme. If such support is absent the task of imposing the implementation of new policies, regulations and decision-making procedures on an unwilling or uninformed society is likely to prove unworkable. Constituencies are also essential at higher levels in the governance hierarchy – typically at the state (province) and/or national level. A new programme must find its place within a pre-existing institutional structure where power and 'institutional turf', both real and perceived, is often jealously guarded. Support for a new ICARM programme among existing governmental agencies and programmes is essential to the successful implementation of a plan of action. Depending upon the scope of the programme and the significance of its actions, constituencies may also need to be built among the general public.

Formal commitment

Key questions

1 Has the appropriate level of government formally approved the Programme's policies and plan of action?
2 Has the government provided the programme with the authorities it needs to successfully implement its plan of action?
3 Have sufficient financial resources been committed to fully implement the programme over the long term?

Government needs to demonstrate commitment in many different ways

The commitment by government of the necessary authorities and resources required to implement a programme is another pre-requisite. This comes initially in the form of a governmental mandate for an ICARM management initiative that defines its scope and characteristics. Once the policies and initial plan of action have been negotiated, government must formally provide the responsible institution or institutions with the necessary authority to allocate natural resources, regulate their use, mediate conflicts and provide the necessary human and financial resources to implement the programme. Such commitment may take the form of a law, decree or other high-level administrative decision that establishes an ecosystem management programme as a permanent feature of the governance structure. The creation of commissions, working groups, user organizations and non-governmental organizations (NGOs) dedicated to the advancement of a plan of action are other important expressions of commitment. This element of the pre-conditions for successful implementation is often referred to as 'political will'.

Institutional capacity

Key questions

1   Does the Programme possess the human resources to implement its plan of action?
2   Have the institutions responsible for the programme demonstrated their capacity to implement the plan of action?
3   Have the institutions responsible for Programme implementation demonstrated their ability to practice adaptive management?
4   Is the Programme structured as a decentralised planning and decision making system?
5   Have important policies been successfully tested at a pilot scale?

The challenges of building the institutional capacity to practice ecosystem-based management should often be the primary concern of young programmes that are responding to international calls for an advance toward more sustainable forms of development and the greater equity, well-being and the healthy environments that this requires. It may take several decades to 'grow' sufficient institutional capacity to implement a complex linked coastal and watershed programme in a large spatial area that impacts a large human population.

Balance programme complexity at a given stage with the capacity of institutions involved

The institutional capacity necessary to implement adaptive, ecosystem-based approaches to governance is typically the principle limiting factor that determines the scope and geographic reach of a programme. A golden rule is to balance the complexity of the agenda of a programme at a given stage in a it's evolution to the capacity of institutions involved to practice ecosystem management. Management capacity is needed in conflict resolution, the ability to manage interdisciplinary teams, the design and implementation of public education programmes, the oversight of discrete development projects, and the ability to evaluate the performance of contractors. The long time frames and complexities of ecosystem-based management demand knowledge and skills to adapt to changing conditions and to the learning that emerges from the programme's own experience.

4.4   Programme implementation as behavioural change: Second Order markers

Second Order outcomes are evidence of the successful implementation of an ecosystem management programme. This includes evidence of new forms of collaborative action among institutions and the actions of state-civil society partnerships, the behavioural changes of resource users and changes in patterns of investment. Unlike the First Order, success does not necessarily require results in all three categories. Depending upon the goals of a programme, results in one or two categories may suffice.

Goals for behavioural change can be expressed as 'expect to see', 'like to see' and 'love to see'

The International Development Research Institute (IDRC) has developed methods for defining, monitoring and analysing behavioural change as the implementation of a programme designed to address linked environmental and societal issues. The IDRC method for 'outcome mapping' (Earle and others 2001) calls for first selecting the groups or institutions with which a programme will work to achieve defined goals. The changes in behaviour that would constitute an advance towards the goals are then defined in a

sequence of outcomes expressed as 'expect to see', 'like to see' and 'love to see'. The desired change is defined as an 'outcome challenge' and progress towards its achievement is defined by a graduated set of markers. Monitoring and assessment of progress – or its absence – is then conducted in reference to these markers.

Changes in the behaviour of institutions

Key questions

1 Are the implementing institutions collaborating effectively to implement the ICARM programme?
2 Are programme policies, procedures and regulations being enforced?
3 Are conflict mediation methods being effectively applied?
4 Are private-public partnerships functional and generating desired results?
5 Is the programme practising adaptive management?
6 Is support within the political structure at a national level being maintained?
7 Is an appropriate set of indicators being monitored to document progress toward the programme's goals?

Changing institutional behaviour is a complex challenge

Since government agencies are usually organized along sectoral lines, a major challenge is to achieve more integrated forms of planning and decision making. The re-organization of institutions, the re-distribution of power and resources, the creation of commissions and task forces are First Order achievements that, when they produce changes in behaviour, mark a critical transition to programme implementation. For example, there are many examples of nations that have formally enacted a progressive Water Law and proceeded to develop and adopt regulations, standards and enforcement procedures. Yet the years of effort that may be required to assemble these First Order achievements may have little or no effect on how water is actually being allocated and used. The progress is all 'on paper'. The challenges of selecting and applying a realistic and effective implementing strategy that will succeed in changing the behaviour of water users are complex and specific to each place.

Changes in the behaviour of individuals, groups and businesses

Key questions

1 Have target groups adopted the ICARM good practices called for by the programme?
2 Are user groups complying voluntarily with the programme's policies and rules?
3 Have destructive forms of resource use been reduced?
4 Have conflicts among user groups been reduced?
5 Is stakeholder and public participation shaping the implementation process?
6 Is there sustained public support for the implementation of the ICARM programme?

Changing the behaviour of the groups and sectors that make direct use of the goods and services that coastal ecosystems generate should be the focal point of programme implementation. The cessation of such destructive practices as dynamite fishing or preventing the release of toxic wastes into the environment are examples of behavioural change in small groups whose actions threaten the condition of an entire ecosystem and its associated

human population. The successful implementation of water conservation practices in agriculture signals a behaviour change that may be important to a reformulation of how freshwater is allocated in a linked water-basin and coastal management system.

The basis for behavioural change of different groups towards more acceptable levels of compliance...

One of the principal challenges of ecosystem-based management is securing acceptable levels of compliance with the adopted regulations and management measures. In fisheries management, for example, we have learned that without widespread support within the fishing community a fishery management programme is doomed (Sutinen and Kuperan 1994; Kuperan and Sutinen 1994; Hanna 1995). The vast majority of compliant behaviour is 'voluntary,' and more the result of moral and social considerations than coercive enforcement.

...is common under standing of the problem, fair procedures and perceived effectiveness

User groups tend to comply more with laws and regulations that they consider to be 'legitimate.' Coercion, the threat of sanction, usually is not the principal factor influencing compliance decisions. Research in several settings has shown that the basis for legitimacy and voluntary compliance is as follows:

- First, there must be a reasonably *common understanding* of the basic nature and extent of the *problem*, such as over-exploitation.
- Second, the *procedures* for developing and implementing management measures must be perceived to be *fair*.
- Third, the resulting measures must be perceived to be *effective*, in other words make a significant contribution to resolving the problem.

These relationships are illustrated in Figure 4. When these conditions are not reasonably well satisfied, the group or sector whose behaviour must change may not cooperate. Their resistance is expressed in a variety of ways: they speak out at public hearings, they seek support from their legislative representatives, and they violate the regulations. Non-compliance for most is a last resort, but it is also one of the most effective means of protest, and it effectively sabotages a management programme.

FIGURE 4   The compliance decision
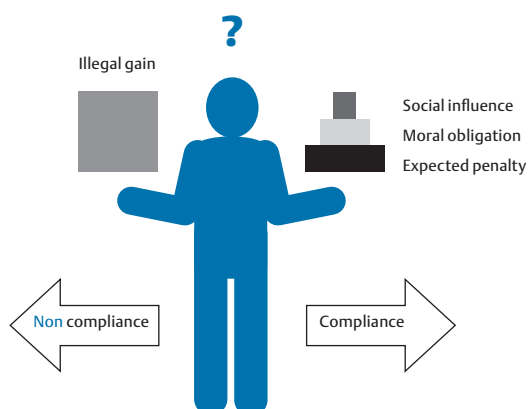
Changes in investments

Key questions

1 Are taxes, fees and other revenue generating mechanisms contributing to the financial basis of the ICARM programme?
2 Are the market prices for ecosystem goods and services reflecting the costs of generating and sustaining these benefits?
3 Are the necessary investments in infrastructure being made?
4 Are the necessary investments being made to strengthen institutional capacity?

Investments that strengthen the capacity of institutions to practice ICARM, to educate the public and to construct the physical infrastructure required for achieving the policies and goals of a programme is the third category of behavioural change. These may include decisions to invest in better enforcement of existing rules, decisions to invest in sewage treatment or the construction and maintenance of shoreline protection works. Investments in habitat protection and restoration including the purchase of protected areas and conservation easements, and restoration of wetlands may all be important expressions of programme implementation.

Investments are only justified if behaviour of institutions and groups change in the right direction

Investments in infrastructure are the most readily quantifiable and may be the easiest to justify and monitor. On the face of it, there are fewer unknowns. If a sewage treatment plant or a water distribution system of a specific design has been shown to work elsewhere, competent firms can be contracted to build them. 'Good practices' for the administration of such projects are widely known and the implementation of these elements of an ICARM plan of action appear to be relatively tractable. But such apparent simplicity can be deceiving. A poor institutional capacity assessment and insufficient attention to the human dimensions of successful use and adequate maintenance may mean that a few years later, the sewage treatment plant has broken down and the water system no longer delivers water to the people who still need it. Unfortunately examples of such failures abound in 'developing' nations and re-enforce that the key feature of implementation is behavioural change in target institutions and groups.

4.5 Achievement of a sequence of goals as progress towards sustainable development

Third Order outcomes mark the achievement of the programme's goals as these were defined during the issue selection and planning phase and may have been adjusted during implementation. These outcomes are the rewards for sustained behavioural change in the targeted institutions and groups. Water quality improves, there are more fish, income levels rise, and target communities' engagement in supplemental livelihoods stabilizes or improves. Such Third Order Outcomes can be allocated to two categories of ecosystem management goals:

· the condition of the human population as may be expressed as greater equity and diversified livelihoods; and
· sustained or restored qualities and functioning of the bio-physical environment.

Achieving the specific programme goals will also bring a variety of additional benefits
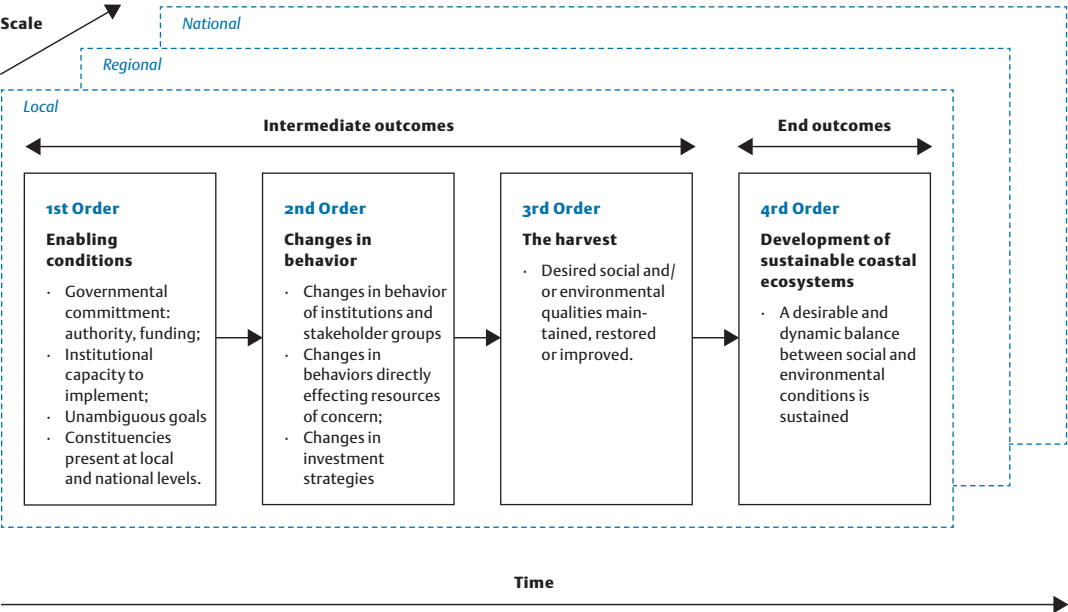
Good management practices may be expected to bring additional benefits of strengthened systems of participatory democracy that bring order, transparency, and equity to decision making and to the manner in which resources are allocated. By modelling standards of good governance, ecosystem management programmes bring hope, a greater sense of security and belief that the political system can respond to societal needs. The induced changes in behaviour can increase the standard of living of coastal residents by improving food security, and provide opportunities to generate income through supplemental employment. Properly managed, diversified income generating activities that improve economic welfare can be related to improvements in the condition of the environment.

Achieving the ultimate challenge, sustainable coastal development, is vastly complicated

The difference between Third and Fourth Order Outcomes is that sustainable development requires achieving a dynamic equilibrium among *both* social and environmental qualities. Third Order assessments examine the degree to which a programme's societal and environmental goals have been achieved. They strive to evaluate the contribution that the programme has made to achieve such ends. The Fourth Order, on the other hand, adds the dimension of balance and asks whether the conditions achieved are sufficient to sustain a healthy, just and equitable human society that is sustaining the qualities of the ecosystem of which it is a part. Sustainable development will not have been achieved if, for example, the state of coral reefs of a place are sustained or improved while the people associated with them continue to live in unacceptable poverty. Similarly, sustainable development has not been achieved if some measures of quality of life are high but such achievements are eroding the resource base or require the exploitation of other social groups. The challenge is vastly complicated by the imperative of defining an acceptable balance in terms of both intergenerational equity and a planetary perspective on both societal and environmental conditions and trends. Recognizing that all living systems are in a constant process of change, sustainable forms of development will be dynamic, not static, and must be capable of responding to the surprises that Mother Nature delivers.

Figure 5 summarizes the Four Orders of Outcomes Framework in a diagramme, also illustrating that the Order of Outcomes Framework is scale independent.

FIGURE 5   **The Four Orders of Outcomes in ecosystem-based management**

1st Order	**2nd Order**	**3rd Order**	**4rd Order**
Enabling conditions	**Changes in behavior**	**The harvest**	**Development of sustainable coastal ecosystems**
· Governmental committment: authority, funding; · Institutional capacity to implement; · Unambiguous goals · Constituencies present at local and national levels.	· Changes in behavior of institutions and stakeholder groups · Changes in behaviors directly effecting resources of concern; · Changes in investment strategies	· Desired social and/ or environmental qualities maintained, restored or improved.	· A desirable and dynamic balance between social and environmental conditions is sustained

Scale — National — Regional — Local

Intermediate outcomes — End outcomes

Time

Source: Olsen, 2003

Applying the Outcomes Framework to individual programmes

5

Specify progress assessment purpose and objectives, and the way findings will be used

5.1 Defining the purposes and context of a progress assessment

It is always important to clearly define the purposes of any progress assessment. The markers in Annex 1 are designed as a basis for a self-assessment undertaken by the staff of an ICARM project or programme and their associates. The markers serve as the basis for an internal stocktaking exercise to consider what is being learned, whether adjustments in the design and strategies of a programme are called for and to help identify priorities for the next stage of work. In more formal progress and outcomes evaluations conducted by an external team it is essential to negotiate the specific objectives of the exercise and the way the findings of the evaluation may be utilized. In either case it will be important to identify what agencies and interest groups should be consulted and the manner in which they will participate.

If the application of the markers is a feature of a performance evaluation that will be tied to future funding and judgements on the effectiveness and efficiency of the programme it will be essential to review the relationship between the markers and the programme design. Where programme design and programme contracts were based on assumptions and practices that differ from the Orders of Outcomes Framework it would be unfair to hold that programme accountable to this framework.

Keep the programme specifics in mind when comparing progress in different programmes

One of the strengths of the markers is that they can be used as a basis for comparing across a set of initiatives. Such cross-portfolio analysis can be a major source of learning. However, it will be essential to recognize the differences in the setting in which each programme is being applied and relating progress – or its absence – to difference in such factors as:
· the socio-political context in which the initiative is being attempted,
· the geographic scale of the initiative,
· the complexity of the issues being addressed,
· the resources and institutional capability being applied,
· the maturity of the effort,
· the state of the ecosystem (both its human and environmental components) at the outset of the initiative,
· the specific Third Order goals and shorter term targets against which the initiative is being measured, and
· the external forces beyond the control or influence of the programme that are shaping the context within which it operates.

Since markers based on the Orders of Outcomes Framework can be applied to ecosystem management initiatives at any scale it is essential to begin an application by defining precisely to what geographic area and to what human activities and projects or programmes the indicators are being applied. This must be defined carefully since several independently managed programmes may be contributing directly or indirectly to the management of a given river basin and its associated coastline, estuaries and shelf waters. The cover sheet included in Annex 1 provides the essentials of this context.

A sequence of applications of the marker sets offered in Annex 1 – typically at three to five year intervals – can trace the evolution of an ICARM programme over time. The Third Order outcomes must be defined and monitored by any ecosystem management programme and will always be tailored to the goals of a programme. These, in turn will be shaped by the ecosystem(s) in question, the management issues that have been selected and the capacities to practice ecosystem-based management within the institutions involved. The marker set can be applied at regular intervals to monitor a programme over time

5.2 Making adjustments to the markers and justifying ratings

The marker set may have to be adjusted for different applications

Once the area, the scope of issues or topics and the purpose of applying the markers have all been defined, the tables of markers should be reviewed with those who will be conducting the survey and those who will be responding to – or will be affected by – the results. Depending upon the nature of the ICARM programme and the use and interpretation of key terms, it may be necessary to make adjustments to the phrasing of indicators and to make some additions or deletions. It is important, however, not to eliminate any of the categories of markers within each Order. If the marker set is to be used to compare and analyze progress across a portfolio of programmes this process of adjustment can become quite complex and time consuming since the same indicator set should be applied to each participating ICARM programme.

Annotate the ratings in the table in a separate note as back up for later analysis

The ratings awarded to questions posed in Annex 1 invariably involve judgement calls and will reflect the background of those making the assessment and the spirit in which it is made. It is therefore useful to back up each answer with a brief text that gives the basis for that answer. Such text should note any differences of opinion and important caveats. Experience with markers in other fields has repeatedly demonstrated that such notes are the most useful basis for an in-depth assessment of a programme and for an analysis of changes in a programme and its context between one review and another.

5.3 Monitoring requirements and their implications

Set the governance baseline for a programme by filling in the tables

An initial application of the marker set can establish a 'governance baseline' against which the changes that occur during the life of an ICARM programme can be assessed. Such a base-line can reveal the gaps in the existing governance system and thereby guide the design of the ICARM initiative and the setting of realistic expectations for what can be accomplished in a given time period and a given investment of resources. It is always essential to place such monitoring in the context of other processes at work within the river basin and coastal area of concern since most forms of change will be the result of many forces, including those that are operating over larger areas and are beyond the reach of an ICARM initiative.

Once the baseline has been set, and programme goals have been articulated it will be important to decide what specific social and environmental variables it will be most useful to monitor. The Outcome Mapping techniques developed by the IDRC (Earl and others 2001) suggest the use of logbooks and other techniques for documenting and analyzing the changes in behaviour associated with the Second Order. Documenting progress towards Third Order goals will require monitoring the social and environmental variables that are

Then decide which variables to monitor based on the programme goals

judged to be both indicative of the programme's effort and technically tractable. Whatever variables are selected, and monitoring protocols are adopted, the time and resources required for monitoring can be considerable. As a rule of thumb, assigning not less than 10 per cent of a project or programme budget to such monitoring will be necessary and appropriate.

5.4   The Orders as a basis for programme design and training

The indicator table can be used for training events...

Depending upon the purposes of an ICARM assessment, the progress markers offered in Annex 1 can be applied in various settings. For example, in training events the markers can be applied in a field exercise to help trainees grasp the complexity of ecosystem-based management and appreciate how differences in socio-political context and issues in a given system will shape the expectations and design of an ICARM initiative.

When the marker set is used as a basis for periodic self-assessments by an ICARM programme, an appropriate format is a retreat or workshop that draws together project or programme staff and selected partners from other institutions, NGOs or private sector stakeholders. Conducting such self-assessments annually as a pre-cursor to framing a work plan for the subsequent year is a practice that has proven to be very useful in many ICM and IWRM programmes.

...for periodic self-evaluation...

Initial applications of the marker tables have shown that river basin, freshwater or coastal managers often differ in how they respond to the questions. Civil servants working in central government departments, for example, will not necessarily know what is going on locally. Local practitioners may be unaware of actions and concerns at regional or national levels. Even people working in the same organization often differ with their colleagues in assessing whether a particular action is being fully implemented or not. It is therefore important to bring together freshwater, coastal and marine practitioners from different administrations, organizations, agencies and interest groups to complete the tables jointly. Since it may not always be possible, or cost-effective, to hold workshops for a large river basin and its associated coast another option is to have one individual or group fill in the tables and then circulate them electronically to colleagues and interested stakeholders.

...or for more formal external evaluations

If the marker table is to be a feature of a more formal external evaluation it will be essential to carefully review the degree of conformance between the design of the project or programme and the conceptual framework and assumptions that are the basis of the Orders of Outcomes Framework. In these situations the indicator table may be completed by the programme or project staff as a way of organizing the materials to be reviewed by the evaluators. The evaluation team may use the table as a way to organize their findings from a review of the documents, interviews, and in some cases a public workshop or hearing.

In all cases experience demonstrates that it is important to solicit feedback and comments from a diversity of observers and participants in a programme and to note those topics in which there is a strong divergence of opinion.

Further development of methods for assessing progress

6

6.1 Initial responses to the ICARM progress assessment framework

Initial response to the Orders of Outcome framework and to the marker tables has been positive. Practitioners of both ICM and ICARM have stated repeatedly that the framework is helpful in better understanding the complexities of ecosystem-based management. The framework underscores the imperative of a long-term perspective on the changes in thinking and behaviour that are required when shifting from traditional sector-by-sector planning and decision-making and linking their projects and programmes to the fundamental goal of sustainable forms of development. One of the strength of the Orders framework is that it does not present a competing methodology for undertaking area specific management. By focusing on the outcomes produced by any method for achieving ecosystem-based management goals and targets, the Orders framework can accommodate a diversity of designs and management strategies.

Early versions of the progress marker set have been applied in workshop settings to a number of ICARM programmes underway in Southern Asia and Latin America. At a workshop held in Sri Lanka in 2005, the marker set was applied to thirteen river basins in eight countries. In Latin America and the Caribbean the EcoCostas network has drawn together ICM and ICARM initiatives funded through a diversity of institutions in ten nations. All members of the EcoCostas network have committed to developing governance baselines and to monitor progress in each initiative following the Orders of Outcomes Framework. As of January 2006, detailed governance baselines that are summarized in an ICARM marker format are being completed for long term initiatives in the Gulf of California (Mexico), the Estero Real (Nicaragua), the Cojimies estuary and watershed in Ecuador, The Galapagos, the Patagonia coast of Argentina and the Sabana-Camaguey region of Cuba.

These initial applications suggested that simple Yes or No answers to questions like those listed in Annex 1 caused difficulties. This prompted framing a gradation of responses. There have been several iterations of the questions and the gradations and these adjustments are likely to continue on into the future. After more experience has been gained in applying the marker sets it is anticipated that a consensus will emerge on which variables are most useful.

6.2 Further development of Orders of Outcome assessment methods

The priority for further developing the Order of Outcomes Framework to assessing progress is to apply it widely. The most useful approach is to apply the framework by completing the First and Second Order Tables in Annex 1 as a baseline and to prepare a commentary that summarizes both reactions to the method itself and what it reveals about the project or programme to which it has been applied. In most cases it is anticipated that ecosystem-based management initiatives at the linked watershed and coastal scale will be working to assemble the First Order enabling conditions and will have proceeded to Second Order implementation only at a pilot project level. Where mature programmes are present that have been engaged in the implementation of a plan of action for several years it will be particularly useful to identify changes in the behaviour of user groups and institutions and to document advances towards the initiative's societal and environmental goals and

targets. The monitoring of changes in behaviour presents many challenges and methods must be further developed.

Since it will be important to analyze and integrate the experience gained from applying these methods it is recommended that one or more workshops be organized within a few years to assess the usefulness of the method and discuss how it can be refined. It would be particularly revealing to assemble such workshops region-by-region since it is clear that local and regional governance contexts have a major influence both on how the method is interpreted and used, and the degree to which ecosystem-based management is succeeding. If the level of interest is sufficient, it would be appropriate to issue a second version of this report that incorporates the refinements made to the method, and summarizes what has been learned about the practice of ecosystem-based management by applying it.

6.3 Concluding remarks

This paper has presented a fresh approach to the complexities of assessing progress in ecosystem-based management initiatives. It provides a potentially important counter-balance to the prevailing focus on performance evaluations and the generalized and generalized statements on 'lessons learned'. The framework offers a rigorous but flexible method for assessing progress towards more sustainable forms of development over long time periods. It can be applied at a range of spatial scales to document and analyse the results of ecosystem-based management initiatives. The Orders of Outcomes Framework can be tailored to relatively simple, local efforts like a community based marine protected area as well as to the complex issues posed by the management of activities in an entire watershed that affect the goods and services produced by an estuary and a large marine ecosystem.

Because the framework is designed to address the long-term trajectory of change in ecosystems where important human activities are taking place, it also is a source of guidance on how ecosystem-based management initiatives are or could be designed and administered. The framework has already proven to be a useful unifying conceptual frame-work in training programmes. It can help those who design and fund ecosystem-based management programmes to visualize the sequence of achievements that must be made before end outcomes are to be realized.

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Annex 1 A Marker set for Integrated Coastal and River Basin Management – First and Second Order Outcomes

1   Name of the ICARM programme to which the Marker set is to be applied

....

2   Names of individuals
    ·   who are conducting this progress assessment

....

    ·   who are participating in the assessment

....

3   Date of the assessment

....

4   Time period covered by the assessment

....

5   Location: country(s), province(s)

....

6   Brief description of the geographic area subject to the programme and the major management issues

....

....

....

7   Size of the management area in km²

....

    ·   per cent freshwater

....

    ·   per cent tidal waters

....

    ·   per cent wetllands

....

8   Population in management area

    ·   Annual average population growth rate (last 10 years)

....

    ·   GNP per capita

....

    ·   per cent of the population in poverty

....

9   The purpose(s) of this progress assessment are?

....

....

....

10   Contributing programmes
     ·   Is an ICM programme in place?

....

     ·   Is an IWRM programme in place?

....

     ·   What other programmes are contributing to this effort?

....

....

....

1ST ORDER MARKERS: ENABLING CONDITIONS

Key questions	Ranking (0-3)				Score	
	0	1	2	3	Time 1	Time 2
Unambiguous goals						
Have ICARM management issues been identified and prioritized?	no action to date	broad issues identified by project team; some stakeholder involvement	specific issues identified with stakeholders; prioritization underway	ICARM issues have been identified and prioritized with stakeholders		
Do the programme's goals define both desired societal and environmental conditions?	no goals defined	goals are being negotiated with stakeholders but have not been formalized	desired long-term goals address either societal or environmental outcomes	goals define both desired societal and environmental outcomes		
Are such programme goals detailed through time bound and quantitative targets (how much, by when)?	no targets defined	targets are expressed in non-quantitative terms	targets specify either a date or a quantitative measure, but not both	targets have been defined in quantitative terms (how much, by when)		
Constituencies						
Do the user groups who will be affected by the programme's actions understand and support its goals, strategies and targets?	many important user groups are unaware of the programme's goals, strategies and targets	user groups are aware of programme's goals and targets but the degree of support varies	with a few important exceptions, user groups understand and support the programme	relevant user groups understand p programme goals and targets and actively support them		
Is there public support for the programme?	there is little public awareness of the programme	public awareness is incipient	public support is building up due to public education efforts, positive press coverage, endorsements from community leaders	surveys reveal that there is wide public support for the programme and its goals and targets		
Do the institutions that will assist in implementing the programme and/or will be affected by its actions understand and support its agenda?	there is little awareness of the programme within institutions that will be important partners during implementation	while pertinent institutions are aware of the programme their degree of support is unclear	with few exceptions pertinent institutions understand and support the programme and have publicly endorsed it	programme recognized as important and legitimate by institutions that will be involved in implementing plan of action		

Formal commitment

Question				
Have the policies of the programme and plan of action been formally approved by the appropriate level of government?	formal approval process has not been initiated	there is a governmental mandate for a ICARM initiative	policies and actions are being negotiated with approving authorities	ICARM plan of action and policies have obtained approval required for implementation
Has the government provided the programme with the authorities it needs to successfully implement its plan of action?	no government support	acknowledgement by some leaders of necessary authorities needed	commitments negotiated between government representatives and responsible institution(s)	formal commitment (law, decree, or decision) cements legitimacy of ICARM programme
Have sufficient financial resources been committed to fully implement the programme over the long term?	no financial resources committed for implementation of plan of action	some pledges and commitments, but significant funding gap remains	adequate short term funding (3–5 years) secured for implementation	sufficient financial resources in place to fully implement programme over long term

Institutional capacity

Question				
Does the ICARM programme possess the human resources to implement its plan of action?	no personnel have been assigned responsibility for programme implementation	staffing for programme implementation is inadequate	staffing is adequate in some institutions but not in others	sufficient human resources are in place to fully implement ICARM programme
Have the institutions responsible for programme implementation demonstrated their capacity to implement its plan of action?	institutional capacity necessary to implement programme is not present	institutional capacity to implement programme is marginal	in some key institutions institutional capacity is adequate but there are important weaknesses in others	sufficient institutional capacity is present in institutions with responsibilities for implementing programme
Have the institutions responsible for programme implementation demonstrated the ability to practice adaptive management	no evidence of adaptive management	practice of adaptive management is incipient and is being expressed as minor adjustments to operational procedures	important institutions engage in periodic self assessments and have modified their behaviour based on experience and learning	programme as a whole has demonstrated its ability to learn and adapt by modifying important targets and/or policies
Is the programme structured as a decentralized planning and decision making system?	power and responsibility are concentrated at one level in governance system	programme provides for some responsibility and initiative at various levels	decision making and responsibility is decentralized but there are significant coordination issues	programme integrates top-down and bottom-up initiatives successfully; has a decentralized structure without sacrificing efficiency
Have important actions and policies been successfully tested at a pilot scale?	no pilot programmes initiated	pilot programmes are underway to assess viability of potential ICARM actions and policies	pilot programmes completed and outcomes have shaped programme actions and policies	policies successfully tested at pilot level

2ND ORDER MARKERS: CHANGES IN BEHAVIOUR

Key questions	Ranking (0-3)				Score	
	0	1	2	3	Time 1	Time 2
Changes in the behaviour of institutions						
Are the implementing institutions collaborating effectively to implement the programme?	no collaboration among institutional partners	institutions maintain their traditional forms of collaboration and agreements	more integrated forms of planning and decision making is apparent but some significant conflicts or inefficiencies remain	Collaboration in programme implementation is effective and efficient among all relevant institutions		
Are programme policies, procedures and regulations being enforced?	programme policies not enforced	policies and regulations are occasionally enforced	widespread but not universal implementation of programme policies	programme policies, procedure and regulations are consistently followed		
Are conflict mediation methods being effectively applied?	no investments in conflict resolution	attempts to practice conflict resolution; the results are uneven	methods in place, usually applied effectively	conflict mediation skills are high and are consistently producing positive results		
Are private-public partnerships functional and generating desired results?	no private-public partnerships	some partnerships exist, but not generating desired results	public and private sector partners work successfully, and often generate positive results	public-private relationships are robust and consistently generate positive results		
Is the programme practicing adaptive management?	adaptive management not practiced	minor attempts to practice adaptive management are being made, but with limited success	adaptive management has brought some significant adjustments to programme	adaptive management fully institutionalized at all programme levels		
Is support within the political structure at a national level being maintained?	political support is weak or non-existent	political leaders recognize programme; public statements in support are rare	political leaders occasionally speak favourably of programme in general terms	political support is strong, well informed and frequently expressed		
Is an appropriate set of indicators being monitored to document progress toward the programme's goals and targets?	progress indicators have not been selected	few progress indicators identified, but monitoring is uneven	full suite of progress indicators have been selected, but monitoring is intermittent	full suite of social and environmental indicators selected and being consistently monitored to asses progress		
Changes in behaviour of individuals, groups, and businesses						
Have the good practices called for by the programme been adopted by target groups?	good practices not adopted by target groups	some good practices are sometimes followed	some good practices are consistently practices, but others are not	all programme's good practices are being applied by target groups		

Question					Score
Are destructive forms of resource use being reduced?	destructive uses of concern to the programme continue unabated	resources users aware of destructive practices; effort to change behaviour are incipient	with some important exceptions, user groups have ceased destructive practices of concern to programme	destructive resource uses have been eliminated	....
Are conflicts among user groups being reduced?	user conflicts are widespread and have not diminished	number and severity of user conflicts appears to be declining	decline in important user conflicts has been documented	major user conflicts have been resolved	....
Are stakeholder and public participation shaping the implementation process?	participation is negligible	stakeholders are generally supportive of programme, but are not contributing directly to its implementation	some important stakeholder are contributing actively to programme implementation	stakeholders and public are actively engaged in implementing programme	....
Is there public support for the implementation of the programme?	no awareness of the programme and no public support	public is little aware of the programme, and is not actively supporting it	civic leaders speak positively about programme; public support is increasing	public is well informed and expresses its support for programme	....
Is the programme's system of penalties and incentives proving to be effective?	no programme incentives or penalties	penalties and incentives exist, but they are not having a discernable effect on target groups	some penalties and incentives are proving effective, but others are not	system of penalties and incentives is working well and produces desired results	....
Changes in investments					
Are revenue generating mechanisms (taxes, fees, …) contributing to financial basis of the programme?	programme does not have mechanisms for sustained funding in place	some sources of sustained funding are in place, but they cover a small proportion of programme's recurring costs	significant sustained funding sources are in place, but long term programme economic viability remains uncertain	programme has secured adequate sustained long-term funding	....
Are sufficient additional financial resources being committed by government to sustain effective programme implementation?	no recurring governmental resources committed	some sustained financial investment by government has been secured but significant funding gaps remain	governmental funding for immediate needs is adequate, but programme's long term economic viability remains uncertain	programme receives adequate long term governmental funding	....
Are the necessary investments in infrastructure being made?	no investments in infrastructure made	investments minimal; necessary infrastructure missing or inadequate	infrastructure in place, but maintenance is inadequate	infrastructure required by programme is in place and well maintained	....
Are the necessary investments being made to strengthen institutional capacity?	no investment in institutional capacity	investments are minimal; institutional capacity needs strengthening	institutional capacity is currently sufficient, but will need additional investments in near future	institutional capacity is strong and strengthened routinely as needs develop	....

Annex 2   Definitions of Integrated Coastal Management (ICM)

Two frequently cited definitions of ICM are as follows:

ICM is a process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resources and space. The process is designed to overcome the fragmentation inherent in single-sector management approaches (such as fishing operations, oil and gas development), in the splits in jurisdiction among different levels of government, and the land-water interface (Cicin-Sain and Knecht 1998).

ICM is a broad and dynamic process that…requires the active and sustained involvement of the interested public and many stakeholders with interests in how coastal resources are allocated and conflicts are mediated. The ICM process provides a means by which the concerns at local, regional and national levels are discussed and future directions are negotiated (GESAMP 1996).

These definitions emphasize distinct characteristics of the ICM process – on the one hand, balancing development and conservation and ensuring multi-sectoral planning, and, on the other hand, participation and conflict mediation. A central purpose of ICM is to create conditions for 'a sustained effort whose fundamental goal is to reform the objectives, structures and processes of governance that control how coastal resources are allocated,' the rates in which coastal resources are used and 'how conflicts among user groups are resolved' (Olsen and others 1998).

ICM employs a suite of tools including Marine Protected Areas (MPAs), land-use control, marine zoning and permit systems, conflict resolution, planning and fisheries management. These concepts and tools are introduced progressively and as necessary in many ICM programmes.

Source: adapted from Christie and others 2005

Annex 3 The Integrated Water Resources Management (IWRM) Concept

IWRM as defined by the Global Water Partnership and used in this document is: a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resulting economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Thus, IWRM relates to the three E-s: Economic development, social Equity and Environmental sustainability.

IWRM involves a wide range of elements – lsuch as aws and regulation, policies, stakeholder participation, and incorporates aspects including science, technology, economics, culture and society. Incorporating all these elements and aspects, also ensures IWRM is designed and implemented from the standpoint of multiple objectives rather than a single environmental objective.

IWRM provides an ecosystems-based approach to water resources management. IWRM builds on the interconnectivity of the various components of the natural resource base (in other words ecosystems) and links it with the institutional, social and economic elements of water resources management, providing an integrated management framework necessary to address the particular problems related to the sustainable maintenance of ecosystems and the services they provide.

IWRM encompasses technical and governance perspectives:

A *technical* perspective that combines interactions between land, groundwater, surface water, and marine resources with respect to quality as well as quantity and the requirements of the natural ecosystems

A *governance* perspective, which includes two key elements namely: cross-sectoral integration in water resources management and integration of all stakeholders in the planning and decision making process. This includes the need for two 'horizontal' elements as well as 'vertical' integration:

· *Cross-sectoral integration* makes the institutional linkages between sectors using or impacting on water resources and water-related ecosystems. This implies that water related developments within all economic and social sectors be taken into account in the overall management of water resources. Thus, water resources policy must be integrated with national economic and national sectoral policies. This means recognizing the value of water and addressing its risks, while at the same time ensuring that sustainable management of water resources is effectively integrated into the adopted social and development pathway.

· *Stakeholder integration* ensures that actors such as water users, local and national authorities, regional/sub-regional bodies and institutions, as well as UN and International Financial Institutions are involved in decision making. Stakeholders will differ according to the management and planning level considered. Indigenous peoples, women, and the poor in particular have knowledge at hand that can provide new and innovative ideas for management and efficiency plans.

· IWRM also implies a vertically integrated structure of water resources management functions at all levels (interstate, national, province, municipality, community) of government and non-governmental organizations, promoting the principle of management at the lowest appropriate level.

Within an IWRM framework, there are three pillars which must be addressed to obtain an adequate coverage of management functions:

· The *enabling environment* – the general framework of national and international policies and strategies, legislation, financing mechanisms, and the dissemination of information for water resources management stakeholders. This framework constitutes the 'game board and the rules of the game' and enables all stakeholders to play their respective roles in the development and management of the resources.

· The *institutional functions* that allow effective interaction between various administrative levels and stakeholders. Collaborative mechanisms and 'forums' are needed to facilitate cross-sectoral integration and stakeholder participation in such a way that the integration of environmental water management functions into an overall water resources management framework is strengthened.

· *Management instruments*, including operational instruments for effective planning, regulation, implementation, monitoring and enforcement. With such instruments the decision-makers will be able to make informed choices between alternative actions. These choices are based on agreed policies, available resources, environmental impacts and social and economic consequences.

Annex 4   Ecosystem approach principles

Principle 1: **The objectives of management of land, water and living resources are a matter of societal choice.**
Rationale: Different sectors of society view ecosystems in terms of their own economic, cultural and societal needs. Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

Principle 2: **Management should be decentralized to the lowest appropriate level.**
Rationale: Decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

Principle 3: **Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.**
Rationale: Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization or institutions involved in decision-making to make, if necessary, appropriate compromises.

Principle 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.**
Rationale: The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favour the conversion of land to less diverse systems. Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

Principle 5: **Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.**
Rationale: Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species.

Principle 6: **Ecosystems must be managed within the limits of their functioning.**
Rationale: In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

Principle 7: **The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.**
Rationale: The approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
Rationale: Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency of humans to favour short-term gains and immediate benefits over future ones.

Principle 9: Management must recognize that change is inevitable.
Rationale: Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential 'surprises' in the human, biological and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change.

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
Rationale: Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
Rationale: Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functions and the impact of human use is desirable. All relevant information from any concerned area should be shared with all stakeholders and actors, taking into account, among others, any decision to be taken under Article 8(j) of the Convention on Biological Diversity. Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.
Rationale: Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

Source: The Convention on Biological Diversity. cop 5, May 2000, Decision V/6

Annex 5   The concept of Integrated Coastal Area and River-basin Management (ICARM)

A General Issues Paper (Ipsen and others 2006) concludes that it is the managers and stakeholders in coastal ecosystems that have the most to gain from the ICARM approach, but that some effects also exist on the up-stream freshwater systems as a result of managers decisions in the coastal zone. A more formal interaction should be established through an ecosystem-based approach, where river managers and coastal zone managers are obliged to also account for impacts downstream and upstream respectively.

Twelve ICARM Guiding Principles for policy and decision makers (UNEP/GPA 2006) have been formulated and presented first at the 3rd World Water Forum, Kyoto, 2003

1   Identify the shared issues for river basin, coastal area and marine environment
River basin management is focussed on its own specific issues, as is the management of the coastal area and marine environment. Some of these issues are common to river and coast and necessitate an integrated approach.

2   Prioritize the shared issues and assess the need for and benefits of integrated management of river basin and coastal area
Integrated management is complex because river basins and coastal zones have different communities and separate management structures. The needs and benefits of integration should be explicit as well as the constraints that prohibit an integrated approach.

3   Analyse cause and effect relations for the identified issues in the river catchment and coastal area
Pressures and driving forces behind the shared issues should be analysed, as well as the impacts on environmental or socio-economic conditions. The potential for environmental change and societal response should be explored. For shared issues the causes, effects and possible solutions may involve river basin and coastal area in a complex manner, making an integrated approach a prerequisite.

4   Define the spatial problem area for the integrated approach and identify the stakeholders relevant to the issues, causes and effects
As Integrated Management of River-basin and Coastal Area (ICARM) builds on the good practices of Integrated Water Resources Management (IWRM) and Integrated Coastal Zone Management (ICZM), the focus of the integrated river-coast management should in principle be on the missing link for the shared issues. Each issue defines its own spatial problem area and needs an area specific strategic approach. A thorough stakeholder analyses should facilitate the selection of the relevant stakeholders to be involved.

5   Secure political commitment as an absolute prerequisite for appropriate integrated management
Build broad political commitment for the integrated management of shared issues for river and coast. This is a pre-condition for effective involvement of relevant stakeholders in dialogues and planning processes. This is especially needed to harmonise separate institutional responsibilities, legislation, regulations and management structures for river basins and coastal areas.

6   Involve all relevant stakeholders from the very beginning to secure their commitment
Involve relevant stakeholders in a dialogue process from the identification and prioritisation of issues to the analysis for management planning and decision making. Special attention should be given to stakeholders interests and concerns and to moderate and building consensus in the dialogues.

7   Define goals of the management initiative as part of a long term perspective of the integrated management of catchment and coast
Defined goals for the short and long term should be realistic, as unrealistic goals risk a loss of credibility. Stakeholders should be involved in the joint definition of management goals. Define indicators for adequate evaluation of the developments.

8   Establish a common knowledge and information platform as a major tool for participatory planning processes
Lack of information is a key impediment to public participation. Sometimes information is abundant, but scattered and access is lacking. A knowledge platform should be specific to the socio-economic conditions of the region and should optimally provide for transparency of information.

9   Facilitate knowledge and awareness raising at all relevant levels to create optimal conditions for a participatory approach
Awareness raising on freshwater-coast interactions and knowledge building about the benefits of integrated management are needed to create involved stakeholders and build support for positive institutional, legislative and regulatory change.

10   Create an enabling environment for the management of river and coast to achieve sustainable solutions at both national, river basin and local level
Governments should be challenged to set the integrated policies and legislation that constitutes the 'rules of the game' and enable all stakeholders to play their respective roles in the context of a joined management of river basin and coastal area.

11   Encourage coastal and freshwater management institutions to make arrangements for an integrated approach of relevant aspects of management of catchment and coast
Integrated management does not necessary imply the integration of institutions. It does however require coordinated strategic, administrative and institutional cooperation at local, national and international levels, through the establishment of basin committees, or other cooperative bodies to address the practical issues of integrated management of river basin and coastal area.

12   Ensure adequate resources and capacity to secure successful implementation and sustainability of integrated management of catchment and coast
People, facilities and funds are essential for proper and full implementation and management stability. Collaborative initiatives on financing between river basin and coastal and marine management authorities can help avoid competition and mutually reinforce sustainability.

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