CHAPTER I

COASTAL STEWARDSHIP IN THE ANTHROPOCENE

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WELCOME TO THE ANTHROPOCENE

Human beings are changing the biosphere in a manner that was inconceivable a few decades ago. Large elements of society, including many important leaders, are unaware of the changes underway or do not believe that what is happening is possible. Yet the evidence is now incontrovertible that our species is changing the planet's climate and causing one of the greatest extinctions of fellow species since the death of the dinosaurs. We are altering the fundamental bio-geo-chemical cycles that govern the distribution of fresh water, the production of the nutrients that plants require, and destroying or degrading habitats critical to the functioning of life on this planet such as wetlands, coral reefs, estuaries and forests. These forces led Paul Crutzen and Eugene Stoermer in 2000 to coin the term "Anthropocene" to describe a geological epoch in which the combined forces of human activity equal or surpass those of nature in modulating the behavior of the planet. These changes are happening at a speed measured in decades and centuries, and not in the millennia that 50 years ago we comfortably assumed is the pace by which our planet evolves. Awareness that we are living in the Anthropocene has gathered momentum

only in the last few decades. In the late 1950s, two oceanographers (Revelle and Suess, 1957) hypothesized that the emissions from burning fossil fuels might be changing the chemistry of the planet's atmosphere. They suggested measuring carbon dioxide and other gasses at the Mauna Loa observatory in the north-central Pacific, far from any immediate sources of these products of the industrial era. The measurements were subsequently made and they have shown that the carbon dioxide concentration in the high atmosphere regularly increases in the spring and summer as plants throughout the Northern Hemisphere grow and respire. The concentrations decrease in the fall and winter when most plant life is dormant. The record shows that the planet as a whole breathes in and breathes out once every year. The record also showed a steady annual increase in the baseline of the amount of carbon dioxide in the atmosphere. This is attributed to the burning of fossil fuels. The Mauna Loa signal triggered a burst of research on climate change and then, increasingly, investigations into other dimensions of the Anthropocene. Beginning in 1991, the International Geosphere Biosphere Program (IGBP) has worked to synthesize the detailed quantitative science that multitudes of scientists have been producing. Box 1 contains their "big picture" conclusions and Box 2 documents graphically the enormity of contemporary ecosystem change at the global scale.

THE PRIMARY HUMAN HABITAT IN THE ANTHROPOCENE

A feature of the Anthropocene is that the planet's people, their infrastructure and their activities are becoming concentrated in a narrow band on the border of oceans, seas and great lakes. By 2000, nearly half the world's people lived within 150 kilometers of a coastline (Cohen et al., 1997). If we eliminate Antarctica and the lands in the Arctic (but not deserts and high mountains elsewhere), this is approximately 15 percent of the inhabited land-space. By 2050, demographers predict that the proportion of the world's people living in this coastal band will have increased to 75 percent. By 2000, 12 of the world's largest 15 cities were coastal. The increases in the density of coastal populations that are expected to be the result of both migration from inland and, in the tropics, population growth in these coastal regions, will transform greater portions of coastlines into sprawling

BOX 1: THE BIG PICTURE FINDINGS OF THE INTERNATIONAL
          GEOSPHERE BIOSPHERE PROGRAM

❖ 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
   extent 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 THRESH-
   OLDS AND ABRUPT CHANGES. HUMAN ACTIVITIES COULD INADVER-
   TENTLY TRIGGER CHANGES WITH CATASTROPHIC CONSEQUENCES FOR
   THE EARTH SYSTEM. Indeed, it appears that such a change was nar-
   rowly 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 mil-
   lion years. Human activities clearly have the potential to switch the
   Earth System to alternative modes of operation that may prove irre-
   versible.

❖ THE EARTH IS CURRENTLY OPERATING IN A NON-ANALOGUE STATE. In
   terms of key environmental parameters, the Earth System has recent-
   ly 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.

From: *IGBP, 2001*

cities. Such urban growth will be greatest in the tropics and in these areas we can expect that large portions of these urban dwellers will continue to live in poverty.

Why have coastlines assumed such prominence? It would appear that this is, at least in part, a consequence of a more interrelated global society in which the number of people who rely on resources from their immediate surroundings for their food and their livelihoods has diminished dramatically. The great bulk of the world's goods and fossil fuels are transported over water by ships, and the nodes in the distribution system are port cities. Industrial infrastructure and populations have clustered around these nodes. Since it is more efficient to transform such energy into goods and services close to their point of distribution, this, too, has contributed to the growth of coastal cities. But the reasons for the importance of coast-lines to people can also be attributed to the natural wealth they contain. According to Costanza et al. (1997) the annual value of the goods and ser-vices produced by coastal ecosystems are more than four times greater than the per unit area value of terrestrial systems and 16 times greater than those produced by the open ocean. (See Box 3.) The reason is that water flows downhill, and runoff from the land, and the nutrients, sedi-ments and other materials that it carries, are all released into estuaries and from there flow out along coastlines and across continental shelves. Waves, currents and tides vigorously mix the resulting stew. The consequence is extraordinarily high biological productivity in estuaries and coastal waters, deltas of rich deep soils, abundant freshwater, a climate in which temperature highs and lows are modulated by the buffering effect of a large water body and, very often, seasonally generous rainfall. The result is that coastal waters produce 90 percent of the world's fish production and coastal lands contain a high proportion of the best farmland. Before mod-ern medicine, many coastlines in the tropics were made inhospitable by such diseases as malaria, yellow fever and typhoid. These constraints have been much reduced since the 1950s and made the urbanization of tropical coasts feasible.

BOX 2: THE NATURE OF GLOBAL CHANGE

Global change is much more than climate change. These expressions of change are accelerating and interact with each other and with social and environmental conditions at local and regional scales. (IGBP, 2001)
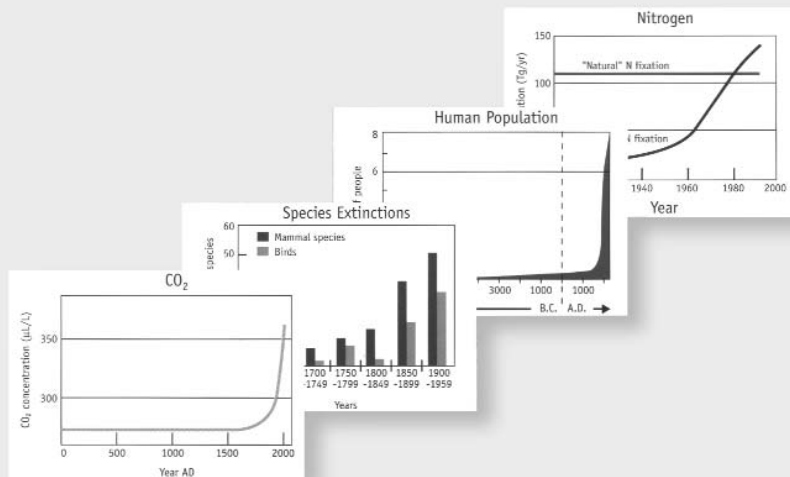
Today, coastal regions support three-quarters of the infrastructure for transportation, energy production and manufacturing. They are, therefore, also the places where the consumption of natural resources is highest— and consequently the places where the most wastes are produced and released into the environment. Last but not least, tourism has become the world's largest industry, and by far the greatest number of tourism desti- nations are coastal.

BOX 3: SUMMARY OF GLOBAL VALUES OF ANNUAL ECOSYSTEM
SERVICES PRODUCED BY MARINE AND TERRESTRIAL BIOMES

One of the most comprehensive studies estimated that the world's ecosystems provide goods and services worth at least $33 trillion a year, of which 63 percent—or $21 trillion—is contributed by the world's oceans. Over half of the oceans' contribution to planetary wealth is accounted for by coastal ecosystems, such as mangrove swamps, coral reefs and sea-grass beds.

Though there is little agreement among the scientific community on the "value" of ecosystem services and natural capital, these estimates nonetheless illustrate the relative magnitude of these resources. More importantly, economists and planners can at least get a rough idea, in economic terms, of what they are losing through non-sustainable development.

BIOME	VALUE per ha ($/ha/yr)
Marine	**577**
Open Ocean	252
Coastal	4,052
Estuaries	22,832
Seagrass/Algae Beds	19,004
Coral Reefs	6,075
Shelf	1,610
Terrestrial	**804**
Forest	969
Tropical	2,007
Temperate/Boreal	302
Grass/Rangelands	232
Wetlands	14,785
Tidal Marsh/Mangroves	9,990
Swamps/Floodplains	19,580
Lakes/Rivers	8,498
Desert	—
Tundra	—
Ice/Rock	—
Cropland	92
Urban	—

From: Costanza, et al., 1997

THE DRIVERS OF ACCELERATING CHANGE

An analysis of the forces of human-induced change at the global scale reveals that the planet's people are divided into two large groupings with distinctly different characteristics (Kates et al., 2001). Both the causes of undesired change to the planet as an ecosystem and actions to mitigate or halt those forces must consider the differences between the two groups. One group, often referred to as "the North," contains about 25 percent of the planet's population and lives primarily in North America, Europe, Japan and such prosperous countries in the Southern Hemisphere as Australia and New Zealand. By 1990, the North was consuming 70 percent of the world's energy, 75 percent of its metals, 85 percent of its wood and 60 percent of its food (UNDP, 1992). A decade later, this imbalance shows no evidence of changing. By the turn of the 20th century, the population growth in the North had stabilized. But, its major characteristic is that its economy requires sustained growth and is based upon a culture of resource consumption. Its citizens, in fact, refer to themselves as "consumers."

"The South" contains three-quarters of the world's people and they, on average, are young, less educated and poor. While the North enjoys resource surpluses, the South suffers resource shortages. The North relies on technical knowledge and invests heavily in theory-driven research. In the South, traditional knowledge dominates.

Both groups are shaping the Anthropocene and both have major roles and major responsibilities in responding to the changes to the planet as an ecosystem that are underway. However, at least until now, the principal causes of global change lie in the North, while the impacts are most evident in the South (Kates et al., 2001). The scale of the differences between the two groups is great and poses enormous challenges to all attempts to develop the ethics and the global governance systems that the Anthropocene requires.

COASTAL MANAGEMENT AS A NEW APPROACH TO PLACE-BASED PLANNING AND DECISIONMAKING

The problems posed by balancing demands for all the natural assets with the human activities that are concentrated along coastlines became an issue of national significance in the U.S. in the 1960s. The Stratton Commission (1969) made a famous analysis of the problems and the opportunities posed by the nation's policies towards the sea and the coast. It recognized that a "new approach" to planning and decisionmaking was needed in coastal zones if the multitude of pressures and the differences in the needs and institutional cultures of specific coastal places were to be managed effectively. The Stratton Commission made two recommendations to guide the "new approach." The first was to create the incentives that could produce a tiered management system for coasts that would clearly differentiate among the roles and responsibilities of state coastal zone authorities and the federal government while assuring that a common set of principles was applied across this governance hierarchy. The second was to recommend very large investments in the scientific and engineering studies that would generate the knowledge and the technologies needed to address current and future coastal problems and opportunities.

The Stratton Commission's recommendations became formalized in the Coastal Zone Management Act (CZMA) of 1972. This was launched as a federal program that offered the states two major incentives to analyze their coastlines and to re-think and restructure the policies and authorities by which coastal planning and decisionmaking occurs. The first incentive was federal funds for an initial phase of studies and planning. A second phase of more generous and sustained funding for program implementation would be triggered when a state's proposed CZM program addressed the topics defined as being in the national interest, met federal standards for clarity of purpose, and demonstrated that the state possessed the authorities and capacities necessary to implement the proposed CZM program. An approved program would be periodically reviewed to ascertain that it was indeed being implemented effectively and responding to new challenges as they materialized. The second incentive was unusual. It promised that the agencies of federal government would themselves abide

by the states' approved CZM programs. This became known as the "consistency clause." As states responded to the challenge, they found that the program was designed to give great attention to the *process* by which coastal management would unfold. There were detailed requirements for informing and involving the public in every step of the process. Each state was also required to consult with all potentially affected federal agencies—providing them the opportunity to specify their interest in that state's coastal zone and to define how that state agency or its policies would be accommodated within the state's CZM program.

Twenty years later, at the United Nation's Conference on Environment and Development held in Rio de Janeiro in 1992, similar ideas were put forward as integrated coastal management (ICM). The Conference's Chapter 17 in Agenda 21 drew upon the U.S. experience and early initiatives in some low-income nations to frame an approach that calls for integrating across the different sectors (for example, fisheries, agriculture, tourism, community planning) and involving the affected stakeholders in an integrated planning and decisionmaking process that addresses needs for both conservation and development. However, the system of incentives that had proved central to the success of the U.S. program was absent. Chapter 17 estimated the cost of implementing a global coastal management program at $6 billion, and called upon all coastal states to formulate and implement coastal management programs by the year 2000. There has indeed been a proliferation of ICM projects and programs since the Rio Conference. One estimate (Sorensen, 2000) identified 345 ICM efforts in 95 coastal nations and semi-sovereign states. Of these, 70 are "developing nations." Very few of these efforts, however, have proceeded beyond the phase of issue analysis and planning and most have been attempted as small-scale pilot projects.

For those working to promote "new approaches" to planning and decisionmaking in coastal regions, the insights of the Stratton Commission are holding up well. Experience is teaching that tailoring the principles and the practices to the socio-cultural and biophysical conditions of a specific place lies at the heart of success. We are also learning that some variables

are more important than others. At least three are emerging as particularly important: (1) the strength and resilience of the existing governance fabric; (2) the speed at which change is occurring; and (3) the prospects for sustained financial support for promising initiatives.

The most important of these variables is the baseline of conditions in governance capacity, authority and institutional structures, and the beliefs that frame the goals of governance. In the North, where nations are wealthy and politically stable, the rules by which the planning and decisionmaking unfold have been formalized and are widely accepted. With few exceptions, here society lives "within the law." In low-income, low-consumption "developing countries" the context is usually very different. Typically, a substantial proportion of the population lives in poverty and is struggling to extract food and marketable products from its immediate environment. Not infrequently, the majority of the society operates outside the law. Government may have little control over the activities that are changing the society and degrading coastal ecosystems. Not infrequently, corruption is rife and governments are willing partners in behavior that is destructive to the nation's natural assets, the people, or both. In the North, controls over land use through zoning, the designation of areas off-limits to development, and rules over where new activities may take place and how they are conducted are all present and generally accepted as "the rules of the game." They provide a framework within which a coastal management program can seek out a role and make a contribution to the common good. In the South, development and change are often occurring in a context of near anarchy under conditions that have been dubbed as "a cowboy economy." In the South, the first challenge is to assemble the institutional capacity, the collective will and the resources that are the preconditions to a viable program.

The second major variable is the pace of coastal change. In the South, the annual growth of unplanned urban development may be as great as 10 percent per year. If sustained, this produces a doubling in the population every seven years. Entire watersheds, coastlines and nearshore habitats can be transformed in a few years by the combined impacts of unregulated

In this chapter the terms management and governance have both been used. What is the difference between these terms? Management 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, or town management, or even conflict management. In the case of business management, for example, the goal is to deliver a certain product or products to the market and to make a monetary profit. Governance, on the other hand, sets the stage in which management occurs by defining—or redefining—the fundamental objectives, policies, laws and institutions by which societal issues are addressed. Governance is by no means only the purview of governments. In many settings the role of government in the governance of a coastal ecosystem is small. During the Anthropocene, the urgent need to redirect the forces of change in coastal ecosystems and promote stewardship of these critically important areas is most often a challenge of governance rather than of management.

deforestation, construction of shrimp ponds, urban expansion, and the building of enclaves for foreign tourists. Such conditions amplify the weaknesses in governance capacity since the costs of destructive and non-sustainable forms of activity accumulate quickly and, not infrequently, bring social unrest.

The third variable lies in the sources of funding for a coastal management program. In the North, national and provincial (or state) governments have played a lead role in catalyzing programs and in maintaining progress through subsidies and other incentives. A "core" of governmental funds typically provides a base from which energetic programs can "leverage" additional resources for projects that contribute to their central mission. The U.S. Coastal Zone Management Program, the Chesapeake Bay Program, Australia's Great Barrier Reef Authority and Europe's Wadden Sea Program are all examples of this pattern (Olsen and Nickerson, 2003). In the South, most governments have many demands on a small budget. Provincial and municipal governments often have little or no tax revenue and depend on an uncertain trickle of funds allocated to them by the national treasury. In these conditions, external funds from an international donor or development banks are the only option for funding a coastal management program. Since there is no sustained source of core funds, and external funding usually flows for only three to six years, it is extremely difficult to maintain continuity of effort. International institutions that provide funds for a coastal management effort have different interests, different selection criteria and different administrative procedures. It is a context that produces many short-term projects but few programs. Since the changes required to address the fundamental forces of social inequity and resource misuse require years of sustained effort, this is both inefficient and ineffective.

COASTAL MANAGEMENT AS LEARNING AND ADAPTATION

ICM is an expression of adaptive management. This means programs need to be viewed as a sequence of generations, each of which links issue analysis and planning with the implementation of a course of action. Sustainable forms of development are not achieved through a single and heroic leap. It is a goal that can be met only by a sequence of incremental steps. The process will be efficient and effective when it is grounded upon sustained learning that connects current and proposed actions to a thorough appreciation of what has succeeded and what has failed in previous management cycles in a given place.
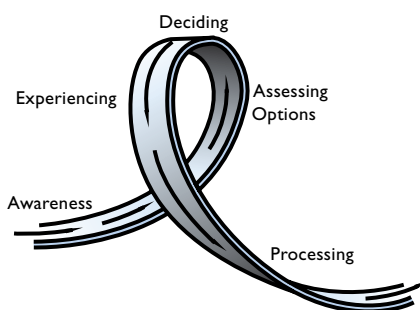
The Learning Cycle

The learning process begins with awareness that some aspect of our behavior needs to change. For example, a person may realize that he is overweight. His doctor has told him that he should do something about this and he has noticed that a walk up the hill requires more pauses than it used to. This is Step 1. In Step 2, he considers his options. The person may read books by various experts and, very likely, get confused by the many, sometimes contradictory, strategies that they advocate for a diet. The most difficult step is to make the commitment to change behavior. In this case, he may announce that he has selected one of the many diets, and have signed up for an exercise class at the local gym. This is Step 3 and it may be greeted by some fanfare. Now comes the greatest challenge—to successfully implement the plan of action (Step 4). This step is often full of surprises. The requirements of the selected diet may have unexpected impacts on other members of the family and requires some adjustments to sustain harmony at the dinner table. For various reasons half the exercise classes are missed. Six months later, having lost only a fraction of the anticipated kilos, the person reflects on his experience and considers what to do next. This is Step 5.

The ICM Policy Cycle

Formalization

Implementation

Program
Preparation

Issue
Assessment
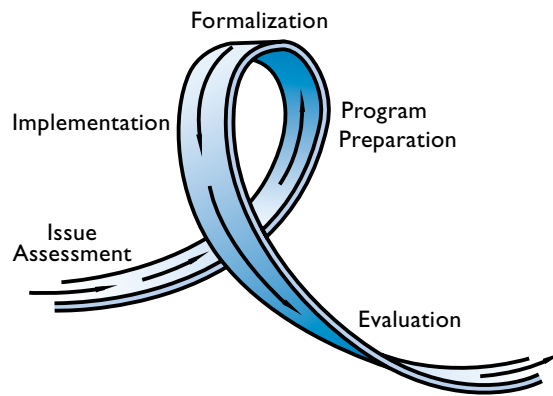
Evaluation

The five steps in the policy cycle (Step 1 Issue Assessment through Step 5
Evaluation) mirror those by which individual learning occurs.

In essence, the steps of conscious learning are the steps of the scientific
method. Much learning is unconscious and emerges by slow trial and
error, often over long periods of time. Conscious learning is more efficient
and it is a foundation of our contemporary civilization. Rather than apply-
ing a set of beliefs or a dogma as an answer to a question, the scientific
method calls for stating an idea for what the answer may be, designing a
way to test this idea, carefully observing what happens, and then drawing
conclusions. This objective and experimental way of learning was as radi-
cal a concept when it was developed by the ancient Greeks as it was when
rediscovered during the European "enlightenment" that brought the soci-

etal transformations that shape today's world. It remains a radical idea when applied to how public policy is formulated and evaluated. Herein lie the many difficulties of making adaptive management an operational reality when developing systems of coastal governance.

In its pure form, the scientific method requires a hypothesis that clearly states what an individual thinks is going to happen and it requires experiments designed to demonstrate whether the hypothesis is affirmed or rejected by reproducible events. Experiments must have controls. Without them, it is difficult to prove if the variables that are being probed are the cause of the outcomes being observed. Adaptive management can seldom attain this level of rigor, but the basics of experimentation remain the same. Applying adaptive management to how coastal governance is practiced, therefore, requires:

❖ Stating clearly the assumptions that underlie a course of action and the expectations (or hopes) for what will happen as the result of those actions. This requires setting unambiguous goals

❖ Deciding what should be monitored to demonstrated progress—or its absence—towards those goals

❖ Since rigorous controls are not feasible, critically observing and acknowledging how the context is changing during a generation of management and engaging those involved in assessing these events and adapting to them

❖ Drawing conclusions as they relate to the goals that were set and the adaptations to the plan of action that were made along the way. As much can be learned from failure as from success. Soliciting the views of informed outsiders is essential when drawing conclusions. The conclusions invariably fall short of a watertight "proof," but this does not negate their value

❖ Setting the next round of goals and repeating the process

By far, the most radical departures from the usual practices are the last two. This is the heart of the scientific method, of science-based management, and of accountability and transparency in governing societies. But since so much public policy is shaped by beliefs and by values, this approach requires a degree of humility and flexibility that does not come easily to the bureaucracies that usually develop and implement public policy. As a result, the adaptive, learning-based approach is a difficult path to follow.

MAKING ADAPTIVE COASTAL GOVERNANCE AN OPERATIONAL REALITY

When coastal management initiatives are conceived as expressions of adaptive management, the many activities that contribute to a project or program can be arranged in a logical sequence. (See Box 6.) Clustering activities around the five steps in the learning process helps in making better judgements on when an initiative is ready to move to the next cluster of activities. It also helps in better understanding the interdependencies between the results and the learnings associated with each step (Olsen et al., 1997; Olsen et al., 1998; Olsen, 2002). (See Box 7.)

The Planning Phase: Steps 1 through 3

This phase begins by identifying the management issues that need to be addressed. Issues are both opportunities and problems. The first questions are "What are the problems, what are the opportunities that need to be addressed?" (Step 1). In the Anthropocene, these are similar in any coastal region, but the dynamics of inter-relationships among the issues, their causes and their tractability within a given culture and place are always different. These differences make this step a critical one. Selecting the issues to be addressed sets the foundation for all that will follow. Typically it starts with the preparation of "issue profiles," site assessments, and other methods for integrating information from a variety of sources on the problems of overfishing or shorefront construction or habitat loss or runaway shrimp pond development or whatever else may be calling for attention. It must be decided which questions require surveys or other forms of research in order to better understand the dimensions of the issues

BOX 7: THE ICM LEARNING CYCLE AND THE ACTIONS ASSOCIATED WITH EACH STEP	
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 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 being developed • Second Order behavioral 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 program implementation obtained
Step 4: Implementation	• Behaviors of strategic partners monitored, strategies adjusted • Societal/ecosystem trends monitored and interpreted • Investments in necessary physical infrastructure made • Progress and attainment of Third Order outcomes documented • Participation of major stakeholder groups sustained • Constituencies, funding and authorities sustained • Program learning and adaptations documented
Step 5: Self Assessment and External Evaluation	• Program outcomes documented • Management issues reassessed • Priorities and policies adjusted to reflect experience and changing social/environmental conditions • External evaluations conducted at junctures in the program's evolution • New issues or areas for inclusion in the program identified

perceived as important. Since a coastal manager's concern lies with ecosystems and the people they contain, it is necessary to select ways to actively involve the people of the place in this process of listening and analysis.

When beginning to formulate a plan of action (Step 2), decisions must be made on the scope of the program and the goals it will achieve in an initial effort. This involves separating the ideal from the practically achievable. It requires matching the capacity of the coastal management program or project (as constrained by time, funds and the capabilities of the people and institutions involved) to the complexity of the issues that the initiative decides to address. The hundreds of coastal management initiatives undertaken in the 1990s all faced the same challenge—they needed to demonstrate how integrating approaches could be successfully applied in settings where they were untested and at the same time show tangible results within a few years. This led many of these programs to focus their efforts on pilot efforts at a small geographic scale. Indeed, the cases in Part 2 of this volume have relied on community-based management pilots (also known as demonstration projects) to introduce integrated approaches to coastal management and to discover which practices are more effective and which are less effective in that setting. There are always instructive exceptions. The Sri Lanka program (Chapter 4), for example, was structured from the start as a national program. It learned what to do and how to do it by focusing on the accessible reaches of coast close to the nation's capital, Colombo, and by limiting its efforts to a single issue (coastal erosion) within this constrained area. Community-based management was a feature of a later phase of this program.

Beginning with an agenda that is reasonably balanced with the capacity of those involved is critical—and a balance that too often is ignored or misjudged. Those who ignore it may claim that the necessary capacity can be imported from elsewhere but underestimate the difficulty of integrating that external capacity (and the beliefs and values that accompany it) into the host society.
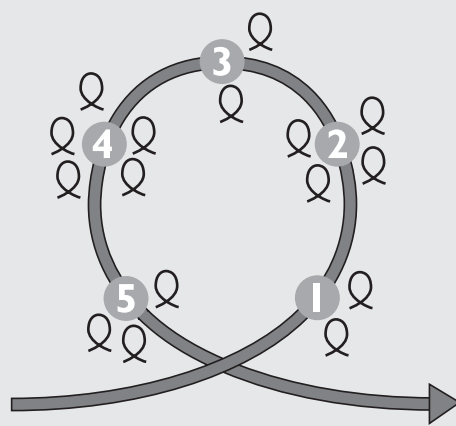
When programs practice adaptive management, each step in their evolution is enriched by analysis and experimentation that traces through the steps of the learning process. Learning accumulates at many time scales simultaneously. Cycles of learning should be completed within each step of a program's evolution. It is particularly important to experiment during the planning step (Step 2) with the ideas being considered for full-scale implementation (Step 4). Such "practical exercises" have been an important feature of CRMP.

The planning and goal-setting step must not be a task relegated to planners and technicians working in offices. It must be an effort that engages the people and institutions that will be affected by the programs. In settings where coastal management is an untested approach and the success or failure of alternative strategies is difficult to assess, it is very important to apply the learning cycle at a small experimental scale during the planning process. (See Box 8.) In the Ecuador program (Chapter 3), these early tests were called "practical exercises" and they became the foundation for activities funded later at a much larger scale during program implementation. This approach has subsequently been a feature of the planning phase of all other CRMP field programs. It is important, however, not to confuse such "experiments" with the full-scale implementation of a formally endorsed program to which the society as a whole has committed itself. Winning such commitment is the challenge of Step 3.

How long does the planning phase take? In the U.S., the CZMA of 1972 created a federally administered and federally funded program that issued grants for up to three years to complete Steps 1 through 3 at the scale of individual coastal states. The planning phase culminated in: (1) obtaining the signature of the state's governor which signaled commitment from the highest executive officer to the program's policies and procedures; and (2) demonstrating that the institutional framework and implementing powers were sufficient to adequately implement the program. In the U.S., despite a stable political context and significant financial incentives, most states required considerably more than three years to meet the federal standards and graduate from the planning phase. In some cases the planning phase extended over 10 years or more.

Progress at smaller scales is usually more rapid. The issues may be less complex and the prospects of winning commitment to a plan of action are often—but by no means always—better, and the procedures less complex. At the village level, commitment to a plan of action may be expressed by a vote at a community meeting, the decision of a village head or mayor, or by the adoption of an ordinance. The time required may be a year or less. But, it is important that such commitments are not *pro forma* and do not
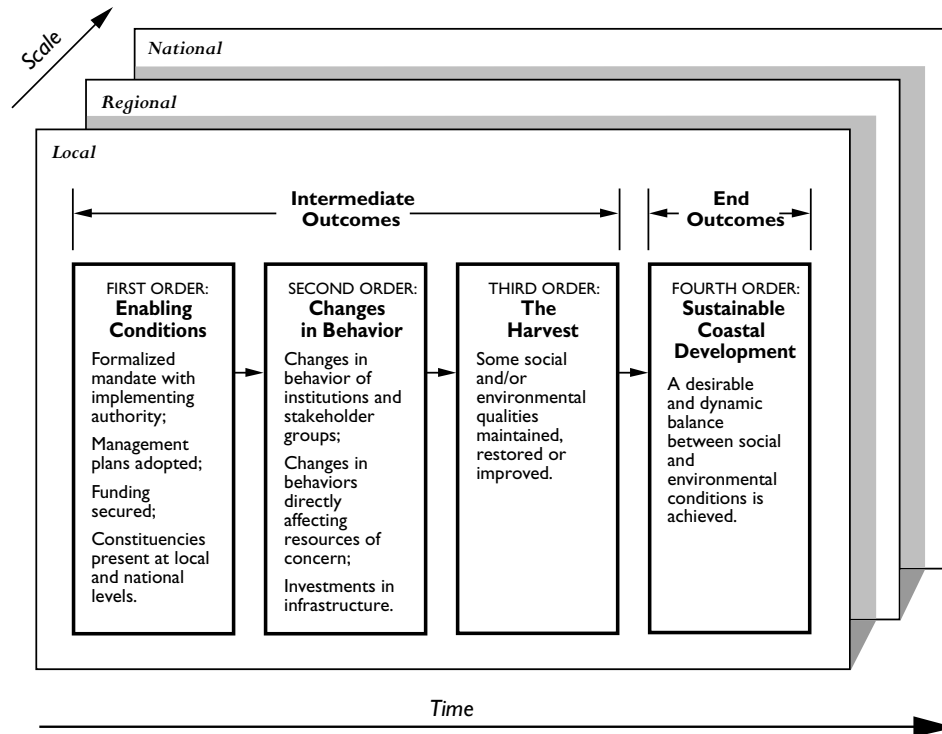
fall into the category of good intentions. The planning phase must engage the people affected and there must be a critical mass of people committed to its implementation (a constituency) if sustained action is to follow.

Implementation, Self-Assessment and Renewal: Steps 4 and 5

At the national or provincial (state) scale, the implementation of a coastal management program requires dedicated staff, supportive constituencies and funding, as well as a clear mandate. In poor and politically unstable nations, these are very difficult pre-conditions to meet. Poor countries see the priority as development—with development measured by economic growth, increased incomes and wage employment. Societal priorities are typically defined in terms of security, employment, education and public health. In this context, it can be difficult to make the case that investments in coastal management are worth the effort and the resources they require. Political scientists have examined the forces at play in such situations and describe the conditions necessary for gaining a place on the political agenda (for example, see Sabatier and Mazmanian, 1979 and 1981). Such analyses are helpful in understanding how a coastal management initiative can be designed and led during Steps 1 and 2 to maximize the chances for success at this critical juncture. The issues that are selected and how the program's goals are articulated in Step 1 and the institutions and other partners selected to help shape the programs policies and proposed actions in Step 2 will all have a major influence on the prospects for getting on the policy agenda and assembling the suite of enabling conditions that are required for success in full-scale implementation.

When ICM programs rely primarily on regulations to implement their policies, they risk becoming bureaucratic and rigid during Step 4. To counteract this tendency, it is essential that the identification and analysis of issues continue during Step 4, and that the program be alert to new problems and new opportunities and that it maintain the ability to respond to them. The program's constituencies must be sustained. They, too, will change as new issues emerge and the ones selected at the beginning of the program mature and become more or less salient.

FIGURE 1 . The Four Orders of coastal governance outcomes

Scale

National

Regional

Local

| Intermediate Outcomes | | | End Outcomes |

FIRST ORDER: **Enabling Conditions**	SECOND ORDER: **Changes in Behavior**	THIRD ORDER: **The Harvest**	FOURTH ORDER: **Sustainable Coastal Development**
Formalized mandate with implementing authority; Management plans adopted; Funding secured; Constituencies present at local and national levels.	Changes in behavior of institutions and stakeholder groups; Changes in behaviors directly affecting resources of concern; Investments in infrastructure.	Some social and/or environmental qualities maintained, restored or improved.	A desirable and dynamic balance between social and environmental conditions is achieved.

Time

Source: Adapted from Olsen et al., 1998

Source: Adapted from Olsen, 1998

At smaller scales, the processes of governance are less formalized and less cumbersome. Practicing adaptive management may be easier. When a threshold of trust has been achieved among the parties involved, it is relatively easy to examine what is working well, what is working less well, and to make adjustments. The "generations of management" spin over more quickly than they do at larger spatial scales.

THE OUTCOMES OF COASTAL MANAGEMENT

The policy cycle is useful as a simplified framework for understanding the process by which coastal management initiatives evolve. It is no less important to analyze and comprehend the outcomes that coastal management works to achieve. As with the ICM cycle, it is important from an

operational perspective to understand the sequences by which impacts accumulate. The Orders of Outcomes shown in Figure 1 groups the outcomes of coastal management along a trajectory that traces the advance to more sustainable forms of coastal development. This framework (Olsen, 2003) emphasizes that the first threshold is creating the enabling conditions that make integrated forms of coastal management feasible. The second threshold is to gauge the success of implementing an ICM program in terms of the changes in behavior that are required to meet its goals. Only after the requisite changes in behavior have been practiced for a sufficient period can improvements be expected in the environment and in the social benefits that may be attributable to a coastal management program.

Finally, achieving the ultimate goal of sustainable forms of coastal development requires a mosaic of environmental and social conditions that are as yet poorly understood and can only be defined in very general terms. In an operational sense, the ultimate goal of sustainable forms of coastal development is a "north arrow" that points in the direction needed to proceed. The most tangible and near-term outcomes lie in achieving the necessary enabling conditions and the forms of behavior that constitute coastal stewardship, and produce some—but not all—of the desired social conditions in a given place.

The First Order: Enabling Conditions

These are achieved when a program has succeeded in completing the first three steps of the ICM cycle. The crucial point is that this essential threshold requires that all five of the following outcomes be present:

1. Constituencies actively support the ICM initiative:
   - ❖ Within the user groups that will be most affected by the ICM program
   - ❖ Within the governmental institutions involved in the program
   - ❖ Within the general public

2. A formal governmental mandate for the program along with the authority necessary to implement a course of action are in place. This may take the form of:

❖ A law, decree or other high-level administrative decision creating an ICM program 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 an ICM agenda

❖ The designation of protected areas and the enactment of land and water use zoning schemes

3. Resources, including sustained annual funding, that are adequate to implement the plan of action are made available.

4. A plan of action is constructed around clear goals.

5. The institutional capacity necessary to implement the plan of action is in place.

Often all five enabling conditions are not achieved in low-income nations because external grants in support of an initiative often evaporate once a program has been formally approved by government. As a result, many projects and programs never make the transition at the national scale to implementation. In these low-income nations, assembling the necessary funds may require a loan from a foreign institution, and already heavily indebted nations are rightfully reluctant to add to their debts. Similarly, the institutions that make such loans to governments usually require a clear demonstration that the benefits of the program will yield economic returns that make the payback economically justifiable. The long-term nature of coastal stewardship makes the demonstration of such short-term economic returns difficult and many important activities essential to the coherence and quality of the program may be judged as "not bankable."

The Second Order: Changes in Behavior

These fall into three broad categories:

1. Changes in the behavior of institutions and interest groups:

- ❖ Collaborative planning and decisionmaking through task forces, commissions, civic associations and the like
- ❖ Successful application of conflict mediation activities
- ❖ Evidence of functional public-private partnerships
- ❖ Collaborative actions by user groups
- ❖ Use of new school curricula on ICM topics

2. Changes in behaviors directly affecting resources of concern.
   For example:
   - ❖ Elimination of destructive fishing practices and over-harvesting
   - ❖ Land use practices that reduce contamination of water and sustain freshwater inflows to estuaries
   - ❖ Adoption of construction setbacks and other controls over shorefront development

3. Investments in infrastructure supportive of ICM policies and plans.
   For example:
   - ❖ Construction and maintenance of shoreline protection works
   - ❖ Construction of port facilities and other transportation-related infrastructure
   - ❖ Waste disposal and pollution reduction infrastructure including sewage treatment facilities and sanitary landfills
   - ❖ Infrastructure to enhance and protect public access to the shore including rights of way, boardwalks, and signage programs
   - ❖ Investments in habitat protection and restoration including purchase of protected areas and conservation easements, and replanting of mangrove wetlands

The third category, investments in physical infrastructure, is the most readily quantifiable and often the easiest to justify on a budget sheet. On the face of it, there are fewer unknowns. If sewage treatment plants or water systems have been shown to work elsewhere and competent firms can be contracted to build them, the problems are relatively tractable and the "good practices" for the administration of such projects are widely

known. 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 fishing port lies empty, the sewage treatment plant has broken down, or the water system no longer delivers water to the people who still need it.

The "outcome mapping" techniques (Earle, Carden and Smutylo, 2001) disseminated by the International Development Research Centre (IDRC) are a powerful means for defining, documenting and analyzing behavioral changes. The method calls for identifying the "boundary partners" that a program selects to work with directly in order to instigate the societal change required to attain its ultimate (harvest) goals. The changes in relationships, activities, actions or behaviors of boundary partners that can be logically linked to the ICM program's activities are carefully negotiated. A graduated set of indicators of changed behaviors are then developed and monitored. Periodic self-assessments provide the feedback loops that encourage the program and its partners to learn and adapt as the program proceeds.

The Third Order: The Harvest

The harvest is the reward for adequate and sustained achievements in institutional and behavioral change. Water quality improves, there are more fish, the quality of life improves, income levels rise, and target communities' engagement in supplemental livelihoods stabilizes or improves.

The changes that indicate Third Order outcomes are invariably the result of multiple events and forces. At anything larger than a local scale it is only occasionally that an ICM program can confidently claim sole responsibility for a positive change in the environment or in social well-being. The more complex the program, the more difficult it is to establish valid cause and effect relationships. A second difficulty is that the benefits of Third Order changes in behavior may be reflected in improvements in coastal conditions over the long term, but not in the short term. A third difficulty in documenting Third Order outcomes often lies in ICM pro-

grams having avoided inappropriate development or in modulating forms of development that have negative impacts on coastal conditions. These are difficult to quantify and place on a balance sheet.

Greater equity and social welfare is one of the important socioeconomic outcomes of ICM. ICM strengthens systems of participatory democracy and brings order, transparency and equity to decisionmaking and to the manner in which resources are allocated. By modeling standards of participatory democracy, ICM programs bring hope, a greater sense of security and belief that the governance system can respond to public needs. ICM-induced changes in behavior can increase the standard of living of coastal residents by improving food security and improving opportunities to generate income through traditional and supplemental employment. Properly managed, diversified income-generating activities that improve economic welfare can be related to improvements in the condition of the environment. In summary, Third Order outcomes fall into two broad categories:

1. Improvements in some coastal ecosystem qualities. For example:
   - ❖ Sustained conservation of desired qualities within the areas subject to ICM
   - ❖ Halting or slowing of undesired trends such as overfishing, sand and coral mining, and/or eutrophication
   - ❖ Restoration of lost qualities, for example, through re-establishment of water flows to wetlands, sufficient diminution of sediment or nutrient loads to permit light penetration to corals or seagrass beds, and/or control of overexploitation of living resources

2. Improvements in some societal qualities. For example:
   - ❖ Increases in indices of quality of life, such as the Human Development Index
   - ❖ Reduced poverty, greater life expectancy and literacy
   - ❖ More equitable access to coastal resources and distribution of benefits from their use
   - ❖ Greater order, transparency and accountability in how planning and decisionmaking processes occur

❖ Greater security, including food security
❖ Greater confidence in the future and hope

It is within Third Order outcomes that the wisdom of Second Order investments in physical infrastructure can be assessed. Sometimes the results are disappointing. Often failures are attributable to an absence of the governance capacity required to successfully administer the facilities that have been built. The case can often be made that this translates into inadequate investments in building the base of First Order outcomes required to sustain the Third Order prize.

Far more effort has gone into developing, refining, and monitoring Third Order outcomes than either First or Second Order outcomes. This has contributed to a very major problem with the designs of most ICM initiatives in developing nations. Most investments in ICM set their "bottom line" targets in Third Order terms even when experience should have made it abundantly clear that these lie beyond the time scales of the usual donor or development bank funded "project." Programs designed and funded for the high-income North countries are more realistic. The more successful, such as the Chesapeake Bay Program, and the Great Barrier Reef Authority, have taken two or more decades to achieve their Third Order goals. In developing nations in the tropics, most Third Order outcomes that are attributable, at least in part, to ICM initiatives are currently limited to small demonstration sites. In the U.S., the documentation of Third Order achievements potentially attributable to the coastal zone management programs of coastal states has been frustrated by an absence of baselines and adequate monitoring protocols (Hershman et al., 1997).

The Fourth Order: Sustainable Coastal Development

The difference between Third and Fourth Order outcomes is that sustainable development requires achieving yet-to-be defined equilibria among both social and environmental qualities. Sustainable development has not been achieved if, for example, the condition of the coral reefs of a place are sustained or improved but the people associated with them continue to live in 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.

There is a long way to go to defining in specific terms the balance among societal and environmental qualities that could be considered sustainable in given coastal places. 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.

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 progression. For example, many successful programs experiment at a small geographic scale before attempting to apply new management practices at the national scale. Thus the First Order threshold may only be achieved at the national scale when Second and Third Order outcomes have accumulated at one or more demonstration sites.

CONCLUSION

This chapter has made the case that coastal governance must be seen as a response to the challenges of the Anthropocene. Since coastal ecosystems are of unique importance to humanity, their governance should be a critical concern. Beginning in the early 1970s in the U.S., coastal management has emerged as a "new approach" to planning and decisionmaking that considers the interactions and the interdependencies of the webs of the ecosystem process and human activities. It is the "I" in ICM that makes it both unusual and significant. Because it works to understand and to influence systems, coastal governance is complex and its benefits accumulate gradually. The second half of this chapter presented simple frameworks for visualizing how the processes of coastal governance unfold and how progress and learning can be documented and evaluated. These frameworks are applied to the case studies presented in Part 2 of this volume.

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CRAFTING COASTAL GOVERNANCE IN A CHANGING WORLD

STEPHEN BLOYE OLSEN, EDITOR

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COASTAL RESOURCES CENTER

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ACKNOWLEDGMENTS

The relationship between the U.S, Agency for International Development (USAID) and the Coastal Resources Center (CRC) at the University of Rhode Island has been a true partnership. Together we have faced the difficulties, surprises and successes that mark any attempt to apply new ideas to old problems. The knowledge that we are a single team working for the same goals, and defining together the changes in strategy required by our own learning and the changing circumstances in each country and the world at large, has been central to success of the Coastal Resources Management Program.

A great many people in USAID, in CRC and in the countries where we have worked have contributed to what has been achieved and learned. The authors of this volume thank everyone involved for their creativity, their energy and their leadership in addressing the complex issues in coastal regions. Most especially we thank our in-country teams and our partner institutions who taught us how what was being learned elsewhere could be appropriately applied to their own cultures and the needs of their countries. We have not attempted to list all those that have contributed to the ideas and the experience presented in this volume. To do so would require several long paragraphs.

While so many contributors to the program, one name stands out: Lynne Hale, former associate director of CRC. Lynne left CRC in the last year of the program—but only after setting in motion the drafting and redrafting that has resulted in this volume of reflections, experience and future directions. Lynne was CRC's point person with USAID. She led the design of the CRMP II field programs and made sure that they capitalized on what had been learned from the first set of filed programs. Throughout the 18 years of the program Lynne's passion, perseverance and perception made it the success it became. All who have contributed to this volume thank her and wish her well in the next stage of her career.

OCEANS, COASTS, WATER, AND THE EVOLVING USAID AGENDA

By Bill Sugrue
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Since 1985, the U.S. Agency for International Development (USAID) has partnered with the University of Rhode Island Coastal Resources Center (CRC) in carrying out the Coastal Resources Management Program (CRMP). CRMP is a pioneering initiative working with developing countries around the world to advance the principles and practices of integrated coastal management (ICM). During this 18-year partnership, USAID and CRC, together with partners in the field, have learned a great deal about the complexities and challenges of better managing our coasts. This has included learning how to balance the need for ecologically healthy coasts with the need to promote a better quality of life for those who live and work there. Throughout this process, CRC has been an instrumental force in promoting a "learning agenda" for (ICM). In the selected CRMP stories included in this book, you will share in some of that learning. Let me summarize here some of the key principles that underlie the ICM learning agenda.

ADVANCE INTEGRATED WATER AND COASTAL RESOURCES MANAGEMENT FOR IMPROVED ENVIRONMENTAL PROTECTION AND MANAGEMENT

It is essential that ICM and integrated water resources management (IWRM) be mainstreamed into sustainable development efforts. ICM and IWRM are essential foundations for improvements in health, food security, economic development, democracy and governance, and biodiversity conservation. We must recognize the interdependence of these development goals. The interdependence of human health, food security, governance and the other human activities is obvious. How development objectives are pursued in these sectors can have dramatic impacts on biodiversity, and on the biosphere. The biosphere is currently in free-fall, so the significance of these impacts is not trivial. Conversely, biodiversity conservation programs, properly conceived, can significantly support CRMP objectives in economic development, food security, governance and other areas. The challenge to development assistance organizations is to ensure that they move beyond single sector responses to more integrated, cross-sectoral approaches that do justice to the exceedingly complex and interrelated factors that shape our world. Principles of integration as practiced in ICM and IWRM must be given the commitment of time and resources that they deserve.

CREATE STRONG GOVERNANCE AT ALL LEVELS

Good governance is more than just good government. It encompasses a range of processes in which public, private and civil societies organize and coordinate with each other to make decisions, and distribute rights, obligations and authorities for the use and management of shared coastal resources. A central operating principle of the CRMP has been that effective governance systems are what create the preconditions for achieving sustainable environmental and social benefits. We have learned that good coastal governance functions best when it exists as part of a nested system—that is, one that operates simultaneously at scales ranging from the local to the global. For example, sub-national and community-based management efforts stand the best chances to be effective and to be sustained

over the long term when they are supported by policies and institutional structures at the national level. Meanwhile, national-level initiatives build capacity for ICM governance across spatial and sectoral scales, providing support to local initiatives while addressing coastal development and conservation of more wide-ranging national interest.

Promote Private and Public Partnerships

Participatory approaches to conservation are now recognized as one of the few means to ensure sustainable management of ecosystems and natural resources while also meeting local peoples' livelihood needs. This participation is most effective when it includes both the public and private sectors. ICM and IWRM are too complex for one institution or group of constituencies to "go it alone." Forging carefully selected, strategic private-public partnerships can help.

Eco-tourism is just one of the issues around which coastal programs are testing such partnerships. The hope is that by partnering with the private tourism sector, chances improve for achieving environmentally sound, financially sustainable, and culturally appropriate coastal tourism development. When these partnerships succeed, eco-tourism can have significant, positive impacts on local economies and can provide strong incentives for sound environmental protection and management. A caution is that "environmentally sound" and "culturally appropriate" cannot be throwaway lines. They need to be taken seriously. Not all eco-tourism is very "eco," and unless there is true and transparent participation—i.e. the local community is fully engaged, not simply consulted—the impact of tourism on local communities can be destructive economically, socially, and culturally, and the impact on the environment catastrophic and permanent. It is not easy to do this right—but it is essential to do so.

Empower Coastal Communities to Self-manage Their Resources

This must be done while promoting alternative livelihood and food security objectives. In cases where local social and economic networks are

already well established and thriving, even at relatively low income levels, poorly conceived outside interventions can be extremely and negatively disruptive. Since poverty is not solely a function of income, but also of control of assets, empowerment, and control over one's fate, even the most well-intentioned efforts at poverty reduction or economic growth can have the opposite effect on people if existing arrangements are not taken fully into account. This is especially worthy of consideration in the case of indigenous communities. In such cases, poverty prevention, rather than poverty reduction, may be the appropriate goal. In this way, intact communities with essentially sound traditions of resource management may best be assisted by simply strengthening and supporting their control over local resources. Only modest, incremental initiatives aimed at ensuring continued food security and additional income streams may be called for; but here again, full engagement of the community, not simply consultation, must be the norm.

ADVANCE INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING AT BOTH THE NATIONAL AND LOCAL LEVELS

Inadequate capacity to practice ICM and to design and implement strategies that lead to more sustainable forms of coastal development remains a primary factor limiting progress in ICM. Too often, development projects bring in external expertise and funding without a parallel effort to build and strengthen in-country partner organizations—leaving partner organizations and the larger ICM effort vulnerable to failure when outside assistance ends. CRMP has used a different approach. Its preference has been to strengthen institutions over extended periods of time and to transfer the skills and the responsibilities for implementation to CRMP collaborating organizations. This approach is grounded in the belief that long-term collaborative relationships with partners maximizes learning and increases the probability that productive efforts will be sustained over many years.

The CRMP experience has also demonstrated the value to be derived from cross-portfolio learning. For example, we have seen how communities in the Philippines that developed community-based marine sanctuaries were able to provide useful insights to Indonesian practitioners attempting to

establish their own marine reserves. Similarly, experience in Ecuador and Sri Lanka in the development of shoreline management guidelines helped CRMP undertake the process more efficiently in Tanzania.

While USAID, through its overseas missions, presently supports coastal and marine activities in over 40 countries, only a small handful of those USAID missions have been able to invest in a more comprehensive ICM approach, with broad attention to all of the general principles cited above. The challenge remains to enhance the dialogue between development agencies and national governments on the economic, social and environmental values of marine and coastal resources, and the proper level of investment to maintain these resources as national and local assets. These priority challenges, which must be faced, and which will help guide USAID's future directions include the need to:

❖ Mainstream applied fisheries research and management into ICM programs, and promote effective governance of commercial, artisanal, and subsistence capture and culture fisheries. Science and technology advances must influence decisions on coastal resource management in a context of good governance. Both are crucial.

❖ Establish networks of marine protected areas with substantial ecological reserves in all regions, while ensuring the sustainability of these activities through the development of alliances and partnerships. Conservation groups and their allies in government and the private sector have made good progress over the past 20 years in establishing parks and reserves to preserve terrestrial biodiversity. The scientific basis for defining these reserves, and managing and linking them, has grown more sophisticated. The number and variety of partners supporting these efforts has grown as well. Coastal and marine reserves need to catch up. Strong partnerships among conservation groups, government, the private sector, and local communities will be essential.

❖ Enhance coastal and nearshore water quality through partnership pro-
grams to control both point and non-point sources of marine pollution,
while addressing the impact of the growing number of coastal megaci-
ties. There has been little meaningful engagement in a significant way
with the challenges of coastal resource management in the context of
megacities. This is a huge challenge that needs to be confronted for
reasons of human welfare and environmental quality.

❖ Reduce the vulnerability of coastal populations and their infrastructure
to the growing threat of flooding, storm surge, and coastal erosion due
to climate change and rising sea levels. Mitigation efforts are essential.
A great deal remains to be done that has not yet been done. But seri-
ous—even drastic—efforts in mitigation do not eliminate the need to
undertake, simultaneously, ambitious initiatives in adaptation because
sea level rise and other effects of global climate change seem
inevitable.

What is next? Clearly, coastal and freshwater management challenges and
needs will not abate in the foreseeable future. World leaders reaffirmed at
the 2002 World Summit on Sustainable Development in Johannesburg the
central role that these resource issues will continue to play in the sustain-
able development agenda. USAID is in full agreement with that affirma-
tion and remains committed to full engagement on these issues.