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Using International Law and Organizations to Manage Marine Resources Sustainably

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IN MEMORIAM

DANNY L. ELDER 1941 — 2001

Danny Elder was a pioneer in the field of marine conservation. He played a key role in the early years of the UNEP Regional Seas Programme and then relaunched IUCN's marine program in 1985. To every endeavor he brought enthusiasm, commitment, and imagination. And he achieved results by matching scientific insight with political savvy. A caring friend and an intelligent, stimulating colleague, he will be greatly missed.

ACKNOWLEDGEMENTS

Without the interest and commitment of the Washington Office of IUCN, this expanded and updated version of the The World Conservation Union's 1995 publication, *The Law of the Sea: Priorities and Responsibilities in Implementing the Convention,* would never have emerged. Charlotte de Fontaubert, Scott Hajost, and John Waugh all played a vital role.

Tom Laughlin of NOAA's Office of International Affairs has been a long-standing source of inspiration and knowledge. He was quick to see how the map series would add value to the publication and his constant support is greatly appreciated.

Special thanks to Christopher Damon at the University of Rhode Island's Environmental Data Center for his substantial effort in producing the map series and his determination to improve upon existing datasets at the expense of evenings and weekends. He went well beyond the call of duty.

Many other individuals knowledgable and influential in international ocean law and management have informed the analysis and recommendations contained in this report. Some have been colleagues and friends for more than 25 years while others have only recently launched their careers. The list would be an endless one from which I will refrain, except to acknowledge a few whose insights and collaboration have spanned decades: Patricia Birnie, Jonathan Charney, Clif Curtis, Robert Hofman, Barbara Kwiatkowska, Gwenda Matthews, Bernard Oxman, Elliot Richardson, and Tucker Scully.

The author takes full responsibility for any errors and omissions and for the recommendations contained in this report.

LEE A. KIMBALL
November, 2001

FOREWORD

This new look at the array of international conventions and organizations governing ocean use offers both a timely assessment of the potential for regional, ecosystems-based ocean governance and forward-looking suggestions for making progress on a number of issues affecting sustainable ocean development. Its analysis of how to target different international legal instruments to solve specific oceans problems remains timeless, since the underlying legal foundation will evolve but not change. *International Ocean Governance* draws on a substantial body of work on ocean law and governance that IUCN has produced over the years.

As the international community increasingly turns its attention to regional approaches for oceans management and development, *International Ocean Governance*, by taking a practical, problem-oriented approach, illustrates how convention linkages and the program resources of international bodies can be rationalized at regional and global levels. In this respect it contributes also to the wider debate over global governance and sustainable development.

International Ocean Governance has three purposes. First, it may be used as a guide and a resource for identifying which international conventions and organizations play a role in addressing various sources of marine pollution, unsustainable fishing practices, invasive species, or other threats to marine biodiversity. It provides general guidance on how to use and develop international legal instruments. Second, it identifies strengths and weaknesses in international management arrangements for each problem. The report's suggestions for further international legal developments and improvements in the resources and functioning of international arrangements are intended to stimulate debate, new research, and fresh ideas. A third goal is to promote discussion of how to advance ocean governance at the regional level based on the importance of maintaining ecosystem goods and services for the people who depend on them.

International Ocean Governance should be useful for government officials and for international and non-governmental organizations working in the international arena, but it will also be a valuable resource to help managers and civil society address the coastal/oceans problems they face at home. I hope it will make a significant contribution to the growing number of national and international deliberations on ocean governance and regional approaches.

SCOTT HAJOST
Executive Director
IUCN — Washington Office

I. INTRODUCTION

I.A. Background and Purpose of This Report

This publication grows out of several earlier initiatives undertaken by IUCN to draw attention to the role of international law in supporting sustainable ocean development. It is directed not only to those working on international law and the broad compass of ocean issues around the world, but also to individuals and organizations working on particular marine issues and problems in a given locale. In part, its goal is to highlight how ocean problems occurring at different scales — local, national, regional, and global — engage the support of international law and organizations, so that existing policy and program resources are apparent to marine conservationists. In part, it maps various pathways to improving international policies and programs so that specialists in different disciplines and fields may better target their efforts to advance sound ocean management. Its main purpose is to consider functional needs for diagnosing and responding to marine and coastal problems and how international institutional resources can help meet these needs.

Twelve years after the adoption of the 1982 UN Convention on the Law of the Sea, all the hurdles were finally cleared for it to enter into force. By that time, marine conservation problems were far more intense and the marine conservation community had grown by several orders of magnitude. Danny Elder and Francoise Burhenne-Guilmin of IUCN's marine and coastal areas and environmental law programs, respectively, decided it would be useful to develop a reference for implementation of the Convention. A major goal was to explain how the Law of the Sea (LOS) Convention served as a comprehensive framework for marine environmental protection and marine resources conservation, which was not widely understood in 1994, and how it interacted with numerous other international agreements on pollution control, fisheries, river basins, and protected areas and species. Another purpose was to identify the many principles and innovative concepts in the Convention that laid the groundwork for an ecosystems-based approach to ocean management and for international cooperation to help all countries realize ocean benefits. Published in 1995, *The Law of the Sea: Priorities and Responsibilities in Implementing the Convention*[1] also outlines follow-up initiatives and the international organizations likely to play a part in them, including IUCN.

The next step was to place the conservation of marine and coastal biodiversity front and center in assessing the opportunities and the application of the many legal instruments associated with the LOS Convention framework. In preparation for the International Coral Reef Initiative (ICRI) conference in the Philippines in May/June 1995, Scott Hajost and John Waugh at IUCN-US supported a review of the possibilities of international law and institutions for sustainable use of marine biodiversity, focused on coral reef ecosystems. The paper was expanded in August 1995 to address marine and coastal biodiversity more broadly and updated in 1996 for distribution at IUCN's World Conservation Congress in Montreal, Canada.[2] Where the LOS publication sought to illustrate how to build on and strengthen existing international legal instruments, issue by issue, the biodiversity paper emphasized the tasks necessary for effective conservation and how different legal instruments might contribute to them. Another purpose was to help define the niche of the Convention on Biological Diversity (CBD) in marine conservation in preparation for the CBD Conference of Parties (COP) in November 1995 that would adopt the Jakarta Mandate on Marine and Coastal Biodiversity.

This updated report has been encouraged by Scott Hajost, John Waugh, and Charlotte de Fontaubert of IUCN-US. It combines the 'issue lens' utilized in international legal instruments — the primary concern of those who would strengthen international law — with the 'functional lens' of problem-solving — the primary concern of those who seek support from international legal regimes and programs. Section II takes the first approach and Section III the second. Section III introduces the subject by examining progress toward an ecosystems-based approach to ocean management and the comparative advantages of regional and global institutions in supporting it. Section IV revisits the potential of a regional emphasis for sustainable ocean management. It is supported by the map series introduced in Section V. The purpose of the maps is to depict a series of relationships between large marine ecosystems, watersheds, national boundaries, and regional ocean management agreements as well as the potential for marine and coastal protected areas to comprise a supportive network for regional, ecosystems-based management approaches. The tables identify international legal instruments by issue, supported by the maps, and major international sources of information and expertise.

I.B. Why Is The History of International Ocean Law Important?

In order to improve the law and tackle new problems, it is essential to understand how the succession of threats to the ocean has influenced legal developments. The primary forces shaping international ocean law are twofold: (1) the 'commons' nature of the seas, where no single nation exercises exclusive control and the fluid medium allows living resources, pollution, and ships to move freely from one area to another; and (2) more intense human pressures due to growing population, technological developments, and consumer demand. In contrast to terrestrial areas, ocean use has been an international affair since ships sailed more than three nautical miles offshore, the widely recognized limit of national jurisdiction until 1982. Even within that narrow limit, migrating fish or foreign sources of pollution required an inter-

national approach. Common restraint was necessary, based on shared knowledge.

The earliest marine agreements targeted conservation of marine living resources and the study of fisheries in the North Atlantic. Risks to human and marine life posed by international shipping were another initial concern. The latter agreements sought to level the playing field among major shipping nations by harmonizing rules and standards: on the one hand to establish safeguards for the shipment of dangerous goods, and on the other to control the discharge of oily wastes as ships converted from wind and coal to oil as a source of power. These *"sector-specific" conventions* reflect the limited uses of the ocean environment up to the middle of the 20th century.

During the 1970s, new sector-specific agreements were concluded to address the movement of the oil industry offshore and greater use of the oceans for waste disposal. Although the disposal agreements covered wastes in general, they were triggered by scientific studies of the impacts of toxic and other harmful substances in the marine environment. These findings launched an ongoing assessment process to identify substances which should be banned or carefully regulated if deliberately disposed of at sea ("dumping" in legal terms); it led more immediately to the first dumping conventions, one regional and one global, agreed in 1972. (Table II-2) A major goal was to ban at-sea disposal of high-level radioactive wastes.[3]

A second trend in ocean agreements also commenced in the 1970s. In small, semi-enclosed or enclosed seas, pollution did not disperse as well as in the open ocean; concentrated and interactive effects caused by different sources were more immediately apparent. This led the states surrounding such seas to conclude *comprehensive agreements* covering all sources of marine pollution: from ships, at-sea disposal of wastes, offshore minerals development, and pollution borne to the sea by rivers and air or from estuaries, coastal development, pipelines, and other land-based sources. The earliest agreements covered the Baltic Sea (1974), North Sea/Northeast Atlantic (1972/1974), and Mediterranean Sea (1976). (Table I-1, Maps B1-B8)

The decades of the nineteen-seventies, eighties, and nineties have revealed new ocean traumas and increasingly complex problems. Scientific research and technological innovations have spurred minerals exploitation — for beach sands, hard rock minerals, and oil and gas — further and further offshore. The day may yet arrive when deep seabed minerals are developed well beyond national jurisdiction — raising new environmental concerns. While pollution from vessels has diminished with increasingly effective international agreements, more and larger ships give rise to new concerns about collisions and damage to small fishing and other vessels in congested shipping lanes; the worldwide movement of ships introduces non-indigenous species to areas where they flourish, undermining ecosystem stability and established human uses.

In the fishing sector, national measures to conserve domestic stocks have been inadequate and major international fisheries are seriously overfished. More efficient fishing gear and methods have yet to be adequately joined with selective measures that reduce impacts on non-target species like seabirds and marine mammals caught incidentally in fishing operations or entangled in lost and discarded nets. The growing size and efficiency of the world's fleets require measures to stabilize fishing capacity so that excessive competition does not exhaust fish stocks or create new inefficiencies in the resources devoted to fishing effort. The discard of substantial numbers of fish that are not the desired target is another wasteful practice that neither human society nor ecological systems can afford. Fisheries disputes of the sixties and seventies over the encroachment by foreign, distant-water vessels on coastal harvests have been replaced by conflicts at the national level between small-scale, traditional fishing communities and newly-developing offshore fisheries and, in some areas, between recreational and commercial fishing sectors. Conflicts with foreign fishing now engage at the 200-mile limit where coastal state jurisdiction ends, or when foreign interests licensed to fish within national jurisdiction displace local fishing communities. Illegal foreign fishing within national zones is a growing problem in some regions, while "flag of convenience" ships and rogue states thwart conservation measures agreed among others taking part in the fishery.

The growing array and intensity of threats to the ocean extend well beyond sea-based activities. They originate upstream in the vast drainage basins of major river systems and inland with the many sources of airborne pollutants. Human activities on land are now recognized as the predominant source of ocean stress. (Table I-1) Coastal areas are particularly vulnerable because they concentrate more than half of the world's population and rest at the crossroads of terrestrial, watershed, and oceanic influences. For upstream communities that have traditionally diverted rivers and streams for agricultural, household, and industrial purposes, the demands of coastal communities for more, quality freshwater may seem unreasonable and hard to meet. Even at the coast, expanding human settlements are likely to pit developmental against recreational interests and to compete with marine species for suitable shoreline habitat. If international tourism is an important source of revenue and employment, conflicts of use may be intense. The challenge today is to identify and reconcile different uses impacting the marine environment, not only in coastal and nearshore areas but also in the hinterland. Further offshore, conflicts of use are not yet a major problem except in relatively small, enclosed seas.

But the challenge goes even deeper: it is not only to curtail human impacts, but to ensure that they do not irreversibly modify the life-support functions of coastal and marine ecosystems. At some stage, overfishing alters predator/prey relationships and species composition; modified river flow and transport of sediments and nutrients may compromise vital habitat like shallow estuaries or coastal reef systems; and non-indigenous species may take over established communities of flora and fauna. The human activities causing ozone depletion and

Figure I-1

STATE OF THE MARINE ENVIRONMENT 1990: CONTRIBUTIONS BY SEA-BASED, LAND-BASED AND ATMOSPHERIC ACTIVITIES

Growing concern with land-based activities is starkly reflected in GESAMP's second global assessment of the marine environment issued in 1990. A rough estimate attributes the relative contribution to marine pollution from human activities as follows:

- **maritime transportation 12%**
- **dumping (deliberate at sea waste disposal) 10%**
- **offshore production 1%**
- **run-off and land-based discharges 44%**
- **atmosphere 33%**

GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection): *The state of the marine environment*, UNEP Regional Seas Reports and Studies No. 115 (UNEP 1990) at 88. GESAMP produced the first global assessment in 1982, UNEP Regional Seas Reports and Studies 16 (UNEP 1982).

climate change undermine ocean ecosystems indirectly. Microscopic, photosynthetic algae at the base of the oceanic food web are harmed by exposure to ultraviolet light due to ozone depletion. Climate change may not only result in sea level rise and more severe coastal storm damage, it may affect temperature and salinity in particular marine ecosystems, causing species mortality and modifying species composition and migratory patterns; at the global level, it may lead to major changes in ocean circulation patterns. Persistent organic pollutants (POPs) accumulate in the fatty tissues of many organisms, especially at the top of the food chain, and tend to concentrate in colder climates. Recent studies indicate that the long-range transport of POPs and their volatility intensify toxic effects on marine species. POPs have been shown to cause failures in the reproductive systems of marine mammals (polar bears, beluga whales), penguins, and seabirds as well as birth defects. Human exposure even to low doses may cause cancer or adversely affect nervous, reproduction, and immune systems or child development.

The 20th century's succession of ocean threats illustrates how isolated impacts from individual sectors today mingle and concentrate, spreading beyond enclosed bays and seas and implicating human activities well inland. Impacts are suffered not only by particular species and the towns and villages that rely on them, but increasingly by the larger natural systems and human societies of which they form a part. This requires management strategies capable of tackling not only the individual sources of stress but also their cumulative and interactive effects. At the international level, it requires both specialized management regimes to control threats from particular sectors and a means to relate the specialized regimes to the full range of influences on a given coastal/marine system. Sites of special concern should be defined and protected within this context. Where linkages exist with major river systems and with migratory species or airborne pollution originating outside the system, these too should be taken into account. Interactions with global-scale problems like ozone depletion and climate change need to be factored in.

In order to respond effectively to today's oceans challenges, societies must establish means to agree on the concerns that have first call on scarce domestic and international resources. This involves decision-making at local, national, and international levels. Success at the international level is contingent on local and national processes that truly engage affected constituencies. At the same time, when the scale of the problem extends beyond national boundaries or when a national problem is exacerbated by external influences, it cannot be solved by a single nation. This sets a dual agenda for the 21st century: to maintain the benefits and functions of marine ecosystems for the communities dependent upon them and for human society as a whole, and to reconcile the sector-specific thread of international legal instruments with the more comprehensive, ecosystem-based approach necessary to diagnose complex problems, determine the relative importance of different sources of stress, and establish priorities. Where logical ecosystem-based units of ocean management converge with international institutional arrangements is at the regional level. (Table III-1)

I.C. How to Use and Develop International Ocean Law

International conventions and the institutional processes they establish are a means to an end. They embody common perceptions of problems and how to deal with them and they provide a forum for regular review: to keep the process honest and to adjust and update agreed measures in response to new scientific findings, technological developments, and other changing circumstances. By virtue of clearly-defined objectives, they both stimulate, and serve as an organizing framework for, a wide range of disperse initiatives. The environmental conventions started from a cautious orientation protective of sovereign rights. Today they have begun to embrace a more forward-looking approach to national rights and duties; they increasingly reflect common but differentiated responsibilities and recognize that using natural resources sustainably and preserving the benefits and functions of ecological systems are essential for human wellbeing.

In the oceans realm, early conventions to control marine pollution sought uniform rules to avoid confusion and discrimination among shipping nations. With time, they have emphasized the goals of reducing adverse impacts on human health, marine species, and habitat. International fisheries arrangements are moving from a narrow concept of conserving shared stocks of target fish to multi-species man-

agement encompassing predator/prey relationships, habitat protection, and the incidental impacts of fishing on marine species and habitat. New directions favor a broad, biogeographic approach to marine management based on ecosystems and strive to link species conservation arrangements with those on marine environmental protection. A few incorporate specific applications of a precautionary approach.

The interlocking web of oceans agreements offers opportunities to advance each nation's responsibilities to achieve sustainable fisheries, prevent marine pollution, and preserve marine habitat and ecological services. Each new development influences and leverages subsequent developments in other fora; for example, agreement in one region to set targets and timetables for controlling sewage, industrial effluents, or agricultural runoff can serve as a model for other regions and highlight the technologies and practices that allow targets to be met. This expands the market for environmentally-sound technologies (ESTs), reducing the price. Agreement on ground-breaking conservation measures in one fishery may influence later regional and global developments; for example, measures that embody a precautionary, go-slow approach to expanding a fishery in step with growing scientific knowledge, or enforcement authorities granted states in whose ports the catch is landed. Such regional developments helped shape the 1995 UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (Fish Stocks Agreement or FSA), a global agreement specifying in more detail how to implement the LOS Convention's fishery provisions. The FSA, in turn, has become a stimulus for improving regional fisheries arrangements. (Section II.C.)

A similar 'push and pull' effect may be observed in the way other global and regional conventions interact (and in the way that national legal developments may inspire international improvements). The end result is that more nations are drawn to the commitments and opportunities of international law. In one example, the CBD inspired regional marine conventions to reflect the broader concept of biodiversity in their conservation mandate and, in the case of the Mediterranean and Northeast Atlantic, to actually incorporate a number of CBD provisions into revised protocols on protected areas and biodiversity. (Section II.D.2) One may hope that regional river basin agreements will increasingly incorporate the obligation stated in the 1997 framework Convention on the Law of the Non-navigational Uses of International Watercourses: that states take the watercourse-related measures necessary to protect and preserve the marine environment. (Section II.D.5.)

A further interaction among conventions may be called the 'drag' effect, where more specific and binding obligations in one convention leverage the achievement of goals under another. Thus, the LOS Convention's requirement that states take pollution control measures which "include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life" (Article 194(5)) reinforces area and species protections established under other conventions. It is generally more compelling than the measures adopted under these conventions and, due to the large number of states parties to the LOS Convention, it may reach more countries. Similarly, the LOS Convention's unqualified requirement that states "adopt laws and regulation to prevent, reduce and control pollution of the marine environment from land-based sources, including rivers…" (Article 207) can be used to induce riparian states to agree on pollution control measures in shared rivers. A similar argument can be made with respect to the FCCC/Kyoto Protocol, where specific obligations to reduce greenhouse gas emissions may encourage 'sinks' enhancements that benefit the coastal/marine environment and contribute to implementation of the regional marine conventions — whether indirectly through improved forest management in watersheds (reducing erosion and marine sediment deposition) or, over the longer run, in ocean sinks directly.

Moving from environmental to international trade agreements, there may also be a constructive interaction. Global environmental conventions rarely specify detailed rules and regulations. There is rather a continuum from general objectives and norms to more specific agreements at the regional level which take account of particular environmental/geographic conditions, different contributing stresses, and varying socio-economic circumstances. The environmental conventions have moved away from agreement on uniform, technology-based standards toward commitments to achieve broad goals and targets (e.g., 30 percent reduction in nutrient input to water or volatile organic compounds to air). This leaves the choice of technical solutions and of sectors bearing the brunt of reductions to national and local authorities. It allows them to determine their own policy mix among command and control strategies, market-based interventions, and voluntary agreements with public involvement.[4] Such flexibility indicates how important it is to identify environmentally-sound technologies and practices as *options* to inform the choices. At the same time, as options are tested and adapted in particular settings, they may offer a basis for neighboring countries to harmonize approaches; they may agree, sector-by-sector, on particular options that best meet common environmental goals. In global marketplace terms, these present an agreed threshold for foreign investors in the region. The measures may be recognized as comparable to those taken elsewhere in light of prevailing conditions in the region. As a result, harmonized measures reflecting regional circumstances can facilitate trade and investment. There is a need to proceed cautiously, however, to ensure that the measures do, in fact, enhance sustainable development.

Incipient principles and concepts in one agreement are another means of advancing conservation goals. By affirming an intention, they stimulate scientific knowledge and the testing of practical applications. The concept in the LOS Convention that fishery conservation and management measures take into account environmental factors, the interdependence of stocks, and effects on associated or dependent species (including marine mammals and seabirds) finds its most detailed expression in the ecosystem basis for conservation articulated in the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). (Section II.C.) It also establishes a legal foun-

dation for measures on selective gear and other practices that reduce incidental catch and marine debris. Another principle in the LOS Convention whose potential has yet to be fully explored is that requiring states in their pollution control measures not to transform one type of pollution into another. It will take some effort to illustrate how it may be practically applied to achieve a net reduction in pollution and wastes to all media. (Sections II.B. and III.D.)

International processes which articulate non-binding guidelines and good practices play a very important role in realizing the possibilities of international ocean law. Detailed measures for a given sector — whether agricultural practices that reduce fertilizer and pesticide runoff, forest practices that reduce erosion and siltation, or guidelines for the wise use of wetlands — serve both as an educational tool and as a practical "how-to" manual for farmers, forest workers, planning authorities, and others. The effect of a binding legal commitment is to concentrate the mind on the need for detailed, practical guidance to achieve stated goals. At the national level, this may be undertaken either on an *ad hoc* case-by-case basis or in accordance with national guidelines that establish a common threshold for action. At the international level, it may be difficult, as noted above, to reach agreement on sound options applicable in different geographic/environmental and socio-economic circumstances. Non-binding measures offer a useful alternative. If endorsed through regional and global convention processes, they acquire some standing as a benchmark against which to judge activities. They may be formally endorsed at the national level through laws and regulations; if applied and adapted by several neighboring countries they may form the basis of a harmonized regional approach. Thus, agreement on non-binding technical guidance both derives from and stimulates international commitments.

These possibilities of international law offer those working on policy developments several avenues for promoting higher national aspirations. Drawing attention to pace-setting legal developments and their application at national or regional levels may stimulate advances elsewhere. The incorporation of more forward-looking principles into a global framework convention may leverage developments at regional and national levels. The elaboration of non-binding guidelines and practices may result in more detailed national laws and provide the basis for regional agreement on specific commitments. Binding obligations in one field may open the door to more substantial accomplishments in another, just as national interest in better access to the global marketplace may reinforce efforts to agree on harmonized international approaches. When one avenue appears blocked, another may be clear; the key is knowing how to use these opportunities to advantage.

From the practical standpoint of ocean management, scientific and technical knowledge represent the first steps toward action. As knowledge emerges, it helps define the problem and draw attention to it, and it helps with the identification and design of response options. Further analysis can determine the costs and benefits, including environmental costs, of different solutions and the circumstances in which each is appropriate. At the national level, shared knowledge helps foster consensus among different interest groups; at the international level, shared knowledge is an essential prerequisite for agreed action. In complicated oceans problems, the next step may be a 'choice of forum' issue; that is, which international process(es) can most effectively promote agreement on solutions? Once legal commitments are made, they 'command' a response, which stimulates further scientific, technical, and socio-economic assessment to make good on the commitments and, ultimately, to expand the menu of options.

The institutionalization of international legal processes derives from both legal and practical concerns. On the one hand, institutional support provides the means for ongoing review to ensure that commitments are met and to take stock of the need for new measures. On the other, the substantial scientific and technical content of problem diagnosis and response in the environment/development field raises the need for information and analysis to a new level. Institutional means are necessary to facilitate access by individual states and private actors to this information and, increasingly, to undertake collective assessments that foster common understanding so as to pave the way toward agreed response actions. In the final stage of implementation, international technical and financial cooperation has spawned new and dedicated institutional arrangements to assist nations in meeting their international obligations. This expanding institutional complex poses new challenges for coherent policy and program developments in support of sustainable ocean use. (Sections III.A.5. and IV.)

ENDNOTES

1 Part I: Lee A. Kimball, "The UN Convention on the LOS: A Framework for Marine Conservation." Part II: Douglas M. Johnston, Phillip M. Saunders and Peter Payayo, "Conservation and Management of the Marine Environment: Required Initiatives and Responsibilities under the 1982 UN Convention on the LOS" (IUCN 1995).

2 Lee A. Kimball, "The Possibilities of International Law for Sustainable Use of Marine and Coastal Biodiversity" (IUCN-US, September 1996). An annex reviews each of a number of international agreements applicable to conserving marine and coastal biodiversity and developments current at the time.

3 The OECD's Nuclear Energy Agency had designated a site 700 km northeast of Spain as the European dumping site for radioactive wastes in 1967. [Samir Mankabady, *The International Maritime Organization,* vol. 1 (London: Croon Helm, 1986) at 352]

4 This mix of policy approaches is now advocated by many environmental management authorities. See Robert T. Watson, John A. Dixon, Steven P. Hamburg, Anthony C. Janetos, Richard H. Moss, *Protecting Our Planet, Securing Our Future* (UNEP, U.S., NASA, The World Bank 1998) at 56-69.

II. FOCUS ON LEGAL ARRANGMENTS: THE FRAMEWORK LAW OF THE SEA CONVENTION AND ASSOCIATED AGREEMENTS

International law, as reflected in the provisions of the U.N. Convention on the Law of the Sea, referred to in this chapter of Agenda 21, sets forth rights and obligations of States and provides the international basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources. This requires new approaches to marine and coastal area management and development, at the national, subregional, regional and global levels, approaches that are integrated in content, and are precautionary and anticipatory in ambition . . .

— Agenda 21, Chapter 17: Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources

II.A. An Introduction to The LOS Convention

The 1982 LOS Convention establishes a comprehensive framework for use and development of the oceans. It specifies each nation's rights and responsibilities and the general objectives and principles that are to guide their ocean use. It defines offshore zones within which coastal states exercise varying degrees of sovereignty and jurisdiction along with the rights and responsibilities of foreign nations in these zones. These basic parameters guide the application of other conventions insofar as they touch on ocean areas and concerns, from the CBD and agreements on protected areas and species to agreements on air pollution or pollution in rivers.

The Convention has been supplemented by two implementing agreements. The 1994 Agreement Relating to the Implementation of Part XI is to be interpreted and applied as a single instrument with the LOS Convention. It clarifies and replaces many of the Convention's deep seabed mining provisions adopted in 1982 and prevails over the Convention in the event of any inconsistency. The 1995 Agreement Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Fish Stocks Agreement or FSA) supplements and elaborates the LOS Convention's fishery provisions, providing further guidance on implementation.

The LOS Convention was designed to serve as a unifying framework for a growing number of more detailed international agreements on marine environmental protection and the conservation and management of marine resources. Understanding its dynamic interaction with these agreements is critical. These relationships are considered issue-by-issue in the following sections. As a general matter, the Convention calls on all states to harmonize national measures, elaborate global and regional rules, and re-examine this body of law as necessary. Its structure of national rights and responsibilities and its goals and principles inform these developments. In turn, the Convention incorporates by reference the more detailed measures as they are progressively developed and its framework obligations may be interpreted and applied in light of this evolving body of law. In some cases, its effect is to apply more detailed global and regional agreements to countries that are not party to them. Its compulsory and binding dispute settlement system may be called into play under agreements that lack such a system.

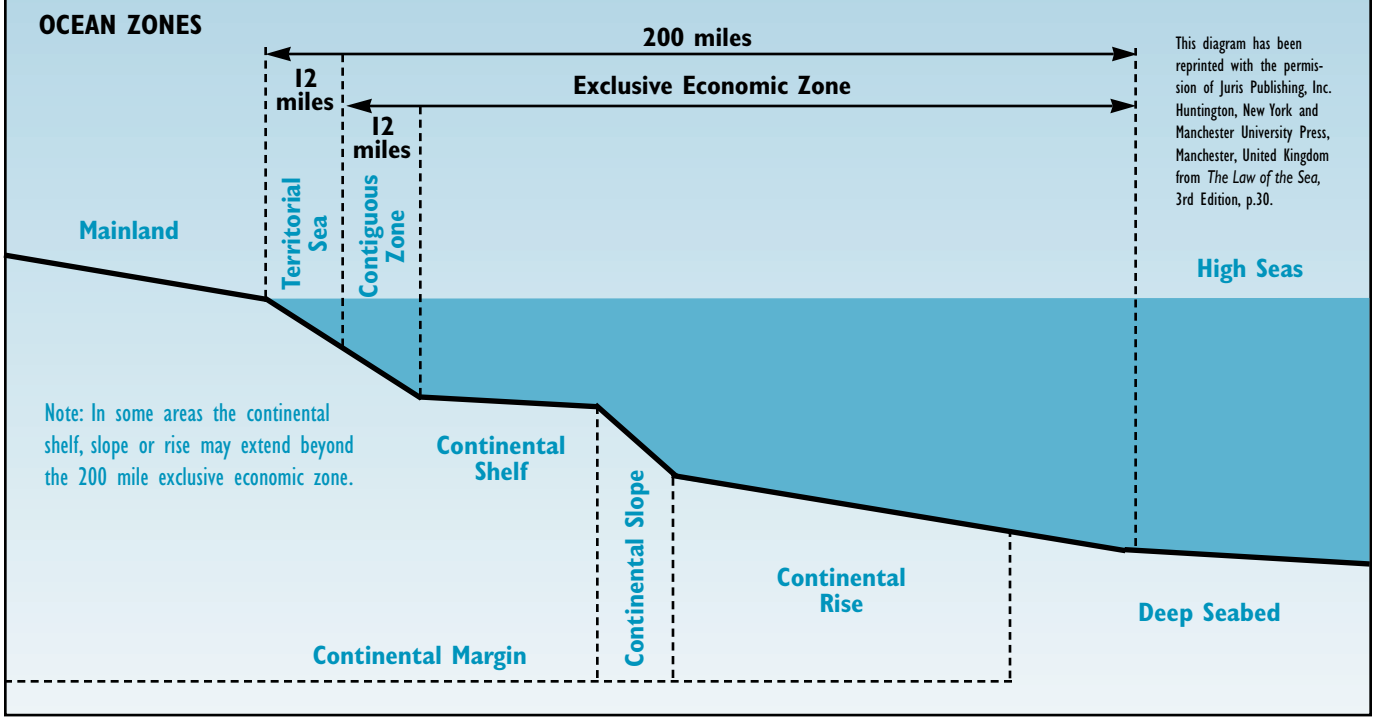
Another vital aspect of the LOS Convention is that it governs activities both on land and at sea. That is, to the extent that activities on land impact the marine environment or the habitat of marine species, they are addressed by various provisions of the Convention. The unqualified nature of Convention obligations on marine pollution, as elaborated through regional and global instruments, may reinforce less compelling commitments under other environmental conventions.

II.A.1. Ocean Zones

The LOS Convention sets forth the rights and obligations of all states in the following offshore zones: (Figure II-1, Maps A1-A8)

- *internal waters*, which are landward of the baseline and form part of a state's territory. Normally, they include estuaries, ports, and rivers and bays up to a certain size. (The *baseline* constitutes the outer boundary of internal waters and the starting point for the delimitation of the zones beyond. Normally, it is the low water line. In particular geographic configurations, baselines may be drawn to include extensive marine areas as internal waters. (Article 7));
- *a territorial sea* of up to 12 nautical miles (n.m.), in which the coastal state exercises full sovereignty subject to the right of innocent passage for foreign ships;
- *a contiguous zone* adjacent to the territorial sea which may not extend beyond 24 n.m. from the baseline, in which the coastal state may exercise control necessary to prevent and punish any infringement of its customs, fiscal, immigration or sanitary laws and regulations that has taken place within its territory or territorial sea;

Figure II-1



- *an exclusive economic zone (EEZ)* beyond and adjacent to the territorial sea which may not extend beyond 200 n.m. from the baseline, in which the coastal state has sovereign rights over natural resources and other economic uses and jurisdiction as specified in the Convention regarding marine scientific research, marine environmental protection, and the establishment and use of artificial islands, installations, and structures; and

- *the continental shelf*, which may extend beyond 200 n.m. but not beyond 350 n.m. from the baseline (depending on the configuration of the seabed), where the coastal state exercises sovereign rights over natural resources and jurisdiction over marine scientific research.

The Convention grants coastal states substantial authority over activities in these zones, but the degree of control they exercise over use by other states varies with the zone and the activity in question. Most fundamentally, the Convention balances the rights and obligations of coastal states in offshore zones with worldwide navigation and telecommunications rights essential for international security and commerce. A fundamental distinction exists between the sovereignty of the coastal state out to the 12-mile limit of the territorial sea, and the less absolute authorities it may exercise in other offshore zones. In recognition of special circumstances, there is also a directive for states bordering enclosed or semi-enclosed seas to cooperate as they exercise their rights and perform their duties under the Convention. (Article 123)

Coastal state control over offshore natural resources, living and nonliving, and over economic activities in general is nearly complete. These rights extend to the production of energy from water, currents, and winds and to the establishment and use of artificial islands and other installations and structures in the EEZ and on the continental shelf. The coastal state's exclusive rights to continental shelf resources extend beyond the EEZ to the edge of the continental margin if the natural prolongation of the continental land mass exceeds 200 n.m. (Figure II-1) A coastal state's rights to offshore resources go hand in hand with obligations to conserve marine living resources and protect and preserve the marine environment. Its right to regulate and authorize marine scientific research in the EEZ and continental shelf is qualified, so as to facilitate access by other states for "basic" or "fundamental" research that advances human knowledge; the coastal state retains full control over research of direct significance for the exploration and exploitation of natural resources. (Articles 246, 252) Convention provisions facilitate access to national zones for research undertaken under the auspices of an international organization. (Article 247) Coastal state control over research on the continental shelf diminishes beyond the 200-mile mark. (Article 246.6) Similarly, coastal state authority to set and enforce pollution control requirements for foreign vessels diminishes as the zones move further offshore, reflecting the balance with international navigation rights. Further refinements to balance coastal state rights and obligations with international freedoms of navigation obtain in narrow international straits and in certain archipelagoes. (Section II.B.1.)

Beyond national jurisdiction, all states have the same rights and obligations on the high seas. For deep seabed mineral resources beyond national jurisdiction, the Convention establishes an international management regime and corresponding institution, the International Seabed Authority, headquartered in Kingston, Jamaica. (Section II.B.6.)

II.A.2. Dispute Settlement, Compliance, and Enforcement

The LOS Convention establishes a unique system for international dispute settlement, since adapted to other international environmental agreements. It offers governments a menu of options for settling disputes, but in the end they must submit to compulsory, binding procedures in most situations. (The procedures are *compulsory* because either party to the dispute may request dispute settlement and the other must go along; most international treaties require both parties' consent and therefore do not have compulsory procedures. The procedures are *binding* if the parties to the dispute must comply with the decision. The decisions of courts and arbitrators are binding; the results of mediation and conciliation procedures are not.) The LOS Convention's exceptions to compulsory, binding dispute settlement concern conflicts over maritime boundaries, issues before the UN Security Council, and military activities. In addition, the coastal state is not obliged to submit certain disputes over its rights with respect to fisheries and marine scientific research to the compulsory, binding processes, as elaborated below.[1]

The four options for compulsory, binding settlement are (1) the International Court of Justice (ICJ), (2) the International Tribunal for the Law of the Sea (ITLOS), established by Annex VI of the Convention and headquartered in Hamburg, Germany; (3) an arbitral tribunal, constituted in accordance with Annex VII; and (4) a "special" arbitral tribunal, constituted in accordance with Annex VIII. The latter applies to four specialized categories of disputes: international navigation, including pollution from vessels and by dumping; fishing; marine scientific research; and protection and preservation of the marine environment. In this case, the arbitrators are experts in the field rather than persons experienced generally in maritime affairs (read "lawyers"). Expert lists are maintained by the International Maritime Organization (IMO), Food and Agriculture Organization (FAO), Intergovernmental Oceanographic Commission (IOC) of UNESCO, and UNEP, respectively.

There are no limitations on the application of compulsory, binding dispute settlement to disputes over *protection and preservation of the marine environment*. Moreover, in circumstances where serious harm to the marine environment may result, the court or tribunal seized of the dispute may prescribe provisional measures to prevent such harm. There are safeguards to ensure that provisional measures are not delayed in urgent situations. The parties to the dispute must comply with them. (Article 290)

As noted above, more specific rules and standards agreed through associated conventions can inform dispute settlement proceedings and help determine if a violation of more general LOS Convention obligations has occurred. The Convention is quite explicit on this point in relation to marine environmental protection. It subjects a coastal state to compulsory and binding procedures when it is alleged to have acted in contravention of applicable international rules and standards for marine environmental protection established by the Convention *or through a competent international organization or diplomatic conference in accordance with the Convention*; and it subjects a state exercising its high seas freedoms to compulsory, binding dispute settlement when it is alleged to have acted in contravention of the Convention or of national laws and regulations adopted by the coastal state in conformity with the Convention *or other rules of international law not incompatible with the Convention*. (Article 297.1) Thus, even if another global or regional convention does not itself provide recourse to compulsory, binding dispute settlement (as is often the case), LOS Convention procedures may be utilized among states parties to the LOS Convention to resolve disputes over application of the other agreement. Moreover, a related agreement may provide explicitly for submission of disputes in accordance with LOS Convention provisions. (Article 288(2); Annex VI, Article 22) This has occurred in the case of international fisheries agreements. (Section II.C.)

Disputes over *fishing* beyond the EEZ are subject to compulsory, binding settlement procedures. Within the EEZ, the coastal state is not obliged to submit a dispute over its fisheries rights or their exercise to a binding procedure. In defined circumstances, an alternative is provided*: compulsory* recourse to a *non-binding conciliation procedure*. The circumstances identified are intended to cover egregious departures from the coastal state's conservation and management obligations. The fact that the report of the conciliation commission must be communicated to appropriate international organizations is intended to put some pressure on the states involved to abide by the recommendations. It may also advance the development of national and international law and practice. (Article 297.2, 297.3 and Annex V)

As with marine environmental protection, another fishery agreement may provide that disputes among parties be settled in accordance with the LOS Convention's procedures. If not, it may still be possible among states parties to the LOS Convention to invoke these procedures for disputes arising under another agreement. Further, even when the offending state is not formally bound by a particular regional agreement, the LOS Convention's compulsory, binding procedures could be invoked if that state were party to the LOS Convention to enforce the LOS Convention's high seas duties to conserve and to cooperate in conservation efforts. These obligations may be violated, for example, when a rogue fishing state is undermining conservation measures agreed on a regional basis. Subsequent developments on fisheries dispute settlement are considered in Section II.C.

On *marine scientific research*, the coastal state may exempt certain actions from compulsory, binding procedures, but *compulsory conciliation* is a recourse. (Article 297.2)

II.A.3. International Cooperation Opportunities

The LOS Convention provides for international cooperation in a variety of ways. It calls on states, individually and collectively, to assist developing nations in strengthening their marine science and technology capabilities. (Parts XIII and XIV) Assistance for environmental purposes receives special attention. (Articles 202, 203) On a bilateral basis, by expanding offshore jurisdiction the Convention allows coastal states to define the terms and the price for foreign access to natural resources. When a coastal state does not fully harvest marine living resources subject to its jurisdiction, there are opportunities for the international community to share in underutilized resources. (Articles 62, 69-71) There are also opportunities to share in the revenue from developing non-living resources of the continental shelf in areas of national jurisdiction beyond 200 miles.[2] (Article 82) In addition, when a foreign state seeks access from the coastal state for research purposes, it must respond to coastal state interest in taking part in the venture, share results and conclusions, and assist with interpretation if requested. The basic thrust of the relevant articles favors widespread publication and dissemination of research results (subject to coastal state rights regarding research of direct resource significance), in cooperation with intergovernmental organizations (IGOs). (Articles 244, 249)

For seabed mineral resources beyond national jurisdiction deemed the "common heritage of mankind," the Convention regime functions to grant title to resources and avoid conflicts over claims, to promote orderly development, to guarantee human safety and environmental protection, and to ensure benefits for mankind as a whole. The deal struck in the 1982 Convention, as modified by the 1994 Implementation Agreement, promotes equitable participation by developing nations in resource management decisions and in technical and financial benefits once deep seabed mining becomes commercially feasible.

The *institutional support* contemplated by the LOS Convention draws on existing international organizations. Its secretariat is established within the United Nations, currently the Division of Ocean Affairs and the LOS (DOALOS) in the Office of Legal Affairs. Although the Convention rarely refers explicitly to particular IGOs, it frequently calls on competent international organizations to serve two basic functions: to facilitate agreement on supplementary legal instruments at global and regional levels, and to promote implementation of the law through regional and global initiatives on marine research, environmental monitoring and data management, environmental assessment, information exchange, and capacity-building. In addition, it calls for the establishment of regional marine scientific and technological research centers to promote these goals. (Articles 276-77) The need for a more rational and coherent approach to international institutional support for ocean law is considered further in Sections III.A.5. and IV.

II.B. The International Legal Regime for Marine Environmental Protection: Pollution Control

The LOS Convention does not qualify in any way the obligation of all states to protect and preserve the marine environment. (Article 192) It requires that they take all measures, consistent with the Convention, that are necessary to prevent, reduce and control pollution from any source and that are necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life. (Article 194) Pollution control obligations are elaborated in some detail, whereas those on ecosystem and habitat protection are not. The latter are considered in Section II.D.

What Is Pollution?

International law treats marine pollution in six categories:

- vessel-source pollution (the discharge of wastes or other matter incidental to or derived from the normal operation of ships, as well as pollution resulting from ship accidents);
- pollution by dumping (the deliberate at-sea disposal of wastes or other matter from vessels, aircraft, platforms, or other man-made structures, including the disposal of vessels, aircraft, and man-made structures);
- pollution arising from seabed activities (e.g., offshore oil and gas development) and from artificial islands and other installations and structures subject to national jurisdiction;
- pollution arising from land-based sources and activities, including rivers, estuaries, pipelines and outfall structures;
- pollution arising from the development of seabed mineral resources beyond national jurisdiction;
- pollution from or through the atmosphere (from all sources, including aircraft).

The broad *definition of "pollution"* in the LOS Convention is an essential part of the framework: "the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities." (Article 1.4)

The Convention's basic framework is subject to continuing refinement. The early emphasis in international environmental law on toxic, harmful, and noxious substances, especially those which are persistent, is found also in ocean law. As more is learned about the various pathways by which these substances enter the marine environment, agreements on dumping and vessel-source pollution have been supplemented by agreements covering transboundary movement and disposal of hazardous and toxic substances and, specifically, maritime transport; and on airborne emissions deposited to the marine environment.

Understanding how persistent organic pollutants (POPs) enter the marine environment and concentrate in marine species has spurred new agreements that not only limit air emissions but also require the elimination of production and use of the substances. The treatment of non-indigenous (alien) species introduced into the marine environment has also matured with growing knowledge. An abbreviated reference in the LOS Convention continues to be elaborated through various specialized international fora: in the IMO, with respect to ballast water discharge and the use of anti-fouling paints; and in FAO and certain regional bodies regarding responsible practices for introductions through aquaculture. (Section II.D.3) The scope of the term "land-based sources" of marine pollution now explicitly encompasses "activities" on land to underscore that both run-off from agriculture and human settlements and physical degradation producing sediments are included. On practical grounds, it has made sense to distinguish among airborne sources of pollution so that land-based emissions and emissions from aircraft, ships, or offshore structures and platforms are covered by different laws, nationally and internationally.

What are States Required to Do?

Standard-Setting

Depending on the category of marine pollution, the LOS Convention establishes a different threshold for national action giving effect to international instruments. It is important to note that the precise way in which these obligations are structured differs markedly from other international environmental conventions and presents clear opportunities for strengthening national action. For activities taking place at sea (vessel-source pollution, dumping, offshore seabed activities, deep seabed mining), *international rules represent minimum standards*. National laws and regulations must be as effective as international rules and standards, without qualification. No allowance is made for varying national capabilities. (Articles 208, 209, 210, 211) For pollution that derives from activities within national land territory (land-based and airborne sources), national laws need only *take into account* international rules and standards. (Articles 207, 212) As a general matter, the measures each state employs must rely on the "best practicable means at [its] disposal and be "in accordance with [its] capabilities." (Article 194(1)) The latter qualifications recognize that not all countries will be in a position to modify their domestic development activities immediately. At the same time, they in no way undercut any specific obligations assumed by states in conventions relating to the marine environment — bilaterally, regionally, or globally. (Article 237) To the contrary, they establish a presumption that where international rules and standards exist, even if the state in question is not party to a specific agreement, the international measures represent a benchmark that cannot be ignored. In relation to offshore seabed activities and land-based and airborne sources, the LOS Convention goes even further. National laws and regulations must take into account internationally *recommended* practices and procedures; that is, non-binding measures. As a general rule, every state may enact national laws that are more stringent than international rules for domestic sources, including ships flying its flag and aircraft of its registry. *Enforcement* rights and obligations are considered within each section below.

The Scientific, Technical, and Economic Basis

The international legal regime for marine environmental protection hinges on growing understanding of how and why impacts occur and on human ingenuity in developing means to avoid impacts. On the science side, the LOS Convention strongly endorses further international research and study of marine pollution and related environmental monitoring. (Articles 200, 204*) It clearly recognizes the stages necessary for the development of international law: that knowledge acquired from research and data collection is necessary for states to establish, collectively, scientific criteria for the formulation and elaboration of rules, standards, and recommended practices and procedures*. (Article 201) This step-by-step process does not impede the application of a precautionary approach; rather, it reinforces it.

With respect to solutions, the Convention was concluded in an era when innovative technologies to reduce marine pollution were beginning to emerge, but they were not necessarily widely available or affordable. As noted above, it combines a "best practicable means" approach qualified by what is "at the disposal" of each state. There will always be tension between the means available and the cost of applying them. In some respects, the LOS Convention reflects an earlier, defensive approach that opposes capabilities and the need for economic development against measures to protect the marine environment. More recent work in the field of environmental economics highlights the costs to society of damage to natural resources. As methods of analysis continue to improve, international law can increasingly evolve to ensure that environmental costs are taken fully into account and internalized by those responsible (polluter pays). It can incorporate economic incentives for sustainable ocean development and oppose perverse subsidies, and it can promote the efficient use of natural resources to avoid waste (pollution prevention, broadly defined).

Institutional Roles: Risk Assessment

The major international institutional processes for assessing the hazards and risks of substances entering the marine environment are noted here because they straddle the different pathways for entry. They were formalized with the implementation of the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) and the 1973 International Convention on the Prevention of Pollution by Ships (MARPOL 73). The assessment processes arose from early concern over nuclear waste disposal at sea and accidents involving chemical substances transported by ships. The International Atomic Energy Agency (IAEA) is responsible for determining the suitability of disposing radioactive materials at sea and for developing recommendations on their safe transport and handling. The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)[3] is charged with developing haz-

ard profiles for chemical substances. These assessments inform agreements on dumping, maritime transport of hazardous substances, and discharges from ships in the normal course of operations — regulated by the IMO conventions — as well as efforts to eliminate and reduce pollution from land-based activities.

In 1994, in the follow-up to the UN Conference on Environment and Development (UNCED), a new initiative was launched to concentrate and expand efforts on chemicals. This Intergovernmental Forum on Chemical Safety (IFCS)[4] aims to provide clear and consistent advice to governments, international bodies, and NGOs on chemical risk assessment and environmentally-sound management of chemicals; and to improve delineation and mutual understanding of roles within and among governments and international agencies responsible for chemical safety. It is supported by an inter-agency body, the Inter-Organizational Programme for the Sound Management of Chemicals (IOMC). One major IFCS initiative, coordinated by the OECD, involves the development of a globally harmonized system for classifying and labelling chemicals, based on the risks of exposure. This is linked to the work of the UN Committee of Experts on the Transport of Dangerous Goods, which develops criteria and recommendations for the safe and environmentally-sound transport of dangerous goods, harmonizing hazard classification and labelling for all modes of transport. New procedures approved by GESAMP in 1997 for evaluating chemical hazards to the marine environment will be harmonized with the OECD's effort to harmonize classification of hazardous substances to the aquatic environment and thus help ensure that ship pollution regulations are compatible with those governing chemicals outside the shipping industry.[5] New procedures to assess POPs are being developed in conjunction with the negotiation of a global, legally binding instrument. (Section III.D)

II.B.1. Vessel-Source Pollution (Ships)

The rules dealing with pollution from vessels cover both accidental and intentional discharges. Intentional discharges are wastes from the normal operation of ships, some of which may be discharged in quantities and locations that do not cause harm. The rules address the design, construction, equipment, operation, and manning of vessels and how to prevent accidents and deal with emergencies. Some specify means to ensure safe at-sea operations and prevent discharges, while others endorse routeing systems designed to minimize the risk of accidents. They cover also waste reception facilities in port, an essential element in preventing discharges at sea.

The LOS Convention spells out in some detail the balance between the coastal state's rights and duties in offshore zones and international freedoms of navigation. It supplements traditional flag state control over ships by granting the coastal state certain rights to set and enforce rules vis-a-vis foreign vessels in order to protect its marine resources and coastline from damage. In exchange, the coastal state must respect international navigation rights. Port states (countries in whose ports foreign vessels are voluntarily located) may exercise limited additional enforcement rights for specified international rules and standards. Today, the term "port state enforcement" commonly refers to a broader concept combining port and coastal state enforcement authorities, as explained below. Flag state responsibilities are also set out in the LOS Convention. Each state is required to establish conditions for granting national (flag) status to ships, based on a genuine link to the ship which allows the flag state to exercise control over administrative, technical, and social matters. The flag state must also exercise its control effectively. (Articles 91-94)

The relationship between the LOS Convention and the more specialized global conventions on vessel safety and pollution control developed through the International Maritime Organization (IMO) requires that flag state rules meet the minimum standards set by these "generally accepted" international rules and practices. (Articles 94.5 and 211.2) All states parties to the LOS Convention may enforce generally accepted international rules and standards even if the flag state of the vessel is not party to the specific convention establishing the standard. This system is reinforced in the specialized shipping conventions; for example, MARPOL 73/78 permits parties to apply its requirements to the ships of non-parties to ensure that non-parties do not receive more favorable treatment. There are by now numerous IMO conventions that are continually updated. (Table II-1) As the revised measures take effect, they are automatically incorporated to the body of "generally accepted" rules for international shipping. This process is expedited by the "tacit acceptance" procedure used in many IMO conventions, through which updates to a convention's technical annexes may bypass formal amendment procedures and enter into effect more quickly. In addition, the technical codes adopted and updated by the IMO have increasingly become mandatory under different conventions.

There are far fewer generally accepted international rules governing the 'genuine link' between a flag state and its vessels; that is, that help determine whether the flag state exercises control over its vessels effectively. In 1999 the Commission on Sustainable Development (CSD) invited IMO to develop binding measures in this context to ensure that ships of all flag states meet international rules and standards and to consider the implications for fishing vessels also. (Section II.C).

Coastal State Standard-Setting Rights in Offshore Zones and International Navigation Rights

As a general matter, nothing in the LOS Convention precludes a state from setting standards higher than international standards for its own vessels. A coastal state's rights vis-à-vis foreign ships decrease as its zones of jurisdiction move further offshore. (Figure II-1) Closer to shore, it may supplement some of the generally accepted international rules and standards with more stringent national measures. In the EEZ, it may only apply the generally accepted rules.

More specifically,

- In *internal waters*, there are no limitations on the coastal state's right to enact and enforce any environmental or safety measure and apply it to vessels voluntarily within its ports, including foreign vessels. When a state has established particular requirements as a condition of entry into its ports or internal waters or for a call at its offshore terminals, these must be well publicized. If two or more states have adopted identical regulations to harmonize policies, participating states in the region may collaborate to determine whether a foreign vessel meets the requirements of the state toward which it is proceeding; a participating coastal state may request a foreign vessel navigating in the territorial sea to indicate whether it is proceeding to a state of the same region participating in the cooperative arrangement and if so, whether it complies with the port entry requirements. These information requests may in no way prejudice the right of innocent passage. (Article 211.3) This provision helped set the stage for *regional port state control arrangements,* below.

- In the *territorial sea*, coastal state sovereignty is qualified by the right of "innocent passage" for foreign vessels. The coastal state may enact laws and regulations relating to marine environmental protection, pollution control, navigational safety, and living resources conservation. While measures like discharge standards applied to foreign ships may exceed generally accepted international rules and standards, those on design, construction, manning, and equipment may not. In designating sealanes or prescribing traffic separation schemes for foreign ships, the coastal state must take into account any recommendations by the IMO but is not bound by them. (Articles 21, 22, 211.4) The reason for distinguishing discharge from construction, design, etc. standards is that unilateral standards of the latter type could be considerably more difficult and costly to meet.

- Within two areas where international passage rights are vital — *international straits and archipelagic sealanes*[6] — coastal state standard-setting authority vis-a-vis foreign ships is more restricted than elsewhere in the territorial sea. Pollution control rules are limited to those giving effect to international discharge regulations (Articles 42.1.b, 54), and any sealanes or traffic separation schemes must be approved by the IMO. (Articles 41.4, 53.9, 211.1) At the same time, flag state obligations are more explicit. The Convention expressly requires all ships to comply with generally accepted international regulations, procedures and practices regarding vessel-source pollution and safety at sea. (Articles 39.2, 54)

- In the *EEZ*, the coastal state's rules for foreign vessels must conform to and give effect to generally accepted international rules and standards. In addition, *if* approved by the IMO, coastal states may prescribe more stringent requirements to control vessel-source pollution in clearly defined areas of the EEZ that meet conditions of vulnerability based on oceanographic and ecological conditions, resource utilization or protection, and the particular character of traffic. These measures may cover navigational practices or discharges but may not require foreign vessels to observe design, construction, manning, or equipment standards other than generally accepted international rules and standards. (Article 211.6) During the 1990s, the IMO has expanded the types of mandatory measures that it will approve for application in these areas.

- In *ice-covered areas within the EEZ* where particularly hazardous navigation conditions and vulnerable ecosystems prevail, coastal states have the right to adopt and enforce non-discriminatory (i.e., equal treatment for all ships) laws and regulations to control vessel-source pollution, with due regard to navigation. (Article 234)

For additional discussion of special measures to protect critical habitat and vulnerable areas, see Section II.D.2.

Enforcement Rights and International Navigation Rights: Flag States, Coastal States, and Port States

In keeping with traditional international law, it is the responsibility of the *flag state* to ensure compliance by its vessels with applicable international rules and standards. (Articles 94 and 217) The LOS Convention supplements this rule by stipulating the circumstances in which coastal and port states may inspect foreign vessels and institute proceedings against them for violations of applicable national and international rules on vessel-source pollution. In specified circumstances, a flag state may pre-empt either port or coastal state proceedings as long as it meets its environmental duties under the Convention. (Article 228) Only monetary penalties may be imposed for violations by foreign vessels of national laws or applicable international rules, except in the case of a wilful and serious act of pollution in the *territorial sea*. (Article 230)

The right to physically inspect a foreign vessel is limited to verifying that it carries certificates and other documents required by generally accepted international rules and standards, unless these are inadequate or there are clear grounds for believing that the vessel's condition or equipment does not correspond to the documents. (Article 226) If a state ascertains that the vessel is in violation of applicable international rules and standards relating to seaworthiness and thereby threatens damage to the marine environment, it is obligated to take administrative measure to prevent the vessel from sailing until the violation has been remedied. (Articles 219, 226) These provisions, together with safeguards that prevent discrimination among vessels, require notification of the flag state and provide for liability arising from enforcement actions. (Articles 227, 231, 232) Combined with those noted above on harmonized port entry requirements, they lay the groundwork for the

regional port state control arrangements discussed at the end of this section.

With respect to flag state obligations and *sovereign immune vessels and aircraft* (warships or other government-owned or operated craft engaged on government non-commercial service), the LOS Convention's provisions on protection and preservation of the marine environment do not directly bind these craft. The effect is that the rules may not be enforced against these ships by foreign countries. Nevertheless, the flag state must ensure that these craft act in a manner consistent with the Convention "so far as is reasonable and practicable," (Article 236) and it is responsible for any loss or damage. (Section II.B.7.) In the *territorial sea*, if a warship does not comply with coastal state rules and disregards its requests for compliance, the coastal state may require that the ship leave the territorial sea immediately. (Article 30)

Coastal state enforcement refers to the right of the state within whose waters a pollution violation may have occurred to enforce applicable national laws and international rules.[7] Its authority to take action is more limited further offshore but increases with the seriousness of the pollution incident. Thus, when the responsible vessel is *voluntarily within its port or at an offshore terminal*, the coastal state may inspect and institute proceedings against the vessel for a violation occurring in the territorial sea or EEZ. For a violation believed to have occurred while the vessel is *navigating in the territorial sea,* based on clear grounds, the coastal state may physically inspect the vessel and, if warranted, institute proceedings and detain the vessel.[8] For a violation believed to have occurred while the vessel is *navigating in the EEZ*, also on clear grounds, the coastal state may, while the vessel is within its offshore zones, request that it answer questions about identify, registry, ports of call (facilitating port state action at a later port of call), and other information required to establish whether a violation has occurred. Further enforcement actions may only be taken by the coastal state if the EEZ violation has resulted in a substantial discharge causing or threatening significant pollution, and if the vessel has refused to give information or the information is manifestly at variance with the factual situation. In that case, the coastal state may physically inspect the vessel. In a final stage, when there is clear, objective evidence that a violation has been committed in the EEZ, resulting in a discharge causing or threatening major damage to the coastline or related interests or to any resources within national jurisdiction, the coastal state may institute proceedings and detain the vessel. (Article 220)

These specific coastal state rights are without prejudice to its right in the event of a maritime casualty to take and enforce measures beyond the territorial sea — proportionate to actual or threatened damage — to protect the coastline or related interests from pollution. The latter provision reaffirms rights specified in the 1969 Intervention Convention (International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties); at the same time, it lowers the threshold for action in that Convention from "grave and imminent danger" to pollution "which may reasonably be expected to result in major harmful consequences." (Article 221)

Under the LOS Convention, *port state enforcement* is restricted to violations of applicable international discharge standards and may be exercised in respect of violations anywhere in the world. It refers to the right of a state, when a foreign vessel is voluntarily in its ports or at an offshore terminal, to undertake investigations and, if warranted, institute proceedings. If the violation has taken place within waters under another state's jurisdiction, either that state, the flag state, or a state damaged or threatened by the discharge must request that the port state intervene, unless the port state itself is damaged or threatened by the discharge violation. A coastal state within whose waters the violation occurred may request that proceedings instituted by the port state be suspended and the evidence and records transmitted to it. (Articles 218, 219)

The rationale for providing explicitly for port state enforcement is that at-sea enforcement actions are dangerous, expensive, and impede international navigation more so than actions taken while a vessel is in port. Moreover, because states have essentially unrestricted authority in their ports, they have more latitude to investigate possible violations and institute proceedings. The rationale for restricting port state enforcement to discharge standards is that violations of construction, manning, equipment, and design standards endure regardless of where the vessel is located. These violations may be enforced by any coastal state in its ports, territorial sea, or EEZ. Discharge violations, on the other hand, are one-time actions at a specific location. When they occur in the EEZ or beyond national jurisdiction, without port state enforcement it may be difficult to initiate action.

For the development of port state enforcement measures in the context of regional fisheries agreements, see Section II.C, "Dispute Settlement, Compliance and Enforcement" and Section III.B.3.

Regional Port State Control Arrangements

In 1982 several European countries adopted an innovative Memorandum of Understanding (MOU) on Port State Control to ensure that vessels entering regional ports were complying with international rules and standards. As noted above, these arrangements build upon provisions in the LOS Convention.[9] The 1982 agreement has been widely replicated as a means of reinforcing flag state obligations. (Table II-1, Inspection/Enforcement) These regional arrangements have proven more effective and economical than national port state control efforts. They establish a harmonized system of port state inspections and means to communicate the results electronically so that future ports of call in the region are quickly alerted to any deficiencies. They avoid distorting competition among regional ports and pre-empt unilateral approaches. Each MOU specifies the applicable international rules and standards — by reference to IMO conventions on vessel safety and pollution control, and to conventions on living and working conditions for seafarers on board ships adopted under the aus-

pices of the International Labor Organization (ILO).[10] The MOUs do not impose additional requirements to those in the identified conventions. They set goals for states to inspect a certain percentage of foreign ships entering their ports on an annual basis. Unless the evidence warrants, a ship is not inspected more frequently than every six months to avoid disrupting navigation. Serious deficiencies may justify detention until they are remedied, and future ports of call may deny access if they do not receive satisfactory evidence of compliance. Port inspections in Europe have achieved virtually 100% coverage of ships entering ports. Goals under the more recent MOUs range from 15% to 50%.

The IMO in 1991 endorsed regional port state control arrangements and has played a role in supporting their development and application. Because inspection results are also conveyed to the flag state and deficiencies reported to the IMO, it becomes possible to track problem vessels more widely and to evaluate whether the flag state has been effective in dealing with substandard ships. There are ongoing efforts to ensure compatibility among the different regional arrangements, to promote electronic information exchange, and to develop further an *international ship information database* to assist port and flag states in controlling substandard ships. (Section III.D.4.) As the scope of inspections has expanded from equipment and technical requirements to operational requirements, which entail verifying that the crew can handle equipment and communicate in emergency situations, the IMO has adopted guidance for qualification and training of port state control officers and for procedures to be followed in inspections. It has also adopted guidance for the detention of ships, the basis for which must be provided in national legislation.[11]

The MOUs have earned the support of shipowners because they have reduced the number of "free rider" ships that do not comply with international rules and because inspection results have proven a guide to likely defects. The instruments continue to evolve. For example, the MOUs for the Caribbean, Mediterranean, and West and Central African regions incorporate specific guidelines for inspectors to ensure that *small cargo vessels and ships of traditional build* that trade mainly within the region are not hazardous to safety, health, or the environment. This permits maritime authorities to take actions with respect to vessels too small to be covered by the IMO conventions. (See also Section III.D.2.)

In a further regional development, the Baltic Sea Commission has adopted measures that allow a port state to investigate any ship suspected of violating not only MARPOL 73/78 discharge requirements under Annexes I, II, and V, but also more stringent requirements under the Baltic Sea Convention on sewage discharge and prohibiting incineration of ship-generated wastes. When a vessel is voluntarily within its port or at an offshore terminal, even if the flag state is not party to the convention at issue, a Baltic Sea state may investigate MARPOL-related incidents occurring within the jurisdiction of Baltic Sea states or beyond national jurisdiction(citing Article 218 of the LOS Convention). For Baltic Sea Convention-related incidents, the incident must have occurred either in the internal waters or territorial sea of a contracting party. The Commission has also taken steps to harmonize fines imposed under the two conventions. [12]

International Institutions

The IMO came into existence in 1958. Its principal committees are the Marine Environment Protection Committee (MEPC), Maritime Safety Committee (MSC), Legal Committee, and Technical Cooperation Committee. Today it has responsibility for administering some forty conventions and numerous non-binding instruments on vessel safety and pollution control, including instruments on crew capabilities and response to emergencies. It provides technical advice on a wide range of shipping matters, including port operations and the management of wastes from ships. Together with the International Hydrographic Organization (IHO), based in Monaco, it has sought to correct serious deficiencies in hydrographic surveys and nautical charts that may lead to vessel accidents. IMO's technical cooperation program was established in 1977 and revitalized in 1992. Funded on a voluntary basis, it supports training programs to assist developing nations apply the IMO conventions and manage port operations efficiently. A joint Subcommittee on Flag State Implementation was established by the MEPC and MSC in 1993 to assess the difficulties encountered by developing states in implementing IMO conventions and help overcome them. One such difficulty is the lack of waste reception facilities in ports, which means that wastes are more likely to be disposed of in the ocean.

LINKAGES:
Pollution from Dismantling of Ships — II.B.2.
Airborne Pollution — II.B.5.
Pollution from Fishing Vessels — II.C.
Non-Indigenous/Invasive Species Introductions - II.D.3.
Vessel Routeing and Protected Areas vis-a-vis Ships - II.D.2., International Shipping
Acoustic Disturbances — II.D.1., CMS
Emergency Preparedness and Response - II.B.7.
Responsibility, Liability, and Compensation for Damage - II.B.7.

II.B.2. Dumping and Wastes Management

The 1972 global Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) is the primary specialized instrument for controlling waste disposal at sea. It was significantly revised by a Protocol adopted in 1996. The LOS Convention's provisions on dumping, like those on vessel-source pollution, incorporate by reference the more detailed rules of the London Convention, including updates and revisions as they enter into force. These become minimum standards for the measures each state party to the LOS Convention must adopt, even if it is not a party to the London Convention; that is, national laws and regulations must be *no less*

effective than global rules. (Article 210) The LOS Convention encourages the establishment of further global and regional rules, and several regional dumping agreements now supplement the London Convention. (Table II-2)

Dumping is defined as "any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; and any deliberate disposal *of* vessels, aircraft, platforms or other man-made structures at sea. (LOS Convention, Art. 1(a)) The 1996 Protocol to the London Convention, once in force, will update this definition to include "any storage of wastes or other matter in the seabed and the subsoil thereof from vessels, aircraft, platforms or other man-made structures at sea; and any abandonment or toppling at site of platforms or other man-made structures at sea, for the sole purpose of deliberate disposal."

When the London Convention was concluded, the major concern was to control the disposal of radioactive and other hazardous wastes in *international* waters, beyond the narrow territorial sea. With the extension of national jurisdiction under the LOS Convention, the coastal state has the right to permit, regulate, and control dumping in the territorial sea, EEZ, and onto the continental shelf. Its express prior approval is required, subject to a duty to duly consider the matter with any states that may be adversely affected due to their geographic situation. (Article 210) The LOS Convention reaffirms the tripartite *enforcement* rights vis-à-vis dumping found in the London Convention: by the flag state, the coastal state in areas subject to its jurisdiction, and the state in whose territory wastes are loaded. (Article 216) This enhances control over high seas dumping as well as dumping within national jurisdiction.

Several changes have been introduced into the London Convention during the 1990s. Originally, substances were classified according to a more hazardous "black list" which could not be dumped at sea (Annex I); a "grey list" that could be dumped subject to strict controls and a special permit (Annex II); and others to be judged against certain criteria to determine whether and how they could be dumped, pursuant to a general permit (Annex III). As a result of new threats and concern that 'burden of proof' requirements might allow dumping of potentially hazardous substances before harm could be demonstrated, the Convention has moved increasingly toward restrictions on dumping and precautionary approaches. Proposals to bury nuclear and other wastes in the seabed led to decisions that expressly brought such actions within its scope. Concern over ocean incineration led the parties to adopt a ban on ocean incineration of industrial wastes and sewage sludge, effective in February 1994. At sea incineration of noxious *liquid* wastes was effectively terminated in 1991 when the last vessels were taken out of service. The parties banned ocean disposal of low-level radioactive wastes as of February 1994 and the dumping of industrial wastes after 1995. The 1996 Protocol prohibits at-sea incineration of wastes, wastes storage in the seabed, and wastes dumping except for a "reverse" list of substances set out in an annex that may be dumped at sea.[13]

In geographic scope the London Convention has been somewhat modified. The global Convention and the early regional agreements did not cover dumping in internal waters because states were wary of international rules intruding into areas where national sovereignty was absolute. Moreover, they considered dumping of noxious and hazardous materials in international waters a more urgent threat. As the latter is increasingly brought under control, concern over coastal dumping of dredged materials and domestic and municipal wastes has grown. Globally, over 80% of dumped material results from dredging, most of it associated with operations to keep harbors, rivers, and other waterways from silting up.[14] These materials may contain serious accumulations of pollutants. In Europe, the regional conventions (Baltic, Northeast Atlantic) were revised in the 1990s to cover dumping in internal waters. The 1996 Protocol to the London Convention requires states either to adopt effective measures to control dumping in marine internal waters or to apply the Protocol. The seaward edge of geographic scope has also been modified. The South Pacific regional agreement extends to areas beyond national jurisdiction. This reflects both the islands' historical experience and strong views regarding nuclear testing and nuclear wastes and the configuration of their EEZs, which produces high seas pockets surrounded by EEZs.

The interaction between the London Convention and regional dumping agreements reflects the 'push and pull' dynamic discussed in section I.C. That is, agreement in Europe to ban ocean incineration and at-sea disposal of industrial wastes set the pace for parties to the London Convention, as did their decisions to extend coverage to internal waters. In principle, the specific global rules and standards adopted pursuant to the London Convention establish minimum standards for national (and regional) measures. In practice, few regions are yet in a position to put in place the bans required. Nor have most regions sought to elaborate on the global Convention at the regional level to take account of characteristic regional features, as contemplated. (London Convention, Article VIII)

International Institutions

The IMO serves as the administrative host and secretariat for the London Convention.

LINKAGES: The Wastes Cycle

The dumping agreements interact with other agreements affecting wastes on land and at sea — in relation to wastes generation, storage, transport, disposal, or damage caused. Clearly, strategies to minimize the generation of pollution and wastes at source reduce the need for storage, transport and disposal, including at sea. Inadequate storage and disposal on land may cause pollutants to leach from landfills along coasts and rivers or leak from storage containers; they may also give local residents no alternative to disposing of garbage at sea. These wastes are then swept out to sea by rains, rivers, tides and currents. For wastes generated on board ships, it is not enough that on-board reten-

tion and port reception facilities avoid at-sea discharge; storage and disposal arrangements must be environmentally sound. Small recreational and fishing vessels with limited space pose special problems for wastes retention, while reception facilities in small ports and marinas are often inadequate. (Section III.D.2. and 3.) Until waste generation and management on land are dealt with effectively, the wastes cycle will continue to degrade the marine environment.

One fairly comprehensive approach to wastes management is found in Antarctica. The 1991 Environment Protocol's annex on waste disposal and waste management establishes a "cradle-to-grave" system for wastes generated in Antarctica. It covers storage, transport, disposal, and removal; for the most part prohibits disposal in or offshore Antarctica; and calls for assessment programs to reduce the generation of wastes in Antarctica. To reinforce Antarctic protections, the Basel Convention prohibits hazardous wastes exports to the Antarctic Treaty area for disposal. It is difficult to find a similar regional situation where human activities are so limited and the level of concern over the relatively pristine and vulnerable environment so great.

The international community has devoted its greatest effort to controlling risks and adverse impacts from hazardous and toxic substances, especially those that accumulate and persist in the natural environment. Arguably, the most complete system of agreements governs contamination that may result from nuclear activities. (Table II-3) There is a growing web of agreements to protect countries potentially affected by international trade in hazardous materials and wastes, including maritime transport and disposal. *The 1989 Basel Convention* establishes a prior consent regime for the import/export of hazardous wastes and their passage through third countries. It emphasizes disposal in the state in which wastes are generated, assigns responsibility to the "state of origin" for ensuring that transport and disposal do not endanger human health or the environment, and calls in general for efforts to minimize the generation of wastes. An amendment adopted in 1995 prohibits OCED (and a few additional) countries from exporting hazardous wastes to other states parties. There are now several regional agreements elaborating the Basel Convention. (Table II-2) The Bamako Convention covers Africa as a whole, whereas the other regional seas agreements address at-sea movements and disposal. None of these conventions alters the balance between coastal state rights and obligations and international navigation freedoms set forth in the LOS Convention.

A related initiative tackles the problem at an earlier stage, when chemicals first enter international trade and before they become wastes. The *1998 Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade*, once in force, will replace voluntary PIC guidelines on chemicals in international trade and the distribution and use of pesticides. (Table II-2) It provides the means for importing countries to obtain information on listed chemicals in order to decide whether they wish to receive future shipments and places responsibility on importing and exporting nations to avoid adverse impacts on human health and the environment. Each nation may decide to ban or severely restrict the import of a chemical, which decisions are conveyed to the other parties. Based on the recommendations of a Chemical Review Committee established by the Convention, the COP decides whether the chemical in question should be subject to PIC and listed in Annex III. For listed chemicals, each party is required to indicate whether or not it consents to import of the substance and any conditions attached to such import. Each exporting state must ensure compliance by exporters subject to its jurisdiction and provide advice and assistance to importing nations to help them manage chemicals safely *throughout their life cycle* (i.e., including storage and disposal). Advance notification of exports must be given to the importing state at least once a year. The ongoing effort to develop a globally harmonized system to classify and label chemicals and the system for ensuring that their movement by all modes of transport is safe and environmentally-sound, noted above, will obviously complement the PIC Convention and advance a more systematic and comprehensive approach to risks posed by chemicals.

A more stringent legal regime is evolving for *persistent organic pollutants (POPs)*. Like the Vienna Convention/Montreal Protocol on substances that deplete the ozone layer, it seeks to phase out *production and use* of certain substances that give rise to POPs. The regional LRTAP Protocol concluded in 1998 is expected to go further than the proposed global convention, due to health and food production concerns in some regions, but it lays down benchmarks for future global achievements. (Section II.B.3.) By covering production, use, sale, transport, and destruction or disposal, it creates a closed system for tracking listed substances. It will be reinforced by the PIC Convention and provides for consistency with the Basel Convention. (Section III.D.1.) With time, these developments may be extended to other substances and regions and help provide a more complete picture of potential impacts from hazardous materials and wastes.

LINKAGES: Pollution from Dismantling and Decommissioning of Ships

It is expected that a large number of the aging ships built during the 1970s boom will be decommissioned and demolished in the coming years. Two concerns ensue: that inadequate regulation of dismantling operations, centered largely in developing nations, will lead to environmental and safety problems due to hazardous materials contained in the ships like asbestos, heavy metals, and ozone-depleting substances; and that lower demand and prices for scrap steel will lead to more incidents of scuttling at sea. The applicable international rules are being discussed in three fora: in the Basel Convention process, presumably when transboundary movements of ships for disposal purposes are involved; in the Scientific Committee of the London Convention, where the adequacy of existing provisions for sea disposal of vessels is under review, with a report due the parties by 2001; and in the IMO's MEPC, which will consider safety and environmental measures in the year 2000 regarding ship scrapping and recycling.

FURTHER LINKAGES:
Airborne Pollution — II.B.5.
Environmental Impact Assessment — II.B.7.

II.B.3. Land-Based Sources and Activities

By the late 1980s, international attention began to shift from the tragic oilspills from ships and offshore platforms that had dominated the nineteen-sixties and seventies to land-based sources of marine pollution. GESAMP's second global ocean assessment published in 1990 captured the mounting evidence that accumulated land-based discharges and run-off, including atmospheric sources, were responsible for more than three-quarters of marine pollution. (Figure I-1) Together with other studies it highlighted the importance of input to the marine environment from major river systems.[15] The GESAMP report played a major role in clarifying misperceptions about the *relative* importance of different land-based sources as well. Rather than discharges from industrial outlets, it indicated that in order of importance, on a worldwide basis, the primary impacts on coastal areas and habitat came from nutrients (sewage and run-off from fertilizer-treated agricultural fields and livestock-raising); microbial contamination of seafood and beaches by sewage; fouling of seas and beaches by plastic litter; and the progressive build-up of synthetic organic compounds (especially in the tropics and subtropics, due to pesticide use). The other lessons learned by the 1990s were that marine and coastal problems should be considered broadly to include physical degradation and sediments as well as contaminants,[16] taking into account linkages with watershed development.

The growing costs to society of degraded coastal and marine areas have led to more comprehensive efforts to identify and tackle the causes. A first step was to overcome confusion about what is covered by the term "land-based sources of marine pollution." The LOS Convention and other international legal instruments cite by way of example "rivers, estuaries, pipelines, and outfall structures," but they do not exclude others. More recent international conventions/protocols and action programs now refer to "land-based activities" in order to clarify that all of the following are encompassed:[17]

- pollution discharged directly to the sea from point sources like outlets for industrial wastewater, sewage treatment plants, other pipelines and conveyances, or offshore outfalls carrying, for example, domestic wastewater;
- diffuse, non-point sources or run-off washed by rainwater directly into the sea, such as motor oils from urban streets, agricultural chemicals, or untreated sewage;
- all point and non-point sources that contribute to pollution carried by rivers, estuaries, canals, and other watercourses, including underground watercourses, into the sea;
- sediments resulting from erosion and land-use practices in upstream and coastal areas; and
- airborne pollutants from activities on land.

Under the LOS Convention, the obligations of coastal states are unqualified. They must adopt and enforce laws and regulations to prevent, reduce, and control pollution from land-based sources. In formulating national measures, they must *take into account* internationally agreed rules, standards and recommended practices and procedures, and they must endeavor to harmonize their policies at the appropriate regional level. Regional rules may take account of characteristic regional features, the economic capacity of developing states, and their need for economic development. But if states have agreed to international rules, they must adopt and enforce measures necessary to implement them. (Articles 207, 213)

The regional seas agreements all reiterate LOS Conventions obligations, and seven have subsidiary instruments on land-based source marine pollution. (Table II-4) Except in Europe, these have not produced detailed commitments or rules, but growing concern is beginning to stimulate stronger international measures. In part, the delay in action may be attributed to coastal states' acquisition of EEZs through the 1982 LOS Convention; that is, with coastal state jurisdiction out to 200 miles, the state of offshore waters became a matter of national concern and for many countries other issues took precedence. Few incidents of major transboundary pollution were documented and the need for harmonized measures was not widely apparent. Another factor contributing to the delay in agreed measures was the concern, particularly in developing nations, that they would all be required to apply the latest, costly technologies. By the 1990s, the costs *at the national level* of deteriorating coastal conditions drew new attention to the subject. UNCED promoted a major initiative that led to the adoption in 1995 of the Global Programme of Action on Protection of the Marine Environment from Land-Based Activities (GPA). The non-binding GPA recognizes that national and regional actions are paramount and that focused international support is a necessary catalyst. It spells out the "how-tos" for states to implement their obligations pursuant to the LOS Convention and regional agreements. Specific commitments made in *Agenda 21* on wastewater treatment are reaffirmed.[18] In addition, the GPA calls for the development of a global, legally-binding instrument for the reduction and/or elimination of emissions and discharges of certain priority POPs and, where appropriate, for eliminating their manufacture and use and illegal traffic in them, taking into account the special concerns of developing nations. The negotiations to conclude a global instrument began in 1998 and are expected to conclude in the year 2000. They draw on development of the LRTAP Protocol and cover the same initial list of twelve chemicals. (Section III.D.)

As programs develop to address all nine "source categories" of land-based activities affecting the marine environment, identified in the GPA, they may lead to further international legal commitments and harmo-

nized measures. Developments in the Wider Caribbean are particularly interesting. The region has taken a new approach in its 1999 protocol on land-based sources and activities. It provides for annexes on distinct pollution threats and includes initially two annexes on sewage and non-point agricultural sources. The annexes serve as a basis for agreement on effluent limits and timetables to achieve them, management practices, and other measures. To avoid misperceptions about the need for all countries to always apply the most advanced technology, the draft employs the term "most appropriate technology," defined as "the best of currently available techniques, practices, or methods of operation to prevent, reduce or control pollution of the convention area that are appropriate to the social, economic, technological, institutional, financial, cultural and environmental conditions of a contracting party or parties." This combines the flexibility to work out solutions at the appropriate geographic level and in the context of specific conditions, with formal, binding commitments. The protocol also reflects the greater emphasis on international cooperation and assistance expressed by the principle of "common but differentiated responsibilities" and promoted through the GPA. As noted in Section I.C, growing harmonization at the regional level in the context of regional circumstances can create international trade and investment benefits while promoting sustainable ocean development. (Section III-D.)

International Institutions

UNEP serves as secretariat for the GPA and collaborates with the different specialized intergovernmental agencies taking lead responsibility for one or another source category. (Table III-7) The regional institutions that support the regional marine conventions, usually in collaboration with UNEP, are noted in Table I-1. See also Tables III-6 and III-7.

LINKAGES:
The Wastes Cycle — II.B.2.
Airborne Pollution — II.B.5.
Rivers and Estuaries — II.D.5.
Environmental Impact Assessment — II.B.7.
Emergency Planning and Response — II.B.7.
Responsibility, Liability, and Compensation for Damage — II.B.7.

II.B.4. Offshore Activities Subject to National Jurisdiction in the EEZ and Continental Shelf

Under the LOS Convention, the coastal state's rights and duties in the EEZ and continental shelf give it substantial control over offshore activities. It has sovereign rights over natural resources and other economic activities, including artificial islands, installations, and structures. It may regulate new and unforeseen economic uses to avoid environmental damage, including facilities used for aquaculture, airports, or to produce energy from water, currents, and winds. It may also regulate marine scientific research in order to protect the marine environment (Articles 56, 240.d, 246), and it may take measures to control pollution from submarine cables and pipelines laid on its continental shelf by another state exercising its right to do so. (Article 79.2) When installations and devices are not subject to coastal state jurisdiction, the state responsible must take all measures to prevent, reduce, and control pollution. All states undertaking marine scientific research must do so in compliance with applicable regulations on marine environmental protection. (Article 240.d)

The obligations of coastal states are to adopt and enforce laws and regulations to prevent, reduce and control pollution arising from or in connection with seabed activities subject to their jurisdiction; they must endeavor to harmonize policies at the appropriate regional level. Where international rules, standards, and recommended practices and procedures apply, states must adopt and enforce laws to implement them. Their national measures may be *no less effective than* the international measures. They should cover installations and devices used for exploring and exploiting seabed resources and other installations and devices operating in the marine environment, and they should address safety, accident prevention and emergency response, and regulations on design, construction, equipment, operation, and manning. (Articles 56, 194.3.c and 3.d, 208, 214, 240.d) The LOS Convention provides for safety zones around artificial islands, installations and structures, *taking account* of applicable international standards determined in the IMO. In addition, any abandoned or disused structures must be removed to ensure safety of navigation. Removal must be undertaken with due regard for marine environmental protection and *taking into account* any generally accepted international standards. (Articles 60 and 80)

To some extent, more detailed requirements on offshore structures are found in the conventions on vessel-source pollution and dumping. MARPOL 73/78 includes fixed or floating platforms in its definition of ships and thus governs their discharge at sea of wastes and pollution resulting from normal operations, including sewage and garbage. The London Convention as amended covers fixed or floating platforms operating for the purpose of at-sea waste disposal (and treatment) as well as at-sea disposal of offshore structures and any abandonment or toppling at site. LOS Convention provisions on removal of abandoned or disused structures have been elaborated through non-binding guidelines adopted by the IMO. The bottom line is that such structures are to be removed (to ensure safety of navigation), but certain criteria are set out for determining whether an offshore structure may be left in place, including for use as an artificial reef. The guidelines cover techniques for maintaining abandoned rigs and dismantling structures in an environmentally-sound manner. (Table II-5)

MARPOL 73/78 and the London Convention expressly do not cover wastes disposal or the discharge of harmful substances arising directly from or related to the exploration, exploitation, and associated offshore processing of *seabed mineral resources*, with the exception of certain oil discharges from drilling rigs and other fixed or floating platforms.[19] However, growing use of floating production, storage, and operations

units within national jurisdiction has led to interest in the IMO in clarifying how the IMO Conventions apply to them.[20] At the regional level, more detailed rules on the development of offshore mineral resources have been agreed. In three cases, these are restricted to oil and gas development, while the 1994 Mediterranean Protocol covers all mineral resource activities. These agreements also address the removal of abandoned or disused facilities and may explicitly cover air emissions and gas flaring. The Gulf/Kuwait Protocol explicitly cross-references a Special Area designated for protection from shipping under the IMO Conventions (Section II.D.2) to ensure that oil discharges from oil and gas installations conform with this more stringent protection. In addition, two of the regional protocols on land-based sources of marine pollution cover discharges from offshore facilities other than those used for exploration and exploitation of the seabed/continental shelf. (Table II-5)

As discoveries of seabed mineral deposits continue, new types of development activities may pose risks to marine ecosystems. Manganese nodules (nickel, cobalt, copper, manganese), polymetallic sulphide deposits found in or near hydrothermal vents where the sea floor is spreading apart (gold, silver, zinc, copper), cobalt-bearing crusts on the sea floor, and gas hydrates occur both within and beyond national jurisdiction. The recent discovery of gold reserves in sulphide deposits off Papua New Guinea is reportedly worth billions of dollars, although the recovery technology does not yet exist and the economic feasibility of a mining operation has yet to be proven. It is important to keep these technical developments under review to ensure that international legal arrangements keep pace. (Sections II.B.6 and III.D)

LINKAGES:
Airborne Pollution — II.B.5.
Environmental Impact Assessment — II.B.7.
Emergency Preparedness and Response — II.B.7.
Responsibility, Liability, and Compensation for Damage — II.B.7.

II.B.5. Airborne Sources: Ships, Aircraft, Land-Based Sources, and Offshore Facilities

The LOS Convention provides that national rules to prevent, reduce and control marine pollution from or through the atmosphere must *take into account* internationally agreed rules, standards and recommended practices and procedures. Where international rules and standards apply, states are obligated to adopt and enforce laws implementing them. (Articles 212 and 222)

For aircraft, the applicable international rules and standards are developed by the International Civil Aviation Organization (ICAO). Both national and international rules must take into account rules concerning the safety of air navigation. ICAO has established worldwide uniform certification procedures since 1981, based on common testing standards, to ensure that aircraft engines conform with agreed emissions levels. Under the 1944 Chicago Convention on International Civil Aviation, ICAO standards are considered mandatory over the high seas. Subject to notification to ICAO, member nations may deviate from these standards within national territory (including the territorial sea). Thus aircraft are subject not only to the rules of the state of registry but also to the rules of the state in whose airspace they are flying, except that ICAO's Rules of the Air apply to aircraft exercising transit passage through international straits or archipelagic sealanes passage. (Articles 39.3 and 54)

For ships, the same standard-setting and enforcement rights and duties obtain for pollution from air emissions as for other forms of pollution. The applicable international rules are developed through the IMO. An annex on air pollution from ships was adopted pursuant to MARPOL 73/78 in 1997. (Table II-6) It sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone-depleting substances. More stringent limits may be placed on sulphur emissions in special control areas, and the Baltic Sea is so designated. The annex also prohibits on-board incineration of certain products like PCBs.[21] While it covers fixed and floating platforms and drilling rigs, like the other MARPOL 73/78 annexes it exempts the release of harmful substances arising directly from offshore minerals activities, notably gas flaring. It is noteworthy that this instrument is not restricted to pollution of the marine environment; rather, it covers more generally air emissions from ships. The IMO launched a study in 1998 of greenhouse gas emissions from ships, including carbon dioxide, in order to examine technical and other options to achieve reductions.[22]

The regional marine agreements generally do not cover airborne pollution from aircraft and ships or merely reference generally accepted international rules and standards. With respect to emissions from offshore facilities, Section II.B.4. indicates that regional instruments on offshore oil and gas activities usually cover gas flaring and other emissions. Air pollution deposited to rivers and the sea from sources on land (e.g., industrial facilities, auto emissions) is for the most part now covered by the instruments on land-based sources and in some cases by the framework regional conventions. Except in Europe, however, very little has been done at the regional level to implement provisions on land-based sources of air pollution. The most substantial program is carried out pursuant to the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP), administered through the UN Economic Commission for Europe (ECE). Since 1988 the LRTAP monitoring program has developed information on harmful inputs to the Baltic Sea as a means of promoting agreement on how to minimize these sources of marine pollution. In the Mediterranean, further studies and restrictions are applicable under the land-based activities protocol as amended in 1996. The World Meteorological Organization (WMO) collaborates in efforts to address airborne emissions.

GESAMP's 1990 assessment attributed, on a global basis, 33 percent of marine pollution to atmospheric sources. There are numerous other

reasons to be concerned about air emissions, from effects on human health, terrestrial flora, and freshwater pollution to global warming and ozone depletion. Because it can be difficult to disaggregate both the effects of airborne pollution and how much each particular source contributes to pollution problems in a given location, it has proved practical to address airborne emissions through specialized instruments focused on a given sector (ships, aircraft, offshore oil facilities) without necessarily distinguishing marine impacts. For domestic sources, the pattern has been to set reduction targets for particular substances and leave the choice of sectors to meet the targets up to individual governments. This pattern has also been followed in dealing with other land-based sources of marine pollution. (Section III.D.) As cooperation to control air emissions takes root in different regions, it will be useful to bear in mind how regional air pollution control agreements interact with the regional seas agreements as well as the Vienna Convention/Montreal Protocol on Ozone and the FCCC/Kyoto Protocol.

LINKAGES:
Climate Change and Ozone Depletion — II.D.7.
POPs — II.B.2.

II.B.6. Seabed Mining Beyond National Jurisdiction

The development of minerals in the seabed beyond national jurisdiction is not expected to become commercially feasible until at least the second decade of the 21st century. Initial interest during the 1960s and 1970s in manganese nodules may be shifting to polymetallic sulphide deposits and cobalt-rich crusts, although their discovery within national jurisdiction may either delay or pre-empt developments beyond national jurisdiction. Methane gas hydrates in the ocean floor may also prove interesting in the future. They form under pressure and in cold temperatures in the seabed and under permafrost and are estimated to contain nearly thirty times the amount of carbon dioxide in the atmosphere. As the Earth warms, the gas may emerge into the atmosphere, mixing with oxygen in the presence of solar radiation to form carbon dioxide.[23] Development would be aimed at recovering the gas before it is released to the atmosphere.

International Institutions

The LOS Convention establishes an International Seabed Authority (ISBA) through which states parties regulate all minerals development beyond national jurisdiction. The powers of its plenary Assembly and 36-member executive Council are set forth in the Convention as modified by the 1994 Agreement. They include adopting measures on prospecting, exploration, and exploitation, including measures to protect and preserve the marine environment. These are defined more precisely as rules to protect and conserve the natural resources of the seabed area and prevent damage to marine flora and fauna, and rules to prevent, reduce, and control pollution and other hazards to the marine environment, including the coastline, as well as interference with its ecological balance. (Article 145) There is also a provision that seabed minerals be developed in accordance with sound principles of conservation to avoid unnecessary waste. (Article 150.b) The definition of activities subject to ISBA regulation does not include processing, since this was expected to take place on shore, within national jurisdiction. Nevertheless, the Convention does provide for rules on the disposal, dumping, and discharge into the marine environment of sediment, wastes, or other effluents in the event of shipboard processing immediately above a mine site. (Annex III, Article 17.2.f) Each state sponsoring mining activities must adopt laws and regulations for controlling pollution that are *no less effective than* the ISBA's rules. (Article 209) They may apply more stringent rules to contractors they sponsor and ships flying their flag. (Annex III, Article 21.3)

The ISBA's Legal and Technical Commission is charged with drafting and revising the rules and advising the Council on environmental matters, taking into account the views of recognized experts in the field. It is to prepare assessments of the environmental implications of seabed minerals activities and to design and coordinate a monitoring program to track pollution risks and effects, the adequacy of regulations, and compliance with them. (Article 165) Other authorities granted the ISBA include issuing emergency orders to suspend or adjust ongoing operations to prevent serious harm to the marine environment (Article 162.2.w); and disapproving areas for exploitation where the evidence indicates that serious harm to the marine environment may occur. (Article 162.2.x) The latter does not refer to prospecting or exploration. Another provision of interest is the stipulation that protections for proprietary data do not permit operators to withhold data from the ISBA that is needed to formulate rules to protect safety and the marine environment, with the exception of equipment design data. (Annex III, Article 14)

The ISBA's draft rules on prospecting and exploration are expected to be adopted in 2000.[24] These will ultimately form part of a complete mining code covering also exploitation. The draft rules lay down responsibilities for establishing baselines and environmental monitoring programs and specify the ISBA's role in developing guidelines and procedures. Applicants for contracts must submit an assessment of potential environmental impacts and mitigation measures and a proposed program for baseline studies and environmental monitoring. The Legal and Technical Commission then determines whether an applicant's proposal provides effectively for environmental protection in making its recommendations to the Council. Contingency plans for incidents likely to cause serious environmental impacts must be prepared before operations begin, and prompt notification of any such incidents is required. In addition, annual reports must be submitted on the monitoring program. Further site-specific impact assessments will be required prior to any major equipment tests. Before proceeding to the exploitation stage, a contractor must propose areas to be set aside for two purposes: as a zone for monitoring impacts where activities are ongoing (impact reference zone) and as a preserved zone where no mining is to occur (preservation reference zone). The Authority is

working on guidelines for contractors to follow in acquiring baseline data, monitoring exploration activities, and reporting to it.

During the period before commercial mining develops, in addition to elaborating rules and standards on environmental protection, the ISBA will concentrate on promoting and acquiring scientific knowledge and monitoring relevant marine technology developments, in particular relating to marine environmental protection. (1994 Agreement, Annex, Section 1, Article 5) States are obliged to promote international cooperation through training, technical assistance, and cooperative programs in marine science and technology and marine environmental protection. (1994 Agreement, Annex, Section 5, Article 1.c)

In August 1998 the Russian Federation formally requested that the ISBA adopt rules on exploration for polymetallic sulphide deposits and cobalt-rich crusts. Work on these rules is expected to begin in 2001.

Enforcement

The Authority exercises control over seabed activities for the purpose of securing compliance with contract terms that are based on the regulations it has adopted, but individual states are responsible for assisting the Authority by ensuring compliance by any mining activities they sponsor. (Articles 139, 153, 216) The ISBA will have use of a staff of inspectors to determine compliance with contract terms and monitor environmental impacts.

LINKAGES:
Responsibility, Liability, and Compensation for Damage — II.B.7.

II.B.7. Cross-Cutting Requirements: Environmental Impact Assessment, Emergency Preparedness and Response, and Responsibility, Liability and Compensation for Damage

The need to develop specialized instruments to address particular marine pollutant pathways is complemented by cross-cutting requirements for environmental impact assessment (EIA), emergency preparedness and response, and responsibility, liability, and compensation for pollution damage.

Environmental Impact Assessment (EIA)

There are few international environmental conventions today that do not provide for states to assess possible adverse effects of planned activities and consult with potentially affected neighboring states. The LOS Convention calls on states generally to assess the potential adverse effects of planned activities on the marine environment and ensure the availability of results to all states. (Articles 205, 206) Another provision may be viewed as an incipient call for technology assessment to avoid marine pollution. (Article 196) These requirements are not limited by location; that is, the assessment must take into account impacts anywhere in the marine environment, including national zones, the zones of neighboring states, or areas beyond national jurisdiction. The LOS Convention also requires that coastal states consult with states that may be adversely affected by dumping in offshore areas subject to the first state's jurisdiction. (Article 210.5) EIA requirements for seabed mining beyond national jurisdiction are considered in Section II.B.6.

The LOS Convention's provisions are reflected in nearly all the regional marine agreements. Some go further in calling for consultations with potentially affected states. In Europe, the regional agreements are complemented by specialized EIA agreements. The Nordic countries concluded an agreement in 1974 that establishes procedures for a private party of one state, or a government authority representing the general environmental interest, to question the permissibility of activities in another state, including its continental shelf, that may cause environmental harm to the questioner, including measures designed to prevent damage. The rights accorded the questioner are the same as those available to a legal entity in the state in which the activity is being carried out. Similar rights apply to private persons seeking compensation for damage. The activities covered include discharges into watercourses or the sea as well as any uses that may entail water pollution or other effects on water conditions, sand drift, air pollution, noise, vibration, changes in temperature, and other matters. A further development is represented by the 1991European Convention on EIA in a Transboundary Context. It provides detailed guidance on the types of activities intended to be covered and outlines procedural requirements for advance notification and participation by potentially affected states. Its list of offshore and other activities likely to cause significant adverse transboundary effects encompasses large industrial facilities, waste disposal installations and landfills, large-diameter oil and gas pipelines, major storage facilities for petroleum and chemical products, offshore hydrocarbon production, ports, large dams, substantial groundwater abstraction activities, and deforestation of large areas. The Convention requires consideration of impacts on land and in marine zones subject to national jurisdiction. It is reinforced in respect of the marine area by provisions on consultation and cooperation in the 1992 Northeast Atlantic and Baltic Sea Conventions, for states party to both the regional sea and the EIA conventions. The Northeast Atlantic Convention, for example, provides that when pollution originating in one state is likely to prejudice the interests of others, the states concerned, at the request of any party, are to seek to negotiate a cooperation agreement. (Article 21) The most fully international approach to EIA is that found in the 1991 Antarctic Protocol, Annex I. When a proposed activity is likely to have more than a minor or transitory impact, Annex I calls for collective review by an advisory committee for environmental protection before a final decision is taken by the national authorities of the state proposing the activity. There are provisions for circulation of EIA documents and public comment.

Another means to secure EIA and consultations with potentially affected neighboring states is through the project development requirements

of donor institutions. For example, the World Bank's operational policy on environmental assessment is binding and requires that all international environmental treaties relevant to project-related impacts be considered. Not only must a borrowing country's treaty obligations be addressed, the Bank will not finance project activities that contravene these obligations.[25]

Emergency Preparedness and Response

In this field, international ocean law is developing to encompass a wider range of threats and to prepare for them in advance. The first convention focused narrowly on oilspills at sea and response by shore-based personnel to protect the coast. Today the growing web of agreements covers contingency planning to prepare for accidents involving oil and other hazardous and noxious substances that may damage the marine environment, preparedness on board ships and at offshore and shore-based facilities, and shore-based centers capable of responding to different types of emergencies. (Tables II-1, II-3, II-4 and II-5)

As growth in demand for oil during the nineteen-sixties and seventies prompted the construction of more and larger tankers, serious oil pollution incidents multiplied. This not only led to stronger international rules on vessel safety and pollution control, it produced new agreements to improve the response to such incidents and facilitate payment of damages. After the 1967 *Torrey Canyon* oilspill in the English Channel, the 1969 Intervention Convention granted each coastal state greater authority to take action when a maritime accident causes or threatens serious pollution harm to its coastline or related interests, including fishing. New arrangements were worked out at regional and global levels for coordination in the event of pollution emergencies. The LOS Convention builds on these early agreements. It requires states to cooperate in preparing for and responding to marine pollution emergencies, to promptly notify potentially affected states, and to assist other states to minimize the effects of major incidents. Competent international organizations are also to play a role. (Articles 198, 199, 202.b, 211.7, 221)

In dealing with marine pollution emergencies, states are obliged not to transfer, directly or indirectly, damage or hazards from one area to another. (Article 195) A related provision exempts the use of technologies or the introduction of alien species from certain pollution control obligations if the action itself is taken to prevent, reduce and control marine pollution; for example, if a biological agent were applied to contain an oilspill. (Article 196.2) This exemption is intended to cover a situation where the need for a rapid response may preclude detailed prior assessment. It should be considered together with general Convention obligations on marine environmental protection, the duty not to transform one type of pollution into another, and requirements for contingency planning and advance assessment.

The LOS Convention continues to be supplemented by numerous regional and global accords. The earlier agreements established cooperative arrangements for reporting, assessing, and responding to grave and imminent danger of pollution by oil as a result of maritime casualties (e.g., accident, collision, grounding). Many have led to the establishment of regional centers to expedite communications and access to appropriate equipment and expertise. The more recent agreements extend coverage to pollution arising from an accumulation of small discharges from vessels (Mediterranean, Black Sea); pollution due to blow-outs from petroleum drilling and production activities or the failure of industrial installations (Kuwait, West and Central Africa, Red Sea); and imminent danger of pollution from harmful substances other than oil (Baltic Sea, North Sea, Northeast Atlantic, East Africa, South Pacific).

After the 1989 *Exxon Valdez* oilspill, the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) was concluded to emphasize preventive measures and emergency planning on board the vessels or facilities where accidents may occur. It cover ships, offshore units engaged in gas or oil activities or the loading or unloading of oil, and sea ports and oil handling facilities including oil terminals and pipelines. Requirements to report pollution incidents are also strengthened. There are ongoing discussions to expand the OPRC to hazardous and noxious substances. These facility-based arrangements complement the regional response agreements. The latter increasingly anticipate marine pollution incidents from all sources and provide for measures to prevent, prepare for, and respond to them. This trend toward more comprehensive regional response arrangements is reinforced not only by specialized agreements on marine facilities but also by specialized conventions governing accidents at land-based facilities like those on nuclear and industrial accidents (Tables II-3 and II-4) It is important to ensure that such agreements address explicitly threats to rivers and seas, including marine and coastal protected areas, and that preparedness and response arrangements are coordinated for terrestrial and adjacent marine areas.

From a different perspective, the *1989 International Convention on Salvage* clarifies certain aspects of international law governing assistance to endangered vessels or property at sea. It requires both the salvor and the owner of the vessel to prevent and minimize damage to the environment and establishes financial incentives for the salvor to do so. That is, the reward due the salvor must take into account skill and effort in avoiding environmental damage, and even if a salvage operation is unsuccessful the award tribunal must give special compensation to a salvor who has acted to prevent or minimize such damage.

International institutions have long played a supporting role in assisting countries prepare for and respond to marine pollution emergencies. The IMO is the primary organization engaged in these activities, in view of its role in vessel-source pollution and vessel safety. Coordination with and through the IMO is explicit in many of the global and regional agreements. The IMO's oil pollution reporting system, communications services, and capabilities in training and technical assistance are a resource for many countries and help support

regional response centers. These resources have proved useful on an *ad hoc* basis for mobilizing a response to marine pollution emergencies from sources on land, for example during the 1990 Gulf war. The IFCS has considered these issues in relation to chemical emergencies. UNEP's role in international response to environmental emergencies is coordinated with that of the UN Office for the Coordination of Humanitarian Affairs in helping countries affected by environmental disasters, including natural disasters. It plans to further develop its environmental assessment and early warning capabilities to support this work.

LINKAGES: Natural Phenomena. Natural phenomena like the El Nino/La Nina oscillations and changing climate influence extreme weather events that damage human settlements and marine habitat. Improving preparations to reduce the costs of such events to society can be undertaken to some extent in tandem with plans for responding to man-made disasters; for example, identifying critical habitat to receive priority protection from oil and chemical spills or that is vulnerable to facilities that may be damaged by natural disasters like earthquakes or hurricanes. Similarly, long-term preventive measures to control erosion in riparian and coastal areas can reduce damage from floods and storms. A thorough study of international legal instruments governing emergency preparedness and response could usefully highlight complementarities and gaps related both to man-made and natural disasters.

Responsibility, Liability, and Compensation for Damage

International legal instruments on liability and compensation for marine pollution damage remain, for the most part, focused on particular sources, primarily vessel-source pollution. Principle 21 of the Stockholm Declaration — a state's responsibility to ensure that activities within its jurisdiction or control do not cause damage to the environment of other states or to areas beyond the limits of national jurisdiction — is codified without qualification in the LOS Convention with respect to marine pollution. (Article 194.2) The Convention ensures that the obligation extends to vessels, aircraft, and other structures and facilities subject to national jurisdiction, wherever located. These provisions are reinforced by the requirement not to transfer pollution damage or hazards from one area to another. (Article 195)

Substantively, the LOS Convention does not elaborate norms and standards concerning state responsibility and liability for marine pollution damage. It incorporates by reference existing international law and calls for states to further develop international rules for damage assessment, compensation, and related dispute settlement. There are provisions to develop criteria and procedures to facilitate compensation, such as compulsory insurance or compensation funds. (Article 235) As more detailed rules evolve regarding marine pollution specifically and responsibility and liability under international law generally, they are not prejudiced by LOS Convention provisions. (Articles 139.2 and 304) There are no restrictions on the institution of civil proceedings in respect of any claim for loss or damage resulting from marine pollution. (Article 229)

The LOS Convention makes explicit the responsibility of a state to adopt appropriate measures to ensure that its *sovereign immune vessels and aircraft* (owned or operated by a state and used only on government non-commercial service) act in a manner consistent with the Convention. The flag state bears international responsibility for loss or damage to the coastal state if such vessels do not comply with applicable rules for passage in the territorial sea, international straits or archipelagic sealanes. (Articles 236 and 31, 42.5, 54) (Section II.B.1.)

The LOS Convention is also explicit regarding marine pollution damage arising from marine scientific research, where both states and international organizations are responsible and liable for damage arising from research undertaken by them or on their behalf. (Article 263.3)

Without specific reference to marine pollution, the Convention's provisions on deep seabed mining state that damage caused by the failure of a party or an international organization to carry out its responsibilities entails liability, and that joint and several liability obtains when states and international organizations are acting together. As noted below, the Convention does not go beyond existing international law in that a state is not liable for damage caused by a private operator it has sponsored if it has taken all necessary and appropriate measures to secure compliance by that operator. (Article 139.2; Annex III, Article 4.4.) Nor are operators, be they private operators or an international entity, subject to liability for damage if no breach of the rules has occurred. Nevertheless, these provisions are without prejudice to evolving rules (Article 139.2), and the ISBA's regulations on deep seabed mining are expected to tackle this subject in more detail as the need arises. (Section II.B.6)

Procedurally, the LOS Convention requires each state to ensure that recourse is available in accordance with its legal system for prompt and adequate compensation for marine pollution damage caused by entities subject to its jurisdiction. (Article 235(2)) Although this allows foreigners to pursue damage claims in another nation's courts, such action may be difficult, time-consuming, and expensive. The provision builds on the 1974 Nordic Convention, which grants reciprocal access to each party's courts/administrative authorities to pursue compensation claims for environmental damage. It has been incorporated into at least one recent regional seas agreement, the 1992 Black Sea Convention.

There are several avenues for developing more detailed international rules on liability and compensation. In the marine field, specialized global agreements currently concentrate on damage caused by vessels carrying oil or other hazardous and noxious substances. (Table II-1) They generally allocate liability between shipowners/operators and cargo owners and set limits on both, and they may establish a pool of funds from which to draw compensation or supplement other pay-

ments in defined circumstances. In some cases, industry-organized schemes may offer supplementary compensation. At the regional level, there are specialized agreements limited to pollution damage from offshore oil and gas development in the Baltic and North Seas and the more general 1974 Nordic Convention covering land-based and continental shelf activities. (Table II-5) Another approach, taken in the 1990 OPRC Convention (Annex), is confined to the recovery of actual costs for assistance rendered in marine pollution emergencies and specifies principles for reimbursement. In other fields, international legal instruments on liability for environmental damages may include damage to the marine environment; for example, liability arrangements covering industrial or nuclear activities or the transboundary movement of hazardous wastes. Marine environmental damage may also be included in ongoing efforts to develop a liability instrument pursuant to the 1991 Antarctic Protocol.

The general rules of international law on responsibility and liability for damage, and for environmental damage specifically, are of limited scope. There is normally no liability on the part of a state if it has enacted and enforced measures to avoid harm and otherwise exercised due diligence to ensure compliance with these measures; that is, "strict" or "no-fault" liability does not attach to the state if no breach of law has occurred.[26] A state may impose strict liability on private owners/operators through specific legal measures, but states have rarely accepted strict *state* liability in international legal instruments. In rare instances, states have accepted an obligation to supplement owner/operator liability if the owner/operator cannot pay full damages (e.g., ultrahazardous activities like nuclear facilities). In addition, the general rules of international law usually restrict the damages for which compensation may be awarded to direct damage to persons or property or impaired use by an established interest such as fisheries. At the national level, some countries have begun to define rules for valuing damage to marine species and ecosystems, but there is no agreed international approach. For marine environmental damage beyond national jurisdiction, there is no agreement on who would have the right to pursue such claims; that is, who represents international community interests in damage to the environment or ecological services. Mechanisms would also have to be agreed for assessing damage and determining awards.

II.C. The International Legal Regime for Sustainable Fisheries

The LOS Convention establishes the international framework for conservation and management of marine living resources. It makes two basic distinctions: the first between fisheries taking place on the high seas beyond national jurisdiction and fisheries subject to coastal state sovereign rights (within the EEZ and on the continental shelf); and the second based on species behavior when a species' migratory path or life cycle takes it outside the boundaries of a single state. All states are obliged to conserve marine living resources, both within their own zones and on the high seas. Within national jurisdiction it is the responsibility of the coastal state to ensure proper conservation and management, whereas all states must cooperate in conserving and managing high seas living resources.[27]

A number of specialized conventions give expression to the LOS Convention's call for further international agreements on stocks shared by more than one country. They cover international fisheries taking place primarily on the high seas as well as international fisheries where most harvesting takes place within national jurisdiction. (Table II-7, Maps B1-B8) As discussed below, they are consistent with the national rights and duties established by the LOS Convention and elaborate its basic provisions and principles. With the exception of whales, regional conventions are adequate to cover the migratory range of the stock or stocks in question.[28]

By the late 1980s, the magnitude of problems affecting world fisheries led governments to reinforce the LOS Convention foundation. In 1995 they concluded an agreement for the implementation of its provisions relating to the conservation and management of straddling fish stocks and highly migratory fish stocks. Although the Fish Stocks Agreement (FSA) is limited to stocks representing only a fraction of the global fish catch, it is expected to raise the threshold both for national action and for specialized regional agreements. Its principles and measures elaborate LOS Convention provisions, notably the scientific/conservation basis for fisheries management and means of enforcement, discussed below. Moreover, most straddling stocks and highly migratory stocks are high value fisheries, and approximately 70 percent of the fisheries occur within national jurisdiction, so the FSA may influence national management more widely. The FSA governs national measures directly and at the same time lays down guidance for specialized regional agreements. In the latter context, it contains a notable reference to the idea of decision-making procedures that facilitate the adoption of conservation and management measures in a timely and effective manner, possibly eroding reliance on consensus. (Articles 10.j, 28)

The LOS Convention and the FSA are supplemented by the non-binding Code of Conduct for Responsible Fisheries, concluded under FAO auspices in 1995. The Code reflects the many progressive developments of the FSA and in some instances goes into more detail. This is particularly valuable because the Code applies to *all* fisheries within and beyond national jurisdiction, whereas the FSA focuses more narrowly on certain types of stocks. The purpose of the Code is to establish principles and criteria for national and international legal and institutional arrangements and to provide standards of conduct for persons involved in the fishery sector. More detailed technical guidance has been prepared by FAO to help states put it into effect. (Table III-3) The LOS Convention is supplemented also by the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

II.C.1. Species Distinctions

The following distinctions are made by the LOS Convention according to species behavior:

- fish stocks that occur entirely within a single EEZ;
- fish stocks or stocks of associated species that occur in more than one EEZ (transboundary straddling stocks);
- fish stocks or stocks of associated species that occur both within an EEZ(s) and in the adjacent high seas (commonly called straddling stocks)
- highly migratory species like tuna, listed in Annex I of the Convention, which migrate long distances, usually through several nations' EEZs and the high seas;
- marine mammals like whales, which range throughout the oceans, and other cetaceans whose range is more regional;
- anadromous species like salmon, which spawn in freshwater rivers and streams but spend most of their life cycle at sea;
- catadromous species like eel, which spawn at sea but spend most of their life cycle in freshwater; and
- sedentary species of the continental shelf, such as crab, lobster, and coral, defined as living organisms "which, at the harvestable stage, either are immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil." (Article 77.4)

For stocks found within national jurisdiction, the coastal state has virtually complete discretion to conserve and manage the resources and decide the terms for any foreign fishing it permits within its EEZ. Coastal state discretion is limited only by the obligations to seek to agree with states *fishing straddling stocks in the adjacent high seas* upon the measures necessary to conserve these stocks *in the adjacent area* (Article 63.2), and to coordinate measures on *transboundary straddling stocks* with neighboring states. (Article 63.1)

On the high seas, nationals of any state have the right to fish, subject to conservation and management obligations set forth in the LOS Convention and other specialized conventions. States whose nationals fish for *straddling stocks on the high seas* adjacent to the coastal state have a special duty to cooperate with the coastal state(s) in conserving these stocks in the adjacent area and may do so through regional or subregional organizations. (Articles 63.2, 116) For the *highly migratory species* identified in Annex I of the Convention, which includes certain cetaceans, all states whose nationals fish them, whether within or outside the EEZ, must cooperate in conserving the species at the regional level. In regions where an international organization does not yet exist for this purpose, coastal and other fishing states should cooperate to establish one. (Article 64, 116) The FSA provides for compatibility between conservation and management measures applied to the same stock within and beyond national jurisdiction. It places the onus on ensuring that measures established for the high seas do not undermine the effectiveness of those established by coastal states for areas within national jurisdiction, while noting that previously agreed measures between coastal states and states fishing on the high seas or at a regional level should be taken into account. (Article 7)

For *marine mammals*, a special regime is provided so that states may prohibit, limit, or regulate exploitation more strictly than the Convention otherwise provides. That is, *the qualified maximum sustainable yield (MSY) standard* (see below) represents a minimum standard, and *optimum utilization requirements* (see below) do not apply. This applies to states individually within national jurisdiction and to the competence granted an international organization. International organizations, notably the International Whaling Commission, are given particular prominence in the conservation, management, and study of cetaceans. (Articles 65, 116, 120)

Primary responsibility for conserving and managing *anadromous species* rests with the state within whose rivers the stocks originate. Harvesting is permitted only within EEZs; it may not take place on the high seas. Nevertheless, in situations where economic dislocation of another state's fishing interests would result (i.e., where other states have a long-standing fishing interest), an effort must be made to agree on terms and conditions for fishing beyond the EEZ which are consistent with conservation requirements and the needs of the state of origin *and* give special consideration to conservation efforts made by states traditionally fishing the stock. When anadromous stocks migrate into a neighboring state's EEZ, that state must cooperate with the state of origin in managing and conserving them. Regional arrangements are encouraged to implement these provisions. (Articles 66, 116) Today, there are no longer any high seas fisheries for anadromous stocks that are recognized as legitimate.

The coastal state in whose waters *catadromous species* spend the greater part of their life cycle is responsible for their conservation and management. As with anadromous species, harvesting may only occur within the EEZ. If the species migrates through a neighboring EEZ, the states concerned must agree on management measures, taking into account the "host" state's responsibility to maintain the species. (Articles 67, 116)

The LOS Convention distinguishes a coastal state's rights over *sedentary species of the continental shelf* from its rights over marine living resources of the water column. The former belong exclusively to the coastal state; they are subject neither to international conservation nor optimum utilization requirements. Coastal state exclusive rights may extend beyond 200 miles if the state can claim a more extensive shelf as provided in the LOS Convention. (Articles 68, 77)

II.C.2. What Are States Required To Do?

Standard-Setting

The measures adopted by each state to conserve EEZ resources and those adopted by states collectively to conserve shared resources must *take into account* any generally recommended international minimum standards, whether subregional, regional, or global. (Articles 61.3, 119.1) Thus, the ongoing process through which fishery management criteria and requirements are agreed and specified in more detail continues to inform national and international law and practice. As the measures attain the status of "generally recommended international minimum standards," the LOS Convention reinforces their application, both in the rules adopted by states and as a resource to inform dispute settlement proceedings pursuant to the Convention. This is reinforced by the FSA, which first strengthens the requirement that states *adopt and apply* such standards and second, expressly indicates that a court or tribunal is to apply *generally accepted standards* for the conservation and management of marine living resources as well as the provisions of the LOS Convention, the FSA, and any relevant subregional, regional, or global fisheries agreement and other rules of international law. (Articles 10, 30.5)

The measures adopted by states must meet two fundamental obligations*: the scientific/conservation basis* outlined below and *optimum utilization* requirements. The latter are intended to ensure that available resources are not hoarded by coastal states; that is, when a coastal state does not have the capacity to harvest the entire allowable catch of marine living resources within its EEZ, it must give other interested states access to the surplus. The Convention further provides guidance for allowing land-locked countries and "geographically disadvantaged states" (e.g., those unable to claim a full EEZ due to overlapping claims with other states) in the same region to participate in exploiting a part of this surplus. (Articles 62, 69, 70, 71, 72) In practice, the coastal state has wide discretion to determine which species may be caught in its EEZ, the allowable catch of each species, its own capacity to harvest the species, and thus any surplus that might be made available, as well as all regulations governing fishing. Any arrangements giving effect to the optimum utilization obligation would require the full cooperation of the coastal state. A similar requirement to promote optimum utilization applies to regional management arrangements for highly migratory species listed in Annex I. (Article 64)

The FSA articulates certain additional principles which states must give effect to in conservation and management measures. Even though some of these principles have yet to be elaborated through specialized guidance and conventions, they lay down a marker in terms of objectives. They include *a precautionary approach*, *ecosystem-based impact assessment*, and *ecosystem conservation and marine biodiversity protection*, discussed below. Recognizing the linkages between fishing and other impacts on marine species, they call on states to minimize pollution, waste, discards, and catch by lost or abandoned gear as well as by-catch of non-target species. They support the development and use of selective, environmentally-safe and cost-effective fishing gear and techniques, including measures to prevent or eliminate *excess fishing capacity.* Finally, they urge states to take into account the interests of *artisanal and subsistence fishers.* (Article 5) These issues are discussed in the section on *technical/economic basis* below and in Section III.B.

II.C.3. Dispute Settlement, Compliance, and Enforcement

The enforcement authority of the coastal state within national jurisdiction is virtually absolute. Among other measures it may require catch and effort reports and vessel position reports, and it may place observers on board foreign vessels. The coastal state may board, inspect, arrest, initiate judicial proceedings against, and fine offending vessels/crews, subject to the requirement that it promptly release an arrested vessel and crew upon the posting of a reasonable bond or other security. Imprisonment and other forms of corporal punishment are not permitted. (Articles 62.4, 73)

Beyond national jurisdiction, enforcement has traditionally been up to the flag state. The LOS Convention is explicit only in respect of fishing for anadromous stocks beyond the EEZ, where enforcement of regulations is subject to agreement between the state of origin and the other states concerned. (Article 66.3.d) In 1999, in the context of encouraging the IMO to develop binding measures to ensure that ships of all flag states meet international rules and standards, consistent with the LOS Convention requirement that a "genuine link" exist between the flag state and ships permitted to fly its flag (Section II.B.1), concern with illegal, unregulated, and unreported fishing (IUU) led CSD7 to encourage the IMO to cooperate with FAO and the UN secretariat in considering the implications for effective flag state control over fishing vessels. This was reaffirmed by the UN General Assembly, which urged the IMO, FAO, regional fisheries organizations (RFOs) and other relevant organizations to collaborate in defining the concept of a genuine link between fishing vessels and the flag state. The CSD also emphasized the importance of further developing port state control in the context of IUU, considered below.[29]

Section I.B. outlines the LOS Convention's provisions on settling fisheries disputes. These reflect the virtual autonomy of the coastal state within the EEZ, where disputes are not subject to binding settlement and *compulsory conciliation* may only be invoked when it is alleged that a coastal state has manifestly failed to comply with its obligation to ensure that EEZ living resources are not seriously endangered, when it has arbitrarily refused to determine the allowable catch and surplus available for others, or when it has arbitrarily refused to allocate to others a declared surplus. (Article 297.3) Fishing disputes beyond national jurisdiction are subject to compulsory, binding settlement.

The FSA makes use of the option in the LOS Convention that parties to other agreements may apply the LOS Convention's dispute settlement

provisions, adding that this shall be the case even when a state is *not* party to the LOS Convention. These provisions apply to disagreements among FSA parties over the FSA itself or related subregional, regional, and global fisheries agreements to which they are parties. Building on the LOS Convention's article for *provisional measures* to preserve the respective rights of the parties or prevent serious harm to the marine environment (Section I.B.), the FSA allows a court or tribunal to establish such measures, citing also the need to prevent damage to the stock(s) in dispute. (BOX 1) Any state may seek provisional measures when the states involved have not agreed on compatible measures to conserve and manage straddling stocks or highly migratory stocks, although a country that is not party to the LOS Convention may stipulate that its consent is required. In disputes of a technical nature, *an ad hoc panel of experts* may be convened to expeditiously resolve the issues without recourse to binding procedures. (Articles 30, 31)

Box 1.

PROVISIONAL MEASURES TO CONSERVE SOUTHERN BLUEFIN TUNA

In the first case involving provisional measures to conserve a fish stock, Australia and New Zealand requested the LOS Tribunal on July 30,1999 to prescribe such measures in a dispute with Japan over southern bluefin tuna, pending the constitution of an arbitral tribunal under Annex VII of the LOS Convention. Since the FSA is not in force, they have relied on the LOS Convention's more general article on provisional measures. All three countries are party to the 1993 Convention for the Conservation of Southern Bluefin Tuna but have disagreed over the status of stocks and allowable harvest. Japan's unilateral decision to carry out an experimental fishery for research purposes in 1998 and 1999, over and above its national quota, is the source of friction. On 27 August 1999 the LOS Tribunal prescribed provisional measures and ordered the parties each to submit by 6 October an initial report on steps taken to ensure prompt compliance with them. Invoking the need for prudence and caution to conserve southern bluefin tuna stocks, the measures require that without agreement among the parties on an experimental fishery, any such catch should be counted against the country's annual quota.

The 1993 FAO Compliance Agreement and the FSA develop several additional approaches to compliance, building on measures evolving at the regional level. The Compliance Agreement targets one issue: flag state responsibilities in respect of vessels fishing on the high seas. The FSA covers fishing for straddling stocks and highly migratory stocks. In addition to flag state control on the high seas, it extends to conservation rules *per se* and the respective rights and duties of states fishing the same stock within the EEZ and on the adjacent high seas. As with the Compliance Agreement, under the FSA flag states engage specific responsibilities to authorize, regulate, and monitor their fishing fleets and to enforce applicable rules. These include establishing a *national record of vessels authorized to fish on the high seas* accessible to other states; *marking vessels and gear* so that they may be easily identified, including lost or discarded gear; and initiating *observer and inspection schemes*. The FSA strengthens each state's reporting requirements and obligations to verify this information, and it seeks to ensure transparency in subregional and regional management bodies. Based on the LOS Convention's duty to cooperate in managing straddling stocks and highly migratory stocks, it requires all states participating in a fishery to apply measures agreed through the relevant subregional or regional arrangements if they wish to gain access to the fishery. Not only are further regional arrangements for compliance and enforcement encouraged, but where regional arrangements already exist the FSA provides detailed guidance for boarding and inspection on the high seas covered by the arrangement to ensure compliance. This may be undertaken by any party to the arrangement even if the flag state of the vessel boarded is not a party, as long as it is a party to the FSA. In addition, modeled on *port state enforcement* provisions developed in the South Pacific fisheries agreements, the FSA reaffirms the right of the port state to take measures to promote the effectiveness of internationally-agreed conservation and management measures, including inspections in port and regulations to prohibit landing and transshipment when it has been established that the catch was taken in a manner which undermines the effectiveness of international conservation and management measures on the high seas. (Articles 8, 12, 14, 17-23, 33) Port state enforcement measures have also been adopted under ICCAT, CCAMLR, and NAFO and in some cases cover states that are not party to the regional agreement. (Section III.B.4.)

II.C.4. The Scientific/Conservation Basis and the Technical/Economic Basis

The first requirement of the LOS Convention for conservation measures in the EEZ and on the high seas is that they be based on the *best scientific evidence available* to the state(s) concerned. Coastal states must *take this into account*, whereas on the high seas the requirement is slightly stronger — that conservation measures be *designed on* such evidence. All states participating in a fishery are obliged to contribute and exchange on a regular basis, through competent international organizations, available scientific information, catch and effort statistics, and other relevant data. (Articles 61, 119) The FSA strengthens the requirement that coastal states base conservation measures for these stocks on the best scientific evidence available. (Article 5.b)

The LOS Convention standard for conservation measures is that they be designed to maintain or restore populations of harvested species at levels which can produce *the maximum sustainable yield (MSY) as qualified by relevant environmental and economic factor*s. These factors include the special requirements of developing states, fishing

patterns, and the interdependence of stocks as well as any generally recommended international minimum standards. A further qualification to MSY exists regarding coastal state conservation measures in the EEZ: the economic needs of coastal fishing communities. The latter is amplified by the FSA's recognition of the rights of artisanal and subsistence fishers. All conservation measures must take into consideration effects on species associated with or dependent upon harvested species with a view to maintaining or restoring these populations above levels at which their reproduction could become seriously threatened. These provisions lay the groundwork for conservation measures that reflect predator/prey relationships and the impacts of fishing on marine mammals and seabirds as well as general ecosystem health. The emphasis on single species management, based solely on MSY, has begun to erode. The emerging concepts in the LOS Convention that fishery conservation and management measures take into account environmental factors, the interdependence of stocks, and effects on associated or dependent species find their most detailed expression in the *ecosystem basis for conservation* articulated in Article II.3 of the 1980 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).[30]

The first detailed specification of how to apply a *precautionary approach* to fisheries management was adopted by the CCAMLR Commission. It restrains harvesting so that a fishery does not develop more quickly than the information necessary to ensure that it can and will be conducted in accordance with CCAMLR's ecosystem conservation principles. This approach was triggered by a proposal in the 1990s for a new crab fishery. Today it applies to new fisheries and to existing fisheries for which there is insufficient information to estimate potential sustainable yield and the impacts of fishing on other system components. To implement the approach, the CCAMLR Scientific Committee must prepare and annually update a plan identifying data needs and how to collect the data. The plan may specify location, gear, effort, and other restrictions on the fishery. A precautionary limit is set on the harvest at a level slightly above that required to obtain the data and conduct the evaluations called for. Those engaged in the fishery are responsible for submitting an annual research and fishery operations plan. This must conform to the Scientific Committee's data collection plan and describe fishing methods, including an assessment of the likelihood of impacts on dependent and related species. It is reviewed by the Committee and the decision-making Commission.

The foundation laid by the LOS Convention for measures on *selective gear* and other practices that reduce *incidental catch* and *marine debris*, also through its reference to effects on associated or dependent species, has been further defined through regional fisheries agreements and elaborated in a more general manner at the global level in the FSA. Examples include restrictions on gear, notably large-scale driftnets;[31] requirements for gear and practices that reduce incidental take (e.g., turtle excluder devices (TEDs) in shrimp fishing or that nets in tuna fishing not be set encircling dolphins[32]);[33] measures in longline fishing that prevent seabirds from being attracted to baited hooks;[34] and more general requirements for vessels to report lost or discarded gear and for governments to support surveys to determine the nature and extent of the marine debris problem.[35]

The FSA reinforces these concepts in its general principles and through provisions on the precautionary approach. (Articles 5 and 6 and Annexes I and II) Certain aspects are also elaborated in the Code of Conduct for Responsible Fishing and its technical guidelines. (Table III-3) The FSA requires impact assessment not only on target fish stocks but also on "species belonging to the same ecosystem or associated with or dependent upon the target stocks," and requires that these cover impacts not only through fishing but also as a result of other human activities and environmental factors. It calls explicitly for the adoption of conservation and management measures focused directly on non-target species, where necessary, with particular emphasis on endangered species, and for the protection of marine biological diversity. This language strongly affirms the need to assess potential impacts of fishing practices and employ selective gear. Elaborated requirements for the collection and sharing of data promote transparency, verification, and availability regardless of whether fishing has occurred within or beyond national jurisdiction. Specifications on the precautionary approach add that states must adopt plans necessary to conserve non-target and associated or dependent species and to protect habitats of special concern; institute enhanced monitoring programs when concerns arise regarding the status of target stocks or of non-target or associated or dependent species; and, based on the CCAMLR model, adopt cautious limits on new fisheries to gather sufficient data for impact assessment and, if warranted, gradual development of the fishery. A final provision further recognizes the *potential impact of natural phenomena* on marine species' populations and requires emergency conservation and management measures when there is a significant adverse impact on straddling or highly migratory fish stocks so that fishing activity does not exacerbate the impact. These provisions add weight to management objectives seeking to maintain the system as a whole rather than focusing solely on target species. There are clear opportunities to implement these principles through national measures and specialized regional agreements.

The FSA also elaborates on the *economic factors qualifying MSY* in the LOS Convention. First, it calls for the interests of artisanal and subsistence fishers to be taken into account. Second, it calls for cost-effective fishing gear and techniques with the intention of minimizing pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species (fish and non-fish), and impacts on associated or dependent species, especially endangered species. These provisions justify specialized measures at national and regional levels to achieve defined goals. The Code and its technical guidelines aim to assist states and others in addressing overcapitalization and socio-economic factors affecting fisheries, post-harvest practices and trade, and destructive fishing methods. Further international agreement on these measures could influence international trade and investment regimes as well as multilateral environmental agreements.

II.C.5. International Cooperation Opportunities

By granting coastal states sovereign rights over EEZ marine living resources and sedentary species of the continental shelf, the LOS Convention allows them to establish whatever terms and conditions they wish for foreign access to these resources. In addition to financial compensation, the Convention expressly refers to terms on the acquisition of fishing industry equipment and technology; the conduct and results of specified fisheries research programs; training, including ship-board training; improved research capabilities; and joint ventures or other cooperative arrangements. (Article 62.4) This, combined with the coastal state consent regime governing marine scientific research (Section II.A.3), represents a major opportunity to advance national capabilities and well-being. The CBD takes this one step further in articulating a state's sovereign right to exploit *genetic resources* within national jurisdiction, which includes the resources of the EEZ and the continental shelf. As discussed below, it reinforces LOS Convention provisions in calling for mutually agreed terms of access to genetic resources, including participation in research by the state of origin and equitable sharing with the state of origin of the results of research and the benefits of commercial or other utilization, including technologies derived from genetic resources. (Articles 15, 16, 19)

In keeping with developments during the 1990s, recent fisheries agreements contain more explicit references to the means of assisting developing nations in implementing the agreements. The FSA calls for establishing special funds for this purpose and identifies as one goal of such assistance helping states to meet the costs of any dispute settlement proceedings they may be involved in. (Articles 24-26)

II.C.6. International Institutions

At the global level, the UN Food and Agriculture Organization (FAO) continues to play an important role in fisheries management and conservation. Regional fishery commissions were first established under FAO auspices in the late 1940s (Table III-4) when the rights of coastal states did not extend very far offshore. Their goal was to support research and the collection and analysis of fishery statistics. FAO's Committee on Fisheries (COFI) came into existence in 1965. With the extension of coastal state jurisdiction to 200 miles, the organization adopted a major strategy to support fisheries management and development in developing nations, but in the ensuing years bilateral arrangements often took precedence over multilateral assistance as foreign states bought access to resources within national jurisdiction. FAO regained prominence in the fisheries area during the 1990s as concern mounted worldwide over fisheries depletion and habitat destruction. In 1989 the organization decided to give higher priority to preventing environmental degradation affecting fisheries. The UNCED decision to convene a conference on straddling fish stocks and highly migratory fish stocks prompted FAO to organize several expert consultations on scientific, technical, economic, and legal issues in fisheries management. The level of support given developing nations through FAO's regional bodies is growing. FAO has recently used its convening authority to bring together FAO and non-FAO regional fishery organizations (RFOs) to exchange information and learn from each other's experience. Under the FSA, FAO serves as the global mechanism to collect and disseminate data on national and regional fisheries, while under the 1993 Compliance Agreement FAO is to *maintain a master file of national registers of vessels authorized to fish on the high seas*, the High Seas Vessel Registration System (HSREG — Section III.B.4.). The Code of Conduct for Responsible Fisheries affords FAO a mandate to keep under the review the full range of fishery and fishery-related issues.

The multilateral banks' efforts to assist developing nations use and manage their marine living resources also diminished when coastal states turned to bilateral arrangements. As fisheries depletion and conflicts have grown more intense, the donor community has joined FAO and the conservation community in taking a new look at management needs and objectives. The emphasis in the FSA, the Code, and the CBD on support for artisanal and subsistence fishers has influenced recent international fisheries cooperation projects.

In the field of *marine mammals*, the International Whaling Commission established by the 1946 Whaling Convention remains the predominant organization insofar as whales are concerned. For other cetacean species, there are a growing number of regional conservation initiatives, notably pursuant to the Convention on Migratory Species. (Table II-8) The RFOs that have adopted measures to reduce incidental take of marine mammals in fishing operations *de facto* support marine mammal conservation.

LINKAGES: Marine Pollution Control

The LOS Convention's provisions on pollution control support its marine species conservation objectives. First, the definition of pollution encompasses harm to living resources and marine life as well as hindrance to fishing. Second, the over-riding obligation of each state to protect and preserve the marine environment requires, at a minimum, responsible fishing. Third, each state's pollution control measures must protect and preserve rare or fragile ecosystems and the habitat of depleted, threatened, or endangered species and other forms of marine life. Fourth, these measures must avoid the introduction of new or alien species that may cause significant or harmful changes to the marine environment. As noted above, the FSA and the Code elaborate on these issues, linking the impacts of pollution on fish stocks to other human and environmental factors. The Code tackles more broadly the need for habitat protection and rehabilitation and the integration of fisheries into coastal area management. In a section on harbors and landing places for fishing vessels it calls for efforts to combat the effects of erosion and siltation. Thus, international fishing agreements continue to penetrate the full range of factors affecting sustainable fisheries.

LINKAGES: Safety and Pollution Control on Fishing Vessels

The IMO Conventions contain various size limits on vessels (tonnage, number of persons) below which they do not apply. To tackle the issue of smaller fishing vessels, a 1977 IMO Convention on the Safety of Fishing Vessels, as revised, covers fishing vessels down to 24 meters in length. It provides explicitly for port state control so that a state may inspect vessels in its ports for compliance with applicable standards. (Section II.B.1.) Because the Convention has not entered into force, the IMO is considering whether to revise its non-binding Code and Guidelines in this field. (Table II-1) These address safety features on board the vessels and working conditions for fisherfolk rather than pollution control. In addition, the ILO is considering which of its maritime instruments should be applied to the fisheries sector through adoption of appropriate protocols and/or new international labor standards for this sector.[36] (Table II-1) The 1995 Fish Stocks Agreement and Code for Responsible Fisheries reintroduce the need for fishery conservation and management measures to address pollution impacting marine species and ecosystems. The Code calls for adequate sanitation and waste disposal arrangements and other pollution controls in its section on harbors and landing places for fishing vessels. (Section III.D.)

LINKAGES: Marine Debris

The problems of marine species' entanglement in or ingestion of marine debris are addressed not only through fishing agreements but also through international agreements on vessel-source pollution, dumping, and land-based pollution. Annex V to MARPOL 73/78 covers garbage disposal by vessels and prohibits discharges at sea of plastics. In designated special areas, virtually all garbage disposal is prohibited. (Table II-8) As noted, the 1996 amendments to the London Convention prohibit at-sea disposal of wastes unless permitted in the "reverse" or "white" list. Persistent plastics, for example, may not be dumped. (Sections II.B.1. and II.B.2.)

LINKAGES: The Convention on Biological Diversity

The CBD has a potentially important role to play in the conservation and sustainable use of marine and coastal biodiversity, but its specific niche vis-à-vis other conventions and international bodies has yet to be clearly defined. In 1995, the CBD/COP adopted the Jakarta Mandate on Marine and Coastal Biological Diversity. One of its five major program areas is the sustainable use of marine and coastal living resources. This is directly affected by the other four: mariculture, alien species and genotypes, integrated marine and coastal area management, and protected areas. These issues are considered further in Section II.D.

The issue of *genetic resources of value in marine species* has acquired new significance with the emphasis in the CBD on access to and benefit-sharing from genetic resources and related international discussions on intellectual property rights. The issues intersect with international ocean law at two points*: resource rights within and beyond national jurisdiction*, and the distinction between marine scientific research and bioprospecting. On the first point, coastal state sovereign rights over EEZ and continental shelf resources, including genetic resources, are essentially identical to rights over terrestrial resources. Access is subject to the consent of the state involved. The definition of mutually agreed terms of access to and benefit from these resources may be realized through national measures and can draw on international guidance. For species that are not endemic to a particular country, there may be competition among "source" countries in striking agreements with foreign investors/developers; regional agreements among the source countries could be advantageous. For genetic resources found beyond national jurisdiction, the situation is murkier. High seas living resources are freely available to all states, and the regime for use and benefits, including from genetic resources, is on a first-come, first-served basis. There is no agreed definition of deep seabed living resources. Some might argue that these, also, are subject to the high seas regime. Others might argue that since the seabed, ocean floor, and subsoil thereof beyond national jurisdiction are the common heritage of mankind (LOS Convention, Articles 1.1 and 136), this would encompass certain living resources attached to or buried within the seabed analogous to the definition of sedentary species of the continental shelf (LOS Convention, Article 77.4).[37] Were the latter argument accepted, an international regime governing benefit-sharing, if not access to these resources, might be warranted. (The existing regime on deep seabed mineral resources is clearly not intended to cover the exploitation of living resources; it does have a role to play in preserving the deepsea environment and biodiversity from harm due to minerals development activities. (Sections II.B.6. and III.D.1.) At the same time, the possibility that species found beyond national jurisdiction occur also within national jurisdiction could vitiate any international regime.

Regarding the *distinction between scientific research and bioprospecting*, this normally lies in the duty to make research data and results freely available for use by all (LOS Convention, Article 244; CBD, Article 17) as opposed to the right to retain data and research results as proprietary, leading to private commercial gain, when prospecting is involved. Within national jurisdiction, the coastal state has the right to control marine research; if authorized to conduct research, a foreign researching state must allow participation by and provide results to the coastal state and ensure that research results are made internationally available as soon as practicable. For research of direct significance for natural resources exploration and exploitation, the coastal state may require its prior agreement for making the results internationally available. (LOS Convention, Articles 246, 249) Beyond national jurisdiction, if rights to genetic resources were vested with the international community, one could establish the presumption that unless data and research results are made freely available within a reasonable period, or if intellectual property results, bioprospecting has occurred and a benefit-sharing agreement is required. CBD/COP2 called for a study

of the relationship of the CBD and LOS Conventions regarding the conservation and sustainable use of deep seabed genetic resources.

II.D. The International Legal Regime For Protecting Marine Species and Habitat and Ecological Function

The international ocean law considered in the previous sections has evolved from two streams: sectoral concerns (e.g., fisheries, and pollution from shipping, dumping, and various offshore and land-based activities like oil and gas development, agriculture, and domestic wastewater) and concentrated impacts on the marine/coastal environment at the regional level. The third stream, outlined in this section, is international conventions that protect species and/or defined geographic areas — when human impacts have so depleted the species as to threaten extinction, or where sites valued for scientific research, habitat, aesthetic, or other reasons may otherwise be compromised by human activities. (Table II-8)

The sectoral agreements have taken on new issues like ship-source air pollution or the problems caused by lost or discarded fishing gear. In this respect they partially tackle problems caused by a wider range of contributing sources like nutrient pollution or entanglement in marine debris. Another serious problem they have begun to address is the introduction of non-indigenous/invasive species that damage natural resource industries and human settlements and may disrupt ecosystems. The IMO is developing new instruments on their introduction through maritime transport, while efforts in other fora address introduction through mariculture or re-stocking of fish, including the introduction of GMOs. These, too, are only partial solutions, since alien species may also be introduced as a result of international trade and tourism — when children return with novelty pets or collectors import exotic animal or plant species that escape to the wild. (Section II.D.3)

Similarly, the protected species/area regimes are restricted in scope; they cannot directly address all threats. They may curtail direct harvesting of endangered species, but their effect is limited in ensuring essential habitat. The growth in coastal human settlements makes it more difficult to insulate spawning and nursery areas for marine species against recreational use or pollution from adjacent areas. Pressures for more lucrative economic activities in coastal areas may compete with restricted use designations, while mariculture poses several types of threats. Other risks may arise from modified sediment or nutrient transport by rivers into coastal habitat or the withdrawal and diversion of freshwater for upstream development. Sediment mobilization and nutrients are beginning to be addressed by the legal instruments on land-based sources of marine pollution (Section II.B.3.), but the issue of estuarine and coastal/marine impacts due to altered river flow is just beginning to emerge as a subject of international law and international technical guidance. (Sections II.D.5., III.C.3.)

The sectoral agreements and the species/area protection regimes are important and necessary elements in sustainable ocean use. But in order to fully achieve an international legal basis for protecting marine species, habitat, and ecological function, a shift in perspective is required that positions the specialized agreements to serve these broader goals. The first step is defining goals based on an understanding of ecosystem components and how they are affected by human activities, and in turn how ecosystem change affects the needs and aspirations of the human societies dependent upon them. The role of international legal agreements is to ensure that principles and mechanisms are adequate to the task. The LOS Convention provides the comprehensive framework for tackling ocean stresses and lays down strong and binding obligations to protect and preserve the marine environment, including rare or fragile ecosystems and the habitat of marine species, and to conserve marine living resources. Its principles and mechanisms have been elaborated through specialized legal instruments to support an ecosystems-based and precautionary approach to sustainable ocean use. The linkages among these agreements are helping to construct a web of international commitments that increasingly encompasses all sources of ocean stress. The CBD's comprehensive approach to species, ecosystem, and genetic diversity and its endorsement of an ecosystems approach to biodiversity conservation strengthen the impetus for an ecosystem-based approach to marine conservation. (See Sections III.A and IV for further discussion.)

The failures of international law lie in relating specialized commitments to ecosystem-based problems. In many parts of the world oceans, regional and subregional[38] arrangements offer a means to combine a comprehensive ecosystems perspective on oceans problems with the specialized legal instruments available to address them. The opportunities of regional arrangements are considered further in Sections III.A and IV. The remainder of this section will outline the international legal regime for protecting marine species, habitat, and ecological function and highlight problems and gaps.

II.D.1. Protected Species

There is only one article in the LOS Convention touching broadly on this subject: it requires states to include in their pollution control measures those necessary to protect the habitat of depleted, threatened or endangered species. (Article 194.5) Its significance lies in reinforcing protections for species designated as threatened or endangered pursuant to other conventions insofar as they may be affected by marine pollution. The commitment extends also to depleted species, which today includes many of the world's major fisheries. Thus, not only are states bound to give effect to international pollution control obligations pursuant to the LOS and associated conventions, as considered in Section II.B., they must pay particular attention to protecting habitat of depleted, threatened or endangered species. This should include species protected under national laws as well as obligations under international conventions.

There are a number of international agreements that identify threatened or endangered species for protection, both globally and regional-

ly. (Table II-8) The Biodiversity Convention supports these arrangements by calling on states in general to conserve biodiversity and use it sustainably and to take necessary measures to protect threatened species and populations. The protected species conventions may be viewed as tackling the subject from the following angles; that is, they require states at the national level and in cooperation with others to:

- prohibit or restrict the harvest of listed species and other "takings" that deplete the species;
- protect and restore habitat and control other factors that endanger the species like pollution or species introductions, and monitor species/habitat conditions and threats;
- support captive breeding and culture operations that help maintain and restore the species and facilitate sustainable harvests as a source of food and income; and
- prevent, control, and monitor trade contributing to pressure on listed species.

The Global Protected Species Conventions

The *1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)* concentrates on preventing and controlling international trade when commercial demand contributes to the threat of a species' extinction or overexploitation. Its appendices identify species at three levels of risk: species threatened with extinction which are or may be affected by trade (Appendix I); species that may become threatened with extinction unless trade is strictly regulated to prevent overexploitation (Appendix II); and species designated by individual countries as subject to national regulation and needing the cooperation of other parties to control trade (Appendix III). Commercial trade in Appendix I species (and parts thereof) is essentially banned, whereas trade in Appendix II species is permitted in a regulated manner. A small trust fund is available to finance implementation initiatives such as scientific and technical studies needed to make listing determinations, regional training seminars, and national efforts to conserve species and habitat.

CITES' goal is to avoid unsustainable harvesting and commerce in wild species — determined on the basis of a species role in the ecosystems in which it occurs. (Article IV.3) During the 1990s, the COP substantially revised and elaborated the criteria for listing species to ensure that they are well-founded. (Res.Conf.9.24) In addition, it expressly reaffirmed the benefits of commercial trade for conserving species and ecosystems and/or for the development of local people, when carried out at a level that is not detrimental to the survival of the species in question. (Res.Conf.8.3) Comprehensive standards and procedures were adopted for captive breeding of Appendix I species for commercial purposes. (Res.Conf.8.15) In keeping with a broader, ecosystem-based approach to defining threats, the revised listing criteria allow risks posed by diminished or degraded habitat, introduced species, and pollution to be taken into account, in addition to overharvesting.

Many species of cetaceans, marine turtles, and corals have been listed in Appendices I and II. For listed species like whales and seals that are subject to earlier conventions, CITES' trade restrictions do not apply if the species is taken in conformity with the relevant convention by parties to it. In relation to captive breeding operations for listed marine species, the COP approved guidelines in 1994 for evaluating ranching proposals to raise sea turtles taken from the wild in controlled circumstances for the purpose of commercial trade. The guidelines embody an ecosystem-based approach by requiring management arrangements that encompass all significant habitat throughout the range of the species and the identification and control of different factors causing stress, including incidental catch. All major range states must be involved. (Conf. Res. 9.20)

Efforts to date to designate certain depleted fish species (e.g., Atlantic bluefin tuna) for protection pursuant to CITES have not been successful. In 1994 CITES/COP9 supported initiatives to collect and evaluate data on the biological status of sharks and trade in sharks, including historical data, noting that some 100 species are exploited either commercially or for recreation and that no multilateral agreement exists to conserve them. (Conf. Res. 9.17) Decisions in 1997 sought further collaboration with FAO and RFOs to support accurate species identification and reports on directed shark fisheries and by-catch in other fisheries. They encouraged national and international management throughout the range of the species to ensure that trade is not detrimental to shark populations. (Conf. Decs. 10.48, 10.73, 10.74) Proposals that CITES study whether other marine fish species exploited on a large scale and subject to international trade might qualify for listing under CITES have prompted FAO to convene a scientific review of the appropriateness of the CITES listing criteria for these species. If the results are approved by FAO/COFI in 2001, they are expected to contribute to a full review by CITES of its criteria.

The *1979 Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention)* lists *migratory* species at two levels of risk: in Appendix I those in danger of extinction throughout all or a significant portion of their range; and in Appendix II those which have an unfavorable conservation status (defined in the Convention) and require or would benefit from an international agreement. If circumstances warrant, some species may be listed in both appendices. The range states of Appendix I species are to take immediate action to protect the species; those of Appendix II species are urged to conclude binding Agreements to improve the species' conservation status. Supplementary review procedures have been adopted to deal with urgent situations.[39] The Convention provides guidelines for the Agreements and serves as an umbrella mechanism for their review. Several less formal Memoranda of Understanding have also been concluded. A small trust offers financing for conservation projects in developing nations. Reflecting the trends of the 1990s, CMS/COP4 agreed in a list of priorities adopted in 1994 that future Agreements should strike a balance between protection and sustainable use. (Res. 4.4)

Both appendices include marine species and migratory seabirds, and several relevant Agreements and an MOU for the conservation of African sea turtles have been concluded. (Table II-8) A decision was taken in 1995 to support work on four main species group in the following order of priority: marine turtles, small cetaceans, migratory birds, and other mammals.

From an ecosystems perspective, the Convention is founded on the need to conserve migratory species throughout their range. A useful provision defines "range states" to include states whose vessels are engaged in taking the species beyond the limits of national jurisdiction. The Convention recognized from the outset that "conservation status" means the "sum of influences acting on the migratory species that may affect its long-term distribution and abundance." (Article 1.b) These concerns are reflected more fully in recent Agreements:

- *Fishing:* The CMS Agreements on small cetaceans call for efforts to modify fishing gear and practices to reduce incidental catch and marine debris. The parties to the Baltic/North Sea Agreement decided to reduce by-catch to less than two percent of stocks within appropriate management regions: either at the national level or *through the competent bodies* (i.e., the International Baltic Sea Fishery Commission and the European Union's common fishery policy).[40] In 1999 CMS/COP6 adopted a general resolution on by-catch threatening migratory seabirds, sea turtles, and marine mammals. It reaffirms the parties' obligations to protect migratory species against by-catch and urges them to take action at the national level with respect to their flag vessels and in highlighting the problem in RFOs.

- *Acoustic Disturbance:* The Baltic/North Sea Agreement incorporates the threat of disturbances "of an acoustic nature." Guidelines developed by the United Kingdom have been recommended to the parties. (Table III-3)

- *Land-Based and Ship-Source Pollution:* In relation to pollution threats, the 1995 CMS/Waterbirds Agreement underscores its own limitations and turns to other appropriate fora in calling for each party to place adequate statutory controls *in accordance with international norms* on the use of agricultural chemicals, pest control, and the disposal of wastewater in wetlands that support listed populations. Similarly, the Black/Mediterranean Seas Agreement requires parties to regulate land-based and maritime pollutant discharges affecting cetaceans *within the framework of other appropriate legal instruments.* It provides for accession not only by range states but also by states whose ships' activities in the area may affect cetaceans.

- *Emergency Preparedness and Response:* Both the CMS/Waterbirds Agreement and the Black/Mediterranean Seas Agreement address emergency threats like pollution events to migratory waterbirds/cetaceans and call for further advance planning to respond to emergency situations.

The Regional Protected Species Conventions

Regional conventions on protected coastal and marine species fall into two categories: the regional seas conventions, where five specialized subsidiary instruments list such species (the Southeast Pacific Protocol does not provide for species listing), and five regional nature conservation conventions that cover protected species and areas more generally and include some marine species. (Table II-8) The nature conservation agreements span a period from 1940 to 1979. They range from broad conservation objectives including the preservation of ecological processes and genetic diversity (ASEAN) to a narrower focus on conserving flora and fauna species and their habitat (Europe). All these agreements call on states to take measures to protect and conserve species and their habitat, including restrictions on harvesting and trade and measures to reduce indirect impacts. A novel aspect of the Caribbean Protocol is that some of the species designations amount to protected area designations for small ecosystems because all species of mangroves, coral reefs, and sea grasses are listed for protection.[41] Under the five nature conservation agreements, the species designations are undertaken in some cases by nations individually and circulated among the parties (South Pacific; Western Hemisphere); in others, there is an agreed list of protected species (ASEAN, Africa, Europe). Subject to a more exhaustive examination, the protected species listed include marine mammals (Western Hemisphere, Africa, Europe), all marine turtles (Africa), and seabirds (Western Hemisphere, Europe).

Marine Mammals

The international legal regime for the protection of marine mammals is comprised of several elements. To recapitulate, it includes: the provisions of the LOS Convention on fisheries and marine mammals as well as the requirements of the LOS Convention and the FSA regarding impacts on associated or dependent species; the 1946 International Whaling Convention; regional agreements to protect cetaceans pursuant to the Convention on Migratory Species; and actions taken pursuant regional fisheries agreements to reduce incidental impacts on marine mammals. In addition, international trade in listed cetacean species is controlled pursuant to CITES. Among the Nordic countries, there is also a regional convention whose purposes are to contribute to the conservation, rational management, and study of marine mammals in the North Atlantic. In 1998 the first IMO action to protect whales from direct physical impacts from ships was taken. (Section II.D.2., "International Shipping") In 1999 Italy, France, and Monaco established by treaty a whale and dolphin sanctuary in the Mediterranean Sea which includes international waters.[42]

Pursuant to the 1946 Whaling Convention, the International Whaling Commission established a moratorium on whaling which took effect in 1985/86. It has adopted whale sanctuaries applying to the Indian

Ocean (1979, extended indefinitely in 1992) and to the Southern Ocean around Antarctica (1994, to be reviewed every ten years). A few countries have objected formally to these decisions, as is their right under the Convention. Only the Norwegians and the Russians maintain their objection to the moratorium and are not bound by it. The Japanese do not observe the Southern Ocean sanctuary and continue to issue permits for research whaling there despite non-binding IWC resolutions urging them not to do so. Governments disagree over whether the Convention applies to small cetaceans. Many states take the view that small cetaceans are subject to national jurisdiction within the 200-mile EEZ. If the species migrates between different nations' EEZs, it is governed in addition by other LOS Convention provisions and the FSA. (Section II.C.)

II.D.2 Protected Areas

The limited number of provisions in the LOS Convention on protected area designation includes the one noted above, which states in full that pollution control measures must include those "necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life." (Article 194.5) Additional provisions particular to international shipping, fishing, and deep seabed mining are considered below. (Protecting objects of archaeological, historical, or cultural significance is not considered in this report.[43]) As with protected species and their habitat, these provisions reinforce protections for rare or fragile ecosystems identified pursuant to other global and regional agreements.

The protected area conventions take two forms. Both identify the values that area designations are intended to protect. Some provide for geographic areas to be defined where activities may be prohibited or restricted; they may identify the types of activities that states are encouraged to regulate. Others prohibit or regulate a narrow range of activities and provide for the identification of areas particularly vulnerable to these activities where more stringent protections apply. (Table II-8) Understanding this interplay between protected area designation and activity regulation is vital. In many parts of the world, population and development pressures make it increasingly difficult to place large core areas off limits to human activities. The effectiveness of buffer zones around the perimeter to shield them from external influences may also be eroded. This has produced strategies that embed protected area designations within a larger bioregional approach to conservation and that tackle directly the sources undermining conservation on an activity-by-activity basis. In the fluid marine environment, it is even more difficult to insulate protected areas from stresses originating outside; an activity-by-activity approach is essential. At the same time, protected area designations give focus to and establish goals for these wider efforts. (Section III.C.1.)

The marine environment poses a unique problem: restrictions on international navigation. Within national jurisdiction, the coastal state's duty to protect the marine environment allows it to identify marine areas that warrant special protection. It may regulate all activities carried out by its own nationals that affect these areas, but its right to curtail activities by foreign ships is carefully circumscribed by the LOS Convention; for the most part, national measures applicable to foreign ships are subject to agreement in the competent "activities" forum, the IMO. Beyond national jurisdiction, special area designations applicable to shipping are also adopted through the IMO. Recent developments at the regional level and in relation to international shipping and future deep seabed mining activities are considered below. Broader proposals to protect high seas or deepsea hydrothermal vent areas and their unique biodiversity have not yet been taken up.

The Convention on Biological Diversity (CBD)

The CBD supports existing arrangements in a general sense by calling on states to establish a network of protected areas at the national level where special conservation measures are needed. Marine and coastal protected areas (MCPAs) are one of the five program elements established by the Jakarta Mandate. A basic principle is that protected areas should be integrated into wider strategies so that external activities do not adversely impact marine and coastal ecosystems. The program aims to increase understanding of the value and effects of MCPAs on sustainable use and to develop criteria for their establishment and management. The marine living resources program element includes action to identify key habitats for marine living resources on a regional basis, prevent their physical alteration and destruction, and protect and restore spawning and nursery areas and other important habitat. The Convention's real value may lie in promoting a more systematic approach to the use of the large number of international agreements promoting coastal/marine protected area designations. This would require a thorough comparison among the criteria/values that justify their designation and among the range of protective measures that may be applied (Table II-9) before considering the value of each instrument in relation to coastal/marine sites for which protection is sought. (Section II.D.6.)

The Global Protected Areas Conventions

There are essentially three global instruments that define geographic areas for special protection. Two of these cover a wide range of natural areas while the third concentrates on wetlands. None of these provides for designation of marine areas beyond the 12-mile territorial sea, thus avoiding any issues related to navigation freedoms. See Maps C1-C8.

The *1971 Convention on Wetlands of International Importance, Especially for Waterfowl (Wetlands or Ramsar Convention)* fills a vital niche by specializing in these unique ecosystems. Its "wise use" principle anticipates the concept of sustainable development and offers a long backlog of experience. During the 1990s the parties have emphasized the need to place wetlands in the context of land use planning, water resources management, and other relevant national poli-

cies and have taken a number of decisions that elaborate the scope of the Convention and its relations with other conventions. These are incorporated into a new comprehensive Framework and Guidelines for the Future Development of the List of Wetlands of International Importance adopted at COP7 in 1999. The goals are to promote a systematic approach to priorities at the national level and to help achieve a global network of sites representing all wetlands types. A global target of 2000 sites by the year 2005 is set. The document's vision of the Ramsar List is: "to develop and maintain an international network of wetlands which are important for the conservation of global biological diversity and for sustaining human life through the ecological and hydrological functions they perform." The global system is to be built from national networks. The Convention has a small grants fund to assist with preparing designations, emergencies, training and technical assistance, and awareness raising.

Coastal wetlands are a critical component in marine conservation. They include mangroves, seagrass beds, coral reefs, intertidal zones, and estuaries that link freshwater and marine systems. They may be protected through other global arrangements, under the regional conventions, and as habitat pursuant to protected species conventions, but the Wetlands Convention offers a unique source of guidance and expertise. Designations may include areas of marine water no more than six meters deep at low tide (and any deeper areas that lie within), and they may incorporate adjacent islands and riparian or coastal zones. More than a third of the nearly 1000 designated wetlands have a marine or coastal component. The Convention's emphasis on coastal/marine systems has grown substantially. In 1994 the parties called for criteria and guidelines to designate wetlands of importance to fish, supplementing the earlier criteria on waterbirds, and when these were adopted in 1996 they urged that priority be given in designating new sites to underrepresented wetlands, notably coral reefs, mangroves, and seagrass beds. The parties have been encouraged to treat coastal wetlands within integrated coastal zone management strategies, and in 1996 they turned their attention to integrating wetlands conservation into river basin management and giving importance to hydrological function. Further detailed guidance on integrating wetland and river basin management was adopted by COP7. (Res. VII.18) This notes the influence of river basin discharges on coastal and marine systems and the need to include marine and coastal ecosystems in allocating water for ecosystem maintenance. COP7 also took up intertidal wetlands like tide flats, salt marshes, mangroves, and seagrass beds and sought further documentation on their status and losses and how to avoid future losses. (Res. VII.21) A decision in 1996 to expand the Convention's wise use guidelines to address oil spill prevention and cleanup, agricultural runoff, and urban/industrial discharges recognizes that this will entail *cooperation with other bodies.*

The Convention continues to place particular importance on *transboundary* wetlands and those providing important habitat for *migratory species* dependent on wetlands. This is reflected in the new guidelines on wetlands and river basin management, which include a section on international cooperation related to shared river basin and wetland systems, but even more so in new guidelines for international cooperation also adopted at COP7. (Annex to Res. VII.19) These indicate how cooperation is now interpreted to include downstream impacts caused by action or inaction in upstream parties, including impacts on coastal wetlands such as land-based marine pollution; responsibility to restrict the spread of alien or invasive species; the need to harmonize implementation of Wetlands Convention obligations with those under river basin agreements, noting the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes as a useful basis for the development of new regional agreements; and, for shared coastal wetlands, the value of developing cooperation frameworks within the legal frameworks provided by existing regional seas programs and embodying Large Marine Ecosystem (LME) concepts. (Section III.A) In relation to shared water-dependent species, the guidelines extend cooperation goals to include not just waterbirds but also migrating species like marine turtles and certain fish stocks, and they refer to partnership with the CMS. In relation to trade in wetland-derived plant and animal products, in addition to encouraging each party to monitor trade to ensure that harvesting is sustainable, they note the clear obligation of the relevant party(ies) to ensure that harvesting from a listed site does not threaten or alter the ecological character of the site, and, if also a party to CITES, to ensure that harvesting and trade take place in accordance with CITES rules. These explicit linkages help guide parties to the appropriate legal instrument for accomplishing particular goals, in collaboration with the Wetlands Convention.

The *1972 Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)* covers both natural and cultural areas of outstanding value. The sites are selected by an international committee of government representatives with the consent of the state concerned. The Convention was the first to recognize that it is the duty of the international community to assist in protecting world heritage. Financed by both mandatory and voluntary contributions, a small fund is available for preparing documentation on potential sites, emergency assistance, training, and other technical cooperation.

Marine and coastal areas may be designated in either or both categories. They must lie within the territory of a contracting party (i.e., not beyond the territorial sea).[44] Somewhat more than 100 natural sites have been designated, of which 14 have a marine and 17 a coastal component.[45] The criteria for selecting natural sites require that they be of sufficient size and contain the necessary elements to ensure the integrity of ongoing ecological and biological processes, noting as an example that a coral reef designation should include seagrass, mangrove, or other adjacent ecosystems that regulate nutrient and sediment inputs into the reef. Another criterion cites important natural habitats for *in situ* conservation of biological diversity, including threatened species of outstanding universal value from the point of view of science or conservation. Operational Guidelines adopted pur-

suant to the Convention describe general principles and management measures to be employed in protecting world heritage sites. Ongoing discussions suggest efforts to better integrate the notions of natural and cultural heritage and harmonize the respective criteria for selection and evaluation.

The parties have launched a strategic campaign to achieve a better regional balance of sites on the World Heritage List. Regional action plans were developed for the first time in 1998 as a means to respond to characteristics in each region and promote collaboration at the regional level, especially in the case of transboundary sites. A more systematic approach to funding will concentrate on underrepresented themes and regions in order to achieve a diverse and representative List.

The *Man and the Biosphere Programme (MAB)* was launched in 1971 as a program of UNESCO. Its Biosphere Reserves do not function under a legally-binding convention. An international committee is responsible for designating Reserves. UNESCO reaffirmed program directions in 1995 through the Seville Strategy and the Statutory Framework for the World Network of Biosphere Reserves. These non-binding documents identify priorities for action at national and international levels and at the level of individual Reserves. They also provide guidance to help strengthen national implementation.

The Reserves are meant to serve as a coordinated international network combining biodiversity conservation with sustainable human development and support for demonstration projects, monitoring, research, and education and training. They must be of sufficient size to achieve these goals. From the outset the Reserves have reflected both the natural and social sciences. They have long recognized the links between the development needs of local communities and conserving biodiversity, including traditional use systems. They comprise a core zone devoted to long-term protection and low-impact research or educational uses; buffer zones for compatible activities; and a surrounding transition zone where sustainable resources management practices are promoted.

The 1995 Strategy emphasizes the importance of coastal/marine designations. At the end of 1992 there were 327 Reserves covering nearly 218 million hectares, of which about 90 had a coastal/marine component.[46]

The Regional Marine Agreements

Five subsidiary instruments to the regional seas conventions allow coastal/marine protected areas to be designated anywhere within national jurisdiction, subject to international rules on navigation freedoms. (Table II-8) In terms of geographic scope, the Caribbean Protocol (1990) is noteworthy because it reaches upstream, allowing designation of related terrestrial areas including watersheds and, as noted above, its protected species designations *de facto* protect entire coastal/marine ecosystems. The revised Mediterranean Protocol (1995) is the first regional marine instrument to incorporate many elements from the CBD, effectively becoming a regional vehicle for implementing the CBD in respect of coastal/marine biodiversity. For example, it calls for protected areas to safeguard: representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and maintain their biodiversity; habitats in danger of disappearance in the region; and habitat critical to endemic as well as endangered or threatened species. It provides for *ex situ* as well as *in situ* conservation measures. In geographic scope, the Mediterranean Protocol contemplates the possibility of designating areas lying partly or wholly on the high seas. (Article 9) This reflects the fact that most of the Mediterranean Sea remains high seas, since many maritime boundaries have yet to be agreed and there are no EEZs. If high seas designations are made, they must be proposed by two or more of the neighboring states concerned and adopted by consensus. While they do not apply to third states, the parties are to invite non-party states to cooperate in implementing the Protocol.[47]

Several of the regional instruments recognize the limitations of area designation if the application of other specialized instruments is not strengthened at the same time; for example, the Mediterranean Protocol refers to instruments on land-based pollution, dumping, seabed exploration and exploitation, and emergency response; the Northeast Atlantic Annex recognizes the importance of broad-based programs to protect species, communities, habitats, and specific ecological processes but notes with respect to impacts from fisheries and maritime transport that its role is to draw potential problems to the attention of the *competent international body*. The Antarctic Treaty concentrates on continental protected areas but includes several with a marine component. While a separate annex to the 1991 Protocol deals with the protected areas system, the annex on wastes management addresses the need to avoid deposition of particulate matter from open burning of wastes in protected areas.

The Regional Nature Conservation Agreements

All five regional nature conservation agreements provide for protected area designations. (Table II-8) With one exception (Europe) they refer to designating areas under national "control." This is further defined in one case as *territorial* waters (Africa) and in another as areas under national *jurisdiction*, including coastal and marine areas (ASEAN), which would encompass also EEZ waters. Three give special emphasis to shared resources, habitat, or migratory species (South Pacific, Europe, and Western Hemisphere with respect to migratory birds).

International Shipping

Section II.B.1 outlines the balance in international ocean law between a coastal state's right to protect its offshore environment and all states' international navigation rights. To recapitulate, while the coastal state may enact more stringent protective measures for vessels flying its flag, its rule-making and enforcement authority vis-à-vis foreign vessels diminishes as its zones of jurisdiction move further offshore. There are

no restrictions on its standard-setting and enforcement authority vis-à-vis foreign vessels in internal waters. Depending on shoreline configuration and fringing islands or reefs, the baselines from which offshore zones are measured may permit substantial nearshore areas to be included within internal waters. (Article 7, LOS Convention) In the 12-mile territorial sea, the coastal state may establish certain discharge measures for foreign vessels, but other standards must either be reviewed or approved through the IMO. In international straits and archipelagic waters, all coastal state measures vis-à-vis foreign shipping must be approved through the IMO. Beyond the territorial sea, the coastal state may neither set nor enforce standards that are higher than the internationally accepted standards adopted through the IMO. This places the burden of protecting ocean areas vulnerable to shipping on activity-specific regulation through the IMO rather than generalized area protection regimes. The IMO agreements and the LOS Convention reinforce each other, and the measures that coastal states may apply to protect vulnerable areas continue to evolve.

The IMO Conventions provide for five types of measures that protect defined geographic areas of the sea:

- To avoid accidents and damage, especially in congested areas, a coastal state may establish mandatory sealanes or other *routeing measures*, including traffic separation schemes and "areas to be avoided" for environmental and safety reasons. Beyond the territorial sea, these must be proposed to and approved through the IMO.[48]

- To protect large areas that are vulnerable to pollution from vessels, such as semi-enclosed or polar seas, MARPOL 73/78 provides for the establishment of *Special Areas* where more stringent restrictions apply to operational discharges, set forth in the respective annexes on oil, noxious liquid substances, garbage, and air pollution. This is reinforced by the LOS Convention which permits coastal states to seek approval through the IMO for special mandatory measures that give effect to Special Area protective measures in defined areas of their respective EEZs. These submissions must provide scientific and technical evidence to justify the designation and information on the *necessary reception facilities in port* to receive the wastes. The measures allowed must implement international rules and standards or navigational practices made applicable through the IMO for Special Areas. The coastal states may supplement these protections with more stringent discharge standards or navigational practices, once approved by the IMO, but measures on vessel design, construction, manning or equipment may not exceed generally accepted international rules and standards. (Article 211.6) The following have been designated as Special Areas pursuant to one or more MARPOL 73/78 annex: Baltic Sea, Mediterranean Sea, Red Sea, North Sea, Black Sea, Gulf of Aden, [Persian/Arabian] Gulfs Area, Wider Caribbean Region, the area covered by the Antarctic Treaty, and North West European Waters. (Table II-8)

- Under Article 211.6 of the LOS Convention, it is arguable that a coastal state may seek IMO approval to prevent vessel-source pollution in *a defined EEZ area that has not been designated a Special Area* pursuant to MARPOL 73/78. It must follow the procedure outlined above to apply Special Area protective measures and any supplementary measures allowed. During the 1980s, the IMO began to explore additional means to protect areas vulnerable to environmental damage from ships and dumping. These areas might be smaller than MARPOL 73/78 Special Areas and complement their objectives. Guidelines adopted in 1991 specify criteria and guidance for designation, revised in 1999. (Table II-1) In addition, they recognize that applications are strengthened if the states concerned are taking or intend to take measures to curtail pollution from sources other than shipping that contribute to stress in the area; if there is an active regime to manage the area's resources; and if discharges pose a threat to amenities.

- The 1991 Guidelines identify in addition a new category of *Particularly Sensitive Sea Areas (PSSAs)*. The criteria for PSSA designation are more flexible than earlier requirements (below) and indicate that environmental stresses from sources other than ships may also be taken into account. The measures that states may apply in PSSAs include Special Area discharge standards and operational practices, routeing options, and vessel traffic services.[49] Buffer zones are also contemplated. The procedures for approval refer back to each of the relevant legal instruments. [50] The IMO decided to review the PSSA Guidelines in 1998, noting recommendations that procedures were needed to facilitate PSSA identification and depict them on hydrographic charts.[51] The revised guidelines were adopted in 1999. Two PSSAs have been designated: the Great Barrier Reef in Australia and the Sabena-Camaguey Archipelago in Cuba.

- A coastal state may propose to the IMO for adoption a *mandatory reporting system in the EEZ,* normally used to avoid accidents and protect the marine environment. Ships must provide their position to coastal authorities and may be required to report additional information on their cargo, destination, and other matters.[52] The IMO adopted a mandatory reporting system off the US East Coast in 1998 to protect endangered large whale species, particularly the right whale, from direct physical impact from ships. It took effect in July 1999.

These measures use different criteria for justifying special protections against vessel-source pollution. The LOS Convention adds "resource use or protection" to the Special Area justifications under MARPOL 73/78 relating to "oceanographic and ecological conditions" and "the particular character of its traffic." The latter are elaborated in the IMO Guidelines on Special Areas. In both cases, the designated areas must meet all the criteria. The PSSA criteria allow designation on the basis of any one of three categories: ecological characteristics (uniqueness, dependency, representativeness, diversity, productivity, naturalness,

integrity, vulnerability); social, cultural and economic values (economic benefit, recreation, human dependency); or scientific and educational values (research, baseline and monitoring studies, education, historical value). Arguably, if the PSSA concept became the basis for designations pursuant to LOS Convention Article 211.6, it might also provide for uniform enforcement rules so that a PSSA straddling different coastal state zones is not subject to different rules governing coastal state and flag state enforcement. (Section II.B.1.)

International Fisheries

Areas closed to *fishing* are identified pursuant to a number of international fisheries arrangements. These may be permanent closings of critical habitat or seasonal closings during the period when the areas are vital for spawning and nursing.

Minerals Development Beyond National Jurisdiction

In order to protect the marine environment from seabed mining beyond national jurisdiction, the LOS Convention contemplates that the International Seabed Authority may disapprove areas for exploitation where substantial evidence indicates the risk of serious harm to the marine environment. (Article 162.2.x) The regulations under development provide that before proceeding to the exploitation stage, a contractor must propose areas to be set aside for two purposes: as a zone for monitoring impacts where activities are ongoing (impact reference zone), and as a preserved zone where no mining is to occur (preservation reference zone). The purpose of the latter is to ensure the preservation of representative and stable biota of the seabed in order to assess any changes in comparison with areas where mining has taken place. The ISBA is contemplating further steps to promote environmental research in support of its regulations to protect the marine environment. (Sections II.B.6., III.D.1.)

II.D.3. Non-Indigenous/Invasive Species Introductions

There are a large number of international legal instruments that refer to prevention and control of adverse impacts from the introduction of non-indigenous species.[53] Some are restricted to marine and freshwater environments, other seek to enhance protections for designated areas and species, while still others address the subject in the broader context of biodiversity or regional nature conservation agreements. The challenge lies in translating these general obligations into specific measures that remedy the problem. The most specific measures today on non-indigenous species introductions govern international shipping and fisheries/aquaculture.

Under the LOS Convention, the subject is dealt with as pollution: states are required to take all measures to prevent, reduce, and control pollution of the marine environment resulting from the intentional or accidental introduction of new or alien species to a particular part of the marine environment which may cause significant and harmful changes. (Article 196.1) As noted, the Convention's definition of pollution broadly encompasses deleterious effects to living resources and marine life, hazards to human health, reduction of amenities, and hindrance to marine activities.

The Biodiversity Convention takes a broad perspective on this problem, increasingly considered one of the greatest threats to biodiversity. Its marine and coastal work program focuses on alien species and genotypes as one of its five main subject areas. The program's aims during the 1998-2000 period are to improve understanding of the causes and impacts on biodiversity of introduced alien species and genotypes; to identify gaps in legal instruments with particular attention to transboundary effects and collect information on response actions with a view to developing a strategy to prevent, control and eradicate alien species which threaten marine and coastal ecosystems, habitats, and species; and to establish an "incident list" on introductions through national reporting and other means. (CBD/COP Dec. IV/5) Further action may follow from these initiatives.

International Shipping

The role of ships' ballast water in spreading unwanted species was first addressed jointly by the WHO and IMO in the early 1970s, when the concern was the spread of epidemic disease bacteria. Today it is estimated that ten billion tons of ballast water are transferred every year. The growing speed of ships has increased the survival rate of species carried in ballast tanks. In 1993 the IMO adopted voluntary guidelines to prevent unwanted introductions, later revised, and it is developing a binding instrument on the subject. (Table II-1) This will identify procedures to minimize the risk of unwanted introductions. It is expected that the instrument will be applied both by flag state authorities and, with respect to foreign vessels in their ports, by port state authorities. The spread of non-indigenous organisms attached to ships' hulls is another growing concern, but efforts to apply "anti-fouling" paints have proven controversial as the paints may contain hazardous substances. The IMO plans to adopt a binding instrument to regulate the use of shipboard anti-fouling systems by the end of 2001. It has already endorsed a deadline of 1 January 2008 for a complete prohibition on the presence of organotin compounds in anti-fouling systems.

Under the LOS Convention, a coastal state's rights in the *contiguous zone* include preventing and punishing infringements of national sanitary laws and regulations that have taken place in the territorial sea. Pending further international agreement, this extends the coastal state's authority to enforce national restrictions on ballast water discharge by foreign ships.

Fisheries/Aquaculture

In the field of fisheries/aquaculture, detailed international measures are non-binding; for example, the ICES Code and FAO's Code and technical guidelines. (Tables II-8 and III-3)

International Trade

Under CITES, there is also interest in finding a means to tackle the introduction of non-indigenous species, recognizing that they are introduced to new areas through commercial trade. In 1997 CITES/COP10 suggested cooperation with the CBD and urged governments to consider how to address the problem as they develop national legislation on trade in live animals or plants. Each party is urged to consult with importing countries regarding any applicable national measures before exporting potentially invasive species. Further efforts to define the scope of the problem are contemplated. (Section III.C.2.)

Antarctica

At the regional level, a fairly stringent rule on the introduction of non-native species applies in Antarctica, but it is the continent's relative isolation and restricted range of human activities that make this a viable, practical option. In order to reduce the possibility of bacterial contamination of Antarctic species, specific prohibitions exists on the introduction of species like sled dogs and live poultry. These are supplemented by a requirement that for all other non-native species, import permits are necessary and may only be issued for species listed in an appendix. (Annex II, 1991 Protocol)

II.D.4. Mariculture and Genetically-Modified Organisms (GMOs)

Mariculture presents opportunities and risks for sustainable ocean use. It may allow coastal communities to supplement food and income and reduce harvesting pressure on natural stocks of marine living resources. At the national level, it may provide revenue and export earnings. The risks, however, are multiple. The conversion of coastal wetlands for mariculture, especially for large-scale commercial operations, reduces habitat and nursery areas for natural stocks and may undermine other ecological functions, damaging the natural resources upon which local communities depend. The operation itself may lead to pollution from wastes or chemical inputs, disease transfer, and the introduction of non-indigenous or genetically-modified species to the natural environment.

There are few international instruments on aquaculture/mariculture, while the broader problems of impacts on habitat and ecological function are just beginning to receive more attention. Pollution from mariculture falls within the scope of the regional agreements on land-based or offshore pollution, but little work on the issue has been undertaken through these agreements to date. On GMOs, the CBD tackles their introduction broadly, and its Biosafety Protocol provides additional guidance on imports of genetically-modified live fish that are to be intentionally introduced into the environment.

The CBD affords a uniquely broad framework through which to address the full range of issues raised by aquaculture, including the introduction of alien species and GMOs. As a first step, its marine and coastal program seeks to assess consequences of mariculture on coastal/marine biodiversity and promote techniques minimizing adverse impacts. The effects of stock enhancement at species and genetic levels will also be studied.

At the regional level, the 1995 Mediterranean protocol on protected areas and biodiversity has incorporated a reference to regulating the introduction of GMOs and prohibiting those that may have harmful impacts. The other regional seas programs are likely to follow suit.

II.D.5. Rivers and Estuaries

Rivers interact with coastal/marine ecosystems in two respects: water quality and water quantity. These connections can be addressed through different conventions. The challenge is to make the best use of available options. There are two major hurdles to overcome in securing the vital link between rivers and coastal/marine systems. First, most of the world's major river systems are shared by more than one country. This calls for cooperation among the riparian nations if pollution control and water allocation are to be equitably managed. But the history of cooperation with respect to international rivers is not a happy one. Few of the world's shared rivers are covered by agreements among the states concerned. (Table II-10, Maps D1-D8) Second, the scope of cooperation on international rivers must be broadened. Traditionally, international watercourse agreements have focused on maintaining navigable waterways and the allocation of water rights among bordering states to extract, divert, and dam the flow. In some areas, pollution has been a growing concern, but pollution effects at the mouth of the river have been addressed in very few international river basin agreements. Water allocation for coastal/marine ecosystems has received even less attention.

For tackling riverborne pollution, the strongest existing handle is the *LOS Convention's* categorical obligation to control land-based pollution. This can stimulate a more comprehensive approach to controlling pollution in the watershed as a whole, taking into account cumulative impacts reaching the coastal/marine environment. More detailed expressions of the LOS Convention obligation are undertaken through the *regional seas conventions*. All the regional protocols on land-based sources urge cooperation among riparian countries when shared watercourses are likely to cause marine pollution. Early efforts to link protection of the North Sea with related river basin conventions in the 1980s are beginning to take hold elsewhere. Both the Baltic Sea Convention (1992) and the Mediterranean protocol (1996) on land-based pollution recognize that control measures should be taken in the whole of the catchment or watershed area. The broader issue of riverborne impacts on coastal/marine species/habitat is touched on in the Caribbean protocol on specially protected areas and species (1990): recognizing that upriver measures may be necessary to preserve coastal/marine species/habitat, it allows parties to designate terrestrial areas, including watersheds, for protection. Such a commitment would be voluntary.

These beginnings are reinforced by a major new framework *Convention on the Non-navigational Uses of International Watercourses*, adopted in 1997. Its purpose is to guide states in their national practice and as they conclude agreements on shared watercourses. It requires states to take all measures with respect to international watercourses necessary to protect and preserve the marine environment, including estuaries, and to take into account generally accepted international rules and standards. (Article 23)

International designation of coastal and riparian *protected areas* offers a more limited means to tackle riverborne pollution and water allocation. These conventions can encourage states to take measures at the national level and help stimulate joint action in shared watersheds. The designated areas may provide a wedge to get at larger problems, as in the initiatives noted above under the Wetlands Convention to integrate wetlands and river basin management and promote international cooperation in shared wetlands and watersheds. These also draw attention to the need to consider coastal/marine impacts. As noted, they cite the 1992 European convention on transboundary watercourses as a model for developing new regional agreements.

Another international option for addressing the coastal/marine impacts of watershed management is *environmental assessment*. The European convention on transboundary EIA discussed in Section II.B.7 includes dams, groundwater abstraction, and riparian deforestation as projects subject to EIA.

There is a long way to go for nations to agree on measures that fully incorporate the freshwater needs of coastal/marine systems. This would entail evaluating how water quality and/or effluent requirements for agricultural, industrial, and municipal uses of freshwater affect riverborne pollution in coastal areas; how allocation decisions affect flow, salinity, nutrients, and sedimentation in coastal areas; and consequent impacts on coastal/marine species, habitat, and ecosystems and human uses thereof.

II.D.6. The Convention on Biological Diversity (CBD)

The CBD's importance lies in taking a comprehensive approach to species, ecosystem, and genetic diversity and endorsing ecosystems as the primary framework for implementation. Its emphasis on sustainable use recognizes that socio-economic values complement scientific values in advancing conservation and reinforces recent developments in the protected species/area conventions. The Convention gives new prominence to local and national concerns by recognizing that priorities at these levels may differ from international priorities and encouraging use patterns that vest incentives for conservation in affected communities. Its express promotion of arrangements on access to and benefit-sharing from genetic resources creates opportunities for marine bioprospecting and biotechnology development which may yield practical options for sustainable development, especially for developing countries.

To recapitulate the five elements of the CBD's program on coastal and marine biodiversity, derived from the Jakarta Mandate adopted at COP2, these are: integrated marine and coastal area management; marine and coastal living resources, including genetic resources; marine and coastal protected areas; mariculture; and alien species and genotypes. The objectives of the first are to review existing instruments and their implications for the CBD, promote development and implementation at local, national, and regional levels, and develop guidelines for ecosystem evaluation and assessment. The objectives of the marine living resources element are to promote ecosystem approaches and make available information on genetic resources, including bioprospecting. Objectives on protected areas, mariculture, and alien species and genotypes are summarized in earlier sections. A broader CBD initiative on indicators for monitoring and assessing biodiversity will apply also to marine and coastal biodiversity.

From an ecosystems perspective, the CBD highlights the many stresses on biodiversity and would have each party identify processes and categories of activities which have or are likely to have significant adverse impacts. (Article 7.c) This provides the basis for further definition of activity-specific response measures and reflects the approach taken in the European Convention on Transboundary EIA. (Section II.B.7.) Its marine/coastal program underscores the need to focus on sectoral activities as crucial components of integrated marine/coastal area management. This invokes the large number of specialized oceans conventions on fishing and marine pollution in the same way as recent developments noted under the protected areas/species conventions refer to "other appropriate legal instruments." Regarding the question of scale, the marine/coastal program stresses the importance of integrating protected areas into wider strategies. (CBD/COP, Decs. II/10 and IV/5)

In relation to the legal framework established by the LOS Convention, the CBD incorporates both the "territorial" and the "flag state" approach; that is, each party must apply Convention provisions to (i) components of biological diversity within national jurisdiction, which would include offshore zones; and (ii) processes and activities subject to its jurisdiction or control, whether the activities are located within or beyond national jurisdiction and regardless of where their effects occur. (Article 4) Parties must implement the Convention with respect to the marine environment consistently with their ocean law rights and obligations. (Article 22.1) The Convention complements and reinforces the LOS Convention by ensuring that conservation and sustainable use goals apply to marine resources landward of the EEZ, where conservation obligations are not explicit under the LOS Convention with respect to the 12-mile territorial sea, internal waters, or sedentary species of the continental shelf. It similarly promotes international cooperation in research and information exchange, training, transfer of technology, and public education and awareness. The CBD elaborates on the LOS Convention's content in relation to genetic resources and GMOs, as discussed above. On inventory and monitoring, EIA, and emergency notification and response (Articles 7, 14), the CBD extends

the LOS Convention's requirements due to its broad definition of biodiversity. Provisions to study liability and redress for damage to biodiversity, including restoration and compensation, also encompass this broader scope. (Article 14.2)

The question remains, what is the CBD's niche in marine and coastal biodiversity, in view of the many other marine instruments and programs. Most importantly, it brings a unifying goal to marine living resources conservation and environmental protection. In addition, the basic principles of its marine/coastal program assert more firmly concepts that are gradually being incorporated into earlier marine conventions: an ecosystem approach, a precautionary approach, knowledge drawn from local and indigenous communities, user-based approaches, and the primacy of action at local and national levels. It shares with the marine conventions the scientific basis for conservation. The ecosystem-based approach suggests a special role for CBD guidelines on ecosystem evaluation and assessment, which may inform decision-making under other conventions; and a systematic scheme for achieving a network of marine/coastal protected areas. Its comprehensive take on sectoral threats to coastal/marine biodiversity suggests that the CBD could help maintain an overview of these threats and ensure that priorities are adequately addressed through existing specialized fora; if required, it offers a venue to consider particular threats from a broader perspective, as with alien species introductions or mariculture. The CBD's initiatives on genetic resources, biotechnology, and biosafety can set the stage for discussion of these issues in other fora. From a legal perspective, specialized instruments developed pursuant to the CBD, binding or non-binding, can address obvious gaps or create a 'drag' effect by elaborating broader goals and principles that influence specialized oceans instruments. The ecosystems approach can help forge better linkages among specialized instruments. The regional seas conventions represent an ideal vehicle for incorporating the CBD's goals and principles in regional marine initiatives.

II.D.7. The Climate Convention/Kyoto Protocol and the Vienna Convention/Montreal Protocol on the Ozone Layer

The Climate Convention addresses both reductions in greenhouse gas (GHG) emissions and enhancements for GHG "sinks," including oceans and coastal and marine ecosystems. Specific commitments affect the oceans directly and indirectly. Cutting GHG emissions can reduce the direct effects of airborne pollution on marine species and the marine environment; indirectly, it can decrease impacts due to changes in temperature and other oceanographic conditions or in the geographic distribution of marine species and the organization of biological communities. Mitigation and adaptation measures to protect against storm impacts in low-lying coastal areas can improve the health of coral reefs and coastal wetlands directly. Sinks enhancement can benefit the coastal/marine environment indirectly; for example, through improved forest management in watersheds (reducing erosion and sediment mobilization). Over the longer run, steps may be taken that enhance ocean sinks directly. Under the Vienna Convention/Montreal Protocol, efforts to curtail ozone depletion will reduce adverse impacts on marine micro-organisms that result from increased exposure to ultraviolet light as well as consequent effects on the ecosystems of which they form a part. Both convention processes stimulate research, monitoring, and assessment programs that will help diagnose threats to marine ecosystems and identify appropriate response options. These legal instruments will not be considered in more detail in this report.

For their part, several oceans conventions contribute to the goals of the climate and ozone agreements. They reduce airborne emissions containing GHGs or ozone-depleting substances from ships and offshore installations (e.g., oil and gas facilities), as considered in Sections II.B.5 and II.B.4. And through numerous other measures discussed throughout this report they reduce threats to features that protect the coasts from storm damage and improve the health of ocean 'sinks.'

ENDNOTES

1 Also excluded from compulsory, binding settlement are disputes over law enforcement activities regarding the coastal state's exercise of these EEZ rights. (Article 298 (1)(b))

2 This reflects a compromise during the LOS negotiations whereby nations lucky enough to be endowed with an extensive continental shelf agreed to make a contribution to the international community in exchange for clear, exclusive title to continental shelf resources.

3 GESAMP is a United Nations inter-agency expert group sponsored jointly by the United Nations, UNEP, FAO, UNESCO/IOC, WHO, WMO, IMO, and IAEA. It was established in 1969 and charged in 1977 with preparing periodic "state of the marine environment" assessments. Comprehensive global ocean assessments were prepared in 1982 and 1990. (See Figure I-1.) The next one is due in 2002. Two additional reports will be completed in May 2000, a biennial assessment of the state of the marine environment and a more detailed assessment of land-based sources and activities affecting the marine, coastal and associated freshwater environment. (Section III.A.5.a)

4 The IFCS secretariat is hosted by the International Programme on Chemical Safety, sponsored jointly by WHO, UNEP, and ILO.

5 John V. Crayford, "MARPOL 73/78 — The Future of Annex II," *IMO News,* no. 1 (1999) at 21-27.

6 The extension of the territorial sea from three to twelve n.m. places nearly 100 straits used for international navigation within the area subject to national sovereignty. The LOS Convention therefore codifies a distinct regime of "transit passage" through and over (aircraft) international straits which is less restrictive than the "innocent passage" regime which otherwise applies in the territorial sea. (Articles 37-54) A similar regime of "archipelagic sealanes passage" applies in sealanes designated through the waters encompassed within archipelagic states, as defined in the Convention. Otherwise, the "innocent passage" regime applies in archipelagic waters. (Article 52.1)

7 While the LOS Convention's provisions on standard-setting, enforcement, and safeguards for foreign vessels do not modify the regime on international straits, states bordering the straits may take appropriate enforcement measures in keeping with these provisions if violations of applicable rules on navigation safety or pollution control cause or threaten major damage to the marine environment of the straits. (Article 233)

8 *In the contiguous zone,* the coastal state may exercise the control necessary to prevent and punish any infringement of its customs, fiscal, immigration, or sanitary laws and regulations that has taken place within its territory or territorial sea. (Article 33)

9 For a complete analysis and history of these arrangements, see David Anderson, "Port States and Environmental Protection," in *International Law and Sustainable Development,* eds. A. Boyle and D. Freestone (Oxford University Press, 1999) at 325-344.

10 For example, the 1982 European MOU lists the following: 1966 International Convention on Load Lines (LOADLINES), as amended in 1988; 1969 International Convention on Tonnage Measurement of Ships; 1972 Convention on the International Regulations for Preventing Collisions at Sea (COLREG); 1973 International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 Relating thereto (MARPOL 73/78); 1974 International Convention for the Safety of Life at Sea (SOLAS), as amended in 1978 and 1988; 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW); and 1976 Merchant Shipping (Minimum Standards) Convention (ILO Convention No. 147, which includes a number of relevant standards from other ILO conventions).

11 IMO Assembly Documents A.742(18) and A.787(19).

12 UN Doc. A/53/456, 5 Oct. 1998, paras. 364-367, with reference to The Guidelines for Cooperation in Investigating Violations or Suspected Violations of Discharge and Related Regulations for Ships, Dumping and Incineration Regulations.

13 These are dredged material; sewage sludge; fish waste, or material resulting from industrial fish processing operations; vessels and platforms or other man-made structures at sea; inert, inorganic geological material; organic material of natural origin; and bulky items primarily comprising iron, steel, concrete and similarly unharmful materials for which the concern is physical impact, and limited to those circumstances where such wastes are generated at locations having no practicable access to disposal options other than dumping, such as small islands with isolated communities.

14 *The state of the marine environment,* UNEP Regional Seas Reports and Studies No. 115 (UNEP 1990) at para. 35. (GESAMP 1990)

15 The evolution of thinking on the importance of coastal and riverborne impacts is traced by Edward L. Miles as follows: *River Inputs to Ocean Systems* (UNEP/IOC/SCOR 1981); *Wastes in the Marine Environment,* OTA-0-334 (US OTA 1987); GESAMP 1990; *Coastal Systems Studies and Sustainable Development,* UNESCO Technical Papers in Marine Science No. 64 (UNESCO/UNEP/SCOR/IOBA 1991/1992); and *Anthropogenic Influences on Sediment Discharge to the Coastal Zone and Environmental Consequences,* GESAMP Reports and Studies No. 52 (GESAMP 1994), in *Sustainable Development and Preservation of the Oceans: The Challenge of UNCLOS and Agenda 21,* eds. Mochtar Kusuma-Atmadja, Thomas A. Mensah, and Bernard H. Oxman, Proceedings of the 29th Annual Conference of the Law of the Sea Institute, Densapar, Bali, Indonesia, June 19-22, 1995 (LSI, 1997) at pages 30-32.

16 The 1990 GESAMP report cites sediments as a growing concern and suggests that the evidence warrants that they be regarded as pollutants in their own right. [GESAMP 1990, *supra* note 14 at para. 75]

17 A more expansive approach to land-based concerns is alluded to in some of the regional seas agreements, with references to coastal erosion; land reclamation and dredging, including in rivers and estuaries; or coastal engineering, mining activities, and sand removal (West and Central Africa, Red Sea, South East Pacific, East Africa, South Pacific).

18 *Agenda 21* sets targets for states to establish waste treatment and disposal quality criteria, objectives and standards (2000); establish monitoring programs (2000); and conform fully with national or international environmental quality guidelines (2025). For industrialized countries, at least 50% of sewage wastes are to conform with national or international guidelines by the year 1995, and for developing nations by the year 2005. UNEP is to develop a specific plan for wastewater treatment and management, in partnership with WHO, UNDP, and HABITAT, bearing in mind these targets and timetables. The UNEP Governing Council decided in 1999 to explore the feasibility of UNEP convening a global conference on sewage by the year 2000.

19 Annex I, MARPOL 73/78, Regulation 21.

20 UN Docs. A/53/456, *supra* note 12 at paras. 249-52, 259-60; A/54/429, 30 Sept. 1999 at paras. 358-60.

21 UN Doc. A/53/456, *supra* note 12 at paras. 351-55.

22 The FCCC/Kyoto Protocol calls on Annex I parties to pursue limitation or reduction of greenhouse gas emissions not controlled by the Montreal Protocol from marine bunker fuels. (Article 22)

23 UN Doc. A/52/487, 20 Oct. 1997 at para. 253.

24 ISBA/5/C/4, 16 Aug. 1999 and ISBA/5/C/4/Add.1, 17 Aug. 1999.

25 OP/BP/GP 4.01. See also Charles DiLeva & O. Kjorven, *International Agreements on Environment and Natural Resources: Relevance and Application in Environmental Assessment* (March 1996), in *Environmental Assessment Sourcebook Updates* (The World Bank).

26 In a general provision of the LOS Convention, when an international organization has been transferred competence over matters governed by the Convention (e.g., the European Union), it assumes responsibility for compliance failures in respect of its competencies; where responsibility as between member states and the organization is not clearly specified, joint and several liability results. (Annex IX, Article 6)

27 The LOS Convention has no explicit requirement that the coastal state conserve marine living resources within internal waters, the territorial sea, or on the continental shelf. Nevertheless, obligations to conserve EEZ and shared resources are likely to penetrate these areas, as are obligations under specialized fishery conventions and the CBD.

28 In a few cases, the convention's area of application may not fully encompass the migratory range of the stock(s) concerned. This may be due to inadequate knowledge at the time the convention was concluded or a shift in range. The result is similar to what occurs with straddling stocks: fishing outside the convention area may undermine conservation measures applied within, as has occurred under CCAMLR.

29 CSD7 Decision on Oceans and Seas at paras. 18 and 35(a); A/RES/54/40(b).

30 CCAMLR requires that any harvesting and associated activities must be conducted in accordance with the following principles of conservation: "(a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purposes its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment; (b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and (c) prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources."

31 In accordance with UN General Assembly resolutions adopted in 1989, 1990, and 1991 (GA Res. 44/225, 45/197, and 46/215), the use of large-scale pelagic driftnets (i.e., in excess of 2.5 km) for high seas fishing has been prohibited since the end of 1992. Within national jurisdiction, a number of countries have imposed similar prohibitions, as have several regional arrangements. There is also a 1989 South Pacific Convention whose purpose is to ban driftnet fishing. (Table II-7). FAO has reported that the Mediterranean is the only region where large-scale pelagic drifnets are being deployed. Large driftnets of less than 2.5 km continue to be used. [UN Doc. A/53/473, 8 Oct. 1998 at para. 26]

32 The 1992 Agreement to Reduce Dolphin Mortality in the Eastern Tropical Pacific Tuna Fishery commits governments to progressively lower limits on dolphin mortality to the year 2000.

33 The unilateral imposition of trade restrictions by the United States on tuna and shrimp imports taken in a manner that does not comply with U.S. rules on these two issues has been judged contrary to international trade rules by GATT and WTO dispute settlement bodies. [David R. Downes and Brennan Van Dyke, *Fisheries Conservation Rules and Trade Rules: Ensuring that Trade Law Promotes Sustainable Fisheries* (Center for International Environmental Law (CIEL), Greenpeace, 1998) at 25-28; *Bridges,* vol. 2, no. 7, Oct. 1998 (Geneva: International Center for Trade and Sustainable Development (ICTSD)) at 9-12.

34 Measures adopted under CCAMLR since 1992 include setting lines only at night, towing streamers above the lines as they are set to scare off birds, and delaying the start of the fishing season to minimize activity during the seabird breeding season. Similar measures have been adopted under the Convention for the Conservation of Southern Bluefin Tuna (CCSBT) since 1995.

35 CCAMLR has adopted measures to this end and the secretariat consults with the CCSBT to identify complementary initiatives.

36 UN Doc. A/52/487, *supra* note 23 at para. 105.

37 William T. Burke, "State Practice, New Ocean Uses, and Ocean Governance under UNCLOS," in *Ocean Governance: Strategies and Approaches for the 21st Century,* ed. Thomas A. Mensah, Proceedings of the 28th Annual Conference of the Law of the Sea Institute, July 11-14, 1994 (LSI, 1996) at 219-35. See also Lyle Glowka, *The Deepest of Ironies: Genetic Resources, Marine Scientific Research and the Area* (IUCN 1995).

38 Use of the term "regional" in this report includes the concept of smaller, subregional divisions.

39 CMS Recommendations 3.2 and 5.2.

40 ASCOBANS, Report of the 6th Advisory Committee Meeting, Aberdeen, United Kingdom, 12-14 April 1999 at 6, 9.

41 They are listed in Annex III, which permits harvesting only on a rational and sustainable basis. See David Freestone, "Protection of Marine Species and Ecosystems in the Wider Caribbean: The Protocol on Specially Protected Areas and Wildlife," 22 *Marine Pollution Bulletin* 597 (1991).

42 Restricted activities include a ban on driftnet fishing, a ban on offshore boating competitions, and supervision of whale-watching activities. The three countries intend to coordinate research and monitoring activities and to intensify efforts to control land-based and sea-based sources of pollution. http://ens.lycos.com/ens/nov99/1999L-11-25-01.html.

43 The LOS Convention requires states to protect objects of an archaeological and historical nature found at sea. Within the 24 n.m. contiguous zone, coastal state approval is required for removal of such objects from the seabed, without prejudice to the rights of identifiable owners or other international law on this subject. Beyond national jurisdiction, such objects are to be preserved or disposed of for the benefit of mankind as a whole, with particular regard to the preferential rights of the country of origin, of cultural origin, or of historical and archaeological origin. (Articles 303 and 149) The seabed mining code under development by the International Seabed Authority has tentatively approved a provision requiring contractors to notify the Authority if such an object is found and to take all reasonable measures to avoid disturbing it. UNESCO has sponsored work on a draft convention on underwater cultural heritage that seeks to elaborate on the LOS Convention's provisions.

44 The Galapagos Islands site extends to 24 km offshore (15 miles) and there is a proposal to extend the nomination to include a Marine Reserve out to 64 km offshore (40 miles). [Report of the World Heritage Committee, 22nd session, 30 Nov. — 5 Dec. 1998 at 14]

45 *A Global Representative System of MPAs,* eds. Graeme Kelleher, Chris Bleakley, and Sue Wells. Great Barrier Reef Marine Park Authority, World Bank, and IUCN (World Bank, 1995), vol. I at 37.

46 *World Resources 1996-7: A Guide to the Global Environment,* WRI, UNEP, UNDP, The World Bank (Oxford University Press, 1996) at 262; *A Global Representative System of MPAs, supra* note 45, vol. I at 38-39.

47 Tullio Scovazzi, "A New Instrument on Specially Protected Areas in the Mediterranean," IUCN Environmental Law Programme Newsletter, May-Sept. 1998 at 7.

48 The measures governing IMO approval of mandatory routeing schemes established by coastal states for areas beyond the territorial sea entered into force on January 1, 1997. These amend the General Provisions on Ships' Routeing adopted pursuant to SOLAS, Chapter 5. (Table II-2)

49 Vessel traffic services (VTS) may only be made mandatory within a country's territorial waters. They are designed to manage traffic in congested areas to enhance safety of life at sea, safety and efficiency of navigation, and the protection of the marine environment and adjacent shore areas. They are designed also to protect worksites and offshore installations from possible adverse effects of maritime traffic. VTS are adopted pursuant to SOLAS, Chapter I, Regulation 8-2.

50 That is, for Special Areas, MARPOL 73/78; for vessel routeing and VTS, SOLAS; and for regulations to prevent collisions at sea, the Convention on the International Regulations for Preventing Collisions at Sea (COLREG).

51 UN Doc. A/53/456, *supra* note 12 at para. 326.

52 The Guidelines and Criteria for coastal states to establish mandatory ship reporting systems beyond the territorial sea entered into force on 1 January 1996. SOLAS, Chapter V, Regulation 8-1.

53 See L. Glowka and Cyrille de Klemm, *International Instruments, Processes and Non-indigenous Species Introductions: Is a Protocol to the Convention on Biological Diversity Necessary?* A Paper Presented at the Norway/UN Conference on Alien Species, Trondheim, 1 July 1996, Revised (IUCN, 1996); and L. Glowka, *Non-Indigenous Species Introductions: References in International Instruments,* Revised Draft (IUCN, 1996).

III. FOCUS ON PROBLEMS

III.A. Introduction

III.A.1. The Role of Law in Ocean Management

When coastal or marine resources are shared by more than one country or when impacts on one nation's resources originate elsewhere, national action alone cannot suffice. International ocean law establishes the basis for pursuing sustainable ocean development. A formal agreement sets down what each nation may expect of the other; it provides continuity and avoids *ad hoc* or arbitrary action. This legal basis is a necessary but not a sufficient condition for achieving sound ocean management. Commitments and laws on the books can only be judged by action that mitigates problems. Taking action requires knowledge and ingenuity to design effective solutions, and it requires engagement on the part of affected sectors, the public, and the administrative establishment to make sure that solutions are applied. The lessons learned from particular response actions are the raw material that advances understanding of how to solve problems. They may expedite national action by illustration and foster internationally-agreed approaches. These lessons may spread well in advance of the law, but the law generalizes them from piecemeal projects to strategic approaches, nationally and internationally. Management thus entails a complicated feedback system comprised of information, analysis, the testing and refinement of solutions, agreement on effective measures, adoption of laws, and regular progress reviews to inform and revise these measures and ensure that they are complied with. The law itself requires constant elaboration and adjustment to take account of new scientific findings, technological developments, socio-economic analyses, and lessons learned. Once laws are in place, they trigger formal mechanisms to review progress and the adequacy of existing measures.

Section II considers how the "Oceans Constitution" — the LOS Convention — is elaborated through more detailed and specialized conventions. Agreements on binding norms and rules are supplemented by internationally-agreed non-binding measures that encapsulate state-of-the-art knowledge and practices. Such measures are a resource for national governments, international convention processes, international development agencies, and the private sector. In some fields, international legal instruments have yet to acquire the specificity necessary to inform practical national actions. This may depend on further scientific and technical developments or it may simply be that solutions at hand in one country or region are not widely known or available in another. In addition, the capacity of many countries to diagnose marine and coastal problems, identify priorities, and apply environmentally-sound approaches is limited.

Section III focuses on oceans problems from the manager's perspective and outlines how international law and organizations can help support managers and decision-makers at local, national, regional,[1] and global levels. The issues are divided according to impacted marine species, impacted areas — be they smaller coastal stretches or critical habitat or larger natural systems, and pollution and other disturbances caused by human activities. It moves between impacted species/areas and the threats caused by human activities to underscore that particular activities are the target of legal and regulatory actions at all levels. Ideally, the actions are designed with reference to a well-founded, ecosystems-based problem diagnosis. This sets the stage for reconciliation among affected interests and stakeholders in setting goals and priorities. *International* law plays an additional role: it helps set objectives for impacted marine species/areas at the appropriate geographic scale. With this in mind, the introduction to Section III first considers an ecosystems-based approach to ocean management and its implications for logical management units. The basic tasks of management relevant to all oceans problems are outlined, with a discussion of the comparative advantages of regional and global institutions in carrying them out. These general prescriptions apply to oceans problems across the board. Within each problem section, further needs and objectives are discussed for each task.

Special mention should be made in this context of international action plans. They are often considered international legal instruments or "soft law," with the implication that they have a compelling effect on national action. It may be more useful to consider them as management tools: they set out the "how-tos" when it comes to implementing international commitments.[2] So many global and regional action plans touch on marine/coastal problems in one way or another that it is meaningless to identify them all. How one relates to another is rarely dealt with. This confusion counteracts the comparative advantage of an action plan vis-à-vis conventions: ideally, an action plan serves a unifying function among specialized, sectoral commitments, establishes priorities, and lays out more detailed goals and strategies than found in most conventions. An action plan can link desired actions to the particular convention process(es) where follow-up responsibility lies and at the same time add complementary goals that surpass binding commitments. To the extent priorities are specified, it can offer supplementary guidance for both national action and international (donor) support. This effect is greater when the action plan encompasses numerous conventions' objectives; for example, the International Coral Reef Initiative (ICRI) or the Barbados Programme of Action for Small Island Developing States (SIDS). But the same effect can be achieved under a single convention, especially when its objectives require multi-sectoral initiatives.

II.A.2. An Ecosystems-Based Approach to Ocean Management

The more that is understood about marine and coastal ecosystems, the more apparent it becomes that sound ocean management must take into account both interactions among ecosystem components and each system's functional linkages with other systems and biological communities. Many of these processes take place at very large scales. This has led to renewed efforts to delineate viable and logical units of management. Variously termed the ecosystem approach, ecosystem management, bioregional planning, or ecoregion-based conservation, [3] these concepts all highlight the importance of large-scale approaches that encompass not only the distinct biological and physical features of a particular system but also the major influences on it: rivers bearing freshwater and pollution to the sea, direct run-off from land, land degradation in coastal areas, airborne pollution, species' larvae and eggs transported long distances by ocean currents, and the natural mixing of water masses due to ocean circulation, temperature, salinity, tides, or the action of wind and storms. In using such large-scale approaches, it is essential to consider the role of any smaller, relatively distinct systems found within them, such as coral reefs, isolated banks or seamounts, and upwelling zones. (Table III-1) These large-scale management approaches rely on similar precepts: the need for sound science, adaptation to changing conditions, partnership with diverse stakeholders and organizations, and a long-term commitment to the welfare of both ecosystems and human societies.

This report will use the term *ecosystems-based approach to ocean management* in order to (1) capture the notion of distinct ecosystems and their external linkages and (2) underscore that management refers not to bio-engineering on some systemic scale but rather to managing human activities that impact coastal and marine systems. As stated at the outset, the dual oceans agenda for the 21st century is to maintain the benefits and functions of marine ecosystems for the communities dependent upon them and for human society as a whole, and to reconcile the sector-specific thread of international legal instruments with the more comprehensive, ecosystems-based approach necessary to diagnose complex problems, determine the relative importance of different sources of stress, and establish priorities. With respect to human impacts on land-ocean-atmosphere interactions — the hydrological cycle, weather and climate — our understanding is still too rudimentary to point to mitigating measures in the ocean environment, although advance planning to adapt to changes in particular natural systems is certainly warranted. See Maps D1-D8.

III.A.3. The Implications of an Ecosystems-Based Approach to Ocean Management

Three primary principles underlie an ecosystems-based approach. *The first is that there are certain limits of stress beyond which coastal/marine ecosystems will no longer function as they have.* We may not be able to diagram accurately the functioning of each system, determine its limits of stress, or predict how changes will affect biodiversity or ecological function, but there is enough evidence to encourage management actions that anticipate change and avoid further adverse impacts.

The second principle is that management decisions must take into account all the different sources of stress impacting an ecosystem. When a particular species' population decreases, it may be due to overharvesting, by-catch in other fisheries, habitat degradation, a shift in the status of food sources or predator populations, or changing environmental conditions such as temperature or salinity. The causes of habitat degradation or predator/prey shifts may themselves be multiple, and managers must distinguish human from natural causes of change. A corollary is the need to agree on priorities. For each system, the sources of stress and their relative importance may differ. Moreover, the proximate cause of nutrient pollution, for example from plantation agriculture, may be aggravated by fertilizer subsidies. Managers must be able to respond to more immediate concerns without losing sight of the need to address underlying factors and policies.

The third principle is that ecosystems and their linkages should be used to determine the appropriate geographic scale for assessment and response actions. In the oceans realm, there is a long-standing trend toward management at a regional or subregional scale, except for the truly global issues like whaling or shipping. The regional marine conventions and programs (Table I-1, Maps B1-B8) are based primarily on geographic configuration, while the regional fishery agreements approximate the range of target species and, in the case of CCAMLR, the ecosystem as a whole. (Table II-7, Maps B1-B8) The regional species conservation agreements encompass countries sharing the migratory range of the species concerned (Table II-8); they may include countries whose vessels fish them on the high seas and they may encourage involvement by non-party states when their cooperation would help implement the agreement. As the fields of ecology and the marine sciences progress, greater understanding of coastal and marine systems will help refine appropriate regions for ocean management. Providing for involvement by states outside the region when their activities affect management within is a useful complementary approach.

III.A.4. Progress Toward Viable Ocean Management Units at the Regional Scale/Level

Table III-1 summarizes efforts to date to delineate logical ocean units.[4] Although limited knowledge precludes any definitive biogeographical classification of the marine environment on a global basis, ongoing analysis is likely to promote a convergence of opinion on large-scale units and to identify where communications among those responsible for different units should be established or strengthened. The results have already led to adjustments in the roles of existing regional conventions and international organizations. They will set the stage for determining how small marine and coastal protected areas (MCPAs)

can be used more effectively and systematically within larger management units. (Section III.C.1.) See also Section V on the maps.

The "boundaries" question in ocean management is usually posed as a constraint; that is, because national borders do not conform to ecosystem boundaries they impede effective management. Yet the application of large-scale, ecosystems-based approaches on land raises similar transboundary complications. And within national territory the need to involve both local and national political jurisdictions and different government ministries mirrors international complexities. Obtaining agreement on the goals of ecosystems-based management and on more detailed measures to be taken within each sector cannot be accomplished by a single decision process, either at national or international levels. In short, it is virtually impossible to identify any natural resources issue where ecosystems-based management could be applied *without* consultations across political/administrative jurisdictions. The international level simply adds another layer. The solution lies in institutional arrangements that facilitate the identification of linkages and reconciliation across jurisdictional lines.

In considering viable ocean management units, it is important to distinguish scientific research and analysis from the manager's challenge of problem assessment and response. From a scientific perspective, the more that is understood about marine species, marine ecological processes, and air-sea-land interactions, the easier it becomes to monitor the effects of human activities and distinguish them from changes brought about by natural causes. Research results may be drawn from worldwide sources and applied to problems at hand. The management challenge is a different one. If the manager takes an ecosystems-based approach, the first step is to identify problems in a given system and their causes, drawing on the scientists' state-of-the-art knowledge. At all levels — local, national, regional — the assessment must capture the impacts of different human activities that together affect the system; that is, it must consider contributing sources at the level in question and those that originate elsewhere. Ideally, the next step is to determine the relative importance of the different contributing sources. If major contributors are located beyond the level in question, it is obvious that effective response actions will have to be determined at a wider scale.

Bearing in mind the trend toward large-scale regional and subregional management units in the marine realm, a proper assessment would concentrate on activities in countries bordering the region and in watersheds draining to it. It would include contributions originating outside the region, borne by ocean and air currents or the movement of ships and aircraft. It would also have to take into account effects in the region due to global system changes like ozone depletion or climate change and the functions of the region vis-a-vis species that migrate through it. A socio-economic assessment would synthesize data on each sector's role in the region and the costs of ongoing degradation. These evolving assessments set the stage for response action. The appropriate level for *deciding* on action will vary. If all major sources contributing to one type of problem are contained within the region, regional goals and measures may be appropriate. There may be one or more specialized convention that could be used to develop an agreed regional approach. If the regional assessment indicates significant external sources, then effective response measures for this source will entail wider international agreement. Yet not every problem will require regional action; in many cases, national goals and measures may be sufficient.

In summary, *actual* contributions to coastal/marine problems can only be evaluated based on an ecosystems approach. The delineation and classification of marine and coastal ecosystems is ongoing. Nevertheless, it is clear that large-scale systems are at most regional or subregional in extent. New scientific findings will help refine the boundaries and improve our understanding of ecological linkages. Assessments at these levels will assist countries in the region to decide which convention to turn to when problems are shared and whether the choice should be regional or global. They may point to the need for new international institutional arrangements to support ecosystems-based management — either in the form of legal instruments or organizational structures.

III.A.5. The Tasks of Ocean Management and the Comparative Advantages of Regional and Global Institutions

An ecosystems-based approach fundamentally affects the tasks of ocean management. Each of the following 'problem' sections — on threatened species, degraded habitat and ecological services, and pollution — considers the key tasks or functions of international organizations: information and assessment to support decision-making; technical and policy response options; scientific, technical and financial support; and accountability: performance/progress review. For certain aspects of these functions common to all three problem areas, current developments and concerns are discussed below. This section also outlines in a generic manner the comparative advantages of regional and global institutions in carrying out each function. Section IV returns to these institutional issues and the particular opportunities and roles of the oceans-related conventions.

III.A.5.a. Information and Assessment to Support Decision-Making

If the manager's first challenge is to obtain an ecosystems-based assessment of ocean problems and causes and their relative importance, information standards must be harmonized and baseline conditions established. Data on domestic wastewater, industrial effluents, or the use of fertilizer and pesticides should be collected so that it can be aggregated in relation to local watersheds and coastal/marine ecosystems. The same is true of socio-economic data. For migratory species and pollution originating outside the system, the information should facilitate inter-regional comparison. Moreover, when researchers travel

the world it should be easy for individuals in the areas they have studied to obtain the data and results. International information repositories need a common approach so that managers at local, national, and regional levels can access them easily.

At the global level, there are also important information needs. When the world community as a whole wishes to take stock of conditions and trends in the coastal/marine environment, it should be possible to synthesize and reconfigure data used in regional assessments and to highlight critical and emerging issues. This would heighten awareness of developments in each region and draw attention to their inter-regional and global implications. The data sets themselves could be used by more than one international body and reduce overall costs of collection and management. A global approach of this type must rest on harmonized categories and standards for data collection that bear in mind the different specialized purposes for which the information may be used and how it may be integrated with other categories.[5] The results should promote data comparability, accessibility, and quality and help countries at the national level improve and coordinate their own information resources. Once existing regional and global bodies responsible for particular categories of information are identified, the next step is to designate a primary or "lead" agency to advance a harmonized approach.

For management purposes, there is a fundamental distinction between information needs for diagnosing problems (regional) and for designing solutions (global): the predominant need for ecosystems-based problem diagnosis is detailed information on conditions, trends, and threats in place, both scientific/environmental and socio-economic; the predominant need for those designing solutions is access to worldwide information on environmentally-sound practices, technologies, and policies and the circumstances in which they have been effective. To be practical, the information on technical and policy response options should be organized (1) by individual sector/human activity, indicating potential impacts on different natural resources and environmental media, and (2) by ecosystem type and the problems encountered in each. The information may then serve as a resource for national decision-makers, for agreement on harmonized rules and guidelines pursuant to one or more specialized conventions, for policy guidance and project development by international donor agencies, and for private sector operations. If necessary, supplementary information on response options appropriate to particular circumstances could be prepared at the regional level.

Resource/Environmental Inventory, Baselines, and Monitoring

A number of the major databases and information resources on marine species and habitat and marine pollution are noted in Table III-2. The information developed through national reporting procedures under international legal instruments is also relevant, as considered in (d) below. Regional pollution monitoring programs have functioned in the Baltic Sea, Northeast Atlantic/North Sea, and Mediterranean since the 1970s. In northern Europe, links have been established with monitoring programs for airborne and riverborne pollution and dumping. In some of the UNEP regional seas programs with more limited resources and capacity, there have been efforts to apply simplified monitoring guidelines in order to initiate rudimentary comparable studies; for example to monitor discharges from rivers to the sea or changes in mangroves and coral reefs. Doubtless there are additional resources held within the regions or by international agencies that are less widely known or accessible.

The overall picture is disappointing. The Joint Group of Experts on Marine Environmental Protection (GESAMP) has expressed concern about the serious shortage of information on marine environmental conditions and trends in different sea areas and its effect on the ability to produce accurate regional assessments and a balanced picture of conditions worldwide.[6] In planning for the Global Oceanic Observing System (GOOS),[7] it has been noted both with respect to marine ecosystem monitoring and assessment and the collection and analysis of fishery statistics that there is inadequate knowledge and integration of many local and regional efforts. A more integrated network could improve global understanding and indicate where present monitoring efforts are inadequate. It could help get agreement on variables to be measured and the observations that benefit users and managers. In one or two regions, discussions have begun of how to link existing regional ocean observing activities with GOOS and how to combine and enhance these initiatives through a common plan.[8]

Baselines and environmental monitoring serve many masters. They relate narrowly to compliance with national and international law, to measuring impacts of particular human activities, and to gauging the effectiveness of particular technical response options. More broadly, environmental monitoring provides time-series data for tracking conditions and trends and contributes to research on marine ecosystems and air/sea interactions. A carefully designed matrix of monitoring objectives can meet several needs in a cost-effective manner.[9]

Assessment

The term "assessment" can be used to refer narrowly to a substance-specific, technology-specific, or site-specific evaluation of impacts or to an overview of conditions and trends. The former may encompass the potential environmental, social, or economic effects of particular activities; the latter refers to an overview of resource/environmental and/or socio-economic conditions and trends and an evaluation of their causes. As with other information initiatives, common criteria and standards are essential for comparing risks and effects or synthesizing results. When transboundary or other shared problems are at issue, widespread acceptance of the analytical methods is usually a prerequisite for specific joint commitments.

For assessing risks and impacts of particular substances and products, the long-standing initiatives by GESAMP and the IAEA to harmonize procedures for *hazardous substance profiles* and *radioactive*

materials, respectively, are notable. Based on agreed assessment procedures, the results inform decisions under more than one convention. Further work is underway on POPs and on agreed criteria and procedures for chemical risk assessment. (Sections II.B. and III.D.) In a similar vein, the CBD has encouraged relevant international bodies to assist in developing criteria for assessing the risks of *alien species introductions*. With respect to *biotechnology and genetically modified organisms (GMOs*), the threats to human and ecosystem health have been considered narrowly in relation to aquaculture by ICES and in the FAO Code. (Section II.D.4., Table II-8) They are likely to receive additional attention under the CBD's Biosafety Protocol.

For assessing impacted species, different assessment frameworks and criteria may be justified on scientific grounds; witness the debate on the appropriateness of the CITES listing criteria for marine fish species under large-scale commercial harvest. (Section II.D.1.) But for many marine species, the use of compatible frameworks may promote agreement on which species are at risk and on mutually reinforcing policy and program decisions under the various global and regional conventions. The IUCN Red List process (Table III-2) and the CITES criteria revised in 1994 represent current international agreement on these matters.

For assessing impacted areas and ecosystems, there are fewer formally-agreed international procedures. Efforts to harmonize the various EIA procedures used by international development and technical assistance agencies have sought both to bring them up to a similar standard and to reduce the paperwork burden on recipient nations. Clearly, the results could improve comparability from one country or region to another. When it comes to *transboundary* EIA, the only formal regional agreement is in Europe. (Section II.B.7.)

For *conditions and trends assessment or "state of the marine environment" reports*, ideally the Global International Waters Assessment (GIWA) (Table III-1) and GESAMP[10] will help forge agreement on common approaches that improve integrated ocean assessment at the regional level as well as comparability from region to region. But the problem is a larger one of striving to conform and coordinate different "state of the environment" reports often covering a wide range of environmental issues. In at least one region, there has been a recommendation to coordinate regional environmental assessments through consultative meetings and synchronized workshops among the different groups.[11] This would improve both comparability and cost-effectiveness.

The *Millennium Ecosystem Assessment (MEA)* takes another perspective. Its goal is to bring together the best available information and knowledge on the goods and services produced by ecosystems and pressures on them in order to inform policy and management decisions - whether taken under environmental conventions or by individual governments, civil society, or the private sector. It will also identify options to improve the management of ecosystems. Preliminary results in 2003 will be followed by more elaborated results at ten-year intervals. A global overview of ecosystem types will be complemented by more detailed assessments at selected regional, national, and local sites. The MEA also seeks to establish baseline information on ecosystem conditions at the turn of the century. The process will draw heavily on, and help draw together, a wide array of ongoing research, monitoring, and assessment activities.[12]

Technical Options and Legal/Policy Information Resources

Tables III-3, III-5, and III-6 offer indicative information on technical guidance for addressing oceans problems, while Tables III-4 and III-7 note the major international institutions where scientific and technical support is available. Table III-3 also notes the major international organizations with specialized programs to provide law and policy information on fisheries/species conservation and marine pollution control. Other initiatives and organizations are considered in the marine 'problem' sections that follow. These reflect a major concern of numerous international organizations and processes today: how to improve the means for making information on appropriate response options easily and widely available to those in need.

Indicators

The term "indicators" is loosely used for quantitative measures that provide a snapshot of changing conditions and alert decision-makers and the public to new and growing concerns. They may coincide with "micro" parameters used in environmental monitoring such as nutrient content. Usually they represent an aggregate of parameters and are used to track broader environment/resource and socio-economic conditions such as annual freshwater withdrawal, coastal water quality, changing extent of mangrove habitat, particular marine species or species composition or endemism *(status*); changing threats to a natural resource such as industrial discharges or alien species introductions (*pressures*); or trends in mitigating actions such as financial support to restore fisheries habitat *(response)*. Their goal is increasingly to measure progress toward sustainable development at local, national, regional, and global levels. Indicators, and more particularly the data that underlies them, form a part of the information resources available for decision-making, but their primary use is as benchmarks of progress and performance, considered under (d) below.

There are numerous international initiatives to improve indicators of sustainable development.[13] Specifically related to the oceans, these include a few of the CSD's set,[14] a GESAMP report,[15] and sample proposals put forward in the context of developing national-level biodiversity indicators for marine/coastal ecosystems.[16] The World Bank is working with the OECD and the United Nations to develop a core set of about 20 indicators of sustainable development among which is an indicator of coastal resource management.[17] Two recent reports by the World Resources Institute (WRI) use indicators in assessing *Coastlines at Risk* and *Reefs at Risk,* as does a study by The Nature Conservancy (TNC) on marine conservation priorities for Latin America and the

Caribbean.[18] A joint WRI/Worldwatch Institute analysis of worldwide watersheds is also indicator-based.[19] Further work is necessary to refine a list of indicators for charting progress toward sustainable ocean development at local, national, regional, and global scales. (For materials flow indicators, see Section III.D.1.)

Public Information and Education

The legitimacy and authority of decision-making processes rests on public involvement in policy debates. Their effectiveness rests on public understanding of the status, causes, and costs of degraded coastal/marine resources. It is vital that the findings of environmental monitoring and assessment be converted into public information and educational programs meaningful to diverse constituencies. It would be helpful if these materials identified both adverse practices and environmentally-sound options *by activity* so as to influence management decisions in each sector and household as well as local and national officials.

For the oceans-related conventions, the challenge is two-fold: to explain convention goals and programs at national and local levels, indicating how international agreement advances national well-being; and, in view of ecological linkages among the different conventions, to facilitate understanding of their specialized roles and convey how the sum can exceed the parts. Specifying how improvements are achieved on an ecosystem basis through different conventions is one approach; another could focus on how the measures taken in a given sector contribute to the objectives of more than one convention.

Research

The knowledge base expands every day, and the challenge of management is to keep up with it and to turn research results into policy-relevant guidance. A second challenge is to help shape research undertakings up front, when simple adjustments could make the results more meaningful for decision-makers. The oceans conventions, like other decision-making bodies, are likely to emphasize research of immediate, practical significance, whether in determining the status of harvested populations, testing innovative technical approaches through pilot projects, or synthesizing lessons learned in the field. But convention processes can also highlight key questions of broader import where major long-term studies are needed.

Today, information about research initiatives and findings sponsored by many different governmental and non-governmental bodies is often inadequately disseminated even within the region(s) concerned. Those in the region lose not only the benefits of the knowledge but the opportunity for collaboration and for coordinated, cost-effective studies. Moreover, many convention secretariats or their scientific/technical advisory bodies are simply not in a position to synthesize the implications of multiple research findings for their decision-making bodies. In addition, communications between researchers and decision-makers are often ineffective — whether in translating knowledge into policy-relevant advice or translating management needs into the design of research programs.

The regional marine conventions and programs offer a mechanism for disseminating relevant research findings among countries with similar conditions or shared marine/coastal ecosystems. In each region they can encourage the establishment of a forum or network (below) to consolidate information on oceans-related research projects. This would encourage complementarity and collaboration in the planning stages and help ensure that the implications of research results are widely known. These findings could be synthesized for other regions. At the global level, UNEP's role in coordinating the environmental conventions, notably in supporting better scientific assessment of ecological linkages between them, offers a means of sharing information on research initiatives and results among the regions and with relevant global conventions.

The responsibility for improving communication between the research community and international decision-making on the oceans is a shared one. On the one hand, convention processes could develop a more strategic approach to explaining information and assessment needs, at both regional and global levels. On the other, private research organizations could take a more proactive approach in encouraging and participating in consultations to identify these needs so that they can take them into account when planning their own research. The established research community is uniquely positioned to ensure rigor and credibility in research design and to tackle controversial issues. The development networks of non-governmental organizations can draw in addition on lessons from small-scale, practical projects. Both can play a special role in forging synergies between targeted research and broader scientific investigations.

Research Networks

Many of the oceans conventions and related environmental conventions have established one or more networks to stimulate contacts among specialists: on scientific and technical questions, policy and legal issues, public awareness and education, or other matters. Numerous other international institutions, governmental and non-governmental, also have expert networks. During the last few years, global bodies have made progress in strengthening their networks at the regional level to support ongoing deliberations and analysis. A further step is needed to improve connections among specialists involved in different, though related conventions processes *at national and regional levels.* This could be facilitated by an intergovernmental or non-governmental organization so that all facets of the issues are addressed outside the framework of any particular convention. For example, the first regional conference of oceans policy and management institutions in Asia and the Pacific was held in 1998 with representation from nine countries. The meeting decided to start building a marine affairs institutions network (MAIN) to share information on substantive issues and on events and projects at the different institutions.[20]

The growing number of information initiatives noted above reflects both interest and commitment to establish baselines, cohere informa-

tion resources, promote integrated environmental monitoring programs that serve management needs, build up information resources and capacity at national and regional levels, and expand the knowledge base. These constitute building blocks for an information system that supports decision-making at all levels. The 'solutions' information still presents a formidable challenge. Other major concerns are to ensure that scientific/environmental information held at the global level on regional issues becomes a resource for decision-making within the region and to promote the development and organization of information on an ecosystems basis.

III.A.5.b. International Law and Policy

The decision to turn to a global or regional agreement to solve oceans problems is influenced by several factors. If sources outside the region contribute to a problem within it, as noted above, a wider inter-regional or global agreement may be necessary. The desire to use a global framework convention or non-binding global guidance to stimulate and upgrade legal instruments at the regional level may also come into play. (Section I.C) Otherwise, transboundary and shared problems are more likely to be worked out at regional and subregional levels, and cooperation at those levels is more likely to create durable institutional arrangements. The countries directly involved can work out more detailed expressions of global commitments and define priorities that reflect the regional mix of stresses, environmental/geographic conditions, and socio-economic circumstances. The advantage of the regional marine conventions is that they combine a forum for considering oceans problems comprehensively with the possibility of developing specialized subsidiary instruments for particular problems. Where international trade and investment are important regional considerations, a common "threshold" environmental standard at the regional level may help protect natural resources and avoid destructive competition among countries in the region.

There will continue to be interactions between regional and global ocean law instruments and numerous other specialized conventions, as elaborated in Section II. The regional level offers the best opportunity to discuss these interactions with reference to concrete problems and attributes. Periodic discussions among governments and stakeholders in the region could help identify constructive roles and synergies among the regional and global conventions applicable in the region, supported by inter-secretariat consultations. At the global level, international organizations, in particular UNEP,[21] can foster inter-secretariat consultations that promote information exchange among the regions and with the global conventions. If focused on particular types of oceans problems or functional issues, such as biodiversity conservation, chemicals, or public education initiatives, they are more likely to produce concrete results. *Intergovernmental* discussions at the global level are unlikely to be very effective in sorting out the respective roles and opportunities of each convention except where regional situations point to the need for wider agreement.

III.A.5.c. Coherent Development Initiatives and International Support

The vast range of human activities affecting the oceans requires integrated planning to ensure that development goals, strategies, and projects do not operate at cross purposes; for example, that efforts to stimulate coastal tourism through construction of hotel or marina facilities do not compromise habitat for valuable shrimp fisheries, and that irrigation policies in upstream areas or overharvesting of marine predators does not undermine the health of coral reefs supporting diverse marine species and profitable recreational activities. These issues arise at all levels, each of which may be compounded by external influences. They require communication and reconciliation among different stakeholders, different departments of government, and between local and national levels of governance. When transboundary resources are at stake, they require international consultations. An additional complication arises in developing nations when international agencies deal with client ministries eager to receive project funds and inattentive to potential interactions with other sectors. At worst, this leads to competing demands that damage natural resources and pit one group of citizens against another; at best, potential synergies are lost. International donors have a particular responsibility to ensure that any transboundary implications are considered in the very early stages of project development.

Well-integrated national development plans help avoid inter-sectoral conflicts at the outset, and they can highlight any transboundary implications of coastal/oceans development. The greater the understanding of ecological linkages within and outside the region, the greater the potential to design strategies that strengthen the natural resource base in the region and use domestic and international resources efficiently. An ecosystems-based assessment that brings to light such linkages provides a basis for regional consultations and agreement on strategic initiatives. These might identify the need for actions at the national level, such as control of industrial pollution at a particular site; for a transboundary project to avoid riparian erosion or manage coastal reef fisheries; or for a cost-effective joint training initiative on data collection and information management. A common action plan allows those in the region to shape international investments in development cooperation and strengthen centers of excellence of their own choosing. It is likely to be more effective in mobilizing international support than a piecemeal menu of project options. Deliberations over the regional strategy can help governments and others develop coordinated approaches to obtaining support for the region from extra-regional sources.

At the global level, the governing bodies of international agencies can insist on greater collaboration among the agencies at the regional level, including a greater devolution of responsibility to that level.[22] Second, they can push for internal policies and program planning arrangements that facilitate ecosystems-based initiatives, including cooperation in information management along the lines suggested at

(a) above. Third, they can help mobilize and channel support, especially if priorities are clearly identified; and fourth, they can encourage that global environmental concerns be taken into account in development planning and capacity-building at regional and national levels. Consultations among secretariats can help support these goals. Among the convention secretariats, coordinated project development can minimize competition for funding and maximize results.

Tables III-4 and III-7 give an indication of the international organizations with specialized programs that provide scientific and technical support for marine species management and marine pollution control. Multilateral Development Banks (MDBs), bilateral aid agencies, private foundations, NGOs, and private industry also form part of the mix of international support, as discussed in each of the following sections.

III.A.5.d. Accountability: Performance/Progress Review

Compliance

At all levels, managers are responsible to their organizations and to the publics they serve. Ensuring compliance with applicable law is a first order obligation. At the international level, governments are accountable for meeting international legal obligations. They have a responsibility to enact and enforce laws giving effect to them, and they are accountable both to their own citizens and to the other contracting parties to the conventions. Unfortunately, in many countries institutional capacity is insufficient to enforce laws on the books. As a result, many conventions have supported efforts to help government officials prepare national implementing legislation, design national programs and strategies, find technical solutions, and undertake other tasks of implementation and enforcement. Further initiatives of this type are certainly warranted. Regional workshops to enhance implementation and compliance can be tailored to circumstances and priorities in the region and promote ongoing collaboration and the establishment of regional networks.

Relatedly, many oceans conventions and some non-binding instruments require or encourage *national reports* on implementation. If reporting requirements are well-defined, they improve accountability. For example, the fisheries conventions tend to be quite specific in their requirements on catch and effort statistics and, in some cases, on scientific data needed to assess the status of stocks and impacts of fishing. Most of the regional seas conventions, in contrast, have few detailed reporting requirements. This is in part because the obligations themselves are not very specific. Efforts to develop more detailed guidelines for national reporting under several international processes (e.g., CBD, GPA, FCCC, World Heritage Convention) are likely to improve the precision and comparability of the information. There are ongoing initiatives to streamline and integrate national reporting so that each government does not have to submit duplicate reports to different intergovernmental bodies.[23]

Effectiveness

National reports have a great deal of potential. Narrowly construed, they provide specific information to ensure that each country has met its obligations under a convention. This is a matter internal to each convention. But the reporting requirements usually call for a variety of information on resource/environmental conditions, national policy and legal measures, and development projects. This represents a substantial volume of useful scientific/environmental and "solutions" information. It can contribute to regional and global assessments, including the establishment of baselines, and to sector/activity-based information on technical and policy response options. A more deliberate attempt to categorize and organize national reports for these purposes could contribute to the broader assessment of what works and what has been accomplished.

Once baselines are established, it is vital to take stock regularly of resource/environmental conditions — at local, national, and regional levels and for the international community as a whole. The regional, ecosystems-based assessments considered under (a) above can draw attention in each region to the need for additional national and international commitments. A global synthesis can mobilize worldwide support and cooperation and ensure that wider global implications are considered. It highlights where global and regional oceans initiatives need to be reinforced or new ones designed. The purpose of such reviews is not to judge national compliance with particular conventions but rather their effectiveness as a whole. *Indicators* (above) play a useful role in this context; by definition, they are indicative of change and trends but do not offer a detailed appraisal of conditions, causes, and inter-linkages.

The Accountability of International Agencies

A third aspect of accountability is that of international donor/technical agencies in supporting sustainable development in their field activities. The backdrop provided by the regional, ecosystems-based assessments offers a means of judging the operational performance of international agencies so that managers at the national level can better determine which agency to turn to, and decision-makers can better determine which regional and global programs deserve greater support. A transparent accounting of donor projects and programs and how they address priorities determined in the region should form part of any regional review.

III.A.5.e. The Weak Links in the Ocean Management Chain

There are several weak links in the complex feedback system that comprises ocean management. Perhaps the weakest is the ability to collect, organize, and transmit knowledge worldwide: so that specialized data and knowledge may be integrated to solve complex problems on site, and so that lessons learned in one locality are widely known for application in other relevant circumstances.

A second weak link is to strengthen knowledge and capabilities at local, national, and regional levels to diagnose problems and respond to the linkages among them. The use of an ecosystems-based approach to organize data on conditions, trends, and threats offers a logical means of tackling the multi-dimensional problems of ocean management. It can help governments and stakeholders review linkages among sectoral management initiatives; and, if problems cross national boundaries, indicate which convention(s) may be called into play. Where similar environmental and socio-economic conditions prevail and opportunities for international collaboration exist, large-scale regional approaches not only capture the dynamics of marine/coastal ecosystems and their linkages, they allow limited skills and resources to be shared for the common good and foster the development of local expertise and institutions.

A third weak link is related to the first two: a means to forge collective understanding of the causes, impacts, and solutions of shared oceans problems so that all those contributing to each problem find common cause in responding. Agreement on assessment procedures is often a prerequisite for further international accord on goals and strategies if not specific response measures.

These weak links have been compounded by the delay in realizing the need for technical and financial collaboration after national jurisdiction was extended 200 miles offshore — with the result that severe impacts in coastal areas are compromising the wellbeing of ever-larger segments of society, disrupting coastal/marine ecosystems, and spreading beyond national borders to affect shared resources and neighboring states. The lack of data and information in certain regions undermines the ability to tackle oceans problems effectively. As more detailed, ecosystems-based assessments progress, they will sharpen the focus on distinct problems affecting particular groups and nations. This, in turn, will permit a more systematic analysis of how to use international laws and programs to advance sustainable ocean management.

III.B. Threats to Marine Fish and Other Marine Species

Based on a working estimate of 13-14 million species on Earth, scientists have described about 1.75 million of which 300,000 are marine species. Coastal areas are responsible for about one-third of the biological productivity of the oceans, with coral reefs and estuarine ecosystems like mangroves and sea grasses considered among the most productive systems in the world. Very little is known about the deep ocean floor, yet in just twenty years deepsea hydrothermal vents have revealed more than two hundred new species. Scientists conservatively estimate that deepsea species may number half a million. The genetic diversity of marine species in general is greater than among freshwater or terrestrial species, and some argue that a considerable proportion of the Earth's genetic diversity is probably found in deepsea organisms like those located in the vicinity of hydrothermal vents.[24]

Threats to marine fish are taking a growing toll. According to FAO, nearly three-quarters of all major marine fisheries should be off limits to fishing. Fifty percent are fully exploited, 15 percent overfished, six percent depleted, and two percent recovering. The rest are underexploited (6%) or moderately exploited (20%). The consequences for human wellbeing are equally compelling: although small artisanal fisheries supply about 25% of the total world catch, they represent 40% of fish used for human consumption and the vast majority of those employed in fishing, especially in the developing nations.

Threats to other marine species like seabirds, sea turtles, and marine mammals derive from direct harvesting and the indirect effects of fishing gear and practices, marine pollution, and numerous human impacts on critical habitat. The effects of fishing are addressed in this section, while habitat and pollution are considered in Sections III.C and III.D.

III.B.1. Information and Assessment to Support Decision-Making

There are many gaps in our knowledge of impacts on marine species, especially the indirect effects of damage to habitat and ecological function and their relative importance vis-a-vis direct threats from fishing and pollution. An unfortunate and unforeseen by-product of the extension of coastal state resource jurisdiction out to 200 miles in the late 1970s and early 1980s was that fisheries data and marine science in many parts of the world suffered a setback, disappearing behind the veil of national sovereignty where nearly 90% of world fisheries occur. The deplorable state of world fisheries only re-emerged in the late 1980s as depleted stocks within national jurisdiction provoked growing conflicts at the 200-mile line or pitted near-shore traditional fisheries against offshore commercial operations. For marine fish less important to human livelihood and for numerous migratory species, it has been difficult to piece together the necessary information to gain a reliable picture of their status.

Tackling the knowledge gaps entails sufficient understanding of each species' population dynamics, migratory range, key habitat, and any changes in predator/prey species that may affect the population. It is essential that habitat and other ecological components affecting fisheries receive at least as much attention as fishing effort, and that ecosystem changes brought about by fishing pressure be understood and documented. The destruction of fish habitat has become a major factor in the depletion of world fisheries and the most critical threat to coastal systems. Its causes include physical destruction and pollution, variations in freshwater run-off from rivers, and alien species introductions. Fishing pressures not only deplete target species, they impact other fish, seabirds, sea turtles, and marine mammals — indirectly through predator/prey relationships or directly as a result of fishing practices. They may even modify species composition in entire ecosystems; for example, when predators are removed that feed on algae attached to the surface of corals, allowing algal growth to smother the corals and growing reefs.

International organizations play a major role in information initiatives on marine species, summarized in Table III-2. These concentrate on fisheries and on species that are endangered or threatened. Growing interest in marine biodiversity has led to new efforts to catalogue and standardize nomenclature in the marine domain and to improve knowledge of all marine species. The adequacy of information resources on protected areas and habitat varies, but as a general comment, the GRSMPA report indicates that lack of available information at the time the study was completed in 1995 allowed management effectiveness to be categorized only in 383 of 1,306 areas.[25] This reflects not only on the documentation of conditions and threats, it raises questions about whether there is sufficient information to determine each area's importance vis-à-vis particular fisheries or threatened/endangered species. As knowledge grows of how defined areas serve particular populations, this will facilitate a more systematic approach to protected areas networks that support ecosystems-based management. (Section III.C.1.) *It is beyond the scope of this report to evaluate the extent or value of information held by regional scientific or management institutions and how it may contribute to an ecosystems-based approach. As GIWA progresses and as regional-scale initiatives take shape, a thorough evaluation of these information resources may be possible.*

If Table III-2 represents the 'status' axis on marine species, the 'direct threats' axis would have to include the following information, compiled in an ecosystems context:

- direct harvest of the species,
- by-catch and discard of the species in other fisheries,
- harm to the species through ingestion of or entanglement in marine debris, and
- details of trade in the species.

Direct Harvest

This information is in most cases available and relatively accurate, although there may be problems in collecting data when a significant proportion of the fishing effort is undertaken by small vessels, as in the Mediterranean, or by subsistence fishers, as in East Africa and many reef fisheries. In other cases, the species harvested may not be distinguished in FAO statistics or in reported data.[26] For example, concern over the status of sharks and trade-related impacts led the CITES COP to suggest that FAO change the manner in which it requests members to record and report data on shark landings to improve shark statistics. (CITES/COP, Dec. 10.93, 1997)

Illegal, Unreported, and Unregulated (IUU) Harvesting

IUU is a growing problem that may need to be estimated in annual accounts of some fisheries. A 1999 FAO conference of fisheries ministers agreed to develop a global plan of action to deal effectively with all forms of IUU fishing, including vessels flying "flags of convenience." This will address the responsibilities of flag states to effectively control and monitor their fishing vessels and ensure that they operate in a manner that does not contravene or undermine relevant rules of international law or international conservation and management measures, including those adopted at the regional level. It could reinforce support for vessel and gear marking, a databank of vessels authorized to fish on the high seas, and port state inspection and enforcement schemes. (See "Conflict Resolution and Enforcement Options," Section III.B.4.)

Excess Fishing Capacity

An assessment of overcapacity in the fishing industry is another element necessary to improve the information base on threats to sustainable fisheries. Excess fishing capacity not only stimulates overfishing, it has produced a global fishing effort that costs more than one-and-a-half times the value of the catch. Recent national and international efforts to reduce excess capacity include eliminating perverse incentives like fishing vessel subsidies and promoting positive incentives like the purchase and removal of fishing vessels from the fishery. In order to make progress, fishing capacity itself requires further definition. Current estimates vary widely and few reflect the total potential catch of the fleets based on the vessels' size, power, gear, and holding capacity. This fails to capture the possibility that a few technologically advanced vessels may more than offset catch reductions as older vessels are retired or bought out.[27] Another concern is that a vessel reduction scheme in one area may simply transfer capacity to another location and exacerbate overfishing there.

The legal basis for eliminating excess fishing capacity found expression in the 1995 FSA, as considered in Section II.C. Building on the FSA and the 1995 Code of Conduct for Responsible Fisheries, FAO adopted in 1999 within the framework of the Code an *International Plan of Action (POA) for the Management of Fishing Capacity*. Its goal is for all states and RFOs to achieve, preferably by 2003 but no later than 2005, efficient, equitable and transparent management of fishing capacity.[28] It outlines three phases: assessment and diagnosis, adoption of management measures, and periodic review and adjustment. The POA calls on all states to ensure that no transfer of fishing capacity to the jurisdiction of another state is undertaken without the express consent and formal authorization of that state, and it calls on flag states to disapprove any transfer of their vessels to high seas areas where the transfer would not be consistent with responsible fishing under the Code of Conduct. States are to develop national plans to manage and, if necessary, reduce fishing capacity and to report to FAO as part of their biennial reporting under the Code. As a next step, FAO is to organize a technical consultation on guidelines to measure fishing capacity and excess in order to advance capacity assessment for transboundary, straddling, highly migratory, and high seas fisheries and to identify regional and global fisheries and fleets where urgent measures are necessary. A parallel effort will be devoted to improving national records of fishing vessels, based on compatible reporting standards, and the

establishment by the end of 2000 of the *international record of fishing vessels operating on the high seas, the High Seas Vessel Registration System (HSREG)* called for in the 1993 Compliance Agreement. (See "Conflict Resolution and Enforcement Options," Section III.B.4.)

Three further assessments would add to the information base: an assessment of fishing gear and methods in each fishery insofar as they produce by-catch, waste, and other damage to marine biodiversity and may be considered destructive fishing practices; an estimate of discards by species in each fishery; and an assessment of the nature and volume of debris in the marine environment affecting marine species and where it comes from. Each warrants further discussion and a more focused approach to collecting and compiling information.

By-Catch or Incidental Catch

Some global databases estimate the impacts of particular fisheries on seabirds, sea turtles, or marine mammals, but for many fisheries these data are minimal. When it comes to impacts on non-target fish species, at the global level the incidental catch is estimated to represent nearly a third of the world fish catch or 29 million tons.[29] If by-catch data were improved in each fishery to cover all impacted species (fish, seabirds, marine mammals, sea turtles), it could be used to determine (i) the potential threat to populations and species at regional and global levels and (ii) in which types of fisheries further effort is required to develop and apply more selective gear/practices — at the national level and through relevant RFOs.

In 1999 FAO adopted two POAs within the framework of the Code of Conduct to expand knowledge and stimulate action on fisheries by-catch. They apply to coastal states responsible for managing EEZ fisheries and to flag states responsible for their vessels on the high seas. States are to cooperate through RFOs and to collaborate with FAO, reporting biennially on measures taken. The *International POA for Reducing Incidental Catch of Seabirds in Longline Fisheries* calls on states to assess and monitor the extent of the problem and adopt national plans to reduce incidental catch, taking into account experience with mitigation measures acquired in the RFOs. The *International POA for the Conservation and Management of Sharks* recognizes the need for better information not only on by-catch in fisheries for tuna, squid, shrimp, and other species but also on direct harvests and utilization and trade in sharks. It notes recent efforts by RFOs to encourage data collection and, in some cases, develop regional databases for the purpose of stock assessment. The sharks POA calls for national plans by 2001. Data collected are expected to lead to improved species identification and assessment. It should be noted that growing attention in FAO and RFOs to sharks was prompted at least in part by decisions taken by the CITES COP. Where the data received by FAO does not always cover by-catch, CITES' mandate facilitates attention to this source of stress as well as harvesting effort. (Section II.C.)

Discards

FAO estimates that the fishing industry on a worldwide basis discards about 20 million tons annually. This may arise with respect to target fish species when the equipment used in the fishery inadvertently damages fish marketability or when there are inadequate storage facilities on board a vessel or ashore. A major share of discards occurs when non-target species are simply dumped overboard. FAO has an important role to play at the global level in synthesizing data by fishery type and by impacted species so that discard rates can be assessed for each. It can draw together information on different regional fisheries, contributing both to regional, ecosystems-based assessments and to a global synthesis.

Marine Debris

The sources of marine debris include lost or discarded fishing gear as well as plastic wastes discarded from ships or land-based sources. FAO has encouraged the development of standard markings for fishing gear so that it can be identified when found, and several RFOs require that gear be marked and call on contracting parties to report and/or recover the debris they come across. Efforts to improve knowledge of the origins of marine debris could be undertaken at both regional and global levels through RFOs, FAO, IMO, and the regional marine conventions and programs. (Sections II.C. and II.B.1. and 2.) At some stage, the information should be drawn together to provide an overview of sources and an assessment of impacts at the regional level as well as a global synthesis.

Fish Trade Statistics

As a general matter, statistics on fish exports are an indicator of national catch levels by species, although they combine fish caught within the limits of national jurisdiction and on the high seas. A more detailed analysis of country data could yield information of help in determining the costs and benefits of trade in different species for different segments of society, including effects on the sustainability of commercial export fisheries and those for local consumption. Export and import data together can help "map" the trail of those who invest, harvest, process, market, distribute, and sell traded fish and fish products. Such a map could help pinpoint responsibility for unsustainable fisheries and the design of measures to counteract them. As further initiatives develop under the RFOs to restrict imports from IUU fishing, these "documentation of origin" schemes will help trace world trade. Such measures may require further differentiation in the classification codes applied to trade. (See "Conflict Resolution and Enforcement Options," Section III.B.4.)

The particular role of CITES is to monitor trade in species listed as threatened or endangered and to detect illegal trade. CITES also uses trade information to determine how trade impacts a species. In some cases, in order to detect trade in a particular species or its parts and products, more specific headings are required in the World Customs

Organization's (WCO) harmonized system (HS) for tariff classification. The CITES secretariat works closely with the WCO; for example, the CITES' sharks initiatives (Section II.D.) call for consultations with the organization to establish more precise headings in order to discriminate among shark products. (CITES/COP, Dec. 10.126, 1997)

Deep Seabed Biodiversity: See Section III.D.1.

Mariculture

On mariculture, as with fisheries, FAO maintains global data on production and value. But in order to gain a full picture in each region, it would be useful to have additional information on the number and scale of different types of culture operations — for finfish, shellfish, and marine plants as well as combined operations. It would also be useful to know how much of the production is consumed locally and how much enters international trade, and how to allocate benefits among local communities, the national economy of the producing state, and foreign interests. Nor are the costs of mariculture documented in any systematic way; that is, costs in terms of the direct effects of pollution on marine species, adverse interactions between cultivated and wild species, and impacts on essential habitat. FAO plays an important role in developing guidelines to help countries collect and analyze relevant information. The results of an FAO meeting that prepared a short list of criteria and indicators for sustainable shrimp culture, as a basis for regular reporting by countries to FAO, are under review.[30] Further refinement and harmonization of the data collected will provide a better basis for assessing how mariculture contributes both to long-term ecosystem health and world food security. The CBD's mariculture initiative may supplement FAO's efforts by providing a broader perspective. (Section II.D.4.) At the regional level, the regional marine conventions and programs offer a vehicle for endorsing harmonized approaches to monitoring the environmental impacts of coastal and offshore mariculture operations. The technical backup may come from FAO and other expert groups like GESAMP.

What Next?

The RFOs are in the best position to improve information resources in their respective fisheries. The governments involved can decide to keep better track of by-catch and discards, gear lost or discarded in the fishery, and changes in fishing capacity including transfer and re-location. They are responsible for illegal and unreported fishing among contracting parties and can promote schemes to collect information on IUU fishing by non-contracting states. These governments can also collaborate within the regional marine conventions and programs to encourage data collection on marine debris and its origins. The regional bodies can then work with FAO and IMO to improve records on debris from ships, including fishing vessels. (See also Section III.D)

At the global level, FAO can organize the information it receives to support regional, ecosystems-based assessment and management. FIGIS is a step in this direction. (Table III-2) FAO's work on species identification and classification not only contributes to better assessment, it can support efforts to monitor trade in fish through the World Customs Organization and CITES. Through the POA on Fishing Capacity FAO can monitor capacity and keep track of vessel transfers that affect sustainable fisheries. Other important contributions by FAO to a global information system include the standard practices on marking fishing vessels and gear and the development of the High Seas Vessel Registration System. (See "Conflict Resolution and Enforcement Options," Section III.B.4.) Further support for these initiatives is vital.

The contributions of bodies like WCMC, Wetlands International, IUCN, and ICLARM complement these traditional sources of fishery information and highlight broader issues of marine species and biodiversity conservation. Table III-2 indicates how IUCN through its SSC Specialist Groups has played a major role in identifying species under threat and working with CITES to review their biological and trade status. The spin-offs from these efforts are better classification, harmonized nomenclature, and species identification techniques. The more recent initiatives noted in Table III-2 to standardize species classifications and establish a comprehensive database should expedite documentation on species before they become endangered. Regarding the identification of threats, a better overview is needed of their nature and magnitude throughout each species' migratory range with an emphasis on essential habitat. The approaches and indicators beginning to be applied by Conservation International (CI), The Nature Conservancy (TNC), (Table III-1) and WRI help fill the information gap. Further refinements to fully reflect the wide range of threats could be considered. (Sections III.C. and III.D.)

Further analysis may be needed to explore the compatibility of criteria for assessing species at risk under the different global and regional protected area/species conventions and the need for further harmonize assessment frameworks.

A thorough map of trade in marine fish and other species and of the allocation of costs and benefits from international trade is needed. This would help pinpoint responsibility for unsustainable fisheries and mariculture and could spur the development of measures that address both immediate and underlying causes.

On mariculture, the FAO, CBD, regional marine conventions and programs, and other expert groups could collaborate in developing monitoring and assessment approaches that receive widespread international endorsement. This would improve data quantity, reliability, and comparability and could set the stage for agreement on goals and good practices.

As the classification and delineation of marine/coastal ecosystems is refined, this will provide a framework for cohering disparate environmental monitoring and assessment programs to better reflect species trends and threats on an ecosystems basis and consequently improve

the ability to judge how local communities as well as national and regional interests are affected.

II.B.2. Technical and Policy Response Options

Sustainable Fishing Practices and Selective Gear

The LOS Convention lays the legal groundwork for sustainable fishing practices and measures on selective gear. (Section II.C.) During the last ten years the contracting parties to a number of fishery agreements have adopted measures to reduce by-catch. Additional requirements under CCAMLR call on states to *assess the impacts of fishing methods*, including on species dependent and related to target species. These objectives have been incorporated into the FSA. In more detail, the FAO Code calls on states, prior to introducing new gear and methods to an area on a commercial scale, to investigate the environmental and social impacts of fishing gear, in particular on biological diversity and coastal fishing communities, and the potential for habitat disturbance. (Section 8.4)

Information on such "solutions" is found in many international fisheries agreements and in national law and policy. The LOS Convention identifies a range of measures available to coastal states and, by implication, the contracting parties of international fisheries agreements. (Article 61) FAO increasingly plays a role in collecting and disseminating information and advice on sound fishery management practices — at the national level and by promoting information exchange among RFOs. It has published a number of technical guidelines on measures to minimize waste, by-catch, and discards (Table III-3), and its work on fishing capacity should lead to additional options. National laws are the means to generalize these measures throughout the country and formalize the means of enforcement, while adoption by RFOs can extend them to the states involved in international fisheries. In 1999 the CSD called on FAO to develop an international POA to eliminate destructive fishing practices. The process itself is likely to highlight the problem and advance knowledge of alternative good practices. It could play a useful role in unifying numerous diverse initiatives. The more specific the plan in identifying problems in different fisheries, the greater will be its impact in triggering action by those responsible — at the national level and through RFOs.

Fish Habitat and Protected Areas

Areas closed to fishing act as an "insurance policy for fisheries," allowing damaged fish stocks to rebuild and enhancing the stability of the stocks.[31] Although closed areas and seasons are a normal feature of national and international fisheries management arrangements, it is clear from the state of world fisheries that there is room for further closures and for a more systematic approach to safe havens for harvested fish species. (See Section III.C for further discussion.)

Sustainable Mariculture

Further steps are underway in FAO to develop technical guidance on sustainable mariculture, as noted above. The World Bank has also launched a pilot project whose aim is to develop a code of conduct for small-scale sustainable shrimp farming. (See "Consumer Initiatives," below.) As these initiatives progress, they will contribute to a clearer picture of the full costs and benefits of different types of operations. This is an area where the CBD has a role to play in ensuring that good mariculture practices comprehensively take into account support for local people, avoiding adverse impacts on coastal/marine ecosystems, and helping preserve species and genetic diversity. Once such guidance is endorsed by relevant COPs, it will acquire greater authority in guiding activities at the national level, by private industry, and supported by international development agencies. Various regional marine conventions have already taken an interest in mariculture, as has the Wetlands Convention. (Res. VII.21 at para. 15)

Access to Marine Genetic Resources

The CBD is facilitating a review of national and regional measures for access to genetic resources. Further developments can be expected to help coastal states benefit from marine genetic resources. There have been suggestions for regional agreements that allow countries to achieve economies of scale in scientific and technological capacity and to share the risk of product development.[32] Other potential benefits include the adoption of a common strategy toward sustainable use of genetic resources as a general matter, including a common database, a common enforcement mechanism, and avoiding competition among countries with similar genetic resources in setting conditions for access and benefit-sharing.[33] (Section II.C.)

In relation to genetic resources beyond national jurisdiction, the legal regime may require further elaboration, bearing in mind provisions of both the LOS Convention and the CBD. (Section II.C.)

What Next?

As provisions on prior assessment of the impacts of fishing methods are incorporated into RFOs and at the national level, they will promote research and development in selective gear and methods. There may be a role for an expert group to meet regularly under FAO auspices to compile, assess, and revise a list of technical and policy measures (with supporting information) that have been demonstrated to enhance sustainable fisheries.

On mariculture, the FAO, CBD, regional marine conventions and programs, and other expert organizations could promote the development of "good practices" guidance for different types of mariculture operations in shellfish, finfish, marine plants, and combined operations. Further guidance addressing the introduction of non-indigenous species and GMOs may also be needed.

Policies to promote sustainable development of marine genetic resources that benefits coastal states or, if found beyond national jurisdiction, the world community as a whole, are just beginning to receive attention under the CBD, bearing in mind LOS Convention provisions. The opportunities of regional agreements could be further explored.

Consumer initiatives of the type described in Section III.B.4 below may begin to play a larger role in promoting sustainable fisheries and mariculture.

III.B.3. Scientific, Technical, and Financial Support

FAO, the multilateral development banks, and other international and bilateral agencies advise and support countries in the development and application of technical and legal measures to promote sustainable fisheries. Tables III-3 and III-4 identify some of the resources available, but they are by no means complete. Further identification of specialized technical and legal guidance and of specialized knowledge and expertise available in each region would be useful.

III.B.4. Accountability: Performance/Progress Review

This section considers accountability in both a narrow and a broad sense. It reviews the types of conflicts likely to arise over fisheries within and beyond national jurisdiction, and the specific means available to enforce international fisheries conventions. It then looks at evolving consumer initiatives whose goal is to bring market pressures to bear on unsustainable fisheries and mariculture. The final discussion outlines existing institutional arrangements for considering the broad question of effectiveness and the degree of progress achieved by existing international commitments and accomplishments.

III.B.4.a. Conflict Resolution and Enforcement Options

Resolving Conflicts Over Fishing

Within national jurisdiction, there may be conflicts between small-scale, coastal subsistence fisheries and offshore pelagic fisheries — when coastal fishers turn to pelagic resources in the off season, when they have overexploited traditional fishing grounds, or when their harvests have decreased due to other causes, or when a growing offshore fishing industry begins to encroach on nearshore fisheries. These conflicts may engage international dimensions when the coastal state has licensed foreign interests to expand pelagic fisheries within the 200-mile zone, usually in the interest of earning foreign exchange. Yet these conflicts remain essentially a matter for domestic resolution. While the central government's economic and political goals may weigh heavily in resolving them, the growing number of international legal instruments on the rights of indigenous peoples may increasingly affect domestic allocation of resource rights. Specifically with respect to fisheries, the 1995 FSA and FAO Code call on states to take into account the interests of subsistence, small-scale, and artisanal fishers.

At the international level, conflicts over fisheries take four primary forms: when foreign fishing vessels enter national fishing zones without authorization, fishing illegally; when foreign vessels harvest straddling stocks in the high seas adjacent to zones of national jurisdiction and are believed to be undermining national conservation measures; when fishing vessels are party to a RFO and conduct fishing operations in a manner that is not consistent with agreed measures; and when fishing vessels on the high seas harvest species subject to a RFO but are not party to the RFO and are believed to be undermining the conservation measures agreed through the RFO. Growing experience with the enforcement options noted below will help address these problems, although technical and financial assistance may be required in some regions to support effective enforcement.

Enforcement Within National Jurisdiction

The extension of national fisheries jurisdiction out to 200 miles vastly extended coastal state rights to enforce their conservation measures. Capacity and cost are the constraints. Patrolling extensive offshore areas by ship or aircraft is expensive, and it may be difficult to apprehend fishing vessels suspected of violations. One alternative when foreign vessels are licensed to fish within national jurisdiction is for the coastal state to establish a program where *observers* travel on the vessels to verify that harvesting is carried out in accordance with national rules. To supplement national enforcement, some regions have established collaborative surveillance and enforcement schemes. In the South Pacific, *port state inspections* are used to verify that harvests are caught in accordance with applicable conservation measures. These countries pioneered the use of a *regional register* to identify fishing vessels that remain in good standing by complying with daily catch reporting requirements and other licensing conditions in the region. If so, they retain the right of access to the waters of any South Pacific Forum Fishing Agency (FFA) member country. There is a tacit understanding that non-listed or "black-listed" vessels will not be licensed by any of these nations.

Enforcement Through RFOs

When fisheries are conducted beyond national jurisdiction on the high seas, traditional flag state enforcement has been supplemented through measures adopted by the RFOs. These include *international inspection and observation schemes* that place observers on board the fishing vessels of contracting parties; provision for high seas boarding and inspection;[34] *the FFA register*, which applies also to vessels fishing on the high seas; provisions that allow contracting parties *to prohibit the landing or transshipment* of fish, even by non-contracting parties to the RFO, unless it can be established by *port state inspections* that the fish were harvested in keeping with measures adopted by the RFO (or outside the regulatory area); and, under ICCAT, that contracting parties may *ban* tuna and swordfish *imports* from non-contracting parties that are undermining the effectiveness of ICCAT conservation measures. In another recent example, the contracting parties to CCAMLR, pursuant to a catch documentation scheme adopted in 1999, will not accept imports of toothfish from fishing vessels of any

country without proper documentation on the origin of the catch and, if the fish were caught within the CCAMLR area, that they were caught in a manner consistent with CCAMLR conservation measures. Non-contracting parties to CCAMLR may participate voluntarily in the scheme, with the implication that CCAMLR parties will not accept imports that do not carry proper documentation. As discussed in Section II.C, the 1995 FSA and 1993 FAO Compliance Agreement reinforce existing developments at the regional level and leverage the adoption of similar schemes in other regions.

With respect to technical means of enforcement, a satellite-based vessel monitoring system (VMS) can track the location of a vessel and help determine how much of the catch comes from within or outside an area subject to RFO measures. RFOs like ICCAT have recommended that each contracting party apply VMS to its fishing vessels. The first mandatory control and enforcement scheme based on satellite tracking and automatic data transmission is believed to be that for NEAFC, as of 1 July 1999; under CCAMLR all vessels fishing for finfish will be required to carry VMS by the end of 2000.

Gear Markings

The purpose of marking gear is to determine the identity of the vessel from which lost or discarded gear comes, for example driftnets used illegally on the high seas. If a vessel suspected of violating agreed national or international measures cuts loose a net to escape enforcement authorities, the markings can be used to help prove that the vessel was fishing illegally. Other identifiable characteristics of discarded gear may point to the manufacturers or sellers who make the gear available to illegal fishers and thus help put pressure on them. The FSA requires flag states to ensure that their fishing vessels mark gear in accordance with uniform and internationally recognizable marking systems. (Article 18)

Vessel Markings and an Automatic Identification System (AIS) for Ships

Standard vessel markings make it easy to identify the flag state of fishing vessels at sea as well as the individual vessel. If these are absent, international law allows the coastal state or other vessels fishing on the high seas to presume that the vessel is illegal. Vessel markings also help trace vessel sales and transfers. FAO has established Standard Specifications and Guidelines for the Marking and Identification of Fishing Vessels, and the FSA requires flag states to ensure that fishing vessels carry such markings. (Article 18) The IMO is considering a *Universal Shipborne Automatic Identification System*. (Section III.D.4.)

High Seas Vessel Registration System (HSREG)

Initial steps were taken by FAO in 1995 to establish the database of vessels authorized to fish on the high seas mandated by the 1993 Compliance Agreement. This will facilitate vessel monitoring and help track reflagging to "flag of convenience" states. Pursuant to the POA on Fishing Capacity, it could give an indication of capacity and capacity transfers. The proposed joint IMO/FAO initiative to explore further means to define the concept of a "genuine link" between flag states and the vessels they register and ensure that it is maintained should further assist enforcement efforts. (Section II.C.)

Illegal Trade

CITES plays an enforcement role in respect of illegal trade in listed species. The secretariat works closely with the World Customs Organization, INTERPOL, national enforcement authorities, and non-governmental bodies like the TRAFFIC network[35] to keep track of trade in listed species and document discrepancies in export/import statistics that may indicate illegal trade. The COP reviews these matters and draws attention to illegal trade.

III.B.4.b. Consumer Initiatives

There is a special role for consumer initiatives in promoting accountability. Several recent efforts harness consumer purchasing power to encourage sustainable fishery and mariculture practices. They develop standards and criteria for "eco-labelling" and a system whereby industries can volunteer to be assessed; if they meet the standards, their products are so certified for consumers. These initiatives have been controversial on two counts. First, it has been difficult to get widespread agreement on the criteria used in judging sustainable practices; second, even voluntary, non-governmental eco-labeling schemes might be held inconsistent with World Trade Organization (WTO) rules.[36] To the extent that there is agreement among experts on the types of practices in fisheries and mariculture that are sustainable, including options that are valid in different regional conditions, these will offer a yardstick for evaluation and the award of eco-labels. FAO continues to hold consultations on eco-labelling in an effort to develop scientifically-based criteria. The need to take into account social issues relevant to sustainable fisheries is also a concern. Keeping better track of the origin of fish imports and of those who benefit from or are harmed by unsustainable fisheries, as noted above, would help shape effective action.

The Marine Stewardship Council (MSC)

The MSC, a joint venture established by Unilever and WWF in 1996, has convened international consultations to develop principles and criteria for sustainable fishing that will be applied by independent, MSC-accredited certifiers. Field tests are under way both in large commercial fisheries (Alaska salmon and Australian west coast rock lobster) and in an artisanal fishery (Galapagos lobsters). Unilever has pledged that by 2005 it will buy fish only from sustainably managed stocks. The MSC's goal is ultimately to reach all stages of fish production from fishing vessels, markets, and processors to retailers and restaurants.

The Marine Aquarium Council

The Council has mounted a similar effort. This independent body will monitor the capture, storage, handling, and transportation of tropical marine species for the aquarium trade, most of which are recovered from coral reefs often using destructive fishing practices. It will estab-

lish standards, accredit bodies responsible for certification, and support education programs that discourage the use of poisons, explosives, and other adverse techniques. Consumers will then be able to buy products obtained by sustainable means. The effort may extend to farming and ranching operations as mariculture begins to supply a growing share of species for the aquarium trade.[37]

The World Bank's Marine Market Transformation Initiative (MMTI)

Launched in 1998, the MMTI will ultimately address four areas: harvest and trade in live coral reef fish for restaurants and aquaria, with the goal of eliminating destructive fishing practices; linking marine tourism to coral reef conservation; sustainable shrimp farming in Southeast Asia; and reducing overcapacity in marine fisheries. Working with partners in industry, NGOs, technical institutions, and a variety of funding agencies, the MMTI will support changes largely in private sector operations through policy reforms, alternative technologies, economic instruments, targeted investments, consumer education, and eco-labeling and marketing.[38] The consumer initiatives noted above are in part supported through the MMTI. A related pilot project will establish a collaborative stakeholder process as a means to develop a code of conduct for sustainable shrimp farming in Thailand. It is intended that the code cover criteria for site designation and effluent standards as well as an incentive package to encourage small-scale shrimp farming — through information on cost-effective technologies applicable to Thai conditions, market pressures, and other measures.

III.B.4.c. Effectiveness

Several international bodies play a role in reviewing performance in the fisheries area, in addition to the individual RFOs. At the global level, the UN General Assembly in its annual review of ocean affairs and the law of the sea takes up in alternate years the implementation of the 1995 FSA and other fisheries matters like driftnets, by-catch and discards, and IUU fishing. Developments in FAO and the RFOs form part of the annual reports prepared for UNGA discussions. The CSD has also drawn attention to problems in world fisheries, and the results of its five-year oceans review are forwarded to UNGA discussions.

FAO monitors fish stocks and trade on a global basis. Recent discussions within FAO have emphasized the need for its Committee on Fisheries (COFI) to address links between RFOs within and outside FAO. In the same way that UNEP has launched inter-regional consultations among the regional marine conventions and programs and other relevant global and regional instruments, FAO can promote the exchange of information and experience among the RFOs. By focusing each meeting on particular topics, as UNEP is doing, the discussion of possible synergies and coordination becomes more concrete; for example, topical discussions of mariculture, fisheries habitat, or evolving enforcement options like regional port state arrangements or documentation schemes for IUU catch. In addition, FAO's growing emphasis on the regional and subregional organizations involved in fisheries (Table III-4) can hasten the organization and review of information on an ecosystems basis. It may bring to light questions about whether to extend the competence of existing bodies to a wider range of species in the system to avoid adverse impacts.

For marine species and habitat more generally, including an overview relevant to the protected species and area conventions, the information programs cited in Table III-2 are the major review bodies. What is missing is a means to effectively link progress reviews for both fisheries and other marine species to the international bodies responsible for measures to reduce habitat degradation. The UN General Assembly in 1999 encouraged states and other entities to integrate environmental protection requirements stemming from the environmental conventions with the management of straddling fish stocks and highly migratory fish stocks.[39] As information on migratory range, key habitat, species interactions, and major threats is improved, it will be easier to apply an ecosystems approach to progress reviews. The forum for making these connections is less apparent. (Section IV.)

III.C. Threats to Habitat and Ecological Services

The previous section on threats to marine species and the following section on pollution encompass most major threats to habitat and ecological services. This section considers management tasks related to three issues: the roles of protected areas and integrated coastal area management; the threats posed by invasive species; and the threats posed by altered freshwater quantity flowing from rivers to the sea. The tasks are the same as those related to marine species conservation: information and assessment to support decision-making; technical and policy response options; scientific, technical, and financial support; and accountability: performance/progress review including enforcement and voluntary consumer initiatives.

III.C.1. The Role of Marine and Coastal Protected Areas (MCPAs) and Integrated Coastal Area Management (ICAM)

MCPAs and ICAM are tools designed to reduce the pressure of human activities on coastal/marine resources. They respond to expanding human settlements/activities that have converted natural habitat, depleted natural resources, and contaminated coastal areas by pollution and wastes. At some stage, cumulative impacts can irreversibly compromise marine species' habitat and modify the ecological services provided by coastal/marine systems. MCPAs and ICAM offer means to tackle multiple human uses in a defined geographic area. Not only do they help conserve biodiversity by protecting habitat, they can increase productivity by providing safe havens for species under threat. They may also be used for long-term environmental monitoring studies and as control sites for studying management techniques. Ideally, stakeholders in and around the area will be involved in working out management objectives and strategies. This process is ongoing, as human activities and resource conditions change.[40]

Section II.D.2 discusses the international legal basis for MCPAs. It notes the limitations of protected areas unless they are combined with measures that curtail threats originating outside the area. If threats originate in part beyond national borders, then international agreements are necessary to safeguard the area. The scale of agreement should reflect the scale of the problem and the nature of the activity. The protected areas conventions increasingly recognize that external threats may invoke the need for action under specialized conventions focused on sectoral activities and impacts. At the same time, designating areas under these conventions gives both authority and focus to the needed actions. Like MCPAs, integrated coastal management may also be undermined by impacts from further afield — borne by rivers, ocean currents, international shipping, or through the atmosphere — and require recourse to international agreements. In both cases, the wider problem will probably require scaling up the range of stakeholder consultations and reconciling a broader range of interests.

Sections III.A.3 and 4 consider an ecosystems-based approach to ocean management on a large, regional scale. Table III-1 notes the current state of affairs in delineating logical ocean units for assessment and management and the role of MCPAs in that context, notably the concept of an *ecological network*. See also Maps. The purpose of such a network is to establish a coherent system of natural and semi-natural areas that is configured and managed to maintain or restore ecological functions while providing appropriate opportunities for the sustainable use of natural resources. By identifying the most critical areas within a region based on an ecosystems approach, a number of small reserves can be targeted to achieve key conservation goals. This sets in motion a manageable conservation strategy that may grow more comprehensive with time. The goal of achieving a coherent network does not mean that local and national reasons for designating a protected area should necessarily conform, but if network goals and strategies are clearly articulated it will be easier for national and international designations to reinforce them. As noted in the initiatives by Conservation International, WWF, and The Nature Conservancy, the next step is more in-depth evaluation at a finer scale to identify critical sites and the timing and sequence of necessary actions.

III.C.1.a. Information and Assessment to Support Decision-making

The information needed to support a systematic approach to MCPAs contemplated in an ecological network is more adequate in some regions than in others. At the same time, such an approach may be expedited by building from existing resources and expert opinion. This entails a convergence between what is known of the relative biological/ecological value of geographic areas in an ecosystems context and what is known of their relative degree of threat. Indicators can play a substantial role in such comparisons, making use of existing information. Table III-1 cites recent efforts to classify areas of high biological/ecological value at a relatively large scale, recognizing that identifying critical areas within them will take further analysis. It will be important to include essential habitat for marine species and their migrations, including major fisheries. It will be more difficult to judge how to preserve the ecological services that terrestrial and freshwater systems provide to coastal/marine systems. Starting from the small end of the scale, the information on national parks and protected areas maintained by Wetlands International, WCMC, IUCN, and Birdlife International already identifies many critical habitats. (Table III-2) The *Globally Representative System of Marine Protected Areas (GRSMPA)* concentrates on critical and vulnerable marine sites that merit special protection. The recent TNC report on Latin American and the Caribbean indicates how protected area designations may be used as a cornerstone for a more systematic approach to protecting larger geographic priorities.[41]

The information on threats to critical habitat and coastal areas draws substantially on indicators like the conversion of estuarine and mangrove systems.[42] Some studies compare threats from one region to the next. What appears unique about the TNC study is that it systematically ranks both areas of high biological/ecological value and threats to them at increasingly smaller scales within an ecosystems context. Moreover, it applies a process and methods that may be adapted from one region to another.

Several regions have begun to make progress toward a more systematic approach to an MCPA network — Northern Europe,[43] the Mediterranean, and the polar regions.[44] The ASEAN region has expressed the intention to develop a regional framework to protect and conserve heritage areas and endangered species.[45]

What Next?

Despite progress made, the various studies and initiatives on critical coastal/marine systems and habitat all call for more in-depth evaluation at a finer scale of resolution. The *GRSMPA* report cites inadequate data on the status of biological resources and the impacts of resource use as one of the main causes of MCPA failure. Other threats to these areas are even less well documented. Further work to collect information on the indirect impacts of fishing on marine species' habitat and on indicators that fully reflect the impacts of all sources of pollution would be useful. (Sections III.B. and III.D.)

From the perspective of international conventions, better documentation is needed of the *international* dimensions of MCPAs and key habitat; that is, whether transboundary natural systems are affected or species that migrate across national boundaries, or whether pollution originates in one country and causes damage in another. For example, a WCMC report indicates that of 955 Ramsar sites studied in the context of shared river basins, 9.6% may be subject to impacts from adjoining countries. This illustrates the scope of international cooperation needed.[46]

The opportunities for collaboration between the *clearinghouse mechanisms* of the CBD and the GPA on Land-Based Activities (Section

III.D) should be further developed in relation to both the causes of coastal/marine habitat degradation and response options, including effective coastal zone management arrangements, as recommended by the second global meeting of regional seas programs.[47]

In the future, exploration and study of the *deep seabed* will bring to light new areas that warrant special protection. (Section III.D.1.) At some stage, protections for *watershed sites* that can reduce adverse riverborne impacts on the coastal/marine environment should be considered.

Special consideration should be given to the use of convention-designated *MCPAs as baseline or control areas and as sites for long-term environmental monitoring of human impacts*. The sites could serve goals under more than one convention, worked out through collaboration among them. The 1995 Seville Strategy for Biosphere Reserves suggests such a coordinated approach as does the Wetlands Convention's strategic framework. (Res. VII.11)

For designated MCPAs, the task of management is not only to protect them from chronic threats but from unexpected emergencies like oil or chemical spills. Development planners and emergency response teams need *maps and charts that indicate the location of MCPAs* and rapid access to databases on their vulnerable assets. The adequacy of these resources needs to be examined region by region. (Section III.D.1.)

III.C.1.b. Technical and Policy Response Options

The failures of MCPAs have been documented to some extent in the *GRSMPA* study, which assessed 29% of approximately 1300 sites studied. In addition to the data deficiencies noted above, the recurring themes are insufficient financial and technical resources; unsustainable use of resources within the area; external impacts; lack of public support and involvement; inadequate enforcement; and lack of clear organizational responsibilities and coordination among the different agencies with relevant responsibilities.[48] There has been no parallel systematic documentation of the advantages and shortcomings of ICAM projects, although numerous studies exist. GESAMP has identified the need for a framework to objectively evaluate the *relative* contributions of integrated ocean and coastal management to social and environmental change in light of overall trends and their causes.[49]

Of the MCPA failings, those attributable to technical and policy issues are unsustainable use of resources within the area, external impacts, lack of public support and involvement, and inadequate enforcement. To some extent, the latter two overlap, in that the involvement of stakeholders is often necessary to stimulate effective enforcement. This report recognizes the need for public and stakeholder involvement in every aspect of policy development and management, but it does not consider the various mechanisms used at the national level to promote such involvement. Enforcement also falls within the purview of national responsibilities, although protected area designation pursuant to a convention usually entails international review of the status of the area, as noted in (d) below. Much of the guidance cited in Table III-5 addresses these issues.

Specialized Sectoral Measures

The other two failings identified — unsustainable use within the area and external impacts — are due to particular sectoral causes. Once general goals and priorities have been agreed for a MCPA (or an ICAM project), sectoral measures have to be developed through the responsible specialized ministry(s) or, if there are international concerns, the appropriate specialized convention. This returns the manager to the various processes engaged in identifying and improving environmentally-sound practices by sector/activity, considered elsewhere in this report. When international agreements are involved, the potential synergies that may be achieved through different conventions should also be explored; for example, conforming discharge rules for offshore oil and gas operations under the Gulf/Kuwait Protocol with those governing vessel-source discharges under the region's Special Area status pursuant to MARPOL 73/78, Annexes I and V (Section II.B.4.), or designating the Baltic Sea as a special control area under MARPOL 73/78, Annex VI on air pollution to reinforce its other Special Area designations. (Section II.B.5.)

Environmental Impact Assessment (EIA) on a Sectoral Basis and a Regional Scale

When a new activity is proposed, EIA is the obvious starting point to identify the need for specialized measures to avoid impacts on MCPAs and vital habitat. It should cover siting of potential activities as well as the manner in which they are conducted. This is reflected in the CBD's provisions (Section II.D.6.) and the evolving international legal regime on transboundary EIA. (Section II.B.7.) Regional EIA is a tool to help development planners at a larger scale design investment strategies, programs, and projects that are environmentally sustainable. It can factor in the cumulative impacts of many different activities affecting natural systems and help identify sites for special protection in a broader, ecosystems context.[50] Tables III-3 and III-5 cite several planning tools for MCPA and ICAM, including some that focus on particular sectors.

Linking Fisheries and Fish Habitat

The challenge for marine conservation of ensuring that fisheries management concentrates not only on fishing effort but also on fish habitat is difficult enough at the national level. It entails consultations among government ministries responsible for fisheries and several other sectors/activities, including local authorities. At the international level, the fisheries conventions do not normally incorporate detailed obligations to maintain and restore fish habitat. They may take account of the effects of degraded habitat on fish stocks in setting catch limits. Nevertheless, the slim hook set out in the LOS Convention requiring states to control pollution in order to protect the habitat of *depleted* as well as threatened or endangered species takes on greater significance as the list of depleted fish species grows longer. (Section II.D.1.) Once the FSA's provisions on a precautionary approach become binding and are incorporated into RFOs, they will give greater impetus

to protecting habitats of special concern for fisheries. (See Section II.C, "The Scientific/Conservation Basis.") The Wetlands Convention's criteria and guidelines on wetlands of importance to fish are also helpful.

Not surprisingly, the international fishery agreement where catch and effort have been addressed together with habitat is one where commercial stakes are high and the people affecting the habitat have a significant consumer interest in the fish —Pacific salmon. A 1999 agreement between Canada and the United States covers, in addition to management and allocation issues, the two countries' obligations to maintain and restore salmon habitat in upstream and coastal areas. (BOX 2) It remains to be seen whether the stakes in other international fisheries will engage similar commitments on habitat.

Habitat Restoration

This issue is beginning to receive more attention in international convention processes as concern grows over species depletion and modified ecological function. Under the protected species/area conventions, the parties have long been urged to maintain and restore species habitat and designated sites. The more recent thrust is to elaborate technical guidance to help them do so. The Wetlands Convention adopted new guidance in 1999 calling for strategic level interventions to restore lost wetlands' functions, processes, and components. (Res. VII.17) This was preceded by discussions on the value of taking an ecosystem approach to rehabilitation as a means to identify priorities, and of methodologies for doing so.[51] Under the regional marine conventions, as considered in Section III.D.3, restoration takes the form of identifying "hot spots" for priority initiatives. The Pacific Salmon Treaty is the first international fishery agreement to incorporate specific provisions and financing for habitat restoration. (BOX 2)

What Next?

Technical guidance on MCPAs and ICAM has been produced by a number of different international programs and conventions and more is in the offing. (Table III-5) It would simplify the task for the user if the guidance in each subject could be streamlined and reconciled within a single framework. Where specialized guidance is valuable for particular features, such as mangroves or coral reefs, this could be endorsed as an elaboration of the broader measures. Specialized guidance on how to incorporate particular sectoral issues into a basic framework for integrated management would also be useful — at the scale of MCPAs, ICAM, or larger areas like watersheds. How to integrate MCPAs and ICAM into wider development strategies so that external threats are addressed should also form part of the framework. Such guidance would gain greater authority if it were endorsed pursuant to different, relevant conventions.

Section II.D.2 suggests further analyses to explore how the different international legal instruments on protected areas may better complement and reinforce each other. This would require a comparison of the criteria/values that justify designation and the range of protective measures available under each. It would also require an evaluation of the benefits of designating areas under more than one convention. The evolving concept of an ecological network of MCPAs is another means to take a more systematic approach to these designations. These issues could be explored through the CBD process, in light of its comprehen-

BOX 2.

THE PACIFIC SALMON TREATY AND HABITAT RESTORATION AND ENHANCEMENT

The 1985 Pacific Salmon Treaty has been a subject of dispute between the United States and Canada since 1992, when agreed fishing arrangements expired as a result of tensions among Canadian and US fishing interests, including differences between US interests in the Pacific Northwest and Alaska. The agreement concluded in 1999 covers the northern and southern boundaries between Canada and the United States, transboundary rivers, and five different salmon species. Six separate agreements run for either ten or twelve years. They apply a new concept of abundance-based management meant to be more responsive to changes in the salmon runs. Initial forecasts are adjusted to take account of actual runs during the fishing season, and catch limits for the two countries will reflect any changes. As an incentive to reduce incidental mortality, some of the sub-agreements permit a portion of the verified reduction to be added to allowable catch. The institutional arrangements to support the bilateral commission have been revised to include a Committee on Scientific Cooperation drawn from both governmental and non-governmental scientific communities, a joint Panel on Transboundary Rivers, rules and procedures to settle technical disputes, and joint technical committees to undertake the analyses required for abundance-based management.

Two Restoration and Enhancement Funds constitute the final element of the agreement, one for the northern boundary and transboundary rivers and one for the southern boundary. These embody the two governments' commitments to protect and restore habitat and maintain adequate water quality and quantity in order to achieve safe passage of salmon to and from their spawning gounds and high levels of natural production. The Funds will be jointly administered to support habitat improvement, rehabilitation, and restoration; low-technology stock enhancement; and the development of better information resources and scientific understanding of the factors affecting salmon production in the marine and freshwater environments. Initial grants by the United States of $75 and $65 million respectively will be treated as endowments; only the annual earnings from invested principal may be spent each year. Procedures for the acceptance, review, evaluation, and approval of project proposals will be developed by the joint committee administering the fund. The Committee on Scientific Cooperation is to provide advice regarding non-fishing factors affecting safe passage and optimum production of salmon.

sive, ecosystems-based mandate. The CBD's marine and coastal program has the added advantage of spanning protected areas and marine living resources. This allows greater attention to critical habitat for fisheries, including areas closed to fishing under the RFOs. The informal task force established by the CBD to elaborate criteria for establishing and managing MCPAs, working among others with the World Bank, IUCN, and the MAB Programme, could take up this challenge. This could draw on and reinforce emerging regional efforts to establish systematic networks.

From the sectoral perspective, the use of specialized conventions to protect designated sites from threats posed by the particular activities they govern should be fully explored. Further development of agreements on transboundary EIA will help identify these threats in the planning stages.

Protecting representative *sites of deep seabed biodiversity* should receive more attention as these sites continue to be explored, both within and beyond national jurisdiction. The international legal regime for doing so requires further study. (Sections II.C., II.D.1.)

Special consideration could be given to the use of MCPAs for ensuring sustainable use in areas where *maritime boundaries have not yet been agreed*. Such designations would be without prejudice to disputed claims but would avoid delays in adopting necessary conservation measures.[52] This approach to high seas protected areas has been taken in the Mediterranean Sea, as noted in Section II.D.2.

Further specifications in the international fisheries conventions on *habitat restoration and enhancement* should be explored. As the species recover, the relative contributions of the states involved to habitat improvements could be linked to quota allocation. As methods for valuing natural resources and ecological function grow more sophisticated, they will help quantify the benefits of restoration and facilitate its consideration in decision-making.

III.C.1.c. Scientific, Technical, and Financial Support

Table III-4 identifies international sources of scientific and technical support for marine species and habitat conservation, including MCPAs and ICAM. The multilateral development banks and other donor agencies also have substantial technical expertise. All these bodies are struggling with how to integrate MCPAs and ICAM into wider development planning and deal with external threats. Recent initiatives to apply larger-scale regional approaches, such as World Bank support for the Mesoamerican Biological Corridor, may ultimately be extended into coastal/marine regions. These more comprehensive approaches still rely on specialized technical guidance and knowledge of environmentally-sound response options for each sector/activity affecting the areas concerned.

The generic roles of conventions outlined in Section IV are especially applicable to MCPA and ICAM projects. The conventions define objectives and provide an organizing framework for initiatives and results. The more specific the guidance from convention processes, the more meaningful the results. By indicating national and international commitment, convention-designated MCPAs lend authority to the goals and can attract financial support to maintain and restore the area.[53] When the countries concerned agree in addition on *priority* sites for MCPA or ICAM initiatives (achieved with stakeholder involvement), this can significantly enhance prospects for support. Using particular sites as demonstration projects is generally attractive to donors and makes good use of circumscribed areas like MCPAs.

The International Coral Reef Initiative (ICRI) (BOX 3) illustrates the potential of well-defined campaigns for habitat protection to generate scientific, technical, and financial support. Although coral reefs stand out from surrounding areas, there is no reason why similar campaigns

BOX 3

THE INTERNATIONAL CORAL REEF INITIATIVE

ICRI was launched in 1994 to highlight human-induced threats to reefs and mobilize action to reduce them. It recognizes that coral reefs play a vital role in ocean productivity as habitat and feeding grounds for diverse marine species, that they are an important source of food for human populations in many countries, and that they help protect coastal areas from the impacts of storms or wave action. As an attraction for tourism, they generate a significant portion of national revenue and foreign exchange in some regions. In 1992 it was estimated that some 10% of the world's reefs were severely degraded, and that if present trends continued this figure would rise to 30% within two decades. Further analyses of risks to reefs indicate that 58% of the world's reefs are at risk from human activities, with about 27% at high or very high risk.[54]

ICRI serves as an umbrella for many activities. It is jointly sponsored by UNEP, IUCN, and IOC and involves collaboration with several other intergovernmental and non-governmental organizations and with multilateral and bilateral donors. Six regional workshops have been convened under the legal and institutional framework of the regional seas programs to define needs and strategies and identify pilot projects. The Global Coral Reef Monitoring Network (GCRMN) has developed monitoring protocols,[55] while other efforts draw together various tools for reef monitoring and assessment.[56] UNEP is supporting the development of a rapid assessment methodology for coral reefs in the Eastern African region, including biophysical and socio-economic aspects, and a manual for monitoring socio-economic parameters. It expects to establish model protected areas and management areas in the regions and to conduct a detailed analysis of coral reef health in Southeast Asia. Support for these initiatives will come in part from the UN Foundation established with funds donated by Ted Turner.[57]

could not be mounted for less readily identifiable habitat. The key is to make the linkage with species and concerns that capture human interest — at both national and international levels. At the national level, habitat protection and MCPAs could be linked to the species of interest to local consumers and to those who make their livelihood from them. This will engage national commitment, in turn encouraging international support.

III.C.1.d. Accountability: Performance/Progress Review

The major global protected areas conventions have established procedures for monitoring the status of internationally-protected areas, but the broader information programs noted in Table III-2 play a major role with respect to these and other critical habitat. From a broader perspective, the emerging initiatives to assess and monitor ecosystems on a global basis (Section III.A.5.a.), and to identify critical coastal/marine systems and focus in on smaller essential habitat zones (Table III-1) will improve the ability to monitor progress more systematically on an ecosystems basis. While the CBD offers an appropriate forum for maintaining an overview of these issues, ecosystems-based review at the regional level would focus more closely on how particular problems actually affect people in the area and help engage their commitment to address them.

As these assessments provide a clearer indication of threats and their origins, this will indicate whether international goals for particular sectors/activities should be set at a higher level and the applicable convention. It will help identify the need for additional international support to diagnose problems, improve response options, or promote implementation and enforcement at the national level.

Consumer initiatives could be developed to encourage private sector support for activities that are compatible with MCPA designations and discourage those that are not.

III.C.2. Non-Indigenous/Invasive Species Introductions

On a global basis, the invasion of non-indigenous species is ranked second to habitat loss as the major threat to biodiversity, and there is growing evidence that the rate of invasions is accelerating as international trade expands. Section II.D.3 and Tables II-1 and II-8 outline existing international legal instruments governing the subject. This section looks at further management initiatives.

The shift from localized to worldwide concern with invasive species dates to the early 1990s, when both IUCN and the Scientific Committee on Problems of the Environment (SCOPE) of the International Council for Science (ICSU) launched more systematic investigations. IUCN established an SSC/Invasive Species Specialist Group to increase awareness of invasions and how to combat them; through its Environmental Law Programme it has begun study of the legal issues involved.[58] In 1996 IUCN and SCOPE combined forces with other groups to understand and document alien species introductions that threaten biodiversity and to assemble, disseminate, and lay the groundwork for new tools to deal with them. This Global Invasive Species Program (GISP)[59] has become the primary resource for determining how to tackle the problem and is developing a global strategy.

The CBD serves as a useful umbrella at the intergovernmental level for considering the overall effect of different specialized international instruments and processes on the intentional or unintentional introduction of alien species into the marine environment, including GMOs. It collaborates closely with GISP and the individual agencies and programs working in this area, including IUCN, IMO, IOC, FAO, WHO, UNEP, SCOPE, ICES, and the regional marine programs in the Baltic Sea and Southeast Pacific.[60]

III.C.2.a. Information and Assessment to Support Decision-Making

In most regions, information on alien species introduced into the marine environment is limited to a few prominent incidents. Available resources include those on intentional introductions, primarily an FAO database covering freshwater introductions of fish species which now includes mollusks, crustaceans, and marine species;[61] a growing list of unintentional introductions through ships' ballast water; and the first regional assessment of a more comprehensive nature on the distribution of alien species as part of the third Baltic Sea status report in 1997. ICES, IOC, and IMO began a joint study on ship-associated introductions in 1996. The group is working on scientific issues and control options regarding ballast water and sediments. It plans further work on other ship-associated means of introduction like hull fouling and will develop an inventory of databases on matters like algal blooms and invasion hot spots that may be relevant to ballast water introductions.

Under the CBD, GISP and other international agencies are collaborating on information resources. Their goals are to make existing information available through the CBD clearinghouse mechanism; develop a standardized terminology on alien species and consider the need for taxonomic work; produce criteria for assessing risks and a model format for case studies; develop a system for reporting new invasions; and compile an inventory of initiatives on invasive species and a roster of experts to be made available through the CBD clearinghouse. Specifically with respect to marine and coastal issues, the secretariat will cooperate with UNEP, SCOPE, ICES, IUCN and GISP to promote understanding of introductions and their impacts on biodiversity and to establish an "incident list" of introductions through the national reporting process and other means. (CBD/COP, Dec. IV/5 and CBD/SBSTTA, Dec. IV/4)

The potential for trade to introduce non-indigenous species to new areas has led to joint efforts by the CITES committees on animals and plants and the IUCN specialists to review species in international trade

that have the biological potential to become invasive. They will collaborate in developing databases on invasive species. (CITES/COP, Dec. 10.75 and 10.85 (1997)) The CBD's work on standardized terminology and taxonomy will facilitate determinations by customs officials as to whether an import is, in fact, non-indigenous.

The Wetlands Convention will contribute to these international initiatives by helping design a data system that identifies invasive species that pose a threat to wetlands and wetland species. This will include methods for and advice on their control and eradication. Wetlands case studies will be developed as well as wetland-specific guidelines for identifying and managing invasive species and establishing priorities. (Res. VII.14 (1999)) Contracting parties are urged to inventory and assess the risks posed by these species.

III.C.2.b. Technical and Policy Response Options

Of the initiatives noted above, response options are contemplated by the joint study of ship-associated introductions, GISP, and the Wetlands Convention. The IMO is developing binding legal instruments on ship-associated introductions through ballast water and hull fouling. (Section II.D.3.)

The CBD secretariat is to cooperate with GISP in developing principles on prevention and introduction of alien species and mitigation of their impacts, taking into account the draft Guidelines on the Prevention of Biological Diversity Loss Due to Biological Invasions developed by the IUCN specialists. In addition, COP5 is likely to invite GISP to undertake a comprehensive review of existing measures for prevention, early detection, eradication, and control of alien species or their impacts, with priority given to issues arising in geographically and evolutionarily-isolated ecosystems. (CBD/SBSTTA, Dec. IV/4)

The CBD's marine and coastal program will work with IMO, UNEP, and IOC to identify gaps in existing or proposed legal instruments and guidelines on alien species threatening to biodiversity, with particular attention to transboundary effects. Information collected on national and international initiatives will be used to prepare a scientifically-based global strategy to prevent, control, and eradicate alien species that threaten marine and coastal ecosystems, habitats, and species. (CBD/COP, Dec. IV/5)

The CITES animals and plants committees are to cooperate with the IUCN specialists to implement the draft IUCN Guidelines insofar as they relate to trade and transport of live specimens of wildlife species. (CITES/COP, Dec. 10.76 and 10.86 (1997))

III.C.2.c. Scientific, Technical, and Financial Support

GISP serves as a framework for developing and identifying scientific and technical resources to support action on invasive species. Specialists in the FAO and IMO/IOC/ICES joint program on ship-source introductions and networks of experts associated with the Wetlands Convention and IUCN are important sources of expertise.

The "tools" component of GISP is partially funded by the GEF. It covers economic and legal aspects, risk assessment, early warning systems, control options, and education. The goal is to develop best practices and disseminate lessons learned, based on an assessment of current activities in eight countries.[62]

III.C.2.d. Accountability: Performance/Progress Review

Different means of introduction require different enforcement procedures. Customs officers serve as the checkpoint for introductions through international trade and tourism, including the import of alien species for use in mariculture, but national laws must be in place to address these issues. The CBD's Biosafety Protocol will lead to checkpoints for the introduction of GMOs. When it comes to ballast water discharges by foreign ships in national zones of jurisdiction, coastal states may apply national rules within the 12-mile territorial sea and enforce them out to 24 miles; otherwise internationally accepted rules must be in place, which may be enforced by coastal and port states. The next step is for the IMO to adopt binding rules. (Sections II.B.1. and II.D.3.)

On the broader issue of effectiveness, emerging information resources are just beginning to establish baselines against which to judge progress. Evaluating progress in the coastal/marine realm will require not only information on the incidence of introductions but also an assessment of their distribution and impacts in socio-economic and ecological terms.

What Next?

As terminology and taxonomy on alien species are improved and standardized, this will facilitate international cooperation in dealing with introductions. Another important element is a well-organized system of databases on potentially invasive species, actual introductions, potential and actual impacts in different types of ecosystems, and the technical and policy options that hasten detection and respond to each means of introduction (e.g., ships, mariculture, international trade and tourism).

When unintentional introductions occur, international agreements should ensure that potentially affected states are immediately notified. Certain types of introductions may be amenable to contingency planning and emergency response teams. These should have the benefit of prior identification of critical sites that warrant special protection.

For ship-associated introductions, the IMO is the proper forum for further initiatives. It is in the process of developing two new binding instruments. At the same time, small vessels may require further attention, including the need for ballast water reception facilities in marinas. (Section III.D.2.)

For intentional introductions, improved risk assessment and EIA procedures are vital. The CBD's collaborative initiative on risk assessment is in a position to draw attention to the many pathways and sectors involved and those with international dimensions. Its Biosafety Protocol will help ensure that the risks of GMO introductions are assessed and promote a system for advance notification and consent. As noted in Section III.B.1, further work may be needed on monitoring and assessment procedures for introductions through mariculture in both coastal and offshore locations.

At some stage, it may be appropriate to reinforce specialized conventions with a broader international legal framework on non-indigenous/invasive species introductions. The CBD seems an appropriate umbrella under which to design such an instrument. It can also serve as a forum for comprehensive review of these issues.

When it comes to reviewing progress in reducing adverse impacts, this will ultimately have to be undertaken in the context of the impacted resources and natural systems. At this level, the regional marine conventions and programs offer a vehicle for endorsing appropriate monitoring arrangements.

III.C.3. River Basin Management

Section II.D.5 and Table II-10, Maps D1-D8 provide an overview of the international legal arrangements that affect management of watersheds or river basins. They comprise requirements to prevent land-based marine pollution, notably through the regional marine conventions; river basin agreements and the recent framework convention on International Watercourses; and the Wetlands Convention. Very few address changes in freshwater flow that impact coastal/marine species and ecosystems. The guidelines adopted recently under the Wetlands Convention are a welcome though non-binding development that supports an integrated approach to wetlands and river basins *and* takes account of the needs of marine and coastal ecosystems. (Section II.D.2.)

Information resources and assessments that specifically address these freshwater quantity issues are scant. This may be improved in the course of the wetlands inventory contemplated under the Wetlands Convention (Res. VII.20); several further international analyses of freshwater resources; and the GIWA. Two assessments of note that do not focus directly on coastal/marine links are *Watersheds of the World* (1998) and the Stockholm Environment Institute's comprehensive freshwater assessment prepared for the CSD in 1997.[63]

Technical and policy options to support coastal/marine water needs are dependent on an integrated approach to watershed management. Several international programs support such an approach, including the GEF's international waters program, the Global Water Partnership (World Bank, UNDP, and UNEP) launched in 1995; the World Water Council (WWC), set up in 1997/8 as a membership organization to serve as an advocate and think tank on water issues; and the International Network of Basin Organizations.

What Next?

The global programs noted above help draw attention to river basin management and increasingly acknowledge linkages with coastal/marine conservation.

The *World Commission on Dams* presents another opportunity to ensure that linkages among rivers and coastal/marine ecosystems are taken into account. Following recent international controversies over dams, whether as developments projects supported by international donor agencies or as a source of conflict between riparian states, the Commission has been charged with a careful analysis of their role in sustainable development. Twelve independent commissioners designated by the World Bank and IUCN are to undertake a global review of the effectiveness of dams in delivering development benefits; work out a framework for decision-makers and other stakeholders to assess dams and alternatives for water and energy resources, including social, environmental, and institutional issues; and, based on an evaluation of current practice, devise internationally-acceptable criteria, guidelines, and standards for planning, designing, appraising, constructing, operating, monitoring, and decommissioning dams in the future. The decision-making framework and the criteria, guidelines, and standards could integrate coastal/marine needs into watershed planning. The Commission's final report is due in June 2000.

Further efforts are required to forge agreements among riparian states that incorporate the effects of water quality and water allocation on coastal/marine ecosystems. In some cases, the impetus may come from concern over coastal water quality and obligations under the regional marine conventions to tackle land-based sources of marine pollution; in others, it may come from growing awareness at regional and national levels of how habitat degradation affects important local or international fisheries and other marine species. The Wetlands Convention, by indicating when impacts originate in more than one country, could help stimulate international legal arrangements at the river basin level. Its goal of 2000 wetlands by the year 2005 could serve a strategic purpose in this respect.

For targeted management actions, the programs taking an integrated approach to marine and freshwater resources like the GEF's international waters programs and the strategic action plans utilized by both the World Bank and the GEF are particularly useful. (Section III.D.3.)

III.D. Pollution (and Other Disturbances) From Human Activities

If habitat degradation is the most significant threat to marine species, pollution is the most severe threat to habitat and marine ecosystems. Section II.B outlines the international legal regime for marine environmental protection. It divides the issues according to the specialized legal instruments developed to address different sources of pollution: ships, deliberate waste disposal at sea (dumping), offshore activities like oil and gas development, land-based activities, and deep seabed mining beyond national jurisdiction. For pollution deposited to water from the air, it indicates how the specialized international conventions have incorporated air emissions from each source. As a general matter, it is increasingly true that specialized sectoral instruments take on the full range of disturbances caused by the activity in question. Thus, the vessel-source conventions have been extended to cover invasive species, airborne pollution, and physical contact with marine mammals; some of the agreements covering offshore activities encompass airborne pollution and acoustic disturbance; and several fishing conventions emphasize selective fishing gear and methods and accounting for lost or discarded gear. (Sections II.D.1, 2, and 3; II.C. and III.B.2.) The application of the conventions has encouraged a broad definition of pollution that includes sediment mobilization from rivers, dredging, or beach mining as well as a broad rationale for prevention and control that extends from threats to human health and marine species to concerns with preserving ecological function, human livelihood, and quality of life. Recent assessments of the state of coastal/marine resources/environment bring into focus the relative importance of different pollution threats and the risks if present trends continue. They emphasize "coastlines at risk" in light of human concentrations within 50 miles of shore and the congestion of sea-based activities in nearshore zones. In contrast, oil pollution from ships has diminished by about 60 percent since 1981, due largely to international regulation.[64]

This section will review pollution and other disturbances caused by human activities from both a sectoral and a geographic perspective. This allows consideration of the full range of impacts from a given activity as well as their cumulative effects in an ecosystems context. It highlights gaps and linkages among the international instruments dealing with these problems. Like the previous sections on threats to marine species, habitat, and ecological services, it affirms the comparative advantages of regional and global bodies in tackling the different tasks of management outlined in Section III.A.5: it explores the need for information resources that can be integrated in an ecosystems context and for technical and policy response options that are tailored to the individual sectors posing threats once goals and priorities have been agreed; it considers how to better coordinate international technical and financial resources in support of large-scale, ecosystems-based approaches; and it supports mechanisms for accountability at both regional and global levels. (See also Section IV.) Tourism is considered as a special case at the end.

III.D.1. Information and Assessment to Support Decision-Making

III.D.1.a. Ecosystems-Based Assessment

GESAMP has drawn attention to the shortage of information on marine environmental conditions and trends in different regions and its effect on the ability to produce accurate assessments at the regional level and a balanced picture of conditions worldwide. This report has discussed the need for harmonized information resources and assessment procedures, for baseline information, and for databases that allow information to be aggregated in different ways. It draws attention to many existing information and assessment initiatives and some of the gaps. These resources, together with the various indicator initiatives, will ultimately provide a better understanding of the health of marine resources and ecosystems and threats to them.

III.D.1.b. Substances and Sectors

The substances and sectors approach to pollution control facilitates both ecosystems-based assessment and an individualized accounting of contributions by each type of human activity. The former sets the stage for an integrated approach to setting goals and priorities; the latter shapes strategies and response options for each activity to meet agreed goals. It alerts managers to potential impacts and response options that reduce net impacts from each activity.

Substance Assessment Database

The decades-long work undertaken by GESAMP to assess and update information on risks to the marine environment posed by chemical substances has resulted in nearly 2,200 hazard profiles now maintained by the IMO. The database is being redesigned and consideration given to providing internet access to it. GESAMP's revised evaluation procedure is being harmonized with technical work carried out by other international agencies in order to create a globally harmonized system for classification and labelling of chemicals. (Section II.B, "Institutional Roles: Risk Assessment") An easy-to-access and reliable database on toxic and hazardous substances, their risks and pathways related to the marine environment, and appropriate prevention and response measures would make a major contribution to management and capacity-building.

Trade in Substances

The information on hazardous chemicals and pesticides in international trade that will be developed pursuant to the PIC Convention constitutes another building block for a database on hazardous substances. The PIC Convention initially covers 22 pesticides and five industrial chemicals, including seven of the twelve persistent organic pollutants (POPs) on the short list (below). As under CITES and the RFOs, harmonized classification and labelling of chemicals and the assignment of specific Harmonized System (HS) custom codes by the World Customs Organization (PIC Convention, Article 13) will facili-

tate their identification and tracking in trade, including illegal trafficking. Section II.B.2 notes how the PIC Convention will reinforce the conventions on transboundary wastes movements up front, when the substances first enter international trade. The PIC Convention, the POPs conventions, and the transboundary wastes movement conventions can all complement each other with respect to trade statistics. Further documentation of international trade in hazardous substances and wastes (supplemented by any figures on national production, use, and wastes) will provide a rough idea of the cumulative effects they may have on human health and the environment at national and regional levels.

The information base on POPs is developing quickly. POPs consist of three broad categories: pesticides like DDT, industrial chemicals like PCBs, and certain by-products and contaminants that come from combustion and industrial processes. The assessment process for the proposed global convention builds on initial scientific and technical work undertaken in developing the 1998 LRTAP Protocol. (Section II.B.3.) It has affirmed the need for international action on the Protocol's short list of twelve POPs. To take matters further, the global negotiation has established an expert group to develop science-based criteria and a procedure for identifying additional POPs as candidates for future international action. This Criteria Expert Group (CEG) will presumably be coordinated with similar efforts under the LRTAP Protocol. It will consider persistence, bioaccumulation, toxicity, and exposure *in different regions*, taking into account the potential for regional and global transport.

With respect to documentation on listed POPs, the LRTAP Protocol gives an indication of what may be expected in the global instrument. Parties are to collect and report on emissions, production, and sale. Transboundary movements of listed substances are covered as well as destruction (e.g., unused pesticide stockpiles) and disposal, and each contracting party is to endeavor to dispose of listed substances domestically. The Protocol thus creates a closed system for tracking production, use, transport, and sale of the substances and for monitoring destruction, disposal, and transboundary movements. For substances like DDT, where necessary uses like health protection are allowed until suitable alternatives are found, the tracking system will be useful in determining the quantity of pesticide used in a given region and the potential for entry into the marine environment. The monitoring of transboundary waste disposal should be similarly useful. On this subject, LRTAP strives to avoid any overlaps or inconsistencies with the Basel Convention but will supplement it where necessary.

Sector/Activity Assessment

For the *shipping and offshore oil and gas industries*, the full range of potential coastal/marine impacts from pollution and other disturbances is relatively well known. The problem is on the receiving end, where location-based data are not systematically collected or organized, with the possible exception of accidental oilspills. To correct this situation, GESAMP is conducting a study on estimates of oil entering the marine environment from sea-based activities. It will cover shipping and transportation through marine pipelines, offshore and coastal exploration and production, atmospheric emissions from sea-based activities, coastal refineries and storage facilities including reception facilities, oil-contaminated material disposed of at sea, and natural seeps. Land-based sources of oil pollution will be mentioned, but they will not be evaluated in detail. GESAMP has noted that given the geographic aspect of the task, it would be worthwhile to consider developing a GIS in support of the project.[65]

For land-based activities, the 1995 Global Programme of Action for Protection of the Marine Environment from Land-Based Activities (GPA) outlines a comprehensive framework for information management and assessment. Its specialized and practical approach to information resources will be useful for managers in government and individual industries and sectors and help inform other interested parties. The GPA:

- differentiates nine source categories that impact the marine and coastal environment/resources: sewage, POPs, radioactivity, heavy metals, oils (hydrocarbons), nutrients, sediment mobilization, litter/plastics, and physical alterations and destruction of habitats, giving initial priority to sewage and POPs;

- sets out a logical analytical framework for defining and ranking problems and determining objectives at national and regional levels (See "Response Options," below); and

- provides for a multi-organizational clearinghouse mechanism (CHM) to improve access to updated information on each source category, cross-referenced to the individual human activities that produce it. For each category a directory will cover the nature, effects, and pathways of contamination or other causes of degradation; standards and reference methods for monitoring, including data quality assurance techniques; measures and strategies that have been successfully (and unsuccessfully) applied; available practices, techniques, and technologies to prevent, mitigate, and control adverse impacts; and references to organizations and private sources of expertise, experience, and technical or financial support. The directories will be accessible through a computer-based system, with provision for non-electronic delivery. The CHM will have global and regional dimensions, recognizing that collaboration will be required among a large number of governmental, intergovernmental, and non-governmental agencies. At the global level, a "lead agency" for each directory will be responsible for convening experts to prepare and update it. (Table III-7) A pilot project on sewage is being implemented jointly by UNEP, WHO, and the Commission on Human Settlements (HABITAT). At the regional level, the directories may be linked to information of special relevance to the region. UNEP is the secretariat for the GPA and established a Coordination Office for the program in 1999 in The Hague, the Netherlands.

As with data on oil pollution from shipping and offshore activities, the problem with pollution from land-based activities is that there is insufficient data on location-based impacts, and the existing data are usually not well organized or easily accessible. The GPA's systematic framework provides a means of collecting and aggregating the data in logical "source" categories without losing sight of the responsible sectors and activities. As data is improved at the regional level, it can be organized on an ecosystems basis to support integrated assessment. At the same time, through a matrix of source categories and the activities contributing to each, it can help identify priority sectoral concerns.

Dreding/Dumping of Dredge Spoils. Dredge spoils constitute over 80% of materials dumped at sea on a global basis. Both dredging and disposal produce suspended particles that impede photosynthesis, and dredging may stir up and disperse accumulated toxic and hazardous substances. (Section II.B.2.) A focused examination of impacts and good practices is needed.

Deep Seabed Mining. It may be many years before commercial recovery of manganese nodules becomes economically viable, but exploration activities and possible on-site equipment testing will set in motion efforts to collect baseline data and design environmental monitoring programs. The need for clear and common methods to characterize environmental data and effects has already been discussed in meetings sponsored by the International Seabed Authority. Growing interest in polymetallic sulphide deposits, cobalt-rich crusts, and gas hydrates enlarges the area where minerals development could ultimately take place.[66] Moreover, discoveries during the last two decades of unique biological communities in the vicinity of hydrothermal vents in the ocean floor have raised the stakes for measures to protect deepsea biodiversity. The potential value of deepsea genetic resources reinforces the importance of improving knowledge of deepsea benthic communities and how they may be impacted by minerals development.

The Seabed Authority intends to develop environmental databases on the Clarion-Clipperton fracture zone where initial nodule mining is likely to occur. A study is planned to identify relevant data sets in existing repositories, gaps, and how to organize the database. On the "solutions" side, the Authority continues to monitor the development of relevant technologies, in particular relating to marine environmental protection, and plans a database on seabed exploration and mining technology. It has been suggested that the Authority could promote a cooperative research program to assess and avoid possible environmental impacts from deep seabed activities. Program elements might include characterizing biodiversity in the Clarion-Clipperton zone and a taxonomy of benthic fauna, and conducting carefully-controlled experiments to evaluate the disturbance and recovery of benthic communities from deepsea mining.[67] Although the small number of countries presently involved in deepsea activities may argue for giving these information initiatives less priority than, say, databases on land-based sources of marine pollution, international cooperation is likely to reduce costs and improve results. It could expedite the dispersion of environmentally-sound approaches, avoiding many of the mistakes that have been made closer to shore.

Offshore Minerals Activities. The potential expansion within national jurisdiction of mineral resources development other than oil and gas should also be kept under review. (Section II.B.4.) Many of the environmental impacts and evolving technologies catalogued by the ISBA may be equally useful to coastal states, and vice-versa. An international repository may supplement studies at the national level and improve the information base available for national decision-making.

This substances and sectors approach is reinforced by additional strategic analyses:

- *Cleaner production* (CP) refers to preventive strategies to reduce adverse environmental impacts from products (e.g., life cycle analysis), production processes, and services. In some cases, reducing pollution and wastes produces cost-savings as natural resources are used more efficiently and/or recycled. It has been embraced by individual companies and reinforced through national laws. At the international level, UNEP through its Industry and Environment Office in Paris promotes CP initiatives. The first regional report on the status of cleaner production was issued for Asia and the Pacific in 1998. It covers successes, barriers, future goals, and recommendations and will serve as a basis for gauging progress in the region. The listing of CP initiatives and references in the region should be a useful resource for other regions and is expected to help coordinate regional efforts. Similar regional reports are being prepared for Latin America and the Caribbean and Sub-Saharan Africa.[68] The multilateral development banks and UN technical agencies increasingly support CP options in their policies and field projects.

- The *materials flow perspective* is a more ambitious means of tracking societal use of natural resources and materials in order to improve efficiency and reduce pollution and wastes. To date, such efforts have focused primarily at the level of a particular facility or firm. New initiatives have begun to examine materials flow at the level of national economies and, ultimately, individual economic sectors. Such "macro" indicators could expand data and knowledge on the sources of pollution and wastes. The World Resources Institute is involved in a collaborative project to develop macro indicators for material inputs into national industrial economies (e.g., minerals, metals, chemicals, fossil fuels, construction materials, soil erosion). Material outputs will be addressed in a second phase. Subsequent steps will characterize material flows in relation to environment, human health, and the economy. Although municipal wastes in the industrial nations have grown in parallel with rising GDP at 40% since 1980, WRI has estimated that hidden flows associated with the upstream generation of wastes during extraction, manufactur-

ing, and distribution account for as much as three-quarters of the total materials used by major industrial economies. Yet recycling rather than avoiding waste generation is the focus of 80% of current policy efforts.[69] The WRI project and the resulting database should contribute to sector-specific analyses that will inform national and international measures aimed at reducing the generation of wastes at source, throughout the production process. It will advance implementation of the duty stipulated in the LOS Convention not to transform one type of pollution into another. (Article 195) It lends support to a comprehensive approach to wastes reduction, management, and disposal. (Section II.B.2.)

III.D.1.c. Pollution Emergencies

The WCMC maintains an internet-based Oil Spill Planning and Emergency Service to help the oil industry assess the likely impacts of oilspills and respond to them (e.g., in protected areas), with support from the International Petroleum Industry Environmental Conservation Association. The service will be further developed as a GIS-based system.

A major upgrade of the international system to enhance human safety in maritime emergencies, the Global Maritime Distress and Safety System (GMDSS), became fully effective under the SOLAS Convention in February 1999. Among other functions, it is used to disseminate meteorological warnings and forecasts coordinated by the WMO. The WMO is also cooperating with the IMO on a global system for providing meteorological and oceanographic information and services to support response operations in the event of marine pollution emergencies. [70]

What Next?

A Comprehensive Information System: The growing number of international conventions that tackle pollution at source — chemicals and POPs, transboundary wastes movements and dumping, land-based activities and offshore facilities — bodes well for an organized approach to specialized information resources for each type of threat. With adequate planning, these resources can be developed in a manner that facilitates preparation of integrated ecosystems-based assessments as well as other aggregations that highlight, for example, international substance movements, potential pollution problems emanating from watersheds, or the sectors in which more environmentally-sound technologies and practices would have the greatest effect in each region.

The GESAMP report due in the spring of 2000 is expected to identify the most serious problems associated with land-based activities as sewage, physical alteration and destruction of habitat, nutrients, and sediment mobilization. More substantial documentation of these threats on location is essential to improve ecosystems-based assessment. The use of *indicators* to estimate threats can expedite problem diagnoses and agreement on priorities. It would be useful to elaborate and harmonize indicators that reflect more fully the nine GPA source categories and activities contributing to each.

A better and more open system for tracking transboundary movement of all potentially hazardous substances including wastes, both at regional and global levels, is another important element in a comprehensive information system. By supplementing national production and use figures, the data would allow a more complete assessment of potential pollution problems at national and regional levels. Its components could be developed as a joint function of the PIC and Basel Conventions, coordinated with the regional maritime agreements on transboundary wastes movement and the legal instruments on POPs.

An Integrated Approach to Wastes Accounting at National and Regional Levels. The volume of wastes generated by human society increasingly exceeds the capacity of environmentally-sound storage and disposal facilities. Incineration causes air pollution; wastes deposited in coastal and riparian landfills often leach pollutants into the water; trash tossed at random into marshes or onto the beach may be carried out to sea while wastes thrown overboard get washed ashore; and wastes received in port from ships place additional strains on land-based disposal options. Although offshore dumping may be diminishing in some areas, coastal dumping of garbage and local wastes is a growing problem in others. An accounting of all these wastes would help decision-makers develop realistic waste management plans. It would underscore education needs and indicate where new approaches and technologies could minimize wastes generation and marine impacts. Similar studies are needed of the impacts of *dredging and the disposal of dredge spoils* and means to curtail them.

Net Impact Reduction by Sector. At the level of individual industries and other activities, specialized pollution and waste assessment and materials flow analysis will help shape the development of more environmentally-sound technical and policy approaches that reduce net impacts to all natural resources including coastal and marine ecosystems.

Geographic Information Systems (GIS). Further development of GIS-based information resources will be especially useful for development planning and impact assessment and reinforce ecosystem-based assessment.

Emergency Preparedness and Response. The information resources used in planning and response to marine pollution emergencies caused by oil — especially if based on GIS — are likely to assist planners dealing with other types of marine pollution emergencies. It would be useful to examine the extent to which emergency planners in each region make use of these resources and consider how they might be further developed.

III.D.2. Technical and Policy Response Options

The GPA Framework for Analysis

This framework lays out steps for reaching agreement on objectives, priorities, goals, and strategies taking into account all nine source categories. It may be applied at both a national and a regional level. It groups objectives into four general themes: food security and poverty alleviation; public health; coastal and marine resources and ecosystem health, including biodiversity; and social and economic uses and benefits, including cultural values. These serve as reference points for determining priorities among source categories and the activities causing them and among *areas of concern*. Decisions are to take into account the costs, benefits, and feasibility of action, including the costs of inaction. Once priorities are fixed, specific management goals are established for each source category and area affected. These set the stage for a management strategy to achieve the goals, tailored to the relevant industrial, commercial, forest, agricultural, or household operations. The strategy must identify institutional authorities and resources to carry out the tasks of management, including arrangements for inter-sectoral coordination; legal and enforcement mechanisms; financial mechanisms; means to identify and pursue research and data needs; arrangements for contingency planning, human resources development, and public participation and awareness; and criteria for evaluation. It should identify appropriate technologies and practices for each source category/activity, including cleaner production measures, and incentives to help implement them.

The Substances/Sectors Approach

This approach fosters specialized attention to environmentally-sound technologies and practices that can reduce impacts from each sector or activity. Building on regional developments under the Northeast Atlantic and Baltic Sea Conventions, it relies on specialized working groups to evaluate technologies and practices as a basis for recommended approaches. The resulting menu of options is available to international convention processes seeking to agree on reduction targets for particular source categories or, at a more detailed level, on specific measures or technologies/practices. The regional marine conventions increasingly identify the particular *land-based* sectors and industries to be considered in setting priorities; for example, energy production, non-point agricultural sources, intensive animal rearing operations, mariculture, fertilizer production, tourism, chemical industries, extractive industries and mining, food processing operations, pulp and paper factories, sugar factories and distilleries, oil refineries, harbor operations, and domestic sewage. This gives momentum to further work to identify specialized technologies and practices. In the Northeast Atlantic, working groups have focused on particular industries; nutrients, with a subgroup on agricultural nutrients; coastal activities, including dredging; and offshore hydrocarbons, the latter in consultation with the group responsible for pollution from ships. In the Caribbean, annexes to the 1999 Protocol are supported by regional technical reports that describe management practices and technologies to control sewage and non-point agricultural pollution appropriate for the region. (Table III-6)

With respect to *dumping,* IMO specialists are preparing a package of guidelines for each of the wastes that may be dumped at sea under the 1996 Protocol to the London Convention. (Section II.B.2.)

For *ships,* the continual revision and updating of technical measures pursuant to the IMO Conventions and Codes (Table II-1), and growing recourse to mandatory rather than recommendatory measures, have increased reliance on technical working groups that have long been a feature of the IMO work program. These groups must address equipment and construction standards for ships as well as standards for manning and crew competence, measures for protecting vulnerable areas from ship-source impacts, and systems for worldwide communications and response to vessel emergencies. The technical study launched by the IMO in 1998 to examine options for achieving reductions in GHG emissions from ships is one more example.

What Next?

The *GPA calls for integrated national and regional strategies* to address cumulative impacts, based on the integrity of ecosystems and ecosystem functions. It recognizes the links between management of coastal areas and watersheds and the need to coordinate with sea-based activities like fishing, shipping, offshore activities, and dumping. Its analytical framework could easily incorporate non-pollution impacts due to fishing practices, mariculture, and tourism as well as pollution and other impacts from offshore facilities and shipping. In this way, it could serve a wider purpose in the development of integrated assessment and response strategies at national and regional levels. If such an analytical framework were adapted as technical guidance pursuant to the regional seas and other relevant conventions, it would reinforce integrated approaches and promote coordination among the different conventions. Transboundary MCPA and ICAM initiatives that address a wide range of pollution and other impacts, with particular reference to wetlands, could be used to test the waters for integrated approaches at subregional and regional levels.

Very few specialized technical measures on *land-based marine pollution* have been adopted pursuant to the regional conventions. At the same time, the international technical agencies and the multilateral development banks, notably the World Bank, have adopted a number of technical guidelines and directives for project development and implementation. (Table III-6) In the context of developing the "supply side toolkit" contemplated for the GPA and the CHM (below), it would be useful to include these measures as a reference point for national action and international agreements.

The substances/sectors approach to marine pollution control can be advanced through the use of technical experts in particular sectors to identify environmentally sound options and improvements needed. The

use of such specialized groups at the regional level has merit, but a global approach that takes into account variations in regional conditions may be more cost-effective. This could be organized through the lead agency process contemplated under the GPA/CHM, but should include experts from the MDBs, the private sector, and other technical institutions. These groups could make use of cleaner production and materials flow analyses in devising technical and policy response options. Regional adaptations of the option lists could then be prepared.

An integrated approach to managing waste. The initial step suggested at (a) above of quantifying wastes and marine debris entering the marine environment from all sources in a given region should point to additional strategies for wastes management, including reduction and re-use. Larger quantities may warrant cooperative regional operations while small, targeted facilities may be more appropriate in other locations. (See "shipping sector" below.)

The IMO Special Area restrictions, which prohibit discharge of food wastes from ships within twelve nautical miles of the nearest land (baseline) and all discharge of oil or oily wastes mixtures, raise the possibility of a consistent approach with regard to land-based wastes reaching the sea or coastal dumping of garbage. This would advance an integrated wastes reduction and management strategy.[71]

In the shipping sector, one gap in international coverage occurs in relation to *port reception facilities for vessel wastes*, notably dirty ballast water, oily wastes, and garbage. Reception facilities are particularly important in MARPOL 73/78 "Special Areas" so that vessels can comply with discharge restrictions. The inadequacy of reception facilities in some areas is considered the main reason for marine pollution. To help address this issue, the IMO has developed a new user-friendly form for ships' masters to report alleged inadequacies in reception facilities to flag and port states.[72] This should help pinpoint where further efforts are needed.

A second gap affects *small pleasure craft and fishing vessels*, which may lack pollution control equipment on board ship and find that waste reception facilities in small harbors and marinas are inadequate. These vessels often fall below the minimum size requirements of the major IMO conventions on pollution control.[73] The safety of fishing vessels and fishermen on board craft of 24 meters or longer has been addressed by the global conventions, although the IMO is turning to non-binding measures since the conventions are not in force. The FAO Code of Conduct for Responsible Fisheries has also addressed pollution from fishing vessels. (Section II.C.) In 1998, the IMO's Marine Environment Protection Committee decided to include in its long-term work plan the development of measures to prevent pollution from small craft. Pollution control and safety issues have already been taken up at the regional level through some of the port state control arrangements. (Section II.B.1) In addition, the countries of the Caribbean and Baltic Seas have adopted non-binding measures recommending garbage retention and reception facilities in small ports and marinas.[74] The former applies only to leisure craft, the latter to all small craft. Under the emergency preparedness and response protocols for the Black and Mediterranean Seas, there is provision for response to accumulations of small discharges from vessels. This problem should be examined in regions where there are many small craft so that coherent response strategies can be developed. This may involve a combination of national and international legal developments, but interim approaches could rely on self-policing through recreational boating associations in collaboration with passengers and shore-based volunteers.

Offshore Facilities. In some regions where offshore oil and gas development occurs there are not yet agreed measures (Table II-5), although national standards may be sufficient or industry standards may govern worldwide operations. For the Arctic region, guidelines and an emergency response manual have been developed under Arctic Council auspices. In the Wider Caribbean, oil refineries will ultimately be covered under the protocol on land-based pollution, but it does not appear that offshore facilities will be covered. When offshore facilities, pipelines, and shore-based refineries are directly linked, a single, sector-based approach seems preferable. The examination by the IMO of the applicability of its conventions to floating production, storage, and operations units within national jurisdiction may help establish a baseline for these activities. (Section II.B.4.)

Growing recourse to offshore facilities for other types of activities from mariculture and airports to the launching of spacecraft warrants closer examination of the means to assess and avoid adverse impacts and the need for international legal instruments.

For *deep seabed mining*, the International Seabed Authority's planned database on seabed exploration and mining technology noted in section (a) above may help identify environmentally-sound options for decisions both within and beyond national jurisdiction.

International requirements and guidelines for *environmental impact assessment* increasingly refer explicitly to coastal and marine impacts and identify the types of activities that should be assessed in transboundary situations. (Section II.B.7.) The CBD's call for each party to identify processes and categories of activities that significantly impact biodiversity is consistent with this approach; the CBD's marine and coastal program could collaborate with the regional marine conventions and programs in highlighting activities potentially harmful to these areas and ensuring that EIA guidance is clear on potential marine and coastal impacts. Collaboration with the Wetlands Convention would also be appropriate.

A thorough review of both commonalities and specialized requirements under the various *emergency preparedness and response* instruments at global and regional levels is needed. These cover ships, offshore oil and gas operations, and chemical facilities and industrial accidents that impact both land and sea areas. At the regional level, actual capabilities for planning and responding to different types of

marine pollution emergencies may need to be improved, with a clear focus on the threats posed by different substances and sectors. While the identification of sensitive areas may be common to the different threats, response measures and equipment may need to be more specialized and the contact points for emergency communications may vary. Moreover, response plans for land-based emergencies in coastal and watershed areas may need to be coordinated with those for sea-based emergencies, and contingency plans for facilities likely to be affected by natural disasters should provide for containing damage to critical natural areas in the coastal/marine environment. In general, global communications and support arrangements should be designed to reinforce regional arrangements.

In order to avoid vessel accidents, serious deficiencies in hydrographic surveys and charts should be addressed, with particular attention to vulnerable areas.

The potential adverse effects in the marine environment of emergency response and clean-up techniques should be assessed in advance, so that situation-specific decisions on the spur of the moment are based on well-founded analyses and criteria.

The International Trade and Investment Potential. As interest develops in regional free trade agreements, this offers opportunities (and pitfalls) in advancing marine environmental protection. In the ASEAN region, the decision to establish a free trade area influenced agreement on targets and timetables to achieve harmonized ambient air and water quality standards and on a long-term commitment to establish goals for coastal water quality. Regional free trade initiatives and the possibility of joining the North American Free Trade Agreement (NAFTA) increased interest in the Caribbean in developing agreed goals for a protocol on land-based marine pollution. Such opportunities should be explored carefully in developing more detailed regional agreements on marine pollution control.

III.D.3. Scientific, Technical, and Financial Support

The options for international support to deal with marine pollution span a wide range of actors at global and regional levels: technical UN agencies, multilateral development banks, NGOs, academic and private research institutions, private foundations, bilateral donors, and private commercial operators. A few concentrate on particular sectors like shipping, while others tackle all types of problems. (Tables III-6 and III-7) The challenge is to cohere this support so that it is mutually reinforcing and capitalizes on the specialized niche of each. Today there are a growing number of partnerships among these actors. Less well established is the idea that if priorities are identified at national and regional levels, this encourages more coherent international support responsive to concerns in the region. As discussed in Section III.A.5.c, an ecosystems-based assessment can highlight linkages and lead to a more well-founded definition of priorities.

One of the major goals of the *GPA* is to mobilize scientific, technical, and financial support behind well-organized national and regional action programs. The advantage of the GPA's analytical framework is that it leads systematically to priority identification and thus channels external financing toward key national and regional concerns. A related strategy for identifying priorities, first utilized in the Baltic Sea program, is the identification of "*hot spots*" with major pollution problems. Once each country has determined its national hot spots, governments agree collectively on those having regional priority and these serve as the basis for a regional financing strategy. Regional programs on land-based activities have already been developed in the Arctic and the Mediterranean, and the Mediterranean region adopted guidelines in 1997 to help states prepare their national programs. A report on Mediterranean hot spots and sensitive areas was completed in 1999.[75] UNEP reports that regional action programs have been formulated in six regions, but notes that in most cases the issues, problems, and actions specified are too generic to enable practical action to be instigated.[76] As an example of the specificity required, it points out that sewage comprises many components that require different strategies and mitigation measures, including point and non-point sources, sludge disposal, storm water run-off, and industrial waste mixed in with sewage. Moreover, some components, such as nutrients, may not have to be entirely removed from wastewater.[77] This has led to a more elaborated "toolkit" strategy (below).

UNEP's GPA Coordination Office, which began functioning officially in November 1997 in the Hague, is responsible for promoting and supporting effective action at national, regional, and global levels. The regional workshops it has convened have in most cases identified sewage as the first priority. During the 2000-2001 period, the Office will concentrate on a strategic plan for sewage, developing the sewage node of the CHM at global and regional levels, and the global conference on sewage expected to take place in 2001. It has been agreed with the regional marine conventions and programs that the Coordination Office will support five clusters of activities for implementation at the regional level: helping determine the stage reached by each regional program on land-based activities (problem identification and assessment; solution identification and action planning; solution implementation; evaluation); preparing a "toolkit" of strategies, measures, and policy options for dealing with each source-category, from problem diagnosis through review and evaluation, including references to successful applications (supply side); preparing a priority list of regional and national needs (demand side); systematically brokering deals between supply and demand with potential donors; and conducting evaluation and review.[78] An additional category of support recommended by the regional programs is the preparation of periodic overviews of the many national, regional, and international programs contributing to GPA implementation. Again, progress toward ecosystems-based assessment will help countries at national and regional levels to define priorities, based on the integrity of ecosystems and ecosystem function as specified in the Programme of Action.

Two other components of UNEP have a special role to play in curbing marine pollution. The *Industry and Environment Office* in Paris concentrates on cleaner production (CP) and has a network of regional centers, sponsored jointly with the UN Industrial Development Organization (UNIDO). In a 1998 discussion of opportunities and barriers to CP investments, the participants noted that while funds are available, there is a lack of good projects and of mechanisms to access the funds. Another deficiency is in personnel trained to transform CP options from assessments into bankable proposals. It was suggested that new investment procedures/mechanisms are needed to facilitate project identification and funding, backed up with national legal and economic instruments.[79] UNEP's *International Environment Technology Center* in Tokyo has a program to promote environmentally-sound technologies for urban wastewater and storm water management and to assist small island states in managing liquid, solid, and hazardous wastes in an integrated manner.[80]

From a substances perspective, the *Basel Convention* has endorsed and promoted the establishment of regional training and technology centers to support environmentally-sound management of hazardous and other wastes and waste minimization strategies.

The IMO established a technical cooperation program for developing nations in 1977, which covers both shipping and IMO responsibilities vis-à-vis the London Convention (dumping).[81] These strengths are recognized in its designation as lead agency for oils and litter in the GPA/CHM.[82] By structuring objectives and priorities on a region-by-region basis for both donors and recipients, this program now provides clear directions for fund-raising and program development. Two major goals are to foster regional cooperation for implementing and enforcing IMO instruments, including port state control arrangements that cover the globe, and to enhance regional cooperation in protecting the marine environment from pollution emergencies.[83] The IMO's special niche in responding to marine pollution emergencies caused by oil-spills gives it an advantage in extending its support to cover marine pollution emergencies from other hazardous and noxious substances, and to cover offshore facilities as well as ships.

The niche of *private industry* in pollution control and waste management initiatives is expanding, notably in the tourism industry (below). Another promising example is the Clean Caribbean Cooperative comprised of oil companies based in the Caribbean. The companies have pooled their resources to help countries respond to oil-spill emergencies. A stockpile of equipment and oil dispersants can be quickly mobilized to any location in the region. The cooperative has also supported regional training programs.[84]

The GEF plays a valuable support role in two respects: it supports pilot projects to develop and test new approaches that may be replicated elsewhere; and it promotes an integrated approach not only to marine and freshwaters through the international waters (IW) program but throughout all its program areas. The IW program targets trans-boundary impacts and impacts on critical habitat caused by land-based pollution, physical degradation, the introduction of non-indigenous species, and overexploitation of living and non-living resources (including freshwater). Two program elements emphasize international collaboration and comprehensive approaches: in relation to trans-boundary freshwater systems and LMEs, and in relation to integrated land and water management with special attention to the needs of small island developing states. A strategic action plan (SAP) may be developed to get initial agreement on system-wide actions and priorities among the countries concerned, not all of which will be undertaken under GEF auspices. The IW program specifically notes that linkages with numerous international agreements represent an opportunity for countries to forge *comprehensive regional approaches*. Moreover, it complements the GEF biodiversity program on coastal, marine, and freshwater systems, which covers wetlands, estuaries, and mangroves with a special focus on topical island ecosystems. Even the GEF climate program in its studies of vulnerability to climate change can improve understanding of the sensitivity of coastal/marine ecosystems and outline policy options and policy frameworks for response action, including the roles and opportunities of the oceans conventions.

The third, contaminant-based element of the IW program is not tied to a multi-country initiative but concentrates instead on demonstration projects and pilot tests. Examples include ship-related concerns like chemical washings or alien species introductions and long-range transport of POPs. In the Wider Caribbean the GEF has tried to tackle wastes management in an integrated manner so that adequate reception facilities for wastes from ships are combined with adequate land-based facilities. In relation to POPs, the GEF is funding a global scientific assessment of persistent toxic substances at the regional level to provide guidance and determine regional priorities; it has expressed willingness to serve as the financial mechanism for the new global convention. In keeping with the Caribbean regional seas program, it will assist four countries in the region to develop agricultural pesticide management programs to reduce run-off.[85]

What Next?

The idea of a *partnership market meeting* has been developed to bring all potential donors to the table to consider well-organized national or regional action programs on land-based activities, developed in accordance with the GPA framework. Its purpose is to identify potential partners in a coherent and cost-effective manner and to involve them from the beginning in planning and implementation. Follow-up projects may range from major loans and infrastructure development to technology purchase or beach clean-up. The private sector plays an important role in creating a business plan for selected elements of the national or regional program in an attractive format keyed to business interests; in identifying financing options; and in developing sustained working relationships with the non-governmental community and government institutions. The level of detail contemplated in the business plan

is what gives the private sector something to respond to. As this new approach to link development assistance and marine environmental protection is tested, its expected benefits include strengthening the role of states and regional organizations in sustainable ocean management and greater engagement, collaboration, and flexibility on the part of all potential actors. Through open discussion of problems and solutions, the degree of coordination needed at local, national, and regional levels should be more clearly defined. [86]

There is a need to transform cleaner production options into bankable proposals. The business plan proposed as part of the partnership market meeting can help define what is required to attract private investment. This, in turn, may point to additional ways in which national and international law and policy can improve prospects for CP investments through goal-setting and other measures.

The GEF has important roles to play in supporting both well-integrated initiatives and promising response measures for particular substances and sectors, and in stimulating collaboration among different actors.

As the GPA Coordination Office concentrates initially on sewage and the global conference in 2001 to broker partnerships for sewage management, it will be important to develop approaches that lead into the larger suite of problems encompassed in the GPA source categories and thus expedite the development of well-integrated national and regional action programs. The seriousness of nutrients, sediment mobilization, and physical alterations and degradation of habitat underscored by GESAMP warrant special attention.

As the regional marine conventions and programs develop their initiatives and measures to control adverse impacts from land-based activities, synergies should be developed with the various regional CP centers and the regional capacity-building centers for hazardous and other wastes established pursuant to the Basel Convention.

III.D.4. Accountability: Performance/Progress Review

A significant recent development in the *enforcement regime for international shipping* grants the IMO for the first time a role in reviewing whether the contracting parties to the STCW Convention have met its requirements, based on information submitted by each contracting party. (Section II.B.1 considers enforcement of IMO conventions more generally.) After reviewing national submissions, the IMO's Maritime Safety Committee prepares a list of parties whose implementing measures meet the minimum requirements of the Convention. The implication for those nations that are not on the list is that certificates issued by them will not be accepted as *prima facie* evidence of seafarer competence. As a result, the vessels on which these seafarers are sailing may suffer long delays in port as inspectors verify competence, and the seafarers may find themselves unemployed.[87] This gets at the problem of inadequate verification of crew competency by some states, a problem analogous to "flag of convenience" states granting papers to substandard ships. The IMO's "white list" of nations whose crew qualification procedures meet international requirements is a useful supplement to inspection and verification of vessel safety and pollution requirements. In another new initiative, the IMO has adopted a self-assessment form for flag states, based on uniform criteria, to voluntarily review their own performance in exercising control over their ships and ensuring that they comply with international rules and regulations. States are encouraged to use the form in seeking technical assistance through the IMO, and the submissions will be used in establishing a database that allows the IMO to better promote consistent and effective implementation of its conventions.[88]

From an "effectiveness" perspective, there are a growing number of initiatives tending toward more detailed and comprehensive, ecosystems-based assessment at the regional level. The GPA calls for regular intergovernmental review of (i) scientific assessments of the state of the marine environment and (ii) GPA implementation, including regional initiatives, inter-regional information exchange, capacity-building and resources mobilization, inter-agency coordination, and national actions. This will be undertaken at periodic intergovernmental meetings convened by UNEP, beginning in 2001. By establishing close links between ecosystems-based assessment and the management regimes represented by the regional marine conventions and programs, these reviews can focus on key problems and priorities in an ecosystems context.

At the global level, the sustainable development review carried out every five years by the CSD and the comprehensive oceans review carried out annually in the UN General Assembly represent other components of an intergovernmental review process covering the full range of pollution and other disturbances of the marine environment caused by human activities. They can draw attention to emerging issues and trends, problems shared by more than one region, and ecological linkages. They can also provide direction for collaborative support programs among specialized regional and global fora. UNEP plays a useful role in inter-secretariat coordination through the consultations it has initiated among the regional marine conventions and programs and relevant global conventions and by focusing these on particular topics like biodiversity (1999) and chemical issues (2000).[89]

What Next?

The IMO is developing a *Universal Shipborne Automatic Identification System (AIS)* that will automatically provide coastal states and other ships and aircraft with information on a ship's identity and movement and other safety factors like the type of cargo. The AIS will function with the accuracy and frequency needed to track ships and eliminate the need for them to report by radio.[90] These systems are only likely to be required on ships built after entry into force of the relevant measures (expected mid-2000).[91] An international ship information database will assist port and flag states in controlling substandard ships.

A system of *self-policing through recreational boating associations*, in collaboration with passengers and shore-based volunteers, to curtail pollution and other disturbances caused by small pleasure craft and fishing vessels has been suggested in the previous section.

As agreed measures evolve under the regional agreements that govern pollution and other disturbances from activities taking place within national jurisdiction, common approaches to reporting and verification should continue to evolve. Consumer initiatives may complement these arrangements.

Further regional approaches to effectiveness are discussed in Section IV.

III.D.5. Tourism/Recreation

The private tourism industry presents a special case. It is highly dependent on a healthy, attractive coastal/marine environment. At the same time, it may heavily impact these areas through activities on land and at sea: establishment of resort facilities and marinas, use of resources, wastes generation, recreational fishing, pollution from pleasure craft and larger tour ships, physical destruction of coral reefs from diving and ship groundings, and introduction of alien species. Moreover, tourism is a worldwide phenomenon that shifts easily to a new locale as the old one loses its shine. There are a number of new approaches to responsible tourism, many founded on *consumer initiatives*. CSD7 in 1999 endorsed a work program on tourism, and the secretariat will collaborate with the World Tourism Organization in establishing a working group to promote sustainable tourism development. It invited the CBD/COP to contribute to international guidelines for sustainable tourism development, including in vulnerable marine and coastal ecosystems, protected areas, and habitats of major importance for biodiversity. The CBD is expected to take part in the CSD process.[92]

Once an inventory of existing measures has been developed, this may point to the need for further elaboration or harmonization at regional or global levels or in relation to particular activities; for example, agreement on a code of practice for divers and pleasure craft in the vicinity of coral reefs or agreement among major international hotel chains on siting and waste management practices. Voluntary compliance with such a code could be reinforced if it were endorsed pursuant to one or more relevant conventions (e.g., regional marine, Wetlands). Certain measures may even be adopted as binding rules. In the Arctic, Principles and Codes of Conduct for Arctic Tourism, developed through a WWF project, helped change operational procedures in certain tourism enterprises cooperating in pilot projects, for example through recycling and more intensive education of clients. WWF plans to build further partnerships with the tourism industry and other stakeholders and will investigate the feasibility and utility of certification at a regional or industry level.[93] For some conventions, further assessment may be required to determine how tourism affects specific objectives; for example, study of the potential adverse effects of whale-watching and other recreational activities on small cetaceans has led to a recommendation that national guidelines be adopted to minimize such disturbance under the CMS Baltic/North Seas Agreement.[94]

What Next?

In principle, the private tourism industry should have a direct interest in education and practical guidance that helps maintain and enhance natural resources in areas visited by tourists. The CSD's umbrella initiative could help identify the need for more specialized approaches and potential targets of opportunity: in different sectors of the tourism industry (e.g., hotels, transport, retail), in different regions, or at the global level and through particular conventions.

Additional consumer initiatives promoting responsible tourism could be developed, as contemplated by WWF and in the World Bank's MMTI initiative. (Section III.B.4.)

The evaluation undertaken in the CBD context may need to be elaborated with reference to particular regional situations. For example, three training manuals on Water and Solid Waste Management for the Tourism Industry, ICAM and Tourism, and Siting and Design of Tourist Facilities are being developed through the Caribbean regional marine program for use by educational and training institutions and individuals involved in the tourism industry. Pilot demonstration projects for sustainable tourism are also underway.[95]

The GEF is developing a global project on best practices for integrating biodiversity considerations into the tourism sector. More specialized applications may then evolve.

ENDNOTES

1 Use of the term "regional" in this report includes the concept of smaller, subregional divisions.

2 Recently, action plans have been adopted together with binding legal instruments and are considered an integral part of the instrument, with the national actions called for subject to review by contracting parties (e.g., 1995 CMS/Waterbirds).

3 "Large Scale Ecosystem Management With Special Reference to the Marine and Coastal Environment," draft prepared by IUCN, UNEP and WWF as a discussion document for the workshop convened by the Ecosystem Conservation Group during CSD7 in New York, April 1999. For further elaboration, see "Large Marine Ecosystems and Ecoregions: Tools for Marine Conservation," a draft prepared by D. Olson (WWF), E. Dinerstein (WWF), K. Sherman (NOAA-NMFS), and J. Waugh (IUCN-US), 1999; and Kenton R. Miller, *Balancing the Scales: Guidelines for Increasing Biodiversity's Chances Through Bioregional Management* (WRI 1996).

4 For a brief summary of schemes for classifying large ocean units to achieve management goals, see "Large Marine Ecosystems and Ecoregions: Tools for Marine Conservation," *supra* note 3.

5 The biodiversity-related conventions launched an initiative of this type in 1998, developed by the WCMC. See Timothy H. Johnson, Ian K. Crain, Martin V. Sneary, *Feasibility Study for a Harmonised Information Management Infrastructure for Biodiversity-related Treaties,* WCMC, August 1998. A new joint website links analogous sections of each convention's website at http://www.biodiv.org/rio-conv/websites.html.

6 Report of the 28th session of GESAMP, 20-24 April 1998, Rep. Stud. GESAMP No. 66 at 38-39.

7 The need to improve oceanic data launched an effort in 1989 to establish a systematic, multidisciplinary GOOS containing four modules: climate, coasts, health of the ocean, and living marine resources. The program was developed by IOC, WMO, and UNEP, supported by ICSU. It comprises a major element of the Global Climate Observing System (GCOS). Planning for the climate module is most advanced because it draws on earlier global programs, but progress has been slow. The coastal program has finally been approved. Pilot phase activities cover sea-level change and coastal flooding; coastal circulation; assessment of organic carbon accumulation in surface coastal sediments; changes in plankton community structure; benthic communities of coral reef ecosystems; and terrestrial vegetation in mangrove communities.

8 Warren S. Wooster, "Report on GOOS Living Marine Resource Panel Meeting," *PICES Press,* vol. 7, no. 1, Jan. 1999 at 19 and vol. 7, no. 2, July 1999 at 38-39; S. Narayanan, "ICES and GOOS: A Progress Report," *PICES Press,* vol. 7, no. 2, July 1999 at 40.

9 The creation in 1999 of a joint IOC/WMO expert technical commission for oceanography and marine meteorology represents a pooling of resources and expertise to meet operational needs for oceanic monitoring and forecasting and to serve climate monitoring, research, and prediction. [UN Doc. A/54/429, 30 Sept. 1999 at para. 622]

10 GESAMP's third comprehensive global ocean assessment, undertaken cooperatively with the GIWA, will be available in 2002. (The first two were completed in 1982 and 1990, Table I-2.) Two additional reports are due in May 2000: a biennial assessment of the state of the marine environment and a report on land-based sources and activities affecting the quality and uses of the marine, coastal and associated freshwater environment. These will include regional overviews. The ROPME/Gulf and Eastern African Region reports are UNEP Regional Seas Reports and Studies No. 166 and 167 (1998). Those for the Wider Caribbean, Upper South-West Atlantic, West and Central Africa, Red Sea and Gulf of Aden, and South-East Pacific will be published by UNEP in 1999. Comprehensive regional assessments of the quality, or status, of the marine environment have been produced in the North Sea since 1987 and in the Baltic Sea since 1986. The first major Arctic Ocean pollution assessment was produced in 1997, followed by a more detailed scientific and technical report in 1998. A comparable biodiversity assessment is expected in the year 2000. See *AMAP Assessment Report: Arctic Pollution Issues*. Arctic Monitoring and Assessment Programme (AMAP), 1998; *Arctic Pollution Issues: A State of the Arctic Environment Report,* AMAP 1997. [*WWF Arctic Bulletin,* no. 4 (1998) at 6, 7]

11 In the Asia/Pacific region, in relation to assessments carried out by UNEP, the Asian Development Bank, the UN Regional Commission ESCAP, ASEAN, and others. [Final Report: Conclusions and Recommendations of the Regional Consultative Meeting on Sustainable Development in Asia and the Pacific, Manila, Philippines, 10-12 Nov. 1998, in *Sustainable Development: Asian and Pacific Perspectives* (Asian Development Bank, 1999) at 6. This might be further coordinated with GIWA and the evolving regional networks of the Intergovernmental Panel on Climate Change (IPCC).

12 For further information and a survey of related science assessments, see http://www.ma-secretariat.org.

13 The OECD pioneered the pressure/state/response model for indicators. Recent reports on this subject include *Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development* (World Bank, 1997); *Indicators of Sustainable Development: Framework and Methodologies* (UN Dept. for Policy Coordination and Sustainable Development, 1996); *Monitoring Environmental Progress: A Report on Work in Progress* (World Bank, 1995); and Allen Hammond *et al.*, *Environmental Indicators: A Systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Context of Sustainable Development* (WRI, 1995). See also http://www.worldbank.org for links to indicator initiatives.

14 The CSD sponsors an inter-agency effort developing and testing a large set of 142 indicators. Those most relevant to oceans are found in the lists related to *Agenda 21* chapters 17 on oceans, 18 on freshwater, 14 on sustainable agriculture and rural development, 19 on toxic chemicals, and 20-22 on waste issues. The information may have to be further refined to be meaningful in the context of the oceans conventions. See http://www.un.org/esa/sustdev/indisd/english/worklist.htm for the list.

15 *Biological Indicators and their Use in the Measurement of the Condition of the Marine Environment,* Rep. Stud. GESAMP 55 (1995), to measure exposure to contaminants and their effects.

16 *Exploring Biodiversity Indicators and Targets under the CBD: A Synthesis Report of the Sixth Global Biodiversity Forum 1997,* eds. Sheldon Cohen and Stanley W. Burgiel (BIONET, IUCN, 1998) at 28.

17 *Environment Matters,* World Bank, Fall 1998 at 48.

18 D. Bryant, L. Burke, J. McManus, M. Spalding, *Reefs at Risk: A Map-Based Indicator of Threats to the World's Coral Reefs,* WRI, ICLARM, WCMC, UNEP (WRI, 1998); and D. Bryant, E. Rodenburg, T. Cox, D. Nielsen, *Coastlines at Risk: An Index of Potential Development-Related Threats to Coastal Ecosystems* (WRI Indicator Brief, 1995). For TNC study, see *infra* note 41.

19 C. Revenga, S. Murray, J. Abramovitz, A. Hammond, *Watersheds of the World: Ecological Value and Vulnerability* (WRI, Worldwatch, 1998).

20 SEAPOL E-News, Jan.-Feb. 1999. Email: seapol@asianet.co.th. Website: http://www.seapol.net.

21 UNEP has begun to convene joint meetings of regional seas conventions and action plans and relevant global conventions. See Report of the Second Global Meeting of Regional Seas Conventions and Action Plans, UNEP (DEC)/RS.2/10, 11 Aug. 1999.

22 The United Nations took several actions in 1998-99 to strengthen coordination among components of the UN system active at the regional level and between these organs and subregional and regional bodies that are not part of the UN system. It is working on criteria to help identify the comparative advantages of regional and global UN bodies in relation to the tasks of research and analysis, norm-setting,

and operational activities (technical assistance, training, project execution). [UN Doc. E/1998/65, 24 June 1998 at paras. 4, 5, 12, 29, 31, 33, 34] In the Rio+5 Programme for the Further Implementation of *Agenda 21* (1997), the CSD was urged to promote greater regional implementation in cooperation with relevant regional bodies. Regional approaches to the environmental conventions have been cited in this context. [*Sustainable Development: Asian and Pacific Perspectives, supra* note 11]

23 For several years the CSD, through the UN Inter-Agency Committee on Sustainable Development (IACSD), has promoted the development of this integrated reporting framework. It provides the basis for country profiles prepared for the CSD. In 1997 it was agreed that secretariats of relevant conventions should participate in the process along with the UN system organizations. The narrower initiative of the biodiversity-related conventions also addresses complementarity among reporting systems, *supra* note 5.

24 *Marine Biodiversity: patterns, threats and conservation needs.* GESAMP Rep.Stud. 62 (1997) at 1-3.

25 *A Global Representative System of MPAs (GRSMPA),* eds. G. Kelleher, C. Bleakley, and S. Wells, Great Barrier Reef Marine Park Authority, The World Bank, and IUCN (World Bank, 1995), vol. I at 14-15.

26 *The Diversity of the Seas: a regional approach,* eds. B. Groombridge and M.D. Jenkins, WCMC Biodiversity Series No. 4 (World Conservation Press, 1996) at 40, 73, 82, 110.

27 Gareth Porter, *Estimating Overcapacity in the Global Fishing Fleet* (WWF-US 1998); I. Lutchman and D.D. Hoggarth, *Net Losses: Untying the Gordian Knot of Fishing Capacity* (IUCN, 1999).

28 Available at http://www.fao.org/WAICENT/FAOINFO/FISHERY/IPA/capace.htm.

29 Statement issued by GESAMP at its 28th session, April 20-24, 1998, reprinted in *IMO News,* no. 3 (1998) at 23.

30 Report of the Ad hoc Expert Meeting on Indicators and Criteria of Sustainable Shrimp Culture. Rome, Italy, 28-30 April 1998. FAO Fish. Rep. 582 (1998).

31 *Guidelines for Marine Protected Areas,* 2nd edition, ed. G. Kelleher (IUCN 2000).

32 W. Reid, C. Barber, and A. La Vina, "Translating Genetic Resource Rights into Sustainable Development: Gene Cooperatives, the Biotrade and Lessons from the Philippines," *Plant Genetic Resources Newsletter* (102), 1995.

33 UN Doc. UNEP/CBD/ISOC/3, 11 May 1999 at para. 18.

34 In this respect, the provisions of the 1995 FSA are modeled on the 1994 Bering Sea Convention.

35 TRAFFIC is a joint venture of IUCN and the World Wide Fund for Nature (WWF), headquartered in Cambridge, United Kingdom. Through a network of offices around the world it monitors trade in wild plants and animals and helps implement CITES.

36 For further discussion of these issues, see David R. Downes and Brennan Van Dyke, *Fisheries Conservation Rules and Trade Rules: Ensuring that Trade Law Promotes Sustainable Fisheries* (Center for International Environmental Law (CIEL), Greenpeace, 1998) at 33-37.

37 A.C. De Fontaubert, D.R.Downes, T.S. Agardy, *Biodiversity in the Seas: Implementing the Convention on Biological Diversity in Marine and Coastal Habitats* (IUCN 1996) at 31; see also http://www.aquariumcouncil.org.

38 *Environment Matters, supra* note 17 at 68.

39 RES/A/54/40(b) at para. 12.

40 *Biodiversity in the Seas, supra* note 94 at 10-18. See also Tundi Agardy, "Creating Havens for Marine Life," *Issues in Science and Technology* (Fall 1999).

41 Kathleen Sullivan Sealey and Georgina Bustamante, *Setting Geographic Priorities for Marine Conservation in Latin America and the Caribbean* (TNC, Arlington, VA, 1999).

42 For example, the five indicators used in *Coastlines at Risk, supra* note 18, are: cities with populations over 100,000, major ports, population density, road density, and pipeline density. The report cites a number of caveats and warns that impacts of fishing, deforestation, and agricultural activity are not covered while impacts from upstream watershed activity are probably under-represented. The indicators of conservation status used in *Setting Geographic Priorities, supra* note 41 include percentage of pristine, moderately altered or heavily altered coastline, number of dammed rivers, loss of species, loss of breeding/nursery areas, changes in abundance, and threats like introduced species, industries discharging untreated pollutants into coastal waters, major ports, and presence of oil.

43 The European Union's (EU) Habitats and Species Directive proposed a network of protected areas (Natura 2000), reinforced by the Bern Convention's call for The Emerald Network that extends to non-EU states. The ASCOBANS (Baltic and North Seas) Advisory Committee has established a working group to examine how these agreements support protection of small cetacean habitat and to consider a mechanism for supplementary initiatives. [Report of the 6th Advisory Committee Meeting, Aberdeen, United Kingdom, 12-14 April 1999 at 25] It is not clear whether it will consider also the role of the Baltic and Northeast Atlantic regional seas conventions.

44 Pursuant to the Antarctic Treaty and 1991 Protocol, Annex V; and under the auspices of the Arctic Council's CAFF (Conservation of Arctic Flora and Fauna) program.

45 ASEAN Strategic Plan of Action on the Environment (1994).

46 Wetlands Convention COP7, Res. VII-19 (1999), Annex at para. 11.

47 UN Doc. UNEP (DEC)/RS.2/10, *supra* note 21 at para. 76.

48 *GRSMPA, supra* note 25, vol. I at 15-16.

49 UN Doc. A/53/456, 5 Oct. 1998 at paras. 425-6. The report indicates that UNDP and SIDA are sponsoring a multi-agency initiative to develop a self-assessment manual for such projects.

50 "Regional Environmental Assessment," *Environmental Assessment Sourcebook,* Update No. 15 (World Bank, 1996). The Wetlands Convention's new guidelines on integrating wetlands with river basin management are one example of this approach.

51 Global Biodiversity Forum 13, 7-9 May 1999, San Jose, Costa Rica.

52 Tullio Scovazzi, "A New Instrument on Specially Protected Areas in the Mediterranean," IUCN Environmental Law Programme Newsletter, May-Sept. 1998 at 7.

53 For the first time in 1998, the World Bank and the Asian Development Bank sent observers to the meeting of the World Heritage Committee. They expressed their institutions' willingness to finance operations in support of Convention objectives. [Report of the 22nd session of the World Heritage Committee, 30 Nov. — 5 Dec. 1998, Document WHI-98/CONF.203/18, 29 Jan. 1999 at para. V.3]

54 The assessment is careful to specify that risks were estimated based on the proximity and intensity of known risk factors rather than an assessment of actual conditions. Ninety percent of the coral reefs in the Pacific have never been assessed. By region, reefs in Southeast Asia are most at risk while in the Pacific, which contains more reefs than any other region, they are less threatened. Six countries (Australia, Indonesia, Philippines, Papua New Guinea, Fiji, and Maldives) contain over half of the world's coral reefs. [*World Resources 1998-99* (Oxford University Press 1998) at 193-94; and *Reefs at Risk, supra* note 18.

55 GCRMN is a component of the GOOS coastal module, *supra* note 64, and co-sponsored by IUCN, UNEP, and IOC. It aims to develop methods, a process, and a framework for assessing and monitoring coral reefs and their use in sustainable development. It will have a nodule in each of the six ICRI regions.

56 Website at http://coral.aoml.noaa.gov/methods.html.

57 UN Doc. UNEP/GC.20/36, 13 Nov. 1998 at paras. 7, 8; http://www.unfoundation.org/grants.

58 See L. Glowka and Cyrille de Klemm, *International Instruments, Processes and Non-Indigenous Species Introductions: Is a Protocol to the Convention on Biological Diversity Necessary?* A Paper Presented at the Norwegian/UN Conference on Alien Species, Trondheim, 1 July 1996, Revised (IUCN 1996); and L. Glowka, *Non-Indigenous Species Introductions: References in International Instruments,* Revised Draft (IUCN, 1996).

59 GISP is a joint venture launched in 1996 by SCOPE, IUCN, UNEP, and CAB International and forms an integral part of the International Programme on Biodiversity Science (DIVERSITAS).

60 See CBD/COP, Dec. IV/5, CBD/SBSTTA, Dec. IV/4, and UN Doc. UNEP/CBD/SBSTTA/4/3, Feb. 1999.

61 UN Doc. UNEP/CBD/SBSTTA/4/8, 15 Feb. 1999 at para. 68.

62 The countries involved are Ivory Coast, Czech Republic, Kenya, Malawi, Mauritius, New Zealand, Poland, and South Africa.

63 *Watersheds of the World, supra* note 19; UN Doc. E/CN.17/1997/9, prepared in collaboration with a number of UN organizations.

64 The estimate refers to marine pollution from ship accidents and routine operations like tank cleaning since 1981. It comes from a 1990 National Academy of Sciences study. [*IMO News,* no. 1(1997) at 16]

65 Report of the 28th session of GESAMP, 20-24 April 1998. Rep. Stud. GESAMP No. 66 (1999) at 10-11, 35.

66 The first exploration licenses for polymetallic sulphide deposits within national jurisdiction were granted by Papua New Guinea in 1996.

67 Report of the Secretary-General of the International Seabed Authority under article 166, para. 4, of the UNCLOS, Doc. ISBA/5/A/1, 12 July 1999 at paras. 33-40, 55-56; and UN Press Release SEA/1651, 30 August 1999.

68 *Cleaner Production,* no. 15 (1998) at 2-3.

69 See http://www.wri.org/sdis/indictrs.

70 UN Doc. A/54/429, *supra* note 9 at para. 428.

71 This parallels the effort to conform requirements for offshore oil and gas operations with Special Area requirements for ships noted earlier.

72 *IMO News,* no. 4 (1998) at 10-11.

73 As of 1 July 1998, garbage disposal requirements under MARPOL 73/78, Annex V apply to all ships of 400 gross tons and above and every ship certified to carry 15 passengers or more. Requirements under Annex I on disposal of oil and oily wastes apply to all oil tankers and to other ships over 400 gross tons. Annex II applies to all ships carrying noxious liquid substances in bulk.

74 UN Doc. A/53/456, *supra* note 49 at paras. 360-61. The Code of Conduct for the Prevention of Pollution from Small Ships in Marinas and Anchorages in the Caribbean Region was adopted in 1996. In the Baltic, the measures apply to all craft and to small ports and marinas. They were recommended pursuant to the Baltic Sea Convention in March 1998. [Rec. 19/9]

75 "Identification of Priority Pollution Hot Spots and Sensitive Areas in the Mediterranean," MAP Technical Reports Series No. 124 (UNEP/MEDU, 1999), prepared in collaboration with WHO and funded by the GEF.

76 UN Doc. UNEP (DEC)/RS.2/10, *supra* note 21 at paras. 30 and 58.

77 *Ibid.* at para. 40.

78 *Ibid.* at paras. 56-65.

79 *Cleaner Production,* no. 15, *supra* note 68 at 3.

80 UNEP (DEC)/RS.2/10, *supra* note 21, Annex V at 55-58.

81 A new framework for technical cooperation on dumping was adopted along with the 1996 Protocol to the London Convention. It takes a broad approach to preventing, reducing and, where practicable, eliminating wastes. It targets developing nations identified in the IMO's Global Waste Survey (1991) as having problems with waste management and disposal. [Res. LC.55 (SM) (1996)]

82 Canada has agreed to help with the development of this CHM node. [UN Doc. UNEP (Dec)/RS.2/10, *supra* note 21 at para. 50]

83 *IMO News,* No. 4 (1998) at 23.

84 *CEPNews,* vol. 14, no. 1 (1999) at 5.

85 *CEPNews,* vol. 13, no. 3 (1998) at 3-4.

86 The first national meeting on the Philippines will take place in May 2000, hosted by the Philippine government, through the Dept. of Environment and Natural Resources, and the US government, through the Dept. of Commerce/NOAA. It is formally a part of the action program of APEC's (Asia Pacific Economic Conference) Marine Resource Conservation Working Group and open to all APEC member economies. IUCN-US serves as secretariat for the meeting and focal point for input from the private sector and NGOs. Contributions will be sought via IUCN's networks throughout the APEC region. See also Lee A. Kimball and Thomas L. Laughlin, "A New Approach to Tackling International Environmental Governance," An informal submission to IUCN's 50th Anniversary, 3-5 Nov. 1998, on file with author.

87 *IMO News,* no. 4 (1998) at 15.

88 *IMO News,* no. 4 (1999) at 4-5 and 23-24.

89 UN Doc. UNEP (DEC)/RS.2/10, *supra* note 21.

90 UN Doc. A/52/487, 20 Oct. 1997 at para. 130.

91 UN Doc. A/54/429, *supra* note 9 at para. 168.

92 CBD/SBSTTA recommended an annexed assessment of interlinkages between tourism and biological diversity to the CSD process and to national governments, the tourism industry, and international organizations as a basis for policies and programs. [Report of the Fourth Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, 21-25 June 1999, Dec. IV/7 and Annex]

93 *WWF Arctic Bulletin,* no. 2 (1999) at 21.

94 With reference to the guidelines adopted by the United Kingdom, Fig. III-3. [Report of the 6th Advisory Committee, *supra* note 43 at 12]

95 *CEPNews,* vol. 13, no. 3 (1998) at 4-6.

IV. A REGIONAL APPROACH TO ECOSYSTEMS-BASED OCEAN MANAGEMENT AND THE ROLES OF INTERNATIONAL INSTITUTIONS

International law and organizations are moving in several respects toward a more ecosystems-based approach to ocean management. The appropriate geographic scale is still undergoing refinements, but large-scale subregional and regional arrangements are clearly favored. (Table III-1) Where the cumulative impacts of pollution in semi-enclosed seas and a tradition of political collaboration influenced earlier regional approaches, today this may also be suggested by the movement of pollutants carried by ocean currents, the migratory range and habitat of fish and other marine species, or the influence of major rivers on coastal/marine systems. These international dimensions mean that the knowledge of many local communities and national institutions may have to be pieced together at the regional level to improve understanding and an effective response. Ideally, this will strengthen collaboration at both political and technical levels and stimulate greater public awareness and involvement in remedial actions.

The importance of linking management arrangements for major rivers with those for marine areas is now widely recognized — to factor in the effects of altered freshwater quantity on coastal habitat and ecosystem health as well as changes in water quality due to pollution and sediment mobilization. The unique position of coastal wetlands in forging such relationships has also been introduced. The remaining disconnect is between managing important commercial and subsistence fisheries and conserving other marine species and biodiversity, on the one hand, and controlling human activities responsible for destroying and degrading critical habitat for these species. A systematic, ecosystems-based approach for identifying priority habitat is an important step, followed by measures to restrict damaging activities. But it will take a broader approach to secure these areas against each type of external threat, drawing on specialized national and, in some cases, international laws. This, in turn, requires scaling up the analysis to determine the relative importance of different types of threats within the larger system in order to agree on objectives and priorities for the system as a whole. These help shape the goals and strategies for tackling particular activities and sectors, nationally and regionally.

The ecosystems approach to ocean management forces a new look at the existing system of international law and organizations. The LOS Convention established the framework for a growing web of international agreements. These continue to evolve through subsidiary instruments, binding and non-binding, which take account of new knowledge and emerging concerns. They are shaped also by the new principles of sustainable development. The interplay between legal developments at global and regional levels constructively influences this process. What the ecosystems approach does is raise new questions about how to relate numerous specialized global and regional agreements to large-scale coastal/marine systems. At the same time, it suggests the possibility of a growing, flexible array of institutional arrangements at regional and subregional levels to realize joint action on shared problems at the appropriate scale. As long as the causes or effects of ocean problems are not contained within a single nation, international agreements are an essential conservation tool. At smaller scales, they allow more detailed commitments to be specified in keeping with broader international norms, and when informal cooperative arrangements precede them, they place these on a more durable footing. By incorporating lessons learned into an agreed list of response options or good practices, they raise the threshold for conservation and, at larger scales, extend it more widely. Once international agreements are in place, they trigger more formal mechanisms to review progress and the adequacy of existing measures.

Before returning to the challenge of relating numerous conventions to large-scale coastal/marine ecosystems, it may be useful to review the opportunities that conventions by their nature offer for advancing the functions of ocean management and promoting more integrated approaches.

IV.A. The Role of Conventions

On information and assessment initiatives, conventions have certain advantages. First, they concentrate the mind on defined objectives, both long-term and short-term, and provide an organizing framework for designing initiatives and translating results for decision-makers. They can ensure that relevant studies and initiatives are widely known and accessible to those involved in the decision-making process. They have fewer resources to make sure that the information reaches the wider community of individuals at regional and national levels who might benefit. Second, when a COP endorses agreed parameters and criteria for monitoring programs, based on well-founded expert advice, this guidance carries a higher level of authority than the normal efforts of scientists and other experts to adopt data standards and follow accepted methods. The use of this authority can promote data quality and comparability and stimulate additional data collection. Third, if a COP calls for an assessment and agrees on a process for carrying it out, it sets itself on a compelling path toward international agreement on response measures. Fourth, its endorsement of research initiatives may stimulate support for private institutions or collaborative ventures among governmental, intergovernmental, and non-governmental bodies.

The conventions also play a role in influencing *sustainable ocean development initiatives and international support.* First, they establish objectives and principles that must be reflected in national activi-

ties by states parties, including activities funded by external sources. The more detailed and specific the implementing measures and guidance adopted by COPs, the more meaningful these become as reference points for national development plans and for project design and evaluation by multilateral and bilateral assistance agencies and other potential sources of external support. Moreover, COPs have increasingly called for interactions with the staff of donor agencies and scrutiny of their projects and practices. Their authority helps obtain conformity with convention goals and measures. Second, an international legal basis can strengthen applications for international support by indicating national and international commitment; the collective priorities established by COPs influence donor decisions. Third, agreement through a convention process on the criteria and procedures that govern implementing action can expedite the development of similar projects. Fourth, convention processes themselves help mobilize international technical and financial support to achieve defined objectives. Fifth, the collective process represented by the convention helps bring special capabilities to light and stimulate collaborative ventures that make efficient use of available skills and resources. At the regional level, this can create a pool of specialized skills available to the region as a whole.

The role of conventions in promoting *accountability* is generally a narrow one focused on compliance. At the same time, the COPs provide a venue for considering the results of regional and global assessments that look more broadly at conditions and trends in the oceans field and what these imply about the adequacy of convention objectives and implementation. In addition, by growing more aggressive in seeking feedback from all sources on the performance of donor programs, the COPs can highlight problems and changes needed. The challenge remains to design a more integrated oceans review process that extends beyond the specific requirements of any given convention to broader conditions and trends and the ecological connections among conventions without losing sight of actual problems and circumstances.

At the global level, the LOS Convention provides the focus for a comprehensive annual overview of ocean affairs by the UN General Assembly. This is supplemented and informed by the results and recommendations of the Commission on Sustainable Development, which considers progress in sustainable oceans development every five years. These bodies have provided guidance and recommended new initiatives to a number of specialized fora at global and regional levels. A new procedure was established by the General Assembly in 1999 to better prepare and focus the annual debate, based on a decision taken by CSD7. The first informal, open-ended consultative process will take place for one week in May/June 2000, scheduled to follow the annual meeting of the states parties to the LOS Convention so that oceans specialists are more likely to attend. If these consultations provide an opportunity for in-depth discussion of specific oceans issues, they could give a practical, specialized focus to the emphasis of the new UNGA process on "coordination and cooperation at intergovernmental and inter-agency levels." They could use new mechanisms to involve non-governmental actors including the private sector. However, while the consultations may suggest certain directions for global and regional bodies in dealing with specific problems, they will not be in a position to carefully evaluate the circumstances and linkages affecting each region.

IV.B. The Management Perspective

From the management standpoint, there have been important steps toward a more integrated approach to *information resources,* particularly on marine species and habitat. Recent indicator-based efforts to identify coastal/marine regions of high biological/ecological value at an increasingly smaller scale hold promise for a systematic outcome. Information on harmful substances is beginning to extend throughout the cycle of production, use, international movement, and destruction/disposal. It stresses increasingly the minimization of pollution and wastes. One major information gap lies on the "threats" side. Far better documentation is needed of the harm caused by different human activities in given locations. That information needs to be aggregated on an ecosystems basis so that well-founded priorities and goals can be established. A second major failure is on the "solutions" side. A more systematic approach is needed to identifying and making available information on environmentally-sound technical and policy response options. A short list of response options for each type of human activity, appropriate for different environmental and socio-economic conditions, should be developed. This would provide guidance for specialized management measures at national and regional levels, whether binding or non-binding, and for voluntary initiatives by the private sector or international development agencies. A third gap exists in documenting the many international initiatives and projects that affect oceans concerns in one way or another. This is important because it defines the starting point for further international support and will help cohere current and future efforts.

New mechanisms may be needed at the regional level to consider interactions among ocean issues and problems and linkages with watershed and terrestrial management. Since the objectives of the GPA on Land-Based Activities take into account effects on habitat and ecosystem function, this affords a link with fisheries conventions where habitat degradation is a significant factor in species depletion. The GPA *assessment framework* at the regional level could be applied to encompass additional sources of threat such as destructive fishing practices and the introduction of non-indigenous/invasive species through sea-based activities. The broader scope of the Millennium Ecosystem Assessment (MEA) may help define ecological linkages among freshwater, terrestrial, and marine systems and the wider regional and global implications of major ecosystem changes. The appropriate regional forum to consider these linkages remains elusive.

Taking effective action is still a piecemeal operation. While every project and program geared toward sustainable ocean development makes a contribution, the key is to concentrate on those that produce the most significant results, based on goals established in an ecosystems context.

Unlike global systems problems such as climate change and ozone depletion, where any action to reduce GHG emissions anywhere in the world can be quantified in relation to others, coastal/marine ecosystems do not extend beyond regional limits. They require a process of parallel scale for agreement on goals and priorities. It should involve the stakeholders directly dependent on the resources and environmental services of large-scale regional systems. The process would engage local communities as well as larger national interests and the concerns of neighboring states and peoples affected by transboundary and regional problems. It should take into account the significance of regional ecological functions for global well-being. The assessment frameworks that are evolving through the GPA, the indicator-based approaches to identifying geographic priorities for conservation, and the MEA all hold promise as tools to assist in priority-setting. The proposed documentation on international support initiatives will help channel future support toward priorities agreed in the region. The appropriate regional forum to review current initiatives and agree on future priorities, and to advance regional collaboration remains elusive.

Turning to the conventions, the delineation of logical ocean management units that reflect large-scale ecosystem boundaries may need further refinement, but the basic outlines exist. (See Maps) They indicate which international conventions are engaged in the area, setting the stage for further discussion of the ecological linkages among them. More in-depth evaluation of threats will help identify which convention is the appropriate vehicle when joint goals and strategies are needed and point to the need for new instruments. The regional marine conventions and programs are the most appropriate vehicle for sharpening the focus of global conventions and programs that affect marine/coastal issues -- whether the CBD's marine/coastal program, the various protected areas and species conventions, mitigation and adaptation measures under the FCCC, or the major global action plans on coral reefs, marine mammals, small island developing states, and certain aspects of fisheries. In some cases, as in the Mediterranean, the regional convention/program may act as a leading edge; in others, it may serve as little more than a framework for numerous ongoing projects and programs, especially those with an international dimension. Most of these regional arrangements also capture the value of collaboration at regional and subregional levels, which stretches existing resources, stimulates learning among those sharing similar conditions, and strengthens capabilities in the region.

The concept of an ecological network of MCPAs nested within coastal/marine ecosystems brings a strategic dimension to numerous, disparate initiatives in this field. The network can incorporate critical habitat for important fisheries at the regional level and protect other significant ecological functions. The identification of such a network can inform decisions about how to use the regional and global conventions, both in designating protected areas and in focusing priorities for the specialized activity-based conventions.

Ultimately, the classification and delineation of coastal/marine ecosystems may lead to adjustments in the geographic scale or substantive scope of regional marine management units; for example, additional subregional arrangements for managing particular fishery or pollution problems within existing frameworks, or modified conservation conventions that cover a wider range of species within the system. This still begs the question of an appropriate forum to address and give some direction regarding linkages among the marine, river basin and fishery conventions applicable in the region and how to use and extend these and other regional and global conventions to better address regional oceans problems. If these issues are not adequately considered at the regional level, regional concerns may be watered down or dismissed in global fora.

At the global level, collaborative programs among oceans management bodies are growing. Within each sector, for example fisheries and the regional marine conventions and programs, mechanisms to promote inter-regional exchange and interaction as well as interactions with relevant global conventions are emerging at the inter-secretariat level, through FAO and UNEP. The IMO is strengthening the regional focus of its technical cooperation programs in relation to both vessel-source pollution and wastes/marine debris.

There are two next steps.

The first is to extend focused inter-secretariat discussions to the regional level in order to bring together international management concerns about pollution and physical degradation of coastal/marine areas with efforts to conserve fisheries and other marine species, and to ensure comprehensive attention to land-based and sea-based impacts. These discussions should be informed by an inventory of information resources and expertise in the region and an inventory of relevant international cooperation programs. They can serve as a focal point for promoting a flexible, problem-oriented network of experts and institutions in the region, and for exchanging knowledge among regions and with global bodies. Together the inter-secretariat mechanism and the wider network could expedite a well-organized approach to exchanging information resources. The inter-secretariat discussions would serve as a preparatory process for the second step. In the South Pacific, the first regional inter-agency coordinating committee has been established, the South Pacific Organizations Coordinating Committee (SPOCC).

The second, more important step is to expand discussions at the regional level to include government officials and stakeholders as well as secretariat officers so that decisions on how to develop and implement the conventions at the regional level and how to deploy the skills and resources of regional and global organizations are well-founded, well-coordinated, transparent, and reflect priorities in the region. Without creating new organizations, a regional consultative forum could be convened periodically for this purpose. This would facilitate greater involvement than a global forum by actors in the region, including local government officials, different sectoral ministries and

experts, and business and professional associations and NGOs. It could draw in extra-regional states whose activities significantly affect regional ocean management goals, for example through fishing or shipping. The specificity of location and issues is more likely to attract participation by the private sector than a global forum. This may also be true for major international donors and technical agencies. Knowledge of actual linkages among oceans problems and with terrestrial and freshwater systems will provide better guidance for integrated policies and actions at national and regional levels and among international conventions and organizations. It can stimulate practical, concrete partnerships. Consultations of this type could also serve to review overall progress and performance in achieving sustainable ocean development, based on integrated assessments. A start toward such an approach has been achieved in the North and Baltic Seas and the South Pacific Forum, where high-level oceans discussions provide guidance for other organizations and treaty bodies in the region.

The use of international legal instruments and programs should not be seen as a top-down, centralized approach to oceans problems. Rather, the legal instruments provide the basis for nations and stakeholders to agree on problems whose geographic scale exceeds the range of national action. Even where problems have not yet crossed national boundaries, conventions help focus cost-effective collaboration at regional and subregional levels and place it on a more solid footing.

ENDNOTES

1 These decisions go well beyond the specific authority of COPs vis-à-vis convention funding mechanisms like the GEF or convention trust funds; they address cooperation through all major donor agencies. As examples, the Wetlands Convention COP has taken several decisions since 1980, including in its guidelines for international cooperation annexed to the Res. VII.19 (1999) at paras. 40, 47-48, 52.E5; the CBD and FCCC COPs have called for review of the financial agencies' guidance and activities in FCCC/COP Dec. I/11 and CBD/COP Dec. II/6, respectively.

2 A/RES/54/40©.

V. INTRODUCTION TO THE MAP SERIES

The maps have been developed by Christopher Damon, Research Associate at the Environmental Data Center of the University of Rhode Island, in consultation with Lee Kimball and John Waugh of IUCN. The Center is a part of the Coastal Institute, headed by Peter V. August. Special thanks go to Christopher for his unflagging efforts to depict multiple data sets clearly and his commitment to getting it right.

The designation of geographical boundaries in the maps does not imply the expression of any opinion whatsoever on the part of IUCN or of sponsoring organizations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers and boundaries.

V.A. Purpose

The purpose of the map series is to demonstrate how ocean management arrangements intersect geographically and how they relate to marine and freshwater ecosystems. The maps depict the relationships between:

- Large marine ecosystems (LMEs) and national boundaries, including coastal state jurisdiction over offshore 200-mile zones [series D and A];
- LMEs and the geographic scope of regional marine and/or fisheries agreements [series D and B];
- LMEs and watersheds [series D];
- Watersheds and national boundaries [series D and A];
- Watersheds and regional marine and/or fisheries agreements [series D and B]
- Regional marine agreements and regional fisheries agreements [series B];
- Regional marine and/or fisheries agreements and national boundaries [series B and A];
- Marine/coastal protected areas (MCPAs) and WWF marine ecoregions [series C];
- MCPAs/WWF marine ecoregions and LMEs [series C and D];
- MCPAs/WWF marine ecoregions and regional agreements [series C and B]; and
- MCPAs/WWF marine ecoregions and watersheds [series C and D].

The maps highlight opportunities for collaboration between regional marine and regional fisheries agreements, including on ecosystem-based management of fisheries as endorsed by the 21st Governing Council of UNEP and the secretariats of the regional marine programs in late 2000/early 2001, for further consideration by the meeting of regional fisheries bodies organized by FAO in 2001.

They help identify where cooperation may be needed between existing watershed management arrangements and regional agreements, and where the development of watershed management arrangements has the potential to improve regional marine and/or fishery management.

The potential to implement ecosystems-based approaches to ocean management is illustrated by the overlap between LMEs or WWF marine ecoregions and regional agreements. This should help identify, for example, where regional marine agreements will need to address nutrient load or toxic chemicals in a given LME or marine ecoregion, or where regional fishery agreements will need to curtail destructive fishing practices if impacts on fish habitat and fisheries or marine biodiversity are to be reduced.

The maps establish a starting point for developing networks of MCPAs at sub-regional and regional levels that help maintain ecosystem goods and services, including fisheries productivity. Such designations may be made under national law, regional marine conventions, regional fisheries conventions (closed areas) and other regional (e.g., Berne Convention, Western Hemisphere Convention) and global (e.g., Ramsar/Wetlands, World Heritage) conventions. Such designations can be examined in relation to the management scope of particular regional marine and/or fisheries agreements and/or with a view to LME productivity and function. They can also be examined in relation to preserving the values of WWF marine ecoregions. At a larger scale, maintaining and restoring the values of WWF marine ecoregions can be evaluated in relation to the health of LMEs, the management goals of regional marine and regional fisheries conventions, and the conservation and sustainable use of biodiversity.

V.B. Sources and Notes

Coastlines, Country Data, and Terrestrial Images:
These data were provided by Environmental Systems Research Institute, Redlands, California, USA.

National Maritime Claims:
These data were provided by Global Marine Boundaries Database, Veridian-MRJ Technology Solutions, Fairfax, Virginia, USA.

Large Marine Ecosystems: (For names corresponding to numbers on maps, see below.)
These data were provided by the US National Marine Fisheries Service (NMFS), Narragansett Laboratory, Narragansett, Rhode Island. NMFS is a part of the National Oceanic and Atmospheric Administration (NOAA) of the US Department of Commerce. The LME boundaries continue to evolve as new research improves delineation and indicates where additional divisions are needed. For updated information, see http://www.edc.uri.edu/lme

Watersheds:
These data include level 1 and level 2 watersheds drawn from the elevation derivative database developed by the US Geological Survey's EROS Data Center in Sioux Falls, South Dakota. The USGS is a part of the US Department of the Interior.
See http://edcdaac.usgs.gov/gtopo30/hydro

Marine and Coastal Protected Areas:
These data were provided by the World Conservation Monitoring Centre (WCMC), now a part of UNEP, in Cambridge, United Kingdom. They show nationally-designated marine protected areas, which generally include all designations under international protected areas conventions. The UNEP/WCMC is continually updating these data and expects to have maps of these designations on their website in the not too distant future. See http://www.wcmc.org.uk

WWF Marine Ecoregions:
These data were provided by the UNEP/WCMC. Thanks also to David Olson, Director of Conservation Science for WWF-US, for his help in developing the maps. For further information, see
http://www.wwfus.org/global200

Conservation International's Critical Marine Areas Map:
Special thanks to Dr. Tundi Agardy, formerly Senior Director for Conservation International's Global Marine Program, for her willingness to make available the CI dataset for the map series. These areas are not included due to the technical difficulty of adding another dataset. See http://www.conservation.org/marine/map.htm

Regional Fishery Agreements: (For full names corresponding to acronyms on maps, see below.)
The data on boundaries of the regional fisheries agreements, for the most part, come from the UN Food and Agriculture Organization (FAO) and are available at http://www.fao.org/fi/body/figiscom/index.htm

- The boundaries for the IATTC and the MHLC are drawn from provisions in the respective conventions.
- NPAFC applies to waters beyond 200 nautical miles but involves information exchange regarding anadromous stocks that migrate into this area from adjacent areas, including areas within national jurisdiction. For further information see http://www.npafc.org.
- NASCO applies to salmon stocks which migrate beyond areas of coastal state fishery jurisdiction throughout their migratory range; it thus governs catch of anadromous species originating in one country that are harvested within the jurisdiction of another state party.
- NASCO, ICCAT, IATTC, and CCSBT cover the migratory range of the species governed by the convention but their areas of application are not defined by geographic coordinates.
  - For NASCO, the secretariat indicates that the most easterly salmon stock within the Convention area is in the Pechora river or near neighboring systems in Russia, while the western boundary would be rivers in the USA and Canada from Ungava Bay in the north to the Connecticut river in the south. For further information, see http://www.nasco.org.uk.
  - In the case of ICCAT, no geographic coordinates are used for the southern and northern boundaries in the Atlantic, nor to define eastern and western boundaries in the northern and southern Atlantic. The secretariat indicates that Atlantic tuna normally do not migrate south of 50°S latitude or north of 65°N latitude. The eastern and western boundaries vary according to the species. The boundaries used here are 60°S latitude and 78°N latitude. For further information and species maps, see http://www.iccat.es, statistics, areas.
  - For the IATTC, which covers the eastern Pacific Ocean, conservation and management measures have generally applied out to 150°W longitude. The 1992 Agreement on the International Dolphin Conservation Program, adopted under the IATTC framework, is defined by the following lines: the 40°N parallel from the coast of North America to its intersection with the 150°W meridian; the 150°W meridian to its intersection with the 40° parallel; and the 40°S parallel to its intersection with the coast of South America.
  - The CCSBT presently covers fishing for southern bluefin tuna by Australia, Japan, and New Zealand. The boundaries depicted indicate the approximate range of the species.

- The MHLC Convention was concluded and signed on September 4, 2000, after the text of this publication had been completed. The Convention does not define its western boundary, but conservation and management measures apply throughout the migratory range of the stocks covered or to specific areas within the Convention area, as will be determined by the Commission.

- For further information on IBSFC, see http://www.ibsfc.org
- For further information and a map of CCAMLR, see http://www.ccamlr.org
- For further information and a map on NAFO, see http://www.nafo.ca
- For further information and maps on NEAFC, see http://www.neafc.org

Regional Marine Conventions: (For full names corresponding to map names, see below)
N.B. The maps depict geographic area according to the countries eligible to join each convention, not all of which have in all cases yet done so.
The datasets for boundaries of the regional marine conventions are provided by the UNEP/WCMC, with certain modifications to reflect the provisions of the respective conventions. See also http://www.unep.ch/seas/mappage1.html. In addition:

- The boundaries of the Antarctic Treaty are drawn from the relevant article of the Treaty.
- The boundaries of the Northeast Atlantic Convention are drawn

from the relevant article of the Convention. This Convention extends into the Arctic. It overlaps with the Arctic program, whose southern boundary within the area of the Northeast Atlantic Convention is not depicted. For further information, see http://www.ospar.org

- The boundaries of the Arctic region are drawn from the Arctic Council's AMAP (Arctic Monitoring and Assessment Programme. For further information, see http://www.amap.no. The southern boundary of the Arctic program where it overlaps with the Northeast Atlantic Convention is not depicted.
- South Africa is included within the boundary of the East African convention. It has been invited to join this Convention and has also expressed interest in acceding to the West and Central African Convention.
- Somalia is a party to both the Red Sea and East African Conventions. The demarcation between the two is drawn from the UNEP/WCMC data.
- Panama is included within the *draft* Eastern Central Pacific Convention/action plan, since it has been participating in these discussions. In addition, while not a party to the South East Convention, it supports and participates in the action plan.
- China and the Republic of Korea participate in both the North West Pacific and East Asian action plans.
- Australia participates in the South Pacific Convention and the East Asian action plan. The demarcation between the two is drawn from UNEP/WCMC data.
- Information and maps on the Caspian Sea program are available at http://www.caspianenvironment.org
- Information on the Baltic Sea program is available at http://www.helcom.fi
- Information on the Caribbean Sea program is available at http://www.cep.unep.org
- Information on the Mediterranean Sea program is available at http://www.unepmap.gr

Large Marine Ecosystems

1. East Bering Sea
2. Gulf of Alaska
3. California Current
4. Gulf of California
5. Gulf of Mexico
6. Southeast US Continental Shelf
7. Northeast US Continental Shelf
8. Scotian Shelf
9. Newfoundland Shelf
10. West Greenland Shelf
11. Insular Pacific-Hawaiian
12. Caribbean Sea
13. Humboldt Current
14. Patagonian Shelf
15. Brazil Current
16. Northeast Brazil Shelf
17. East Greenland Shelf
18. Iceland Shelf
19. Barents Sea
20. Norwegian Shelf
21. North Sea
22. Baltic Sea
23. Celtic-Biscay Shelf
24. Iberian Coastal
25. Mediterranean Sea
26. Black Sea
27. Canary Current
28. Guinea Current
29. Benguela current
30. Agulhas Current
31. Somali Coastal Current
32. Arabian Sea
33. Red Sea
34. Bay of Bengal
35. South China Sea
36. Sulu-Celebes Seas
37. Indonesian Seas
38. Northern Australian Shelf
39. Great Barrier Reef
40. New Zealand Shelf
41. East China Sea
42. Yellow Sea
43. Kuroshio Current
44. Sea of Japan
45. Oyashio Current
46. Sea of Okhotsk
47. West Bering Sea
48. Faroe Plateau
49. Antarctic
50. Pacific Central-American

Regional Fisheries Agreements [Tables II-7 and III-4]

APFIC	Asia-Pacific Fishery Commission (1948)
CCAMLR	1980 Convention/Commission on the Conservation of Antarctic Marine Living Resources
CCSBT	1993 Convention/Commission for the Conservation of Southern Bluefin Tuna
CECAF	Fishery Committee for the Eastern Central Atlantic (1967)
GFCM	General Fisheries Commission for the Mediterranean (1949)
IATTC	Inter-American Tropical Tuna Commission (1949 Convention for the Establishment of an Inter-American Tropical Tuna Commission)
IBSFC	International Baltic Sea Fishery Commission (1973 Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and Belts)

ICCAT	1966 International Convention/Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission (1993)
MHLC	Multilateral High-Level Conference (2000 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean)
NAFO	North Atlantic Fisheries Organization (1978 Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries)
NASCO	North Atlantic Salmon Commission (1982 Convention for the Conservation of Salmon in the North Atlantic Ocean)
NEAFC	Northeast Atlantic Fisheries Commission (1980 Convention on Future Multilateral Cooperation in North East Atlantic Fisheries)
NPAFC	North Pacific Anadromous Fisheries Commission (1992 Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean)
RCFCASBA	1991 Regional Convention on Fisheries Cooperation among African States Bordering the Atlantic Ocean
WECAFC	Western Central Atlantic Fishery Commission (1973)
WIOTO	1991 Western Indian Ocean Tuna Organization Convention

Regional Marine Conventions [Table I-1]

Antarctica	1959 Antarctic Treaty
Arctic	1991 Arctic Environmental Protection Strategy/1996 Arctic Council
Baltic	1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area
Black Sea	1992 Convention on the Protection of the Black Sea against Pollution
Caribbean	1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
Caspian Sea	*Draft* Convention/Action Plan
E. Africa	1985 Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region
E. Asian Seas	1994 East Asian Seas Action Plan
E. Central Pacific	*Draft* Convention/Action Plan
Kuwait	1978 Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution (Gulf/Kuwait)
Mediterranean	1995 Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
N.E. Atlantic	1992 Convention for the Protection of the Marine Environment of the North East Atlantic
N.W. Pacific	1994 Northwest Pacific Action Plan
Red Sea	1982 Regional Convention for the Conservation of the Marine Environment of the Red Sea and the Gulf of Aden Environment
S. Asia	1995 South Asian Seas Action Plan
S. Pacific	1986 Convention for the Protection and Development of Natural Resources and Environment of the South Pacific Region
S.E. Pacific	1981 Convention for the Protection of the Marine Environment and Coastal Areas of the South East Pacific
S.W. Atlantic	*Draft* Southwest Atlantic Action Plan
W. Africa	1981 Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region

Table I-1

Regional Framework Conventions and Non-Binding Agreements on the Marine Environment.[1] See Maps B1-B8	In Force
Europe/Northeast Atlantic Ocean	
• Convention for the Protection of the Marine Environment of the North East Atlantic (1992). This convention supersedes the 1972 Oslo Convention on dumping and the 1974 Paris Convention on land-based sources. It includes a small segment of the Arctic Ocean. Oslo/Paris Commission	1998 1974/1978
• Convention on the Protection of the Marine Environment of the Baltic Sea Area (1992). This convention supersedes the 1974 Baltic Convention. Helsinki Commission	NIF/1980
• Charter of the International Council for the Exploration of the Sea (1902), revised as the Convention for the ICES (1964) and 1970 Protocol.	1968/1975
West Africa/South Atlantic Ocean	
• Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (1981). UNEP/WACAF/RCU	1984
Mediterranean/Black/Caspian Seas	
• Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (1995). This convention supersedes the 1976 Mediterranean Convention. UNEP/MEDU	NIF/1978
• International Commission for the Scientific Exploration of the Mediterranean (1910). ICSEM	
• Convention on the Protection of the Black Sea against Pollution (1992). BSEP (Black Sea Environment Programme)	1994
• *Draft* Framework Convention for the Protection of the Marine Environment of the Caspian Sea.[2] UNEP	
Western Asia/East Africa/Indian Ocean	
• Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution (1978). [Gulf/Kuwait] ROPME (Regional Organization for the Protection of the Marine Environment)	1979
• Regional Convention for the Conservation of the Marine Environment of the Red Sea and the Gulf of Aden Environment (1982). PERSGA (Programme for the Environment of the Red Sea and Gulf of Aden)	1985
• Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region (1985). UNEP/EAF/RCU	1996
Non-Binding:	
• South Asian Seas Action Plan (1995). UNEP/South Asian Cooperative Environment Programme (SACEP)	
East Asia/South Pacific Ocean	
• Convention for the Protection and Development of Natural Resources and Environment of the South Pacific Region (1986). SPREP (South Pacific Regional Environment Programme) Agreement Establishing the SPREP (1993).	1990 1995
Non-Binding:	
• East Asian Seas Action Plan (1983, rev. 1994). UNEP/Coordinating Body on the Seas of East Asia (COBSEA)	
East Asia/North Pacific Ocean	
• Convention for a North Pacific Marine Science Organization (1990). PICES (Pacific ICES)	1992
Non-Binding:	
• Northwest Pacific Action Plan (1994). UNEP/NOWPAP	

(continued)

Table I-1 ***(continued)***

Regional Framework Conventions and Non-Binding Agreements on the Marine Environment.[1] See Maps B1-B8	In Force
Latin America/Pacific Ocean	
• Convention for the Protection of the Marine Environment and Coastal Areas of the South East Pacific (1981). CPPS (Permanent Commission for the South Pacific)	1986
• *Draft* Eastern Central Pacific Convention. UNEP	
Latin America/South Atlantic Ocean	
Non-Binding:	
• *Draft* Southwest Atlantic Action Plan. UNEP	
Caribbean Sea	
• Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (1983). UNEP/CAR/RCU	1986
Antarctic/Southern Ocean	
• Antarctic Treaty (1959). Antarctic Treaty Parties.	1961
Protocol on Environmental Protection (1991).	1998
Arctic Ocean	
Non-Binding:	
• Arctic Environmental Protection Strategy (1991). Arctic Council	
• Declaration on the Establishment of the Arctic Council (1996).	

1 The acronym of the responsible secretariat follows the title. What is commonly referred to as "the UNEP regional seas program" includes nine conventions launched under UNEP auspices and several additional regional programs, based on "action plans," for which there is no formal legal agreement. Four of the regional conventions have chosen UNEP to serve as the administrative host for a secretariat, while the other five have selected or established an independent regional body to perform secretariat functions. The action plans are all served by UNEP. The regional programs initiated outside of UNEP include three conventions -- the Baltic Sea and Northeast Atlantic Conventions and the Antarctic Treaty -- and the Arctic Environmental Protection Strategy (AEPS) now under the aegis of the Arctic Council. The administrative arrangements for these programs have been established by the participating states directly.

2 Pending agreement on the legal status of the Caspian Sea.

Table II-1

Vessels[1]	In Force
Global Agreements	
Vessel Safety and Pollution Control	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
• International Convention on Load Lines (1966) and 1988 Protocol. IMO	1968/NIF
• International Convention on Tonnage Measurements of Ships (1969). IMO	1982
• Convention on the International Regulations for Preventing Collisions at Sea (COLREG 1972). IMO	1977
• International Convention for the Prevention of Pollution from Ships (1973) and 1978 Protocol (MARPOL 73/78). IMO	1983
• Annex I — Oil Discharges	1983
• Annex II — Noxious Liquid Substance Discharges	1987
• Annex III — Harmful Substances in Packaged Form and Containers	1992
• Annex IV — Sewage Discharges	NIF
• Annex V — Garbage Discharges	1988
• Annex VI — Regulations for the Prevention of Air Pollution from Ships (Protocol of 1997)	NIF
• International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) is mandatory under MARPOL 73/78 (and SOLAS).	
• International Maritime Dangerous Goods Code (IMDG Code) is mandatory under MARPOL 73/78, Annex III (and SOLAS) as of 1 Jan. 2002.	
• Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) is mandatory under MARPOL 73/78.	
• International Convention for the Safety of Life at Sea (SOLAS 1974) and 1978 and 1988 Protocols. IMO	1980/81/NIF
• International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) is mandatory under SOLAS.	
• IBC Code is mandatory under SOLAS (and MARPOL 73/78).	
• International Code for Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (INF Code) is mandatory under SOLAS as of 1 Jan. 2001.	
• IMDG Code is mandatory under SOLAS (and MARPOL 73/78, Annex III) as of 1 Jan. 2002.	
• International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) is mandatory under SOLAS for certain ships as of July 1998 and for all ships by 1 July 2002.	
• International Convention in Standards of Training, Certification and Watchkeeping for Seafarers (STCW 1978, as substantially revised in 1995). IMO	1984/1997
• Seafarers' Training, Certification & Watchkeeping Code, Part A is binding under STCW as of 1 Feb. 1997.	
• Convention on the Physical Protection of Nuclear Material (1979). IAEA	1987
• Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Wastes Management (1997). IAEA	NIF
• UN Convention on Conditions for Registration of Ships (1986). IMO	NIF
Non-Binding:	
• Technical Code on Control of Emissions of Nitrogen Oxides from Marine Diesel Engines (1998). IMO	

(continued)

Table II-1 (continued)

Vessels[1]	In Force
Global Agreements	
Labor Standards[2]	
• Merchant Shipping (Minimum Standards) Convention (1976) and 1996 Protocol. ILO No. 147	1991/NIF
• Convention Concerning Seafarers' Welfare at Sea and in Port (1987). ILO No. 163	1990
• STCW Convention, above. IMO	
Fishing Vessels[3]	
• International Convention for the Safety of Fishing Vessels (1977) and 1993 Protocol.[4] IMO	NIF/NIF
• International Convention on STCW for Fishing Vessel Personnel (STCW-F 1995). IMO	NIF
Non-Binding:	
• Code of Safety for Fishermen and Fishing Vessels and Voluntary Guidelines. IMO, in collaboration with FAO and ILO.	
Emergency Preparedness and Response	
• International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969) and 1973 Protocol. IMO	1975/1983
• International Convention on Salvage (1989). IMO	1996
• International Convention on Oil Pollution Preparedness, Response and Cooperation (1990). IMO	1995
• *Draft* Protocol regarding hazardous and noxious substances (2000).	
• *Draft* Wreck Removal Convention. IMO	
Liability and Compensation	
• International Convention on Civil Liability for Oil Pollution Damage (1969) and 1976 and 1992 Protocols. IMO	1975/1981 1996
• International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1971) and 1976 and 1992 Protocols. IMO	1978/1994/ 1996
• Convention on the Liability of Operators of Nuclear Ships (1962).	NIF
• Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (1971). IMO	1975
• Convention on Limitation of Liability for Maritime Claims (1976) and 1996 Protocol.	1986/NIF
• International Convention on Liability and Compensation in Connection with the Carriage of Hazardous and Noxious Substances by Sea (1996). IMO	NIF
• *Draft* Wreck Removal Convention. IMO	
• *Draft* International Convention on Civil Liability for Bunker Oil Pollution Damage (2001). IMO	
Vessel Routeing and Protected Areas	
• MARPOL 73/78, Annexes I, II, V — Special Areas. (Table II-8)	
• LOS Convention, Article 211.6.	
• COLREG 1972.[5] IMO	

(continued)

Table II-1 (continued)

Vessels[1]	In Force
Global Agreements	
Vessel Routeing and Protected Areas (continued)	
• SOLAS 1974.	
• Guidelines and Criteria for Ships Reporting (1994/1995) are mandatory as of 1 Jan. 1996.	
• General Provisions on Ships' Routeing (1985) are mandatory as of 1 Jan. 1997.	
• Guidelines for Vessel Traffic Services (1985) are mandatory as of 1 July 1999.	
Non-Binding:	
• Guidelines for the Designation of Special Areas and the Identification of Particularly Sensitive Sea Areas (PSSAs) (1991).[6]	
Non-Indigenous Species Introductions	
• *Draft* Regulations on Water Ballast Management, to be adopted either as a new annex to MARPOL 73/78 or as a new, separate convention. IMO	
• *Draft* legally binding instrument to prevent the harmful effects of the use of anti-fouling systems on ships (2001). IMO	
Non-Binding:	
• International Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens (1997). (A.868(20)) These replace the 1993 Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges. IMO	
Regional Agreements	
Vessel-Source Pollution	
• Annex IV to the Baltic Sea Convention: prevention of pollution from ships (1992). The 1992 annex supersedes the 1974 annex.	NIF/1980
• Annex IV to the 1991 Antarctic Protocol: prevention of marine pollution (1991).	1998
Non-Binding:	
• Code of Conduct for the Prevention of Pollution from Small Ships in Marinas and Anchorages in the Caribbean Region (1996)	
Inspection/Enforcement	
• Memorandum of Understanding (MOU)[7] on Port State Control (1982) — Europe	
• Vina del Mar Agreement on Port State Control (1992) — Latin America	
• MOU on Port State Control in the Asia Pacific Region (1993)	
• MOU on Port State Control in the Caribbean Region (1996)	
• MOU on Port State Control in the Mediterranean Region (1997)	
• MOU on Port State Control for the Indian Ocean Region (1998).	
• MOU on Port State Control for the West and Central African Region (1999).	
• *Draft* MOU on Port State Control for the Black Sea Region (2000).	
• *Draft* MOU on Port State Control for the ROPME Sea Area (Gulf/Kuwait).	

(continued)

Table II-1 (continued)

Vessels[1]	In Force
Regional Agreements	
Emergency Preparedness and Response	
• Agreement Concerning Cooperation in Measures to Deal with Pollution of the Sea by Oil (1971). Nordic Countries.	1971
• Agreement Between the Government of the United States and the Government of Canada Relating to the Establishment of Joint [Marine] Pollution Contingency Plans for Spills of Oil and Other Noxious Substances (1974) and 1977 and 1982 Amendments.[8]	1974/77/82
• North Sea Agreement: for cooperation in dealing with pollution by oil and other harmful substances (1983). This agreement supersedes the 1969 North Sea Agreement.	1989/1969
• Northeast Atlantic Accord: of cooperation for the protection of the coasts and waters against pollution due to hydrocarbons or other harmful substances (1990).	NIF
• Baltic Sea, Annex VII: response to pollution incidents (1992). The 1992 annex supersedes the 1974 annex.	NIF/1980
• West and Central Africa Protocol: concerning cooperation in combating pollution in cases of emergency (1981).	1984
• Mediterranean Sea Protocol: concerning cooperation in combating pollution by oil and other harmful substances in cases of emergency (1976).	1978
• Black Sea Protocol: on cooperation in combating pollution by oil and other harmful substances in emergency situations (1992).	1994
• Gulf/Kuwait Protocol: concerning regional cooperation in combating pollution by oil and other harmful substances in cases of emergency (1978).	1979
• Red Sea Protocol: concerning regional cooperation in combating marine pollution by oil and other harmful substances in cases of emergency (1982).	1985
• East African Protocol: concerning cooperation in combating marine pollution in cases of emergency (1985).	1996
• South Pacific Protocol: concerning cooperation in combating pollution emergencies (1986).	1990
• South East Pacific Agreement: on regional cooperation in combating pollution by hydrocarbons and other harmful substances in cases of emergency (1981) and 1983 supplementary protocol.	1986/1987
• Caribbean Protocol: concerning cooperation in combating oil spills (1983).	1986
• Antarctic Protocol and its Annex IV: prevention of marine pollution (1991).	1998

1 These conventions and related codes are updated frequently through the IMO. Their numerous amendments are not indicated here.

2 The ILO's International Seafarers Code embodies the labor standards set out in some 39 ILO Conventions and 30 Recommendations. The 1976 Convention is the most far-reaching and covers most of the world's merchant fleet. Port state enforcement may be applied pursuant to the 1976 Convention and Protocol, which includes in an appendix additional ILO Conventions subject to the enforcement provisions. [A/52/487, 20 Oct. 1997 at paras. 100-103]

3 The ILO is reviewing which of its maritime instruments should be applied to the fisheries sector. [A/52/487 at para. 105]

4 The 1993 Protocol amends and absorbs the 1977 Convention, which never entered into force. In view of the low number of states that have ratified these instruments, the IMO has begun to look into revising the non-binding Code and Guidelines.

5 These define the competence of the IMO to adopt traffic separation schemes and regulate ships using them.

6 New procedures for adopting PSSAs were approved by the IMO Assembly in 1999 (A.885(21)), amending the 1991 Guidelines (A.720(17)).

7 The MOUs are informal cooperative arrangements rather than treaties.

8 This covers the Atlantic, Pacific and Arctic boundary areas.

Table II-2

At-Sea Waste Disposal (Dumping) and Maritime Transport of Wastes	In Force
Global Agreements	
Dumping	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
• Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention 1972) and 1996 Protocol. IMO	1975/NIF
Non-Binding:	
• Dredged Material Assessment Framework (1995). IMO	
• Guidelines for the Assessment of Wastes and Other Matter That May Be Considered for Dumping (1997). IMO	
• *Draft* Guidelines for each of the specific wastes permitted to be dumped under the 1996 Protocol to the London Convention (2000).	
Maritime Transport of Wastes and International Trade (See also Table II-3 on Nuclear Contamination)	
• Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention 1989). UNEP	1992
• Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals in International Trade (1998). UNEP and FAO	NIF
• *Draft* Global Convention on Persistent Organic Pollutants (POPs).	
Non-Binding:	
• Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes (1987). UNEP	
• London Guidelines for the Exchange of Information on Chemicals in International Trade (1987) and 1989 Amendments. UNEP	
• International Code of Conduct on the Distribution and Use of Pesticides (1985) and 1989 Amendments. FAO	
The two documents immediately above have been modified to conform with the PIC Convention and constitute the "interim PIC procedure" until a date to be specified by COP1 of the Convention.	
Liability and Compensation for Damage (See also Table II-1)	
• Protocol to the Basel Convention on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (1999). UNEP	NIF
Regional Agreements	
Dumping	
• North East Atlantic Convention, Annex II: prevention and elimination of pollution by dumping or incineration (1992). This supersedes the 1972 Oslo Convention.	1998/1984
• Baltic Sea Convention, Annex V: exemptions from the general prohibition of dumping of waste and other matter (1992). This supersedes the 1974 annex.	NIF/1980
• Mediterranean Sea Protocol: dumping from ships and aircraft or incineration at sea (1976, as amended in 1995).	1978/NIF
• Black Sea Protocol: dumping (1992).	1994
• South Pacific Protocol: dumping (1986).	1990
• South East Pacific Protocol against Radioactive Pollution (1989).	1995
• Antarctic Protocol, Annex III: Waste Disposal and Waste Management (1991).	1998

(continued)

Table II-2 (continued)

At-Sea Waste Disposal (Dumping) and Maritime Transport of Wastes	In Force
Regional Agreements	
Maritime Transport of Wastes and International Trade	
• Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Waste Within Africa (1991). OAU	1996
• Mediterranean Sea Protocol on transboundary movements of hazardous wastes and their disposal (1996).	NIF
• Gulf/Kuwait Protocol on the control of marine transboundary movements and disposal of hazardous and other wastes (1998).	NIF
• Central American Regional Agreement on the Transboundary Movement of Hazardous Wastes (1992).[1]	1995
• Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (1995). South Pacific Forum	NIF
• Agreement on the Monitoring of Transboundary Shipments of Hazardous Wastes between Members of the Commonwealth of Independent States (1996).[1]	1997
• Ban on the export of hazardous wastes for disposal in Antarctica under the Basel Convention (1989).	1992
• LRTAP Protocol on POPs (1998). ECE	NIF

1 It has not been verified that these agreements cover maritime transport.

Table II-3

Nuclear Contamination from the Marine Perspective	In Force
NUCLEAR SAFETY AND RESPONSIBILITY IN GENERAL	
Global Agreements	
• Convention on Physical Protection of Nuclear Material (1979). IAEA	1987
• Convention on Nuclear Safety (1994). IAEA	1996
• Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Wastes Management (1997). IAEA	NIF
Emergency Preparedness and Response:	
• Convention on Early Notification of a Nuclear Accident (1986). IAEA.	1986
• Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986). IAEA.	1987
Liability and Compensation:	
• Vienna Convention on Civil Liability for Nuclear Damage (1963) and 1963 and 1997 Protocols. IAEA	1977/77/NIF
• Joint Protocol Relating to the Application of the Vienna and Paris (below) Conventions (1988). IAEA	1992
• Convention on Supplementary Compensation for Nuclear Damage (1997). IAEA	NIF
Regional Agreements	
• Paris Convention on Third Party Liability in the Field of Nuclear Energy (1960) and 1964 and 1982 Protocols and Supplementary Convention (1963) and 1964 and 1982 Protocols. IAEA	1968/74/88 1974/74/91
• Joint Protocol Relating to the Application of the Vienna (above) and Paris Conventions (1988). IAEA	1992
INTERNATIONAL TRADE/MARITIME TRANSPORT OF NUCLEAR MATERIALS AND RADIOACTIVE WASTE	
Global Agreements	
• UNCLOS, Articles 22.2 and 23.[1]	1994
• International Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (1993), mandatory under SOLAS as of 1 Jan. 2001 (INF Code). IMO	
Emergency Preparedness and Response:	
• Table II-1, insofar as radioactive substances may be covered.	
• INF Code covers shipboard emergency plans.	
Liability and Compensation:	
• Convention on the Liability of Operators of Nuclear Ships (1962).	NIF
• Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material (1971). IMO	1975
Regional Agreements	
• Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Waste Within Africa (1991).[2] OAU	NIF
• Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (1995). South Pacific Forum	NIF
Non-Binding:	
• Northeast Atlantic Strategy with regard to Radioactive Substances (1998).	

(continued)

Table II-3 (continued)

Nuclear Contamination from the Marine Perspective	In Force
DISPOSAL OF RADIOACTIVE WASTE (SEE ALSO TABLE II-2)	
Global Agreements	
• Ban on At-Sea Disposal. London Convention (1972, and 1996 Amendments). IMO	1975/NIF
Regional Agreements	
• Ban on At-Sea Disposal under the regional dumping instruments.[3] (Table II-2)	
• Ban on Disposal in Antarctica. Antarctic Treaty (1959).	1961
NUCLEAR FREE ZONES	
Global Agreements	
• Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (1963).	1963
• Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction in the Seabed and the Ocean Floor and in the Subsoil thereof (1971).	1972
• Comprehensive Nuclear Test Ban Treaty (1996).	NIF
Regional Agreements	
• Treaty for the Prohibition of Nuclear Weapons in Latin America (1967) and Protocols.	1968/1969
• South Pacific Nuclear Free Zone Treaty (1985) and 1986 Protocols.	1986/88[6]
• African Nuclear Weapon Free Zone Treaty and Protocols (1995).[4]	NIF
• Treaty on the Southeast Asia Nuclear Weapon Free Zone and Protocol (1995).[5]	1997
• Antarctica: Ban on nuclear explosions, nuclear weapons testing, and the disposal of radioactive wastes. Antarctic Treaty (1959).	1961

1 Provides that in exercising innocent passage in the territorial sea, foreign ships carrying nuclear or other inherently dangerous or noxious substances and nuclear-powered ships must carry documents and observe special precautionary measures established for such ships by international agreements and may be required to travel in designated sealanes.

2 Although the Basel Convention does not cover radioactive wastes addressed under other international control systems such as the London Convention, the Bamako Convention for Africa bans all at-sea dumping and seabed disposal. This usefully supplements protections for countries that are not party to the London Convention.

3 For example, the Baltic Sea Convention bans all dumping of radioactive wastes; the Northeast Atlantic Convention does the same, with exemptions for two parties; and the 1986 South Pacific regional seas convention prohibits storage of radioactive wastes or other radioactive matter and calls for measures to prevent, reduce, and control pollution from the storage of toxic and hazardous wastes and from the testing of nuclear devices.

4 The African treaty covers dumping of radioactive wastes or other radioactive matter only within the territorial sea and archipelagic waters.

5 The Southeast Asia treaty covers dumping in the territorial sea, archipelagic waters, EEZ and continental shelf and defines dumping to include the deliberate disposal at sea of vessels, aircraft or other structures containing radioactive material.

6 Protocol I is not in force.

Table II-4

Pollution From Land-Based Sources and Activities	In Force
Global Agreements	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
Explicit Linkages:	
• UN Convention on the Law of the Non-navigational Uses of International Watercourses (1997).	NIF
• *Draft* Global Convention on Persistent Organic Pollutants (POPs).	
Non-Binding:	
• Global Programme of Action on Protection of the Marine Environment from Land-Based Activities (1995). UNEP This agreement effectively supersedes the Montreal Guidelines for the Protection of the Marine Environment against Pollution from Land-based Sources (1985).	
• International Code of Conduct on the Distribution and Use of Pesticides (1985), as amended. FAO	
• Cairo Guidelines and Principles for the Environmentally-Sound Management of Hazardous Wastes (1987). UNEP	
Emergency Preparedness and Response	
• Convention Concerning Safety in the Use of Chemicals at Work (1990). ILO No. 170	1993
• Convention Concerning the Prevention of Major Industrial Accidents (1993). ILO No. 174	1997
Regional Agreements	
• Northeast Atlantic, Annex I: on the prevention and elimination of pollution from land-based sources (1992). This supersedes the 1974 Paris Convention.	1998/1978
• Baltic Sea, Annex III: criteria and measures concerning the prevention of pollution from land-based sources (1992). The 1992 annex supersedes the 1974 annex.	NIF/1980
• Mediterranean Sea, Protocol: (1980, as amended in 1996)	1983/NIF
• Black Sea, Protocol: pollution from land-based sources (1992).	1994
• Gulf/Kuwait, Protocol: pollution from land-based sources (1990).	1993
• South East Pacific, Protocol: pollution from land-based sources (1983).	1986
• Wider Caribbean, Protocol: pollution from land-based sources and activities (1999).	NIF
Explicit Linkages:	
• Freshwater:[1] Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992). ECE	1996
• Airborne Pollution: (Table II-6)	
• Environmental Impact Assessment:	
• Convention on EIA in a Transboundary Context (1991). ECE	1997
• European Community Directives.	
• Nordic Convention (1974).	1976
• Antarctic Protocol, Annex I (1991).	1998
• Emergency Preparedness and Response:	
• Convention on Transboundary Effects of Industrial Accidents (1992). ECE	NIF
• Liability and Compensation:	
• Nordic Convention (1974).	1976
• Convention on Civil Liability for damages resulting from activities dangerous to the environment (1993). Council of Europe	NIF

[1] A complete examination would be required to determine which of the river basin agreements noted in Table II-10 explicitly address impacts to the coastal/marine environment.

Table II-5

Pollution from Offshore Activities	In Force
Global: General	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
• MARPOL 73/78 covers fixed and floating platforms.	II-2
• The London Convention covers fixed and floating platforms, including at-sea disposal of offshore structures.	II-3
Both IMO conventions exempt discharges and dumping from facilities related to seabed minerals development and processing except for certain oil discharges.The IMO is reviewing MARPOL Annex I to clarify applicability to floating oil production and storage units.	
Non-Binding:	
• Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the EEZ (1989). IMO	
• Recommendations on Safety Zones and Safety of Navigation around Offshore Installations and Structures (1989).	
• Code for the Construction and Equipment of Mobile Offshore Drilling Units (1989).	
• Code for the Safe Practice for the Carriage of Cargoes and Persons by Offshore Supply Vessels (1997). IMO	
• *Draft* Recommendations on Training of Personnel on Mobile Offshore Units (1999). IMO	
Global Oil and Gas Activities	
Emergency Preparedness and Response	
• International Convention on Oil Pollution Preparedness, Response and Cooperation (1990). IMO	1995
Non-Binding:	
• Guidelines and Principles on Offshore Mining and Drilling (1982). UNEP	
Regional Oil and Gas and Other Offshore Minerals Activities[1]	
• Northeast Atlantic, Annex III: offshore sources (1992).	1998
• Baltic Sea, Annex VI: offshore activities (1992).	NIF
• Mediterranean Sea, Protocol: exploration and exploitation of the continental shelf and the seabed and its subsoil (1994).	NIF
• Gulf/Kuwait, Protocol: exploration and exploitation of the continental shelf (1989).	1990
Environmental Impact Assessment	
• Convention on EIA in a Transboundary Context (1991). ECE	1997
• Nordic Convention (1974).	1976
Emergency Preparedness and Response	
• See Table II-1 and text at Section II.B.7.	
Liability and Compensation	
• Nordic Convention (1974).	1976
• Convention on Civil Liability for Oil Pollution Damage resulting from Exploration and Exploitation of Seabed Mineral Resources (1977). This Convention covers the North Sea, Baltic Sea, and Northeast Atlantic.	NIF
Other Regional Activities	
The following regional protocols on land-based sources of marine pollution cover discharges from offshore facilities and structures used for purposes other than exploration and exploitation of the seabed/continental shelf:	
• Gulf/Kuwait.	
• Mediterranean Sea.	

[1] *The Northeast Atlantic, Baltic Sea, and Gulf/Kuwait agreements only cover offshore oil and gas, while the Mediterranean Sea Protocol covers all mineral resource activities.*

Table II-6

Pollution From or Through the Air	In Force
Global Agreements	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
Aircraft	
• Convention on International Civil Aviation (1944). ICAO	1947
Ships	
• MARPOL 73/78, Annex VI, Regulations for the Prevention of Air Pollution from Ships (1997). IMO.	NIF
Non-Binding:	
• Technical Code on Control of Emissions of Nitrogen Oxides from Marine Diesel Engines (1998). IMO	
Offshore Installations and Structures	
• MARPOL 73/78 Annex VI applies to fixed and floating platforms and drilling rigs but exempts emissions from offshore activities related to seabed minerals development.	
Greenhouse Gases and Ozone Depletion	
• Framework Convention on Climate Change (1992). UN	1994
• Kyoto Protocol (1997).	NIF
• Vienna Convention for the Protection of the Ozone Layer (1985). UNEP	1988
• Montreal Protocol on Substances that Deplete the Ozone Layer (1987).	1989
Persistent Organic Pollutants (POPs)	
• *Draft* Convention on POPs.	
Regional Agreements	
Land-Based Sources	
All seven regional instruments on land-based marine pollution explicitly cover airborne deposition to the marine environment. In addition, the framework regional agreements (Table I-1) cover airborne sources of marine pollution and the Red Sea/Gulf Aden Convention refers explicitly to airborne sources in its article on land-based sources.	
• Convention on Long-Range Transboundary Air Pollution (1979). ECE	1983
• Protocol on Long-Term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (1984).	1988
• Protocol Concerning the Reduction of Sulphur Emissions or Their Transboundary Fluxes (1985).	1987
• Protocol Concerning the Control of Emissions of Nitrogen Oxides or Their Transboundry Fluxes (1988).	1991
• Protocol Concerning the Control of Emissions of Volatile Organic Compounds (VOCs) or Their Transboundary Fluxes (1991).	1997
• Protocol on Further Reductions of Sulphur Emissions (1994).	1998
• Protocol on POPs (1998).	NIF
• Protocol on Heavy Metals (1998).	NIF
• *Draft* Protocol on integrated acidification, ground-level ozone, eutrophication.	
Offshore Installations and Structures	
The four regional instruments on offshore facilities and structures (Table II-5) cover airborne deposition to the marine environment, although the Baltic Sea agreement is less explicit than the others.	
Ships:	
The Baltic Sea is a sulphur oxide emission control area under MARPOL 73/78 Annex VI.	

Table II-7

Sustainable Fisheries (See also Table II-8, Protected Species) See Maps B1-B8	In Force
Global Agreements	
Fishing	
• UN Convention on the Law of the Sea (1982). UN/DOALOS	1994
• Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (FSA 1995).	NIF
• Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993). FAO	NIF
• Convention on Biological Diversity (1992). UNEP	1993
Non-Binding:	
• Code of Conduct for Responsible Fisheries (1995). FAO	
• UN General Assembly Resolutions on Large-Scale Pelagic Driftnet Fishing and Its Impacts on the Living Marine Resources of the World's Oceans and Seas (1989, 1990, 1991).	
• FAO Global Plans of Action (POAs)	
To reduce the incidental catch of seabirds in long-line fisheries (1999).	
For the conservation and management of sharks (1999).	
For the management of fishing capacity (1999).	
Forthcoming plan on illegal, unreported and unregulated fishing.	
Forthcoming plan to eliminate destructive fishing practices.	
See Table III-3 on Technical and Legal Guidance on Fisheries, Mariculture, and Marine Species.	
Fishing Vessels (See also Table II-1)	
• 1993 Compliance Agreement (above). FAO	NIF
Non-Binding:	
• Standard Specifications for the Marking and Identification of Fishing Vessels (1989). FAO	
Marine Mammals (Table II-8)	
Marine Debris	
• Annex V (Garbage), MARPOL 73/78.	II-2
• London Convention 1972.	II-3
Mariculture	
• Convention on Biological Diversity (1992). UNEP	1993
• Protocol on Biosafety (2000).	NIF
Non-Binding:	
• Code of Practice on the Introductions and Transfers of Marine Organisms (1994). ICES. This supersedes earlier versions of 1973, 1979, and 1990.	
• Code of Conduct for Responsible Fisheries (1995). FAO	
See Table II-8 on Non-Indigenous Species Introductions and GMOs.	
See Table III-3 on Technical and Legal Guidance on Fisheries, Mariculture, and Marine Species.	
Non-Indigenous Species and Genetically Modified Organisms (Table II-8)	

(continued)

Table II-7 (continued)

Sustainable Fisheries (See also Table II-8, Protected Species) See Maps B1-B8	In Force
Regional Agreements (See also Table III-4, Regional Fishery Organizations)	
North Atlantic Ocean	
• Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and Belts (1973) IBSFC	1974
• Convention on Future Multilateral Cooperation in North East Atlantic Fisheries (1980). NEAFC	1982
• Convention for the Conservation of Salmon in the North Atlantic Ocean (1982). NASCO	1983
• Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries (1978). NAFO	1979
• European Community Treaty (1957).	1958
• Agreement to end unregulated fisheries of regulated stocks in the high seas area of the Barents Sea ("Loophole Agreement" 1999).	1999
Central/South Atlantic Ocean	
• International Convention for the Conservation of Atlantic Tunas (1966) and 1984 and1992 Protocols. ICCAT	1969/97/NIF
• Regional Convention on Fisheries Cooperation among African States Bordering the Atlantic Ocean (1991).	1995
• *Draft* treaty on the South East Atlantic Fisheries Organization (SEAFO).	
Mediterranean/Black/Caspian Seas	
• Convention Concerning Fishing in the Black Sea (1959).	1960
• *Draft* Agreement on the conservation and rational use of biological resources of the Caspian Sea (1992).[1]	
Caribbean Sea	
Indian Ocean	
• Western Indian Ocean Tuna Organisation Convention (1991).	1994
North Pacific Ocean/Bering Sea	
• Pacific Salmon Treaty (1985). US/Canada. PSC	1985
• Convention Between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea (1953) and 1979 Protocol. IPHC	1953/1980
• Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean (1992). NPAFC	1993
• Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (1994). CCMPRCBS	1995
Central/Eastern Pacific Ocean	
• Convention for the Establishment of an Inter-American Tropical Tuna Commission (1949). IATTC[2]	1950
• *Selective Gear:* Agreement to Reduce Dolphin Mortality in the Eastern Tropical Pacific Tuna Fishery (1992).	1992
Agreement for the International Dolphin Conservation Programme (1998).	1999
South Pacific Ocean	
• South Pacific Forum Fisheries Agency Convention (1979). FFA	1979
• Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America (1987). FFA This will be superseded by the draft Convention below.	1988
• Agreed Minutes on Surveillance and Enforcement Cooperation.	
• *Draft* Convention on Highly Migratory Fish Stocks in the Central and Western Pacific.	
• Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest (1982) and two implementing arrangements: FFA	1982
• Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region (1992).	1993
• Harmonized Minimum Terms and Conditions of Access (MTC) (1993).	1993

(continued)

Table II-7 (continued)

Sustainable Fisheries (See also Table II-8, Protected Species) See Maps B1-B8	In Force
Regional Agreements (See also Table III-4, Regional Fishery Organizations)	
South Pacific Ocean (continued)	
• Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery (1992). FFA	1995
• Federated States of Micronesia Arrangement for Regional Fisheries Access (1994). FFA	1995
• Convention for the Conservation of Southern Bluefin Tuna (1993). CCSBT	1994
• *Selective Gear:* Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific and 1989 and 1990 Protocols.	1991/92/NIF
• Mariculture: Agreement on the Network of Aquaculture Centres in Asia and the Pacific (1988).	1990
Antarctica/Southern Ocean	
• Convention on the Conservation of Antarctic Marine Living Resources (1980). CCAMLR Commission.	1982

[1] This agreement has not been signed pending resolution of the legal status of the Caspian Sea. UN Doc. A/54/461, 15 Oct. 1999 at para. 9.

[2] It should be noted that the IATTC effectively now replaces the 1983 Eastern Pacific Ocean Tuna Fishing Agreement and Protocol and the 1989 Convention for the conservation, protection and optimal utilization of tuna fish in the Eastern Pacific Ocean, which never entered into force.

Table II-8

Marine Protected Areas and Species (See Maps C1-C8)	In Force
Global Agreements	
Protected Species	
General	
• Convention on International Trade in Endangered Species of Wild Flora and Fauna (1973). UNEP	1975
• Convention on the Conservation of Migratory Species of Wild Animals (1979). UNEP	1983
• Convention on Biological Diversity (1992). UNEP	1993
Non-Binding:	
• World Charter for Nature (1982).	
Marine Mammals	
• UN Convention on the Law of the Sea (1982).	1994
• International Convention on the Regulation of Whaling (1946). Int'l Whaling Commission (IWC)	1948
• SOLAS 1974, mandatory reporting to protect the right whale, see Table II-1 and Section II.D.2. in text.	II-2
Non-Binding:	
• Global Plan of Action for the Conservation, Management and Utilization of Marine Mammals (1984, rev. 1997). UNEP	
Protected Areas	
• UNCLOS, Articles 194.5 and 162.2.x.	1994
• International Whaling Convention 1946: Indian Ocean and Southern Ocean Sanctuaries.	1979/1994
• Convention on Biological Diversity (1992).	1993
• Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971). IUCN	1975
• Convention Concerning the Protection of the World Cultural and Natural Heritage (1972). UNESCO	1975
Non-Binding:	
• Action Plan for Biosphere Reserves (1984) and Seville Strategy and Statutory Framework for the World Network of Biosphere Reserves (1995). UNESCO	
Regional Agreements	
Protected Species	
The following regional and inter-regional agreements have been concluded pursuant to the 1979 Convention on Migratory Species:	1983
• Agreement on the Conservation of Seals in the Wadden Sea (1990).	1991
• Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS 1992).	1994
• Agreement on the Conservation of African-Eurasian Migratory Waterbirds (1995).	1999
• Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS 1996).	NIF
• MOU for the Conservation of African Sea Turtles (1999).	
Marine Mammals	
• Interim Convention on Conservation of North Pacific Fur Seals (1957) and Protocols.[1]	1957
• Annex II: Conservation of Antarctic Fauna and Flora, Antarctic Treaty Protocol on Environmental Protection (1991).	1998
• Convention on the Conservation of Antarctic Seals (1972).	1978
• Agreement on Conservation of Polar Bears (1973). Arctic	1976
• Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic (1992).	1992
• IATTC Agreements on Dolphin Mortality.	II-7

(continued)

Table II-8 (continued)

Marine Protected Areas and Species (See Maps C1-C8)	In Force
Regional Agreements (continued)	
Marine Mammals (continued)	
Non-Binding:	
• Action Plan for the Conservation of Cetaceans in the Mediterranean Sea (1991). UNEP/MEDU	
Sea Turtles	
• Inter-American Convention for the Protection and Conservation of Sea Turtles (1996).	NIF
Marine Protected Areas and Species	
• Mediterranean Sea, Protocol Concerning Specially Protected Areas and Biological Diversity (1995) and 1996 Annexes. This supersedes the 1982 Protocol on Specially Protected Areas.	NIF/1986
• Northeast Atlantic: Annex V on the Protection and Conservation of the Ecosystems and Biological Diversity of the Maritime Area (1998).	NIF
• East Africa, Protocol Concerning Protected Areas and Wild Fauna and Flora (1985).	1996
• South East Pacific, Protocol: conservation and management of protected marine and coastal areas (1989)	1994
• Caribbean Sea, Protocol: specially protected areas and wildlife (1990).	NIF
• Antarctica, Annex II: Conservation of Antarctic Fauna and Flora, Antarctic Treaty Protocol (1991).	1998
Annex V: Area Protection and Management (1991).	NIF
• *Draft* Gulf/Kuwait Protocol on Biological Diversity and Establishment of Special Protected Areas	
Other Regional Protected Areas and Species	
• Convention on the Conservation of European Wildlife and Natural Habitats (1979). Council of Europe. This effectively supersedes the 1950 International Convention for the Protection of Birds.	1982
• African Convention on the Conservation of Nature and Natural Resources (1968). OAU	1969
• ASEAN Agreement on the Conservation of Nature and Natural Resources (1985). ASEAN	NIF
• Convention on the Conservation of Nature in the South Pacific (1976). SPREP	1990
• Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere (1940). OAS	1942
• Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (1994). UNEP	1996
Regional Fishing Agreements (Table II-7)	
Most regional fisheries conventions provide for areas closed to fishing either permanently or during the season when the areas are critical spawning grounds or nurseries.	
Regional Shipping Measures under Global Agreements	
Vessel Routeing and Protected Areas (Table II-1)	
• Two PSSAs have been designated through the IMO:	
The Great Barrier Reef — Australia	
Sabena-Camaguey Achipelago — Cuba	
Special Area Designations Under MARPOL 73/78[2] *	
• Baltic Sea — Annexes I*, II*, V*, VI (sulphur oxide emissions control area)	
• Black Sea — Annexes I*, II, V	
• Mediterranean Sea — Annexes I*, V	
• Gulfs Area (Arabian/Persian) — Annexes I, V	

(continued)

Table II-8 (continued)

Marine Protected Areas and Species (See Maps C1-C8)	In Force
Regional Agreements (continued)	
Special Area Designations Under MARPOL 73/78 (continued)	
• Red Sea — Annexes I, V	
• Gulf of Aden — Annex I	
• Antarctica Treaty Area — Annexes I*, II*, V*	
• North Sea — Annex V*	
• Wider Caribbean — Annex V	
• North West European Waters — Annex I* (North Sea & approaches, Irish Sea & Approaches, English Channel & Approaches, and NE Atlantic immediately west of Ireland)	
Threats to Marine Protected Areas and Species	
Global Agreements	
From Marine Pollution	
• From Ships: Table II-1.	
• From Dumping: Table II-2.	
• From Land-Based Activities: Table II-4.	
• From Offshore Activities: Table II-5.	
• From Airborne Sources: Table II-6.	
From Mariculture: Table II-7.	
From Unsustainable Fisheries: Table II-7.	
From Non-Indigenous Species Introductions: (See also Table II-1)	
• UN Convention on the Law of the Sea (1982)	1994
• Convention on Biological Diversity (1992)	1993
Non-Binding:	
• Code of Practice on the Introductions and Transfers of Marine Organisms (1994). ICES This supersedes earlier versions of 1973, 1979, and 1990.	
• Code of Conduct for Responsible Fisheries (1995). FAO	
• *Draft* Guidelines for the Prevention of Biodiversity Loss Due to Biological Invasions (2000). IUCN	
See Table III-3 on Technical Guidance on Fisheries, Mariculture, and Marine Species..	
From Genetically-Modified Organisms (GMOs):	
• Convention on Biological Diversity (1992).	1993
• Protocol on Biosafety (2000).	NIF
Non-Binding: Same as above	
• Regional Agreements on GMOs:	
• European Union Directive: on the deliberate release into the environment of genetically modified organisms (1990).	
• Convention on Civil Liability for damages resulting from activities dangerous to the environment (1993). Council of Europe	NIF

[1] The Interim Convention and Protocols expired on 14 October 1984.

[2] The designations under Annexes I, II and V become effective once adequate waste reception facilities are available in the surrounding coastal states.

* in effect.

Table II-9

Marine Protected Areas: Values and Protective Measures[1]

Values and Criteria for Designation in the Marine Agreements

- Biological and ecological value, in particular fragile, vulnerable, or unique ecosystems
- Genetic diversity
- Satisfactory population levels of species and their breeding grounds and habitats, with emphasis on flora or fauna in danger of depletion or extinction
- Representative types of ecosystems or ecological processes
- Sites of particular scientific, ecological, economic, aesthetic, historical, archaeological, cultural, tourist, or educational interest
- Wilderness value

Possible Added Value of the Biodiversity Convention:

- Ecosystems and habitats:
  - Containing high diversity or large numbers of endemic or threatened species
  - Required by migratory species
  - Associated with key evolutionary processes
- Species and communities that are:
  - Wild relatives of domesticated or cultivated species
  - Important for research in the conservation and sustainable use of biodiversity (e.g., indicator species)
- Genomes and genes of social, scientific, or economic importance

Protective Measures To Be Applied in the Marine Agreements

- Dumping
- Discharge of wastes, including land-based sources
- Passage of ships and any stopping or anchoring (consistent with international law)
- Fishing, hunting, capture of animals; harvesting of plants
- Introduction of non-indigenous species
- Acts likely to harm or disturb flora or fauna, including the introduction of indigenous species
- Seabed (or subsoil) exploration or exploitation, or the modification of soil or seabed profiles
- Archaeological activities
- Scientific activities
- Tourist activities, including pleasure craft
- Trade in and import/export of animals, parts of animals, plants, parts of plants, or their products or eggs, and of archaeological objects that originate in protected areas and are subject to protection
- *Ex Situ* Conservation Measures
- Protection from the introduction of GMOs

[1] This superficial summary is indicative only.

Table II-10

River Basin Agreements[1] See Maps D1-D8	In Force
Global Conventions	
• UN Convention on the Law of the Non-navigational Uses of International Watercourses (1997). UN	NIF
Non-Binding:	
• Helsinki Rules on the Uses of Waters of International Rivers (1966). ILA	
• Rules on Water Pollution in an International Drainage Basin (1982). ILA	
• Seoul Rules on International Groundwaters (1986). ILA	
Regional Conventions	
Europe/North Atlantic Ocean	
• Protocol Concerning the Constitution of an International Commission for the Protection of the Mosel Against Pollution (1961) and related agreements.	1962
• Agreement for the Protection of the Rhine River Against Chemical Pollution (1976) and Convention on the Protection of the Rhine against Pollution by Chlorides (1976). [Agreement concerning the International Commission for the Protection of the Rhine Against Pollution (1963)] The Convention below will replace the two Agreements, but it will not replace the Chlorides Convention.	1979 1965
• Convention on the Protection of the Rhine (1998).	NIF
• Convention on the International Commission for the Protection of the Elbe (1990).	
• Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992). ECE	1996
• Protocol on Water and Health (1999).	
• Agreement on the Protection of the Rivers Meuse and Scheldt (1994).	
• *Environmental Impact Assessment:* Convention on EIA in a Transboundary Context (1991). ECE[2]	1997
West Africa/South Atlantic Ocean	
• Agreement concerning the River Niger Commission and the Navigation and Transport on the Niger River (1964) and 1973 revision. Convention Creating the Niger Basin Authority (1980) and related agreements.	1966/1973 1982
• Conventions concerning the Status of the Senegal River, and Establishing the Senegal River Development Organization (1972).	
• Convention relating to the Status of the River Gambia, and the Creation of the Gambia River Basin Development Organization (1978).	
• Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System (1987) and related agreements. Zambezi River Authority/Commission	1987
• Agreement on the Establishment of a Permanent Okavango River Basin Commission (Angola, Botswana, Namibia). (1994)	
• Protocol on Shared Watercourse Systems in the Southern African Development Community (SADC) Region (1995).	
Mediterranean/Black/Caspian Seas	
• Convention on Cooperation for the Protection and Sustainable Use of the Danube River (1994).	1998
• Nile Waters Agreement concluded between Egypt and the Sudan (1959).	
Western Asia/East Africa/Indian Ocean	
• Indus Waters Treaty concluded between India and Pakistan (1960).	
• Statute Establishing the Indo-Bangladesh Joint Rivers Commission (1972).	
• Treaty Between the Government of the Republic of India and the Government of the People's Republic of Bangladesh on Sharing of the Ganga/Ganges Waters at Farakka (1996).	
East Asia/South Pacific Ocean	
• Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (1995).	

(continued)

Table II-10 (continued)

River Basin Agreements[1] See Maps D1-D8	In Force
Regional Conventions (continued)	
East Asia/North Pacific Ocean	
North America/Pacific Ocean	
• Treaty Relating to the Cooperative Development of the Columbia River Basin (1961).	
Latin America/Pacific Ocean	
Latin America/South Atlantic Ocean	
• Treaty for Amazonian Cooperation (1978).	1980
• Treaty on the Rio de la Plata Basin (1969) and related agreements.	1970
Caribbean Sea	
• Convention between the United States and Mexico on Boundary Waters (1889).	1890
• Treaty Between the United States and Mexico Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande (1944) and related agreements.	1945
• Treaty for Amazonian Cooperation (1978).[3]	1980
North America/Atlantic Ocean	
• Boundary Waters Treaty between the United States and the United Kingdom on behalf of Canada (1909) and related agreements.	1910
• 1978 Great Lakes Water Quality Agreement.	1978
• 1991 Agreement on Air Quality.	1991
Arctic Ocean	

[1] This list is a work in progress. Useful websites include http://faolex.fao.org, http://terra.geo.orst.edu/users/tfdd, and http://home.att.net/~intlh2olaw.

[2] ECE guidelines and recommendations that support the Convention in respect of international watercourses include guidelines on the ecosystem approach in water management (1993), on the prevention and control of water pollution from fertilizers and pesticides in agriculture (1995), on licensing waste-water discharges from point sources into transboundary waters (1996), and on water-quality monitoring and assessment of transboundary rivers (1996); and recommendations to governments on water-quality criteria and objectives (1993), on the prevention of water pollution (1994), and on specific measures to prevent, control and reduce groundwater pollution from chemical storage facilities and waste disposal sites (1996).

[3] The outflow from the Amazon River is believed to circulate North and West into the Caribbean.

Table III-1

Logical Ocean Units (See Maps)

Regional Seas: Table I-1 lists the regional marine conventions and action plans. The Special Area designations employed by MARPOL 73/78 closely parallel these divisions. (Section II.D.2 and Table II-8)

Regional Fishery Organizations (RFOs): These organs are listed in Tables II-7 and III- 4. In one attempt to indicate the relationship between fisheries management and other regional marine approaches, the World Conservation Monitoring Centre (WCMC) shows the lack of congruence among FAO's statistical areas for reporting fish catches, the regional seas programs, and LMEs (below).[1] It is important to bear in mind, however, that the FAO statistical areas do not fully coincide, and are not intended to fully coincide, with the bodies responsible for fisheries management.

Large Marine Ecosystems (LMEs — Maps D1-D8) are regions of ocean space that extend from near-coastal areas like river basins and estuaries to the seaward boundary of continental shelves and the seaward margins of coastal current systems. On the order of 200,000 or more sq. km, they are characterized by distinct bathymetry, hydrography, productivity, and trophically dependent populations.[2] The concept was originally applied in the context of fisheries management under CCAMLR to take account of predator/prey relationships and environmental factors affecting the survival of target stocks. It has since been adapted to address marine pollution and habitat degradation in the broader context of ecosystems-based ocean management, with links to river basin management.

Several elaborations of these large-scale regional approaches to logical units of ocean assessment and management are presented below. They have more shared features than differences.[3]

The Global International Waters Assessment (GIWA), a four-year, $13 million project of the GEF linking freshwater and marine systems, takes the 50 LMEs as a starting point for its marine units and adds ten, including the Caspian Sea. An additional unit, the Mekong River, is linked to the marine units. The rest are land-locked freshwater systems and the Aral Sea. Approved in 1997 and managed by UNEP,[4] GIWA's goal is to help governments identify priorities for GEF funding.[5] It tackles interconnections between water flow, sediment mobilization, pollution, sustainable fisheries/aquatic resources, habitat degradation, and global climate change, and it covers environmental, political, economic, and social considerations. The assessment should help refine the concepts and geographical boundaries of coastal/marine ecosystems and their wider ecological linkages. As a global process, based on agreed criteria and principles, it should improve the information base for ecosystem management and comparability from region to region. Since it will be integrated with the regional seas programs,[6] it should strengthen regional information resources, regional assessment capabilities, and, ultimately, ecosystem-based management at the regional level.

LMEs: Conservation International (CI — Maps C1-C8) also uses the LMEs as a starting point and has refined and extended the classification to include 74 marine/coastal LMEs or bioregions linked both by physical oceanographic processes and by corresponding distributions in representative species. Following this classification, critical areas were identified on the basis of existing information for species richness and endemism and for key ecological processes that help maintain biodiversity, such as high productivity, upwelling and convergence zones, large estuarine areas, and important corridors for marine migration. A parallel assessment placed the 74 LMEs in one of three categories of threat. The result shows 15 critical areas that are highly threatened, although CI cautions that a more in-depth evaluation of threats will be needed at the regional level to focus the analysis more closely on threatened areas. Another result of the assessment is to identify critical areas that are not highly threatened today where proactive steps may be taken to promote sustainable use and conserve whole ecosystems. http://www.conservation.org/marine/

Marine EcoRegions: The World Wide Fund for Nature (WWF — Maps C1-C8) is in the process of classifying biogeographic units called ecoregions, defined by a characteristic set of natural communities that share a large majority of species, dynamics, and environmental conditions. It has selected 237 globally outstanding ecoregions to represent the best of every major habitat type, including 61marine ecoregions. These take into account species endemism and richness in addition to biogeographic patterns and marine ecosystem dynamics. Their boundaries generally approximate or are nested within LMEs. Analyses of biological, social, and economic factors at a finer scale will be needed to identify key sites for conservation within each ecoregion and the types of conservation activities required. The goals of the initiative are to fully represent all the world's ecosystems in global conservation efforts and to ensure that major regional ecosystems are represented in regional conservation strategies.[7] http://www.wwfus.org/global200

Marine and Coastal Protected Areas (MCPAs): An Ecological Network — Maps C1-C8. MCPAs are usually not on the same order of magnitude as the regions noted above, with the exception of the MARPOL 73/78 Special Area designations. (Section II.D.2) They are included here because they have a vital role to play in ecosystems-based management if construed as part of a network within larger units. The concept of an "ecological network" is still being applied and tested, but its purpose is to establish a coherent system of natural and semi-natural areas that is configured and managed to maintain or restore ecological functions while providing appropriate opportunities for the sustainable use of natural resources. Its complementary elements are core areas, corridors between them, and buffer zones for the network as a whole. In the marine realm, the idea is to combat biodiversity loss by protecting the most critical areas within larger regional units as a system of marine reserves. Countries in several regions are in the process of developing MCPA networks while Canada, Australia, and the Bahamas are designing national approaches.8 The goal of a coherent system does not mean that local and national reasons for designating an MCPA should necessarily conform with system-wide goals, but if the latter are clearly articulated it will be easier for national and international designations to reinforce them.

A major study was released in 1995 identifying priority sites of national and regional interest for the conservation of marine biological diversity. A

(continued)

Global Representative System of Marine Protected Areas[9] (GRSMPA) delineates 18 biogeographic regions where existing protected areas were inventoried. The regions largely parallel the regional seas programs.[10] In each region, GRSMPA recommends as priorities either existing sites where further effort is warranted or new sites needed to complete a fully representative system. Altogether the four-volume report identifies 640 sites of national priority, from which 155 have been selected as regional priorities.[11] Seventy-three of the regional sites have already been designated as protected areas and 82 are new proposals. In the first instance, biogeographic and ecological criteria were used in selecting priorities, supplemented by criteria on naturalness, economic importance, social importance, scientific importance, international or national significance, and practicality/feasibility.[12] It should be noted that the areas studied are primarily subtidal and coastal; the report does not focus on intertidal, estuarine, or wetlands areas. IUCN's World Commission on Protected Areas (WCPA) established eighteen regional networks to undertake the study, and another working group was established after the study was completed to consider the high seas beyond national jurisdiction.

A Systematic Assessment at Increasingly Smaller Scales: The Nature Conservancy's (TNC) Latin America and Caribbean program released a report in late 1999 that classifies the marine environment in the region at three scales to identify geographic priorities for conservation: nine geographic provinces (a modification of the LMEs but on that order of magnitude or slightly smaller); within them, 38 smaller coastal biogeographic regions called marine ecoregions; and within one ecoregion — the Central Caribbean — 51 smaller coastal systems.[13] In addition to using physical and biological features, the coastal systems were classified according to dominant habitat type (e.g., reef, seagrass, upwelling). To determine priorities for conservation action, biological criteria and indicators of conservation status (threats) were used to compare ecoregions within each province. A similar analysis was undertaken to rank coastal systems within the Central Caribbean using additional factors like choosing the least disturbed examples of each habitat type, with some geographic distribution in the upstream/downstream ocean circulation pattern. Other factors included commitment and capacity for marine resources conservation, because this would affect the outcome of proposed actions, and the feasibility of investment in conservation action at the site. The report notes that some portion of each coastal system should be part of a protected area or reserve and indicates that the presence of existing MCPAs influenced the feasibility criterion. It sets the stage for three decades of work on MCPAs to be incorporated into an ecosystems framework in Latin America and the Caribbean. The analysis appears to be the first that systematically ranks threats relative to a comparison of biological/ecological value at increasingly smaller scales, within an ecosystems framework.

ENDNOTES

1 *The Diversity of the Seas: a regional approach*, eds. B. Groombridge and M.D. Jenkins, WCMC Biodiversity Series No. 4 (World Conservation Press, 1996) at page 29, table 8.

2 K. Sherman and D.A. Busch, "Assessment and monitoring of LMEs," *Evaluating and monitoring the health of large-scale ecosystems*, eds. D.J. Rapport, C.L. Guadet, and P. Calow (Springer-Verlag, Berlin 1995); *The Large marine ecosystem (LME) concept and its application to regional marine resources management,* eds. K. Sherman and T. Laughlin, IUCN Marine Conservation Development Reports (IUCN, 1992).

3 For a brief summary of the variations found among some of these classifications, see "Large Marine Ecosystems and Ecoregions: Tools for Marine Conservation," a draft prepared by D. Olson (WWF), E. Dinerstein (WWF), K. Sherman (NOAA-NMFS), and J. Waugh (IUCN-US) in 1999. The WCMC report adds four regional areas to the existing marine conventions and programs. Three of them group more than one LME (North Atlantic, Northeast Pacific, South Africa) and the fourth adds a new subdivision (Southwest Australia). *The Diversity of the Seas, supra* note 1.

4 In collaboration with GESAMP, SCOPE, ICSU, the World Water Council (WWC), Advisory Committee on Protection of the Sea (ACOPS), and regional intergovernmental bodies and national institutions.

5 Of the 24 LMEs that are not located in or near industrialized nations, the GEF is already supporting projects in eleven, with more proposals in preliminary stages. Study of GEF's Overall performance (GEF, 1998) at para. 515. They focus on the Black Sea/Danube River, Mediterranean Sea, Gulf of Guinea LME, Caspian Sea, East Asian Seas/Mekong River, South Pacific Island States, MesoAmerican Barrier Reef, Red Sea/Gulf of Aden, Sulu-Celebes LME, Canary Current LME (Northwest Africa), Yellow Sea LME, Bay of Bengal LME, Baltic Sea, Western Indian Ocean, and South China Sea.

6 Report of the Second Global Meeting of Regional Seas Conventions and Action Plans, UNEP (DEC)/RS.2/10, 11 Aug. 1999 at para. 27.

7 D. Olson and E. Dinerstein, "The Global 200: a representation approach to conserving the earth's most biologically valuable ecoregions," in *Conservation Biology* 12(3): 502-15 (1998); and WWF International Discussion Paper, "Marine Protected Areas: WWF's Role in their Future Development," at http://www.panda.org/resources/publications/water/mpa/mpa.pdf

8 Tundi Agardy, "Creating Havens for Marine Life," *Issues in Science and Technology,* vol. XVI, no. 1 (Fall 1999); "Bahamas to Create No-Take Reserve Network to Protect Fisheries, Fishermen," MPA News, vol. 1, no. 5 (February 2000), http://www.mpanews.org

9 Eds. Graeme Kelleher, Chris Bleakley, Sue Wells (World Bank, 1995). The cooperating agencies in the report were Australia's Great Barrier Reef Marine Park Authority, the World Bank, IUCN and its Commission on National Parks and Protected Areas (CNPPA — now the World Commission on Protected Areas (WCPA)), and WCMC.

10 Antarctic, Arctic, Northwest Atlantic, Northeast Atlantic, Baltic, Wider Caribbean, West Africa, South Atlantic, Central Indian Ocean, Arabian Seas, East Africa, East Asian Seas, South Pacific, Northeast Pacific, Northwest Pacific, Southeast Pacific, Australia/New Zealand.

11 Ninety-eight of these sites lie within the ecoregions identified by WWF.

12 The criteria were initially developed in a report by Kelleher and Kenchington, *Guidelines for Establishing Marine Protected Areas* (IUCN, 1992). They were utilized by the IMO in developing its guidelines for identifying PSSAs and under the Baltic Sea Convention. [*GRSMPA, supra* note 9, vol. 1 at 3-4] A revised edition of the IUCN guidelines has been completed: *Guidelines for Marine Protected Areas,* edited and coordinated by G. Kelleher (IUCN 2000).

13 Kathleen Sullivan Sealey and Georgina Bustamante, *Setting Geographic Priorities for Marine Conservation in Latin American and the Caribbean* (TNC, Arlington, VA, 1999). The report was produced as a collaborative process among 27 marine scientists in the region. It relies on existing information and expert opinion to produce a scientifically-sound analysis of high priority conservation areas. The outer limit of all classifications is the outer boundary of the EEZ, while the outer limit of coastal systems is the 1,000 meter depth contour.

Table III-2

International Marine Species and Protected Areas Information Resources

FAO collects and compiles statistics on fisheries within and beyond national jurisdiction, as reported by governments and pursuant to international fisheries agreements. Its review of the state of world fisheries is the single most authoritative source on fisheries and fish trade on a global basis. The FAO statistical areas do not coincide fully with regional seas, LMEs, or RFOs. FIGIS (Fisheries Global Information System) is being developed by FAO to aggregate national and regional analyses of fisheries data in order to assess population changes. FAO also maintains a database on introductions of aquatic species. http://www.fao.org/fi/statist and http://www.fao.org/waicent/faoinfo/fishery/statist/fisoft/dias/index.htm.

Regional Fishery Organizations (RFOs) compile catch and effort data on harvested populations. Most also collect additional information on fish populations and environmental conditions that affect the distribution, abundance, and productivity of harvested species including, in some cases, dependent or related species or populations. (Tables II-7 and III-4)

Regional Scientific Organizations maintain important biological and environmental information relevant to the condition of marine species. Some, like ICES, play a major role in fish stock assessments and are mandated to advise RFOs; others help organize and coordinate research that improves understanding of marine species and ecosystems and thus helps national governments and RFOs, but they are not formally involved in providing advice. (Tables III-4 and III-7)

The International Center for Living Aquatic Resources Management (ICLARM) in Manila runs Reefbase, a GIS-based database on the world's coral reefs and their resources, and Fishbase, a global database on fish distribution. Reefbase, the official GCRMN database, contains information on more than 7,000 reefs. Fishbase incorporates the updated FAO database on introduced aquatic species. http://www.cgiar.org/iclarm.

Wetlands International holds the most definitive data on wetland ecosystems and waterbird distribution and abundance. It has integrated the Asian Wetlands Bureau, International Waterfowl and Wetlands Research Bureau, and Wetlands for the Americas and represents networks of specialists in more than 100 countries. The organization maintains the database of listed sites for the Ramsar Convention.[1] http://www.wetlands.ca/wia (Americas); http://ngo.asiapac.net/wetlands (Asia-Pacific); http://www.wetlands.agro.nl (Africa, Europe, Middle East).

Birdlife International is the leading source of worldwide information on birds and their habitat, notably seabirds and shorebirds in the oceans context. A partnership of conservation organizations, it compiles information on populations and distribution, threats, and response options. It plays a role in the CMS and works with Wetlands International and IUCN. http://www.wnn.or.jp/wnn-n/w-bird/bli/bli_e.html

WCMC, the World Conservation Monitoring Centre, maintains substantial information resources on protected species and habitat and on national parks and protected areas that includes over 4,000 marine and coastal protected areas. It provides information and capacity-building services in these areas, including database design and management and map-based geographic information systems (GIS). WCMC compiles the definitive Red List of the world's most threatened species and the UN List of Protected Areas on behalf of IUCN and is contracted to undertake specific information management services for CITES, the World Heritage Convention, CMS, and CBD. It has been suggested that the UN List be reviewed and restructured to serve as a unifying thread in reporting under several international agreements.[2] WCMC's marine and coastal programme includes support for Reefbase; the GRSMPA; and mapping and data on global mangrove resources, including protected mangrove sites. These resources will be extended to cover other diverse and productive marine ecosystems and the species they harbor, including seagrass beds, tidal mudflats, and kelp forests. Additional maps are planned of EEZ boundaries, sea turtle nest sites, and the distribution of manatees and dugong. WCMC works with many partners in these initiatives. It was jointly established by IUCN, UNEP, and WWF in 1988 as an independent, non-profit organization. It will become a UNEP center for biodiversity information, monitoring, and assessment in the year 2000. http://www.wcmc.org.uk.

IUCN works closely with WCMC in developing information resources on threatened species and protected areas. It develops the Red List drawing on the more than 100 specialist groups of its Species Survival Commission (SSC), while its World Commission on Protected Areas helps WCMC compile systematic information on protected areas for the UN List. More than 100 fish species appear on the Red List as well as many sea turtles, marine mammals, and seabirds.

BCIS, the Biodiversity Conservation Information System, was launched by IUCN in 1996 as a joint venture with many conservation organizations. It brings together information resources held by more than 1,400 organizations and 10,000 experts from around the world.[3] Its goals are to support environmentally sound decision-making at local, national, regional, and global levels and to strengthen information management capabilities and infrastructure among its member groups. BCIS offers internet access through a decentralized network to data on species and ecosystems, and to information on indicators that help measure threats and the effectiveness of conservation measures. http://www.biodiversity.org.

The **CBD** supports several activities whose goal is to promote the development and sharing of information resources related to biodiversity. The clearinghouse mechanism (CHM) is to promote and facilitate technical and scientific cooperation to strengthen national capabilities in biodiversity information systems. It is to work with relevant international bodies, build on existing facilities, and network with governmental and non-governmental bodies. National CHM focal points are envisaged, linked through the CBD/CHM. The CBD's Global Taxonomy Initiative (GTI) aims to advance the classification of biodiversity through efforts at national, regional and international levels. It will facilitate greater access to and dissemination of information on taxonomy through the CHM, concentrating initially on training and capacity-building. A coordination structure for the GTI is being developed by the CBD secretariat, and regional expert meetings are expected to identify priorities, opportunities, and constraints. Special consideration

(continued)

will be given to setting up regional centers of taxonomic expertise. http://www.biodiv.org and http://www.biodiv.org/chm

The Global Biodiversity Information Facility, launched by OECD in 1999, will establish a global electronic network to facilitate access to and sharing of biodiversity information. It will pull together databases around the world on all the Earth's animals, plants, and micro-organisms, including historical and newly-developing collections. This undertaking will be carried out in collaboration with the CBD/CHM and other sources. An initial step is to standardize names and classifications and create a catalogue of the scientific names of all named species and any synonyms so that there are no ambiguities. A far greater challenge will come at a later stage when the project begins to link the species databases with data on soil, climate, and other environmental factors that help define ecosystem links and how the species are affected by different threats.[4]

1 The Ramsar Convention has encouraged other regions to use the tools developed in the collaborative wetlands initiative in the Mediterranean (MedWet), especially the methodology and database for collecting, managing, and storing inventory data on wetlands. (Res. VII.22)

2 The suggested content would include nationally and internationally-designated sites, comparative information on coverage of international sites, and analysis of coverage and effectiveness. [Jerry Harrison and Mark Collins, "Harmonizing the Information Management Infrastructure for Biodiversity-related Treaties," presented at the International Conference on Synergies and Coordination between Multilateral Environmental Agreements, UN University, Tokyo, 14-16 July 1999]

3 BCIS consortium members are Birdlife International, Wetlands International, WCMC, Conservation International, TRAFFIC, The Nature Conservancy, Botanic Gardens Conservation International, International Species Information System, and IUCN and its SSC, WCPA, CEM, and Environmental Law Programme.

4 Marlise Simons, "Team of Scientists to Prepare A Rolodex of Life on Earth, *New York Times*, July 27, 1999.

Table III-3

TECHNICAL and LEGAL GUIDANCE on Fisheries, Mariculture, and Marine Species Conservation

This list is by no means exhaustive. It identifies some of the major bodies that supplement treaty organizations in developing technical and legal guidance and that serve as a resource for countries and convention processes in crafting technical and policy response options. Examples of guidance issued at the national level are included because they have been recommended by a treaty body to the contracting parties.

TECHNICAL GUIDANCE

Pursuant to the FAO Code of Conduct for Responsible Fisheries (1995):

- FAO Technical Guidelines for Responsible Fisheries.

No. 2. 1996. 54p. (Precautionary Approach to Capture Fisheries and Species Introductions)

No. 4. 1997. 82p. (Fisheries Management, Code Article 7)

No. 5. 1997. 40p. (Aquaculture Development, Code Article 9)

No. 3. 1996. 22p. (Integration of Fisheries into Coastal Area Management)

No. 1. 1996. 91p. (Fishing Operations)

Since the mid-1970s, FAO has issued technical papers and reports of expert consultations that contain technical guidance for fisheries assessment and management. A few more recent publications are noted here. http://www.fao.org/fi/publ

- Principles of hydraulic management of coastal lagoons for aquaculture and fisheries. FAO Fisheries Technical Paper No. 314. 1990. 88p.
- Reference Points for Fisheries Management, FAO Fisheries Technical Paper 347. 1995. 83p.
- Geographic information systems: applications to marine fisheries. FAO Fisheries Technical Paper No. 356. 1996. 335p.
- Individual quota management in fisheries methodologies for determining catch quotas and initial quota allocation. FAO Fisheries Technical Paper No. 371. 1997. 41p.
- Introduction to tropical fish stock assessment. Part I. Manual. FAO Fisheries Technical Paper No. 306.1, Rev. 2. 1998. 407 p.
- Fisheries bioeconomics: Theory, modeling and management. FAO Fisheries Technical Paper No. 368. 1998. 108p.
- A short review of precautionary reference points and some proposals for their use in data-poor situations. FAO Fisheries Technical Paper No. 379. 1998. 30p.
- Integrated Coastal Area Management and Agriculture, Forestry and Fisheries: FAO Guidelines. 1998.
- Technical Note attached to the International POA for Reducing Incidental Catch of Seabirds in Longline Fisheries, and more detailed guidance on mitigation measures found in FAO Fisheries Circular No. 937. 1999. 100p.
- Managing fishing capacity: selected papers on underlying concepts and issues. FAO Fisheries Technical Report No. 386. 1999. 206p.
- FAO Code of Practice for the Full Utilization of Sharks.

Issued jointly by World Bank and FAO:

These organizations are preparing an "implementation guide" for countries to use in designing legislation to implement the 1995 FSA and the 1993 FAO Compliance Agreement. (2000)

Issued by GESAMP:

- Reducing environmental impacts of coastal aquaculture. Rep. Stud. GESAMP No. 47. 1991.
- Monitoring of ecological effects of coastal aquaculture wastes. Rep. Stud. GESAMP No. 57. 1996.
- Towards safe and effective use of chemicals in coastal aquaculture. Rep. Stud. GESAMP No. 65. 1997.
- *Draft* on Integration of Aquaculture into Coastal Management (2000).

Issued at the National Level:

- JNCC guidelines to protect marine mammals from impact by potentially harmful noise levels due to seismic surveys. United Kingdom.[1]
- Guidelines to minimize disturbance to cetaceans from whale-watching operations and from recreation at sea. United Kingdom.[2]

(continued)

POLICY AND LEGAL GUIDANCE: All Fields

- Treaty secretariats usually receive national reports containing relevant national legislation, publish compendiums of this information, and increasingly make the information available on the internet.
- The UN Division for Ocean Affairs and the Law of the Sea (DOALOS) coordinates a centralized system for information and advice on marine legislation and policy. It hosts a website with linkages to FAO, IMO, and other relevant international bodies with specialized collections and maintains several additional databases that supplement this information. Included are multilateral conventions, bilateral delimitation agreements, and growing databases of national marine legislation. http://www.un.org/Depts/los; http://faolex.fao.org; and http://www.imo.org
- ECOLEX, the joint UNEP/IUCN Environmental Law Information Service, provides internet access to comprehensive information on environmental law and policy, including full texts of international agreements. Its goal is a comprehensive system including soft law and published commentary. Country profiles will ultimately feature multilateral and bilateral treaties to which each country is a party, national environmental legislation, and secondary literature on the environment for that country. The service is expected to include a broad consortium of partner institutions. CD-ROM and other publications are contemplated. http://www.ecolex.org

1 ASCOBANS, Report of the 6th Advisory Committee Meeting, Aberdeen, United Kingdom, 12-14 April 1999 at 11.

2 *Ibid.* at 12.

Table III-4

Scientific and Technical Institutional Support — Marine Species

This list does not include the multilateral development banks. It identifies specialized technical institutions that are regional or global, but it is by no means exhaustive.

Global Organizations

Marine Species/Habitat

- WCMC
- Wetlands International
- IUCN
- UNEP

Fisheries/Aquaculture

- FAO
- GESAMP
- ICLARM

Regional Organizations[1]

FAO Regional Fishery Organizations[2]

- Asia-Pacific Fishery Commission (APFIC). Est. 1948. (formerly, Indo-Pacific Fishery Commission)
- Fishery Committee for the Eastern Central Atlantic (CECAF). Est. 1967.
- General Fisheries Commission for the Mediterranean (GFCM). Est. 1949. This includes the Black Sea.
- Indian Ocean Fishery Commission (IOFC). Est. 1967, abolished 1999. It is expected that its Ban of Bengal Committee will be merged with APFIC and that its Gulfs Committee and Southwest Indian Ocean Committee will be established as FAO Article XIV bodies, the latter to deal with non-tuna fisheries of common interest to island and mainland states in the region. IOTC has assumed its tuna functions.
- Indian Ocean Tuna Commission (IOTC). Est. 1993.
- Western Central Atlantic Fishery Commission (WECAFC). Est. 1973. WECAFC is considering the possibility of restructuring as an FAO Article XIV body with potentially binding management functions.

Non-FAO Regional Organizations (The Regional Fishery Conventions are listed at Table II-7.)

- International Council for the Exploration of the Sea (ICES). Est. 1902. North Atlantic.
- International Commission for the Scientific Exploration of the Mediterranean (ICSEM). Est. 1910.
- North Pacific Marine Science Organization (PICES). Est. 1990.
- Southeast Asian Fisheries Development Centre (SEAFDEC).[3] Est. 1967.
- Secretariat of the Pacific Community (SPC).[4] Est. 1947. (formerly, South Pacific Commission)
- Organization for the Asia-Pacific Network of Aquaculture Centres (1988 Agreement, Table II-7)
- Permanent Commission for the South Pacific (CPPS). Est. 1952.
- Latin American Organization for Fishery Development (OLDEPESCA). Est. 1982. OLDEPESCA initiated the Central American Fisheries Research Centre for the Caribbean in 1988.
- South Atlantic Fisheries Commission.[5] Est. 1991.
- Organization of Eastern Caribbean States (OECS). Est. 1981.
- Caribbean Community (CARICOM). Est. 1973.
- Regional Fisheries Committee for the Gulf of Guinea (COREP). 1984 Convention NIF.
- Sub-regional Commission on Fisheries (CSRP) — West Africa. 1985 Convention NIF.
- Gulf Cooperation Council.[6] Est. 1981.

1 See David Freestone, Report on the Role of Regional and Intergovernmental Organizations in Marine Fisheries Management, 30 June 1995. Prepared as a background paper for the London Workshop on Environmental Science, Comprehensiveness and Consistency in Global Decisions on Ocean Issues; and the FAO website at www.fao.org/fi/body/body.asp.

2 These bodies are established either under Article VI (CECAF, IOFC, WECAFC) or XIV (APFIC, GFCM, IOTC) of the FAO Constitution. Those under Article XIV may have the power to adopt potentially binding measures, but only the IOTC has to date assumed this power.

3 Data on subsistence and reef fisheries.

4 Programs on coastal and reef fisheries, oceanic fisheries, and aquaculture.

5 United Kingdom/Argentina.

6 Fisheries research, with some duplication of the IOFC Gulfs Committee.

Table III-5

Technical Guidance on MCPAs and ICAM

Issued by IUCN:

- Guidelines for Marine Protected Areas, 2nd edition, ed. G Kelleher (IUCN, 2000).
- R.V. Salm and J.C. Clark, Marine and Coastal Protected Areas: A Guide for Planners and Managers. 3d ed. (IUCN, 2000)
- Cross-sectoral, Integrated Coastal Area Planning: Guidelines and Principles for Coastal Area Development, John Pernetta and Danny Elder (IUCN, 1993).
- A practical guide to designing and using legal tools for coastal protection and management, including the use of economic instruments, will be published by IUCN in the year 2001. It will feature concrete examples from different biogeographic regions and legal systems.

Issued by the World Bank:

- Environmental Assessment Sourcebook (World Bank, 1991) Update No. 7, "Coastal Zone Management and Environmental Assessment" (March 1994).
- The Noordwijk Guidelines for ICZM were developed by the World Bank in cooperation with UNEP and FAO in 1993 and provide a general framework for Bank projects. See also "Guidelines for Integrated CZM," eds. Jan C. Post and Carl G. Lundin. Environmentally Sustainable Development Studies and Monographs Series No. 9 (1996).
- World Bank Operational Policies, Procedures, and Good Practices on Natural Habitats (OP/BP/GP 4.04).

Issued by GESAMP:

- The contributions of science to integrated coastal management, Rep. Stud. GESAMP No. 61. 1996.
- *Draft* on Integration of Aquaculture into Coastal Management (2000).

Issued by UNEP:

- An approach to environmental impact assessment for projects affecting the coastal and marine environment. UNEP Regional Seas Reports and Studies No. 122. 1990.
- Monitoring coral reefs for global change. Reference Methods for Marine Pollution Studies No. 61. 1993.
- Guidelines for integrated management of coastal and marine areas, with special reference to the Mediterranean Basin. UNEP Regional Seas Reports and Studies No. 161. 1995.
- Environmental Economics for integrated coastal area management: Valuation Methods and policy instruments, T.A. Grigalunas, J. Opaluch and G. Grown, Jr. UNEP Regional Seas Report and Studies No. 164. 1995.
- Guidelines for Integrated Planning and Management of Coastal and Marine Areas in the Wider Caribbean Region. UNEP/CEP. 1996.

Issued by FAO:

- Integrated management of coastal zones. FAO Technical Report No. 327. 1992. 167p.
- Integrated Coastal Area Management and Agriculture, Forestry and Fisheries: FAO Guidelines. 1998. These consider how to incorporate planning for the agriculture, forestry, and fisheries sectors into ICAM.[1]

Issued by GEF/UNDP/IMO:

- Enhancing the Success of Integrated Coastal Management (ICM): Good Practices in the Formulation, Design, and Implementation of ICM Initiatives: Report of the International Workshop on ICM in Tropical Developing Countries, (GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas and Coastal Management Center, Quezon City, 1996).[2]

Issued by UNESCO/IOC:

- Methodological Guide to ICZM. Manuals and Guides No. 36. UNESCO. 1997.

Issued by the Council of Europe:

- The Committee of Ministers of the Council of Europe is expected to recommend application by governments of a Code of Conduct for Coastal Zones and a Model Law on the Sustainable Development of Coastal Zones.[3]

Related to Climate Change:

- "Guidelines to Assist Policy Makers and Managers of Coastal Areas in the Integration of Coastal Management Programmes and National Climate Change Action Plans," Charles Ehler et al., in Ocean and Coastal Management (1997).

1 Report on Oceans and the Law of the Sea, UN Doc. A/53/456, 5 Oct. 1998 at para. 424.

2 Doc. UNEP/CBD/COP/5/INF/6, 17 April 2000 at para. 23.

3 Report of the Second Global Meeting of Regional Seas Conventions and Actions Plans, UNEP (DEC)/RS.2/10, 11 Aug. 1999 at para. 69.

Table III-6

Technical Guidance on Marine Pollution Control

This list is not exhaustive. It identifies three major sources of technical guidance on a worldwide basis, the World Bank, GESAMP, and UNEP, and it uses publications by the Wider Caribbean regional seas program to illustrate how specialized technical guidance directly serves the needs of that region in controlling land-based-source marine pollution. The WHO plays a special role in recommending standards for freshwater quality to protect human health, and these affect pollution borne to the sea by rivers.

Issued by WHO:

- Guidelines for Drinking-Water Quality. 2nd Edition, 1993-1997. 3rd Edition, 2003.

Issued by the World Bank:

- Pollution Prevention and Abatement Handbook: Toward Cleaner Production (1999)
- Environmental Assessment Sourcebook (1991) and Updates, notably:
  - Update No. 7, "Coastal Zone Management and Environmental Assessment" (March 1994)
  - Update No. 13, "Guidelines for Marine Outfalls and Alternative Disposal and Reuse Options" (March 1996)

Operational Directives and Policies, Procedures (BP), Good Practices (GP)

- Environmental Assessment (OP/BP/GP 4.01)
- Environmental Action Plans (OP/BP/GP 4.02)
- Agricultural Pest Management (OP 4.09/GP 4.03)
- Water Resources Management (OP 4.07)[1]
- Forestry (OP/GP 4.36)
- Projects on International Waterways (OP/BP/GP 7.50)

Issued by GESAMP:

- Guidelines for marine environmental assessment. Rep. Stud. GESAMP No. 54. 1994.
- Biological Indicators and their use in the measurement of the condition of the marine environment. Rep. Stud. GESAMP No. 55. 1995.
- *Draft* on Integration of Aquaculture into Coastal Management (2000).

Issued By UNEP:

Since the early 1980s the UNEP regional seas programme has issued a number of scientific and technical assessments and published reference methods for marine pollution studies. A few more recent publications that concentrate on providing technical guidance are noted here. In addition, the GPA Coordination Office plans to issue publications providing guidance on best practice and technical measures for each of the nine source categories defined in the Global Programme of Action and the sectors/activities that produce each. These will also be incorporated into the GPA clearinghouse mechanism: http://www.gpa.unep.org.

- Guidelines for the determination of riverine inputs of contaminants to estuaries. Reference Methods for Marine Pollution Studies. No. 41. 1987.
- Methodology for assessment and control of coastal erosion in West and Central Africa. UNEP Regional Seas Reports and Studies No. 107. 1989.
- An approach to environmental impact assessment for projects affecting the coastal and marine environment. UNEP Regional Seas Reports and Studies No. 122. 1990.
- Standard chemical methods for marine environmental monitoring. Reference Methods for Marine Pollution Studies No. 50 (Rev. 1). 1991.
- Guidelines for monitoring chemical contaminants in the sea using marine organisms. Reference Methods for Marine Pollution Studies No. 6. 1993.
- Monitoring coral reefs for global change. Reference Methods for Marine Pollution Studies No. 61. 1993.

Issued by the Wider Caribbean Regional Seas Programme:

- Appropriate Technology for Sewage Pollution Control in the Wider Caribbean Region, CEP Technical Report NO. 40 (1998).
- Best Management Practices for Agricultural Nonpoint Sources of Pollution, CEP Technical Report No. 41 (1998).

1 The Bank is preparing a Water Resources and Environmental Management Series to support implementation of this policy, presenting practical methodologies, best practice, and lessons learned on managing surface and groundwater resources. This will serve as a contribution to the Global Water Partnership (GWP) and the World Commission on Dams. [*Environment Matters*, Annual Review 1999 at 60-61] See website: www-esd.worldbank.org/water.

Table III-7

Scientific and Technical Institutional Support — Marine Pollution

This list does not include multilateral development banks. It identifies specialized scientific and technical institutions that are global or regional, but it is not exhaustive. Many organizations dealing with marine species and protected areas are increasingly turning their attention to impacts and sources of pollution.

Global Organizations

- GESAMP
- IOC
- IMO
- UNEP
- IAEA Marine Laboratory (Monaco)
- WHO

Lead agency responsibilities for land-based source categories of marine pollution in the clearinghouse mechanism of the Global Programme of Action (GPA):

• Sewage	WHO
• POPs	UNEP
• Heavy metals	UNEP
• Radioactive substances	IAEA
• Nutrients	FAO
• Sediment mobilization	FAO
• Oils	IMO
• Litter	IMO
• Physical alterations and Destruction of habitat	UNEP

Regional Organizations

- ICES
- PICES
- ICSEM

APPENDIX

LIST OF ACRONYMS

ACOPS	Advisory Committee on Protection of the Sea
AEPS	Arctic Environmental Protection Strategy
AIS	Automatic Identification System
AMAP	Arctic Monitoring and Assessment Programme
APEC	Asia Pacific Economic Conference
APFIC	Asia-Pacific Fishery Commission (FAO, originally Indo-Pacific)
ASCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (CMS)
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (CMS)
ASEAN	Association of Southeast Asian Nations
ATCM	Antarctic Treaty Consultative Meeting
BCIS	Biodiversity Conservation Information System
BSEP	Black Sea Environment Programme
CAFF	Conservation of Arctic Flora and Fauna (Arctic Council)
CAR	Caribbean Region (UNEP)
CBD	Convention on Biological Diversity
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCMPRCBS	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
CCSBT	Convention for the Conservation of Southern Bluefin Tuna
CECAF	Fishery Committee for the Eastern Central Atlantic (FAO)
CEG	Criteria Expert Group (POPs)
CEM	Commission on Environmental Management (IUCN)
CEP	Caribbean Environment Programme (UNEP)
CHM	clearinghouse mechanism
CI	Conservation International
CIEL	Center for International Environmental Law
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COBSEA	Coordinating Body of the Seas of East Asia (UNEP)
COFI	Committee on Fisheries (FAO)
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
COP	conference of the parties (to a convention)
CPPS	Permanent Commission for the South Pacific
CSD	Commission on Sustainable Development
DOALOS	Division for Ocean Affairs and the Law of the Sea (UN)
EAF	Eastern African Region (UNEP)
ECE	Economic Commission for Europe (UN)
ECOLEX	Environmental Law Information Service (UNEP/IUCN)
EEZ	exclusive economic zone
EIA	environmental impact assessment
EST	environmentally sound technology
EU	European Union
FAO	Food and Agriculture Organization
FCCC	Framework Convention on Climate Change (UN)
FFA	Forum Fisheries Agency (South Pacific Forum)
FIGIS	Fisheries Global Information System (FAO)
FSA	Fish Stocks Agreement (Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks)
GEF	Global Environment Facility
GCOS	Global Climate Observing System
GCRMN	Global Coral Reef Monitoring Network
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GFCM	General Fisheries Commission for the Mediterranean (FAO)
GIS	geographic information system
GISP	Global Invasive Species Program
GIWA	Global International Waters Assessment (GEF)
GMDSS	Global Maritime Distress and Safety System (IMO)
GMO	genetically modified organism
GOOS	Global Oceanic Observing System
GPA	Global Programme of Action on Protection of the Marine Environment From Land-Based Activities (UNEP)
GRSMPA	Global Representative System of Marine Protected Areas
GTI	Global Taxonomy Initiative (CBD)
GWP	Global Water Partnership
HABITAT	UN Commission on Human Settlements
HS	Harmonized System (of customs codes of the WCO)
HSREG	High Seas Vessel Registration System (FAO)
IACSD	Inter-Agency Committee on Sustainable Development (UN System)
IAEA	International Atomic Energy Agency
IATTC	Convention for the Establishment of an Inter-American Tropical Tuna Commission
IBC	International Bulk Chemical Code (International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IMO))
IBSFC	International Baltic Sea Fishery Commission
ICAM	integrated coastal area management
ICAO	International Civil Aviation Organization
ICCAT	International Convention for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
ICJ	International Court of Justice
ICLARM	International Centre for Living Aquatic Resources Management
ICRI	International Coral Reef Initiative
ICSEAF	International Commission for the South East Atlantic Fisheries
ICSEM	International Commission for the Scientific Exploration of the Mediterranean
ICSU	International Council for Science
IFCS	Intergovernmental Forum on Chemical Safety
IGC	International Gas Carrier Code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IMO)
IGO	intergovernmental organization
IHO	International Hydrographic Organization
ILA	International Law Association
ILO	International Labor Organization
IMDG	International Maritime Dangerous Goods Code (IMO)
IMO	International Maritime Organization
IPHC	International Pacific Halibut Commission
INF	International Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships (IMO)
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOFC	Indian Ocean Fishery Commission (FAO)
IOMC	Interorganizational Programme for the Sound Management of Chemicals (UN System)
IOTC	Indian Ocean Tuna Commission (FAO)
IPCC	Intergovernmental Panel on Climate Change
IPCS	International Programme for Chemical Safety
ISBA	International Seabed Authority
ISM	International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (IMO)
ITLOS	International Tribunal for the Law of the Sea
IUCN	World Conservation Union
IUU	illegal, unreported and unregulated (fishing)
IWC	International Whaling Commission/Convention
LME	large marine ecosystem
LMO	living modified organism
LOS	Law of the Sea

LRTAP	Convention on Long-Range Transboundary Air Pollution
MAB	Man and the Biosphere Programme (UNESCO)
MAIN	Marine Affairs Institutions Network (Asia Pacific)
MARPOL	International Convention for the Prevention of Pollution from Ships
MCPA	marine and coastal protected area
MDB	Multilateral Development Bank
MEA	Millennium Ecosystem Assessment
MEDU	Mediterranean Unit (UNEP)
MEPC	Marine Environment Protection Committee (IMO)
MMTI	Marine Market Transformation Initiative (World Bank)
MOU	memorandum of understanding
MSC	Maritime Safety Committee (IMO)
	Marine Stewardship Council
MSY	maximum sustainable yield
MTC	Minimum Terms and Conditions
NAFO	North Atlantic Fisheries Organization
NAFTA	North American Free Trade Agreement
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	North East Atlantic Fisheries Commission
NGO	non-governmental organization
NIF	not in force
NOWPAP	Northwest Pacific Action Plan (UNEP)
NPAFC	North Pacific Anadromous Fisheries Commission
OAS	Organization of American States
OAU	Organization of African Unity
OECD	Organization for Economic Cooperation and Development
OLDEPESCA	Latin American Organization for Fishery Development
PERSGA	Programme for the Environment of the Red Sea and Gulf of Aden
PIC	prior informed consent
PICES	North Pacific Marine Science Organization (Pacific ICES)
POA	plan of action
POPs	persistent organic pollutants
PSC	Pacific Salmon Commission
PSSA	particularly sensitive sea area (IMO)
RCU	regional coordination unit (UNEP regional seas)
RES	resolution
RFO	regional fishery organization
ROPME	Regional Organization for the Protection of the Marine Environment
SACEP	South Asian Cooperative Environment Programme (UNEP)
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice (CBD)
SCOPE	Scientific Committee on Problems of the Environment (ICSU)
SEAFDEC	Southeast Asian Fisheries Development Centre
SEAFO	South East Atlantic Fisheries Organization
SIDA	Swedish International Development Agency
SIDS	Small Island Developing States
SOLAS	International Convention for the Safety of Life at Sea
SPC	Secretariat of the Pacific Community (formerly, South Pacific Commission)
SPOCC	South Pacific Organizations Coordinating Committee
SPREP	South Pacific Regional Environment Programme
SSC	Species Survival Commission (IUCN)
STCW	International Convention in Standards of Training, Certification and Watchkeeping
TEDs	turtle excluder devices
TNC	The Nature Conservancy
UN	United Nations
UNCED	UN Conference on Environment and Development
UNCLOS	UN Convention on the Law of the Sea
UNGA	United Nations General Assembly
UNDP	UN Development Programme
UNEP	UN Environment Programme
UNESCO	UN Educational, Scientific and Cultural Organization
VOCs	volatile organic compounds
WACAF	West and Central African Region (UNEP)
WCMC	World Conservation Monitoring Centre (UNEP)
WCO	World Customs Organization
WCPA	World Commission on Protected Areas (IUCN)
WCR	Wider Caribbean Region (UNEP)
WECAFC	Western Central Atlantic Fishery Commission (FAO)
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resources Institute
WTO	World Trade Organization
WWC	World Water Council
WWF	World Wide Fund for Nature